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

# School Safety Engineering Project

# FINAL REPORT: P.S. 22 (Graniteville School), Staten Island


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

**May 4, 2006**

# School Safety Engineering Project
# Final Report: P.S. 22, Staten Island

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# 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 350 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). P.S. 22 (Graniteville School) 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

[redacted]

## 2.2 NEIGHBORHOOD DESCRIPTION

Exhibit 1, at the end of this section, shows an aerial view of the neighborhood surrounding the school. P.S. 22 is bounded by Monsey Place to the south, Sanders Street to the west, Forest Avenue to the north, and Richmond Avenue to the east. The area surrounding the school is generally residential and low density in character. P.S. 22 is located adjacent to two commercial roadways: Forest Avenue on the north and Richmond Avenue to the east. These roadways carry significant traffic volumes.


*Figure 1: Looking west along Forest Avenue across Richmond Avenue (school is up and to the left)*

## 2.3 MEETING WITH SCHOOL REPRESENTATIVES

Staff from the consultant team, New York City Department of Transportation, and the school Principal met at the school on the morning of April 30, 2004. According to the school Principal, the problems facing P.S.22 students are as follows:

- High traffic volumes on Forest Avenue and on Richmond Avenue, especially during the morning peak hour.
- Speeding is considered to be a problem on Forest Avenue in front of the school.
- Congestion is a problem during the morning arrival period, particularly when the students are being dropped-off. According to school representatives, parents will often drop-off their children, mixing in with the buses. The buses arrive between 8:10 and 8:20 am, approximately the same time parents are dropping-off their children.
- The school has requested an additional crossing guard. There are currently two crossing guards assigned to the school (see Exhibit 4 at the end of this section).
- Additional personnel are needed to safely escort students from school buses and into school entrances when in front of school on Forest Avenue.
- School representatives described the parking situation as "atrocious."

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

### 2.6 PRIMARY MODE 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. Based upon information gathered from the school principal, the catchment area shown in Exhibit 2 was verified as correct for P.S. 22.

The school's catchment area is quite irregular and roughly defined as running along the Staten Island Expressway and Interstate 278 / 440 (POW-MIA Memorial Highway) to the southwest; the Arthur Kill to the west; along a general line which includes Continental Place and Dixon Avenue for the northerly boundary, with an extension north to the Kill

Van Kull approximately between Van Pelt Avenue and Lake Avenue; to the easterly border along Decker Avenue to Watchogua Road; then westerly along Watchogua Road to Stewart Avenue and then southerly along Stewart Avenue to Caswell Avenue; then westerly along Caswell Avenue to Martin Luther King Jr. Expressway, to return southerly to the POW-MIA Memorial Highway.

Table 1 presents the mode of travel for P.S. 22 as identified by school representatives.

| **TABLE 1: MODE OF TRAVEL** | **STUDENTS (Percentage)** |
|---|---|
| Walk | 25% |
| Driven by car | 25% |
| School bus | 40% |
| Bus/Subway | 10% |
| Bicycle | 0% |
| **TOTAL** | **100%** |

### 2.7 ADDITIONAL STUDENT PEDESTRIAN TRAFFIC GENERATORS

Forest and Richmond Avenues have commercial activities that generate pedestrian and vehicular traffic around the school. A McDonalds restaurant located on the north side of Forest Avenue, opposite from the school, is a major traffic generator for pedestrians including student pedestrians from P.S. 22 (see Figure 1). In addition, a shopping mall located southeast of the school on Richmond Avenue, between Richmond Avenue and Willowbrook Place, generates pedestrian and vehicular traffic.

### 2.8 CROSSING GUARD LOCATIONS

According to the school principal, there are crossing guards assigned to the following two intersections:

- Forest Avenue & Sanders Street
- Forest Avenue & Richmond Avenue

The school has requested an additional crossing guard. In addition to the two crossing guards listed above, it was requested to have a crossing guard at the intersection of Monsey Place & Richmond Avenue. Students are now crossing Richmond Avenue at Monsey Place, and Richmond Avenue is a wide roadway with six lanes at the intersection.

Exhibit 4, at the end of this section, shows the (existing) crossing guard locations.


**EXHIBIT 1**

**P.S. 22 STATEN ISLAND**

**GRANITEVILLE SCHOOL**

**AERIAL PHOTOGRAPH**


**LEGEND:**

CATCHMENT AREA, (DEPARTMENT OF EDUCATION DESIGNATED
AREA FROM WITHIN WHICH STUDENTS ARE ENTITLED TO ATTEND P.S. 22)

0 250 500 1,000 Meters

6

**EXHIBIT 2**

**P.S. 22 STATEN ISLAND**

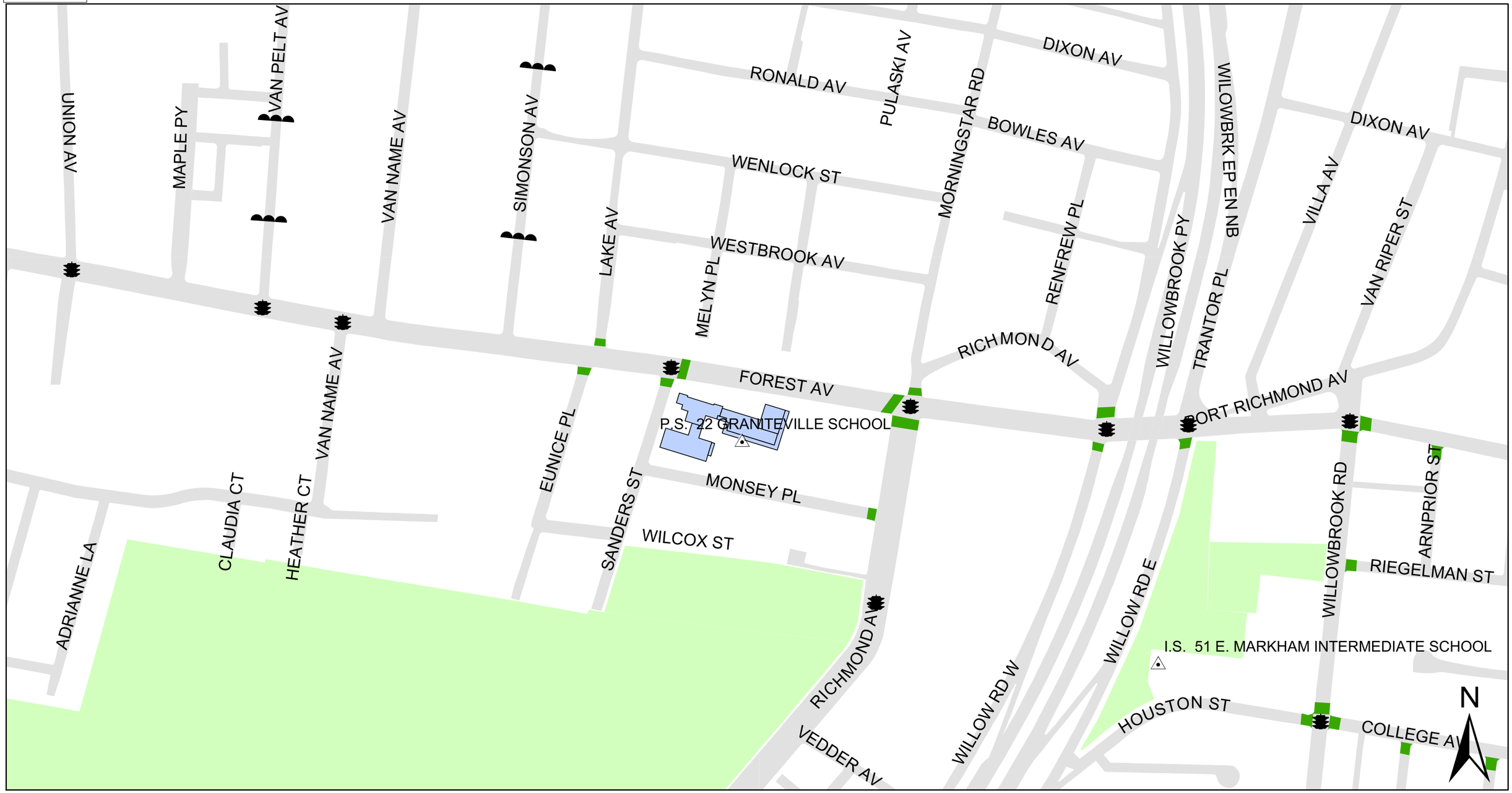
**GRANITEVILLE SCHOOL**

**CATCHMENT AREA**

New York City
Department of Transportation

# School Traffic Safety Map

Traffic Operations Division




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

## PS 22 Staten Island
## GRANITEVILLE SCHOOL

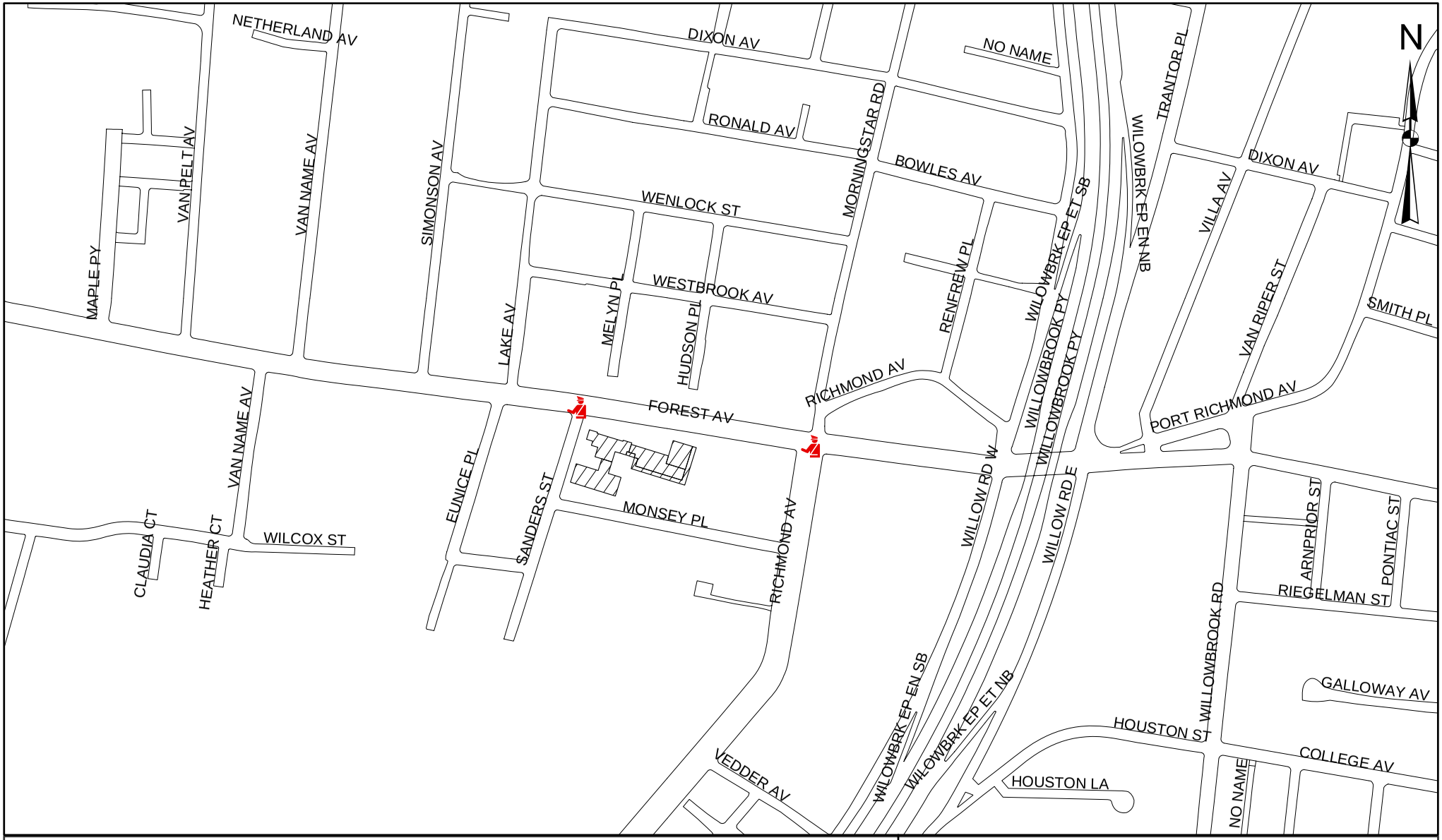
Prepared by the NEW YORK CITY DEPARTMENT OF TRANSPORTATION, Iris Weinshall, COMMISSIONER.

Map created on 11/16/2006

**EXHIBIT 3**

COMM. BOARD: 501
PRECINCT: 120

1.5.1




**LEGEND:**

CROSSING GUARD LOCATION

0 250 500 1,000 Feet

8

# EXHIBIT 4

## P.S. 22 STATEN ISLAND

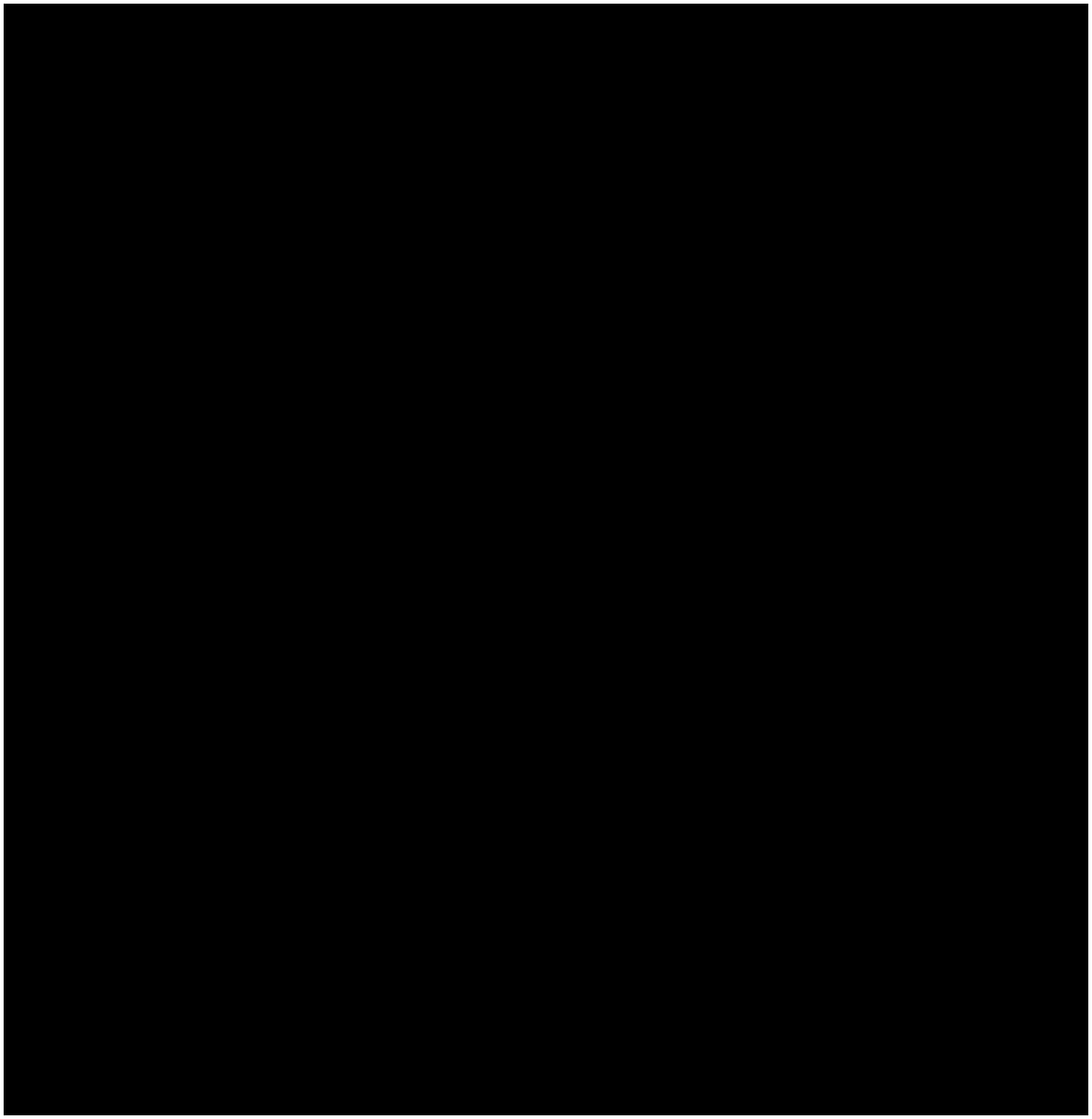
## GRANITEVILLE SCHOOL

## CROSSING GUARD LOCATIONS

# 3. TRAFFIC OPERATIONS

## 3.1 SCHOOL BUS OPERATIONS

According to school representatives, there are approximately sixty (60) students who ride a city (MTA) bus to school, and approximately five hundred (500) students who ride a yellow school bus to school. Bus transportation for the students consists of ten to twelve yellow school buses as well as three special education buses. The MTA buses drop-off students on Forest Avenue. The yellow school buses drop students off on Monsey Place.



## 3.3 PARKING REGULATIONS

Parking regulations around the school block are shown in Exhibit 5 at the end of this section.

## 3.4 EXISTING SCHOOL SIGNS AND MARKINGS

Exhibit 3, at the end of Section 2, shows the existing school signs and markings assigned to P.S. 22. It should be noted that a citywide signage program is currently underway to upgrade school signage to the current Federal Manual on Uniform Traffic Control Devices (MUTCD) standards of fluorescent yellow-green accompanied by downward pointing arrows. Signs scheduled to be installed under this program are shown as "existing" in Exhibit 8.

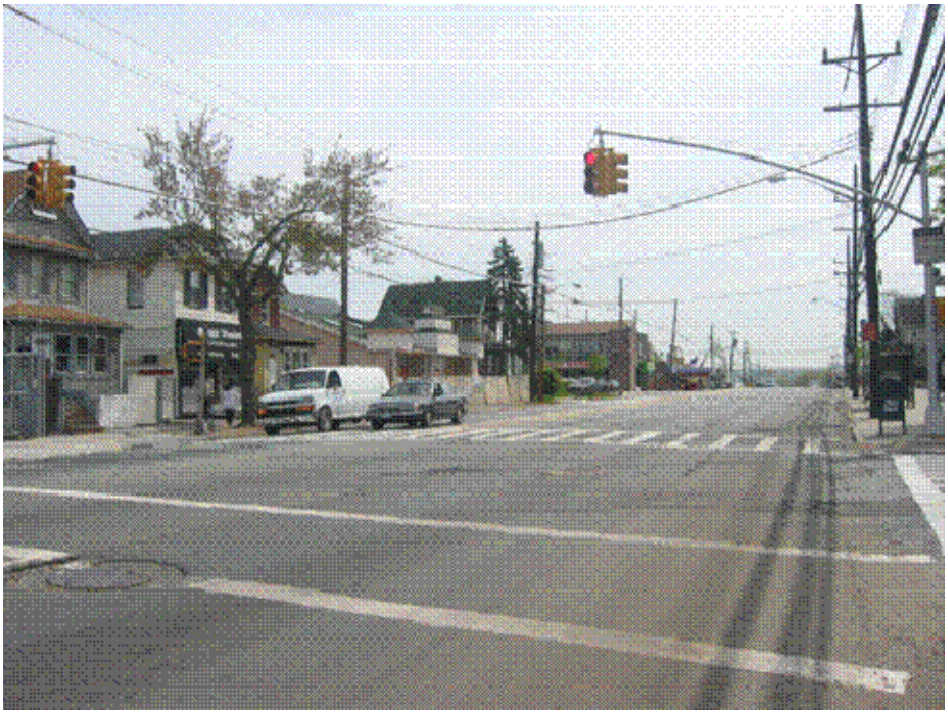


*Figure 3: Looking east along Forest Avenue at Sanders Street (school is off to the right)*

### 3.5 ACCIDENT SUMMARY

The number and severity of accidents at a location are typical indicators used to help determine the existence and severity of any potentially safety-related situations. Such situations are then examined for possible solutions and/or remedies.

Exhibit 6, at the end of this section, and Table 2 show a summary of accidents, as obtained from the New York State Department of Motor Vehicles (DMV) in the vicinity of P.S. 22 for a three-year period from January 1, 1998 through December 1, 2000. The DMV data provides some detail relating to the cause of an accident. Table 3 is a summary of more recent accident data obtained from the New York City Police Department (NYPD). Though current through 2004, the NYPD data does not provide the same level of detail as the DMV data.

Further discussions on accidents are included 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 & Richmond Avenue | 115 | 8 | 0 | 1 |
| Forest Avenue & Sanders Street | 11 | 1 | 0 | 0 |
| Forest Avenue & Willow Road West | 48 | 0 | 0 | 0 |
| Forest Avenue & Lake Avenue | 11 | 0 | 0 | 0 |
| Richmond Avenue & Monsey Place | 13 | 0 | 0 | 0 |
| **TOTAL** | **198** | **9** | **0** | **1** |

**TABLE 3: ACCIDENT SUMMARY OF NYC PD DATA87 (2001-2004)**

| INTERSECTION | TOTAL ACCIDENTS | PEDESTRIAN ACCIDENTS | PEDESTRIAN FATALITIES | SCHOOL-RELATED ACCIDENTS* |
|---|---|---|---|---|
| Forest Avenue & Richmond Avenue | 171 | 9 | 0 | 1 |
| Forest Avenue & Sanders Street | 18 | 1 | 0 | 0 |
| Forest Avenue & Willow Road West | 76 | 4 | 0 | 1 |
| Forest Avenue & Lake Avenue | 10 | 0 | 0 | 0 |
| Richmond Avenue & Monsey Place | 15 | 1 | 0 | 0 |
| **TOTAL** | **290** | **15** | **0** | **2** |

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

## 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 P.S. 22.

### *3.6.1 Richmond Avenue & Forest Avenue*

This is a four-leg signalized intersection with school crosswalks located across the north and south legs of Richmond Avenue, and across the east and west legs of Forest Avenue. Forest and Richmond Avenues are both two-way streets with two travel lanes and a parking lane on each side of the roadway (see Figures 1 and 4).

This intersection has been the site of one hundred and fifteen (115) accidents between 1998 and 2000. There were eight (8) pedestrian accidents, one of which was a school-related accident. The school-related accident involved a fourteen-year old pedestrian who was crossing the street with the signal at 3:00 pm in the afternoon, on Friday, September 18, 1998, and suffered a non-incapacitating injury. The NYPD accident data (Table 3) shows one hundred seventy-one (171) accidents including nine (9) pedestrian accidents between 2001 and 2004. There was one (1) school-related accident during the same four-year period. No additional information about the school-related accident is available.


*Figure 4: Looking south along east side of Richmond Avenue across Forest Avenue*

### *3.6.2 Forest Avenue & Sanders Street*

This is a signalized T-intersection with school crosswalks located across the east leg of Forest Avenue and the south leg of Sanders Street. Forest Avenue is a two-way street with two travel lanes and a parking lane on each side of the roadway.

Sanders Street is a one-way northbound street from Monsey Place to Forest Avenue (the section of Sanders Street adjacent to the school) with one travel lane and parking on both sides of the roadway. Sanders Street is a two-way street with one travel lane and a parking lane on each side of the roadway south of the intersection with Monsey Place (see Figures 2 & 3).

This intersection has been the site of eleven (11) accidents between 1998 and 2000; one (1) of these was pedestrian accident. The pedestrian accident was not a school-related. The NYPD accident data (Table 3) shows eighteen (18) accidents between 2001 and 2004. There was one (1) pedestrian accident during the same four-year period which was not a school-related accident.

The school officials reported a speeding problem on Forest Avenue. Therefore, a speed survey was conducted on Forest Avenue between Sanders Street and Richmond Avenue in the vicinity of the school in order to verify the existence of a speeding problem and to determine its extent.

The 85$^{th}$ percentile speed for westbound vehicles on Forest Avenue between Sanders Street and Richmond Avenue was found to be 31 mph. The 85$^{th}$ percentile speed for eastbound vehicles on Forest Avenue between the same segment was found to be 28 mph.

The 85$^{th}$ percentile speed is considered to be the representative speed for the street segment. Speeds above the 30 mph threshold would indicate a speeding problem and may require appropriate traffic calming measures.

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

### *3.6.3 Forest Avenue & Willow Road West*

This is a signalized intersection with school crosswalks located across the north and south legs of Willow Road West. Forest Avenue is a two-way arterial with two travel lanes and a parking lane on each side of the roadway. Willow Road West is a one-way southbound roadway with three travel lanes and no parking.

This intersection has been the site of forty-eight (48) accidents between 1998 and 2000. There were no pedestrian accidents. The NYPD accident data (Table 3) shows seventy-six (76) accidents including four (4) accidents between 2001 and 2004. There was one (1) school-related accident during the same four-year period. No additional information about the school-related accident is available.

### *3.6.4 Richmond Avenue & Monsey Place*

This is an unsignalized T-intersection with a school crosswalk located across Monsey Place. Monsey Place is a one-way westbound street with one travel lane and parking on both sides of the roadway.

Richmond Avenue is a two-way street with two travel lanes and a parking lane on the west, or southbound side of the roadway. North of the intersection, Richmond Avenue has a wide painted median along the center of the roadway. South of the intersection, Richmond Avenue has a narrow painted median separating the two directions of travel plus a dedicated left turn lane for northbound vehicles entering Monsey Place westbound.

This intersection has been the site of thirteen (13) accidents between 1998 and 2000, none of which were pedestrian accidents. The NYPD accident data (Table 3) shows fifteen (15) accidents including one pedestrian accident between 2001 and 2004. There was not a school-related accident during the same four-year period.

*Figure 5: Looking west along Monsey Place across Richmond Avenue*
*(School is down on north side of Monsey Place)*

### *3.6.5 Monsey Place & Sanders Street*

This is an unsignalized T-intersection with no school crosswalks. Monsey Place is a one-way westbound street with one travel lane and parking on both sides of the roadway.

Sanders Street is a two-way street with a travel lane and a parking lane on each side of the roadway south of Monsey Place. North of the intersection, Sanders Street is one-way northbound street from Monsey Place to Forest Avenue with one travel lane and parking on both sides of the roadway.

A "STOP" sign is installed for westbound Monsey Place at Sanders Street. There were no accidents reported at this intersection between 1998 and 2004.

*Figure 6: Looking east along Monsey Place across Sanders Street, empty bus drop-off area shown along curb (school is on the left)*

### 3.7 SIGNAL TIMING: PEDESTRIAN PHASE

Pedestrian crossing times were field verified for crosswalks at signalized intersections in the vicinity of P.S. 22, and found to be adequate based upon a child pedestrian walking at the rate of 3 feet per second. Signal timings are shown in Table 4.

**TABLE 4: PEDESTRIAN CROSSING TIME AT SIGNALIZED INTERSECTIONS**

| Intersection Name | Crosswalk Length (Feet) | Pedestrian Time Actual (Seconds) | Pedestrian Time Required (Seconds) | Timing Adjustment Required? |
|---|---|---|---|---|
| Forest Ave & Richmond Ave | | | | |
| crossing Forest Avenue | 62 | 34 | 24 | NO |
| crossing Richmond Avenue | 80 | 38 (am) - 35 (pm) | 30 | NO |
| Forest Ave & Sanders St | | | | |
| crossing Forest Ave | 60 | 34 | 23 | NO |
| crossing Sanders St | 34 | 52 | 15 | NO |
| Forest Ave & Willow Rd West | | | | |
| crossing Forest Ave | 72 | 45 (am) - 42 (pm) | 27 | NO |
| crossing Willow Rd West | 50 | 41 (am) - 44 (pm) | 20 | NO |

*Note – A rate of 3 ft/sec plus 3 seconds reaction time was utilized as the child pedestrian walking rate*

## 3.8 PHYSICAL CONDITIONS

### *3.8.1 Roadways and Sidewalks*

The roadways and sidewalks in the vicinity of P.S. 22 are generally in fairly good condition. Sidewalks are generally 10 to 15 feet wide in the area adjacent to the school (see Figures 2 and 6).

### *3.8.2 Pedestrian Ramps*

Overall, pedestrian ramps in the area of the school appear to be standard except at the following locations:

- Northwest corner of Richmond Avenue and Monsey Place where there is no pedestrian ramp (see Figure 5).
- Northeast corner of Forest Avenue & Richmond Avenue where a pedestrian ramp is mis-located and the crosswalk is obstructed by a utility/signal pole (see Figure 9).
- North and south corners of Monsey Place on the east side of Sanders Street, where pedestrian ramps are missing (see Figure 6).
- Southwest corner of Forest Avenue and Sanders Street where a pedestrian ramp is partially obstructed by a utility pole (see Figure 8).

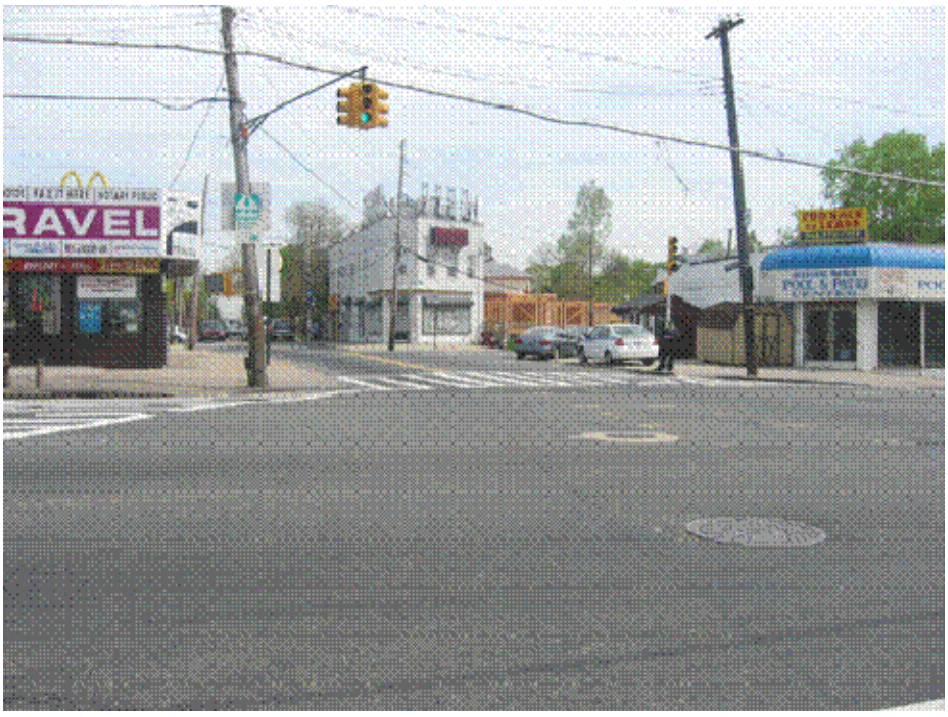



*Figure 7: Looking north on Richmond Avenue across Forest Avenue intersection*


*Figure 8: Looking west along Forest Avenue at Sanders Street (to left)*

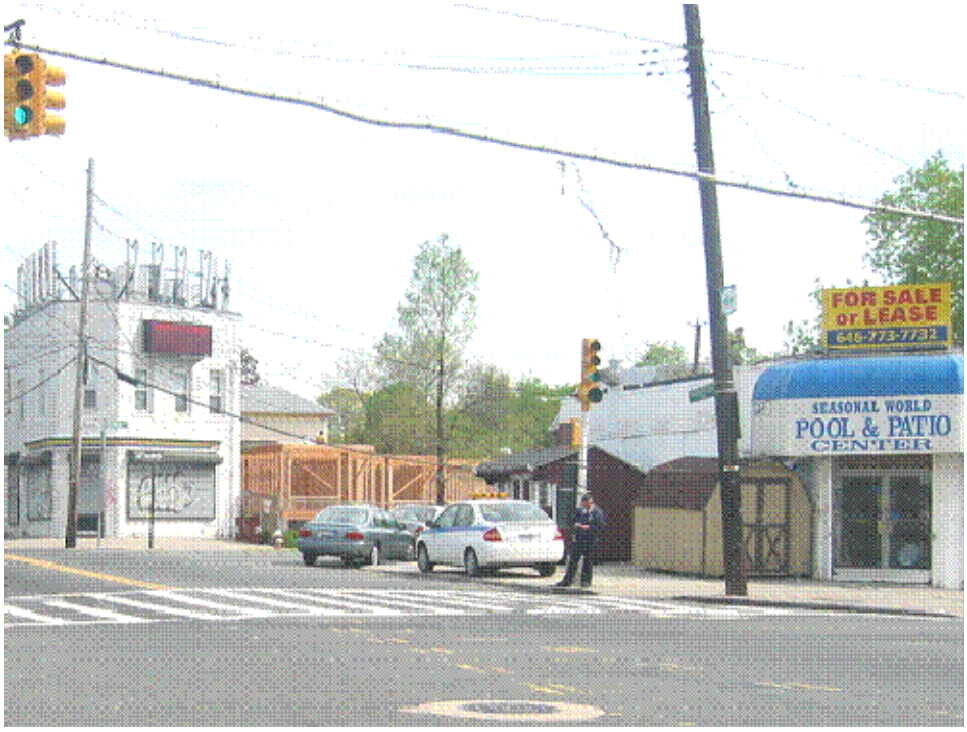
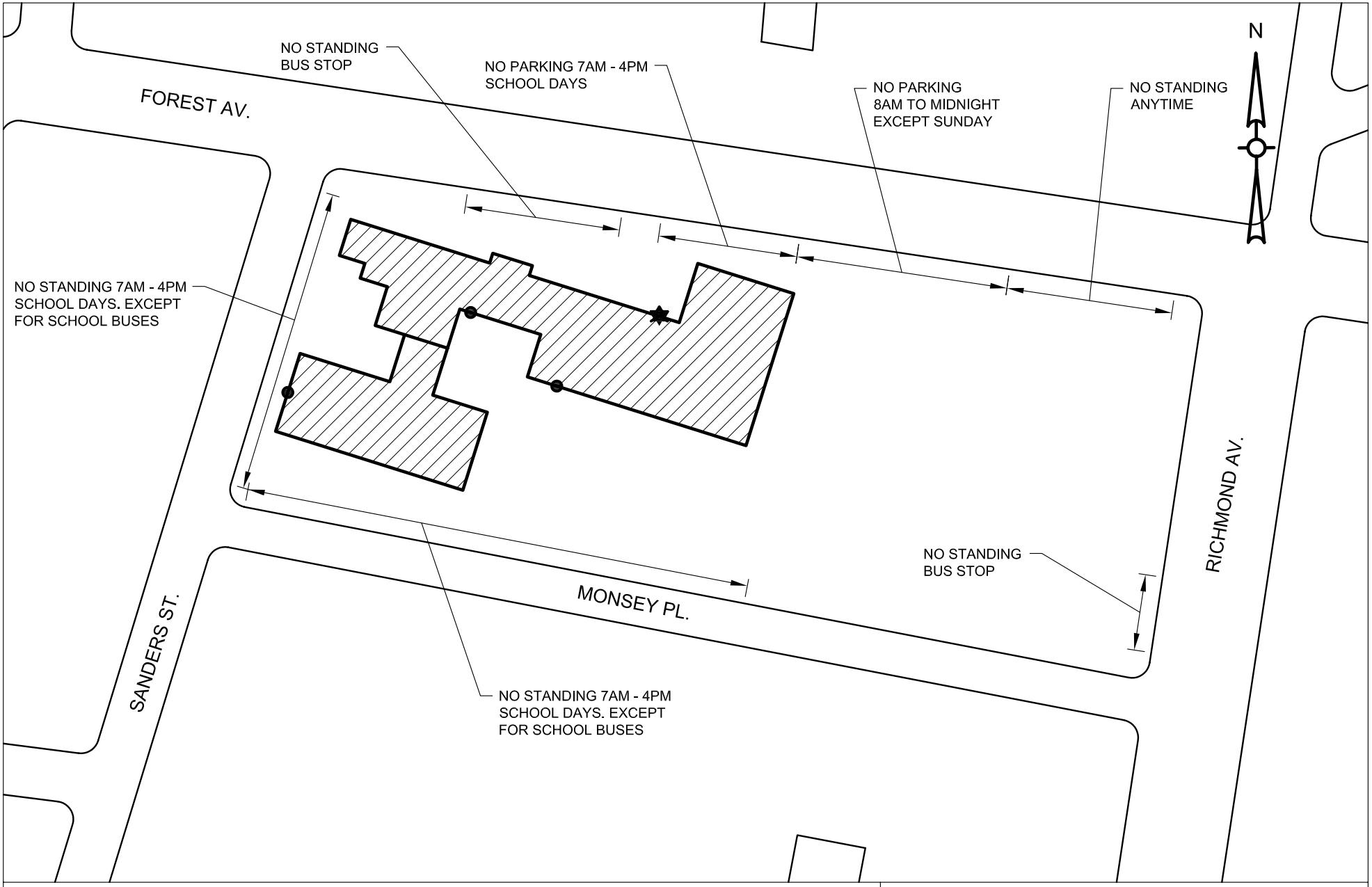



*Figure 9: Looking at northeast corner of Forest Avenue and Richmond Avenue at miss-located pedestrian ramp and pole obstructing northerly crosswalk.*




LEGEND:

MAIN ENTRANCE

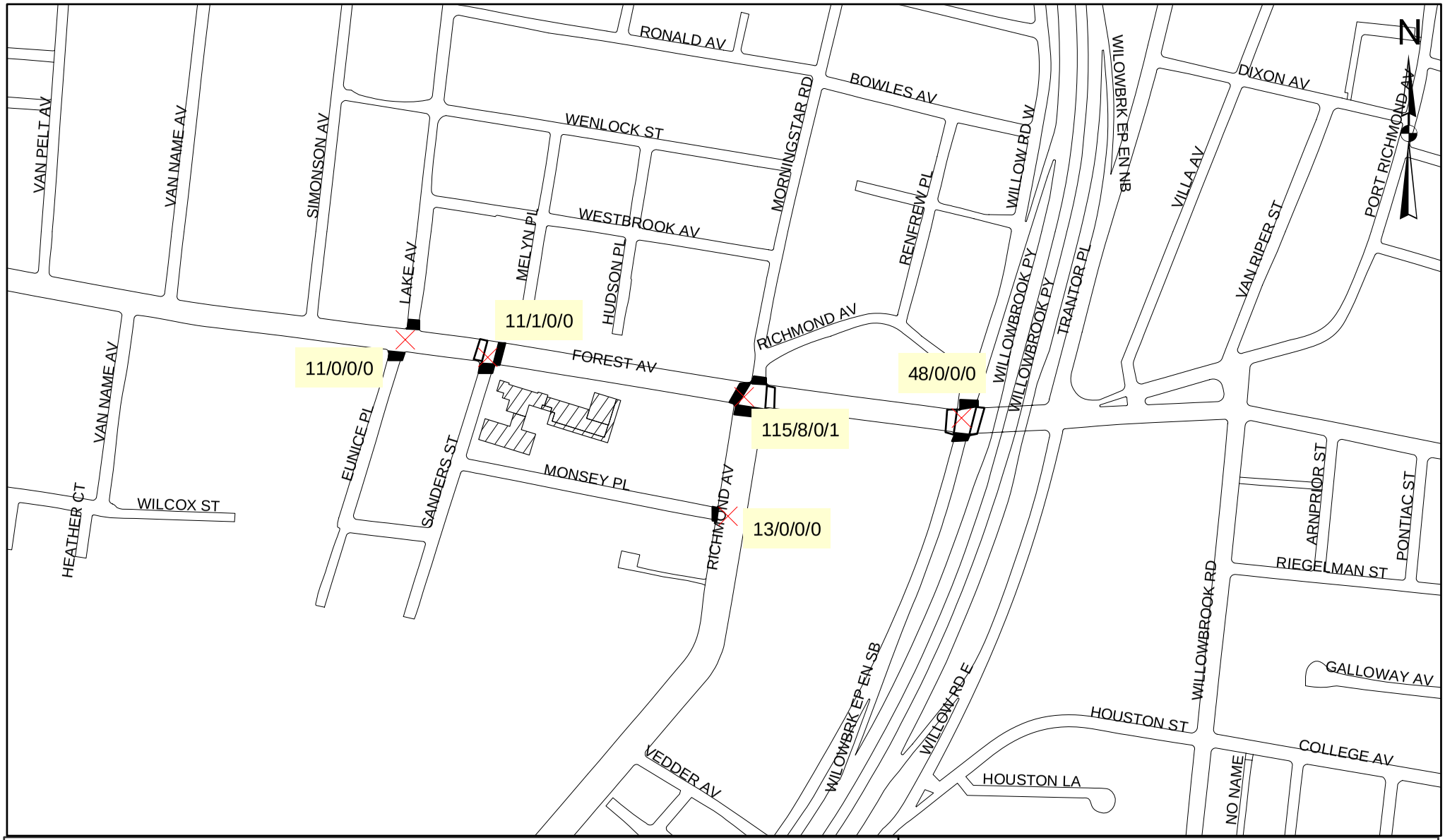
ENTRANCE

0 100 200 FEET

EXHIBIT 5

P.S. 22 STATEN ISLAND
GRANITEVILLE SCHOOL

EXISTING PARKING REGULATIONS




**LEGEND:**

ACCIDENT LOCATION

SCHOOL CROSSWALK

SCHOOL CROSSWALK ASSIGNED TO ANOTHER SCHOOL

X/X/X/X — TOTAL ACCD / PED ACCD / PED FATAL / SCHOOL_PED ACCD

500 250 0 500 Feet

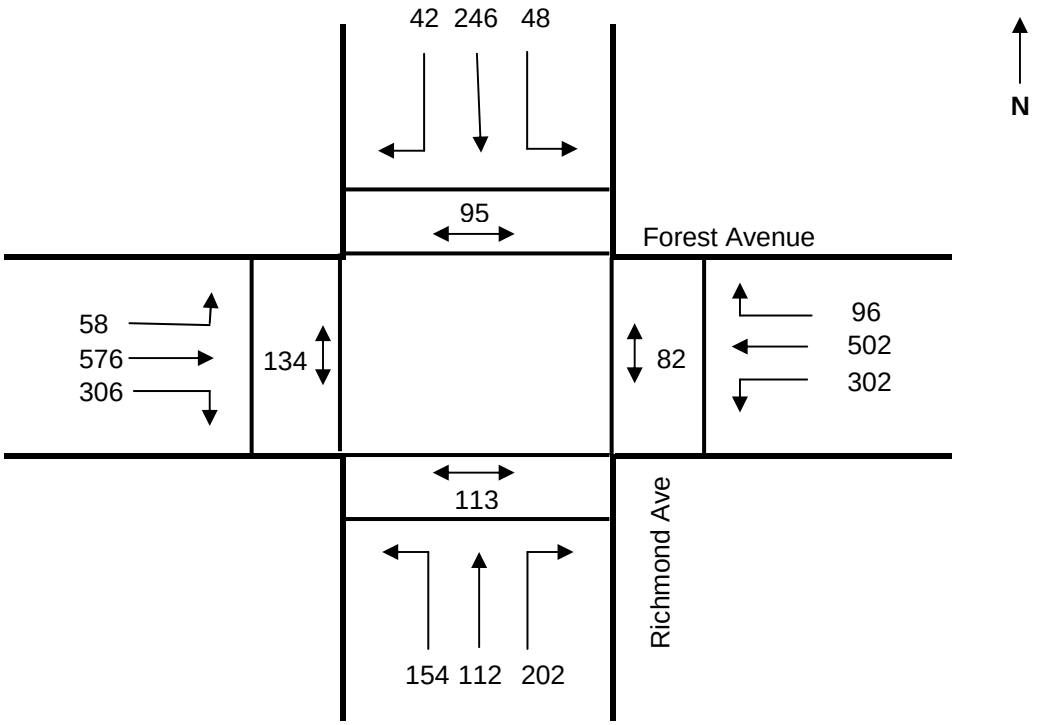
# EXHIBIT 6

**P.S. 22 STATEN ISLAND**

**GRANITEVILLE SCHOOL**

**ACCIDENT SUMMARY (1998-2000)**

**One Hour Traffic Volumes**
**Monday, May 9th, 2005 2:45pm - 3:45pm**




***Intersection of Richmond Avenue and Forest Avenue***

**Table of Content:**

Pedestrian Counts

Vehicle Movement

| EXHIBIT 7 |
| --- |
| **P.S. 22 STATEN ISLAND GRANITEVILLE SCHOOL** |
| **TRAFFIC COUNTS** |

# 4. PROPOSED MEASURES TO IMPROVE SCHOOL PEDESTRIAN SAFETY

This section describes the proposed measures to improve school pedestrian safety around P.S. 22. 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 P.S. 22 is discussed as follows, and is shown in more detail in Exhibit 8 at the end of this section.

## 4.1 SHORT-TERM MEASURES

- *Install "No Standing 7AM – 4PM School Days" Signs*

  Replace the existing "No Standing 7AM – 4PM School Days" signs with "No Standing 7AM – 4PM School Days" signs for thirty feet (30') in front of the main entrance of the school. (This is a typical requirement for all NYC public schools in order to provide for emergency access to and from the school.)

- *Place advanced stop bars before school crosswalks*

  The MUTCD and New York City Department of Transportation (NYCDOT) standard for placement of a stop bar is four feet (4') in advance of a marked crosswalk. At signalized intersections and mid-block crossings, the vehicle stop line can be moved farther back from the pedestrian crosswalk.

  For school crosswalks with significant potential for vehicular / pedestrian conflicts, it is recommended that the advance stop bar be placed ten feet (10') in advance of the crosswalk to maximize the safety benefit for school-aged pedestrians. (This would improve visibility of pedestrians to motorists, and allow pedestrians to proceed in a crosswalk before motor vehicles turn.)

  Ten feet (10') advanced stop bars before school crosswalks are recommended on the following approaches of signalized intersections surrounding P.S. 22:

  - Northbound, eastbound, and westbound approaches of Richmond Avenue and Forest Avenue intersection
  - Westbound and northbound approaches of Forest Avenue Sanders Street intersection

- *Monsey Place*

  School officials reported parents drop students off on Monsey Place and mix-in with the school buses and often discharge the students in the street next to the parked school buses. The children then travel between the buses to get to the sidewalk. The parents are dropping-off their children at the same time the buses arrive, generally between 8:10 - 8:20 am. Two alternatives are available for alleviating this situation, they are:

  - Designate a separate parental drop-off area in the easterly section, on the north side of the street (the school side) closer to Richmond Avenue, in order to keep them separate from the drop-off area for buses, which is near Sanders Street and the school.

- As an alternate, the street could be closed to accommodate bus drop-offs from 8:00 to 8:30 am, and then reopened for parental drop-offs after 8:30 am.

In either case, the presence of school officials could help parents to understand the new drop-off procedures, and encourage their continued use.

➢ *Safety Education Program*

In addition to the two existing crossing guards, the school has requested an additional crossing guard at the intersection of Monsey Place & Richmond Avenue. Students are now crossing Richmond Avenue at Monsey Place, and Richmond is a wide roadway with six lanes at the intersection.

- It is recommended that the NYCDOT Safety Education Program be utilized to help school officials deter students from crossing Richmond Avenue at Monsey Place. This is an unsignalized and unmarked crossing, and students should be directed to cross only in marked crosswalks at adjacent intersections.

- *Speed Reducer*

Forest Avenue is a two-way street, adjacent to the school. The school officials reported speeding as a safety problem along Forest Avenue. The speed survey conducted on Forest Avenue between Sanders Street and Richmond Avenue in the vicinity of the school showed that the 85$^{th}$ percentile speed exceeded the 30 mph threshold speed limit for the westbound direction of travel (see Section 3.6.2 and Appendix). Forest Avenue has two travel lanes and a parking lane in each direction. Further, Forest Avenue is a designated local truck route and carries local buses as well. Therefore, a speed-reducer (hump) can not be recommended.

➢ *Pedestrian Ramps*

A pedestrian ramp is missing at the northwest corner of Richmond Avenue and Monsey Place. Similarly pedestrian ramps are also missing on the north and south corners of Monsey Place on the east side of Sanders Street.

- Therefore, it is recommended to install pedestrian ramps at the following locations:
  - Northwest corner of Richmond Avenue and Monsey Place
  - North and south corners of Monsey Place on the east side of Sanders Street

The pedestrian ramp is partially obstructed by a utility pole at the southwest corner of Forest Avenue and Sanders Street. Further, a pedestrian ramp is mis-located and the crosswalk is obstructed by a utility/signal pole at the northeast corner of Forest Avenue & Richmond Avenue.

- Therefore, it is recommended to reconstruct pedestrian ramps to current standards at the following locations:
  - Southwest corner of Forest Avenue and Sanders Street.
  - Northeast corner of Forest Avenue and Richmond Avenue.

- *Repair Sidewalk*

- Repair sidewalk on west side of Richmond Avenue south of Monsey Place. This sidewalk leads to the pedestrian crosswalk adjacent to the shopping center entrance.

## 4.2 LONG-TERM MEASURES

- *Consider curb extension at the following intersection:*

  - Provide curb extension at the southwest corner of Richmond Avenue at its intersection with Forest Avenue.

  Curb extensions should be installed at the corners as shown in Exhibit 8. The purpose of the curb extension is to provide additional reservoir space for pedestrians, to shorten the crossing distance for pedestrians, and to reduce the speed of vehicles approaching and turning on school crosswalks. The curb extension will not eliminate or reduce the width of any travel lanes. Curb extensions are not proposed where they would hinder the ability of a vehicle to turn.

- *Consider pedestrian refuge islands at the following locations, as shown in Exhibit 8:*

  There is a striped median on Forest Avenue between Sanders Street and Richmond Avenue. The median is very narrow: about three to four feet wide at Richmond Avenue and Sanders Street. However, the travel lanes are about twelve feet (12') wide.

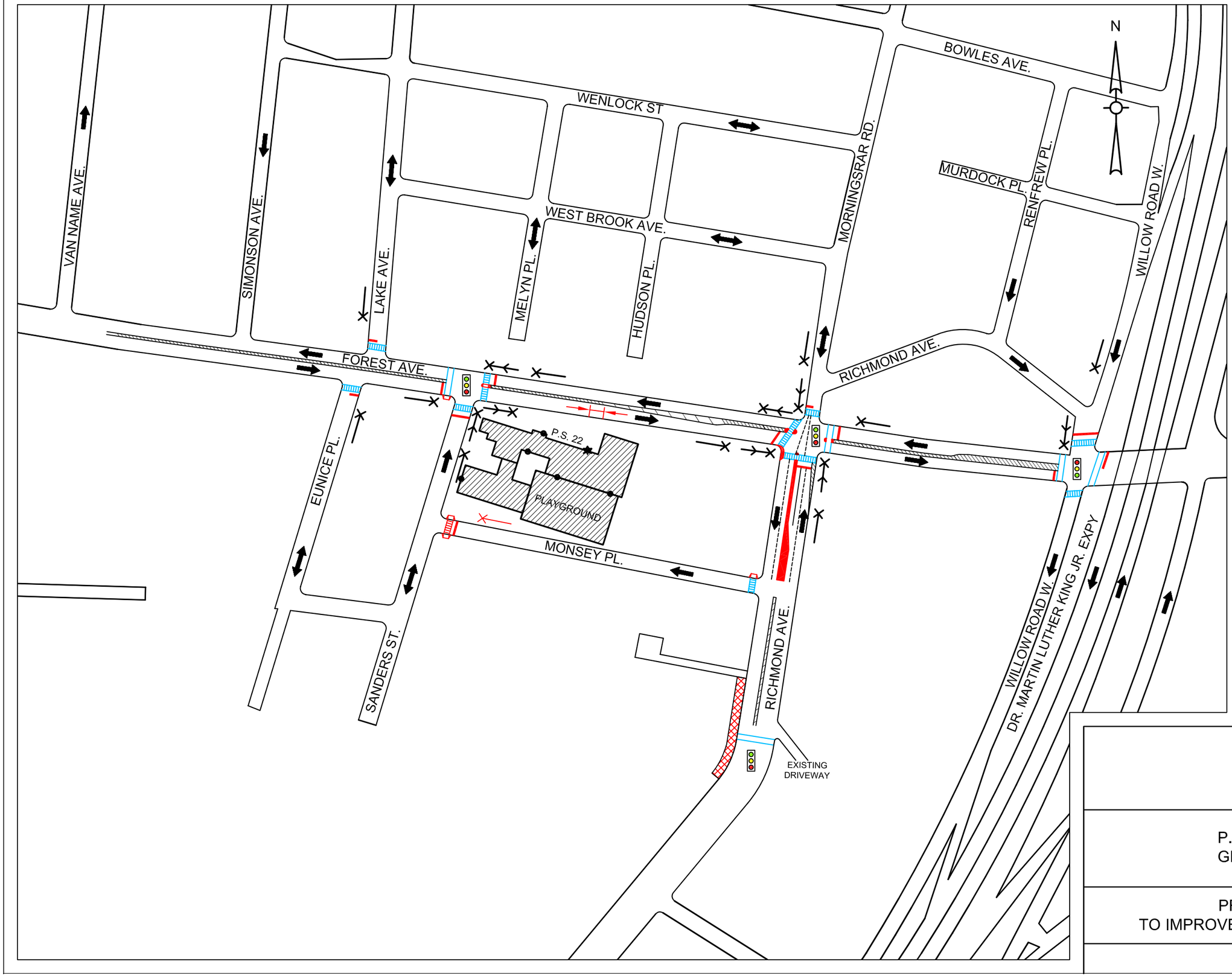
  It is therefore recommended to:

  - Reduce the width of existing travel lanes from twelve feet (12') to eleven feet (11')
  - Provide pedestrian refuge island, that is 4 foot wider than the current striped median, at the west leg of Forest Avenue at its intersection with Richmond Avenue
  - Provide pedestrian refuge island at the east leg of Forest Avenue at its intersection with Sanders Street

  There is an existing striped median on Richmond Avenue between Forest Avenue and Monsey Place. In addition, there is striped roadway section along the east curbline just south of Forest Avenue. It is therefore recommended to:

- Reconfigure the northbound approach of Richmond Avenue to move the northbound travel lanes to further east (using the striped section along the east curbline) and provide a built median on Richmond Avenue between Forest Avenue and Monsey Place. The proposed built median should extend through the school crosswalk located across the south leg of Richmond Avenue at its intersection with Forest Avenue.

The refuge islands with extended medians will provide a refuge for pedestrians who do not complete the crossing during the flashing "Don't Walk" indication. The proposed median should be at least six feet wide, should extend beyond the crosswalk, and should have at least a five foot at grade cut through section. These medians are not proposed where they would hinder the ability of vehicles to turn. Final details pertaining to proposed refuge islands and curb extensions will be developed during Final Design.




LEGEND

- MAIN ENTRANCE
- OTHER ENTRANCES
- EXISTING TRAVEL DIRECTION
- EXISTING ADVANCE WARNING SIGN OR SCHEDUALED TO BE INSTALLED
- EXISTING SCHOOL CROSSWALK WARNING ASSEMBLY OR SCHEDUALED TO BE INSTALLED
- EXISTING SIGNALIZED LOCATION
- EXISTING SCHOOL CROSSWALK
- EXISTING PEDESTRIAN CROSSWALK
- EXISTING STRIPED MEDIAN
- PROPOSED SCHOOL CROSSWALK
- PROPOSED SCHOOL ADVANCE WARNING SIGN
- PROPOSED TRAFFIC SIGN
- PROPOSED PEDESTRIAN RAMP
- PROPOSED STOP LINE IN ADVANCE OF SCHOOL CROSSWALK
- PROPOSED "NO STANDING 7AM - 4PM SCHOOL DAYS"
- PROPOSED CONCRETE MEDIAN
- PROPOSED CONCRETE REFUGE ISLAND
- PROPOSED CURB EXTENSION (NECKDOWN)
- AREA OF SIDEWALK TO BE RECONSTRUCTED

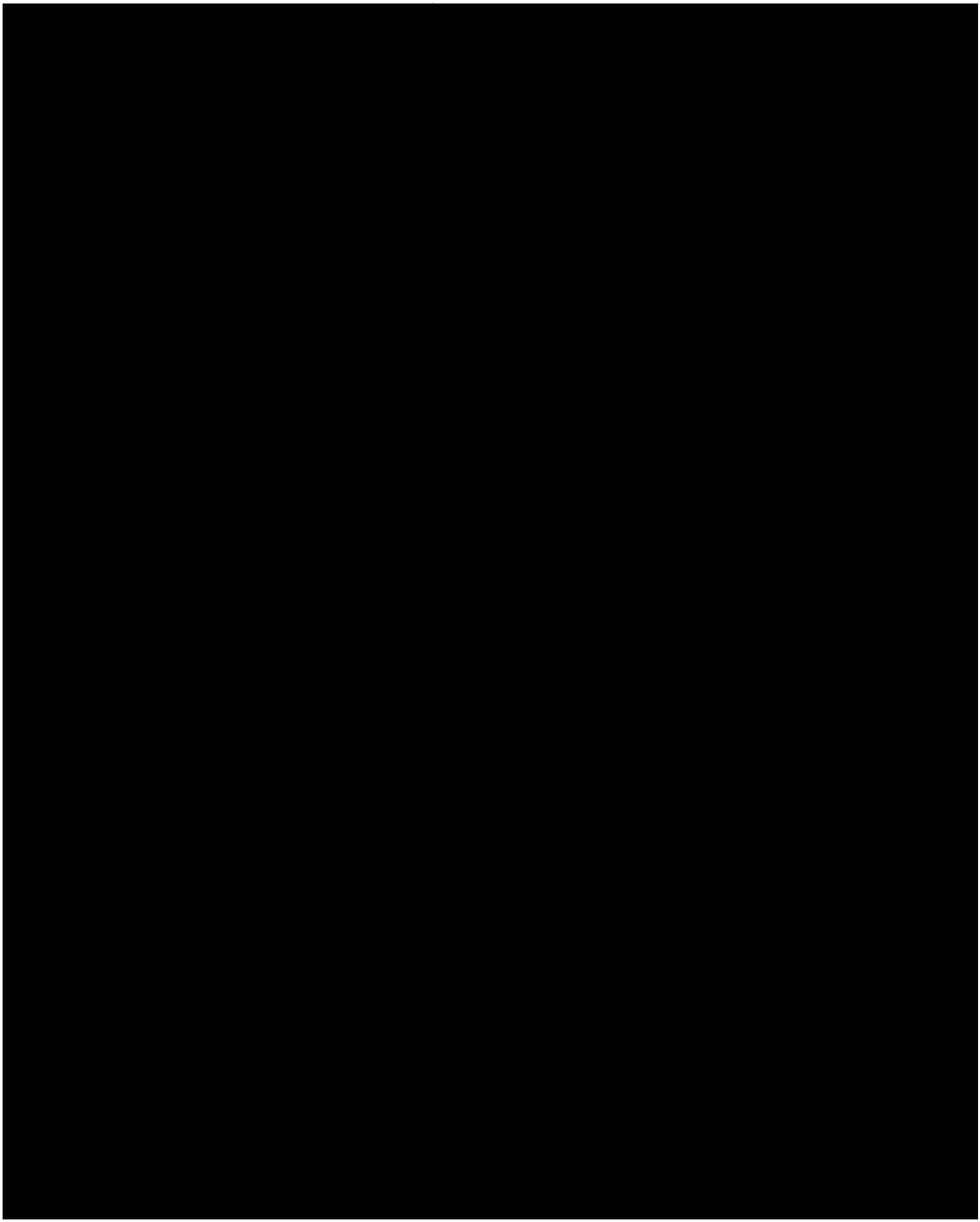
1" = 200'

EXHIBIT 8

P.S. 22 STATEN ISLAND
GRANITEVILLE SCHOOL

PROPOSED MEASURES
TO IMPROVE SCHOOL PEDESTRIAN SAFETY

# APPENDIX



# SPOT SPEED STUDY

Date: **May 9, 2005** Time: **1:50PM** School: **P.S. 22**
Location: **Forest Ave between Richmond Ave and Sanders Ave** Direction: **Eastbound**
Surveyor: **Richard Calvache & Keren Mor** 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 | 1 | 0.9% | 0.9% | 15 | 225 |
| 16 | 2 | 1.7% | 2.6% | 32 | 512 |
| 17 | 1 | 0.9% | 3.4% | 17 | 289 |
| 18 | 5 | 4.3% | 7.7% | 90 | 1620 |
| 19 | 3 | 2.6% | 10.3% | 57 | 1083 |
| 20 | 19 | 16.2% | 26.5% | 380 | 7600 |
| 21 | 7 | 6.0% | 32.5% | 147 | 3087 |
| 22 | 13 | 11.1% | 43.6% | 286 | 6292 |
| 23 | 8 | 6.8% | 50.4% | 184 | 4232 |
| 24 | 28 | 23.9% | 74.4% | 672 | 16128 |
| 25 | 6 | 5.1% | 79.5% | 150 | 3750 |
| 26 | 4 | 3.4% | 82.9% | 104 | 2704 |
| 27 | 5 | 4.3% | 87.2% | 135 | 3645 |
| 28 | 5 | 4.3% | 91.5% | 140 | 3920 |
| 29 | 3 | 2.6% | 94.0% | 87 | 2523 |
| 30 | 2 | 1.7% | 95.7% | 60 | 1800 |
| 31 | 1 | 0.9% | 96.6% | 31 | 961 |
| 32 | 0 | 0.0% | 96.6% | 0 | 0 |
| 33 | 0 | 0.0% | 96.6% | 0 | 0 |
| 34 | 0 | 0.0% | 96.6% | 0 | 0 |
| 35 | 2 | 1.7% | 98.3% | 70 | 2450 |
| 36 | 0 | 0.0% | 98.3% | 0 | 0 |
| 37 | 0 | 0.0% | 98.3% | 0 | 0 |
| 38 | 1 | 0.9% | 99.1% | 38 | 1444 |
| 39 | 0 | 0.0% | 99.1% | 0 | 0 |
| 40 | 0 | 0.0% | 99.1% | 0 | 0 |
| 41 | 0 | 0.0% | 99.1% | 0 | 0 |
| 42 | 0 | 0.0% | 99.1% | 0 | 0 |
| 43 | 0 | 0.0% | 99.1% | 0 | 0 |
| 44 | 0 | 0.0% | 99.1% | 0 | 0 |
| 45 | 1 | 0.9% | 100.0% | 45 | 2025 |
| 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 |
| | 117 | 100.0% | | 2740 | 66290 |

Mean Speed = 23.4 mph
Standard Deviation = 4.3 mph
Margin of Error (95% Confidence) = ± 0.8 mph

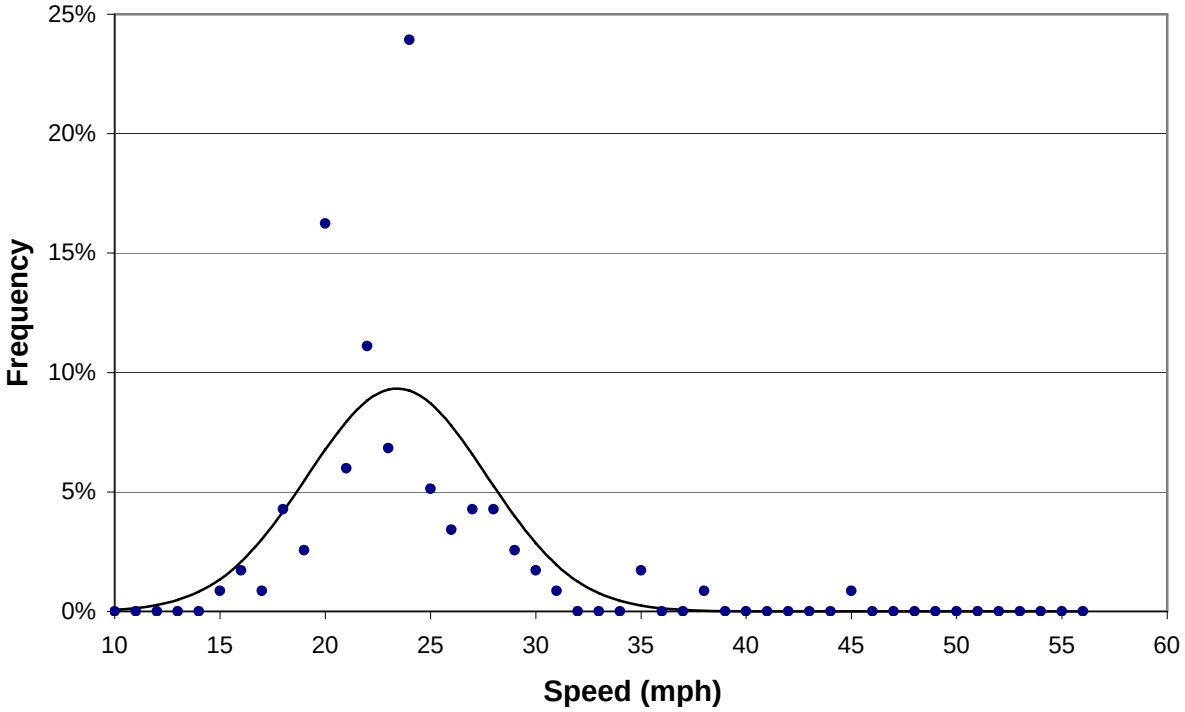
Median Speed = 23.4 mph
15th Percentile Speed = 19.0 mph
85th Percentile Speed = 27.9 mph

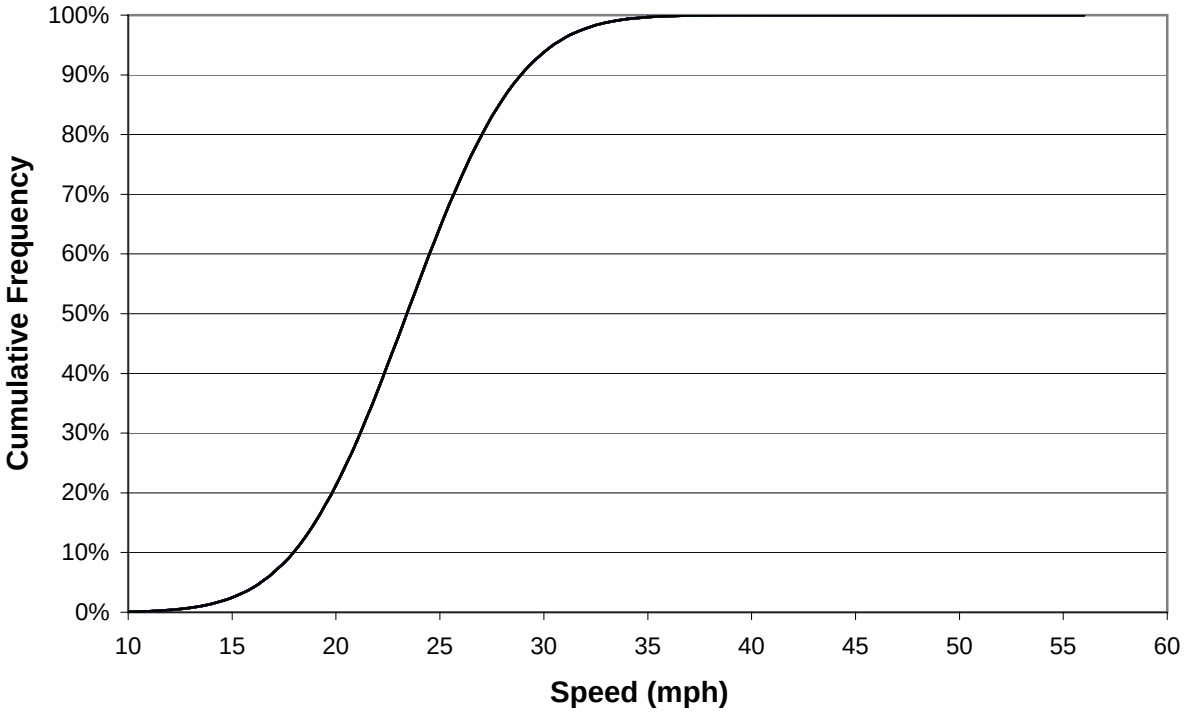
## SPOT SPEED STUDY

Date: **May 9, 2005** Time: **1:50PM** School: **P.S. 22**
Location: **Forest Ave between Richmond Ave and Sanders Ave** Direction: **Eastbound**
Surveyor: **Richard Calvache & Keren Mor** Comments:

Mean Speed = 23.4 mph
Standard Deviation = 4.3 mph
Margin of Error (95% Confidence) = ± 0.8 mph

Median Speed = 23.4 mph
15th Percentile Speed = 19.0 mph
85th Percentile Speed = 27.9 mph



# SPOT SPEED STUDY

Date: **May 9, 2005** Time: **1:50PM** School: **P.S. 22**
Location: **Forest Ave between Richmond Ave and Sanders Ave** Direction: **Westbound**
Surveyor: **Richard Calvache & Keren Mor** 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 | 3 | 3.0% | 3.0% | 45 | 675 |
| 16 | 0 | 0.0% | 3.0% | 0 | 0 |
| 17 | 1 | 1.0% | 4.0% | 17 | 289 |
| 18 | 5 | 5.0% | 9.0% | 90 | 1620 |
| 19 | 2 | 2.0% | 11.0% | 38 | 722 |
| 20 | 6 | 6.0% | 17.0% | 120 | 2400 |
| 21 | 0 | 0.0% | 17.0% | 0 | 0 |
| 22 | 8 | 8.0% | 25.0% | 176 | 3872 |
| 23 | 15 | 15.0% | 40.0% | 345 | 7935 |
| 24 | 5 | 5.0% | 45.0% | 120 | 2880 |
| 25 | 9 | 9.0% | 54.0% | 225 | 5625 |
| 26 | 7 | 7.0% | 61.0% | 182 | 4732 |
| 27 | 9 | 9.0% | 70.0% | 243 | 6561 |
| 28 | 6 | 6.0% | 76.0% | 168 | 4704 |
| 29 | 2 | 2.0% | 78.0% | 58 | 1682 |
| 30 | 6 | 6.0% | 84.0% | 180 | 5400 |
| 31 | 2 | 2.0% | 86.0% | 62 | 1922 |
| 32 | 5 | 5.0% | 91.0% | 160 | 5120 |
| 33 | 4 | 4.0% | 95.0% | 132 | 4356 |
| 34 | 1 | 1.0% | 96.0% | 34 | 1156 |
| 35 | 1 | 1.0% | 97.0% | 35 | 1225 |
| 36 | 2 | 2.0% | 99.0% | 72 | 2592 |
| 37 | 0 | 0.0% | 99.0% | 0 | 0 |
| 38 | 0 | 0.0% | 99.0% | 0 | 0 |
| 39 | 1 | 1.0% | 100.0% | 39 | 1521 |
| 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 |
| | 100 | 100.0% | | 2541 | 66989 |

Mean Speed = 25.4 mph
Standard Deviation = 4.9 mph
Margin of Error (95% Confidence) = ± 1.0 mph

Median Speed = 25.4 mph
15th Percentile Speed = 20.3 mph
85th Percentile Speed = 30.5 mph

## SPOT SPEED STUDY

Date: **May 9, 2005** Time: **1:50PM** School: **P.S. 22**
Location: **Forest Ave between Richmond Ave and Sanders Ave** Direction: **Westbound**
Surveyor: **Richard Calvache & Keren Mor** Comments:

Mean Speed = 25.4 mph
Standard Deviation = 4.9 mph
Margin of Error (95% Confidence) = ± 1.0 mph

Median Speed = 25.4 mph
15th Percentile Speed = 20.3 mph
85th Percentile Speed = 30.5 mph