Appendix 2: Traffic Analysis

Introduction

Recommendations to reuse excess roadbed for new bicycle lanes along the five-mile study corridor do not remove travel lanes. Excessively wide streets afford the opportunity to install on-street bicycle facilities without affecting traffic operations, and no traffic impact analysis is required. However, existing and future traffic conditions were assessed and vehicular levels-of-service (LOS) were calculated in order to better understand route conditions for cyclists and pedestrians. Data was collected and analyzed at seven major intersections along the study corridor:

Link 1: Shore Parkway Off-ramp/Shore Road South and Bay Parkway;
Link 3: Neptune Avenue and Cropsey Avenue/West 17th Street;
Link 4: Neptune Avenue and West 31st Street;
Link 5: Neptune Avenue and Stillwell Avenue;
Link 5: Neptune Avenue and Ocean Parkway;
Link 6: Neptune Avenue and Coney Island Avenue; and
Link 7: Emmons Avenue and Nostrand Avenue.

Future no-build and build traffic conditions were then identified and analyzed based on a build year of 2005 for the striping of Class 2 bicycle lanes on-street.

Appendix 2: Traffic Analysis

Highway Capacity Manual and Software

The operation of signalized intersections within the study area was analyzed applying the methodologies presented in the 2000 Highway Capacity Manual (HCM2000). These procedures evaluate signalized intersections for average delay per vehicle and level of service (LOS). The capacity analysis methodology separates an intersection approach into lane groups on the basis of the movements occurring during each signal phase. The lane groups are then analyzed to determine the specific vehicular capacity and LOS. This analysis requires the following input parameters: intersection geometry, lane utilization, number and width of travel lanes, on-street parking conditions, locations of bus stops, number of buses stopping per hour, vehicle turning movements, vehicle classification, conflicting pedestrian movements, traffic signal cycle length, and allocation of green time.

The operating characteristics of signalized intersections can be estimated and evaluated by analyzing capacity and performance. The capacity of an intersection represents the throughput of a facility (i.e., the maximum number of vehicles that can be processed in one hour). Capacity analysis results in the volume-to-capacity ratio (v/c ratio) which presents the proportion of capacity (supply) utilized by the existing traffic volume (demand). High v/c ratios (>0.85) indicate some traffic congestion, and low v/c ratios (<0.60) indicate a smooth traffic flow.

The performance of an intersection is based on the estimated average delay time (i.e., the average stopped time per vehicle) for each vehicle utilizing a roadway segment. Delay time is determined by the capacity of a lane group, the amount of green time allotted to a lane group, and the signal cycle length. Delay time is the factor which determines the LOS for a lane group. Short delays correspond to a good LOS while long delays correspond to a poor LOS. For example, an average delay of up to ten seconds per vehicle is categorized as LOS A, and 80 seconds delay is categorized as LOS F. In New York City, an LOS of mid-D, corresponding to average delay of 45 second, is considered acceptable. Table 1 describes the LOS definitions for signalized intersections.

Appendix 2: Traffic Analysis

Table 1: Level of Service Definitions for Signalized Intersections

Flow Quality	Description
Level A	Describes operation with very low delay, i.e., less than or equal to 10 seconds per vehicle. This occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
Level B	Describes operation with delay in the range of >10-20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.
Level C	Describes operation with delay in the range of >20-35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although some may still pass through the intersection without stopping.
Level D	Describes operation with delay in the range of >35-55 seconds per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, longer cycle lengths, or high v/c ratios. Many vehicles stop and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
Level E	Describes operation with delay in the range of >55-80 seconds per vehicle. This is considered 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 occurrences.
Level F	Describes operation with delay in excess of 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with saturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.
Source:	*Highway Capacity Manual*, Transportation Research Board, National Research Council, Washington, D.C., 2000

Appendix 2: Traffic Analysis

Data Collection

As mentioned, a traffic analysis was performed to assure the feasibility of recommendations to narrow the roadway on Shore Parkway South and on Neptune and Emmons avenues to accommodate new pedestrian and bicycle facilities. The studies involved extensive field work, route reconnaissance, and data collection, including automatic and manual traffic volume and vehicle classification counts.

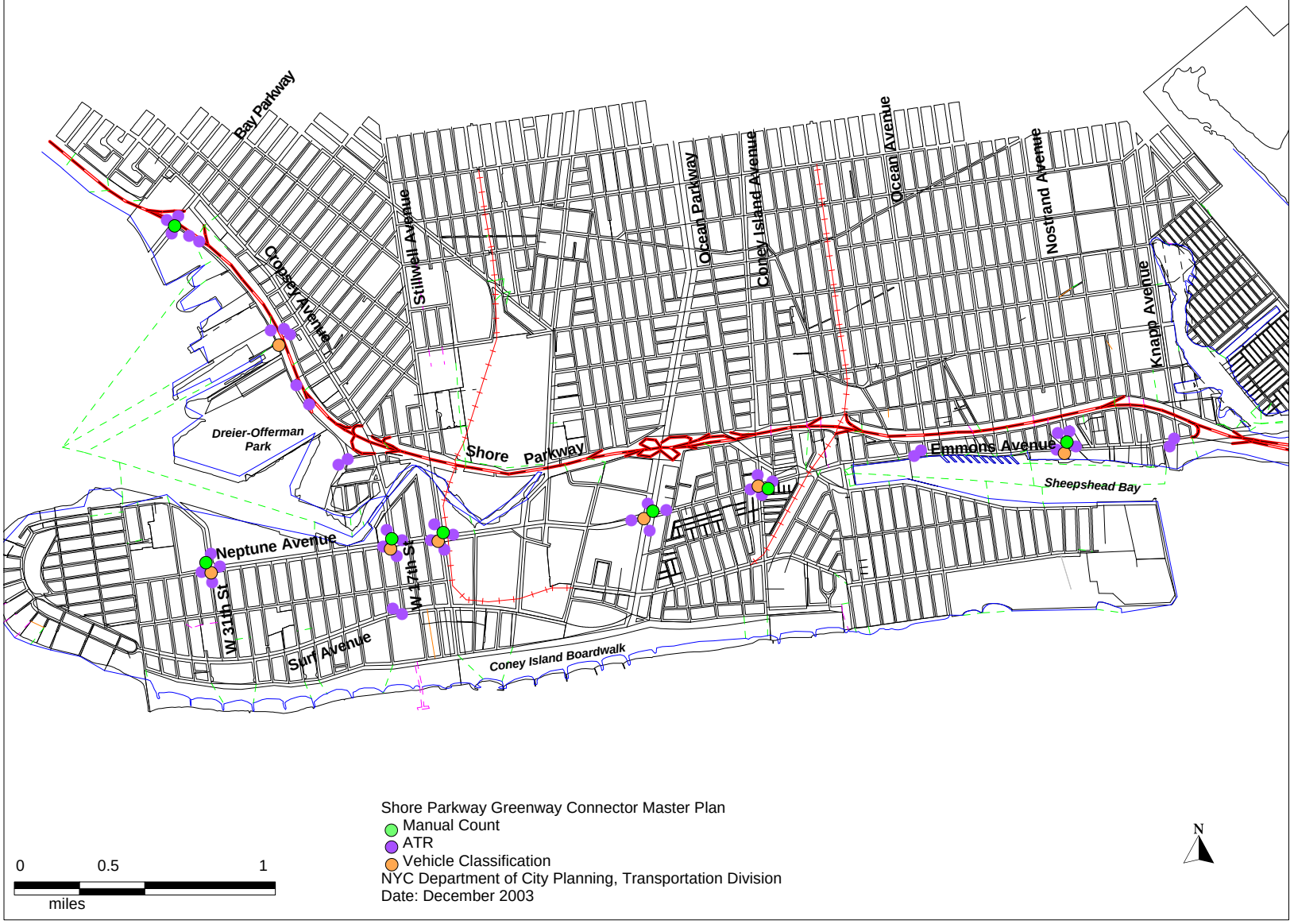
Vehicular Traffic

Forty-two automatic traffic recorders (ATRs) were setup at various locations along the corridor for a two-week period in July 2003. Data was collected in the summer, a period typically considered abnormal for traffic studies, in order to capture the peak seasonal traffic generated by activities on the Coney Island waterfront.

A preliminary AM, MD, PM and weekend peak hour in the corridor was identified using available study area ATRs from the past three years. Then two-hour manual counts were conducted at the seven selected intersections for the AM (7:30-9:30 am), MD (12:00-2:00 pm), PM (4:30-6:30 pm), and weekend (12:00-2:00 pm) peak period during the same period in July when ATR data was collected. Twenty-minute (or one-hundred-vehicle minimum) vehicle classification counts were also conducted at these seven intersections. Map 1 shows automatic and manual count and vehicle classification locations. (Vehicles entering or exiting the mall to/from Shore Road South were counted at three parking lot driveways.)

Appendix 2: Traffic Analysis

Map 1. ATR, Manual Count and Vehicle Classification Count Locations, August 2003



Appendix 2: Traffic Analysis

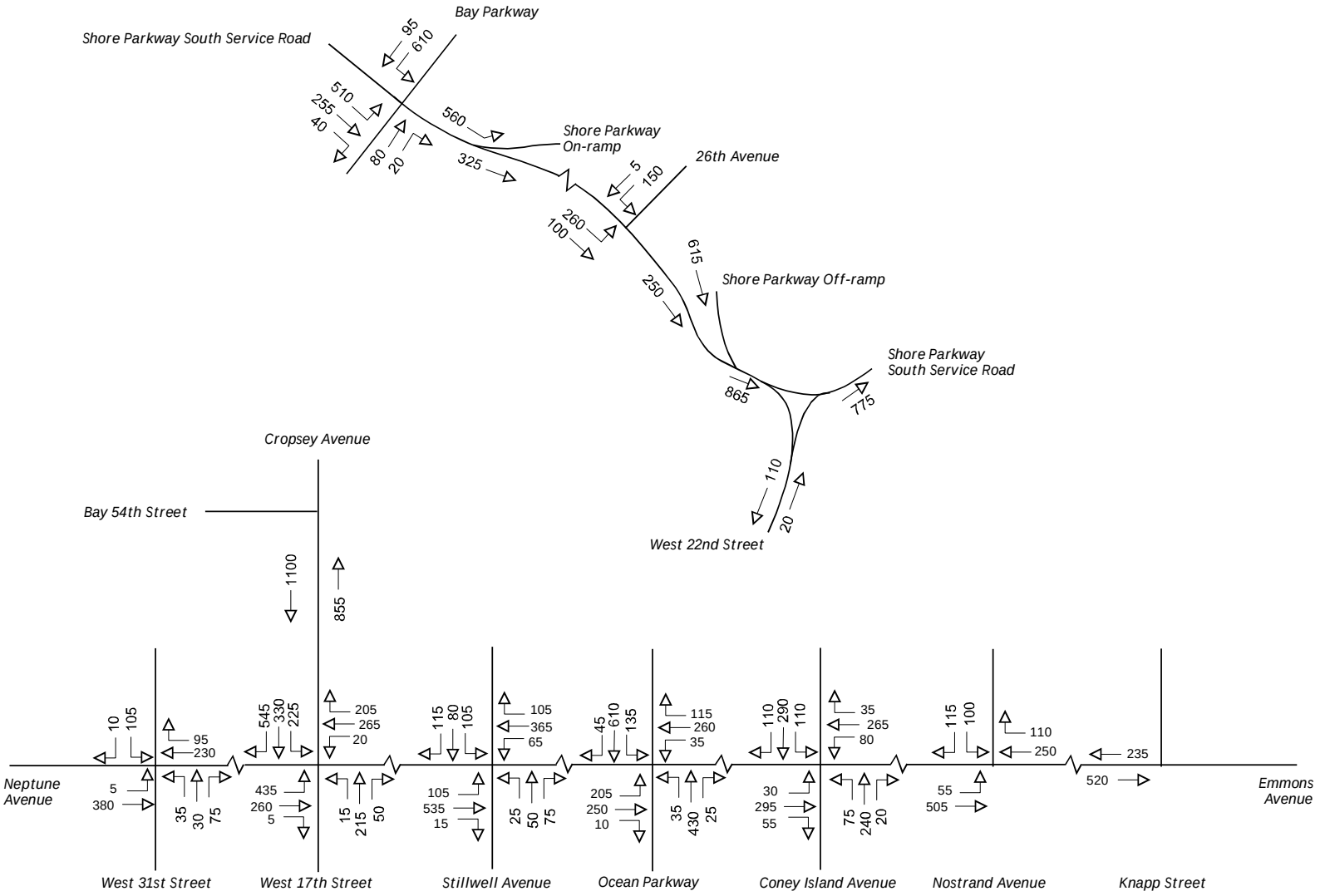
Existing Conditions

Typical weekday and weekend peak hour traffic volumes were compiled for the AM (8:15-9:15 am), MD (1:00-2:00 pm), PM (5:00-6:00 pm), and weekend (Saturday 1:00-2:00 pm) from old and new ATRs, manual counts, and axle factor data. The balanced existing traffic volumes for each period are shown in Figures 1, 2, 3 and 4, respectively. Traffic signal phasing and timing was requested from the City DOT, verified in the field, and reconfirmed with DOT. Bus and parking movements were studied and recorded, and, at key intersections, pedestrians and bicyclists were counted.

Table 2 presents a summary of the existing LOS at the seven intersections. Cropsey and Neptune avenues experience the worst overall traffic conditions, especially the southbound left turn movement. East- west traffic on Neptune Avenue at Stillwell Avenue has a low level of service, perhaps due to the allocation of more green time (76 seconds) to the north- south traffic at the expense of signal time (34 seconds) for the east-west traffic. Eastbound left turns on Neptune Avenue at Ocean Parkway operate poorly at LOS E. During the morning peak hour, the eastbound left and through movements on Emmons and Neptune avenues operate at LOS E due to traffic bound for the Shore Parkway.

Appendix 2: Traffic Analysis

Figure 1

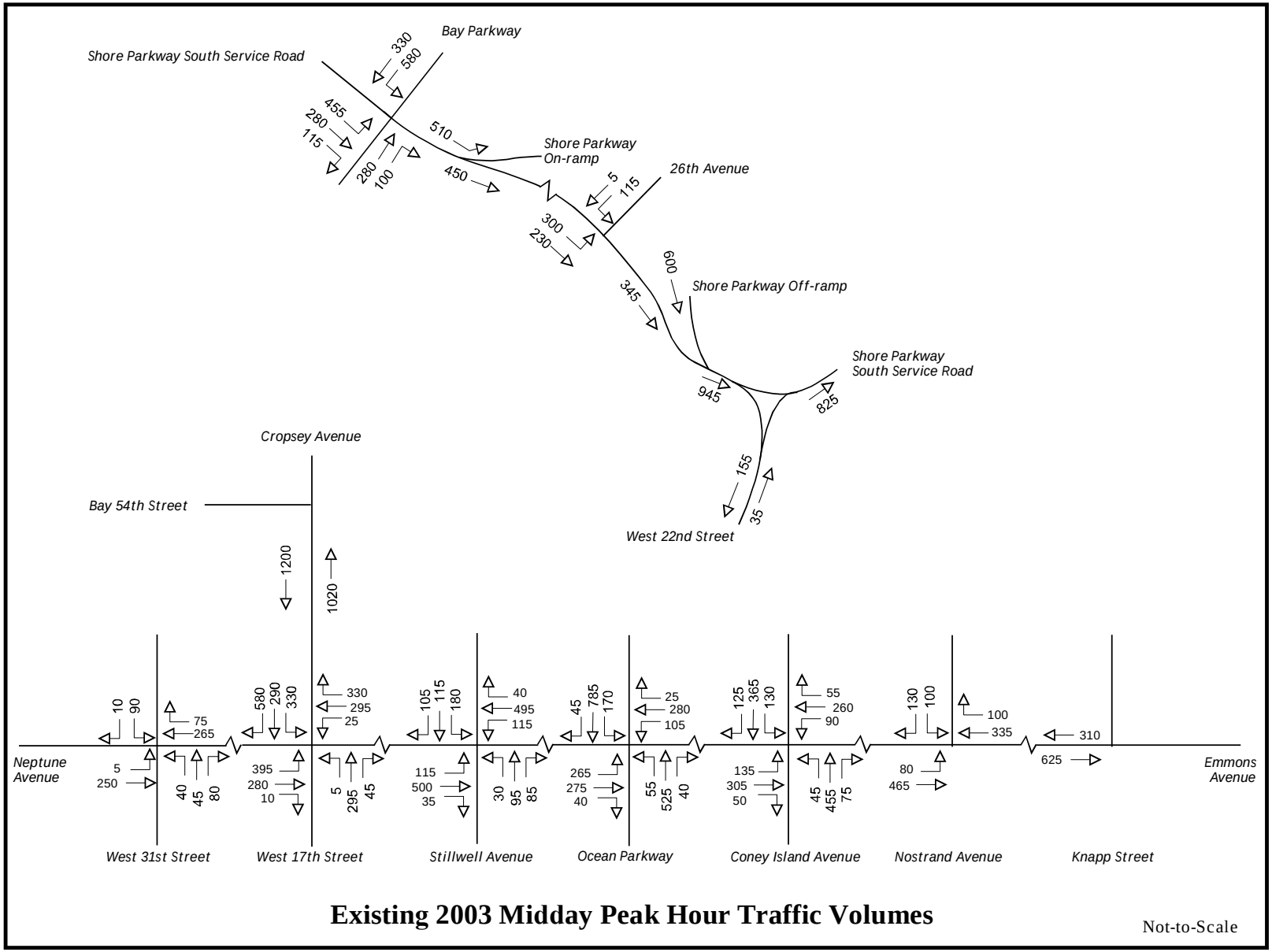


Existing 2003 AM Peak Hour Traffic Volumes

Not-to-Scale

Appendix 2: Traffic Analysis

Figure 2

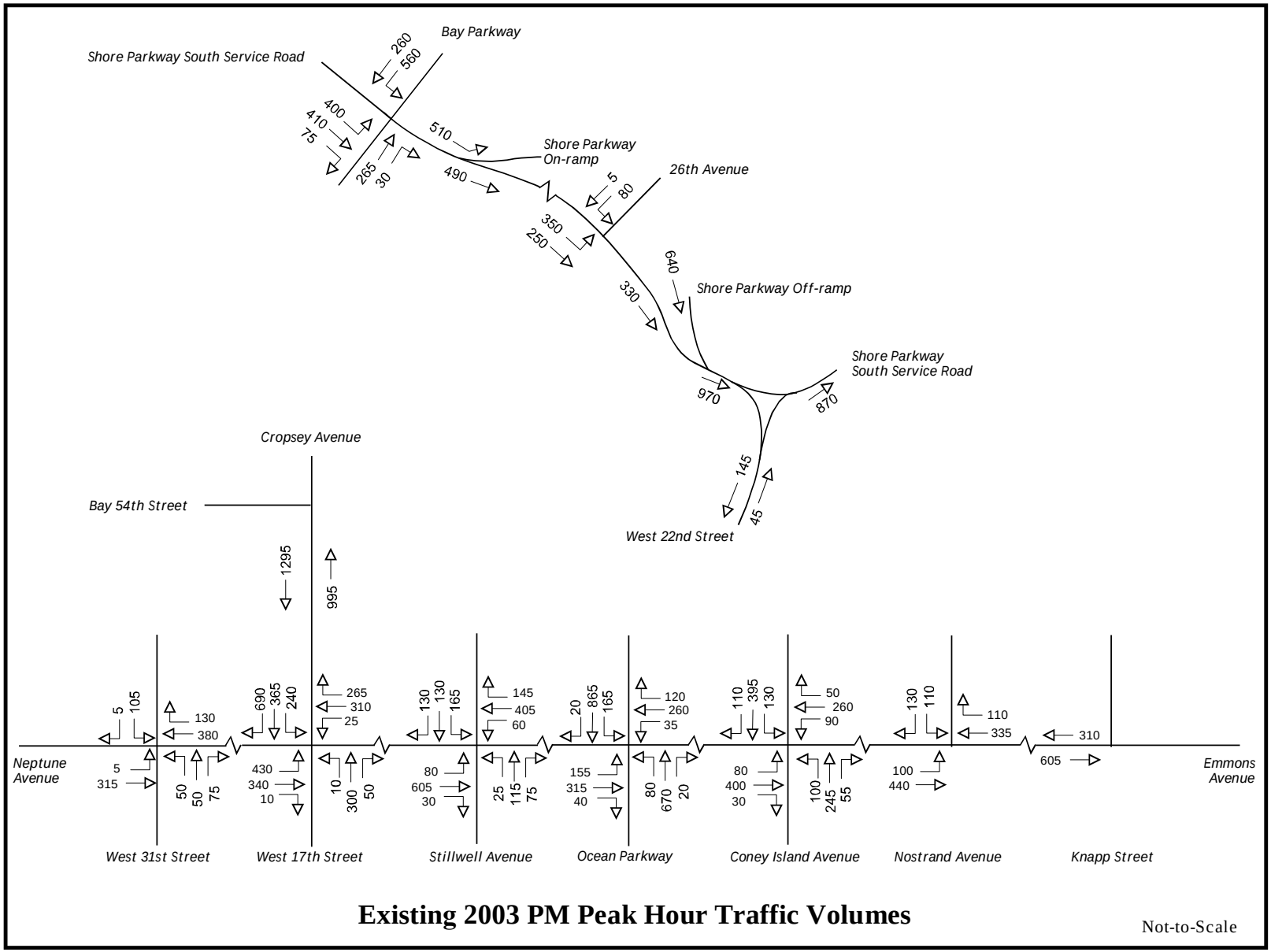


Existing 2003 Midday Peak Hour Traffic Volumes

Not-to-Scale

Appendix 2: Traffic Analysis

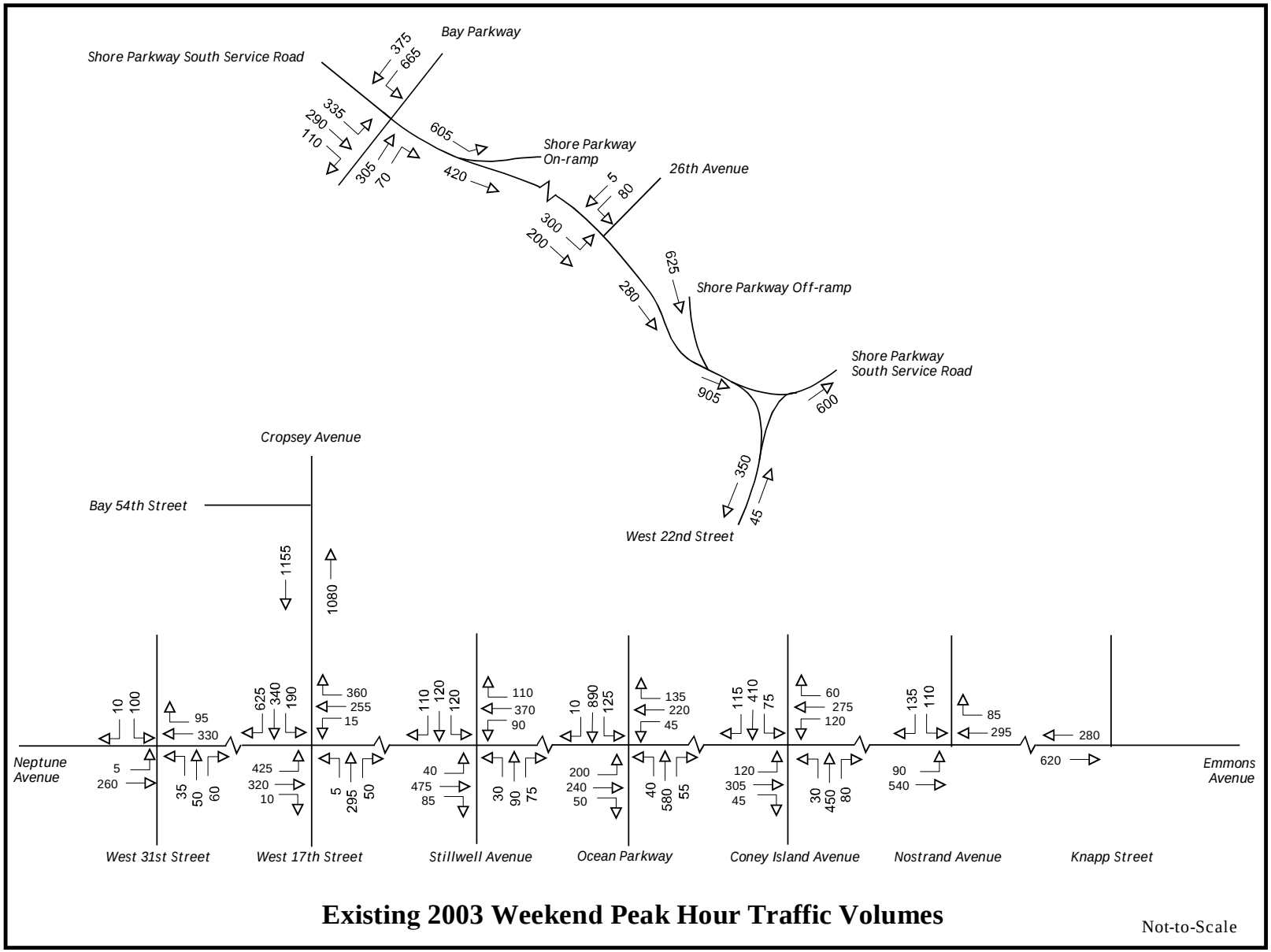
Figure 3



Existing 2003 PM Peak Hour Traffic Volumes

Appendix 2: Traffic Analysis

Figure 4



Existing 2003 Weekend Peak Hour Traffic Volumes

Not-to-Scale

Appendix 2: Traffic Analysis

Table 2

2003 Existing Traffic Conditions

		Weekday									Weekend		
Signalized	Lane	AM (7:15am-8:15am)			MD (1:00pm-2:00pm)			PM (5:00pm-6:00pm)			MD (1:00pm-2:00pm)		
Intersections	Group	V/C Ratio	Delay (sec/veh)	LOS	V/C Ratio	Delay (sec/veh)	LOS	V/C Ratio	Delay (sec/veh)	LOS	V/C Ratio	Delay (sec/veh)	LOS
Shore Pkwy Service Rd (E)	**EB-L**	1.00	79.9	E	0.88	46.6	D	0.80	49.5	D	0.63	31.3	C
Bay Parkway (N-S)	**EB-TR**	0.59	39.2	D	0.80	39.9	D	0.99	77.9	E	0.78	38.7	D
	NB-T	0.13	32.2	C	0.37	28.1	C	0.33	35.1	D	0.40	28.6	C
	NB-R	0.07	31.9	C	0.33	29.2	C	0.09	32.2	C	0.23	27.5	C
	SB-L	0.26	23.6	C	0.33	23.8	C	0.23	24.1	C	0.43	27.2	C
	SB-LT	0.40	38.4	D	0.84	45.2	D	0.60	42.5	D	0.90	52.0	D
Neptune Avenue (E-W)	**EB-LT**	0.29	11.7	B	0.17	10.8	B	0.23	11.2	B	0.19	10.9	B
West 31 Street (N-S)	**WB-TR**	0.17	10.7	B	0.19	10.9	B	0.27	11.6	B	0.23	11.3	B
	NB-LTR	0.37	24.7	C	0.42	25.7	C	0.4	25.3	C	0.34	24.2	C
	SB-L	0.31	24.1	C	0.32	24.4	C	0.34	24.6	C	0.26	23	C
	SB-R	0.03	19.9	B	0.03	19.9	B	0.01	19.8	B	0.02	19.8	B
Neptune Avenue (E-W)	**EB-L**	0.61	15.5	B	0.51	14.5	B	0.61	15.8	B	0.53	14.9	B
Cropsey Avenue (N-S)	**EB-TR**	0.17	10.2	B	0.18	10.3	B	0.23	10.8	B	0.20	10.5	B
	WB-L	0.09	22.2	C	0.12	22.7	C	0.13	23.0	C	0.07	21.9	C
	WB-TR	0.50	26.6	C	0.68	30.5	C	0.62	28.7	C	0.66	29.7	C
	NB-LTR	0.74	38.5	D	0.94	61.4	E	1.00	75.1	E	0.85	45.8	D
	SB-L	0.91	66.8	E	0.98	73.1	E	0.97	78.1	E	0.92	72.9	E
	SB-T	0.61	30.1	C	0.56	28.9	C	0.68	32.5	C	0.61	30.2	C
	SB-R	0.44	12.6	B	0.49	13.4	B	0.56	14.4	B	0.49	13.3	B
Neptune Avenue (E-W)	**EB-LTR(DEF L)**	0.52	19.8	B	0.54	27.6	C	0.54	20	C	0.39	17.8	B
Stillwell Avenue (N-S)	**(EB-TR)**				0.47	19.0	B						
	WB-LTR	0.66	23.8	C	0.83	32.0	C	0.73	26.1	C	0.67	24.2	C
	NB-LTR	0.18	15.8	B	0.22	16.1	B	0.25	16.5	B	0.19	15.8	B
	SB-LTR(DEF L)	0.43	19.1	B	0.44	20.9	C	0.53	20.9	C	0.43	18.9	B
	(SB-TR)				0.46	20.8	C						
Neptune Avenue (E-W)	**EB-L**	0.84	62.3	E	0.93	76.8	E	0.53	31.2	C	0.67	42.8	D
Ocean Parkway (N-S)	**EB-T**	0.45	28.8	C	0.43	27.0	C	0.50	29.5	C	0.37	25.7	C
	EB-R	0.02	21.9	C	0.08	21.4	C	0.08	22.6	C	0.09	21.6	C
	WB-LTR	0.57	39.6	D	0.61	39.2	D	0.55	39.3	D	0.50	36.0	D
	NB-L	0.10	21.1	C	0.17	26.5	C	0.27	31.8	C	0.13	26.8	C
	NB-TR	0.34	29.5	C	0.44	32.3	C	0.56	34.5	C	0.49	33.1	C
	SB-L	0.34	23.1	C	0.45	30.3	C	0.51	36.5	D	0.34	27.5	C
	SB-TR	0.54	32.8	C	0.66	36.8	D	0.77	40.5	D	0.71	38.1	D
Neptune Avenue (E-W)	**EB-L**	0.23	36.6	D	0.48	25.2	C	0.61	55.6	E	0.46	24.7	C
Coney Island Avenue (N-S)	**EB-TR**	0.93	71.2	E	0.62	25.8	C	0.98	77.9	E	0.62	25.6	C
	WB-L	0.76	76.9	E	0.37	22.5	C	0.79	77.3	E	0.48	25.4	C
	WB-TR	0.78	52.7	D	0.56	24.3	C	0.83	57.2	E	0.57	24.1	C
	NB-LTR	0.26	10.1	B	0.49	17.5	B	0.34	11.0	B	0.45	16.8	B
	SB-LTR	0.39	11.5	B	0.68	22.1	C	0.46	12.5	B	0.55	18.6	B
Emmons Avenue (E-W)	**EB-LT**	1.00	69.4	E	0.51	19.6	B	0.57	26.1	C	0.56	20.5	C
Nostrand Avenue (N-S)	**WB-TR**	0.29	20.9	C	0.34	17.1	B	0.35	21.6	C	0.32	16.8	B
	SB-L	0.19	19.9	B	0.16	15.4	B	0.16	19.5	B	0.16	15.4	B
	SB-R	0.25	21.0	C	0.24	16.5	B	0.23	20.5	C	0.23	16.3	B

Shaded area indicates "E" level-of-service.

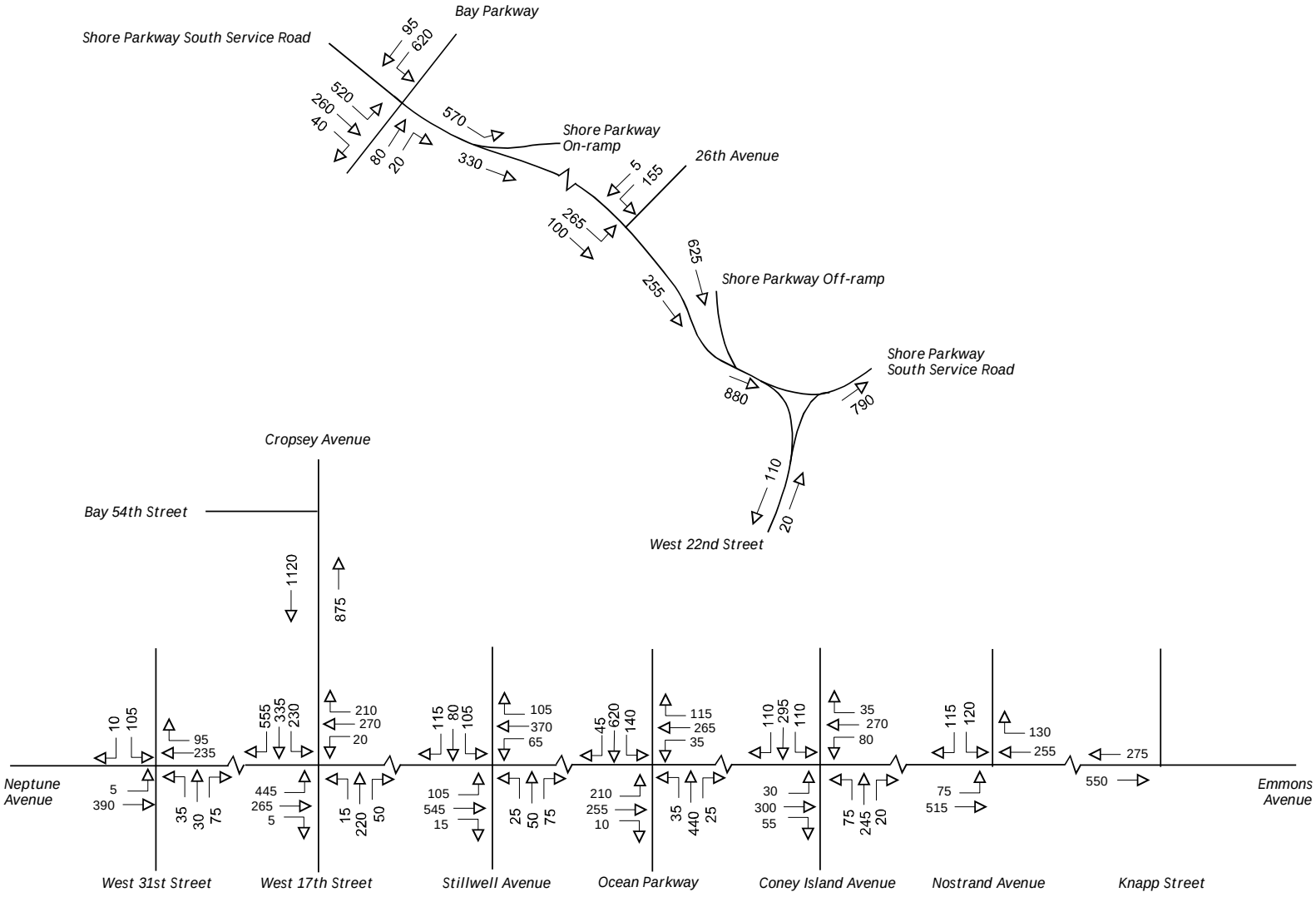
Appendix 2: Traffic Analysis

Future No-Build Conditions

Based on the existing traffic volumes, 2005 future no-build traffic volumes were constructed. A background one percent annual growth rate, as specified for Brooklyn in the updated City Environmental Quality Review (CEQR) Technical Manual, was applied to the existing traffic volume from 2003 to 2004. At year 2004, a 125-unit residential development on Emmons Avenue is planned. Using standard trip generation and assignment methodologies, the number of project-generated trips was calculated and added to the street network. Then another one percent annual growth rate was applied to the 2004 network with development to determine 2005 future traffic volumes for each intersection for each peak hour at as shown in Figures 5, 6, 7, and 8, respectively.

Appendix 2: Traffic Analysis

Figure 5

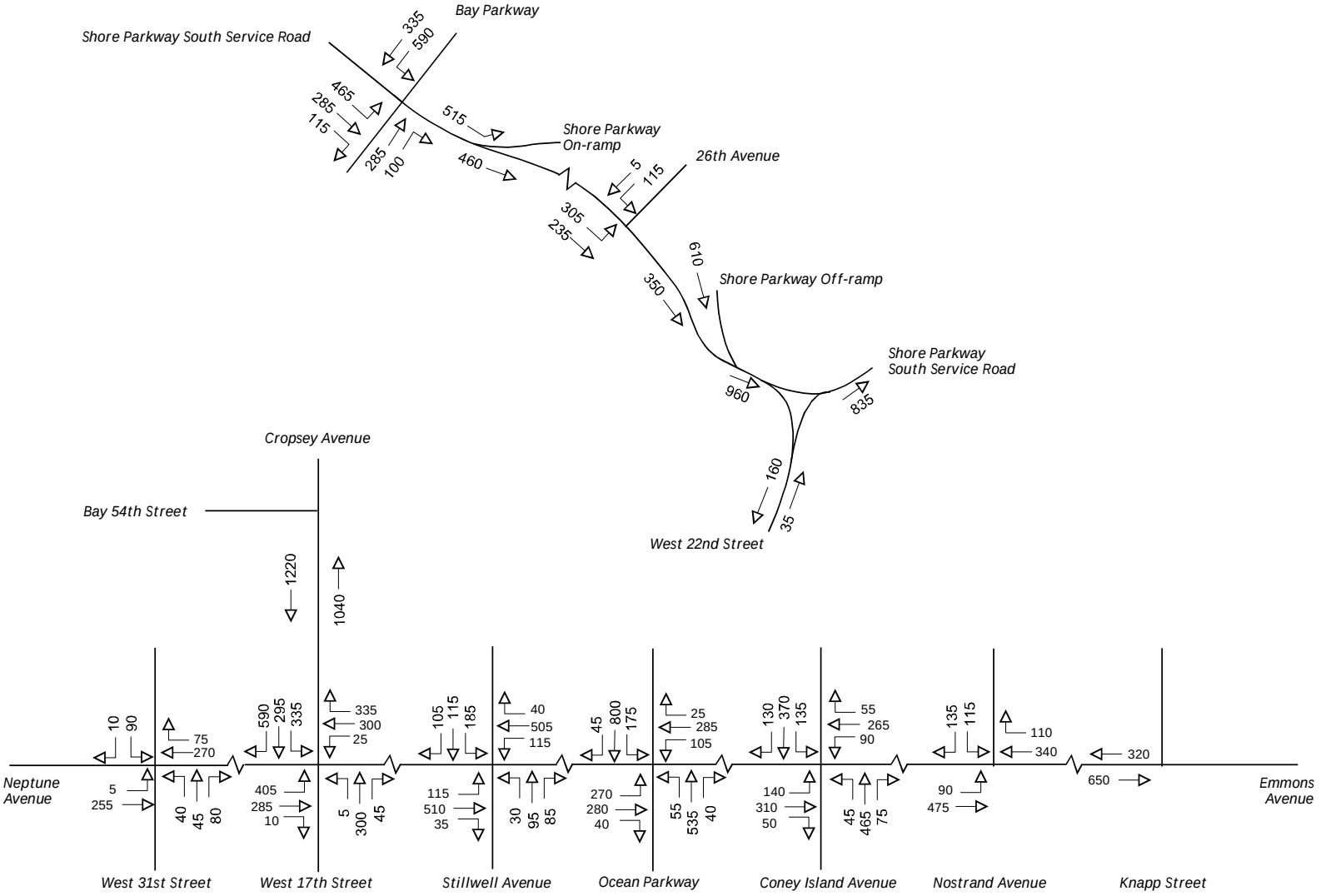


Future No-Build 2005 AM Peak Traffic Volumes

Not-to-Scale

Appendix 2: Traffic Analysis

Figure 6

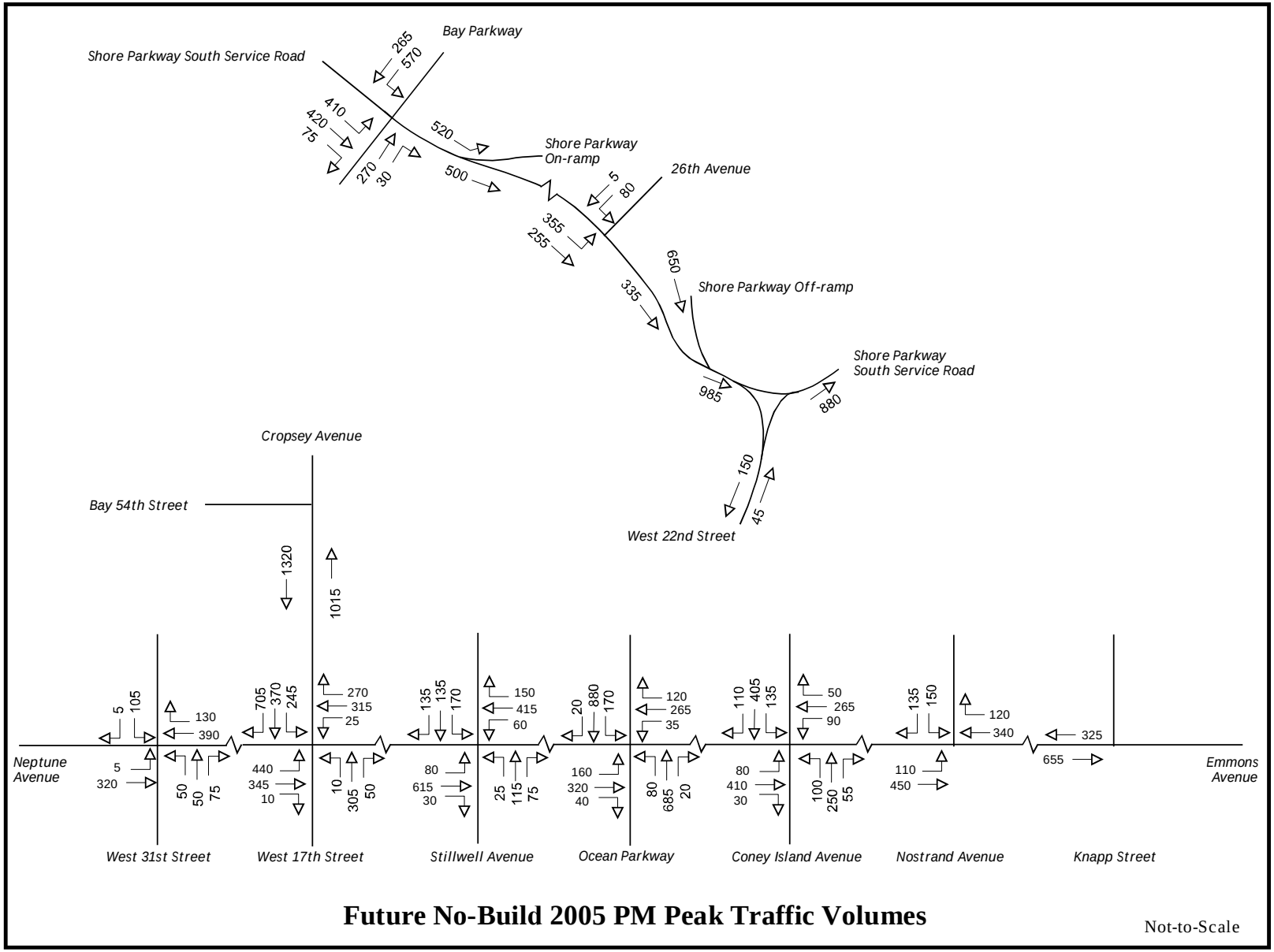


Future No-Build 2005 MD Peak Traffic Volumes

Not-to-Scale

Appendix 2: Traffic Analysis

Figure 7

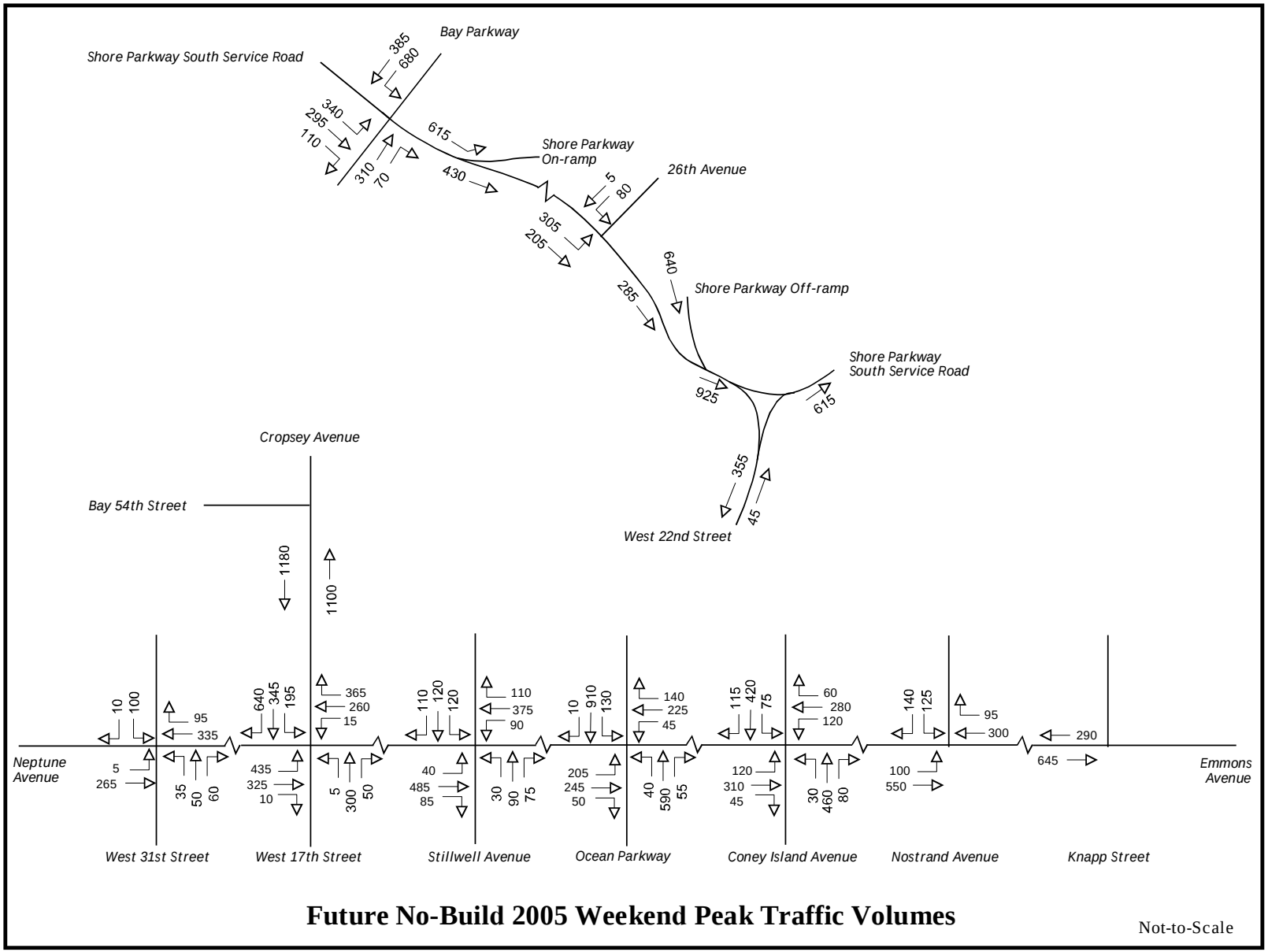


Future No-Build 2005 PM Peak Traffic Volumes

Not-to-Scale

Appendix 2: Traffic Analysis

Figure 8



Future No-Build 2005 Weekend Peak Traffic Volumes

Not-to-Scale

Appendix 2: Traffic Analysis

Table 3

2005 Future No-Build Conditions

		Weekday									Weekend		
Signalized	**Lane**	**AM (7:15am-8:15am)**			**MD (1:00pm-2:00pm)**			**PM (5:00pm-6:00pm)**			**MD (1:00pm-2:00pm)**		
Intersections	**Group**	**V/C Ratio**	**Delay (sec/veh)**	**LOS**	**V/C Ratio**	**Delay (sec/veh)**	**LOS**	**V/C Ratio**	**Delay (sec/veh)**	**LOS**	**V/C Ratio**	**Delay (sec/veh)**	**LOS**
Shore Pkwy Service Rd (E)	**EB-L**	1.02	84.9	F	0.90	49.1	D	0.82	51.2	D	0.64	31.6	C
Bay Parkway (N-S)	**EB-TR**	0.60	39.6	E	0.81	40.6	D	1.01	83.0	F	0.79	39.3	D
	NB-T	0.13	32.2	C	0.37	28.2	C	0.34	35.2	D	0.41	28.6	C
	NB-R	0.08	31.9	C	0.33	29.2	C	0.09	32.2	C	0.23	27.5	C
	SB-L	0.28	24.1	C	0.36	24.4	C	0.25	24.7	C	0.51	28.2	C
	SB-LT	0.41	38.5	D	0.85	46.3	D	0.61	42.8	D	0.93	55.2	E
Neptune Avenue (E-W)	**EB-LT**	0.3	11.8	B	0.18	10.8	B	0.23	11.2	B	0.19	10.9	B
West 31 Street (N-S)	**WB-TR**	0.17	10.8	B	0.2	10.9	B	0.28	11.7	B	0.24	11.3	B
	NB-LTR	0.37	24.7	C	0.42	25.7	C	0.4	25.3	C	0.34	24.2	C
	SB-L	0.31	24.1	C	0.32	24.4	C	0.34	24.6	C	0.26	23	C
	SB-R	0.03	19.9	B	0.03	19.9	B	0.01	19.8	B	0.02	19.8	B
Neptune Avenue (E-W)	**EB-L**	0.62	15.7	B	0.52	14.7	B	0.62	16.1	B	0.54	15.1	B
Cropsey Avenue (N-S)	**EB-TR**	0.17	10.3	B	0.18	10.3	B	0.23	10.8	B	0.20	10.5	B
	WB-L	0.09	22.2	C	0.12	22.7	C	0.13	23.0	C	0.07	21.9	C
	WB-TR	0.51	26.8	C	0.69	30.8	C	0.63	29.0	C	0.67	30.0	C
	NB-LTR	0.75	39.4	D	0.96	64.4	E	1.02	78.8	E	0.86	47.1	D
	SB-L	0.93	70.7	E	0.99	76.7	E	0.99	82.8	F	0.94	77.9	E
	SB-T	0.61	30.3	C	0.57	29.2	C	0.69	32.8	C	0.62	30.5	C
	SB-R	0.44	12.7	B	0.50	13.5	B	0.57	14.6	B	0.50	13.5	B
Neptune Avenue (E-W)	**EB-LTR(DEF L)**	0.53	19.9	B	0.55	28.1	C	0.55	20.2	C	0.4	17.9	B
Stillwell Avenue (N-S)	**(EB-TR)**				0.48	19.2	B						
	WB-LTR	0.67	24	C	0.85	33.1	C	0.75	26.8	C	0.68	24.4	C
	NB-LTR	0.18	15.8	B	0.22	16.1	B	0.25	16.5	B	0.19	15.8	B
	SB-LTR(DEF L)	0.43	19.1	B	0.45	21.1	C	0.55	21.3	C	0.43	18.9	B
	(SB-TR)				0.46	20.8	C						
Neptune Avenue (E-W)	**EB-L**	0.86	66.2	E	0.96	82.3	F	0.55	31.8	C	0.69	44.9	D
Ocean Parkway (N-S)	**EB-T**	0.46	29.0	C	0.44	27.2	C	0.50	29.7	C	0.38	25.8	C
	EB-R	0.02	21.9	C	0.08	21.4	C	0.08	22.6	C	0.09	21.6	C
	WB-LTR	0.57	39.8	D	0.62	39.4	D	0.56	39.5	D	0.51	36.3	D
	NB-L	0.10	21.3	C	0.17	26.9	C	0.27	32.3	C	0.13	27.2	C
	NB-TR	0.35	29.6	C	0.45	32.4	C	0.58	34.7	C	0.50	33.3	C
	SB-L	0.36	23.7	C	0.47	31.1	C	0.53	37.7	D	0.36	28.2	C
	SB-TR	0.55	33.0	C	0.67	37.1	D	0.79	41.0	D	0.73	38.6	D
Neptune Avenue (E-W)	**EB-L**	0.23	36.8	D	0.51	26.0	C	0.61	55.6	E	0.47	25.0	C
Coney Island Avenue (N-S)	**EB-TR**	0.94	74.0	E	0.63	26.0	C	1.00	83.8	F	0.63	25.9	C
	WB-L	0.79	82.3	F	0.37	22.6	C	0.79	77.3	E	0.48	25.7	C
	WB-TR	0.79	53.6	D	0.57	24.5	C	0.84	58.5	E	0.58	24.3	C
	NB-LTR	0.27	10.2	B	0.50	17.6	B	0.34	11.1	B	0.46	16.9	B
	SB-LTR	0.39	11.5	B	0.71	23.0	C	0.48	12.8	B	0.56	18.8	B
Emmons Avenue (E-W)	**EB-LT**	1.16	123	F	0.54	20.2	C	0.61	27.2	C	0.6	21.2	C
Nostrand Avenue (N-S)	**WB-TR**	0.31	21.2	C	0.36	17.2	B	0.36	21.8	C	0.33	16.9	B
	SB-L	0.23	20.5	C	0.18	15.7	B	0.22	20.3	C	0.18	15.7	B
	SB-R	0.25	21	C	0.24	16.6	B	0.23	20.6	C	0.23	16.4	B

Shaded area indicates an "E" or "F" level of service.

Appendix 2: Traffic Analysis

Future Build Conditions

HCS LOS analysis was conducted using the 2005 future no-build traffic volumes, as summarized in Table 3. LOS deteriorated during some or all peak periods, requiring mitigation at five intersections:

1. Shore Parkway Off-ramp/South Service Road and Bay Parkway in the AM, PM, and weekend peak;
2. Neptune Avenue and Cropsey avenues during all peak periods;
3. Neptune Avenue and Ocean Parkway in the AM and Midday peak;
4. Neptune Avenue and Coney Island Avenue in the AM and PM peak; and
5. Emmons and Nostrand avenues in the AM peak period.

Signal timing changes, recommended to address the poor vehicular LOS, improve the performance of each analyzed intersection as summarized in Table 4. Improved traffic conditions would benefit bicyclists and pedestrians by reducing vehicular congestion and facilitating turning movements. Table 5 shows a comparison of the existing and proposed signal timing at each of the five intersections.

Appendix 2: Traffic Analysis

Table 4

2005 Future No-Build Conditions with Recommended Signal Timing Changes

		Weekday									Weekend		
Signalized	**Lane**	**AM (7:15am-8:15am)**			**MD (1:00pm-2:00pm)**			**PM (5:00pm-6:00pm)**			**MD (1:00pm-2:00pm)**		
Intersections	**Group**	**V/C Ratio**	**Delay (sec/veh)**	**LOS**	**V/C Ratio**	**Delay (sec/veh)**	**LOS**	**V/C Ratio**	**Delay (sec/veh)**	**LOS**	**V/C Ratio**	**Delay (sec/veh)**	**LOS**
Shore Pkwy Service Rd (E)	**EB-L**	0.90	55.5	E	0.90	49.1	D	0.73	40.8	D	0.64	31.6	C
Bay Parkway (N-S)	**EB-TR**	0.53	33.8	C	0.81	40.6	D	0.89	54.6	D	0.79	39.3	D
	NB-T	0.14	34.6	C	0.37	28.2	C	0.37	37.9	D	0.44	30.8	C
	NB-R	0.09	34.2	C	0.33	29.2	C	0.10	34.6	C	0.25	29.5	C
	SB-L	0.38	29.2	C	0.36	24.4	C	0.35	29.9	C	0.54	28.0	C
	SB-LT	0.44	40.5	D	0.85	46.3	D	0.66	45.6	D	0.84	43.7	D
Neptune Avenue (E-W)	**EB-LT**	0.3	11.8	B	0.18	10.8	B	0.23	11.2	B	0.19	10.9	B
West 31 Street (N-S)	**WB-TR**	0.17	10.8	B	0.2	10.9	B	0.28	11.7	B	0.24	11.3	B
	NB-LTR	0.37	24.7	C	0.42	25.7	C	0.4	25.3	C	0.34	24.2	C
	SB-L	0.31	24.1	C	0.32	24.4	C	0.34	24.6	C	0.26	23	C
	SB-R	0.03	19.9	B	0.03	19.9	B	0.01	19.8	B	0.02	19.8	B
Neptune Avenue (E-W)	**EB-L**	0.62	17.9	B	0.51	16.8	B	0.61	18.2	B	0.53	17.3	B
Cropsey Avenue (N-S)	**EB-TR**	0.18	12.4	B	0.20	12.5	B	0.26	13.0	B	0.22	12.7	B
	WB-L	0.11	25.4	C	0.14	26.0	C	0.15	26.4	C	0.08	25.0	C
	WB-TR	0.59	31.3	C	0.80	38.4	D	0.73	34.9	C	0.78	36.9	D
	NB-LTR	0.66	30.9	C	0.84	42.7	D	0.90	48.8	D	0.76	34.8	C
	SB-L	0.82	48.1	D	0.88	49.0	D	0.87	54.0	D	0.83	53.1	D
	SB-T	0.54	25.4	C	0.50	24.6	C	0.60	27.0	C	0.55	25.5	C
	SB-R	0.41	10.3	B	0.46	10.9	B	0.53	11.8	B	0.47	10.9	B
Neptune Avenue (E-W)	**EB-LTR(DEF L)**	0.53	19.9	B	0.55	28.1	C	0.55	20.2	C	0.4	17.9	B
Stillwell Avenue (N-S)	**(EB-TR)**				0.48	19.2	B						
	WB-LTR	0.67	24	C	0.85	33.1	C	0.75	26.8	C	0.68	24.4	C
	NB-LTR	0.18	15.8	B	0.22	16.1	B	0.25	16.5	B	0.19	15.8	B
	SB-LTR(DEF L)	0.43	19.1	B	0.45	21.1	C	0.55	21.3	C	0.43	18.9	B
	(SB-TR)				0.46	20.8	C						
Neptune Avenue (E-W)	**EB-L**	0.79	53.6	D	0.82	53.3	D	0.55	31.8	C	0.69	44.9	D
Ocean Parkway (N-S)	**EB-T**	0.44	27.3	C	0.42	24.8	C	0.50	29.7	C	0.38	25.8	C
	EB-R	0.02	20.7	C	0.08	19.6	B	0.08	22.6	C	0.09	21.6	C
	WB-LTR	0.57	39.8	D	0.65	42.0	D	0.56	39.5	D	0.51	36.3	D
	NB-L	0.10	22.8	C	0.19	29.4	C	0.27	32.3	C	0.13	27.2	C
	NB-TR	0.37	31.2	C	0.45	32.4	C	0.58	34.7	C	0.50	33.3	C
	SB-L	0.37	25.4	C	0.51	34.9	C	0.53	37.7	D	0.36	28.2	C
	SB-TR	0.58	34.9	C	0.67	37.1	D	0.79	41.0	D	0.73	38.6	D
Neptune Avenue (E-W)	**EB-L**	0.15	28.3	C	0.51	26.0	C	0.49	40.6	D	0.47	25.0	C
Coney Island Avenue (N-S)	**EB-TR**	0.76	45.0	D	0.63	26.0	C	0.82	46.8	D	0.63	25.9	C
	WB-L	0.48	39.3	D	0.37	22.6	C	0.63	50.6	D	0.48	25.7	C
	WB-TR	0.64	38.5	D	0.57	24.5	C	0.68	40.3	D	0.58	24.3	C
	NB-LTR	0.30	14.2	B	0.50	17.6	B	0.39	15.5	B	0.46	16.9	B
	SB-LTR	0.44	16.1	B	0.71	23.0	C	0.54	18.0	B	0.56	18.8	B
Emmons Avenue (E-W)	**EB-LT**	0.96	53.2	D	0.54	20.2	C	0.61	27.2	C	0.6	21.2	C
Nostrand Avenue (N-S)	**WB-TR**	0.27	16.3	B	0.36	17.2	B	0.36	21.8	C	0.33	16.9	B
	SB-L	0.27	25.9	C	0.18	15.7	B	0.22	20.3	C	0.18	15.7	B
	SB-R	0.3	26.7	C	0.24	16.6	B	0.23	20.6	C	0.23	16.4	B

*Shaded is where changes applied.

Appendix 2: Traffic Analysis

Table 5

2003 Existing and Recommended Signal Timing Changes

INTERSECTION AND APPROACH	AM				MD/SAT				PM			
	Phase	Existing Green	Recommended Green	Y/R	Phase	Phase	Recommended Green	Y/R	Phase	Phase	Recommended Green	Y/R
Shore Pkwy South Service Rd/Bay Pkwy												
EB LTR/	1	37	42	5	1	28	28	5	1	37	42	5
NB Ped/	2	8	8	~	2	8	8	~	2	8	8	~
NB TR /SB LT	3	34	31	5	3	24	22	5	3	34	31	5
SB LT	4	26	24	5	4	15	17	5	4	26	24	5
Cycle Length		*120*				*90*				*120*		
Neptune Avenue/West 31st Street												
EB LT /WB T	1	48.6	63	5.4	1	48.6	48.6	5.4	1	48.6	48.6	5.4
NB LTR /SB LR	2	30.6	47	5.4	2	30.6	30.6	5.4	2	30.6	30.6	5.4
Cycle Length		*90*				*90*				*90*		
Neptune Avenue/Cropsey Avenue												
EB LTR/SB R	1	15.3	15.3	5.4	1	15.3	15.3	5.4	1	15.3	15.3	5.4
EB LTR /WB LTR	2	28.8	24.8	5.4	2	28.8	24.8	5.4	2	28.8	24.8	5.4
NB LTR /SB LTR	3	29.7	33.7	5.4	3	29.7	33.7	5.4	3	29.7	33.7	5.4
Cycle Length		*90*				*90*				*90*		
Neptune Avenue/Ocean Parkway												
EB LTR/	1	9	11	5	1	8	13	5	1	9	9	5
EB LTR /WB LTR	2	34	34	6	2	37	35	6	2	34	34	6
NB LTR /SB LTR	3	42	40	5	3	40	40	5	3	40	40	5
NB L /SB L	4	14	14	5	4	14	11	5	4	16	16	5
Cycle Length		*120*				*120*				*120*		
Neptune Avenue/Coney Island Avenue												
EB LTR /WB LTR	1	34	42	5	1	37	37	5	1	34	42	5
NB LTR /SB LTR	2	76	68	5	2	43	43	5	2	76	68	5
Cycle Length		*120*				*90*				*120*		

Shaded areas indicate change in signal timing.

Appendix 3: Parking Analysis

Introduction

Recommendations developed in Links 1 and 7 propose to eliminate on-street parking and reassign road space as Class 2 bicycle lanes. In Link 1 recommended options to stripe a bi-directional bicycle facility on-street or build a shared-use sidewalk eliminate parking on the south side of Shore Road South. In Link 7 proposed options to stripe bicycle lanes along either the curb or the median remove a lane of parking on Emmons Avenue. Parking capacity and utilization studies were conducted to assess the potential impacts of the recommended actions.

Data Collection

On-street parking conditions were examined on Shore Road South between Bay Parkway and 26th Street, and on Emmons Avenue between Ocean Avenue and Knapp Street. Extensive field work, route reconnaissance, and data collection was completed over the course of several days in Summer 2003 in order to capture the peak seasonal traffic generated by activities on the Coney Island waterfront. For both street segments the study compiled data on curbside parking regulations, the number of available parking spaces, including metered spaces, on each side of the street, and the number of cars parked legally or illegally during the weekday AM, MD, and PM peak hour.

Appendix 3: Parking Analysis

On-Street Parking

Link 1: Existing Conditions
Off-street parking lots at the mall adjacent to the Shore Parkway South Service Road and Bay Parkway provide over 1,200 parking spaces, thereby satisfying most of the parking demand in the area. Shore Road South between Bay Parkway and 26th Street has a total of 118 on-street parallel parking spaces, 101 spaces along the north curb and 17 metered spaces along the south curb. During the AM, MD, and PM peak periods, the occupancy rates along the north curb were 65, 63, and 58 percent, respectively. Combining the17 metered parking spaces and illegal parking on the south curb, the occupancy rates were 68, 70, and 61 percent during the morning, midday, and evening peak periods, respectively. The capacity and utilization rates are shown in Table 1.

Link 1: Future Conditions
The elimination of the 17 parking spaces from the south curb would result in occupancy rates along the north curb of 80, 83, and 72 percent in the AM, Midday, and PM peak hours, respectively. The 101 north-side parking spaces would be sufficient to meet the existing demand, although the removal of metered spaces would result in a loss of revenue.

Link 7: Existing Conditions
Emmons Avenue between Ocean Avenue and Knapp Street provides on-street parking along both the north and south curbs and along either side of the raised/painted median. On eastbound Emmons Avenue there are 26 parallel parking spaces along the south curb and 221 angled parking spaces along the center median; on westbound Emmons Avenue there are 86 parallel parking spaces along the north curb and 150 parallel parking spaces along the median. The total utilization rates during the AM, MD, and PM peak periods (Tables 2 and 3) are 75, 93, and 63 percent, respectively.

Link 7: Future Conditions
The proposed removal of the parallel parking lane along the westbound center median for approximately 10 blocks would result in a loss of 150 spaces, reducing the overall on-street parking supply from 483 to 333 spaces. During the AM peak, 29 spaces, or 9 percent of the existing demand, would not be met. During the MD peak, 118 spaces, or 35 percent of the demand, would not be met. During the PM peak, 92 percent of the available spaces would be occupied, resulting in an excess supply of 28 spaces. The elimination of a parking lane to provide on-street bicycle lanes is not supported by the analysis.

Appendix 3: Parking Analysis

Table 1

Link 1: Existing Parking Capacity and Utilization

Northside - Curbside									Southside - Curbside									
			Number of Spaces Occupied									Number of Spaces Occupied						
			AM		MD		PM					AM		MD		PM		
	Signage*	Available Parking Spaces	Legal	Illegal	Legal	Illegal	Legal	Illegal		Signage*	Available Parking Spaces	Legal	Illegal	Legal	Illegal	Legal	Illegal
Bay Parkway									**Bay Parkway**								
between	3	0	0	0	0	0	0	0	*between*	2, 3, 4	0	0	0	0	0	0	0
Shore Parkway On Ramp									**Shore Parkway On Ramp**								
between	8	22	19	0	16	0	9	0	*between*	2	0	0	0	0	0	0	0
East end of Mall									**East End of Mall**								
between	8	20	20	0	16	0	18	0	*between*	4, 6, 7	9 Meters	2	3	5	3	8	0
After New York Sport Club									**Atlantic Express**								
between	8	22	18	0	21	0	20	0	*between*	4, 6, 7	8 Meters	1	0	4	0	4	1
Bayside Oil									**Bayside Oil**								
between	3, 8	10	6	0	3	0	7	0	*between*	2	0	0	0	0	0	0	0
25th Avenue									**25th Avenue**								
between	8	27	3	0	8	0	5	0	*between*	1	0	0	1	0	0	0	0
Bay 41st Street									**Bay 41st Street**								
between	3	0	0	0	0	0	0	0	*between*	4, 5	0	0	7	0	7	0	0
26th Avenue									**26th Avenue**								

* Posted Signs Chart

1 = No Signage
2 = No Parking Anytime
3 = No Standing Anytime
4 = Bus Stop
5 = Bus No Parking Sign
6 = No Parking 8:30-9am Sat
7 = 3 Hour Parking 9am-9pm
8 = No Parking 9-10:30am Sat

Appendix 3: Parking Analysis

Table 2

Link 7 Existing Parking Capacity and Utilization ~ Eastbound

Eastbound																		
Northside - Median									Southside - Curbside									
Street	Signage*	Available Parking Spaces	Number of Spaces Occupied						Street	Signage*	Available Parking Spaces	Number of Spaces Occupied						
			AM		MD		PM					AM		MD		PM		
			Legal	Illegal	Legal	Illegal	Legal	Illegal				Legal	Illegal	Legal	Illegal	Legal	Illegal	
Ocean Avenue									**Ocean Avenue**									
between	N	19**	1	0	14	0	5	0	*between*	N	0	0	0	0	0	0	0	0
E 21 Street									**E 21 Street**									
between	N	54	39	0	54	2	23	0	*between*	N	0	0	0	0	0	0	0	0
Dooley Street									**Dooley Street**									
between	N	17	17	0	17	1	0	0	*between*	N	0	0	0	0	0	0	0	0
E. 23 Street									**E. 23 Street**									
between	N	2	2	0	2	0	0	0	*between*	N	0	0	0	0	0	0	0	0
Bedford Avenue									**Bedford Avenue**									
between	N	18	18	0	18	0	3	0	*between*	N	0	0	0	0	0	0	0	0
E. 26 Street									**E. 26 Street**									
between	N	20	16	0	17	0	4	0	*between*	N	0	0	2	0	0	0	0	0
E. 27 Street									**E. 27 Street**									
between	N	13	9	0	12	0	12	0	*between*	N	0	0	1	0	0	0	0	0
E. 28 Street									**E. 28 Street**									
between	N	18	3	0	9	0	6	0	*between*	N	0	0	0	0	0	0	0	0
E. 29 Street									**E. 29 Street**									
between	N	18	6	0	9	0	8	0	*between*	N	0	0	0	0	1	0	0	0
Nostrand Avenue									**Nostrand Avenue**									
between	N	30	21	0	26	0	27	0	*between*	N	20	15	1	20	1	18	0	
Batchelder Street									**Batchelder Street**									
between	N	6	3	0	1	0	2	0	*between*	N	5	4	1	5	2	4	0	
Ford Street									**Ford Street**									
between	N	6	6	0	3	0	2	0	*between*	N	0	0	0	0	0	0	0	0
Coyle Street									**Coyle Street**									
between	N	8	6	0	5	0	4	0	*between*	N	1	1	2	0	2	0	2	
Bragg Street									**Bragg Street**									
between	N	11	11	0	7	0	9	0	*between*	N	0	0	0	0	0	0	0	0
Brigham Street									**Brigham Street**									
between	N	0	0	0	0	0	0	0	*between*	N	0	0	0	0	0	0	0	0
Knapp Street									**Knapp Street**									

* N = No Signage
** Parking Meter Spaces

Appendix 3: Parking Analysis

Table 3

Link 7 Existing Parking Capacity and Utilization ~ Westbound

Westbound																		
Southside - Median									Northside - Curbside									
Street	Signage*	Available Parking Spaces	Number of Spaces Occupied						Street	Signage*	Available Parking Spaces	Number of Spaces Occupied						
			AM		MD		PM					AM		MD		PM		
			Legal	Illegal	Legal	Illegal	Legal	Illegal				Legal	Illegal	Legal	Illegal	Legal	Illegal	
Knapp Street									**Knapp Street**									
between	N	9	7	0	7	0	9	0	*between*	N	7	5	0	6	0	7	1	
Brigham Street									**Brigham Street**									
between	N	10	9	0	8	0	9	0	*between*	N	6	4	0	4	0	5	0	
Bragg Street									**Bragg Street**									
between	N	9	9	0	7	0	5	0	*between*	N	6	4	0	6	0	3	0	
Coyle Street									**Coyle Street**									
between	N	7	7	0	6	0	5	0	*between*	N	3	3	0	3	0	1	0	
Ford Street									**Ford Street**									
between	N	6	5	0	4	0	1	0	*between*	N	5	2	1	2	0	2	0	
Batchelder Street									**Batchelder Street**									
between	N	14	10	0	13	1	9	0	*between*	N	5	4	0	4	1	4	0	
Brown Street									**Brown Street**									
between	N	0	0	0	0	0	0	0	*between*	N	1	0	0	0	0	1	0	
Haring Street									**Haring Street**									
between	N	13	10	0	11	0	11	0	*between*	N	12	6	0	8	0	9	1	
Nostrand Avenue									**Nostrand Avenue**									
between	N	8	4	0	5	0	8	0	*between*	N	8	1	0	3	0	5	0	
E. 29 Street									**E. 29 Street**									
between	N	8	5	0	5	0	7	0	*between*	N	8	0	0	4	0	0	0	
E. 28 Street									**E. 28 Street**									
between	N	7	6	1	6	0	4	0	*between*	N	0	0	0	0	1	0	1	
E. 27 Street									**E. 27 Street**									
between	N	13	7	0	9	0	2	0	*between*	N	12	4	0	8	0	6	0	
E. 26 Street									**E. 26 Street**									
between	N	10	8	0	8	0	6	0	*between*	N	4	1	0	3	0	3	0	
Bedford Street									**Bedford Street**									
between	N	1	1	1	1	0	0	0	*between*	N	2	2	0	2	0	1	0	
E. 23 Street									**E. 23 Street**									
between	N	8	8	0	8	0	7	0	*between*	N	7	5	0	7	1	4	0	
Dooley Street									**Dooley Street**									
between	N	27	26	0	27	1	18	0	*between*	N	21**	6	0	20	2	10	0	
E. 21 Street									**E. 21 Street**									
between	N	10**	1	0	4	0	4	0	*between*	N	8**	4	0	5	2	7	0	
Ocean Street									**Ocean Street**									

* N = No Signage
** Parking Meter Spaces

Appendix 4: Accident Analysis

Introduction

An analysis of study area accident data for the last three available years (1998-2000) was conducted at selected intersections to further understand existing conditions along the proposed route. 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 physical damages of $1,000 or more or if there is an injury or fatality. Accidents resulting in less monetary damage or no injuries are designated as non-reportable (which does not mean that a police report was not filed.) Pedestrian and bicycle accidents are reportable by their very nature.

Accidents

Total, reportable, and pedestrian/bicycle accidents were examined at the same seven intersections subject to traffic analysis, as shown in Table 9. Overall, there were not high numbers of accidents along the corridor. The total accidents at all seven intersections averaged less than 25 per year; total reportable accidents averaged less than 13 per year. Neptune Avenue at Ocean Parkway, at Coney Island Avenue, and at Cropsey Avenue/West 17th Street had the highest numbers of total and reportable accidents along the route, but even these three intersections had on average fewer than 22 reportable accidents per year. Neptune Avenue and West 31st Street had the fewest reportable accidents of the seven intersections analyzed, but also had the only fatality recorded during the three-year period.

Table 1

Intersection	Total	Reportable	Fatalities	Pedestrians	Cyclists
Bay Parkway and Shore Road South	59	21	0	6	1
Neptune Avenue and West 31th Street	23	15	1	2	2
Neptune Avenue and Cropsey Avenue/West 17th Street	85	42	0	3	0
Neptune Avenue and Stillwell Avenue	43	19	0	5	0
Neptune Avenue and Coney Island Avenue	112	58	0	7	4
Neptune Avenue and Ocean Parkway	169	95	0	7	0
Emmons Avenue and Nostrand Avenue	30	13	0	0	1

Between 1998 and 2000 there were only 30 total pedestrian accidents, or an average of 10 per year, at all seven intersections combined. Neptune Avenue at Ocean Parkway (seven) and Coney Island Avenue (seven), and Shore Road South at Bay Parkway (six), had the most pedestrian accidents over three years.

Appendix 5: Technical Advisory Committee

The following is a list of individuals and organizations that participated or were invited to participate in this project.

Elected Officials
The Honorable Marty Markowitz, President of the Borough of Brooklyn
The Honorable Lewis A. Fidler, City Council Member, District 46
The Honorable Domenic Recchia, City Council Member, District 47
The Honorable Michael Nelson, City Council Member, District 48
The Honorable Carl Kruger, State Senator, District 21
The Honorable Seymour Lachman, State Senator, District 22
The Honorable Helene E. Weinstein, State Assembly, District 41
The Honorable Steven Cymbrowitz, State Assembly, District 45
The Honorable Adele Cohen, State Assembly, District 46
The Honorable William Colton, State Assembly, District 47

Elizabeth Ernish, Borough President Markowitz's Office
Rodney Knight, Councilmen Recchia's Office
Marc Rivlin, State Senator Lachman's Office
Roslyn Sokol, State Assembly Cymbrowitz's Office
Michael Treybich, State Assembly Cohen's Office

New York City and State Agencies
Jennifer Hoppa, New York City Department of Parks and Recreation
Joshua Laird, New York City Department of Parks and Recreation
Tweeps Phillips, New York City Department of Parks and Recreation
Julius Spiegel, New York City Department of Parks and Recreation
Lori Ardito, New York City Department of Transportation
Holly Haff, New York City Department of Transportation
Dalila Hall, New York City Department of Transportation
Dan Orlando, New York City Department of Transportation
Michael Primeggia, New York City Department of Transportation
Naim Rasheed, New York City Department of Transportation
Carren Simpson, New York City Department of Transportation
Anne Marie Turner, New York City Department of Transportation
Milorad Ubiparip, New York City Department of Transportation
Andrew Vesselinovitch, New York City Department of Transportation
Aizaz Ahmed, New York Metropolitan Transportation Council
Gerard J. Bogacz, New York Metropolitan Transportation Council
Guy La Monaca, New York State Department of Transportation
Roger Weld, New York State Department of Transportation
Community Affairs, Brooklyn South Precinct, NYC Police Dept. Precinct 60
Community Affairs, Brooklyn South Precinct, NYC Police Dept. Precinct 61
Community Affairs, Brooklyn South Precinct, NYC Police Dept. Precinct 62

Community Boards
Howard Feuer, Brooklyn Community Board 11
William R. Guarinello, Brooklyn Community Board 11
Corrado Manfredi, Brooklyn Community Board 11
Brian Gotlieb, Brooklyn Community Board 13
Jeannette LoSciuto, Brooklyn Community Board 13
Chuck Reichenthal, Brooklyn Community Board 13
Ida Sanoff, Brooklyn Community Board 13
Barbara Teitelbaum, Brooklyn Community Board 13
Paula Lupka, Brooklyn Community Board 15
John E. Nikas, Brooklyn Community Board 15

Civic Groups, Associations, Organizations and Citizens
Maggie Bowman, Transportation Alternatives
Noah Budnick, Transportation Alternatives
John Comer, Community School District 22
Edward DeFreitas, Five Borough Bike Club
Diana Gavales, Transportation Alternatives
Heather Jacksy, Transportation Alternatives
Gary Katz, Bicyclist
Dave Lutz, Neighborhood Open Space Coalition
Byron McClenney, Kingsborough Community College
New York Cycle Club
Al Normandia, Sizzling Bicycles
Nostrand Avenue Merchants' Association
Mario Novello, Bath Beach Cycles
Brian Palmer, Coney Island Hospital
Ed Pino, Five Borough Bike Club
Mary Powell, Madison Marine Civic Association
Gil Retrey, Kingsborough Community College
Jeff Sandgrund, Partnership For Parks
Pat Singer, Brighton Neighborhood Association
Louis Spina, Kings Bay Youth Organization
Ellen Susnow, Greater Sheepshead Bay Development Corporation
Pam Tice, Bike New York
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