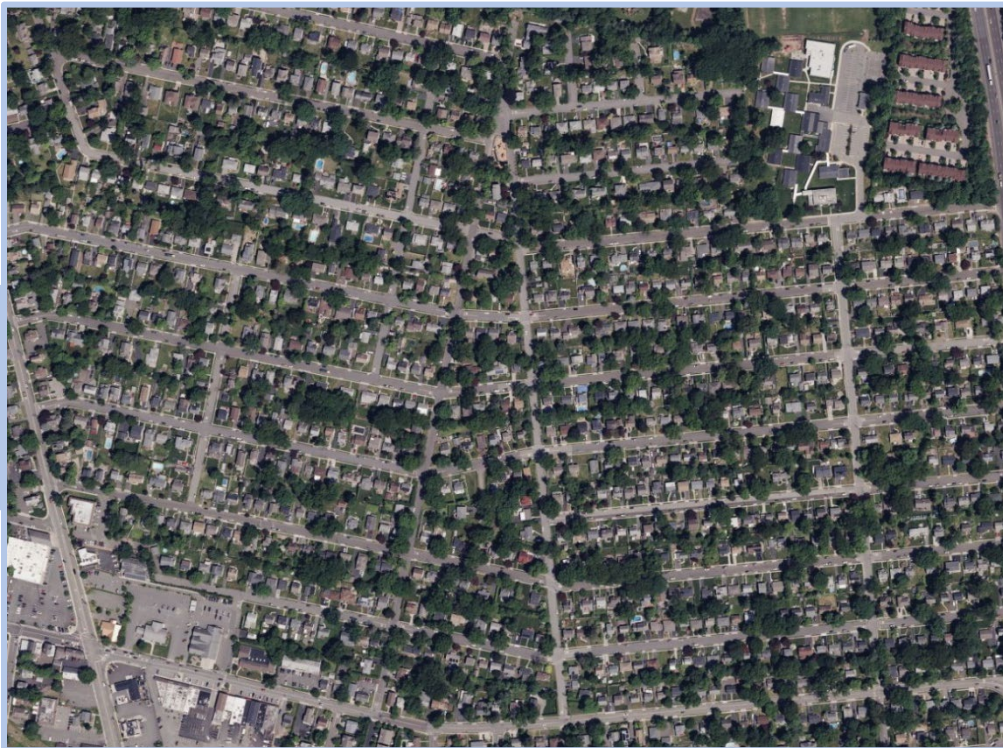




# Borough of Waldwick Traffic Safety Study

## Traffic Calming Measures for Neighborhood Roadways



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Borough of Waldwick

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# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

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# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

### Introduction

The study includes traffic speed and volume collection to frame a potential traffic safety issue and to recommend safety countermeasures within the roadways bounded by Franklin Turnpike to the west, NJ Route 17 to the east, East Prospect Street to the south, and Mackay Avenue to the north. The Borough of Waldwick initiated this study in response to safety concerns over traffic speeds raised by members of the public, with the goal of developing a safer street grid. The study's Purpose and Need is to recommend traffic calming measures within the study area to improve vehicular speed compliance and address the vehicular speeding issue evidenced through traffic data collection.

### Traffic Data Collection

#### Speed and Volume Data

A speed study was conducted to determine the speed and volume of vehicles in the study area at 16 locations. Table 1 below lists the data collection locations are listed below with 24-hr volume totals measured on Jan 18, 2023. which is shown in Table 1 below.

**Table 1: 24-Hour Traffic Volumes by Location, Collected on Jan 18, 2023**

Location	Direction	24-Hr Volume
Location 1: East Prospect Street between Nordham St and Ridge St	EB	6757
	WB	7889
	Bi-Directional	<b>14646</b>
Location 16: East Prospect Street between Franklin Tpk and Centre St	EB	7353
	WB	8076
	Bi-Directional	<b>15429</b>
Location 2: Ridge Street between Dora Ave and Grove St	NB	990
	SB	680
	Bi-Directional	<b>1670</b>
Location 3: Grove Street between Nordham St and Ridge St	EB	158
	WB	280
	Bi-Directional	<b>438</b>
Location 4: Waldwick Avenue between Nordham St and Ridge St	EB	199
	WB	158
	Bi-Directional	<b>357</b>
Location 5: Lincoln Place between Nordham St and Ridge St	EB	187
	WB	164
	Bi-Directional	<b>351</b>
Location 6: Nordham Street between Lincoln Pl and Bergen Ave	NB	575
	SB	479
	Bi-Directional	<b>1054</b>
Location 7: Bergen Avenue between Nordham St and Ridge St	EB	607
	WB	258
	Bi-Directional	<b>865</b>
Location 8: Ridge Street between Summit Ave and Bergen Ave	NB	658
	SB	520
	Bi-Directional	<b>1178</b>
Location 9: Summit Avenue between Nordham St and Ridge St	EB	529
	WB	508
	Bi-Directional	<b>1037</b>
Location 10: Summit Avenue between Centre St and Park Ave	EB	315
	WB	353
	Bi-Directional	<b>668</b>



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## Traffic Calming Measures

Location	Direction	24-Hr Volume
Location 11: Bergen Avenue between Cortland St and Central Ave	EB	564
	WB	320
	Bi-Directional	<b>884</b>
Location 12: Centre Street between Lincoln Pl and Bergen Ave	NB	276
	SB	210
	Bi-Directional	<b>486</b>
Location 13: Lincoln Place between Cortland St and Central Ave	EB	173
	WB	223
	Bi-Directional	<b>396</b>
Location 14: Waldwick Avenue between Central Ave and Centre St	EB	250
	WB	242
	Bi-Directional	<b>492</b>
Location 15: Grove Street between Central Ave and Centre St	EB	303
	WB	305
	Bi-Directional	<b>608</b>

Speed data collected over the same 24-hour period on Jan 18, 2023 is presented in Figures 1 and 2. These figures show where drivers exceeded the 25 MPH speed limit, with Figure 1 indicating that more than half of the drivers on yellow, orange, and red roadways were driving above the speed limit, as reflected by the 50th percentile speed or median. Meanwhile, Figure 2 depicts the 85th percentile speeds, where 15 percent of drivers are above the 85th percentile and the rest are below, highlighting the prevalence of excessive speeds throughout the entire study area. Full-size versions of Figure 1 and Figure 2 can be found in Appendix A.

The data collected on January 18th, 2023, demonstrates that speeding is a consistent issue across the entire study area. Although analysis revealed that motorists most frequently exceeded the posted speed limit by less than 5 MPH, a substantial portion of drivers traveled at 10 MPH or more above the posted speed limit. Throughout the entire study area, approximately 2,100 motorists traveled at 35 MPH or more in a 24-hour period for all measured roadways. The largest contributors to this figure are East Prospect Street and Nordham Street, where more than 2,000 drivers exceeded the posted speed limit by more than 10 MPH. While the highest speeds are primarily on these two roads, the neighborhood streets also experienced excessive speeds that could be addressed through engineering countermeasures.

To assess the extent of the speeding problem and determine if engineering interventions are necessary to reduce speeds in the study area, the project team adopted the Institute of Transportation Engineers' (ITE) criteria for identifying speeding issues. While definitions of speeding vary region to region, according to ITE's publication "A Guide to Speed Reduction Techniques: Planning and Design of Speed Humps, Speed Tables, and Other Related Measures" (2022) the following roadway conditions may indicate a speeding issue:

1. Excessive Speed:
  - a. Percent of vehicles exceeding posted speed by 5+ MPH above 25 percent (excessive)
  - b. Percent of vehicles exceeding posted speed by 10+ MPH above 10 percent (racing)
2. Uniformity of Speed:
  - a. Pace speed<sup>1</sup> percentage below 70 percent
  - b. Pace speed above 20 MPH to 30 MPH (30 km/h to 50 km/h)
3. Speed: 85th percentile 7 MPH (11 km/h) above posted speed
4. Volume: Daily vehicle volume of 2,000 vpd and greater [on neighborhood streets]
5. Street Width: Pavement width greater than 32' (9.8 m)
6. Parking: No parking allowed or limited use of on-street parking

Using ITE's guidance, Michael Baker determined that all locations analyzed within the study area meet at least one of the definitions for the presence of speeding issues. The most common criteria met are Criteria 2b: Uniformity of Speed, Criteria 3: Speed, and Criteria 1a: Excessive Speed. Criteria 2b was satisfied at all 16 locations within the study area, while Criteria 3 and Criteria 1a were met at six (6) and

<sup>1</sup> Pace speed is the 10 MPH range of speeds that comprises the largest portion of motorists in the traffic stream on a given roadway.



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

five (5) of the study locations respectively. The analysis performed highlights that speeding is an issue of the neighborhood streets of Waldwick Borough. The full results of the analysis can be found in Appendix B.

In addition to evaluating Waldwick’s roads for speeding issues using ITE’s guidance, Michael Baker developed a list of the facilities in order of the number of vehicles exceeding the speed limit (25 MPH). This list identifies the top speeding locations and can be used to prioritize the Borough’s investments in countermeasures to reduce speeding. Shown in Table 2, Waldwick’s roads are listed in descending order by the total number of vehicles exceeding 25 MPH during the 48-hr data collection period.

**Table 2: 48-Hour Traffic Volumes over 25 MPH by Location**

<b>Rank</b>	<b>Location</b>	<b>Bi-Directional Volume Traveling Above 25 MPH over 48-hr Period</b>
1	Location 1: East Prospect Street between Nordham St and Ridge St	21144
2	Location 16: East Prospect Street between Franklin Tpk and Centre St	11360
3	Location 6: Nordham Street between Lincoln Pl and Bergen Ave	2315
4	Location 2: Ridge Street between Dora Ave and Grove St	1714
5	Location 11: Bergen Avenue between Cortland St and Central Ave	1244
6	Location 9: Summit Avenue between Nordham St and Ridge St	908
7	Location 10: Summit Avenue between Centre St and Park Ave	814
8	Location 15: Grove Street between Central Ave and Centre St	718
9	Location 7: Bergen Avenue between Nordham St and Ridge St	681
10	Location 8: Ridge Street between Summit Ave and Bergen Ave	523
11	Location 13: Lincoln Place between Cortland St and Central Ave	456
12	Location 5: Lincoln Place between Nordham St and Ridge St	436
13	Location 4: Waldwick Avenue between Nordham St and Ridge St	424
14	Location 14: Waldwick Avenue between Central Ave and Centre St	385
15	Location 12: Centre Street between Lincoln Pl and Bergen Ave	270
16	Location 3: Grove Street between Nordham St and Ridge St	187



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

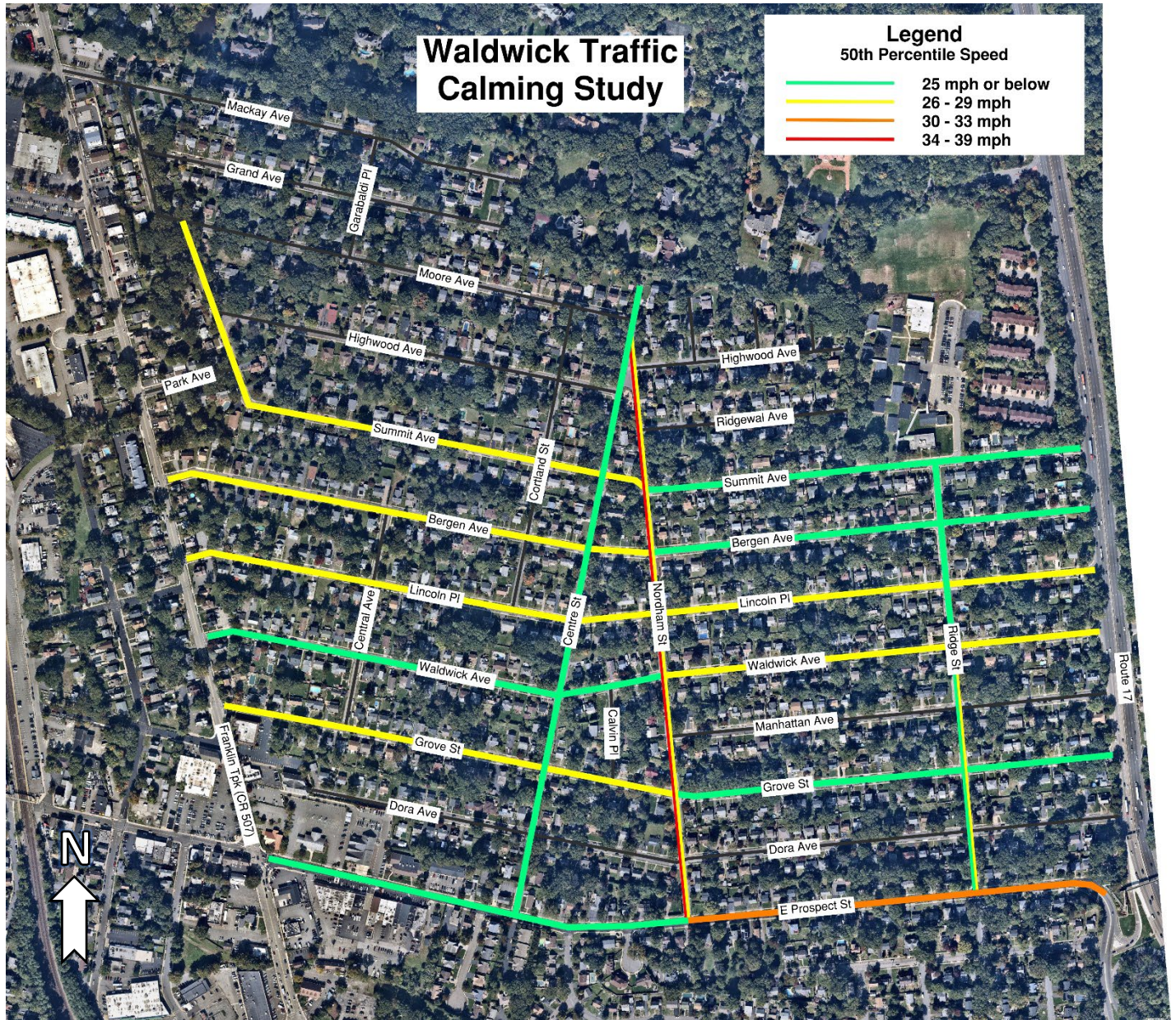


Figure 1: 50<sup>th</sup> Percentile Speed for Study Area



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

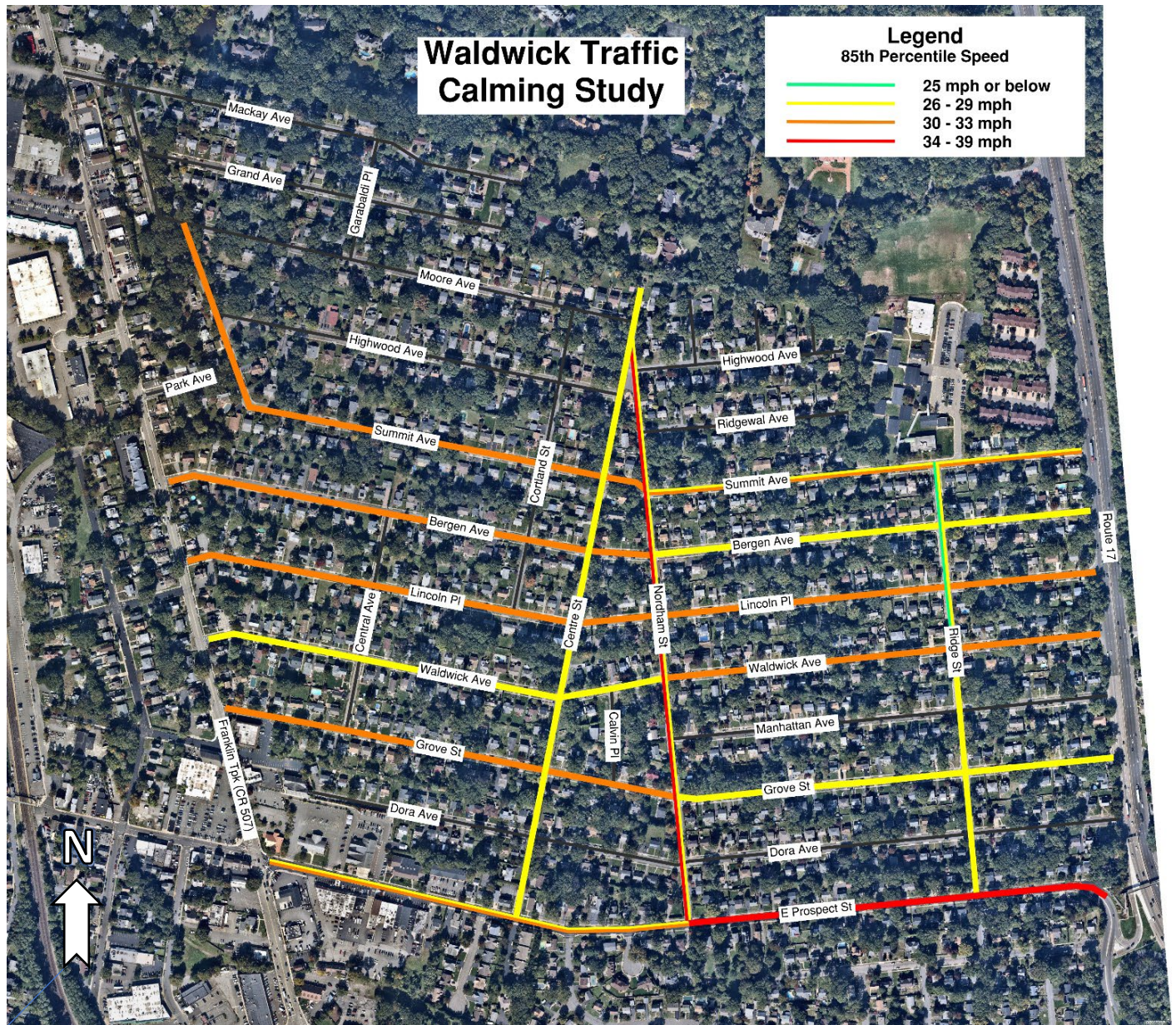


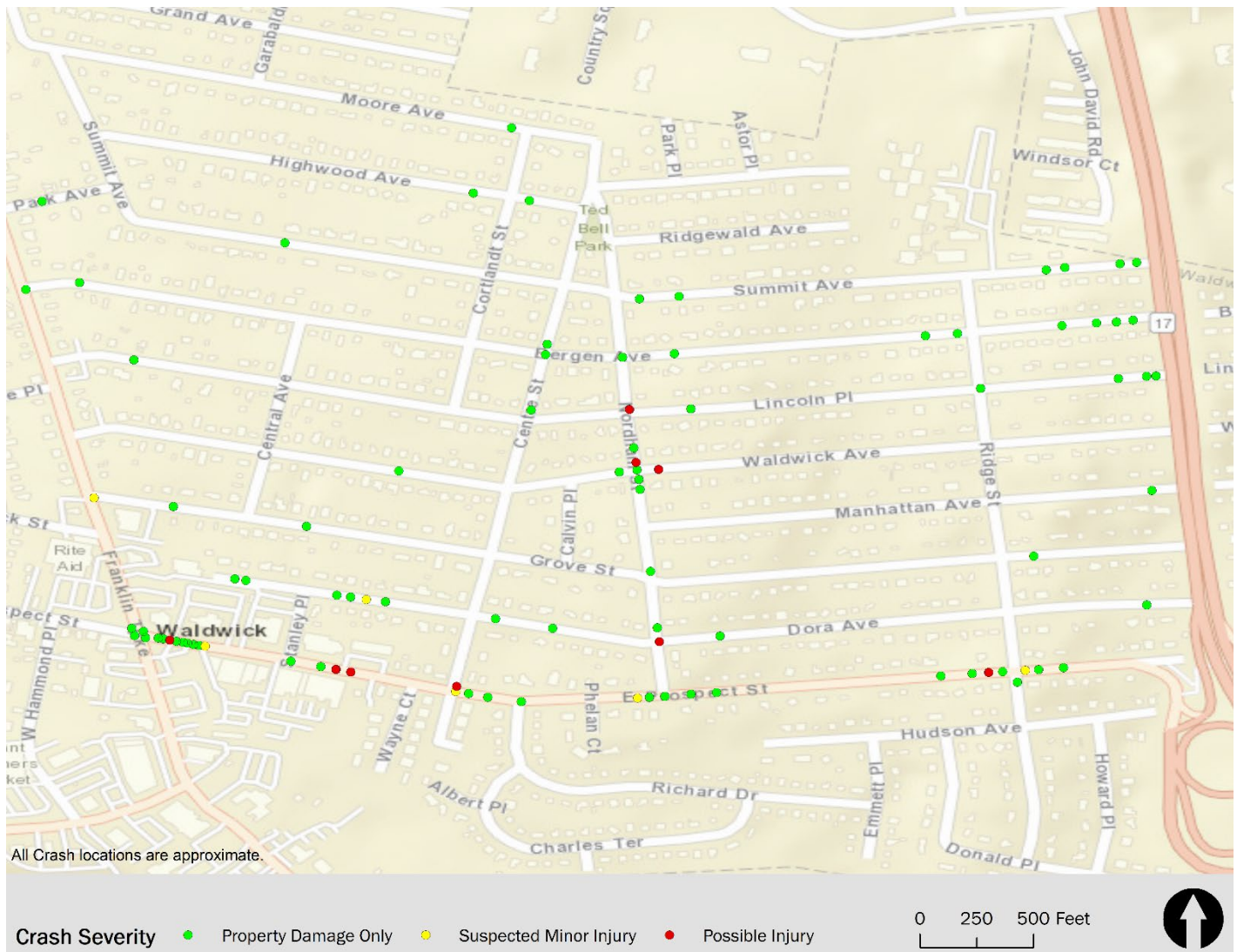
Figure 2: 85<sup>th</sup> Percentile Speed for Study Area



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

### Crash Data



**Figure 3: Crashes within Study Area (2016 – 2020)**

Crash data was collected using NJDOT’s Safety Voyager software. Between 2016 and 2020, 98 crashes occurred on roads within the study area. These crashes typically resulted in minimal or no injuries and occurred during daytime hours in clear weather conditions. Crashes occurred most frequently on East Prospect Street, Nordham Street, Bergen Avenue, and Dora Avenue. Crash patterns mirror the collected vehicle speed data, occurring more frequently where speeds are higher. Crash clusters are present near Route 17 SB and at intersections on roadways where the highest vehicle speed and number of speeding vehicles were recorded (East Prospect Street & Nordham Street). Additional crash data can be found in Appendix C.



### Traffic Calming Measures

With the goal of reducing speeds and improving safety within the project area, Michael Baker has assessed several traffic calming devices. Each of the traffic calming treatments listed below has been evaluated based on three criteria: its ability to reduce speed, its ability to reduce traffic volumes, and its impact on emergency vehicle response times. These treatments are not mutually exclusive and multiple options can be applied to the roadway to compound traffic calming effects.

#### Roadway Segments

##### 1. Chicanes

- Speed Reduction – Moderate (5-13 mph)
- Traffic Volume Impact – Moderate
- Emergency Vehicles Impacts – Low
- Cost – Low (<\$6k) to Medium (\$6k-\$15k). Cost varies greatly depending on chicane design. Simple designs deploying pavement striping, epoxy paint, and flex post delineators are cheap and easy to install. Designs that involve curb line reconstruction, or adding new curbing with rain gutters, will be more expensive.
- Similar treatments – Delineated On-Street Parking (Low (\$6k)), Gateway Treatment (Medium (\$6k-\$15k))
- Applicability – Appropriate on residential streets with volumes less than 3,500 vehicles per day.
- Placement of Measures – Placed in series along roadway segment. Can also be used as a gateway treatment when placed in close proximity to an intersection.
- Compounding Treatments – Can be used in conjunction with intersection traffic calming measures, such as speed cushions and curb extensions.
- Quick Build Option – Pavement striping and flex post delineators.



**Figure 4: Chicane Treatments (Left – Low Cost Quick Build Option; Right – Permanent Feature with adjusted Curb Line)**  
(Source: City of Edmonton - Community Traffic Management)



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

### 2. Choker

- Speed Reduction – Low (3-4 mph)
- Traffic Volume Impact – Low
- Emergency Vehicles Impacts – Low
- Cost – Low (<\$6k) to Medium (\$6k-\$15k). Cost varies greatly depending on choker design. Simple designs deploying pavement striping, epoxy paint, and flex post delineators are cheap and easy to install. Designs that involve curb line reconstruction, or adding new curbing with rain gutters, will be more expensive.
- Similar treatments – Painted Chicanes (Low (<\$6K)), Painted Curb Extensions (Low (<\$6K))
- Applicability – Appropriate on residential streets with volumes less than 3,500 vehicles per day.
- Placement of Measures – Placed along roadway segments
- Compounding Treatments – Can be used in conjunction with intersection traffic calming measures, such as speed cushions and curb extensions.

### 3. Speed Cushion

- Speed Reduction – Moderate to High (15 to 20 mph). Varies based on spacing between traffic calming devices.
- Traffic Volume Impact – Low to High. Most effective when placed in series.
- Emergency Vehicles Impacts – Low. Design provides an unobstructed path for Emergency Response Vehicles.
- Cost – Low (<\$6k per location). The cost for asphalt cushions varies between \$2,500 and \$6,000 per location
  - NJ School Zone Design Guide: Cost Estimate \$1k to \$12k
- Similar Treatments – Speed Hump (Low (<\$6k)), Speed Table (Medium (\$6k-\$15k)), Raised Crosswalk (Medium (\$6k-\$15k)), Raised Intersection (High (>\$15k))
- Applicability – Appropriate for relatively low traffic volume (<5,000 vpd).
- Placement of Measures – Placed midblock, approximately 150' from unsignalized intersections.
- Compounding Treatments – For best results place speed cushions every 250-300'. Can be used in conjunction with all other road segments and intersection traffic calming measures.
- Quick Build Option – Rubber mat speed cushions
  - Cost – Low (<\$6k per location). The cost varies between \$2,500 and \$5,500 per location. The lower range reflects only 2 cushion per location (no cushions in parking lanes) and the higher range represents 4 units per location.



**Figure 5: Speed Cushion (Left – Temporary Speed Cushion Mats; Right – Asphalt Speed Cushions)**  
(Source: Google)



## Borough of Waldwick – Traffic Safety Study

### Traffic Calming Measures

#### 4. Speed Feedback Sign

- Speed Reduction – Moderate (5-9mph)
- Traffic Volume Impact – Low
- Emergency Vehicles Impacts – Low
- Cost – Medium (\$6k-\$15k) to High (>\$15k). Cost of a radar speed sign can range from \$1900 up to \$7500 per sign.
- Similar Treatments – SLOW pavement markings
- Applicability – Appropriate for relatively low traffic volume.
- Placement of Measures – Applicable at locations within network where speeding is most prevalent.
- Compounding Treatments – Can be used in conjunction with all other road segments and intersection traffic calming measures.
- Quick Build Option – Speed Display with solar panel added to existing Speed Limit sign, or mobile Speed Feedback Trailer
- Considerations:
  - Power supply required
  - Effectiveness can degrade over time as drivers become accustomed to the sign
  - Installation should be accompanied by targeted enforcement on a recurring basis
  - Mobile units can help avoid degradation of effectiveness by changing installation location on a regular basis (several times a year)



**Figure 6: Speed Feedback Signs (Left – Permanent Fixture; Center and Right – Temporary Installments)**

(Source: Google)



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

### Intersections

#### 1. Neighborhood Traffic Circle

- Speed reduction – Moderate (5-13 mph). Varies based on design.
- Traffic Volume Impact – Low to Moderate. Most effective when placed in series.
- Emergency Vehicles Impacts – Low
- Cost – Medium (\$6k-\$15k) to High (>\$15k). Typical range between \$15,000 and \$60,000.
- Similar Treatments → Miniature-Roundabout
- Applicability – Appropriate for relatively low traffic volume (2,000-3,500 vehicles per day or less).
- Placement of Measures – Located at intersections.
- Compounding Treatments – Can be used in conjunction with all other road traffic calming measures. Most effective when used in series.
- Quick Build Option – Traffic cones, flex-post delineators, or landscaped planters



**Figure 7: Neighborhood Traffic Circle**  
(Source: FHWA Traffic Calming ePrimer)

#### 2. Curb Extension

- Speed Reduction – Moderate (3-4 mph)
- Emergency Vehicle Impacts – Low
- Traffic Volume Impact – Low
- Cost – Medium (\$6k-\$15k) to High (>\$15k). If drainage is not an issue, typical cost for four corner extensions ranges between \$8,000 and \$12,000; if drainage alteration is required, cost can increase to \$40,000.
- Similar treatment – Choker (Medium (\$6k-\$15k))
- Applicability – Appropriate for relatively low traffic volume.
- Placement of Measures – Primarily used at intersections to reduce pedestrian crossing distance and visibility and to slow the speed to turning vehicles, reducing crash chances.
- Compounding Treatments – can be used with raised crosswalks, as well as all road segment treatments.
- Quick Build Option – Curb extensions can be implemented using interim materials such as delineator post, epoxied gravel paint, and pavement striping. Painted curb extensions do not require alterations to existing drainage facilities.
  - Cost: Low (<\$6k)



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures



**Figure 8: Curb Extensions (Left – Painted Blub-outs; Right – Permanent Landscaped Curb Extension)**  
(Source: Google)

### 3. Raised Crosswalk

- Speed Reduction – Moderate (6-9 mph)
- Traffic Volume Impact – Low to Moderate. Most effective when placed in series
- Emergency Vehicles Impacts – Low
- Cost – Medium (\$6k-\$15k). Typically requires more material than a speed hump; cost ranges between \$4,000 and \$8,000.
- Similar Treatments – Speed Hump (Low (<\$6k)), Speed Table (Medium (\$6k-\$15k)), Raised Intersection (High (>\$15k))
- Applicability – Appropriate for relatively low traffic volume.
- Placement of Measures – Can be installed at both midblock and intersections.
- Compounding Treatments – Works well with curb extensions. Can also be used in series with speed cushions for maximum volume and speed reduction results.
- Quick Build Option – Installing rubber mat raised crosswalks are a cheaper, temporary solution that can be installed quickly, but will not last as long and may not be as effective.



**Figure 9: Raised Crosswalk**  
(Source: Google)



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

### 4. Raised Intersection

- Speed Reduction – Low
- Traffic Volume Impact – Low
- Emergency Vehicles Impacts – Low
- Cost – High (>\$15K)
- Similar Treatments – Speed Table (Medium (\$6k-\$15k)), Raised Crosswalk (High (>\$15k))
- Applicability – Appropriate on streets with volumes up to 10,000 ADT.
- Placement of Measures – Primarily used at intersections.
- Compounding Treatments – can be used all road segment treatments.
- Quick Build Option – NA



**Figure 10: Raised Intersection**  
(Source: FHWA Traffic Calming ePrimer)

### 5. Conversion from Two-Way to All-Way Stop Sign Control (along Nordham Street and Centre Street)

- Speed Reduction – Low
- Traffic Volume Impact – Low
- Emergency Vehicles Impacts – Low
- Cost – Medium (\$6k-\$15k)
- Similar Treatments – N/A
- Applicability – Should meet MUTCD warrants for All-Way Stop Control.
- Placement of Measures – Intersections that meet warrant thresholds.
- Compounding Treatments – Can be used in conjunction with all other road traffic calming measures.
- Quick Build Option – SLOW pavement markings
- Note – This treatment is not a FHWA proven speed management countermeasure.



**Figure 11: All-Way Stop Conversion**  
(Source: Google)



## Borough of Waldwick – Traffic Safety Study

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### Traffic Calming Measures

6. Full Closure (AKA cul-de-sac)
  - Speed Reduction – Low (~3mph)
  - Traffic Volume Impact – High. Produces largest reduction in traffic volume on subject street among all traffic calming measures.
  - Emergency Vehicles Impacts – High. Can be modified to include removable delineators, breakaway or lockable bollards, lockable gates, low landscaping, or a mountable curb apron along with a passable area wide enough for an emergency vehicle; still adds delay.
  - Cost – Medium (\$6k-\$15k) to High (>\$15k). Simple closure can cost less than \$10,000; complex closure with drainage modifications can cost as much as \$100,000.
  - Similar Treatments – Can be designed to include removable delineators, breakaway or lockable bollards, lockable gates, low landscaping, or a mountable curb apron along with a passable area wide enough for an emergency vehicle
  - Applicability – Appropriate for relatively low traffic volume.
  - Placement of Measures – At the Rt 17 and local street intersections.
  - Compounding Treatments – Compatible with other treatments, however, due to the high efficiency of preventing cut-through traffic, other traffic calming measures may not be necessary.
  - Quick Build Option – Landscape planters.



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

### Countermeasure Summary

Countermeasure	Speed Reduction	Traffic Volume Reduction	Emergency Services Impact	Cost <sup>1</sup>
<b>Road Segments</b>				
<b>Roadway Restriping</b>	<b>Low to Moderate</b>	<b>Low to Moderate</b>	<b>Low</b>	<b>Low to Medium</b>
Hardened Chicanes or Chokers	Moderate	Moderate	Low	Medium to High
<b>Painted Chicanes or Chokers</b>	<b>Moderate</b>	<b>Moderate</b>	<b>Low</b>	<b>Low</b>
Speed Cushion (Asphalt)	Moderate to High	Low to High	Low	Low
<b>Speed Cushion (Rubber Mats)</b>	<b>Moderate to High</b>	<b>Low to High</b>	<b>Low</b>	<b>Low to Medium</b>
<b>Speed Feedback Signs</b>	<b>Moderate</b>	<b>Low</b>	<b>Low</b>	<b>Low to Medium</b>
<b>Intersections</b>				
Neighborhood Traffic Circle	Moderate	Low to Moderate	Low	Medium to High
Hardened Curb Extension	Moderate	Low	Low	Medium to High
<b>Painted Curb Extension</b>	<b>Moderate</b>	<b>Low</b>	<b>Low</b>	<b>Low</b>
Raised Crosswalk	Moderate	Low to Moderate	Low	Medium
Raised Intersection	Low	Low	Low	High
All-Way Stop Sign Control Conversion	Moderate	Low	Low	Medium
Full Closure (AKA cul-de-sac)	Moderate	High	High	High
Notes: 1. Cost Information pulled from the FHWA's Traffic Calming ePrimer free online resource. Link: <a href="https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer">https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer</a> 2. <b>Blue</b> denotes recommended countermeasures, as discussed below. 3. A conceptual cost estimate for the proposed countermeasures is provided in Appendix D.				



### Recommendations

#### Countermeasure Selection

After reviewing Waldwick's unique speed and volume conditions, Michael Baker recommends the installation of high visibility crosswalks at key locations to improve safety conditions for crossing pedestrians, and recommends speed cushions, painted curb extensions, and speed feedback signs as speed-reduction measures due to their ease of construction, lower cost, and flexibility in terms of ease of deployment. The proposed traffic calming measures have short-term build alternatives, such as rubber mat speed humps and epoxied gravel paint curb extensions, that can be implemented using durable materials, prior to permanent installation of sometimes more aesthetically pleasing permanent materials in asphalt and concrete. A conceptual cost estimate is provided in Appendix D.

Rubber mats are a common type of speed cushion used across North America. There are several suppliers offering benefits from precision designs to environmentally friendly products. Rubber mat speed cushions have been used as a temporary device to gauge public reaction and evaluate effectiveness before proceeding with permanent structures made of asphalt. However, if using rubber mats as speed cushions, they should be marked and signed as if they were permanent features. Reflectors or delineators should be installed adjacent to the features to alert maintenance crews of their presence to avoid damaging the device during snow or leaf removal. Speed cushions should be combined with flexible delineators to form a narrowed roadway or 'choker,' which reduces total costs by effectively narrowing the roadway width and minimizing the number of speed cushions needed per location.

According to ITE's "Guide to Speed Reduction Techniques; Planning and Design of Speed Humps, Speed Tables, and Other Related Measures" (2022), when speed cushions (either asphalt or rubber) comply to design guidance, there are no adverse noise impacts on the surrounding community. Studies have even concluded speed cushions can result in less traffic noise due to lower operating speeds of vehicles. However, this noise reduction may be offset by the noise of braking and accelerating at speed humps and loose objects moving around in the back of larger vehicles (such as pick-up trucks or service vehicles). The speed cushions are designed to accommodate service vehicles, so this concern has been mitigated.

Epoxied gravel painted curb extensions with flex post delineators should be the first phase of full curb extensions. Painted curb extensions can include a community engagement aspect as well. The community members can choose to have painted murals or landscaped planters within the limits of the curb extension space. Additionally, studies have shown that engaging community members, who may also be speeding, in traffic calming measure discussions helps to change their driving behaviors as well.

Permanent concrete curb extensions may be considered in a future construction phase. Permanent features may be more aesthetically pleasing, and may eliminate the need to maintain the flexible delineators common to impermanent applications. Research is incomplete to suggest whether temporary or permanent curb extension installations perform differently with respect to their speed reduction value. Ultimately, curb extensions will require the relocation of the curb line which can impact drainage of the roadway. Field inspection of the intersections where curb extensions are recommended confirms the presence of drainage inlets typical at all four intersection corners. Permanent concrete curb extension construction would require reconstruction of the curblines and drainage inlet relocation and reconstruction. Several drainage alternatives may be explored in a future project phase to balance drainage function and construction cost.

Chicanes and chokers, or road-narrowing features were also deemed appropriate for recommendation on neighborhood streets within the project limits. Chicanes and chokers have quick-build applications, and may be retrofitted into permanent installations upon community approval. Chicanes and chokers are most effective in reducing speeds when traffic volumes are relatively balanced in both directions, therefore special attention should be paid to street selection. The volume data table above identifies Waldwick Avenue, Lincoln Place, Summit Avenue, Grove Street and Centre Street have equal traffic volumes of equal distribution. Chicanes can also be used as a gateway treatment by installing a series of two (2) bulb-outs staggered on alternating sides of the street within the vicinity of an intersection.

The project team notes that chicanes are compatible with speed cushions and may reduce total costs when combined by effectively reducing the roadway width and minimizing the number of speed cushions needed per location. If temporary installations are positively reviewed by the public, the Borough may install permanent chicanes or chokers using either flex post or curb reconstruction (narrowing). For permanent chicane or choker installations which modify the curblines, roadway drainage patterns must be examined. Chicanes or chokers



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

can be built to maintain the existing gutter line or to integrate with rain gardens and vegetation. Signage will be required to alert drivers to the presence of permanent chicanes.

High visibility crosswalks are an FHWA Proven Safety Countermeasure, and can lower the potential of a pedestrian crash at a crossing. Given their increased cost with respect to a traditional pair of crosswalk lines, high visibility thermoplastic crosswalks in a continental or piano-key pattern help to make crossing pedestrians more visible and communicate to drivers that they are traversing a pedestrian crosswalk and should yield the right-of-way to crossing pedestrians.

Nordham and Centre street are the main north-south arteries within the neighborhood street network, and both of these streets lack concrete sidewalk. To improve pedestrian safety and mobility, a 6-ft striped sidewalk on Nordham and Centre Street is recommended in lieu of street parking in one direction. This striped sidewalk should be delineated with a retroreflective 4" stripe, and the 6-ft wide area should be epoxy-painted in a conspicuous, contrasting color as to be visible to drivers and communicate to pedestrians and drivers that the area is dedicated to the conveyance of pedestrians as an on-street sidewalk. This feature will narrow the existing roadway width with paint and may also serve as a traffic calming and speed-reduction measure per FHWA research, which indicates that lane and roadway narrowing may be associated with reduced vehicular speeds.

The project team also notes that many of the curb ramps within the study area are not ADA-compliant and the crosswalks do not meet the latest visibility design standards. ADA-compliant curb ramps and high-visibility crosswalks should be considered during project construction activities: In temporary and permanent construction phases, and/or in general future roadway maintenance or construction activities.

### Countermeasure Placement

According to Figures 1 and 2, speeding is not an issue on every street within the study area. However, if traffic calming measures are only placed on roadways that experience speeding, then the speeding issue will likely shift to another untreated street within the roadway network. Therefore, the project team recommends a neighborhood scale traffic calming program to address speeding and cut-through traffic issues.

When traffic calming measures are used in series (speed cushions along roadway segments and curb extensions at intersections), the spacing of features is critical to achieve a reduction in speeding. The project team consulted ITE's "Guide to Speed Reduction Techniques; Planning and Design of Speed Humps, Speed Tables, and Other Related Measures" (2022) to determine the appropriate spacing of traffic calming features. The guide states the following:

Since speed cushions are not located within intersections, general block-length guidelines based on the experience of several agencies are provided below:

- A single speed hump is recommended for use on block spacing of 300' to 500'.
- A two-hump configuration may be satisfactory on single-block segments of 500' to 1,000'.
- On very long blocks of 1,000' to 1,500' (300 m to 450 m), three or more humps may be necessary.
- On lengthy continuous segments or corridors that have segments comprising a number of blocks, it is recommended to space humps 250' to 500' apart. Experience in Portland has indicated that if block spacing is closer than 200' (60 m), a hump every block is excessive, and slightly greater spacing may be more effective.

The typical block length from Route 17 to Ridge St is 600' and from Ridge St to Nordham St or Centre St is 1,150'. According to the above guidance, one (1) speed cushion can be placed on Summit Ave, Bergen Ave, Lincoln Pl, Waldwick Ave, Manhattan Ave, Grove St, and Dora Ave between Route 17 and Ridge Street. And two (2) speed cushion can be placed on Summit Ave, Bergen Ave, Lincoln Pl, Waldwick Ave, Manhattan Ave, Grove St, and Dora Ave between Ridge St to Nordham Street. The main North-South roadways (Ridge St, Nordham St, and Centre St) are stop controlled on the minor streets with intersections about every 215'. Based on this configuration and the guidance above for "continuous segments" it is recommended that a speed cushion to be placed every other block.

Additional ITE "A Guide to Speed Reduction Techniques" guidance on placement states that speed cushions should be placed at least 100' from the closest intersection of residential collector streets and not within 20' of the closest intersection of residential local streets. Placement



## Borough of Waldwick – Traffic Safety Study

### Traffic Calming Measures

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of speed cushions should desirably be 30' to 80' from the crosswalk to slow traffic at the crossing and provide space for the vehicles to clear the feature before stopping for the crosswalk activity. Lastly, vertical deflection features should be located at least 5' from driveways where possible. Speed cushions under the proposed design do not affect parking.

The location of traffic calming measures for the remainder of the roadway network were determined using the above guidance. For a more detailed layout of traffic calming measures, please refer to the Implementation Plan shown in Figure 12 for neighborhood wide deployment. Figure 13 shows the example signage layout associated with the speed cushion devices.

Speed cushions should be deployed in the active travel lanes, in conjunction with flexible bollards in the adjacent parking lane. This pairing will reduce the overall roadway width at the feature; preventing drivers from navigating around the speed cushion and avoiding the device.

Curb Extensions are recommended at all 4-way intersections on Nordham, Centre, and Ridge Street, where speeding is most prevalent, to supplement the neighborhood scale traffic calming program at the frequency/density recommended in the above guidance.

Speed feedback signs are most effective approximately 1,000' upstream and 300' downstream of their installation location, with the greatest reduction in operating speeds seen in the vicinity of the device. Additionally, the impact of speed feedback signs degrades over time, as drivers become accustomed to the device they are less likely to reduce speeds<sup>2</sup>. While estimates of the loss in effectiveness over time vary, research shows that speed feedback signs remain a useful traffic calming measure well after installation. To fully utilize this traffic calming measure, the Borough should consider the installation of quick-build or mobile units at the following locations:

- Summit Avenue in the vicinity of Julia A. Traphagen Elementary School (capturing WB traffic)
- Bergen Avenue approximately 300' west of Route 17 SB (capturing WB traffic)
- Nordham Street between Bergen Avenue and Lincoln Place (capturing SB traffic)
- Centre Street between Bergen Avenue and Lincoln Place (capturing NB traffic)
- East Prospect Street west of Ridge Street (capturing WB traffic)

These locations were selected to prioritize locations where volumes are highest and speeding occurs. Summit Avenue and Bergen Avenue were selected because they experience the highest volumes of the east/west roads (outside of East Prospect Street). Nordham Street and Centre Street were selected because they represent the main north/south roads within the neighborhood network. East Prospect Street was selected as it has the highest prevalence of speeding among the Waldwick roadway network.

Chicanes and chokers were deemed appropriate for the neighborhood roadways but are not recommended for installation within the network. The density of speed cushions and curb extensions is sufficient to achieve speed reduction without the need for additional traffic calming chicanes or chokers. The road-narrowing effect of a chicane or choker is replicated in the use of curb extensions (road narrow at intersections), and road narrowing at speed cushions with adjacent parking-lane delineators.

High visibility crosswalks are recommended for all crossings on the perimeter of the neighborhood streets bounded within the project area between Franklin Turnpike, E. Prospect Street, and Route 17, as shown on Figure 12, to improve pedestrian visibility and to communicate to drivers that they are traversing a pedestrian crosswalk and should yield the right-of-way to crossing pedestrians.

To improve pedestrian safety and mobility, a 6-ft striped sidewalk on Nordham and Centre Street is recommended in lieu of street parking in one direction. This striped sidewalk may be located on the northbound side of Nordham Street, and southbound side of Centre Street, as a majority of the neighborhood lies to the west of Centre Street or to the east of Nordham Street, and need not cross the two roadways to initially access the striped sidewalk. This feature will narrow the existing roadway width with paint and may also serve as a traffic calming

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<sup>2</sup> Santiago-Chaparro, K. R., Chitturi, M., Bill, A., & Noyce, D. A. (2012). Spatial effectiveness of speed feedback signs. *Transportation Research Record: Journal of the Transportation Research Board*, 2281(1), 8–15. <https://doi.org/10.3141/2281-02>



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

and speed-reduction measure per FHWA research, which indicates that lane and roadway narrowing may be associated with reduced vehicular speeds.

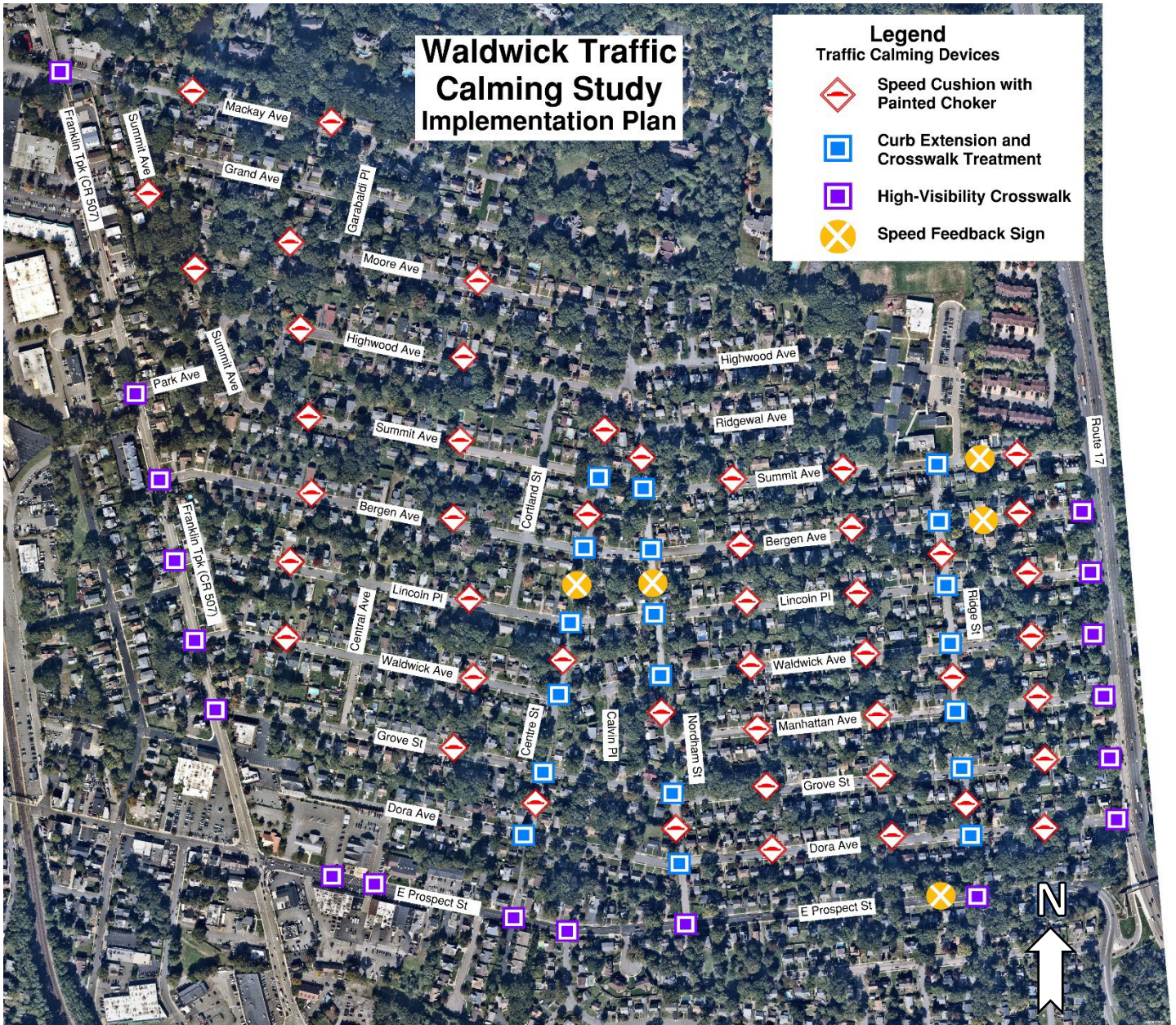


Figure 12: Implementation Plan



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures



**Figure 13: Traffic Calming Measures – Bergen Avenue Example Layout**

### Site Specific Suggestions

1. Julia A. Traphagen Elementary School – Intersection of Summit Ave. and Ridge St.
  - a. Speed Feedback Sign
  - b. Asphalt art on Summit Avenue in vicinity of school
2. Ted Bell Park
  - a. Add crosswalks to access park
  - b. Add pedestrian walking space on exterior of park fence
  - c. Asphalt art
  - d. Delineate y+ intersection roadway
3. E. Prospect Street
  - a. Speed Feedback Sign



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

### Countermeasure Cost Estimate

Michael Baker developed a conceptual cost estimate associated with the recommended Implementation Plan to assist the Borough in future decision-making. The conceptual cost estimate was based on NJDOT contract bid data, or Bid Price Reports for years 2019 to 2021, and on the NJDOT Cost Estimating Guidelines. The detailed conceptual Cost Estimate is available in Appendix D. The estimated construction cost of the full set of treatments proposed in the Implementation Plan are summarized in Table 3 below.

**Table 3: Implementation Plan Cost Estimate**

Estimate Item	Cost
Construction Subtotal	\$362,500
Contract Items Subtotal	\$73,000
Contingencies	\$44,000
Construction Total	\$480,000
Engineering Phase Estimate	\$144,000
Construction Engineering	\$48,000
Post Const. Evaluation	\$24,000
Total Project Cost (In 2023 Dollars)	\$650,000

The Project Team notes that the traffic calming measures included in the Implementation Plan are modular in nature, and can be modified, removed, and added individually to meet Borough budget constraints as necessary. Thusly, the Implementation Plan is intended to be flexible, and the most cost-effective features to reduce driver speeding may be selected. To assist the Borough in selecting the most appropriate traffic calming features, and to provide visibility on the cost-benefit of each feature, Michael Baker also developed a standard cost for each proposed traffic calming measure: Roadway reconfiguration/ restriping; crosswalk striping; painted curb extension; speed cushion; painted chicane, which can be seen in Table 4 below.

**Table 4: Traffic Calming Measure Individual Costs**

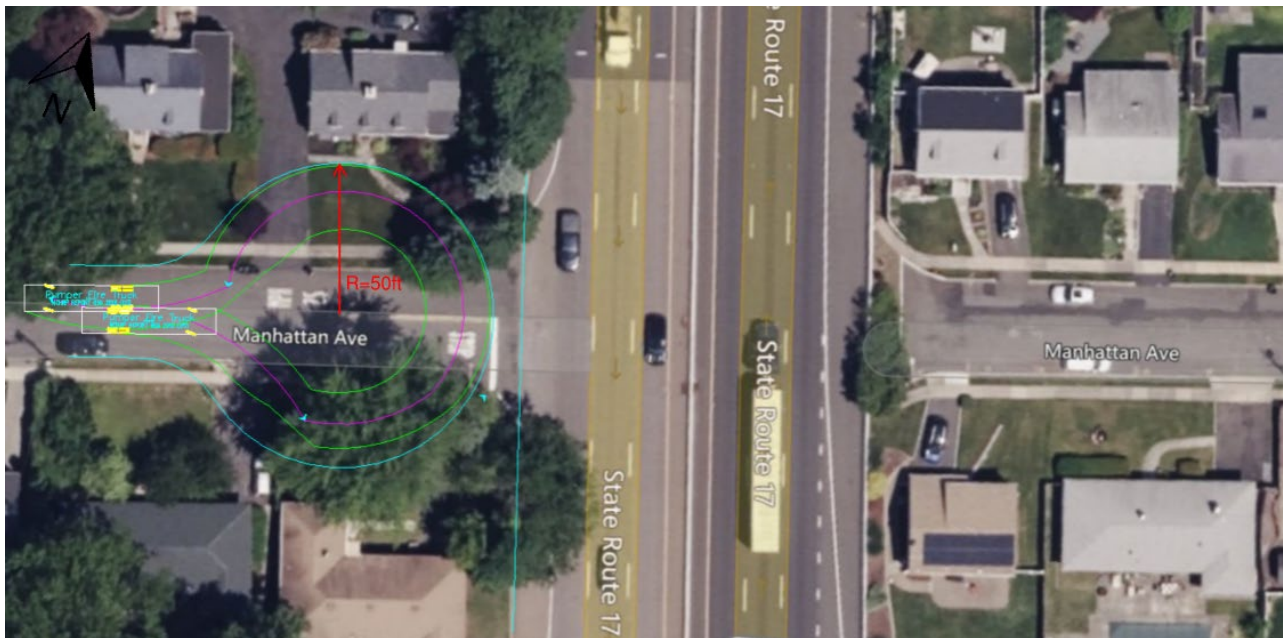
Estimate Item	Reference	Cost
Painted curb extension	Per intersection (4 corners); Excluding optional interior paint	\$2,400
Hardened curb extension	Per intersection (4 corners)	\$6k to \$15k (\$40k w/ drainage work)
Speed cushion (rubber mat)	Per road crossing (single location)	\$4,200
Speed cushion (asphalt)	Per road crossing (single location)	\$2.5k to \$12k
Speed feedback sign	Per location	\$5k to \$15k
Painted chicane or choker	Per pair (single location)	\$1,800
High visibility crosswalk striping	Per intersection (4 crossings)	\$1,300
Crosswalk striping (Single lines)	Per intersection (4 crossings)	\$100-\$200
Roadway / restriping	Per typical 500' roadway segment	\$1,600
Notes:		
1. The above costs are for comparative reference to one another only		
2. The above costs include construction items only and do not include other associated Contract items or expenses.		



### Road Closures with Route 17 SB Investigation (E.g., Cul-De-Sac)

Michael Baker examined prohibiting access to and from Route 17 SB as a means of reducing motorist cut-through traffic to Franklin Turnpike via Waldwick's network of neighborhood streets; where cut-through traffic is a noted issue among Waldwick neighbors. This approach could significantly reduce speeding on Waldwick streets, but is difficult to accomplish due to regulatory hurdles, and would come with significant impacts to roadway access, to private property, and public services such as trash collection, snow clearing, and emergency response. Michael Baker reviewed the impact of the proposed closure and identified measures to mitigate potential impacts.

Closing access to Route 17 SB presents a significant challenge due to compliance issues with Waldwick Borough General Ordinance Section 97-67.9 Dead-End Streets. According to this ordinance, dead-end streets should not exceed a length of 900 feet and must have a turnaround roadway with a minimum outside radius of 50 feet at the closed end. Similarly, New Jersey Fire Code Chapter Section 503.2.5 Dead Ends mandates that dead-end streets longer than 150 feet must have an approved area for turning around fire apparatus. The closure of access to and from Route 17 SB would thus necessitate the creation of cul-de-sacs on seven streets including Summit, Bergen, Lincoln, Waldwick, Manhattan, Grove, and Dora. This would require significant Right of Way (ROW) acquisition and have a considerable impact on private property, including the potential acquisition of approximately 23 homes located adjacent to Route 17 SB. Figure 15 shows potential impacts of creating a cul-de-sac on Manhattan Avenue with a radius of 50 feet.



**Figure 15: Potential Impact of Road Closure via Cul-De-Sac**

An alternative approach exists that does not prohibit emergency vehicle access or require the creation of cul-de-sacs at the end of every street. The proposed treatment would involve the installation of hardened features such as curbing and signage. Specifically, mountable concrete islands with sloping curbs would be constructed across each intersection, parallel to Route 17 SB (Figure 16 & Figure 17). These mountable islands would be traversable by emergency vehicles as well as public works vehicles during trash pick-up or snow removal. "Authorized Vehicles Only" (R5-11) signage would be installed on both sides of the intersections to clearly indicate that drivers are no longer allowed to access Waldwick via these streets. In practice, the proposed treatment would function similarly to the emergency vehicle turnarounds on the New Jersey Turnpike.

This approach eliminates ROW impacts and maintains emergency vehicle access between Route 17 SB and the local street network. However, implementation would require a traffic impact study of the anticipated impacts to travel patterns on the greater roadway network.

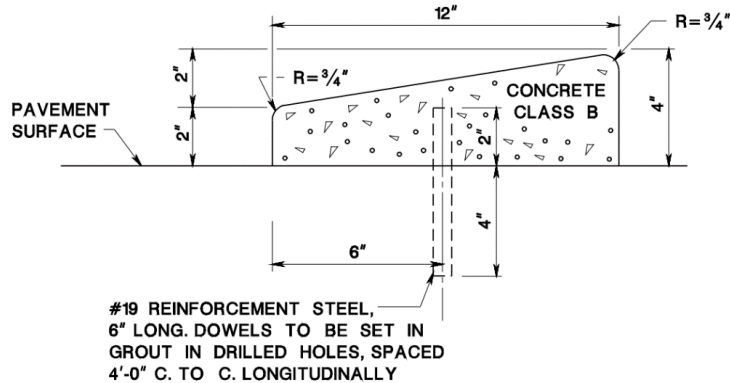


# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

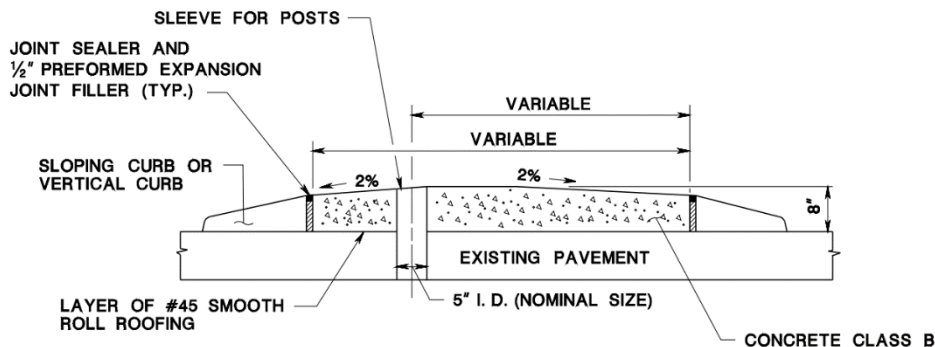
Other considerations are summarized below:

- Neighborhood streets on the east side of Route 17 have been converted into dead end streets and do not have a 50' turnaround. This configuration is likely a result of a legacy design and is not an option for the intersections along Route 17 SB given the regulatory considerations described earlier.
- NJDOT Access Permit Process
- Waste and snow removal operations would be impacted by the closure of the Route 17 SB intersections. Traversable concrete islands may be designed with provisions for public works and emergency service vehicles, with mountable features.



**12" x 3" CONCRETE SLOPING CURB, DOWELLED**

CD-607-1.3



**CONCRETE ISLAND ON EXISTING PAVEMENT**

CD-606-3.1

Figure 16: NJDOT Standard Details for Mountable Curb and Concrete Island



Figure 17: Authorized Vehicles Only (R5-11)



#### Traffic Impact Study

In addition to the potential ROW implications and impacts to emergency vehicle access, closure of the Route 17 SB intersections would reroute traffic on local streets within Waldwick and on Route 17 SB. Rerouted traffic would likely significantly increase delay at the E Prospect Street & Franklin Turnpike intersection as well as the Route 17 SB off-ramp & E Prospect Street intersection. Detailed analysis would be required to determine the impact on the road network. A traffic impact study would be a required element of any plan to close the intersections with Route 17 SB to determine the potential impacts on traffic.

A traffic impact study is a comprehensive analysis used to evaluate the potential impact of a proposed modification to a transportation facility on the surrounding transportation network. Traffic impact studies typically include a review of existing traffic conditions, stakeholder coordination, an analysis of the expected traffic generation (in the case of new developments), and an evaluation of the impact on adjacent roads, intersections, and transportation facilities. Traffic impact studies can also consider factors such as pedestrian and bicycle access, parking demand, transit use, and roadway safety. In addition to the traditional elements of a traffic impact study, the Borough may consider performing a parallel public outreach campaign to engage the local community, inform them of the project, and solicit feedback on the potential design.

The findings of a traffic impact study are used to develop strategies to mitigate any negative impacts on the transportation network, such as improving roadway infrastructure, changing signal timings, adding turn lanes, or implementing alternative transportation modes. Ultimately, the goal is to ensure that a development or modification to a facility does not significantly disrupt the flow of traffic or create unsafe conditions for road users, including drivers, pedestrians, and cyclists.

In the context of closing the intersections along Route 17 SB in Waldwick Borough, a traffic impact study would focus on the impacts of rerouting traffic to the Sheridan Avenue interchange as well as the East Prospect Street & Franklin Turnpike intersection. In order to complete the study, a robust data collection effort would need to take place, including Turning Movement Counts (TMCs) at approximately 18 intersections, nine (9) ATR counts in addition to those completed as part of this study, and the collection of signal timing directives and plans for the E Prospect Street & Franklin Turnpike intersection. This data would be used to create a microsimulation model of the Waldwick road network in the existing and proposed conditions. Based on the results of this model, the engineering team would determine whether closing the Route 17 SB intersections is feasible. The traffic impact study would conclude with the preparation of a memorandum, documenting each phase of the study and its findings.



### Conclusion

The Borough of Waldwick initiated this study to address safety concerns over speeding raised by the public, with the goal of creating a safer street grid. The study revealed that speeds on the Borough's roads exceeded posted speed limits and met the definition of a "speeding issue" as described in ITE's "A Guide to Speed Reduction Techniques." While all 16 locations studied met at least one of ITE's criteria for the presence of speeding issue, several experienced excessive vehicle speeds to a greater degree than others: East Prospect Street, Nordham Street, Summit Avenue, Lincoln Street, and Waldwick Avenue.

To address these findings, potential countermeasures were identified to reduce vehicle speeds on Waldwick's streets. Among the measures reviewed, speed cushions, curb extensions, and speed feedback signs were deemed the most appropriate due to their lower costs and short-term build alternatives while maintaining a long-term impact on operating speeds. Rubber mats can be used as speed cushions and should be marked and signed as if they were permanent features. Epoxied gravel painted curb extensions with flex post delineators are recommended as the first phase of full curb extensions. The community may engage in the process by choosing to have painted murals or landscaped planters within the limits of the curb extension space. In addition to curb extensions and speed cushions, spot treatments including speed feedback signs, crosswalk installation, and asphalt art, are recommended to provide additional speed reduction at critical locations.

An Implementation Plan (Figure 12) was developed to provide the Borough with a detailed methodology for creating a safer street network and addressing public concerns. The plan recommends installing curb extensions at 4-way intersections on the north-south neighborhood roadways, Nordham St, Centre St, and Ridge St, using low-cost and quick build approaches. Speed cushions are recommended at regular 300' intervals along all east-west routes as well as Ridge Street, Nordham Street, and Centre Street. Speed feedback signs are recommended on East Prospect Street, Summit Avenue, Bergen Avenue, Centre Street, and Nordham Street, and can be implemented using mobile units that can be moved occasionally by the Waldwick Borough Police Department. Speed feedback signs should be installed in partnership with occasional, but regular, enforcement efforts. To improve pedestrian safety, high visibility continental crosswalks are recommended on all intersections which form the boundary of the neighborhood roadways in the project area, specifically at neighborhood roadway intersections with Franklin Turnpike, E. Prospect Street, and Route 17 southbound. Additionally, a 6-ft striped on-street sidewalk on Nordham and Centre Street is recommended in lieu of street parking in one direction. Finally, specific intersection treatments are recommended in front of Julia A. Traphagen Elementary School and near Ted Bell Park to improve safety and access to these key community locations.



# Borough of Waldwick – Traffic Safety Study

## Traffic Calming Measures

### Supplemental Resources

Below is a compiled list of supplemental resources with brief descriptions to assist the project team in future decision-making with respect to traffic calming measures and their implementation:

- 2022 ITE A Guide to Speed Reduction Techniques, Planning and Design of Speed Humps, Speed Tables, and Other Related Measures, now renamed to Guide to Vertical Deflection Speed Reduction Techniques  
<https://www.ite.org/technical-resources/topics/traffic-engineering/guide-to-vertical-deflection-speed-reduction-techniques/>
- ITE Traffic Calming ePrimer -  
<https://highways.dot.gov/safety/speed-management/traffic-calming-eprimer>
  - Provides an overview of the traffic calming practice, with definitions, illustrations, application considerations, case studies, and research
- 2021 World Resources institute, Low Speed Zone Guide  
<https://www.wri.org/research/low-speed-zone-guide>
  - Guidance on how to plan, design, and build streets where motorists are encouraged to operate at safer speeds through environmental design measures. Background; History; Case Studies
- ~2017 Burlington Vermont Public Works – Quick Build Design & Materials Standards  
<https://www.burlingtonvt.gov/DPW/Quick-Build>
  - The Burlington Quick-Build program is an initiative of the City of Burlington Department of Public Works to deliver a phased approach to bicycle and pedestrian infrastructure projects
- 2016 People for Bikes – Quick Builds for Better Streets – A New Project Delivery Model for U.S. Cities  
<https://www.peopleforbikes.org/reports/quick-builds-for-better-streets-a-new-project-delivery>
  - Provides an overview of the traffic calming practice, with definitions, illustrations, application considerations, case studies, and research
- 2016 Tactical Urbanist's Guide to Materials and Design  
<http://tacticalurbanismguide.com/>
  - An approach to neighborhood building that uses short-term, low-cost, and scalable interventions and policies
- 2014 New Jersey School Zones Design Guide – NJ Safe Routes, NJDOT  
<https://www.saferoutesnj.org/new-jersey-school-zone-design-guide/>
  - Provides guidance on traffic calming measures to support safe bicycling and walking, especially to school
- 2012 FHWA Speed Management – A Manual for Local Rural Road Owners  
<https://highways.dot.gov/safety/local-rural/speed-management-manual-local-rural-road-owners>
  - Pertinent sections: 4 Implementing Countermeasures; 4.1 Preparing for Implementation; 4.2 Evaluate Progress



# Borough of Waldwick – Traffic Safety Study

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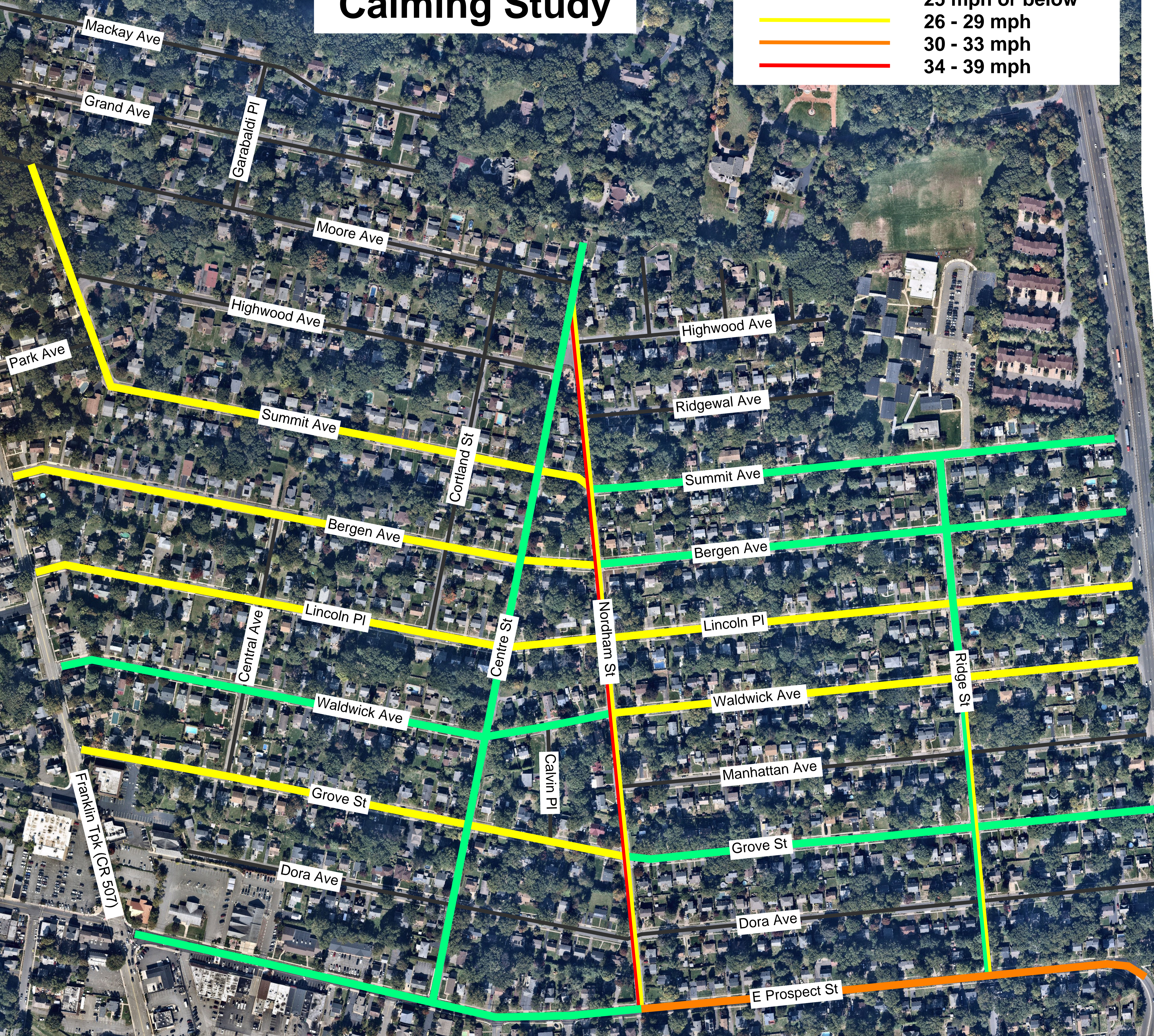
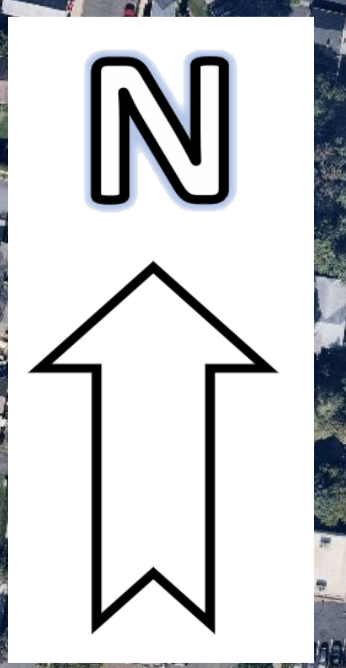
Traffic Calming Measures

## Appendix A – Traffic Speed Maps for 50<sup>th</sup> and 85<sup>th</sup> Percentile Speed

# Waldwick Traffic Calming Study

## Legend 50th Percentile Speed

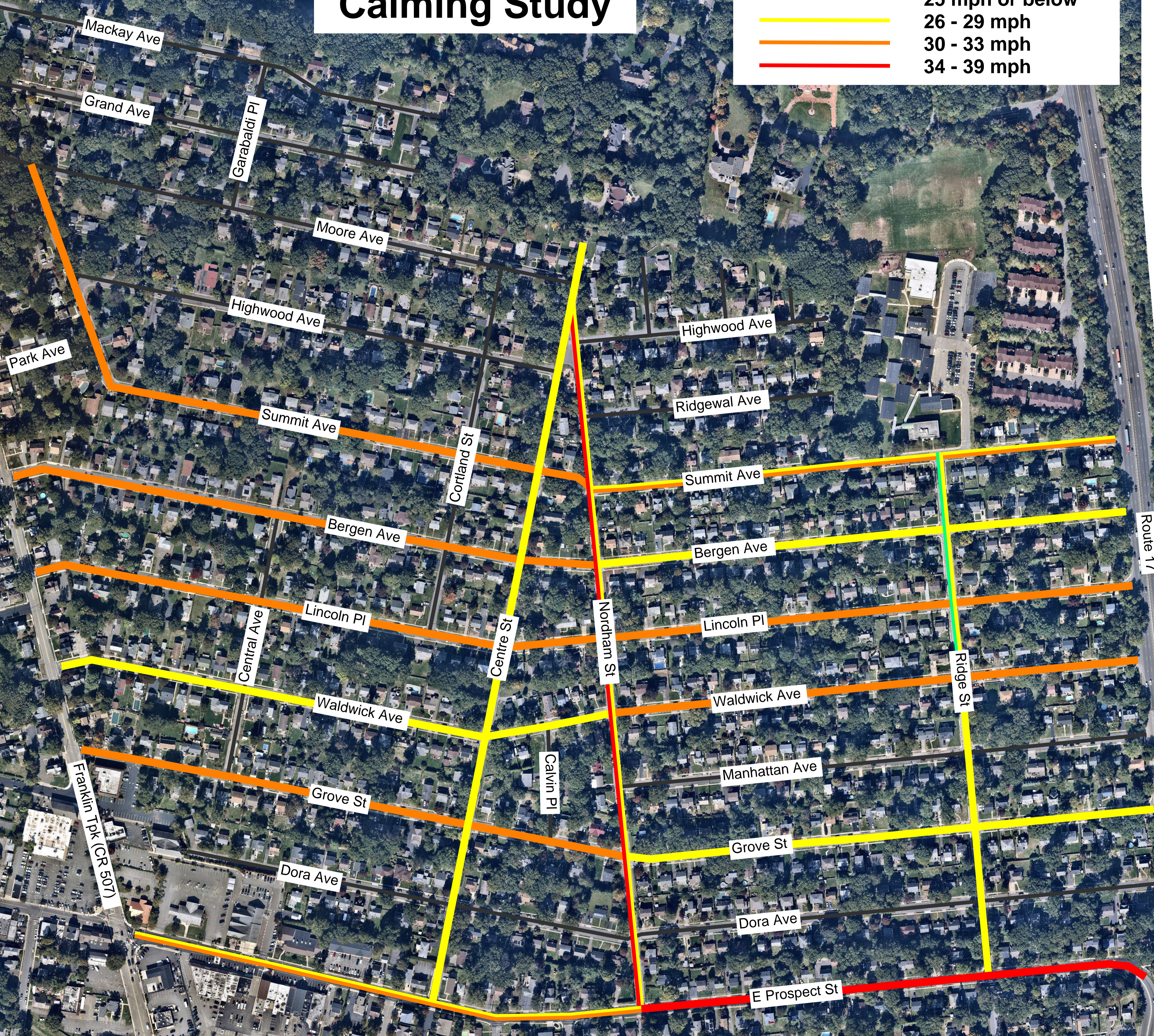
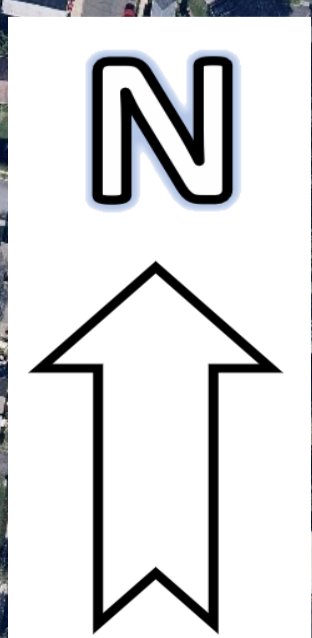
- 25 mph or below
- 26 - 29 mph
- 30 - 33 mph
- 34 - 39 mph



# Waldwick Traffic Calming Study

## Legend 85th Percentile Speed

- 25 mph or below
- 26 - 29 mph
- 30 - 33 mph
- 34 - 39 mph





# Appendix B – Speed Evaluation per ITE’s “A Guide to Speed Reduction Techniques”

Location Number	1		2		3		4		5		6		7		8	
Location	East Prospect St, West of Ridge St		Ridge St, South of Grove St		Grove St, West of Ridge St		Waldwick Ave, West of Ridge St		Lincoln St, West of Ridge St		Nordham St, South of Bergen St		Bergen St, West of Ridge St		Ridge St, South of Summit Ave	
Direction	EB	WB	NB	SB	EB	WB	EB	WB	EB	WB	NB	SB	EB	WB	NB	SB
Excessive Speed (Excessive)	Yes	Yes	No	No	No	No	Yes	No	No	Yes	No	Yes	No	No	No	No
Excessive Speed (Racing)	No	Yes	No	No	No	No	No	No	No	No	No	Yes	No	No	No	No
Uniformity of Speed (Pace Percentage < 70%)	No	No	No	No	No	No	Yes	No	No	Yes	No	Yes	No	No	Yes	No
Uniformity of Speed (Pace above 20 to 30 MPH)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
85th Percentile Speed	Yes	Yes	No	No	No	No	Yes	No	Yes	Yes	No	Yes	No	No	No	No
Volume	N/A		No		No		No		No		No		No		No	
Street Width	No		No		No		No		No		No		No		No	

Location Number	9		10		11		12		13		14		15		16	
Location	Summit Ave, West of Ridge St		Summit Ave, West of Cortland St		Bergen Ave, West of Cortland St		Centre St, South of Bergen St		Lincoln Pl, West of Cortland St		Waldwick Ave, West of Centre St		Grove St, West of Centre St		East Prospect St, West Wayne Ct	
Direction	EB	WB	EB	WB	EB	WB	NB	SB	EB	WB	EB	WB	EB	WB	EB	WB
Excessive Speed (Excessive)	No	No	Yes	No	Yes	Yes	No	No	No	No	No	No	No	No	No	No
Excessive Speed (Racing)	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Uniformity of Speed (Pace Percentage < 70%)	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Uniformity of Speed (Pace above 20 to 30 MPH)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
85th Percentile Speed	No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No	No	No
Volume	No		No		No		No		No		No		No		N/A	
Street Width	No		No		No		No		No		No		No		No	

**Notes**

To determine the scope of the speeding issue and whether operating speeds within the study area warrant engineering countermeasures to reduce speed, the project team utilized the Institute of Transportation Engineers' (ITE) characterization of speeding issues. The ITE's definition of speeding comes from "A Guide to Speed Reduction Techniques: Planning and Design of Speed Humps, Speed Tables, and Other Related Measures," published in 2022. The ITE states that while definitions of speeding vary from region to region, a speeding issue could be present if a given roadway displays one the following characteristics:

1. **Excessive Speed:**
  - a. Percent of vehicles exceeding posted speed by 5+ MPH above 25 percent (excessive)
  - b. Percent of vehicles exceeding posted speed by 10+ MPH above 10 percent (racing)
2. **Uniformity of Speed:**
  - a. Pace speed percentage below 70 percent
  - b. Pace speed above 20 MPH to 30 MPH (30 km/h to 50 km/h)
3. **Speed:** 85th percentile 7 MPH (11 km/h) above posted speed
4. **Volume:** Daily vehicle volume of 2,000 vpd and greater [on neighborhood streets]
5. **Street Width:** Pavement width greater than 32 ft. (9.8 m)
6. **Parking:** No parking allowed or limited use of on-street parking





# Borough of Waldwick – Traffic Safety Study

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Traffic Calming Measures

## Appendix C – Crash Data and Analysis

Severity	Frequency	Percentage
No Apparent Injury	83	85%
Possible Injury	9	9%
Suspected Minor Injury	6	6%
<b>Total</b>	<b>98</b>	<b>-</b>

Hours of Occurrence	Frequency	Percentage
00:00-00:59	1	1%
01:00-01:59	1	1%
02:00-02:59	0	0%
03:00-03:59	0	0%
04:00-04:59	0	0%
05:00-05:59	0	0%
06:00-06:59	3	3%
07:00-07:59	4	4%
08:00-08:59	7	7%
09:00-09:59	3	3%
10:00-10:59	10	10%
11:00-11:59	7	7%
12:00-12:59	6	6%
13:00-13:59	7	7%
14:00-14:59	7	7%
15:00-15:59	10	10%
16:00-16:59	6	6%
17:00-17:59	7	7%
18:00-18:59	8	8%
19:00-19:59	4	4%
20:00-20:59	3	3%
21:00-21:59	0	0%
22:00-22:59	3	3%
23:00-23:59	1	1%
Unknown	0	0%
<b>Total</b>	<b>98</b>	<b>-</b>

Roadway	Frequency	Percentage
E Prospect St	33	34%
Bergen Ave	10	10%
Nordham St	10	10%
Dora Ave	9	9%
Summit Ave	7	7%
Lincoln Pl	5	5%
Centre St	4	4%
Grove St	4	4%
Waldwick Ave	3	2%
W Prospect St	2	2%
Manhattan Ave	2	3%
Highwood Ave	2	2%
Stanley Pl	2	2%
Charles Ter	1	1%
Mackay Ave	1	1%
Moore Ave	1	1%
Park Ave	1	1%
Ridge St	1	1%
<b>Total</b>	<b>98</b>	<b>-</b>

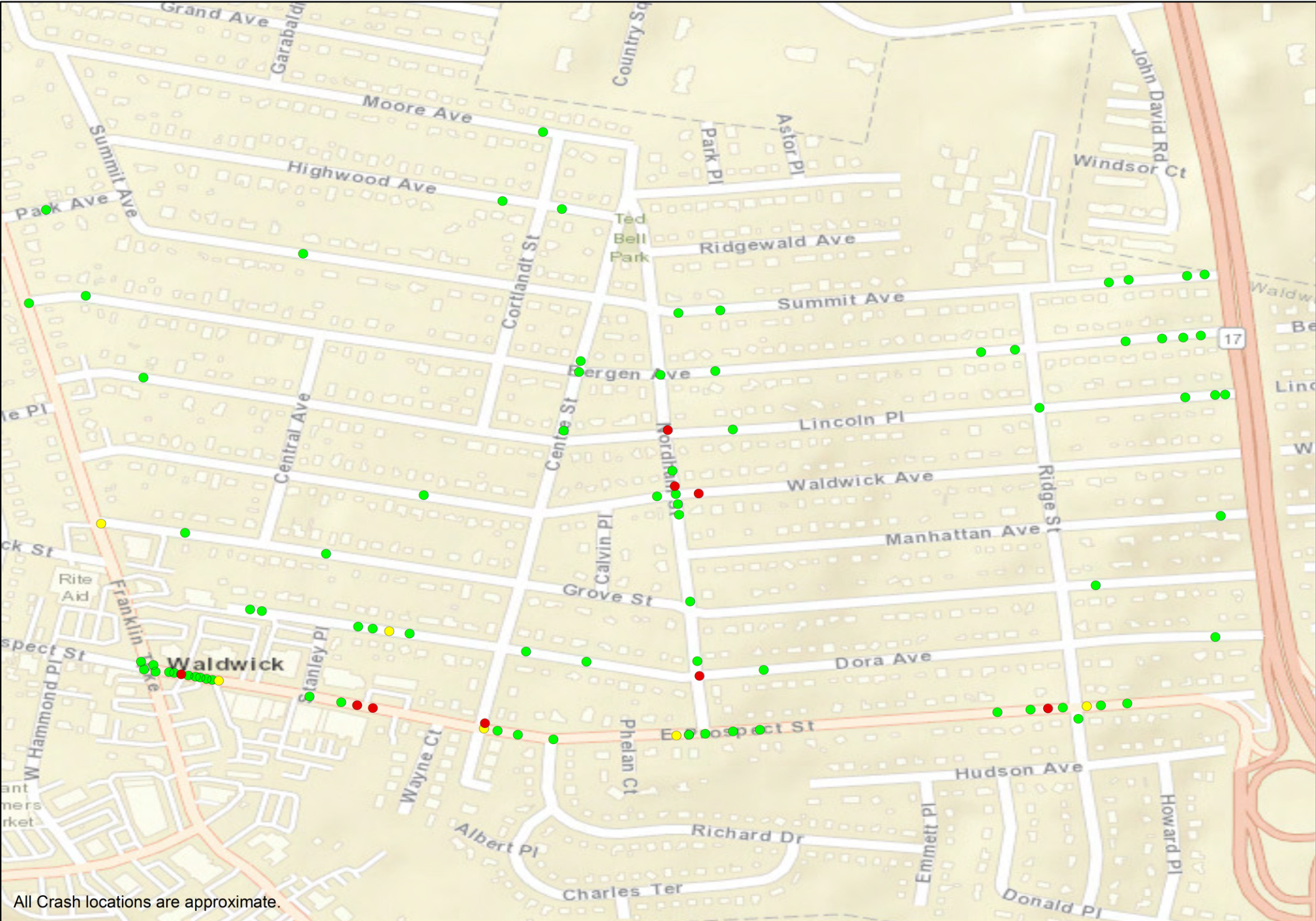
Lighting Condition	Frequency	Percentage
Daylight	77	79%
Dark (Street lights on, Cont.)	11	11%
Dark (No street lights)	2	2%
Unknown	2	2%
Dawn	2	2%
Dark (Street lights off)	2	2%
Dark (Street lights on, Spot)	1	1%
Dusk	1	1%
<b>Total</b>	<b>98</b>	<b>-</b>

Crash Type	Frequency	Percentage
Struck Parked Vehicle	32	33%
Right Angle	21	21%
Rear End	15	15%
Backing	13	13%
Fixed Object	9	9%
Sideswipe	3	3%
Animal	3	3%
Pedestrian	1	1%
Non-fixed Object	1	1%
<b>Total</b>	<b>98</b>	<b>-</b>

Environmental Condition	Frequency	Percentage
Clear	81	83%
Overcast	11	11%
Rain	5	5%
Snow	1	1%
<b>Total</b>	<b>98</b>	<b>-</b>

Waldwick Crash Data Analysis Summary		
Time Period: 2016 - 2020		
<u>Summary</u>		
Crash data was collected using NJDOT's Safety Voyager software. Between 2016 and 2020, 98 crashes occurred on roads within the study area. These crashes typically resulted in minimal or no injuries and occurred during daytime hours in clear weather conditions. Crashes occurred most frequently on E Prospect St, Nordham St, Bergen Ave, and Dora Ave. Crash patterns mirror the collected vehicle speed data, occurring more frequently where speeds are higher. Crash clusters are present near Rt 17 SB and at intersections on higher speed streets (E Prospect St & Nordham St). A crash map showing the approximate crash locations is attached.		

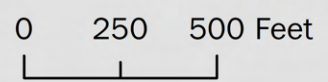




All Crash locations are approximate.

**Crash Severity**

- Property Damage Only
- Suspected Minor Injury
- Possible Injury





# Borough of Waldwick – Traffic Safety Study

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Traffic Calming Measures

## Appendix D – Construction Cost Estimate

**Construction Cost Estimate**

**Waldwick Borough Traffic Calming Speed Study**

Reference: NJDOT Bid Price Report, AASHTOWare Project Estimation and NJDOT Cost Estimating Guideline



Project Classification No.: 7 Safety and Traffic Control

Implementation Plan Cost Estimate						
SEQUENCE NO.	DESCRIPTION	UNIT	QUANTITY PER LOCATION	NUMBER OF LOCATIONS	UNIT COST	TOTAL COST
<b>Construction Items</b>						
<b>Painted Curb Extensions</b>						
1	Pavement surface paint (Excluded, optional)	SF	500	18	\$2.00	-
2	Retroreflective 4" white stripe	LF	400	18	\$0.50	\$3,600
3	Flex post delineators	U	24	18	\$90	\$38,880
4					Subtotal	\$42,480
<b>Combo - Speed Cushion (Rubber Mats) and Painted Choker</b>						
5	Speed cushion	U	1	48	\$3,400	\$163,200
6	Signage	U	1	48	\$400	\$19,200
7	Retroreflective 4" stripe (single)	LF	20	48	\$0.50	\$480
8	Delineator flex post	U	4	48	\$90	\$17,280
9					Subtotal	\$200,160
<b>Speed Feedback Sign</b>						
10	Speed feedback sign	U	1	5	\$7,000	\$35,000
<b>Pedestrian Path Striping on Nordham, Centre St.</b>						
11	Retroreflective 4" stripe line	LF	2,400	2	\$0.50	\$2,400
12	Filled Epoxy Paint	SF	14,400	2	\$2.00	\$57,600
13					Subtotal	\$60,000
<b>High Visibility Crosswalk Striping (Exterior entry roads: E. Prospect (All crossings); Franklin. Tpk., East leg; Rt 17 intersection crossings; Elem. School; Ted Bell Park)</b>						
14	High-visibility crosswalk striping	SF	90	30	\$4	\$10,800
15	Existing striping removal	LF	60	30	\$0.60	\$1,080
16					Subtotal	\$11,880
<b>High Visibility Crosswalk Striping (Nordham, Centre, Ridge: N and S Intersection Legs)</b>						
17	High-visibility crosswalk striping	SF	72	35	\$4	\$10,080
18	Existing striping removal	LF	60	17	\$0.60	\$612
19					Subtotal	\$10,692
<b>Lined Crosswalk Striping (Nordham, Centre: E and W Intersection Legs)</b>						
20	Lined crosswalk striping	LF	60	26	\$0.50	\$780
21	Existing striping removal	LF	60	0	\$0.60	\$0
22					Subtotal	\$780
<b>Julia A. Traphagen Elementary School</b>						
23	Asphalt art	LS	1	1	\$500	\$500
<b>Ted Bell Park</b>						
24	Asphalt art	LS	1	1	\$500	\$500
25	Delineate y+ intersection	LS	1	1	\$500	\$500
26					Subtotal	\$1,000
<b>Construction Items Subtotal</b>						
27					Construction Items Subtotal	\$362,500
<b>Contract Items</b>						
28	Contract Items - Lump Sum	LS	1	1	\$18,000	\$18,000
29	Mobilization (8%)	LS	1	1	\$29,000	\$29,000
30	Maintenance and Protection of Traffic (7%)	LS	1	1	\$26,000	\$26,000
31					Contract Items Subtotal	\$73,000
<b>Construction Subtotal</b>						
32					Construction Subtotal	\$435,500
<b>Contingencies</b>						
33					Contingencies (10%)	\$44,000
34					Construction Total	\$480,000
<b>Design and Support</b>						
35					Estimated Engineering Cost (20%)	\$96,000
36					Construction Engineering (10%)	\$48,000
37					Post Construction Eng. Evaluation, per FHWA Guidance (5%)	\$24,000
38					Total Project Cost (In 2023 Dollars)	\$650,000

**Construction Cost Estimate**

**Waldwick Borough Traffic Calming Speed Study**

Reference: NJDOT Bid Price Report, AASHTOWare Project Estimation and NJDOT Cost Estimating Guideline



Project Classification No.: 7 Safety and Traffic Control

**'Per Item' Cost Estimate**

SEQUENCE NO.	DESCRIPTION	UNIT	QUANTITY PER LOCATION	NUMBER OF LOCATIONS	UNIT COST	TOTAL COST	REFERENCE
<b>'Per Item' Cost Estimate</b>							
<b>Painted Curb Extensions (Per intersection)</b>							
1	Pavement surface paint (Excluded, optional)	SF	500	1	\$2.00	-	NJDOT Bid Price Report Data
2	Retroreflective 4" white stripe	LF	400	1	\$0.50	\$200	"
3	Flex post delineators	U	24	1	\$90	\$2,160	"
4						Subtotal per intersection	\$2,360
<b>Hardened Curb Extensions (Per intersection)</b>							
5	Hardened Curb Extensions (Per intersection)	U	1	1	\$6k to \$40k	-	ITE: \$6k to \$15k. Up to \$40k if drainage alteration is required.
<b>Speed Cushion (Rubber Mats) and Painted Choker</b>							
6	Speed cushion	U	1	1	\$3,400	\$3,400	Manufacturer quote
7	Signage	U	1	1	\$400	\$400	NJDOT Bid Price Report Data
8	Retroreflective 4" stripe (single)	LF	10	2	\$0.50	\$10	"
9	Delineator flex post	U	2	2	\$90	\$360	"
10						Subtotal per single road crossing	\$4,170
<b>Speed Cushion (Asphalt)</b>							
11	Asphalt speed cushion	U	1	1	\$2.5k to 12k	-	ITE ePrimer: \$2.5k to \$6k (Assume values are Nationwide average). NJ School Zone Design Guide: \$1k to \$12k. Assume top range in Northeast USA.
<b>Speed Feedback Sign</b>							
12	Speed feedback sign	U	1	1	\$7,000	\$7,000	ITE: \$5k to \$7k. NJ School Zone Design Guide \$5k to \$15k.
<b>Painted Chicane or Choker</b>							
13	Retroreflective 4" stripe (double)	LF	100	2	\$0.50	\$100	NJDOT Bid Price Report Data
14	Delineator flex post	U	6	2	\$90	\$1,080	"
15	Signage	U	1	2	\$320	\$640	"
16	Pavement surface paint (Excluded, optional)	SF	150	2	\$2.00	-	"
17						Subtotal per pair (single road crossing)	\$1,820
<b>High Visibility Crosswalk Striping (Nordham, Centre, Ridge: N and S Intersection Legs)</b>							
18	High-visibility crosswalk striping	SF	72	4	\$4	\$1,152	NJDOT Bid Price Report Data
19	Existing striping removal	LF	60	4	\$0.60	\$144	"
20						Subtotal per intersection	\$1,296
<b>Lined Crosswalk Striping (Nordham, Centre: E and W Intersection Legs)</b>							
21	Lined crosswalk striping	LF	60	4	\$0.50	\$120	NJDOT Bid Price Report Data
22	Existing striping removal	LF	60	0	\$0.60	\$0	"
23						Subtotal	\$120
<b>Roadway Restriping</b>							
24	Retroreflective 4" stripe line (Assume 4 lines total)	LF	500	4	\$0.50	\$1,000	NJDOT Bid Price Report Data
25	Stop Bars	LF	15	2	\$4	\$120	"
26	Thermoplastic intersection markings (STOP text)	SF	22	2	\$7	\$308	"
27	Existing striping removal	LF	50	2	\$0.60	\$60	"
28	Existing thermoplastic removal	SF	30	2	\$2.50	\$150	"
29						Subtotal per 500-ft Roadway (Intersection on each side)	\$1,638