

**New York City Department of Transportation
Office of School Safety Engineering**



School Safety Engineering Project

FINAL REPORT: I.S. 51 (Edwin Markham), Staten Island



**Prepared by
The RBA Group/Urbitran Associates**



October 25, 2006

**School Safety Engineering Project
Final Report: I.S. 51, Staten Island**

TABLE OF CONTENTS

1. INTRODUCTION 3

 1.1 PROJECT DESCRIPTION 3

2. BACKGROUND—EXISTING CONDITIONS AND ANALYSIS 4

 2.2 NEIGHBORHOOD DESCRIPTION 4

 2.3 MEETING WITH SCHOOL REPRESENTATIVES 5

 2.6 PRIMARY MODES OF TRANSPORT TO AND FROM SCHOOL 6

 2.7 ADDITIONAL STUDENT PEDESTRIAN TRAFFIC GENERATORS 7

 2.8 CROSSING GUARD LOCATIONS..... 7

3. TRAFFIC OPERATIONS 12

 3.1 SCHOOL BUS OPERATIONS 12

 3.2 PARENT DROP-OFF OPERATIONS 12

 3.3 PARKING REGULATIONS 13

 3.4 EXISTING SCHOOL SIGNS AND MARKINGS 13

 3.5 ACCIDENT SUMMARY 15

 3.6 TRAFFIC OPERATIONS AND ISSUES..... 18

 3.6.1 FOREST AVENUE AND WILLOWBROOK ROAD 18

 3.6.2 FOREST AVENUE AND CRYSTAL AVENUE/DECKER AVENUE 21

 3.6.3 FOREST AVENUE AND WILLOW ROAD EAST 21

 3.6.4 FOREST AVENUE AND ARNPRIOR STREET..... 22

 3.6.5 FOREST AVENUE AND PONTIAC STREET..... 22

 3.6.6 HOUSTON STREET/COLLEGE AVENUE AND WILLOWBROOK ROAD 22

 3.6.7 COLLEGE AVENUE AND CRYSTAL AVENUE..... 24

 3.6.8 WILLOWBROOK ROAD AND RIEGELMAN STREET 24

 3.6.9 WILLOWBROOK ROAD AND WILLOWBROOK COURT..... 24

 3.6.10 COLLEGE AVENUE AND BRYSON AVENUE 24

3.6.11 COLLEGE AVENUE AND COLLFIELD AVENUE..... 24

3.7 SIGNAL TIMING 25

3.8 PHYSICAL CONDITIONS..... 25

 3.8.1 ROADWAYS AND SIDEWALKS..... 25

 3.8.2 PEDESTRIAN RAMPS 27

4. POTENTIAL MEASURES TO IMPROVE STUDENT PEDESTRIAN SAFETY..... 28

4.1 SHORT-TERM MEASURES..... 28

4.2 LONG-TERM MEASURES 30

EXHIBITS

EXHIBIT 1 - AERIAL PHOTOGRAPH 8

EXHIBIT 2 - CATCHMENT AREA..... 9

EXHIBIT 3 - SCHOOL TRAFFIC SAFETY MAP..... 10

EXHIBIT 4 - CROSSING GUARD LOCATION 11

EXHIBIT 5 - EXISTING PARKING REGULATIONS 27

EXHIBIT 6 - ACCIDENT SUMMARY (1998-2000)..... 17

EXHIBIT 7 - POTENTIAL MEASURES TO IMPROVE STUDENT PEDESTRIAN SAFETY 32

TABLES

TABLE 1: MODES OF TRAVEL 7

TABLE 2: ACCIDENT SUMMARY OF NYS DMV DATA (1998-2000) 15

TABLE 3: ACCIDENT SUMMARY OF NYC PD DATA (2001-2004) 16

TABLE 4: PEDESTRIAN CROSSING TIMES AT SIGNALIZED INTERSECTIONS..... 25

APPENDIX


SPEED SURVEY DATA.....A8-A11

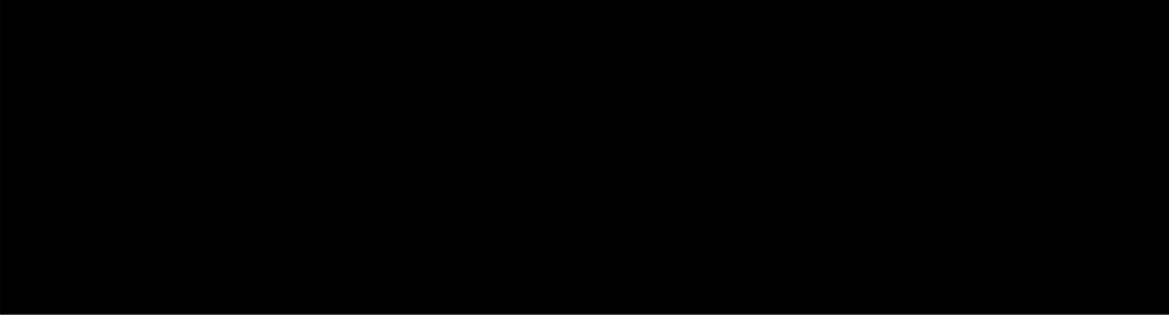
1. INTRODUCTION

1.1 PROJECT DESCRIPTION

The Department of Transportation (DOT) has developed school safety maps for 1,471 schools throughout the City. Schools currently in the program are primarily elementary and intermediate schools with an enrollment of at least 250 students. The safety plans include the designation of official school crosswalks, identified by prominent warning signs and roadway markings. DOT also designates curbside locations for school bus loading and unloading and other parking controls to improve conditions for students. In addition, nearly 600 speed reducers (humps) have been installed in the immediate vicinity of schools.

Under this consultant study, the School Safety Engineering Project, crash data in the vicinity of all program schools was reviewed. As a result, schools were ranked in terms of pedestrian safety, and 135 “priority” schools were identified Citywide. At each of these priority schools, safety improvements are being recommended (e.g., new school crosswalks, new traffic signals and signal timing modifications, new speed reducers). In addition, 32 of these schools will receive further investigation to design physical improvements (e.g., raised center medians, widened sidewalks, “neckdowns” or “bulbouts” at intersections). I.S. 51 (Edwin Markham) in Staten Island is one of the 135 “priority” schools identified by the New York City Department of Transportation, Office of School Safety Engineering.

2. BACKGROUND—EXISTING CONDITIONS AND ANALYSIS



2.2 NEIGHBORHOOD DESCRIPTION

Exhibit 1 shows an aerial view of the neighborhood surrounding the school. I.S. 51 is bounded by Houston Street to the south, Willow Road East to the west, Forest Avenue to the north, and Willowbrook Road to the east. Willow Road East is also aligned east of, and parallel to, the Martin Luther King Jr. Expressway (NY Route 440). The land uses in the vicinity of the school are generally low-density residential, with single-family houses to the east and south of the school. Forest Avenue to the north is a designated local truck route. The intersections of Forest Avenue and Willow Road East, and Forest Avenue and Willowbrook Road, carry high traffic volumes.



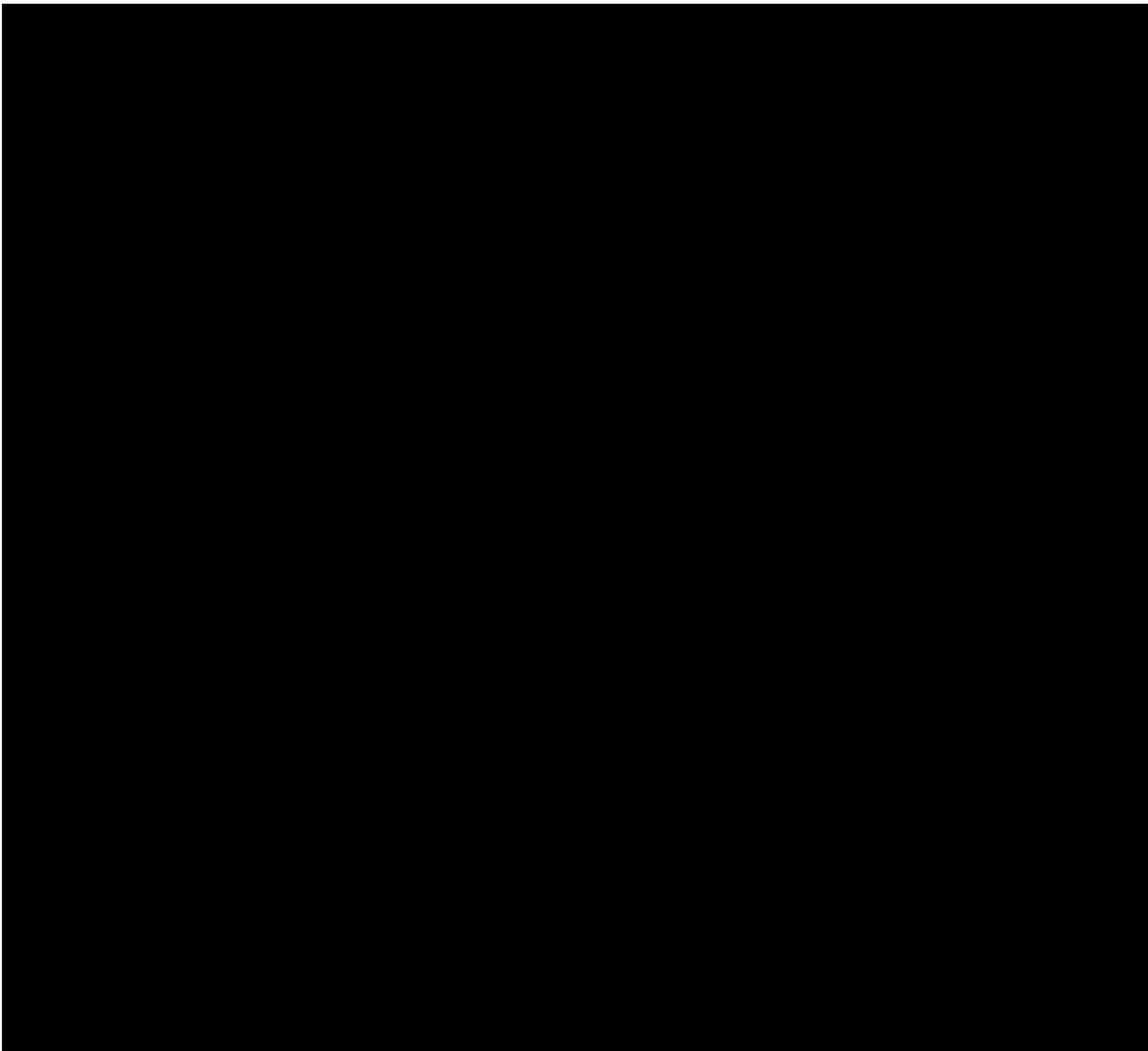
Figure 1: Looking south along Willowbrook Road toward intersection of College Avenue / Houston Street (I.S. 51 is on the right)

2.3 MEETING WITH SCHOOL REPRESENTATIVES

Staff from the consultant team, the school principal, assistant principal, and the two co-presidents of the PTA met at the school on the afternoon of Wednesday, June 9, 2004. According to the school representatives, student pedestrians face the following problems in the vicinity of I.S. 51:

- The dismissal of the students causes some problems for the school, local residents, local commercial establishments, and the students. Some local merchants lock their doors at dismissal time to prevent a large influx of students into their stores. The students often congregate in large numbers, generating the associated problems of fights, stepping out into traffic, stopping vehicles, etc., at various places, but especially at the intersections of Forest Avenue and Willowbrook Road, and Forest Avenue and Willow Road East.
- Local homeowners have complained to the school about students gathering in their yards, on their steps, and in their doorways after dismissal.
- The school is very interested in obtaining some special MTA buses for dismissal. They feel that many of the problems associated with dismissal would be alleviated if the students had buses to board upon exiting the school, rather than congregating and wandering in groups.
- Since many of the students must traverse unsafe locations between the school and their homes, and the distance to many of their homes is so great, student safety is of even greater significance. School representatives believe that yellow buses would be especially appropriate for the students going to such places as Arlington, Mariner's Harbor, and Port Richmond.
- School representatives believe that crossing guards, traffic agents, or some other form of authority is required at the intersections of Willowbrook Road and Houston Street/College Avenue, and at Forest Avenue and Willowbrook Road, to help with students crossing at these locations.
- At dismissal, the school's administrative staff often goes out into the surrounding roadways to stop vehicles while students are crossing the road in the vicinity of the school. The staff also attempts to prevent drivers from passing stopped school buses while flashing lights are operating on the buses (see Figure 12).
- Speeding can be a problem along Houston Street due to vehicles accessing the Willowbrook Expressway.

(See Appendix for a summary of school concerns, and the school's survey response.)



2.6 PRIMARY MODES OF TRANSPORT TO AND FROM SCHOOL

The school’s “catchment area” as defined by the Department of Education is shown in Exhibit 2 at the end of this section. According to school representatives, the catchment area shown in Exhibit 2 is much smaller than the one that currently exists for I.S. 51. The catchment area map seems to be outdated and is now much larger. The school representatives helped delineate the actual catchment area to better represent the distances students travel, which include areas north to the Kill Van Kull, including the Richmond Terrace area; east to Jewett Avenue down to Forest Avenue and then east to Manor Road down to Victory Boulevard; south along Victory Boulevard to and along the Staten Island Expressway to Old Place; then north to Arlington to form the westerly border of the catchment area.

According to school officials, approximately 15% of the students walk to school, 15% arrive by private vehicles, 15% arrive by yellow buses, and 55% arrive by public transportation.

Table 1 presents the mode of travel for I.S. 51 as identified by school representatives.

TABLE 1: MODES OF TRAVEL (AS ESTIMATED BY SCHOOL OFFICIALS)	STUDENTS (Percentage)
Walk	15%
Driven by car	15%
School bus	15%
Bus/Subway	55%
Bicycle	0%
TOTAL	100%

2.7 ADDITIONAL STUDENT PEDESTRIAN TRAFFIC GENERATORS

Since Forest Avenue is heavily commercial, fast food restaurants, delis, and other stores located along Forest Avenue in the vicinity of the school generate considerable pedestrian and vehicular traffic around I.S. 51. According to school representatives, the dismissal of large numbers of students (see Figure 3) causes problems for the local commercial establishments. Some of the local merchants lock their doors at dismissal time to prevent a large influx of students into their buildings.



Figure 3: Looking north along the Willowbrook Road sidewalk toward Forest Avenue at dismissal

2.8 CROSSING GUARD LOCATIONS

According to the school principal, there is one crossing guard assigned to I.S. 51 at the intersection of Houston Street and Willowbrook Road. The crossing guard location is shown in Exhibit 4 at the end of this section.

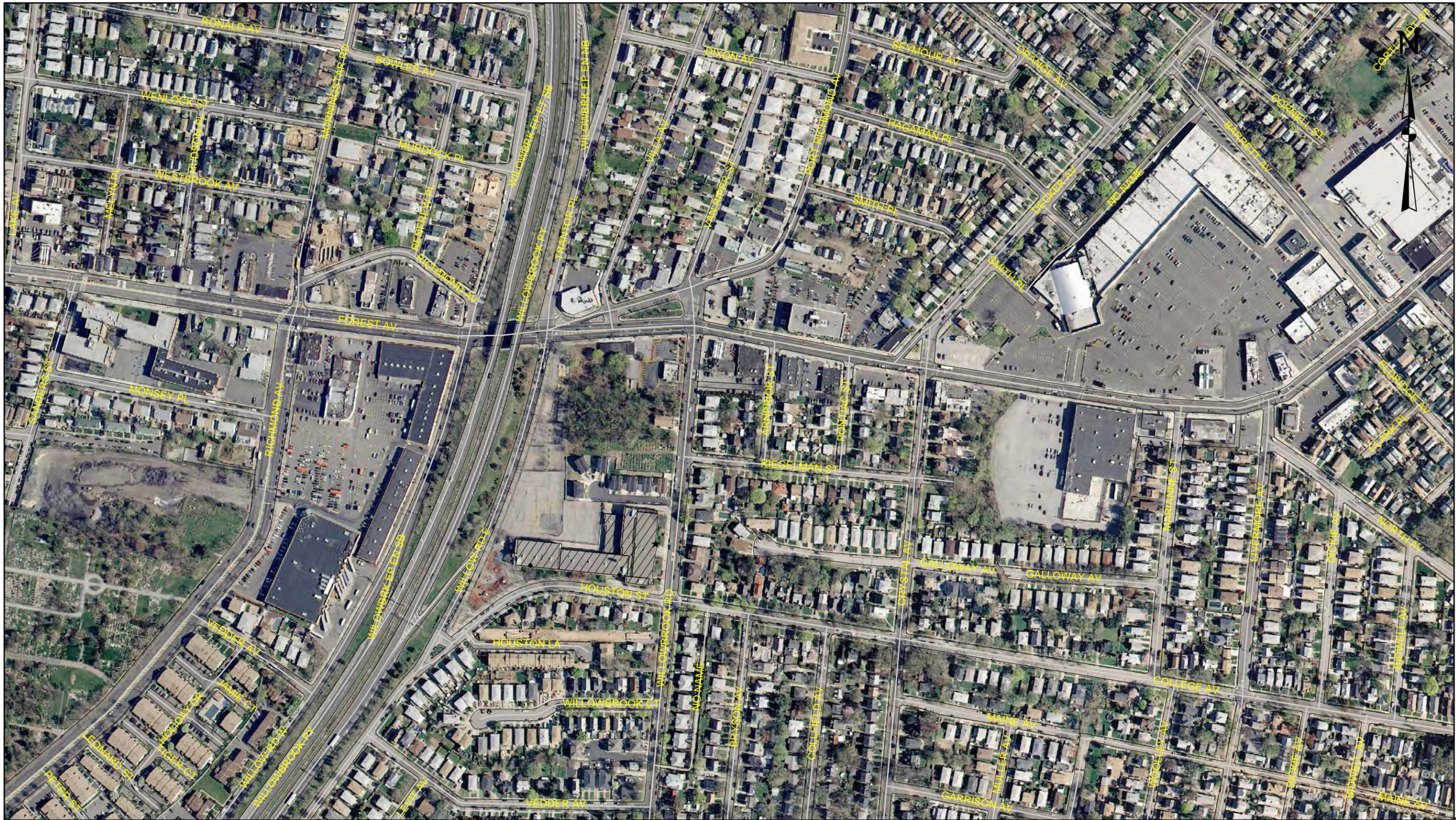


EXHIBIT 1
I.S. 51 STATEN ISLAND
E. MARKHAM I.S. SCHOOL
AERIAL PHOTOGRAPH

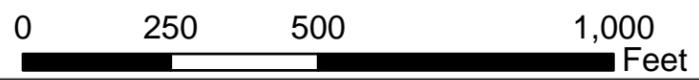
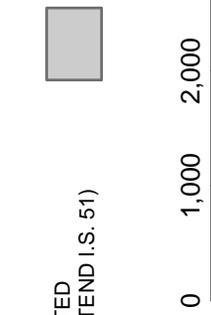




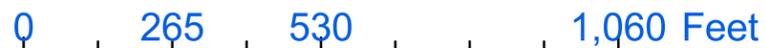
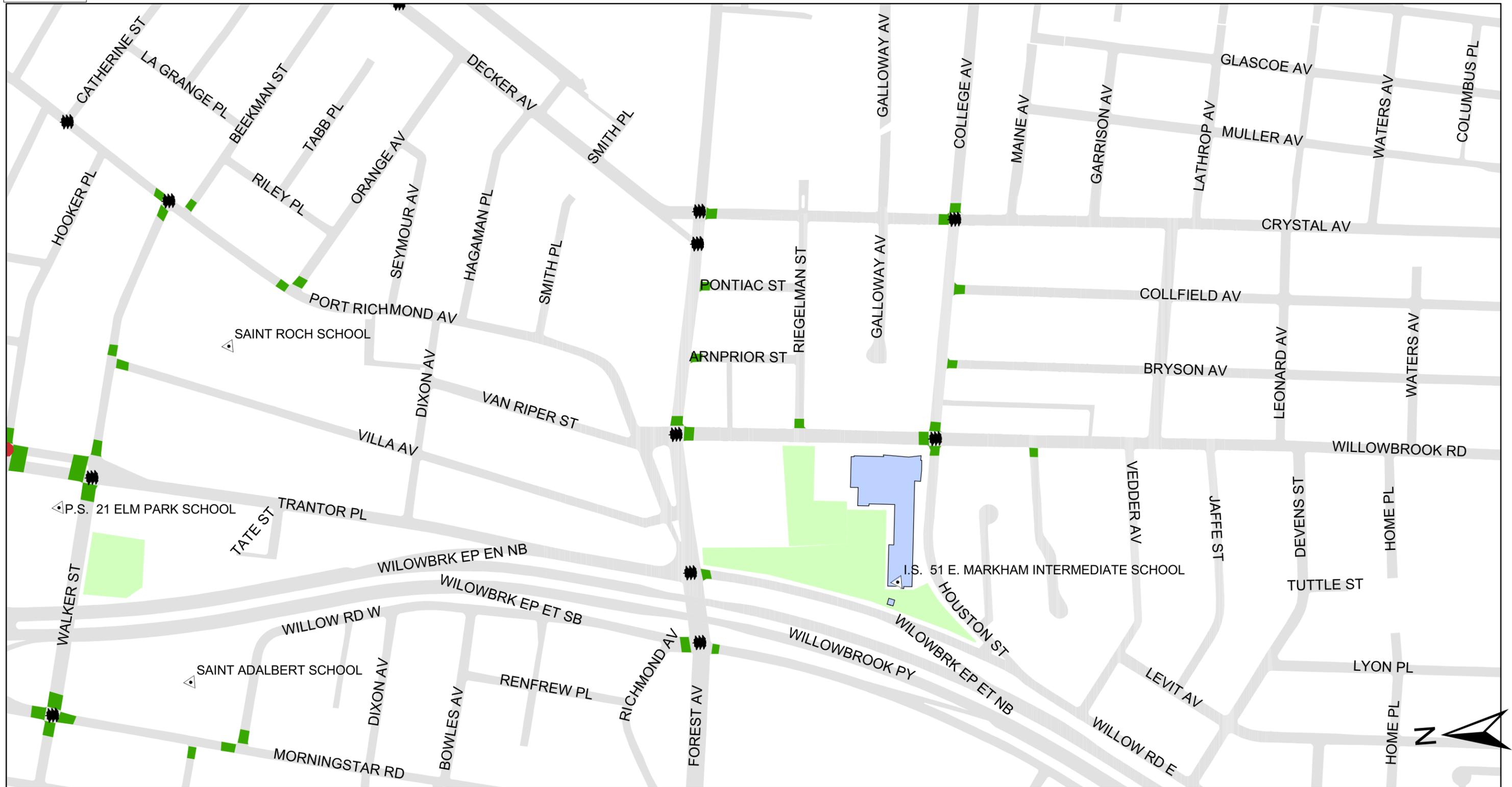
EXHIBIT 2
I.S. 51 STATEN ISLAND
E. MARKHAM I.S. SCHOOL
CATCHMENT AREA



LEGEND:
 CATCHMENT AREA, (DEPARTMENT OF EDUCATION DESIGNATED AREA FROM WITHIN WHICH STUDENTS ARE ENTITLED TO ATTEND I.S. 51)



School Traffic Safety Map



The School Traffic Safety Map was established to help provide the maximum degree of safety for children going to and from school - by indicating the location of speed reducers, school crosswalks and some traffic control devices. (While virtually all intersections in NYC benefit from traffic control devices - such as stop signs, traffic signals, yield signs, and all way stop signs - this map shows only traffic signals and all way stop signs.) The school crosswalks that are shown are ladder striped and make the crosswalk more visible to drivers and help make the intersection safer. These crosswalks are where school children are recommended to cross.

Note: Every attempt has been made to provide complete and accurate information that is updated regularly. The City's streets are constantly changing and it is not always possible to present information without error.

LEGEND:

- | | |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| SCHOOL LOCATION  | TRAFFIC SIGNAL  |
| SCHOOL CROSSWALK  | ALL - WAY STOP  |
| | SPEED REDUCER  |

IS 51 Staten Island
E. MARKHAM INTERMEDIATE SCHOOL

Prepared by the NEW YORK CITY DEPARTMENT OF TRANSPORTATION, Iris Weinsahl, COMMISSIONER.

Map created on 11/16/2006

EXHIBIT 3

COMM. BOARD: 501
 PRECINCT: 120

3. TRAFFIC OPERATIONS

3.1 SCHOOL BUS OPERATIONS

According to school representatives, approximately 800 students ride a city (MTA) bus to school and approximately 200 students ride a yellow school bus to school. Bus transportation for the students consists of ten yellow school buses, as well as two special education buses. At arrival, the yellow school buses drop students off at the intersection of Willowbrook Road and Houston Street. According to school representatives, limitations in the availability of city (MTA) buses forces many students to walk, causing associated problems for the school and the neighborhood.

3.2 PARENT DROP-OFF OPERATIONS

According to school representatives, students are typically dropped off on Willowbrook Road and Houston Street. Congestion is a problem in the morning due to these drop-offs. Parents were observed dropping off students in an unsafe manner, often mixing in with the school buses. At dismissal, parents waiting to pick up students from the school were observed double parking in the vicinity of the school.

Figures 4 and 5 depict travel conditions at school dismissal.



Figure 4: Looking west along Houston Street, showing school bus pick up operations



Figure 5: Looking east along Forest Avenue at students boarding a city (MTA) bus, west of Willowbrook Road

3.3 PARKING REGULATIONS

Parking regulations around I.S. 51 are shown in Exhibit 5 at the end of this section.

3.4 EXISTING SCHOOL SIGNS AND MARKINGS

Exhibit 3 shows the existing signals and school crosswalk pavement markings around the I.S. 51. It should be noted that a citywide signage program is currently underway to upgrade school signage to the current edition of the Federal Manual of Uniform Traffic Control Devices (MUTCD) standards of fluorescent yellow-green signs accompanied by downward pointing arrows. (Signs scheduled to be installed under this program are shown as “existing” in Exhibit 7.)

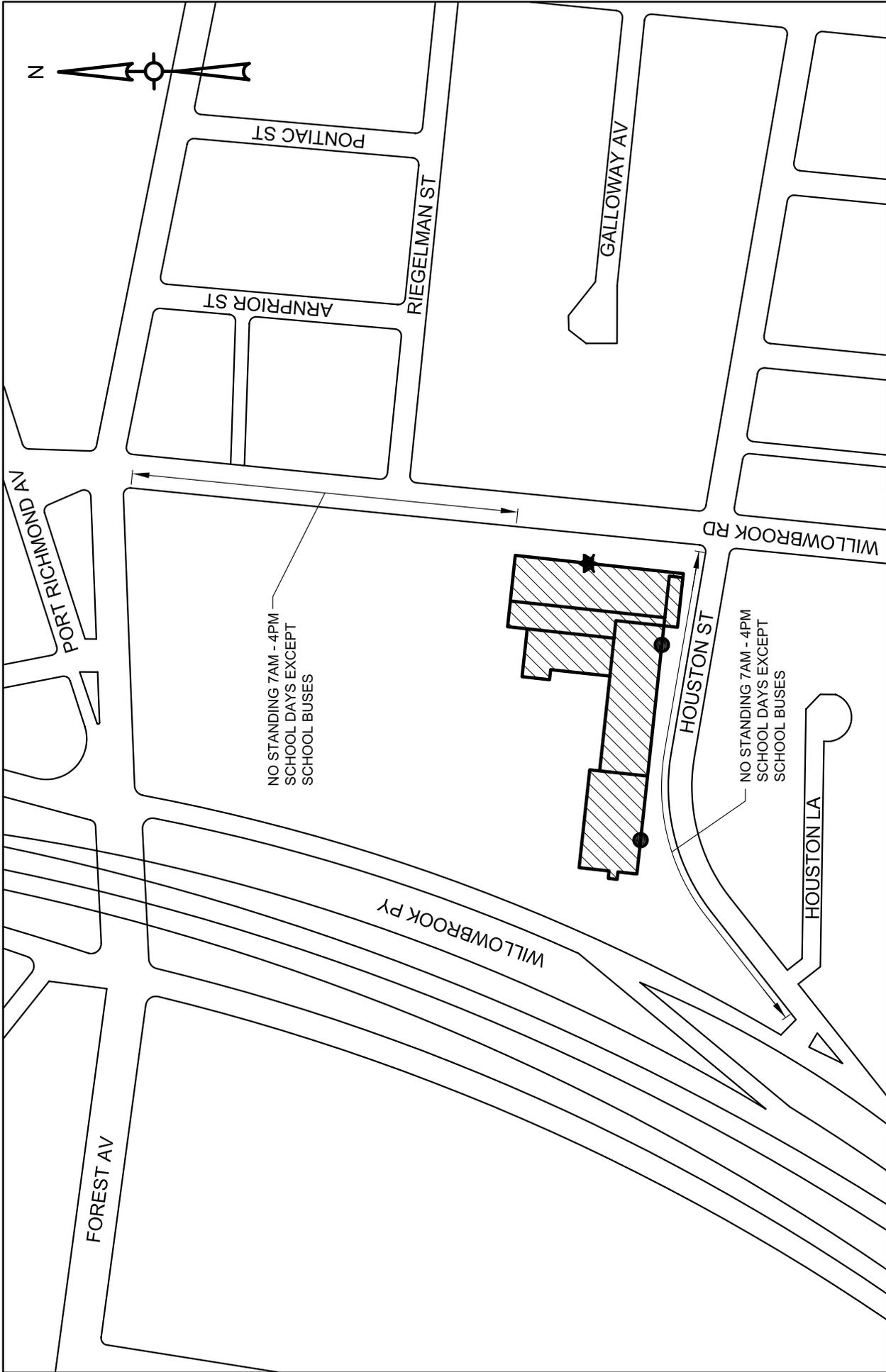


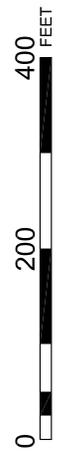
EXHIBIT 5

I.S. 51 STATEN ISLAND
 E. MARKHAM I.S. SCHOOL

EXISTING PARKING REGULATIONS

LEGEND:

- ★ MAIN ENTRANCE
- ENTRANCE



3.5 ACCIDENT SUMMARY

Exhibit 6 and Table 2 show a summary of accidents, as obtained from the New York State Department of Motor Vehicles (DMV), in the vicinity of I.S. 51 for a three-year period from January 1, 1998 through December 31, 2000. The DMV data provides some detail relating to the circumstances and cause of an accident. Table 3 is a summary of more recent accident data obtained from the NYC Police Department (NYPD). Though current through 2004, the NYPD data does not provide the same level of detail as the DMV data.

This report targets intersections closest to the school where the highest concentration of student pedestrians occurs. Intersections farther from the school and locations for which detailed data was not available at the time of this study will be addressed with the ongoing work of DOT's School Safety Engineering Program. DMV accident data is discussed in Section 3.6, Traffic Operations and Issues.

TABLE 2: ACCIDENT SUMMARY OF NYS DMV DATA (1998-2000)				
INTERSECTION	TOTAL ACCIDENTS	PEDESTRIAN ACCIDENTS	PEDESTRIAN FATALITIES	SCHOOL-RELATED ACCIDENTS*
Forest Avenue and Willowbrook Road	54	1	0	0
Forest Avenue and Crystal Avenue	27	1	0	0
Forest Avenue and Willow Road East	61	2	0	0
Forest Avenue and Arnprior Street	14	2	0	0
Forest Avenue and Pontiac Street	14	1	0	0
Willowbrook Road and Houston Street/College Avenue	8	2	0	1
College Avenue and Crystal Avenue	11	0	0	0
Willowbrook Road and Riegelman Street	5	0	0	0
Willowbrook Road and Willowbrook Court	3	0	0	0
College Avenue and Bryson Avenue	2	0	0	0
College Avenue and Collfield Avenue	0	0	0	0
TOTAL	199	9	0	1

* School-related accidents are defined as accidents involving school-age pedestrians (age 4 to 14), occurring on weekdays during the school year.

TABLE 3: ACCIDENT SUMMARY OF NYPD DATA (2001-2004)				
INTERSECTION	TOTAL ACCIDENTS	PEDESTRIAN ACCIDENTS	PEDESTRIAN FATALITIES	SCHOOL-RELATED ACCIDENTS*
Forest Avenue and Willowbrook Road	52	6	0	0
Forest Avenue and Crystal Avenue	36	1	0	0
Forest Avenue and Willow Road East	86	1	0	0
Forest Avenue and Arnprior Street	18	1	0	0
Forest Avenue and Pontiac Street	10	1	0	0
Willowbrook Road and Houston Street/College Avenue	11	1	0	0
College Avenue and Crystal Avenue	12	2	0	0
Willowbrook Road and Riegelman Street	6	1	0	1
Willowbrook Road and Willowbrook Court	2	0	0	0
College Avenue and Bryson Avenue	1	0	0	0
College Avenue and Collfield Avenue	2	0	0	0
TOTAL	236	14	0	1

* School-related accidents are defined as accidents involving school-age pedestrians (age 4 to 14), occurring on weekdays during the school year.

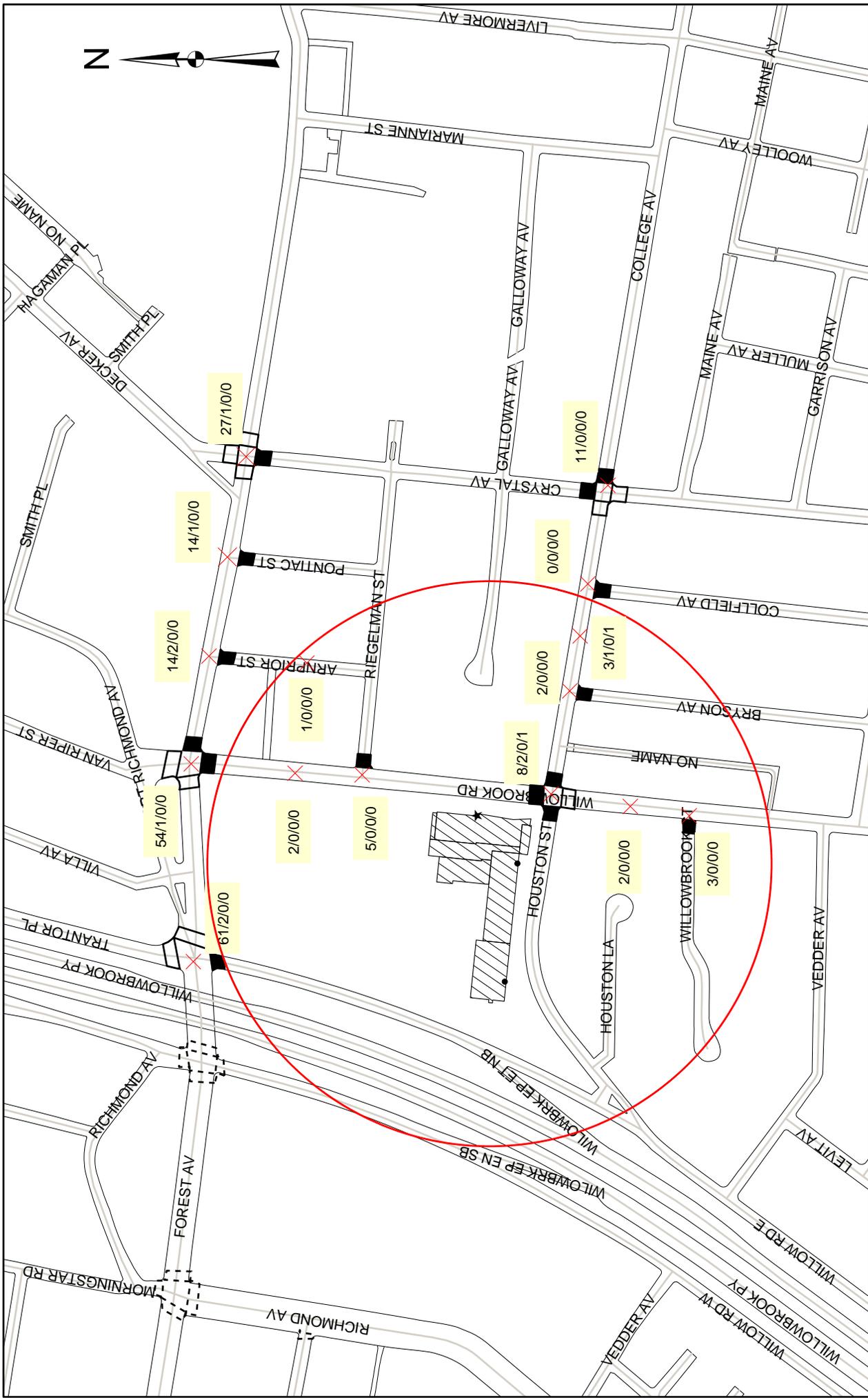


EXHIBIT 6
I.S. 51 STATEN ISLAND
E. MARKHAM I.S. SCHOOL
ACCIDENT SUMMARY (1998-2000)

LEGEND:
 ACCIDENT LOCATION (X)
 SCHOOL CROSSWALK (thick black line)
 SCHOOL CROSSWALK ASSIGNED TO ANOTHER SCHOOL (dashed line)
 BORDER OF 700 FEET (red circle)
 TOTAL ACCD / PED ACCD / FATAL / SCHOOL_PED ACCD (X/X/X)

3.6 TRAFFIC OPERATIONS AND ISSUES

The specific roadway-related physical conditions for each location within the school's vicinity directly affect the safety and efficiency of operations for both pedestrian and vehicular traffic. These conditions are required information when analyzing a location, and are the starting point for any revisions that may be considered to improve safety and/or efficiency.

The following sub-sections outline the physical conditions and issues concerning traffic operations and accidents at the intersections in the vicinity of I.S. 51.

3.6.1 Forest Avenue and Willowbrook Road

This is a four-leg signalized intersection with school crosswalks located across the south and east legs (see Figures 6 through 10). Forest Avenue and Willowbrook Road are both two-way streets with one travel lane and one parking lane on each side of the roadways. School representatives identified this as a problematic intersection, due to the high volumes of students crossing in all directions.

There were a total of 54 accidents at this intersection between 1998 and 2000 (Table 2), including one pedestrian-related accident, which was not school-related. However, according to school representatives, a girl who was walking to school was struck on the northeast corner of the intersection in the fall of 2004. There were no pedestrian fatalities reported at this intersection during this time period.



Figure 6: Students crossing the west leg of Forest Avenue at Willowbrook Road during school dismissal



Figure 7: Students crossing the west leg of Forest Avenue at Willowbrook Road during school dismissal



Figure 8: Looking north towards Port Richmond Avenue and Van Riper Street from the intersection of Forest Avenue and Willowbrook Road, showing the wide expanse of pavement students must cross



Figure 9: Looking northwest toward Port Richmond Avenue from the intersection of Forest Avenue and Willowbrook Road, showing the large crossing distance for students traveling north-south

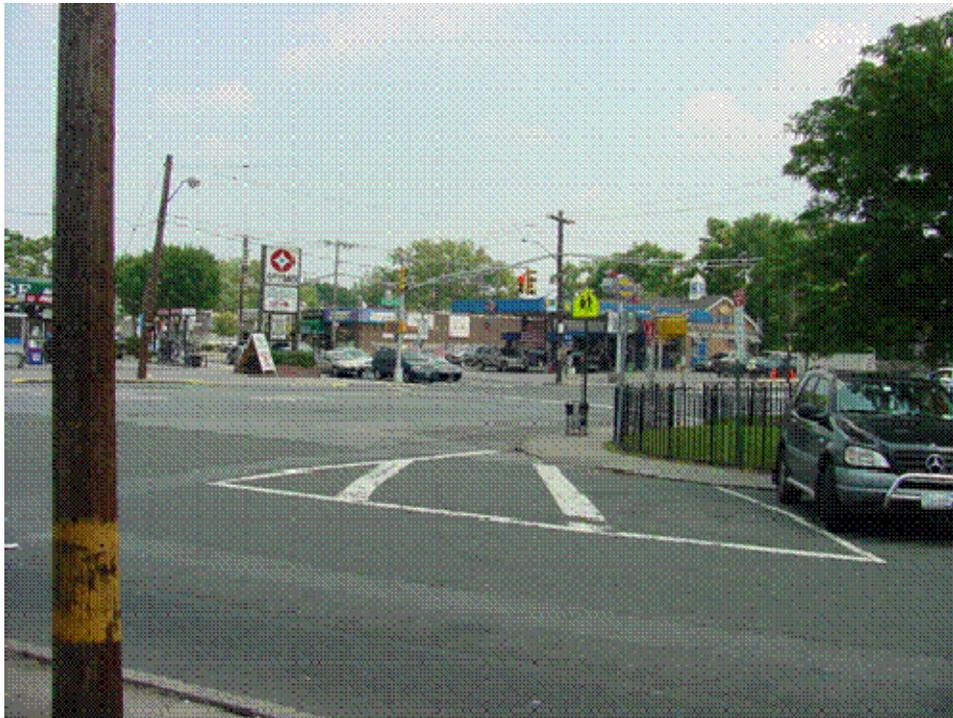


Figure 10: Unmarked pedestrian crossing for I.S. 51 students across Port Richmond Avenue

3.6.2 Forest Avenue and Crystal Avenue/Decker Avenue

This is a four-leg signalized intersection with a school crosswalk located across the south leg of Crystal Avenue. Forest Avenue is a two-way street with one travel lane and one on-street parking lane on each side of the roadway. Crystal Avenue, the south leg of the intersection, is a two-way street with one travel lane and one on-street parking lane on each side of the roadway. Decker Avenue, the north leg of the intersection, is also a two-way street with one travel lane and one on-street parking lane on each side of the roadway. At the intersection with Forest Avenue, the Decker Avenue approach provides one exclusive left-turn lane, one exclusive through lane, and one channelized right-turn lane.

There were 27 accidents at this intersection between 1998 and 2000 (Table 2), including one pedestrian accident that was not school-related. There were no pedestrian fatalities reported at this intersection, during this time period.

3.6.3 Forest Avenue and Willow Road East

This is a four-leg signalized intersection with a school crosswalk located across the south leg of Willow Road East (see Figure 11), and pedestrian crosswalks located on the north, east, and west legs of the intersection. Forest Avenue is a two-way street with one travel and one on-street parking lane on each side of the roadway. Willow Road East is a one-way northbound street with two travel lanes and one on-street parking lane. However, on the approach to Forest Avenue, Willow Road East provides three travel lanes and parking is prohibited on either side of the roadway.

There were 61 accidents at this intersection between 1998 and 2000 (Table 2) including two pedestrian accidents, neither of which were school-related. However, according to school representatives, a seventh-grade boy was struck on the northwest corner of the intersection while riding a bicycle to school in the winter of 2004. The boy was crossing the intersection with the signal. There were no pedestrian fatalities reported at this intersection during this time period.



Figure 11: Looking west along Forest Avenue at the intersection of Willow Road East, at the school crosswalk across the south leg of intersection

3.6.4 Forest Avenue and Arnprior Street

This is an unsignalized “T”-intersection with a school crosswalk located across the south leg of Arnprior Street. Forest Avenue is a two-way street with one travel and one on-street parking lane on each side of the roadway. Arnprior Street is a one-way southbound street with one travel lane and on-street parking on both sides of the roadway.

There were 14 accidents at this intersection between 1998 and 2000 (Table 2), including two pedestrian accidents, neither of which were school-related. There were no pedestrian fatalities reported at this intersection during this time period.

3.6.5 Forest Avenue and Pontiac Street

This is an unsignalized “T”-intersection with a school crosswalk located across the south leg of Pontiac Street. Forest Avenue is a two-way street with one travel and one on-street parking lane on each side of the roadway. Pontiac Street is a one-way northbound street with one travel lane and on-street parking on both sides of the roadway.

There were 14 accidents at this intersection between 1998 and 2000 (Table 2), including one pedestrian accident that was not school-related. There were no pedestrian fatalities reported at this intersection during this time period.

3.6.6 Houston Street/College Avenue and Willowbrook Road

This is a signalized intersection with school crosswalks located across the north leg of Willowbrook Road, the east leg of College Avenue, and the west leg of Houston Street, and a pedestrian crosswalk located across the south leg of Willowbrook Road (see Figure

12). Willowbrook Road and Houston Street/College Avenue are both two-way streets with one travel lane and one on-street parking lane on each side of each roadway.

There were eight accidents at this intersection between 1998 and 2000 (Table 2), including two pedestrian accidents, one of which was school-related. The school-related accident occurred at approximately 2:00 pm on Friday, June 11, 1999, when a twelve-year-old pedestrian did not use the crosswalk while crossing the street and suffered a “non-incapacitating injury”. The road surface was dry, the weather was clear, and the accident occurred during daylight conditions. There were no pedestrian fatalities reported at this intersection during this time period.

Because school representatives reported a potential speeding problem along Houston Street, a speed survey was conducted on Houston Street, west of Willowbrook Road.

The 85th percentile speed for westbound vehicles on Houston Street, west of Willowbrook Road, were found to be 27 mph. Eastbound vehicles on Houston Street, west of Willowbrook Road were found to be traveling at an 85th percentile speed of 30 mph.

The 85th percentile speed is considered to be the representative speed for the street segment. 85th percentile speeds above the 30 mph threshold suggest a possible speeding problem that may require appropriate traffic calming measures.

The detailed results of that spot speed survey are shown in the Appendix at the end of the document.



Figure 12: Looking north along Willowbrook Road towards Houston Street, showing school principal in the roadway assisting with student crossings during dismissal

3.6.7 College Avenue and Crystal Avenue

This is a four-leg signalized intersection with school crosswalks located across the north leg of Crystal Avenue and east leg of College Avenue, and pedestrian crosswalks located across the south leg of Crystal Avenue and the west leg of College Avenue. College Avenue and Crystal Avenue are both two-way streets with one travel lane and one on-street parking lane on each side of the roadways.

There were 11 accidents at this intersection between 1998 and 2000 (Table 2), none of which involved pedestrians. There were no pedestrian fatalities reported at this intersection during this time period.

3.6.8 Willowbrook Road and Riegelman Street

This is an unsignalized “T”-intersection with a school crosswalk located across the east leg of Riegelman Street. Willowbrook Road is a two-way street with one travel lane and one on-street parking lane on each side of the roadway. Riegelman Street is also a two-way street with one travel lane and one on-street parking lane on each side of the roadway. Riegelman Street is stop-controlled at its intersection with Willowbrook Road.

There were five accidents at this intersection between 1998 and 2000 (Table 2), but none of these were pedestrian accidents. There were no pedestrian fatalities reported at this intersection during this time period.

3.6.9 Willowbrook Road and Willowbrook Court

This is an unsignalized “T”-intersection with a school crosswalk located across the west leg of Willowbrook Court. Willowbrook Road is a two-way street with one travel lane and one on-street parking lane on each side of the roadway. Willowbrook Court is a two-way dead end street with one travel lane and one on-street parking lane on each side of the roadway. Willowbrook Court is stop-controlled at its intersection with Willowbrook Road.

There were three accidents reported at this intersection between 1998 and 2000 (Table 2), but none of these were pedestrian accidents.

3.6.10 College Avenue and Bryson Avenue

This is an unsignalized “T”-intersection with a school crosswalk located across the south leg of Bryson Avenue. College Avenue is a two-way street with one travel lane and one on-street parking lane on each side of the roadway. Bryson Avenue is a two-way residential street with on-street parking permitted. Bryson Avenue is stop-controlled at its intersection with College Avenue.

There were two accidents at this intersection between 1998 and 2000 (Table 2), neither of which was a pedestrian accident.

3.6.11 College Avenue and Collfield Avenue

This is an unsignalized “T”-intersection with a school crosswalk located across the south leg of Collfield Avenue. College Avenue is a two-way street with one travel lane and one on-street parking lane on each side of the roadway. Collfield Avenue is a two-way

residential street with on-street parking permitted. Collfield Avenue is stop-controlled at its intersection with College Avenue.

There were no accidents reported at this intersection between 1998 and 2000 (Table 2). However, there was one mid-block pedestrian accident reported on College Avenue, between Bryson Avenue and Collfield Avenue. This particular accident occurred at approximately 6:00 pm on February 18, 1998, when a nine-year-old cyclist sustained a “possible injury” when crossing the roadway. The accident occurred during rainy weather, and the roadway lighting condition was reported as “dark, road lighted”.

3.7 SIGNAL TIMING

Pedestrian crossing times were field-verified for crosswalks at signalized intersections in the vicinity of I.S. 51, and were found to be adequate based on a child pedestrian walking at the rate of 3 feet per second. Signal timings are shown in Table 4.

TABLE 4: PEDESTRIAN CROSSING TIMES AT SIGNALIZED INTERSECTIONS				
INTERSECTION	CROSSWALK LENGTH (FEET)	PEDESTRIAN TIME ACTUAL (SECONDS)	PEDESTRIAN TIME REQUIRED (SECONDS)	TIMING ADJUSTMENT REQUIRED?
Forest Avenue and Willowbrook Road				
crossing Forest Avenue	56	32	23	NO
crossing Willowbrook Road	51	35	20	NO
Forest Avenue and Crystal Avenue				
crossing Forest Avenue	41	24	17	NO
crossing Crystal Avenue	41	47	17	NO
Willowbrook Road and Houston Street				
crossing Willowbrook Avenue	43	30	18	NO
crossing Houston Street/College Avenue	42	47	17	NO
Forest Avenue and Willow Road East				
crossing Forest Avenue	70	45 (am) 42 (pm)	27 27	NO NO
crossing Willow Road East	25	41 (am) 44 (pm)	12 12	NO NO
crossing Willow Road East	50	41 (am) 44 (pm)	20 20	NO NO
College Avenue and Crystal Avenue				
crossing College Avenue	38	29	16	NO
crossing Crystal Avenue	38	29	16	NO

Note: A child pedestrian walking rate of 3 feet/second, plus 3 seconds reaction time, was utilized to calculate the required pedestrian crossing time.

3.8 PHYSICAL CONDITIONS

3.8.1 Roadways and Sidewalks

The roadways in the vicinity of I.S. 51 were observed to be in good condition. Sidewalks adjacent to the school are approximately 15 to 20 feet wide and in fair condition. However, some sidewalks need replacement or widening, especially the sidewalk along

the west side of Willowbrook Road, north of the school and adjacent to the Lake Cemetery (see Figure 13), and along the south side of Forest Avenue, east of Willow Road East (see Figure 14).



Figure 13: Looking south toward I.S. 51, at broken sidewalk along the west side of Willowbrook Road



Figure 14: Looking west along Forest Avenue, east of Willow Road East, at the narrow sidewalk on the south side of Forest Avenue

3.8.2 Pedestrian Ramps

Overall, pedestrian ramps in the vicinity of the school were observed to be standard. One problem location was on the southwest corner of Forest Avenue and Willowbrook Road where the pedestrian ramp is of substandard width and is also immediately adjacent to a utility pole (see Figure 6).

4. POTENTIAL MEASURES TO IMPROVE STUDENT PEDESTRIAN SAFETY

This section describes the proposed measures to improve school pedestrian safety around I.S. 51. The proposed recommendations are divided into short-term and long-term measures. Short-term measures are those that potentially can be performed in-house. Long-term measures involve capital improvements. Each of the short- and long-term measures recommended for I.S. 51 is discussed as follows, and is shown in more detail in Exhibit 7 at the end of this section.

4.1 SHORT-TERM MEASURES

➤ Install “NO STANDING 7AM – 4PM SCHOOL DAYS” signs

A parking regulation should be instituted 30 feet in front of the main entrance to the school with signs installed reading: “NO STANDING 7AM - 4PM SCHOOL DAYS”. (This is a typical requirement for all NYC schools in order to provide for emergency access to and from the school.)

➤ Install graphic “YIELD TO PEDESTRIAN” signs

Install “YIELD TO PEDESTRIAN” signs at intersection approaches with substantial vehicle/student pedestrian volumes. “YIELD TO PEDESTRIAN” signs are recommended as follows:

- Eastbound approach to the signalized intersection of Forest Avenue and Crystal Avenue

This sign is suggested to improve driver awareness and the visibility and safety of student-pedestrians.

➤ Place advance stop bars ten feet before school crosswalks

The MUTCD and New York City DOT standard for placement of a stop bar is four feet in advance of a marked crosswalk. At signalized (or stop controlled) crosswalks, the vehicle stop line can be placed farther back from the crosswalk in order to maximize visibility of pedestrians and to minimize the potential for pedestrian/vehicle conflicts. Therefore, it is recommended that stop bars be placed ten feet in advance of all school crosswalks.

➤ Convert Existing Pedestrian Crosswalks to School Crosswalks

Because significant volumes of students were observed crossing the west leg of the Forest Avenue and Willowbrook Road intersection (see Figures 7 and 8), the following actions are recommended:

- Convert the pedestrian crosswalk across the west leg of Forest Avenue to a school crosswalk.
- Install advance school crossing signs and markings on the westbound approach to the intersection.

There is also a school crosswalk across the north leg of Willow Road West at its intersection with Forest Avenue. In order for students to avoid the pedestrian

crossing on the north leg of the Willow Road East and Forest Avenue intersection (that has a channelized right-turn lane), it is recommended to:

- Install advance school crossing signs and markings on the eastbound approach to the intersection.

➤ *Install new Crosswalks*

During the field visit, students were observed crossing Port Richmond Avenue on the west side of the Van Riper Street and Willowbrook Road intersection (see Figures 7 and 8), where no crosswalk currently exists. Therefore, the following actions are recommended:

- Provide a school crosswalk and a pedestrian crosswalk across the west and east legs, respectively, of the Port Richmond Avenue and Van Riper Street/Willowbrook Road intersection.
- Install advance school crossing signs and markings on the westbound approach to the intersection.

➤ *Request that NYPD assign a Crossing Guard*

The school representatives requested crossing guards or traffic agents at key intersections experiencing significant student pedestrian activity. Therefore, it is recommended to:

- Request that NYPD assign a crossing guard at dismissal time to direct students at key intersections, especially at the Forest Avenue and Willowbrook Road intersection, and at the Willowbrook Road and Houston Street/College Avenue intersection.

➤ *Administer student pedestrian safety education program*

The school officials reported that students cross unsafely at mid-block locations and intersections such as of Willowbrook Road and Houston Street/College Avenue, and at Forest Avenue and Willowbrook Road. It is therefore recommended that:

- The school should participate in the NYCDOT Safety Education Program to educate students to use designated school crosswalks while crossing the street, not to cross mid-block, not to cross against signals, and not to run out between cars.

➤ *Speeding on Houston Street*

School officials also reported a speeding problem on Houston Street in front of the school. Therefore, a speed survey was conducted on Houston Street, west of Willowbrook Road, in order to verify the existence of a speeding problem and to determine its extent (see Section 3.6.6).

The 85th percentile speed for westbound vehicles on Houston Street, west of Willowbrook Road, were found to be 27 mph. Eastbound vehicles on Houston

Street, west of Willowbrook Road were found to be traveling at an 85th percentile speed of 30 mph.

This finding suggests the need for speed reduction measures for this section of roadway.

Therefore, it is recommended to:

- Install two speed reducers (humps) on Houston Street, west of Willowbrook Road. A speed reducer should help reduce speeding along Houston Street. The speed reducer should be marked and signed per NYCDOT standards.

➤ *Additional Buses*

For safety reasons, school representatives suggested using yellow buses to transport students who live far from I.S. 51, especially students traveling to and from the Arlington, Mariner's Harbor, and Port Richmond neighborhoods.

Therefore, it is recommended to:

- Provide additional yellow school buses to transport students to and from neighborhoods such as Arlington, Mariner's Harbor, and Port Richmond.
- Expand MTA bus service at dismissal time to accommodate student passengers.

4.2 LONG-TERM MEASURES

➤ *Consider installing curb extensions at the following locations*

Consideration should be given to installing curb extensions at the following locations, provided that the Final Design confirms that construction of the recommended curb extensions would be feasible and not interfere with traffic operations. Final details pertaining to the number, location and geometry of curb extensions will be developed during the Final Design/Contract Document preparation.

- The southeast corner of Arnprior Street at its intersection with Forest Avenue.
- The southwest corner of Pontiac Street at its intersection with Forest Avenue.
- The northwest corner of Van Riper Street and Forest Avenue intersection.

The purpose of the curb extensions is to shorten the crossing distance for pedestrians, and to reduce speeds of vehicles approaching and turning at these heavily utilized school crosswalks [or intersections]. These curb extensions would not eliminate or reduce the width of any moving lanes.

➤ *Reconstruct intersection geometry*

Consideration should be given to building the existing channelized areas on Forest Avenue and Willowbrook Road shown in Exhibit 7, provided that the Final

Design confirms that construction of the recommended curb line would be feasible and not interfere with traffic operations. Final details pertaining to the geometry of the curb line, and proposed sidewalk expansions, will be developed during the Final Design/Contract Document preparation.

The purpose of expanded sidewalk space is to shorten crossing distances for pedestrians, and to reduce speeds of vehicles approaching and turning at these heavily utilized school intersections. The new curb extensions would not eliminate any existing moving lanes.

➤ Replace Existing Sidewalk

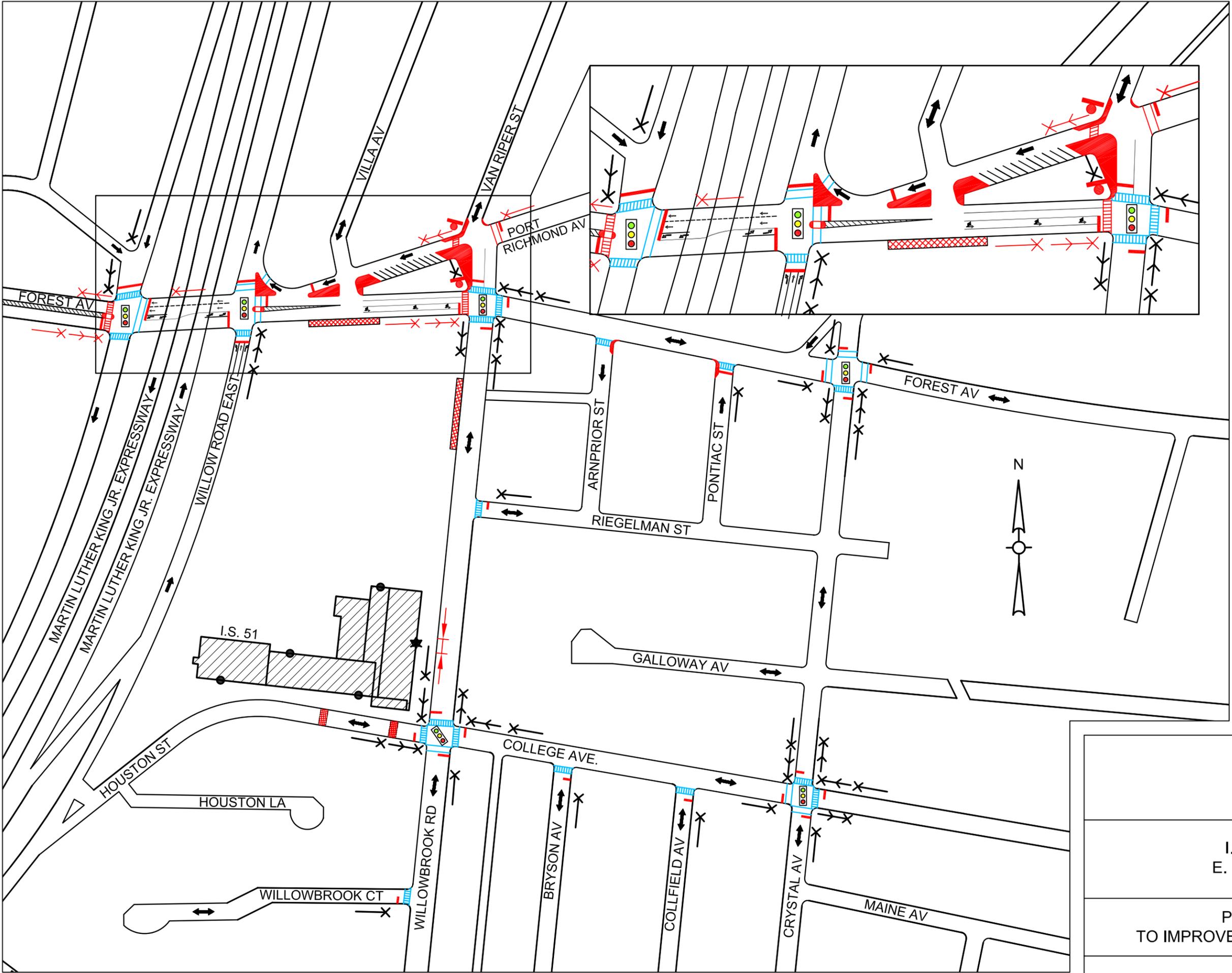
The sidewalk along the west side of Willowbrook Road, adjacent to the Lake Cemetery, is cracked and broken (see Figure 13). Therefore, the following actions are recommended:

- Replace the sidewalk along the west side of Willowbrook Avenue between I.S. 51 and Forest Avenue, adjacent to the Lake Cemetery, and with a wider sidewalk.

➤ Widen Existing Sidewalk

Sidewalk in the vicinity of I.S. 51 is of substandard width (see Figure 14). Therefore, the following action is recommended:

- Widen the existing sidewalk on the south side of Forest Avenue between Willowbrook Road and Willow Road East.



LEGEND

- ★ MAIN ENTRANCE
- OTHER ENTRANCES
- ↔ EXISTING TRAVEL DIRECTION
- X EXISTING ADVANCE WARNING SIGN OR SCHEDULED TO BE INSTALLED
- X EXISTING SCHOOL CROSSWALK WARNING ASSEMBLY OR SCHEDULED TO BE INSTALLED
- 🚦 EXISTING SIGNALIZED LOCATION
- ▨ EXISTING CHANNELIZATION
- ▤ EXISTING SCHOOL CROSSWALK
- ▥ EXISTING PEDESTRIAN CROSSWALK
- X PROPOSED ADVANCE WARNING SIGN
- X PROPOSED SCHOOL CROSSWALK WARNING ASSEMBLY
- ▤ PROPOSED SCHOOL CROSSWALK
- ▥ PROPOSED PEDESTRIAN CROSSWALK
- +— PROPOSED "NO STANDING 7:00AM - 4:00PM SCHOOL DAYS"
- PROPOSED STOP LINE IN ADVANCE OF SCHOOL CROSSWALK
- ◻ PROPOSED CONCRETE REFUGE ISLAND
- ▨ AREA OF SIDEWALK TO BE RECONSTRUCTED
- ⤵ PROPOSED CURB EXTENSION (NECKDOWN)
- ▨ PROPOSED SPEED REDUCER



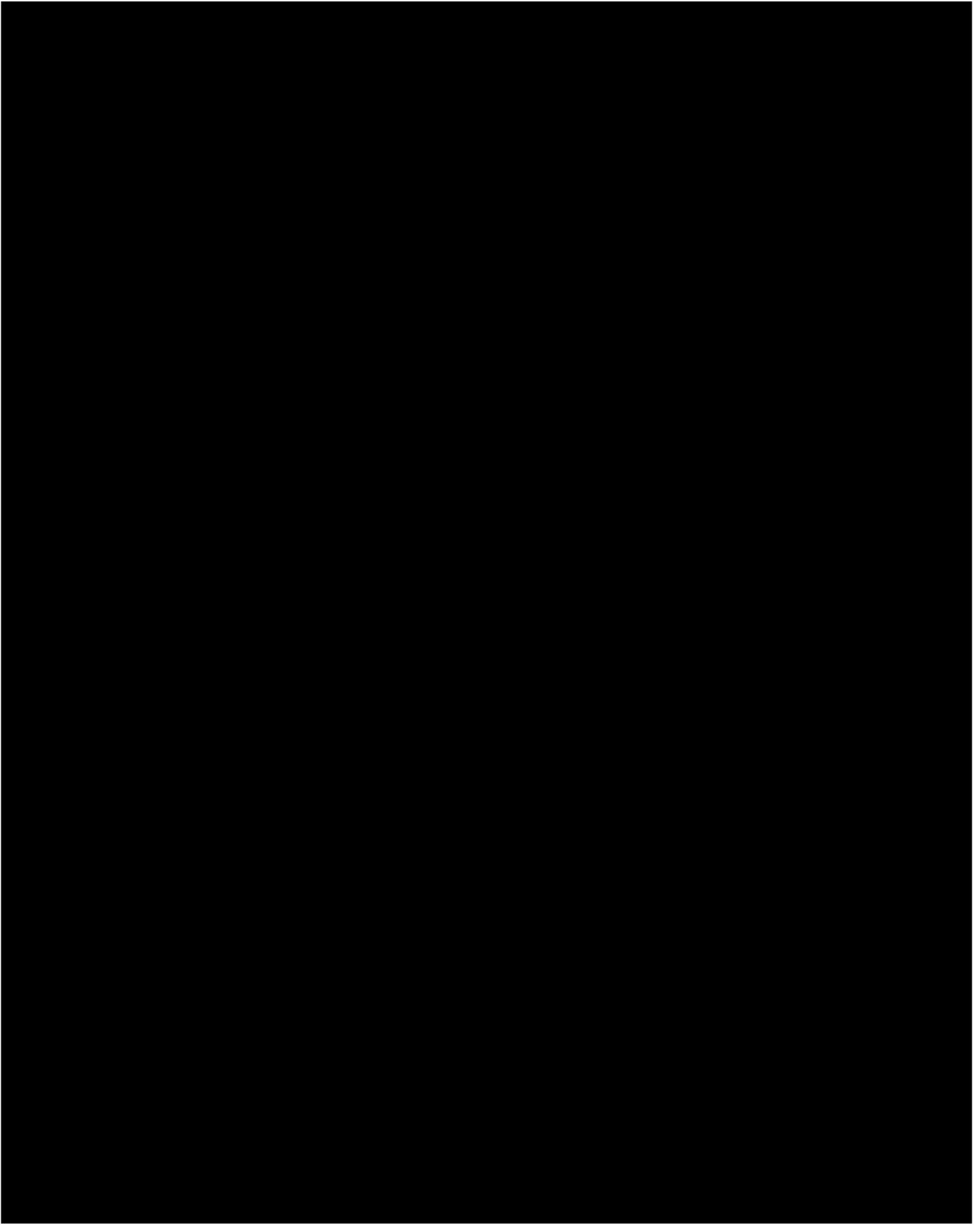
1" = 200'

EXHIBIT 7

**I.S. 51 STATEN ISLAND
E. MARKHAM I.S. SCHOOL**

**POTENTIAL MEASURES
TO IMPROVE STUDENT PEDESTRIAN SAFETY**

APPENDIX





SPOT SPEED STUDY

Date: **May 10, 2005** Time: **11:00AM**
 Location: **Houston St, west of Willowbrook Rd**
 Surveyor: **Richard Calvache & Keren Mor**

School: **I.S. 51**
 Direction: **Eastbound**
 Comments:

Speed S (mph)	No. of Vehicles in Group n	% of Vehicles in Group	% Cumulative Vehicles	nS	nS ²
8	0	0.0%	0.0%	0	0
9	0	0.0%	0.0%	0	0
10	0	0.0%	0.0%	0	0
11	0	0.0%	0.0%	0	0
12	0	0.0%	0.0%	0	0
13	0	0.0%	0.0%	0	0
14	0	0.0%	0.0%	0	0
15	0	0.0%	0.0%	0	0
16	0	0.0%	0.0%	0	0
17	0	0.0%	0.0%	0	0
18	2	5.1%	5.1%	36	648
19	1	2.6%	7.7%	19	361
20	4	10.3%	17.9%	80	1600
21	5	12.8%	30.8%	105	2205
22	1	2.6%	33.3%	22	484
23	2	5.1%	38.5%	46	1058
24	3	7.7%	46.2%	72	1728
25	1	2.6%	48.7%	25	625
26	3	7.7%	56.4%	78	2028
27	5	12.8%	69.2%	135	3645
28	4	10.3%	79.5%	112	3136
29	1	2.6%	82.1%	29	841
30	1	2.6%	84.6%	30	900
31	1	2.6%	87.2%	31	961
32	1	2.6%	89.7%	32	1024
33	3	7.7%	97.4%	99	3267
34	1	2.6%	100.0%	34	1156
35	0	0.0%	100.0%	0	0
36	0	0.0%	100.0%	0	0
37	0	0.0%	100.0%	0	0
38	0	0.0%	100.0%	0	0
39	0	0.0%	100.0%	0	0
40	0	0.0%	100.0%	0	0
41	0	0.0%	100.0%	0	0
42	0	0.0%	100.0%	0	0
43	0	0.0%	100.0%	0	0
44	0	0.0%	100.0%	0	0
45	0	0.0%	100.0%	0	0
46	0	0.0%	100.0%	0	0
47	0	0.0%	100.0%	0	0
48	0	0.0%	100.0%	0	0
49	0	0.0%	100.0%	0	0
50	0	0.0%	100.0%	0	0
51	0	0.0%	100.0%	0	0
52	0	0.0%	100.0%	0	0
53	0	0.0%	100.0%	0	0
54	0	0.0%	100.0%	0	0
55	0	0.0%	100.0%	0	0
56	0	0.0%	100.0%	0	0
	39	100.0%		985	25667

Mean Speed = 25.3 mph Median Speed = 25.3 mph
 Standard Deviation = 4.6 mph 15th Percentile Speed = 20.5 mph
 Margin of Error (95% Confidence) = ± 1.4 mph 85th Percentile Speed = 30.0 mph

SPOT SPEED STUDY

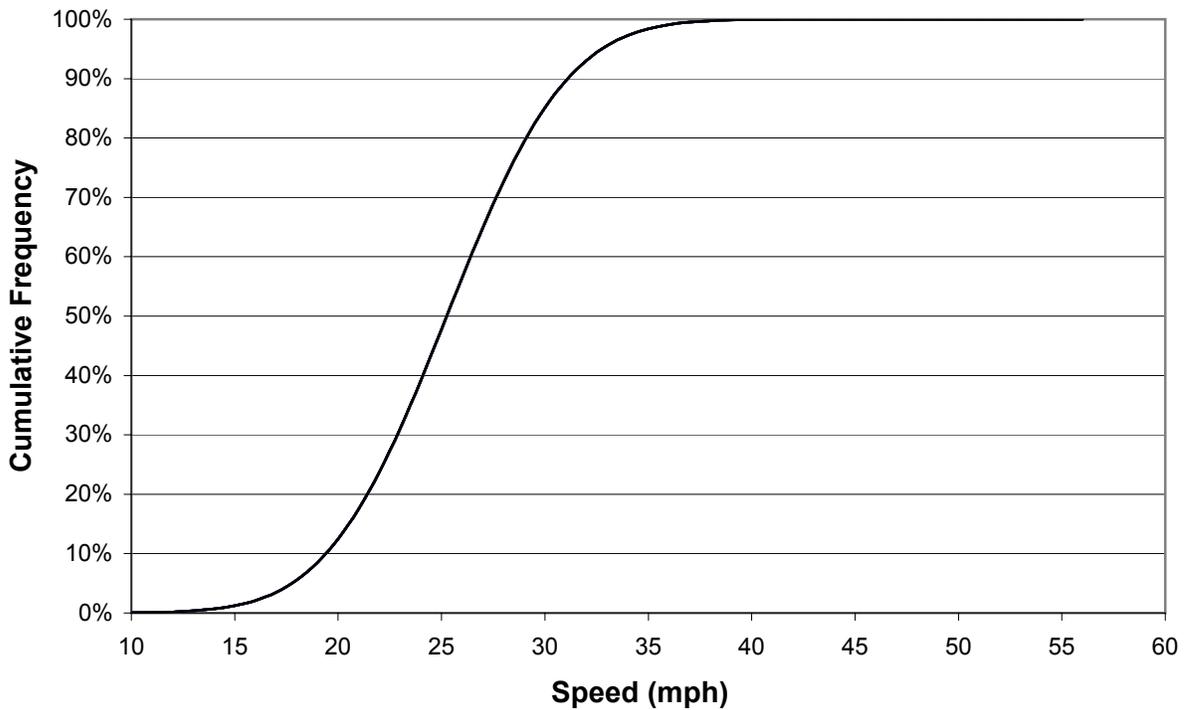
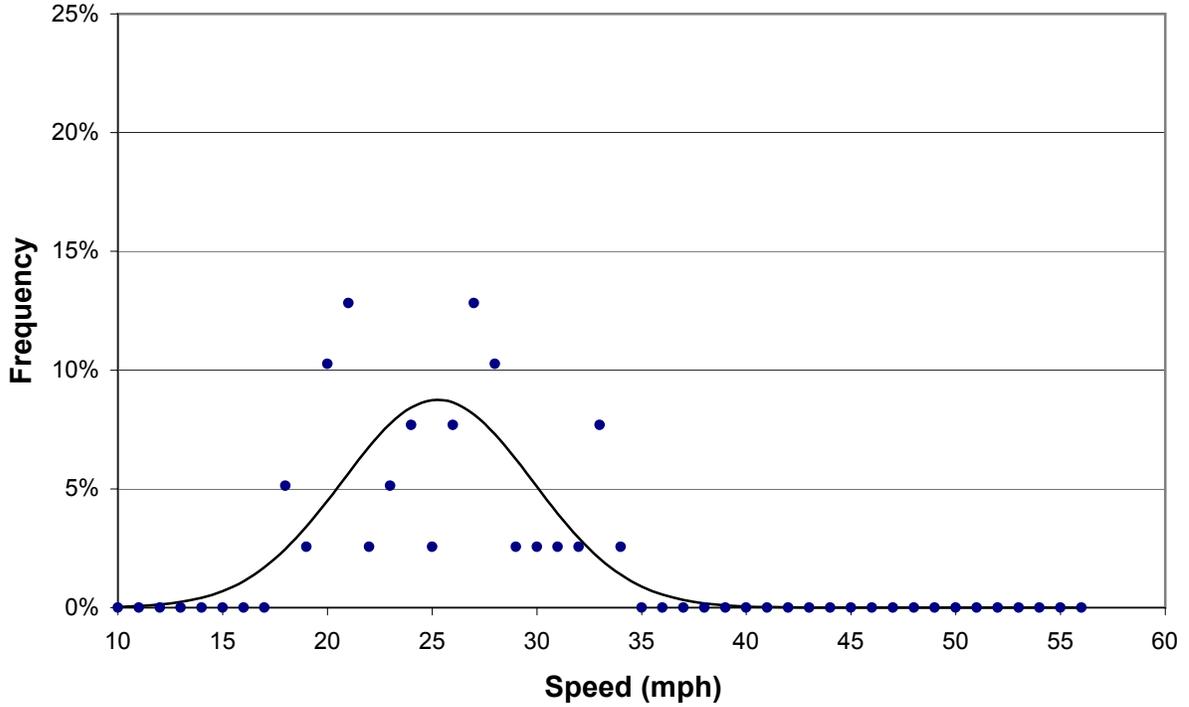
Date: **May 10, 2005**
 Location: **Houston St, west of Willowbrook Rd**
 Surveyor: **Richard Calvache & Keren Mor**

Time: **11:00AM**

School: **I.S. 51**
 Direction: **Eastbound**
 Comments:

Mean Speed = 25.3 mph
 Standard Deviation = 4.6 mph
 Margin of Error (95% Confidence) = ± 1.4 mph

Median Speed = 25.3 mph
 15th Percentile Speed = 20.5 mph
 85th Percentile Speed = 30.0 mph



SPOT SPEED STUDY

Date: **May 10, 2005** Time: **11:00AM**
 Location: **Houston St, west of Willowbrook Rd**
 Surveyor: **Richard Calvache & Keren Mor**

School: **I.S. 51**
 Direction: **Westbound**
 Comments:

Speed S (mph)	No. of Vehicles in Group n	% of Vehicles in Group	% Cumulative Vehicles	nS	nS ²
8	0	0.0%	0.0%	0	0
9	0	0.0%	0.0%	0	0
10	0	0.0%	0.0%	0	0
11	0	0.0%	0.0%	0	0
12	0	0.0%	0.0%	0	0
13	0	0.0%	0.0%	0	0
14	0	0.0%	0.0%	0	0
15	0	0.0%	0.0%	0	0
16	1	1.8%	1.8%	16	256
17	2	3.6%	5.5%	34	578
18	4	7.3%	12.7%	72	1296
19	3	5.5%	18.2%	57	1083
20	5	9.1%	27.3%	100	2000
21	5	9.1%	36.4%	105	2205
22	6	10.9%	47.3%	132	2904
23	7	12.7%	60.0%	161	3703
24	6	10.9%	70.9%	144	3456
25	6	10.9%	81.8%	150	3750
26	2	3.6%	85.5%	52	1352
27	2	3.6%	89.1%	54	1458
28	1	1.8%	90.9%	28	784
29	1	1.8%	92.7%	29	841
30	2	3.6%	96.4%	60	1800
31	0	0.0%	96.4%	0	0
32	0	0.0%	96.4%	0	0
33	0	0.0%	96.4%	0	0
34	0	0.0%	96.4%	0	0
35	1	1.8%	98.2%	35	1225
36	0	0.0%	98.2%	0	0
37	1	1.8%	100.0%	37	1369
38	0	0.0%	100.0%	0	0
39	0	0.0%	100.0%	0	0
40	0	0.0%	100.0%	0	0
41	0	0.0%	100.0%	0	0
42	0	0.0%	100.0%	0	0
43	0	0.0%	100.0%	0	0
44	0	0.0%	100.0%	0	0
45	0	0.0%	100.0%	0	0
46	0	0.0%	100.0%	0	0
47	0	0.0%	100.0%	0	0
48	0	0.0%	100.0%	0	0
49	0	0.0%	100.0%	0	0
50	0	0.0%	100.0%	0	0
51	0	0.0%	100.0%	0	0
52	0	0.0%	100.0%	0	0
53	0	0.0%	100.0%	0	0
54	0	0.0%	100.0%	0	0
55	0	0.0%	100.0%	0	0
56	0	0.0%	100.0%	0	0
	55	100.0%		1266	30060

Mean Speed = 23.0 mph Median Speed = 23.0 mph
 Standard Deviation = 4.1 mph 15th Percentile Speed = 18.7 mph
 Margin of Error (95% Confidence) = ± 1.1 mph 85th Percentile Speed = 27.3 mph

SPOT SPEED STUDY

Date: **May 10, 2005**
 Location: **Houston St, west of Willowbrook Rd**
 Surveyor: **Richard Calvache & Keren Mor**

Time: **11:00AM**

School: **I.S. 51**
 Direction: **Westbound**
 Comments:

Mean Speed = 23.0 mph
 Standard Deviation = 4.1 mph
 Margin of Error (95% Confidence) = ± 1.1 mph

Median Speed = 23.0 mph
 15th Percentile Speed = 18.7 mph
 85th Percentile Speed = 27.3 mph

