FINAL REPORT

Traffic On-Call Assignment

Grand Avenue Complete Streets Traffic Study

NYMTC
NEW YORK METROPOLITAN TRANSPORTATION COUNCIL

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Submitted by:
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A LiRo Group Company

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Introduction

LiRo Engineers, Inc. was retained by the Nassau County Department of Public Works to provide traffic engineering services for the Grand Avenue Complete Streets Traffic Study in the Hamlet of Baldwin. The Grand Avenue study corridor, approximately 1.4 miles long, traverses between Merrick Road and Stanton Avenue. Funding for this study was provided by the New York Metropolitan Transportation Council (NYMTC) through the Unified Planning Work Program (UPWP).

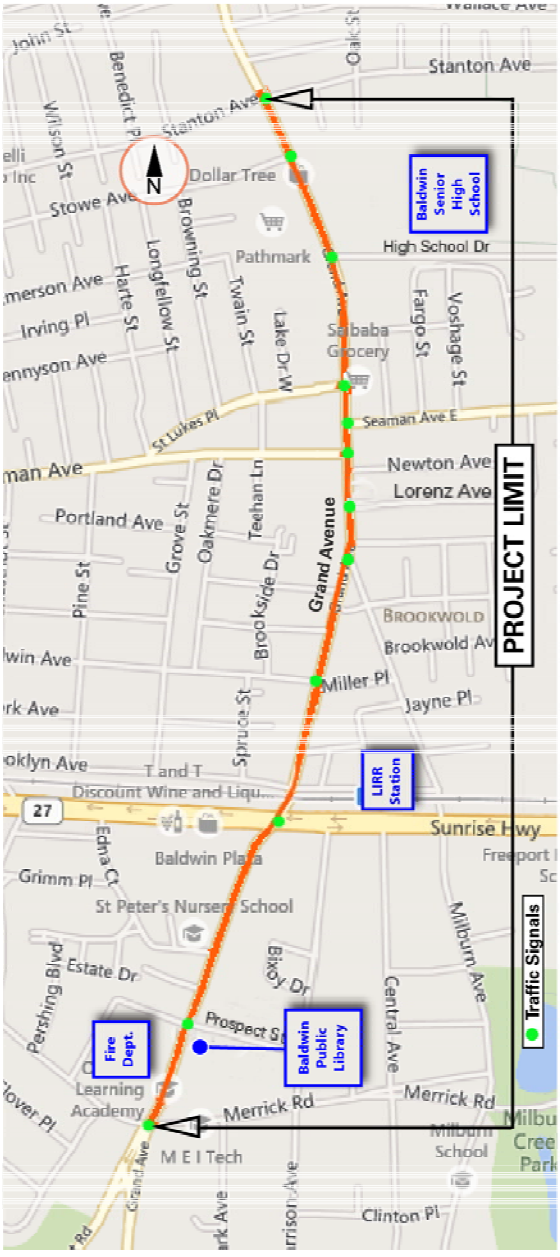
In 2013, the Nassau County Legislature enacted a Complete Streets Law, ensuring consideration of all roadway users in the planning and design of new and renovated thoroughfares. A Complete Street is a roadway planned and designed to consider the safe and efficient access and mobility for all modes and users of all ages and abilities. This entails pedestrians, bicyclists, public transportation riders and motorists, and includes children, the elderly, and persons with disabilities.

The objective of the study was to identify Complete Streets and traffic calming measures that will provide a safer pedestrian environment, improve circulation and serve as a catalyst for economic development and revitalization in downtown Baldwin. The mix of land uses along Grand Avenue, with existing commercial developments and proximity to the LIRR Baldwin Station provide the fabric for a vibrant central business district.

Design features of Complete Streets typically include sidewalks, crosswalks, ramps, traffic signals, signs, lane striping, bicycle lanes, paved shoulders suitable for use by bicyclists, curb cuts, bus pull-outs, amenities for transit users, curb extensions, raised crosswalks and other traffic calming measures.

Complete Streets guidelines imply that streets work for all travelers, with special attention given to the most vulnerable – children and senior citizens who are walking; provide safe access for all modes and users of all ages and abilities; encourage mode shift from single occupancy cars to other more sustainable alternatives; and improve safety. Standard industry guidelines and references developed and presented by agencies including Federal Highway Administration (FHWA) were utilized in this study.

Project Location Map



It is well documented that Complete Streets benefit all roadway users, support livable and sustainable communities, promote local businesses, and leverage economic growth and vitality.

Study Methodology

Extensive data were collected and analyzed for this study. This included manual turning movement counts, vehicle classification, continuous machine counts, pedestrian and bicycle volumes, spot speed data, operating speeds, posted speed limits, travel time and delay runs, roadway geometric information, accident data, field inventories and observations. Utilizing the data, capacity and level-of-service analyses were conducted at all signalized key intersections along the corridor for the 2014 existing conditions.

The existing volumes were then projected for ten years to establish future demands in 2024. The projections were based on an anticipated growth in background traffic, potential developments, and possible increase in occupancy levels of the existing vacant or underutilized properties along the corridor. Using the projected traffic volumes, the key intersections along the corridor were reanalyzed for capacity and level-of-service to establish future 2024 No-Build conditions. This scenario utilized the existing roadway geometry and signal timings to establish the future conditions with the projected traffic growth, but without the implementation of any improvement measures recommended in this study.

The aforementioned traffic database and analyses for the existing and future conditions, together with the input from the key stakeholders and public outreach meetings discussed below, provided a platform to assess the safety and operating conditions, and to determine the needs and opportunities along the study corridor. Based on these assessments, feasible traffic calming and Complete Streets improvement measures and recommendations were developed. To assess the recommended measures, the key intersections were reanalyzed for capacity and level-of-service under the future 2024 Build conditions, utilized the project traffic volumes.

A robust outreach program was undertaken to provide project information and obtain input from the community and key stakeholders. Effective outreach is essential for a successful traffic calming and complete streets project. This activity included two public information and outreach meetings and three focus group meetings with key stakeholders. The first public information and outreach meeting and three meetings with the key stakeholders were conducted during the data collection and analysis phase of this study. The intent of these meetings was to provide project information and solicit input from public and key stakeholders. The second public information and outreach meeting was conducted to present the traffic calming and Complete Streets recommendations developed in this study. The focus groups of the key stakeholders were established in consultation with the County and the study team.

The study team included NCDPW officials, Nassau County Legislator of 5th District, staff of LiRo Engineers, and representatives of Town of Hempstead from Councilwoman Sweeney's Office, Baldwin Civic Association, Baldwin Chamber of Commerce and Vision Long Island. The study team conducted periodic progress and coordination meetings to review and coordinate the analysis data, assessment of existing and future conditions, determination of need and opportunities, and identification and recommendation of the improvement measures developed in this study.

An extensive Technical Memorandum entitled Existing Data Collection and Analysis was prepared and submitted to Nassau County upon completion of the existing data collection and analysis task.

This report is prepared to summarize and present the study methodology, data, analysis results, findings and recommendations.

Study Tasks

The following tasks were conducted to accomplish the goals of this study.

1. Background Data Review
2. Existing Data Collection and Analysis
   - 2a. Study Corridor
   - 2b. Field Observations and Inventory
   - 2c. Manual Turning Movement Counts
   - 2d. Vehicle Classification Counts
   - 2e. Automatic Traffic Recorder (ATR) Counts
   - 2f. Pedestrian Counts
   - 2g. Spot Speed Data
   - 2h. Travel Time and Delay Runs
   - 2i. Accident Data
   - 2j. Roadway Plans
   - 2k. Signal Timing Data
   - 2l. Synchro Analysis
3. Public Information and Outreach
   - 3a. First Public Information and Outreach Meeting
   - 3b. Key Stakeholder Meetings
   - 3c. Second Public Information and Outreach Meeting
4. Progress and Coordination Meetings
5. Future 2024 Traffic Projections
6. Future 2024 No-Build Conditions Analysis
7. Identify Needs and Opportunities
8. Develop and Recommend Improvement Measures
9. Future 2024 Build Conditions Analysis

The above tasks and subtasks are discussed as follows.

1. Background Data Review

To gain understanding and capitalize upon the relevant data and findings of previous studies conducted in the area, available documents were obtained and reviewed. This included the following key studies.

- Revitalizing Sunrise Highway, conducted by Walkable and Livable Communities Institute sponsored by Vision Long Island/AARP (June 2014).
- Nassau County Infill Redevelopment Feasibility Study (March 2014).
- Baldwin NY Rising Community Reconstruction Plan (March 2014).
- Grand Avenue Urban Renewal Plan, Baldwin, New York (July 2007).
- Baldwin, New York: Strategic Downtown Improvement Plan, prepared for the Baldwin Chamber of Commerce (April 2000).

The Nassau County Infill Redevelopment Feasibility Study (Infill Study), which triggered this Grand Avenue Complete Street Traffic Study, recognized the area surrounding the LIRR Baldwin Station as suitable for redevelopment through strategic mobility improvements. As part of that study, the County partnered with the Baldwin Civic Association (BCA) to assess and estimate the economic impacts of implementing Complete Streets and traffic calming improvements along Grand Avenue in the vicinity of Merrick Road, Sunrise Highway and the LIRR station. The Infill Study found that similarly-scaled complete streets projects throughout the country generated significant economic returns and leveraged additional private investment within the respective commercial districts. The subject Grand Avenue Complete Streets Traffic Study capitalized upon the relevant data and findings of the Infill Study.

The Baldwin NY Rising Community Reconstruction Plan and the relevant sections of Grand Avenue Urban Renewal Plan provided by the County were also reviewed. Pertinent information presented in these references were utilized to prepare the Grand Avenue Complete Streets Traffic Study.

Baldwin's desire and readiness for a mixed-use development to anchor its downtown, as understood during the public outreach phases of the Infill Study, complements the Town of Hempstead's initiative to redevelop the northwest corner of Grand Avenue and Merrick Road. Also, Baldwin residents were some of those hardest hit by superstorm Sandy in 2012, making the need for sustainable development including housing, businesses and pedestrian amenities important. These aspects were considered in the Grand Avenue Complete Streets Traffic Study.

In the Infill Study, residents and business owners raised concerns that Sunrise Highway is dangerous to pedestrian safety, and represents a significant barrier in connecting development opportunities north and south of the Long Island Railroad (LIRR) Baldwin Station area. This was an important consideration in the Grand Avenue Complete Streets Traffic Study. The Sunrise Highway intersection is owned by New York State Department of Transportation (NYSDOT), and was specifically discussed in the meeting with them.

The existing commercial street wall and proximity to the LIRR Baldwin Station provide the fabric for a vibrant downtown and central business district. However, it requires improvements to better accommodate pedestrians and other modes of non-motorized transportation. The roadway network of Grand Avenue, Milburn Avenue, and Brooklyn Avenue, surrounding the municipal parking lot to the north of the LIRR Baldwin Station, coupled with the "Main Street" scale of Grand Avenue, provides a foundation with great potential for a walkable district.

There are some vacant or underutilized properties along the corridor which offer opportunity for smart growth and sustainable development. These developments were considered in projecting the future conditions for No-Build and Build conditions analyses.

2. Existing Data Collection and Analysis

Extensive data were collected and analyzed for this study. This included manual turning movement counts, vehicle classification, continuous machine counts, pedestrian and bicycle volumes, spot speed data, operating speeds, posted speed limits, travel time and delay runs, roadway geometric information, accident data, as well as field inventories and observations. The data collected were reviewed, summarized and tabulated, and were utilized to conduct capacity analyses and assess the prevailing traffic

conditions along the study corridor. The existing data also provided the basis to project and analyze the future conditions in 2014.

Prior to the collection of the data including traffic volumes, spot speeds, and travel time and delay runs, a detailed data collection plan was prepared and submitted to NCDPW for review and approval. Several site visits were conducted during peak and off-peak hours to observe the prevailing traffic conditions along the study corridor.

As mentioned above an extensive Technical Memorandum entitled Existing Data Collection and Analysis was prepared and submitted to Nassau County upon completion of the existing data collection and analysis task, which presents detailed data and analyses conducted in this study. Various data collected and analyzed in this study are discussed below.

2a. Study Corridor

Grand Avenue is a north-south collector roadway under the jurisdiction of Nassau County. It extends north from Baldwin Harbor Park (in the south) to the Southern State Parkway, and turns into Baldwin Road. In the study area, it intersects with Sunrise Highway (NY 27) and Merrick Road, two major east-west arterials in Nassau County. The study corridor is approximately 1.4 miles long. There are 12 signalized intersections and several unsignalized intersections and driveways along the study corridor. Traffic data were collected and all signalized intersection were analyzed in detail as key locations along the study corridor.

2b. Field Observations and Inventory

Several site visits were conducted to observe the prevailing conditions along the study corridor. To complete the inventory, roadway plans were obtained from NCDPW as discussed below. The information was utilized in the analysis and evaluation of the existing conditions, as well as to project and assess future conditions in 2014.

Grand Avenue has two travel lanes and additional turning lanes at certain intersections along the corridor. Posted speed limit is 30 miles per hour. On-street parking is provided on both sides of Grand Avenue, except for certain areas. Grand Avenue northbound is a designated hurricane evacuation route, north of Sunrise Highway. These feature were considered in developing roadway modifications and improvement plans.

Sidewalks exist on both sides of Grand Avenue, although the widths are narrow or restricted by elements such as trees or utility poles at certain locations. Intermittent streetscape treatments, including decorative pavers, lighting, trash receptacles and benches exist on the sidewalks. Feasible improvements including bulb-out and curb extensions were developed and recommended in this study to increase the sidewalk areas, particularly at the key intersections, enhancing pedestrian operation and safety.

There are marked crosswalks and countdown pedestrian signals at certain signalized intersections. The existing crosswalks are long at certain location including Merrick Road, Sunrise Highway, and Milburn Avenue. Feasible improvement measures were developed and recommended in this study

to reduce walking distance and pedestrian exposure and improve visibility of crosswalks, enhancing operation and safety, throughout the study corridor.

LIRR Baldwin Station is located in the northeast corner of Sunrise Highway and Grand Avenue. With bus stops on both sides of the roadway, Long Island Bus operates the n35 route along Grand Avenue which serves Hempstead and Baldwin Harbor. In addition, n4 along Merrick Road serves Freeport, Rockville Centre and the Valley Stream area. The n35 and n4 bus routes connect to the Long Island LIRR Stations at Baldwin, Rockville Centre and Freeport. These services provide a good network of public transportation in the area, and were considered in developing Complete Streets alternatives.

Although bus stops exist along both sides of Grand Avenue, most of them do not provide adequate waiting areas for riders. For example, the riders waiting for southbound service at Stanton Avenue were observed to be standing in the narrow sidewalk on the west side of the Grand Avenue, impeding the pedestrian circulation on the sidewalk. Although sidewalk is substantially wider and a bench is also provided on the opposite of this location on Grand Avenue, a proper waiting area with shelter and seating is lacking. Riders waiting for buses were observed at these bus stops during our field observations. Realizing the right of way constraints, feasible improvements were developed and recommended in this Complete Streets study.

Similarly, there is no adequate waiting area on the west side of Grand Avenue by the Baldwin High School Driveway. A significant number of riders, particularly students at school dismissal, were observed at this bus stop. A small shelter with a bench exists on the opposite side of this location.

Significant activity of bus riders was also observed at the Merrick Road intersection – mainly related to the transfer between the eastbound and northbound bus service along Merrick Road and Grand Avenue, respectively. Although certain amenities exist at the bus stops on the west side of Grand Avenue and the south side of Merrick, improvement needs were realized during field observations. Feasible improvements were developed and recommended to enhance these facilities for the riders as well as to create more room on the sidewalks for pedestrian circulation. Crosswalks at the Merrick Road intersections were also critically examined, and improvements were developed and recommended to enhance pedestrian operation and safety.

As such, this Complete Streets study requires, as well as provides an opportunity, to enhance public transportation along the corridor. Realizing the right of way constraints, feasible improvement measures were developed and recommended accordingly to enhance facilities for the existing riders as well as to attract new users.

The land use along the study corridor is mixed, and the combination of uses varies along the corridor. It includes retail, commercial, big-box stores, residential, institutional, municipal parking fields, and places of worship. Baldwin Public Library, Fire Department and High School are also located in the study area. These facilities generate varying levels of pedestrian, auto, bus and truck trips throughout the corridor, and were considered in developing feasible improvement measures in this study.

There are some vacant properties along the corridor which offer opportunity for smart growth and sustainable development. During the month of July, 2015, the Nassau County Department of Public Works conducted a windshield survey of vacant storefronts in the study area and found a total of 24

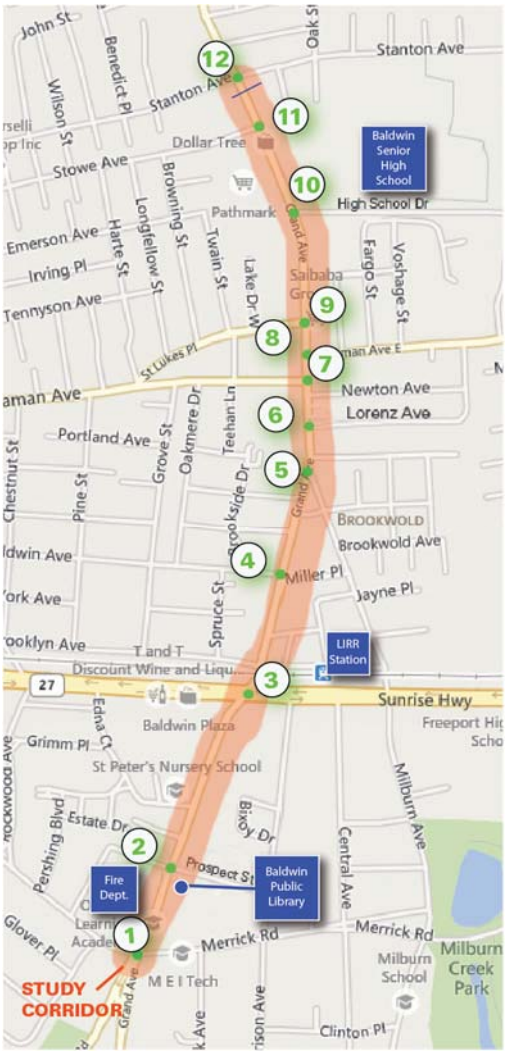
vacant commercial establishments totaling approximately 56,000 square feet of floor area. This includes the vacant properties in the northwest corner of Merrick Road and Grand Avenue. These developments were considered in projecting the future 2024 conditions for analysis.

2c. Manual Turning Movement Counts

Manual turning movement counts including vehicles and bicycles were collected at 12 signalized intersections along the study corridor. These intersections are located along Grand Avenue at:

1. Merrick Road
2. Prospect Street
3. Sunrise Highway
4. Baldwin Avenue/Miller Place
5. Milburn Avenue
6. Lorenz Avenue
7. Seaman Avenue (west of Grand Avenue)
8. Seaman Avenue (east of Grand Avenue)
9. St Lukes Place
10. Baldwin Senior High School Driveway/ Ethel T. Kloberg Drive
11. Stowe Avenue
12. Stanton Avenue

Manual Turning Movement Count Locations



The data were collected concurrently with the ATR counts (described below) on Thursday, November 13, 2014 during morning (7AM - 9AM), midday (11AM - 1PM) and evening (2PM - 6PM), and on Saturday, November 15, 2014 during midday (11AM - 2PM) peak period. The counts were recorded at 15-minute intervals.

The traffic counts collected were reviewed, summarized and tabulated to determine the peak hours and related volumes at the intersections. A review of the hourly volumes indicates that, rather than peaking at the same time, the peak hours at the individual intersections vary during the peak periods. However, the variation in hourly volumes is generally minor. To be conservative, the highest hourly volumes recorded at the individual intersections were utilized in the capacity and level of service analysis. Manual turning movement count data are presented in the Technical Memorandum prepared for this study.

2d. Vehicle Classification Counts

Vehicle classification counts were collected for all turning and through movements at the following four key signalized intersections:

- Grand Avenue at Merrick Road
- Grand Avenue at Sunrise Highway
- Grand Avenue at Seaman Avenue (west of Grand Avenue)
- Grand Avenue at Seaman Avenue (east of Grand Avenue)

The data classified vehicles into the following five categories:

- Automobiles (cars, SUVs, vans)
- Buses
- School Buses
- Light-Duty Trucks (2 axles)
- Heavy-Duty Trucks (3 or more axles)

The collection of vehicle classification counts including FHWA categories was not in the scope of work for this study. However, considering the presence of schools and retail and commercial facilities along the corridor, resources were maximized to collect the data at the aforementioned key locations and classes deemed useful for this study.

Vehicle classification counts were collected concurrently with the manual turning movement counts during the weekday and Saturday peak periods indicated above. The data were reviewed, summarized and tabulated to determine the peak hour volumes as well as the distribution and percentages by classification of vehicles. It provides the information about the type of vehicles utilizing the Grand Avenue corridor and was utilized in the capacity and level of service analysis. The classification data were summarized and tabulated.

Detailed classification data and tabulations, presented in the Technical Memorandum, indicate that automobiles (cars, SUVs and vans) constitute the predominant class of vehicles (90 to 99 percent) at the key intersections, followed by some light trucks (five percent or less) and school buses (four percent or less) in certain peak hours.

ATR Count Locations

2e. Automatic Traffic Recorder (ATR) Counts

ATR machine counts were collected continuously for a period of more than one week from Wednesday, November 12, 2014 to Saturday November 22, 2014. As shown in the map, the ATR counts were collected at the following six key locations along the study corridor.

1. Grand Avenue, between Merrick Road and Prospect Street
2. Grand Avenue, south of Sunrise Highway

3. Grand Avenue, north of Sunrise Highway
4. Grand Avenue, between Milburn Avenue and Lorenz Avenue
5. Grand Avenue, between St Lukes Place and Baldwin Senior High School Driveway
6. Grand Avenue, between Stowe Avenue and Stanton Avenue

At each of the six key locations, two machines were installed to record northbound and southbound traffic separately. The data obtained were reviewed summarized and tabulated to determine the peak hours and daily traffic volumes. Data were also plotted to graphically depict the hourly and daily variations in traffic volumes. Detailed ATR data are presented in the Technical Memorandum.

ATR counts were also processed in NYSDOT format to determine average weekday high hour and Average Annual Daily Traffic (AADT) volumes by applying seasonal and axle adjustment factors. This information is presented in Attachment C. Based on these data, AADT volumes at the six key locations along Grand Avenue are tabulated below.

Location along Grand Avenue	2014 Average Annual Daily Traffic (AADT)		
	Northbound	Southbound	Total
1. Between Merrick Road and Prospect Street	8,770	8,401	17,171
2. South of Sunrise Highway	9,386	10,102	19,488
3. North of Sunrise Highway	9,189	10,938	20,127
4. Between Milburn Avenue and Lorenz Avenue	13,965	14,837	28,802
5. Between St Lukes Place and Baldwin Senior High School Driveway	14,712	14,578	29,290
6. Between Stowe Avenue and Stanton Avenue	15,639	16,795	32,434

2f. Pedestrian Counts

Pedestrian counts were collected by direction at all approaches/legs of the 12 signalized intersections identified under manual turning movements counts above. These counts were collected concurrently with the manual turning movement counts on Thursday, November 13, 2014 during morning (7AM - 9AM), midday (11AM - 1PM) and evening (2PM - 6PM), and on Saturday, November 15, 2014 during midday (11AM - 2PM) peak period. The counts were recorded at 15-minute intervals.

Pedestrian counts collected were reviewed, summarized and tabulated to determine the peak 15-minute and peak hourly volumes at individual crosswalks and intersections. The data tabulations indicate that the highest pedestrian activity along the corridor occurs at the intersection of Grand Avenue and Baldwin Senior High School Driveway.

The count data indicate that the highest pedestrian volumes occur at the intersection of Grand Avenue and Baldwin Senior High School Driveway during the morning and afternoon peak periods corresponding to school arrival and dismissal times. During these periods, a total of 112 crossing pedestrian were observed in the peak 15 minutes from 7:30 AM to 7:45 AM and 123 from 2:45 PM to 3:00 PM. Similarly, 189 pedestrians crossed the intersection during the peak hour from 7:00 AM to 8:00 AM and 327 from 2:30PM to 3:30 PM. A great majority of these pedestrians were students, utilizing the north crosswalk at the intersection, which is marked and signalized with pedestrian indications. During other times and at other intersections monitored, pedestrian volumes were significantly lower. Pedestrian volumes observed at the intersections along the corridor are generally

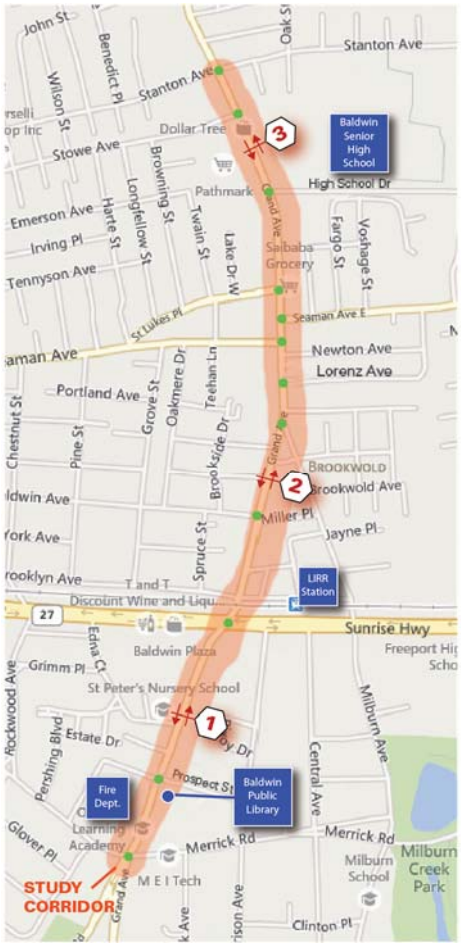
considered as low to moderate. Detailed counts at the intersections and crosswalks are presented in the Technical Memorandum.

2g. Spot Speed Data

Manual spot speed data were collected using a radar gun on Thursday, November 20, 2014 during off-peak hours (9AM – 1PM). During this survey, northbound and southbound traffic speeds were recorded separately at the following three roadway segments.

1. Grand Avenue, between Prospect Street and Sunrise Highway
2. Grand Avenue, between Miller Place and Milburn Avenue
3. Grand Avenue, between Baldwin Senior High School Driveway and Stowe Avenue

Spot Speed Data Locations



In each segment, a statistically significant number of readings (175 per direction) were recorded. Spot speed data were collected under free-flow conditions (off-peak hours). Vehicles were targeted away from the influence of the intersections. Standard industry guidelines were followed to gather the data. Data were collected under daylight dry conditions.

Spot speed data were reviewed, tabulated and summarized, and using frequency distribution curves, prevailing average, minimum, maximum, pace and 85th percentile speeds were calculated for each direction and location. The data indicate that the operating speeds at all key locations are 6 to 10 miles per hour (mph) over the 30 mph posted speed limit along the corridor. These operating speeds are not unusual for similar type of roadways and level of enforcement. Detailed data are presented in the Technical Memorandum.

2h. Travel Time and Delay Runs

Travel time and delay runs were conducted in both (northbound and southbound) directions along the Grand Avenue corridor between Merrick Road and Stanton Avenue (end intersections included). The runs were conducted using the "floating car" method (in which the test car attempts to "float" in the traffic stream to obtain a representative travel time).

Travel time and delay runs were conducted concurrently with the manual turning movement counts on Thursday, November 13, 2014 during morning (7AM - 9AM), midday (11AM - 1PM) and evening (2PM - 6PM), and on Saturday, November 15, 2014 during midday (11AM - 2PM) peak period. Three to four runs per hour were conducted in each direction. The 12 signalized intersections listed above

were the control points where readings were recorded. Actual time was noted at the beginning of each run. Elapsed time was recorded upon crossing each signalized intersection (control point), and any en route delays were recorded separately for each segment (between two control points).

The data were reviewed, summarized and tabulated, and running and travel speeds were calculated for each segment and overall corridor in each direction. The data tabulations for each individual run and averages for each peak period are presented in the Technical Memorandum. Based on the data tabulations, average running speeds and delays along the corridor during the peak periods are summarized below.

During the weekday AM peak period, the average northbound running speed along the corridor was 22.4 mph. This includes delays due to traffic signals at the intersections. Significant signal delays occurred at the Sunrise Highway intersection, with an average of 46 seconds of 64 seconds total along the corridor. At all other intersections, signal delays were zero to five seconds. The average southbound running speed was 18.4 mph. Significant signal delays occurred at the Merrick Road and Sunrise Highway intersections, with averages of 39 and 22 seconds, respectively, of 81 seconds total along the corridor. At all other intersections, signal delays were zero to six seconds.

During the weekday midday peak period, the average northbound running speed along the corridor was 20.2 mph. This includes delays due to traffic signals at the intersections. Significant signal delays occurred at the Sunrise Highway and Stowe Avenue intersections, with averages of 36 and 10 seconds, respectively, of 55 seconds total along the corridor. At all other intersections, signal delays were zero to six seconds. The average southbound running speed was 22.2 mph. Significant signal delays occurred at the Merrick Road and Sunrise Highway intersections, with averages of 41 and 26 seconds, respectively, of 81 seconds total along the corridor. At all other intersections, signal delays were zero to five seconds.

During the weekday PM peak period, the average northbound running speed along the corridor was 21.1 mph. This includes delays due to traffic signals at the intersections. Significant signal delays occurred at the Sunrise Highway intersection, with an average of 74 seconds of 89 seconds total along the corridor. At all other intersections, signal delays were zero to six seconds. The average southbound running speed was 19.9 mph. Significant signal delays occurred at the Merrick Road and Sunrise Highway intersections, with averages of 26 and 56 seconds, respectively, of 98 seconds total along the corridor. At all other intersections, signal delays were zero to four seconds.

During the Saturday midday peak period, the average northbound running speed along the corridor was 21.7 mph. This includes delays due to traffic signals at the intersections. Significant signal delays occurred at the Sunrise Highway and Stowe Avenue intersections, with averages of 29 and 15 seconds, respectively, of 67 seconds total along the corridor. At all other intersections, signal delays were zero to seven seconds. The average southbound running speed was 19.7 mph. Significant signal delays occurred at the Merrick Road, Sunrise Highway and Stowe Avenue intersections, with averages of 39, 25 and 15 seconds, respectively, of 97 seconds total along the corridor. At all other intersections, signal delays were zero to five seconds.

2i. Accident Data

Accident data were obtained from NYSDOT for the most recent available three year period from May 1, 2011 to April 30, 2014. These data, maintained by NYSDOT under Accident Location Information System (ALIS), included County Interim Accident Summary and Accident Verbal Description reports for the study corridor. The accident data were reviewed, summarized and tabulated to sort the accidents by type, severity and location. The data, tabulated below, indicates that a total of 736 accidents occurred along the entire corridor during the three year period. Of these, 184 (25%) involved injury and 551 (75%) were property damage only accidents, while one accident involved fatality. Rear end (30%), overtaking (25%), right angle (12%), and left turn (9%) were most prevalent type of accidents along the study corridor. Accident data further summarized and tabulated by location or intersection are presented in the Technical Memorandum, along with the data obtained from NYSDOT.

Accident Summary by Severity – Entire Corridor

Year	Accident Severity			
	Fatality	Injury	Property Damage	Total
5/1/2011 - 12/31/2011	0	54	124	178
1/1/2012 - 12/31/2012	0	56	174	230
1/1/2013 - 12/31/2013	1	49	200	250
1/1/2014 - 4/30/2014	0	25	53	78
Total	1	184	551	736
	0%	25%	75%	100%

Accident Summary by Type of Collision – Entire Corridor

Year	Accident Type									
	Right Angle	Rear End	Head On	Left Turn	Right Turn	Fixed Object	Ped/ Bicycle	Overtake	Other/ Unknown	Total
5/1/2011 - 12/31/2011	20	53	2	19	4	0	5	41	34	178
1/1/2012 - 12/31/2012	32	73	1	15	6	2	9	54	38	230
1/1/2013 - 12/31/2013	29	71	2	26	3	7	8	69	35	250
1/1/2014 - 4/30/2014	6	26	0	3	4	3	2	19	15	78
Total	87	223	5	63	17	12	24	183	122	736
	12%	30%	1%	9%	2%	2%	3%	25%	17%	100%

In addition, NCDPW initially provided accident data obtained from Nassau County Police Department covering a period from July 1, 2010 to September 1, 2014. This data, also presented in the Technical Memorandum, was found difficult to sort by location, type and severity due to its coded format, so the NYSDOT data were utilized.

2j. Roadway Plans

Roadway plans including pavement marking and signage were provided by NCDPW. These plans provide a complete inventory of roadway features including type, direction and widths of lanes,

pavement markings and crosswalks at intersections as well as traffic control signs and parking regulations. This information, along with spot field checks, was utilized in developing Synchro models for capacity and level of service analysis. NCDPW also provided right-of-way maps for the study corridor. The roadway plans are included in the Technical Memorandum.

2k. Signal Timing Data

Traffic signal plans and timing data were obtained from NCDPW. These data, along with field checks, were used in Synchro models for capacity and level of service analysis. Signal timing data are presented in the Technical Memorandum.

2l. Synchro Analysis

Using the data collected for this study, Synchro models were developed to analyze the existing traffic conditions during weekday AM, midday and PM and Saturday midday peak hours. Synchro is a traffic analysis and signal timing optimization program commonly used in the industry. In this analysis, traffic volumes, in conjugation with the intersection geometry and signal timing and phasing plans were used to determine the existing capacity and level-of-service of the study intersections. The aforementioned 12 signalized key intersections were included in this analysis.

According to Highway Capacity Manual (HCM) published by the Transportation Research Board, an industrywide reference, there are six classes of level-of-service (LOS) for signalized intersections, ranging from A (best) to F (worst). Levels-of-service from A to D are generally considered acceptable. Synchro analysis results for weekday AM, midday and PM and Saturday midday peak hours are summarized in the attached Tables 1 through 4, while detailed analysis worksheets are presented in the Technical Memorandum.

The analysis results, summarized in Tables 1 through 4, indicate that the key signalized intersections analyzed along the corridor operate at an overall LOS D or better, except for the following intersections, which experience an overall intersection LOS E or F during certain peak hours as noted below.

- Grand Avenue at Sunrise Highway – This intersection operates at an overall LOS E or F during all peak hours analyzed, which is mainly due to longer delays at approaches caused by higher volumes and longer signal cycle lengths.
- Grand Avenue at High School Driveway – This intersection operates at an overall LOS F during the weekday AM peak hour, which is mainly due to longer delays at the southbound left and northbound right turns to the High School Driveway. These movements, related to the school arrival activity, often cause significant queuing along Grand Avenue, particularly in the shared right turn and through lane at the northbound approach.
- Grand Avenue at East Seaman Avenue – This intersection operates at an overall LOS E during weekday PM and Saturday midday peak hours, mainly due to the southbound left turn traffic,

which also blocks southbound through traffic in the shared lane, resulting in queues and delays.

Although the overall LOS at the remaining intersections is D or better, some lane groups at the intersections operate at LOS E or F during certain peak hours as follows.

- Grand Avenue at Merrick Road
  - Northbound shared through and right turn – Weekday AM peak hour
  - Westbound left turn – Weekday PM peak hour
  - Southbound shared through and right turn – Weekday PM and Saturday midday peak hour
- Grand Avenue at Milburn Avenue
  - Northbound shared through and right turn – Weekday PM peak hour
- Grand Avenue at West Seaman Avenue
  - Southbound shared through and right turn – Weekday PM peak hour
- Grand Avenue at East Seaman Avenue
  - Eastbound shared left and right turn – Weekday AM peak hour
- Grand Avenue at Stowe Avenue
  - Northbound left turn – Weekday PM peak hour

3. Public Information and Outreach

A robust outreach program was undertaken for this study to present project information and obtain input from the community and key stakeholders. Effective outreach is essential for a successful traffic calming and Complete Streets project. This effort primarily included two public information and outreach meetings and three focus group meetings with key stakeholders, which are discussed in the following section. The first public information and outreach meeting and three meetings with the key stakeholders were conducted during the data collection and analysis phase of this study. The intent of these meetings was to provide project information and solicit input from public and key stakeholders. The second public information and outreach meeting was conducted to present the traffic calming and Complete Streets recommendations developed in this study. In addition, four supplemental meetings, two before and two after the second public meeting, were conducted with key stakeholders.

The public outreach and key stakeholder meetings are discussed below.

3a. First Public Information and Outreach Meeting

The first public information and outreach meeting was conducted on Tuesday, February 24, 2015 from 7:00 PM to 9:00 PM at the cafeteria of Baldwin Senior High School, 841 Ethel T. Kloberg Drive in Baldwin. The intent of this meeting was to share the project information and solicit community input at the early stage of the project to help in identifying issues and developing feasible improvement

measures. Meeting flyers and invitations were prepared and circulated to inform public and stake holders. Copies of the flyer and invitation are presented in the Technical Memorandum.

Distribution of meeting invitation and flyers by Baldwin Civic Association and Baldwin Chamber of Commerce as well as mass mailing of flyers and postcards to the area residents by the office of Nassau County Legislator (5th District), Honorary Laura Curran, greatly contributed in informing and gathering people for this meeting. This meeting was attended by more than 80 people.

At the meeting, the Grand Avenue Complete Streets Traffic Study project team presented an overview, as well as data and information collected for the study. Data were also presented on display boards. A copy of the presentation, included in the Technical Memorandum, was also uploaded to the Nassau County Planning Department's website at the following address:

http://www.nassaucountyny.gov/2856/Planning-Department

To solicit comments, a questionnaire was developed and its copies were provided to the attendees at the meeting. In response, 38 people returned the questionnaire with written comments at the meeting, while 8 people responded via email. Copies of the public comments received are presented in the Technical Memorandum. All comments received were reviewed, summarized and tabulated by type, concern and location. These summaries are presented in the attached Table 5.

3b. Key Stakeholders Meetings

As mentioned above, three meetings with the key stakeholders were conducted during the data collection and analysis phase of this study. The intent of these meetings was to present project information and solicit input from the key stakeholders. The focus groups of the key stakeholders were established in consultation with the County and the study team. The three focus group meetings were conducted with the following key stakeholders:

1. New York State Department of Transportation – Region 10 (NYSDOT)
2. Baldwin Chambers of Commerce
3. Town of Hempstead

The meeting with NYSDOT was conducted on March 25, 2015 at the State Office Building in Hauppauge. This meeting was attended by personnel representing departments of traffic and public involvement of NYSDOT as well as representatives from NCDPW and LiRo. The primary intent of this meeting was to obtain information about the key intersection of Sunrise Highway along the Grand Avenue corridor, which is under the jurisdiction of NYSDOT. Following the introductions, a brief overview of the Grand Avenue Complete Streets Traffic Study was presented by the project team. NYSDOT's projects in the study area, available studies and plans as well as needs and opportunities were discussed in the meeting. NYSDOT indicated that the key intersection of Grand Avenue at Sunrise Highway has been studied recently under the safety improvement project along Sunrise Highway. Regarding the concerns about the long (skewed) crosswalks at the intersection, NYSDOT indicated that the option of straighten up the crosswalk to reduce crossing distance or relocating crosswalks away from the intersection were reviewed, but were not deemed feasible. As such, the intersection has been recently repaved and restriped, and further improvements are not anticipated,

except for some audible signal equipment, which is being considered for implementation at this intersection.

The meeting with Baldwin Chamber of Commerce, representing local property owners and businesses, was conducted on April 14, 2015 at their regular luncheon in Baldwin. Around 50 people attended the meeting, along with the project team representatives from NCDPW and LiRo. A brief overview of the Grand Avenue Complete Streets Traffic Study was presented by the NCDPW representatives. During an informal discussion after the presentation, some attendees conveyed the following comments:

- Speeding is a problem on Grand Avenue and Milburn Avenue – install more signals and stop signs
- Graffiti is a concern - it needs to be cleaned and stopped
- On-street parking at the corner of Newton Avenue and Grand Avenue is a concern – there is a deli, church and other facilities, and people park (illegally) for short periods to pick-up and drop-off, blocking traffic to/from Newton Avenue and making it inconvenient. A Church and Walgreens across the street also generate traffic, adding to the activity and movements. Newton is primarily residential (mostly occupied by owners) and residents are concerned. Police has been called for blockage. Problem is mainly due to on-street parking shortfall. The first house on the north side of Newton Avenue is vacant, and the Town should consider buying it and turning it to municipal parking (lot size is approximately 125' X 50').

The meeting with the Town of Hempstead was conducted on March 25, 2015 at the Department of Planning and Development in Hempstead. This meeting was attended by personnel representing Departments of Planning and Development and Department of Economic Development of the Town as well as representatives from NCDPW and LiRo. The primary intent of this meeting was to obtain information about any planned or proposed development related to the Grand Avenue study corridor. At the meeting, a brief overview of the Grand Avenue Complete Streets Traffic Study was presented by the project team. The discussions at the meeting revealed that there are no specific plans or proposals under consideration along the corridor, including the redevelopment at the northwest corner of Grand Avenue and Merrick Road, at this time.

3c. Second Public Information and Outreach Meeting

The second public information and outreach meeting was conducted on Wednesday, November 18, 2015 from 7:00 PM to 9:00 PM. This meeting was conducted at the cafeteria of Baldwin Senior High School at 841 Ethel T. Kloberg Drive in Baldwin. The intent of this meeting was to present and share the information and findings from the study as well as the complete streets improvement measures developed and recommended along the corridor. Meeting flyers and invitations were prepared and circulated to inform public and stake holders about this meeting.

Similar to the first public meeting, Baldwin Civic Association and Baldwin Chamber of Commerce, along with distribution of flyers to the area residents by the office of Nassau County Legislator (5th District), Honorary Laura Curran, greatly contributed in informing and gathering people for this meeting. In addition, prior to the public meeting, two key stakeholders meetings with the groups of

Baldwin Civic Association and Baldwin Chamber of Commerce were held to discuss the project and inform about the upcoming public meeting. The second public information and outreach meeting was also well attended, with more than 50 attendees furnishing the sign-in sheets.

At the meeting, the Grand Avenue Complete Streets Traffic Study project team presented the study data, findings and recommended improvement measures along the corridor. Renderings of recommended improvement measures and study data were also presented on display boards for public to review. A copy of the presentation, included in the Appendix A of this report, was also uploaded at the aforementioned Nassau County Planning Department's website.

Following the second public information and outreach meeting, two separate focus group meetings were conducted with the Baldwin Fire District and Town of Hempstead Sanitation District Number 2 to present and discuss the study findings and recommendations.

4. Progress and Coordination Meetings

The study team conducted periodic progress and coordination meetings over the course of this study to review and coordinate the analysis data, assessment of existing and future conditions, determination of need and opportunities, and development and recommendation of the complete streets and traffic calming measures in this study. The study team included NCDPW officials, Nassau County Legislator of 5th District, staff of LiRo Engineers, and representatives of Town of Hempstead from Councilwoman Sweeney's Office, Baldwin Civic Association, Baldwin Chamber of Commerce and Vision Long Island.

5. Future 2024 Traffic Projections

Future traffic projections were made to analyze the traffic conditions with and without the complete streets and traffic calming measures recommended in this study. This included analysis of two scenarios, Build and No-Build conditions, as discussed in the following sections. To analyze these scenarios in a ten year horizon, the existing 2014 traffic volumes were projected for the year 2024. These projections were based on an anticipated growth in the background traffic, potential developments and increase in occupancy levels of the existing vacant or underutilized buildings along the corridor. NCDPW obtained the relevant data from NYMTC to establish the background traffic growth rate along the corridor. Based on the data, an annual compounded traffic growth rate of 0.5 percent was established for the background traffic.

As discussed above, there are some vacant properties along the corridor which offer opportunity for smart growth and sustainable development. During the month of July, 2015, NCDPW staff conducted a windshield survey of vacant storefronts in the study area and found a total of 24 vacant commercial buildings with a combined floor area of approximately 56,000 square feet. This included the vacant properties in the northwest corner of Merrick Road and Grand Avenue, while the remaining properties scattered along the corridor. To account for the traffic anticipated from the vacant properties, the aforementioned annual background growth rate was increased by 20 percent, from 0.5 percent to 0.6 percent compounded, and was used in the projections.

In addition, project-generated trips presented in the Grand Avenue Urban Renewal Plan Traffic Study date 2007 were also added in the projections of traffic volumes at intersections to conduct capacity analyses for future No-Build and Build conditions. The information obtained through the outreach and key stakeholder meetings indicated that there were no current plans for the development at the Urban Renewal site located at the northwest corner of Merrick Road and Grand Avenue. All growth rates and projections were developed in close consultation and approval of NCDPW.

The existing AADT volumes were also projected for the future 2024 conditions using the aforementioned traffic growth rate, and are summarized in the following table.

Location along Grand Avenue	2024 Average Annual Daily Traffic (AADT)		
	Northbound	Southbound	Total
1. Between Merrick Road and Prospect Street	9,311	8,919	18,230
2. South of Sunrise Highway	9,965	10,725	20,689
3. North of Sunrise Highway	9,755	11,612	21,368
4. Between Milburn Avenue and Lorenz Avenue	14,826	15,752	30,578
5. Between St Lukes Place and Baldwin Senior High School Driveway	15,619	15,477	31,096
6. Between Stowe Avenue and Stanton Avenue	16,603	17,830	34,433

6. Future 2024 No-Build Conditions Analysis

The analysis of future conditions without the complete streets and traffic calming measures recommended in this study or "No-Build" conditions was performed to evaluate the future traffic conditions attributed to the normal background growth and additional traffic generated by vacant properties along the corridor. In other words, this scenario presents the expected future traffic conditions regardless of the improvements proposed in this study, and establishes a baseline condition to develop improvement measures and compare their effectiveness.

Future No-Build traffic conditions were analyzed for 2024, the ten year horizon year. This scenario utilized the traffic volumes projected for the 2024 conditions, as discussed above, while keeping the existing roadway features and signal timing plans. The aforementioned 12 key signalized intersections along the corridor were reanalyzed for capacity and level-of-service using Synchro models. This included analysis of traffic conditions during weekday AM, midday and PM, and Saturday midday peak hours. The analysis results are summarized in the attached Tables 1 through 4, while detailed worksheets are presented in Appendix B of this report.

The analysis results, summarized in Tables 1 through 4, indicate that the delays at the key signalized intersections along the corridor would generally increase due to the growth in traffic from the existing to No-Build conditions. While most of the intersections would continue to operate at an overall LOS D or better, operating conditions would deteriorate to LOS E or F at certain locations as noted below.

- Grand Avenue at Sunrise Highway – This intersection, which operates at an overall LOS E or F during all peak hours under the existing conditions, would experience a significant increase in delays in all peak hours. The existing LOS would deteriorate from E to F during the AM peak hour.

- Grand Avenue at High School Driveway – This intersection operates at an overall LOS F during the weekday AM peak hour under the existing conditions, which is mainly due to longer delays at the southbound left and northbound right turns to the High School Driveway. While the intersection LOS F would not change, overall delay would substantially increase during the AM peak hour.

- Grand Avenue at East Seaman Avenue – The existing LOS at this intersection would deteriorate from E to F during weekday PM and Saturday midday peak hours, and from D to E during the weekday AM peak hour. This is mainly due to the southbound left turn traffic, which also blocks southbound through traffic in the shared lane, resulting in queues and delays.

- Grand Avenue at West Seaman Avenue – The overall LOS at this intersection would deteriorate from D under the existing conditions to E under the No-Build conditions during the weekday PM peak hour.

Although the overall LOS at the remaining intersections would be D or better, some lane groups at the intersections would operate at LOS E or F during certain peak hours as follows.

- Grand Avenue at Merrick Road
    - Northbound shared through and right turn – LOS would deteriorate from E to F during the weekday AM peak hour
    - Westbound left turn – LOS would deteriorate from E to F during the weekday PM peak hour
    - Northbound shared through and right turn – LOS would deteriorate from D to E during the weekday PM peak hour
    - Southbound shared through and right turn – LOS would deteriorate from E to F during the weekday PM and Saturday midday peak hours

- Grand Avenue at Milburn Avenue
    - Northbound shared through and right turn – Delay would increase, but LOS E would remain unchanged during the weekday PM peak hour, while LOS would deteriorate from D to E during the Saturday midday peak hour

- Grand Avenue at Stowe Avenue
    - Northbound left turn – LOS would deteriorate from E to F during the weekday PM peak hour
    - Eastbound movements – LOS would deteriorate from D to E during Saturday midday peak hour

7. Identify Needs and Opportunities

The information gathered and analyses performed in the aforementioned tasks were utilized to identify needs and opportunities to develop complete streets and traffic calming measures along the corridor. As discussed above, this includes field observations and inventories, traffic data, future projections, existing and future conditions analyses, as well as information obtained through public information and outreach and meeting with key stakeholders.

The comments and input obtained through the first public information and outreach meeting was one of the main considerations in assessing and identifying the needs, concerns and recommendations. Among the numerous comments received during the public outreach, which are categorized and summarized in the attached Table 5, the top three most frequently made comments pertinent to this study were:

1. Install Bike Lanes
2. Install Left Turn Lanes/Signals at Seaman Avenue intersections
3. Consider Road Diet along Grand Avenue (reducing 4 lanes to 2 lanes)

The public comments were given due consideration and were evaluated and addressed accordingly in developing and identifying improvements discussed in the following section. Vehicular circulation and safety, particularly speeding along the corridor, pedestrian circulation and safety, provision of enhanced facilities for bus riders, green infrastructure and beautification were the pertinent public comments and concerns, among others, which were considered in this assessment.

Several public comments indicated to extend the study corridor limit to the north to the Southern State Parkway. Although extending the study corridor limits was beyond the scope of this study, NCDPW has undertaken the study of the extended area under a separate project.

Concerns about speeding along the corridor was also noted during the key stakeholder meetings. Although not unusual for this type of roadway, the data collected and analyzed above also indicated that the operating speeds were higher than the posted speed limits along the study corridor. Bicyclists were also observed to be riding on the sidewalks, rather than on the roadway. These aspects prompted the need to consider traffic calming and complete streets measures for a safer environment for vehicles and for more vulnerable non-motorized users including pedestrians and bicyclists along Grand Avenue.

As noted above, sidewalks exist on both sides of Grand Avenue. However, the sidewalk widths are narrow or restricted by elements such as trees or utility poles at certain locations. Considering the right of way constraints, feasible measures such as bulb-out and curb extensions were considered, particularly at the key intersections, in identifying the improvements to increase the sidewalk areas for enhanced pedestrian operation and safety as further discussed in the following section.

Although there are marked crosswalks and countdown pedestrian signals at certain signalized intersections, the existing crosswalks are long at certain location including Merrick Road, Sunrise Highway, and Milburn Avenue, indicating the need and opportunity for improvements. Consideration was given and feasible improvement measures were developed and recommended in the following section to reduce crossing distance and pedestrian exposure and to improve visibility of crosswalks, enhancing safety and operation, throughout the study corridor.

As discussed above, the Grand Avenue study corridor is served with a good network of mass transit. LIRR Baldwin Station is located in the northeast corner of Sunrise Highway and Grand Avenue. Long Island Bus operates the n35 route along Grand Avenue, serving Hempstead and Baldwin Harbor. The n4 bus route along Merrick Road serves Freeport, Rockville Centre and the Valley Stream area. The n35 and n4 bus routes connect to the Long Island LIRR Stations at Baldwin, Rockville Centre and Freeport. While the LIRR Station is relatively busy, bus riders were observed along Grand Avenue, indicating the demand.

The availability of the network provides an opportunity to consider improvements to enhance transit facilities for the current users as well as to attract new users and increase ridership, particularly for the underutilized bus service along Grand Avenue. As such, the goal of this complete streets study is also to consider measures enhancing the public transportation along the corridor.

As discussed in detail above, most of the bus stops along Grand Avenue do not provide adequate waiting areas for riders. For example, at the Stanton Avenue intersection bus stop, riders were observed to be waiting in the narrow sidewalk, impeding the pedestrian flow. Similarly, there is no adequate waiting area on the west side of Grand Avenue by the Baldwin High School Driveway, where a significant number of riders, particularly students at the school dismissal, were observed standing and waiting for the bus, occupying in the narrow sidewalk. Such locations along the corridor indicate the need and opportunity for improvements. Realizing the right of way constraints, considerations were made and feasible improvements were developed and recommended in the following section.

Significant activity of bus riders was also observed at the Merrick Road intersection, which is mainly related to the transfer between the eastbound and northbound bus service along Merrick Road and Grand Avenue, respectively. Although certain amenities exist at the bus stops, the demand indicates the need and opportunity for improvement at this location. As such, feasible improvements were developed and recommended to enhance the facilities for the riders as well as for pedestrian circulation. Crosswalks at the Merrick Road intersections were also thoroughly reviewed, and improvements were developed and recommended to enhance pedestrian operation and safety.

The land use along the study corridor is mixed, and the combination of uses varies along the corridor. It includes retail, commercial, big-box stores, residential, institutional, municipal parking fields, and places of worship. Baldwin Public Library, Fire Department and High School are also located in the study area. These facilities generate varying levels of pedestrian, auto, bus and truck trips throughout the corridor, and were considered in developing feasible improvement measures in this study.

There are some vacant properties along the corridor which offer opportunity for smart growth and sustainable development as discussed above. These developments, along with the background traffic growth, were considered in projecting the future 2024 conditions, which were utilized to establish the anticipated traffic operating conditions and needs along the corridor.

Grand Avenue, with two travel lanes and additional turning lanes at certain intersections, is a main north-south arterial in Baldwin. Posted speed limit along Grand Avenue is 30 miles per hour, with on-street parking on both sides, except for certain areas. Grand Avenue northbound is a designated hurricane evacuation route, north of Sunrise Highway. These feature were considered in developing roadway modifications and improvement plans.

8. Develop and Recommend Improvement Measures

The above discussions indicate that there are needs and opportunities to implement complete streets and traffic calming measures, enhancing traffic operations and safety along the corridor for all users. If nothing is done, the existing roadway features will remain the same, while the traffic conditions will significantly deteriorate with the anticipated increase in future demands. This scenario is depicted in the No-Build conditions analyzed and presented above. The analysis results indicate that doing nothing is not a feasible option. It will defeat the purpose of this traffic study, and will result in a lost opportunity to enhance the conditions along the corridor.

The objective of the study is to identify complete streets and traffic calming measures that will provide a safer pedestrian environment, improve circulation and serve as a catalyst for economic development and revitalization in downtown Baldwin. The mix of land uses along Grand Avenue, with existing commercial developments and proximity to the LIRR Baldwin Station provide the fabric for a vibrant central business district. However, the success of a commercial corridor fundamentally depends upon safe and efficient access for pedestrians, which should be considered accordingly.

Traffic calming is an important element to consider in planning for a revitalized and walkable central business district or downtown. It is part of a new movement of transportation engineering that is more multimodal in focus (pedestrians, bikes, buses), and less auto-centric than previous trends. Commonly used traffic calming tools and techniques include speed bumps and humps, traffic signals, signs, crosswalk narrowing to reduce walking distance, medians, islands, landscaping, bike lanes, removing a lane of auto traffic, and reconfiguration or narrowing of streets.

As such, traffic calming entails implementation of mainly physical measures that reduce auto speed and create safer streets for pedestrians, bicyclists, transit riders, and other road users. This also enhances accessibility. Enhancing safety and accessibility for all users is essential to promote and sustain economic vitality in the downtown area. As indicated above, availability of transit service along Grand Avenue also provides an opportunity to enhance this complete streets element.

Provision of enhanced facilities for all modes and users including pedestrian, bicyclists and transit riders will pave the way for sustainable developments along Grand Avenue. It will be prudent to consider sustainable developments along Grand Avenue and vicinity that would result in minimizing vehicular trip generation. This will help to alleviate the already saturated conditions along the corridor, particularly at the key intersections of Sunrise Highway and Merrick, which currently operate at or near capacity and will further deteriorate in the future No-Build conditions. Provision of enhanced facilities for pedestrians, bicyclists, and bus riders will support these goals.

Due to the built-up nature of the study corridor, property taking or expanding the roadway section to provide new or enhanced elements such as bike lanes, wider sidewalks, parking lanes or bus stops is not feasible. Therefore, options that maximize the use of the existing right of way by reallocating the space and balancing it among the users were considered in this study.

Based on the aforementioned factors and constraints, the following traffic calming and complete street measures were considered to address the needs and objectives identified in this study.

- Sidewalks
- Crosswalks
- Pavement striping and signage
- Pedestrian signals
- Signal retiming
- Curb extensions / bump-outs
- Bus stop improvements
- Medians / islands / pedestrian refuge areas
- Green space / infrastructure
- Turn lanes
- Additional signals and traffic controls
- Road diet – reduction in lanes
- Bicycle lanes / wider shared parking lanes

These measures were evaluated and recommended, where feasible, along the corridor. Based on the recommended measures, schematic plans and renderings were developed, which are presented at the end of this report.

The recommended traffic calming measures are expected to curb speeds, particularly of the vehicles operating above the posted limit along the study corridor, which is an identified concern. Overall, the recommended measures will enhance safety and accessibility for all users including pedestrians, bicyclists, transit riders and automobiles, providing them with enhanced facilities. As discussed above, pedestrian safety and accessibility is essential for a walkable environment and promoting sustainable growth and vitality in a downtown, which serves as a catalyst for economic development and revitalization.

The traffic calming and complete streets measures considered and recommended are discussed below.

Sidewalks – Sidewalks are essential elements of complete streets, and their continuity and adequacy is important for safe and efficient pedestrian movement. As noted above, sidewalks exist on both sides of Grand Avenue, although the widths are narrow or restricted by elements such as trees or utility poles at certain locations. Intermittent streetscape treatments, including decorative pavers, lighting, trash receptacles and benches exist on the sidewalks. NCDPW is also planning to implement a streetscape project along Grand Avenue in the vicinity of the Seaman Avenue intersections during the summer of 2016. Due to the right of way constraints, widening of sidewalks is not feasible. Improvements including bulb-outs and curb extensions were developed and recommended in this study to increase the sidewalk areas, particularly at the key intersections, enhancing pedestrian operation and safety. It is also recommended to reevaluate and enhance the sidewalks as well as incorporate streetscape treatments, where feasible, in the design phase of this project.

Crosswalks – Along with adequate sidewalks, safe and efficient crossings are essential to enhance pedestrian circulation and walkability. Although, there are marked crosswalks and countdown pedestrian signals at certain signalized intersections, existing crosswalks are long at certain location including Merrick Road, Sunrise Highway, and Milburn Avenue. Feasible improvement measures were developed and recommended to reduce walking distance and pedestrian exposure in the crosswalks, enhancing operation and safety, throughout the study corridor. The recommended measures include curb extensions, bump-outs and high visibility crosswalks as depicted in the schematic plans.

Safe and frequent crosswalks support walkable environment. Marked crosswalks are currently provided at signalized intersections. However, there is a considerable distance between them at certain locations. For example, there is no intermediate crossing between Prospect Avenue and Sunrise Highway, and pedestrians have to walk a long distance to cross at the designated locations. To avoid extra walking, pedestrians generally cross at undesignated locations. Also, since there are no traffic controls on Grand Avenue, between Prospect Street and Sunrise Highway, vehicles tend to speed up in this section. To enhance pedestrian safety and convenience, an additional crosswalk is recommended at the unsignalized intersection at Edna Court or in its vicinity. As shown in the conceptual plans, curb extensions to shorten the crossing distance and high visibility crosswalk markings, with appropriate signs and flashing beacons, are recommended to enhance safety and operation. The recommended road diet, discussed below, will also enhance the safety and operation in this roadway section as pedestrians will cross three lanes of automobile traffic, rather than four under the existing conditions. The recommended curb extensions will provide additional sidewalk space for pedestrian circulation, and can also be utilized for street furniture, green infrastructure and streetscape enhancements. Overall, the recommended features are expected to significantly change the roadway environment, resulting in traffic calming and enhancing pedestrian safety and circulation. It is recommended to finalize the location and features of this crosswalks, and also evaluate and provide similar unsignalized crossings along Grand Avenue in the design phase of this project.

Additional crosswalks are recommended at Mc Kenna Place. While most of the measures recommended are similar to those describe above for Edna Court, a traffic signal is recommended at this location. These features will significantly enhance safety and operation, particularly for pedestrian generated by area facilities as well as bus riders using the bus stops on both sides of Grand Avenue at this location.

As shown in the attached schematic plans, the recommendations at the Grand Avenue and Milburn Avenue intersections would significantly enhance the crosswalks at this location by reducing crossing distance and pedestrian exposure. The recommendations would also create green space, enhancing pedestrian circulation and walkability.

Pavement striping and signage – Proper lane markings and signage are important in traffic safety and operation. These features are also utilized in traffic calming. Pavement striping commonly used in traffic calming includes centerline stripes, edge line stripes, lane line stripes, crosswalks, stop bars at stop signs and traffic signals, words and symbols. While traffic calming and complete streets measures are depicted in conceptual plans, appropriate roadway markings, lane striping and signage will be developed in the design phase of this project.

Pedestrian signals – As noted above, existing marked crosswalks are located at signalized intersections. There are pedestrian signals, some with countdown heads, at certain locations along the corridor. It is recommended to consider updated equipment during the design phase. A new traffic signal and high visibility crosswalks are recommended for Mc Kenna Place. Pedestrian signals are also recommended at this location. As indicated in the schematic plans, further study is recommended for a potential traffic signal at the intersection of Brooklyn Avenue to be synchronized with the signal at Sunrise Highway. If warranted, pedestrians signals are recommended to enhance safety and operation of users, particularly LIRR commuters. Similarly, further study is recommended for a traffic signal requested by the community at the (former) Pathmark driveway. If warranted, high visibility crosswalk, with pedestrian signals, are recommended at this location.

Signal retiming – Signal retiming and optimization is an important consideration for the efficient and safe flow of traffic for both vehicles and pedestrians along the corridor. Several recommended measures, particularly those resulting in reduced pedestrian crossing distance, provide opportunities to retime traffic signals to enhance flows. As such, proper management of capacities with optimal signal timings will be the key for the success of recommendations, particularly in road diet sections, as well as at the Merrick Road, Milburn Avenue, Mc Kenna Place, and Seaman Avenue intersections, where roadway modifications are recommended. Also, certain intersections would require signal retiming in the future due to the growth in traffic demands. Accordingly, signal retiming and optimization was performed in the future 2024 Build conditions analysis to assess the impact of recommended measures. A comparison of the results with the No-Build conditions indicates that the signal retiming and optimization will significant help in improving the traffic operating conditions. It is recommended to further optimize the signal timings for optimal results once the recommended measures are finalized in the design phase.

Curb extensions / bump-outs – Curb extensions and bump-outs are commonly used traffic calming measures generally recommended for arterials such as Grand Avenue, where the speed limits is 35 mph or less and vertical measures such as speed bumps or humps are not feasible due to higher vehicular speeds. There are several operational and safety benefits of these measures, including:

- Curb extensions and bump-outs visually and physically narrow the roadway, which tend to decrease vehicular speed.
- These treatments reduce curb to curb distance, shortening crossing distance and pedestrian exposure in crosswalks, enhancing safety and operation.
- They clearly delineate areas of pedestrian activity and crosswalk locations.
- Curb extensions or bump-outs restrict parking at street corners, clearing the line of sight.
- Curb extensions and bulb-outs increase the overall visibility of pedestrians by aligning them with the parking lane, enhancing safety and operation.
- They increase the available sidewalk space for pedestrian circulation and waiting to cross the street. The additional sidewalk space can also be utilized to accommodate or enhance other elements such as street furniture, benches, plantings, transit service and bus stops.

Curb extensions and bump-outs were considered and recommended at several locations along the corridor as shown in the attached conceptual plans. Considering that curb extensions and bulb-outs can reduce on-street parking, to minimize impacts, these measures are recommended at the intersection corners and at bus stops, where on-street parking is generally prohibited. It is recommended to further evaluate the identified measures and provide at additional locations, where feasible, in the design phase of this project.

Curb extensions, as a traffic calming measure, are generally recommended with tighter curb radii at intersection corners, which encourages turning vehicles to slow down, enhancing pedestrian safety. It should be noted that the turning radii and geometric features of curb extensions and other recommended measures shown in the attached schematic plans are merely conceptual. Various types of vehicles including fire and delivery trucks and buses use Grand Avenue, and maintaining their satisfactory operation is important. It is recommended that, considering an appropriated design vehicles, adequate turning radii and geometric features should be provided after evaluation in the design phase.

Also, the recommended curb extensions and bump-outs may impact drainage at certain location, which should also be reviewed and addressed in the design phase.

Bus stop improvements – As discussed above, availability of the bus service along Grand Avenue and the transit network provides an opportunity to consider improvements to enhance facilities for the current users as well as to attract new users and increase ridership. This may result in reducing vehicular traffic along the corridor.

Although there are bus stops along both sides of Grand Avenue, most of the bus stops do not provide adequate waiting areas for riders. Considering the right of way limitations, enhancements to the bus stops, along with curb extensions, are recommended throughout the corridor as shown in the attached conceptual plans. This includes bus stops at the intersections of Merrick Road, Mc Kenna Place, Lorenz Avenue, Miller Place/Baldwin Avenue, Baldwin High School Driveway, and Stanton Avenue. Similar improvements can be included at other locations, if feasible, during the next phase(s) of this study.

The recommended curb extensions at bus stops, also known as bus bulbs, align the bus stop with the parking lane. This allows buses to stop and board passengers without ever leaving the travel lane. This also helps buses move faster and more reliably by decreasing the amount of time lost when merging in and out of traffic, which may improve bus travel times. The curb extensions also help to prevent motorists from parking in the bus stop, which can also be inconvenient for passengers.

The curb extensions will increase the sidewalk space, which will help to improve the bus stops. It is recommended to enhance the bus stops with amenities such as transit shelters, seating, wayfinding maps, plantings, and trees where possible. Shelters make transit more attractive and change the appearance of the area. As such, proper amenities enhance the overall transit user experience.

Medians / islands / pedestrian refuge areas – Properly designed medians, islands and pedestrian refuge areas result in traffic calming and help in changing the roadway characteristics, enhancing safety and walkability. The right of way constraints and the use of the corridor by fire trucks and emergency vehicles limit the provision of these measures along Grand Avenue. As shown in the attached schematic plans, the recommended measures, particularly at the Grand Avenue intersections with Merrick Road and Milburn Avenue, would significantly enhance the available pedestrian space and related operation and safety.

The recommended removal of the southbound left turn lane at the Milburn Avenue intersection provides an opportunity to construct a green median island on Grand Avenue, which is not expected to adversely impact the movement of fire trucks and emergency vehicles. This green median, along with the other measures recommended at the Milburn Avenue intersection, would significantly alter and enhance the roadway characteristics and environment.

Alternatively, the removal of the left turn lane at Milburn Avenue would provide an opportunity to turn the extra asphalt surface into more useful and attractive elements such as widening of sidewalks on one or both sides of Grand Avenue or possibly gaining some on-street parking in the area. These details should be analyzed and evaluated in the design phase to proceed with the most viable option.

It is also recommended to explore, in the design phase, the possibility of providing pedestrian refuge area(s) using the center turn lane in the recommended road diet sections, particularly at “T” intersections

where left turns do not occur. However, careful attention will be required in developing such measures, ensuring safe and unobstructed flows, particularly for fire trucks and emergency vehicles, as they frequently use the center turn lanes to bypass traffic in emergencies.

Overall, the aforementioned measures, along with the road diet, curb extensions and related treatments are expected to result in traffic calming, enhancing pedestrian circulation and walkability, by changing roadway characteristics and environment along Grand Avenue.

Green space / infrastructure – As discussed above and shown in the attached schematic plans, significant parcels of green spaces can be created by the recommended measures at the intersections of Grand Avenue at Milburn Avenue and Merrick Road. The measures to create green spaces at the Milburn Avenue intersection are discussed above. At the Merrick Road intersection, the green spaces would be created by eliminating the eastbound and westbound right turn ramps, extending the curbs and utilizing the existing islands. The recommended measures would enhance the overall layout by turning this large skewed intersection into a more regular shaped compact intersection. Lengths of all crosswalks and pedestrian exposure will substantially reduce. Narrow islands will be eliminated, enabling pedestrians to cross the streets (curb to curb) directly rather than in two steps under the existing conditions. In addition, curb extensions and bulb-outs are recommended at several locations along the corridor. These measures would not only enhance pedestrian circulation and safety, but provide significant green spaces with plantings, trees, street furniture, decorated lights, benches, tables and chairs, and bus stops with shelters, seating and other amenities. The identified green spaces as well curb extensions provide an opportunity to construct green infrastructure along Grand Avenue.

Turn lanes – Provision of adequate turn lanes is important to enhance traffic operation and safety. Additional turn lanes were considered and recommended as follows.

The information gathered through field observations and public outreach as well as capacity analyses conducted for this study indicated the need for left turn lanes on Grand Avenue at the intersections of Seaman Avenue and St Lukes Place. To address the issues, as shown in the attached schematic plans, additional left turn lanes are recommended at East Seaman Avenue and St. Lukes Place in the northbound direction and at East Seaman Avenue in the southbound direction. The additional left turn lanes will result in the removal of approximately 17 on-street parking spaces along the west side of Grand Avenue. Capacity analyses conducted for future 2024 Build conditions, discussed below, indicate that the recommended left turn lanes will substantially improve the operating conditions at the intersections.

The information gathered indicated that the southbound left turn lanes on Grand Avenue at Milburn Avenue is inadequate. As the left turn lane is short, the queuing vehicles often spill back in the adjacent through lane, raising operational and safety concerns. Considering the right of way constraints and adverse impacts of increasing the length of the turning lane, particularly on the on-street parking, it is recommended to eliminate the left turn lane at this location and provide an exclusive left turn lane at the adjacent intersection of Grand Avenue at Mc Kenna Place. This relocation would result in some additional traffic on Mc Kenna Place. The left turn from Grand Avenue to Mc Kenna Place is currently permitted. Mc Kenna Place, with parking on both sides, is a short two-way connector between Grand Avenue and Milburn Avenue. To address the issues about its width and alignment, it is recommended to review the geometric conditions and develop adequate mitigation, if needed, in the design phase.

As discussed above, it is recommended to eliminate the existing eastbound and westbound right turn lanes or ramps at the Merrick Road intersection. This will provide additional pedestrian and green space, enhancing traffic operation and safety. As depicted in the attached schematic plans, an additional eastbound right turn lane is also recommended at the intersection. Future 2024 Build conditions analyses, discussed below, were conducted to present the effectiveness of the recommended measures.

Public outreach indicated the need for left turn lanes on Grand Avenue at Stanton Avenue. However, due to the right way constraints, such a provision would adversely impact on the on-street parking to the north of this intersection. It is recommended to further evaluate the feasibility of the installation of the left turn lanes in the next phase of the Grand Avenue study.

The road diet would provide a center two-way left turn lane in the recommended section. This will facilitate left turns into side streets and driveways along Grand Avenue, enhancing safety and operation.

Additional signals and traffic controls – As discussed above and shown in the attached schematic plans, a southbound left turn lane is recommended on Grand Avenue at Mc Kenna Place. Installation of a traffic signal is recommended at this intersection to enhance safety and operation. Public outreach indicated that motorists cut through Mc Kenna Place to avoid the traffic signal at Milburn Avenue. It also indicated that the cars parked in close proximity to the intersection restrict sight distance for vehicles turning from Mc Kenna Place onto Grand Avenue, and a traffic signal was recommended to address these issues. As also discussed above, a traffic signal would facilitate the new crosswalks recommended at this intersection. However, it is recommended to conduct warrant analyses in the design phase to further evaluate the feasibility and justification of the traffic signal.

As indicated in the attached schematic plans, further study is recommended for a potential traffic signal at the intersection of Brooklyn Avenue to be synchronized with the existing traffic signal at Sunrise Highway. Such a traffic signal, if warranted, would enhance safety and operating conditions for vehicles and pedestrians at this intersections in close proximity to the LIRR station.

Further study is also recommended for a traffic signal requested by the community at the (former) Pathmark driveway. If warranted, pedestrian signals and high visibility crosswalks would enhance traffic safety and operation at this location.

As noted above, public outreach indicated the need for left turn lanes on Grand Avenue at Stanton Avenue, with left turn signals. It is recommended to evaluate the feasibility of the left turn signals, along with the installation of the left turn lanes in the next phase of the Grand Avenue study.

Road diet – reduction in lanes – Road diet is generally described as removing a travel lane(s) from a roadway and utilizing the space for other uses and travel modes. As defined in the Road Diet Information Guide published by the Federal Highway Administration (FHWA-SA-14-028), a classic road diet converts an existing four lane undivided roadway segment to a three lane segment consisting of two through lanes and a center two-way left turn lane. This is the configuration considered in this study. As described in the FHWA reference, a road diet improves safety by including a protected left turn lane for mid-block left turning vehicles. This reduces crossing distance for pedestrians, while decreasing vehicle speeds. The reduction in vehicular speeds results in decreasing the severity of crashes. In addition, the road diet provides an opportunity to allocate the excess roadway width to other purposes such as bicycles lanes,

pedestrian refuge islands or on-street parking. As noted above, the field observations and public outreach indicates the need to enhance these elements.

The referenced FHWA guide has identified road diets as a proven safety countermeasure. As stated in this reference, the safety and operational benefits of a road diet may include:

- Overall crash reduction (ranging from 19 to 47 percent).
- Reduction in rear-end and left-turn crashes with the provision of a dedicated left-turn lane.
- Fewer lanes for pedestrians to cross.
- Opportunity to install pedestrian refuge islands.
- Opportunity to install bicycle lanes with the reallocated roadway cross-section width.
- Reduction in right-angle crashes as side street motorists cross three lanes instead of four.
- Traffic calming and reduced speed differential can decrease the number of crashes and reduce the severity of crashes if they occur.
- Opportunity to reallocate the roadway width for other purposes such as on-street parking.
- Encouraging a more community-focused, "Complete Streets" environment.
- Simplifying road scanning and gap selection for motorists, especially older and younger drivers, making left turns from or onto the mainline.

In addition to the aforementioned direct benefits, a road diet can improve the comfort level for all users through the combination of bicycle lanes, pedestrian improvements, and reduced speed. This can result in improving walkability, livability and quality of life along the corridor.

Based on the aforementioned benefits of road diet, this measure was considered for the Grand Avenue corridor. To evaluate its feasibility, the traffic data and related demands along the corridor were reviewed in accordance to the guidelines provided in the FHWA reference.

As indicated in the FHWA reference, average daily traffic is the primary measure for the consideration of road diet. FHWA indicates that roadways with average daily traffic up to 20,000 vehicles per day may be good candidates for road diets. However, the reference states that the maximum threshold for road diet implementation considered by agencies is 25,000 vehicles per day. It further states that road diet projects have been completed on roadways with relatively high traffic volumes in urban areas or near larger cities with satisfactory results.

As discussed above, ATR machine counts were collected continuously at six key locations along the study corridor. A review of the data summarized and tabulated above indicates that the traffic volumes increase from south to north along the corridor, and the average daily traffic increases above the aforementioned threshold north of Milburn Avenue. Therefore, road diet was considered for Grand Avenue south of Milburn Avenue. Considering the higher average daily traffic volumes, further parameters including peak hour volumes and results of capacity analysis conducted at the key intersections were reviewed, following the guidelines.

A review of the capacity analysis results indicated that the reduction of lanes on Grand Avenue at the intersections of Sunrise Highway and Merrick would not be feasible. Thus, road diet was recommended in two shorter segments, north and south of Sunrise Highway, as shown in the attached schematic plans.

It should be noted that the attached plans are conceptual, and the limits of the road diet sections and their transition will be finalized in the design phase.

Future 2024 Build conditions analyses, discussed below, were conducted to determine the operating conditions with the recommended measures including road diet. The analyses indicated that signal retiming will be required, as discussed above. The future 2024 Build conditions analysis results indicate that the two signalized intersections in the road diet segments along Grand Avenue at Prospect Street and Baldwin Avenue/Miller Place will operate at an overall LOS D or better during all peak hours analyzed.

Bicycle lanes / wider shared parking lanes – The road diet will provide an opportunity to install bicycle lanes in the recommended segments of Grand Avenue. Alternatively, as shown in the attached schematic plans, the space gained by the road diet could be used to provide wider shared bicycle and parking lanes.

9. Future 2024 Build Conditions Analysis

The analysis of future 2024 Build conditions was performed to evaluate the expected traffic conditions with the implementation of the improvement measures recommended in this study. This scenario utilized the traffic volumes projected for 2024 as discussed above. Signal retiming and optimization was also considered in this analysis. The aforementioned 12 key signalized intersections along the corridor were reanalyzed for capacity and level-of-service using Synchro models. This included analysis of traffic conditions during weekday AM, midday and PM, and Saturday midday peak hours. The analysis results are summarized in the attached Tables 1 through 4, while detailed worksheets are presented in Appendix C of this report.

The analysis results, summarized in Tables 1 through 4, indicate that the operating conditions under the future 2024 Build conditions will generally improve as compared to the future 2024 No-Build conditions. Under the future 2024 Build conditions, the overall LOS at all intersections analyzed will be D or better during all peak hours, except for the intersections at Sunrise Highway and High School Driveway. The LOS E or F at the Sunrise Highway intersection will remain the same as No-Build conditions during all peak hours. At the High School Driveway intersection, although the delay will substantially reduce with signal retiming in the future 2024 Build conditions, the LOS F will remain the same during the weekday AM peak hour. The LOS will be C or better during all other peak hours at this intersection.

Recommended Next Steps

This Study provides recommended complete streets improvements based on the described analysis and public outreach. While the recommendations are supported by the findings of the analysis, additional traffic modeling and preparation of detailed design plans are required to ultimately determine the specific complete streets measures to be constructed. As such, the following technical phases should be undertaken:

- Additional traffic modeling/analysis of roadway segments in the recommended road-diet portions of the study area.

- Further traffic analysis at the intersections to evaluate and finalize the limits of the recommended road-diet sections.
- Selection of dedicated bicycle lane or shared parking/bicycle lanes within road-diet sections.
- Preliminary Design.
- Final Design.

Attachments

Table 1 – Capacity and Level of Service (LOS) Summary - Weekday AM Peak Hour
Table 2 – Capacity and Level of Service (LOS) Summary - Weekday Midday Hour
Table 3 – Capacity and Level of Service (LOS) Summary - Weekday PM Peak Hour
Table 4 – Capacity and Level of Service (LOS) Summary - Saturday Midday Peak Hour
Table 5 – Public Outreach Comments Summary
Schematic Plans and Renderings

GRAND AVENUE COMPLETE STREETS TRAFFIC STUDY

CAPACITY ANALYSIS AND LEVEL OF SERVICE (LOS) SUMMARY

WEEKDAY AM PEAK HOUR

TABLE 1

Intersection		Approach	Existing/ No-Build Lane Group	Build Lane Group	Storage Length (ft)	EXISTING 2014 CONDITIONS							FUTURE 2024 NO-BUILD CONDITIONS							FUTURE 2024 BUILD CONDITIONS						
						Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)	Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)	Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)
1	Grand Avenue at Merrick Road	EB	L	L	200	60	0.28	17.9	B	25.8	C	45	64	0.30	18.1	B	25.9	C	47	64	0.38	23.3	C	29.4	C	52
			T	T		398	0.57	34.0	C			168	431	0.60	34.2	C			183	431	0.63	36.2	D			191
			R	R	100	108	0.09	0.1	A			0	119	0.10	0.2	A			0	119	0.31	8.3	A			43
		WB	L	L	100	158	0.69	29.8	C	29.4	C	102	169	0.76	34.2	C	30.6	C	109	169	0.85	50.0	D	49.3	D	126
			T	TR		639	0.68	33.2	C			268	688	0.72	33.8	C			295	771	0.91	49.0	D			434
			R		40	72	0.07	0.1	A			0	83	0.08	0.1	A			0							
		NB	L	L	150	166	0.56	24.6	C	49.8	D	126	186	0.67	30.4	C	74.1	E	145	186	0.66	28.6	C	48.3	D	127
			TR	TR		710	0.95	55.6	E			442	761	1.07	84.7	F			491	761	0.96	53.0	D			419
		SB	L	L	150	46	0.31	20.8	C	39.7	D	38	54	0.40	23.4	C	47.9	D	44	54	0.37	19.7	B	32.5	C	40
			TR	TR		459	0.77	42.2	D			262	497	0.88	51.3	D			295	497	0.72	34.3	C			220
		Overall Intersection								**36.8**	**D**						**46.2**	**D**						**41.9**	**D**	
2	Grand Avenue at Prospect Street	EB	LTR	LTR		54	0.21	16.9	B	16.9	B	35	67	0.29	18.3	B	18.3	B	42	67	0.45	33.1	C	33.1	C	61
		WB	LTR	LTR		26	0.11	1.4	A	1.4	A	0	28	0.12	1.8	A	1.8	A	0	28	0.17	4.2	A	4.2	A	0
		NB	LTR	L		684	0.56	10.1	B	10.1	B	109	728	0.57	10.1	B	10.1	B	118	3	0.02	4.3	A	25.3	C	2
				TR																725	0.89	25.6	C			549
		SB	LTR	L		561	0.62	11.7	B	11.7	B	110	613	0.66	12.3	B	12.3	B	127	39	0.20	6.5	A	18.0	B	16
				TR																574	0.81	19.0	B			456
		Overall Intersection								**10.9**	**B**						**11.3**	**B**						**21.9**	**C**	
3	Grand Avenue at Sunrise Highway	EB	L	L	300	117	0.74	84.9	F	61.6	E	188	124	0.75	85.7	F	83.1	F	198	124	0.75	85.7	F	83.1	F	198
			TR	TR		1468	0.96	59.7	E			649	1559	1.05	82.8	F			719	1559	1.05	82.8	F			719
		WB	L	L	400	161	0.92	103.0	F	89.2	F	282	176	0.97	113.1	F	123.2	F	321	176	0.97	113.1	F	123.2	F	321
			TR	TR		1740	1.08	87.6	F			840	1847	1.17	124.4	F			918	1847	1.17	124.4	F			918
		NB	L	L	150	98	1.01	156.4	F	87.9	F	230	104	1.08	172.0	F	98.3	F	245	104	1.08	172.0	F	98.6	F	245
			TR	TR		582	0.94	76.3	E			413	630	0.99	86.0	F			468	630	0.99	86.4	F			468
		SB	L	L	150	77	0.94	142.3	F	78.0	E	192	82	0.99	155.6	F	84.1	F	204	82	0.99	155.6	F	84.1	F	204
			TR	TR		519	0.87	67.7	E			355	563	0.92	73.0	E			405	563	0.92	73.0	E			405
		Overall Intersection								**78.3**	**E**						**101.2**	**F**						**101.2**	**F**	
4	Grand Avenue at Baldwin Avenue/ Miller Place	EB	LTR	LTR		58	0.48	31.1	C	31.1	C	39	62	0.50	31.0	C	31.0	C	40	62	0.51	35.0	C	35.0	C	44
		WB	LTR	LTR		17	0.26	28.8	C	28.8	C	12	17	0.26	28.8	C	28.8	C	12	17	0.40	45.9	D	45.9	D	16
		NB	LTR	L		663	0.44	12.4	B	12.4	B	225	714	0.48	13.5	B	13.5	B	279	14	0.10	9.3	A	19.1	B	13
				TR																700	0.75	19.4	B			645
		SB	LTR	L		763	0.54	21.4	C	21.4	C	315	823	0.59	22.9	C	22.9	C	361	12	0.05	7.1	A	31.1	C	4
				TR																811	0.96	31.5	C			878
		Overall Intersection								**18.3**	**B**						**19.5**	**B**						**26.6**	**C**	
5	Grand Avenue at Milburn Avenue	WB	T	T		267	0.45	13.9	B	13.9	B	121	283	0.48	14.2	B	14.2	B	127	283	0.81	48.6	D	48.6	D	288
		NB	TR	TR		719	0.90	39.4	D	39.4	D	316	773	0.98	51.8	D	51.8	D	353	773	0.49	11.0	B	11.0	B	84
		SB	L		80	165	0.49	14.2	B	10.5	B	100	175	0.53	14.7	B	10.8	B	107					6.9	A	
			T	T		740	0.54	9.6	A			47	798	0.58	9.8	A			48	973	0.63	6.9	A			49
		Overall Intersection								**22.1**	**C**		**Overall Intersection**				**27.1**	**C**						**14.5**	**B**	
6	Grand Avenue at Lorenz Avenue	WB	LR	LR		21	0.18	31.3	C	31.3	C	28	23	0.19	31.7	C	31.7	C	30	23	0.23	38.3	D	38.3	D	35
		NB	TR	TR		984	0.55	4.8	A	4.8	A	84	1054	0.59	5.5	A	5.5	A	86	1054	0.57	4.5	A	4.5	A	142
		SB	LT	LT		986	0.52	4.0	A	4.0	A	75	1058	0.56	3.8	A	3.8	A	88	1058	0.55	1.7	A	1.7	A	33
		Overall Intersection								**4.8**	**A**						**5.1**	**A**						**3.6**	**A**	
7	Grand Avenue at West Seaman Avenue	EB	LR	LR		186	0.70	39.5	D	39.5	D	140	198	0.71	39.4	D	39.4	D	147	198	0.73	45.1	D	45.1	D	165
		NB	LT	L		951	0.83	23.2	C	23.2	C	393	1020	0.95	35.4	D	35.4	D	460	50	0.46	15.4	B	9.4	A	18
				T																970	0.64	9.0	A			112
		SB	TR	TR		1020	0.68	16.1	B	16.1	B	132	1094	0.74	52.2	D	52.2	D	124	1094	0.68	9.4	A	9.4	A	182
		Overall Intersection								**21.5**	**C**						**43.5**	**D**						**12.8**	**B**	
8	Grand Avenue at East Seaman Avenue	WB	LR	LR		327	0.92	91.8	F	91.8	F	236	350	0.95	104.6	F	104.6	F	264	350	1.09	107.2	F	107.2	F	356
		NB	LR	LR		1043	0.92	50.9	D	50.9	D	417	1118	1.00	66.7	E	66.7	E	395	1118	0.91	21.2	C	21.2	C	463
		SB	LT	L		802	0.92	30.3	C	30.3	C	364	860	1.07	78.1	E	78.1	E	413	61	0.59	29.7	C	12.0	B	90
				T																799	0.58	10.5	B			61
		Overall Intersection								**50.9**	**D**						**77.3**	**E**						**33.1**	**C**	
9	Grand Avenue at St. Lukes Place	EB	LR	LR		123	0.60	39.2	D	39.2	D	104	131	0.62	39.7	D	39.7	D	110	131	0.65	46.2	D	46.2	D	125
		NB	LT	L		959	0.69	7.7	A	7.7	A	96	1026	0.75	8.1	A	8.1	A	95	42	0.17	3.9	A	6.2	A	6
				T																984	0.59	6.4	A			90
		SB	TR	TR		814	0.49	3.2	A	3.2	A	40	873	0.52	3.2	A	3.2	A	43	873	0.51	8.8	A	8.8	A	294
		Overall Intersection								**8.2**	**A**						**8.4**	**A**						**10.2**	**B**	
10	Grand Avenue at High School Driveway	EB	LTR	LTR		5	0.02	0.0	A	0.0	A	0	5	0.02	0.0	A	0.0	A	0	5	0.02	0.0	A	0.0	A	0
		WB	LTR	LTR		253	0.88	43.4	D	43.4	D	258	270	0.90	46.3	D	46.3	D	289	270	0.98	69.9	E	69.9	E	362
		NB	L	L	150	4	0.05	29.2	C	189.7	F	m6	4	0.05	29.5	C	272.0	F	5	4	0.04	23.5	C	119.1	F	7
			TR	TR		931	1.35	190.8	F			478	997	1.54	273.5	F			523	997	1.18	119.7	F			501
		SB	L	L	200	146	0.87	59.5	E	25.1	C	132	155	0.90	62.4	E	26.9	C	139	155	1.14	133.9	F	44.3	D	140
			TR	TR		705	0.46	12.3	B			164	755	0.51	13.8	B			165	755	0.47	11.2	B			170
		Overall Intersection								**103.2**	**F**						**142.3**	**F**						**82.1**	**F**	
11	Grand Avenue at Stowe Avenue	EB	LTR	LTR		58	0.46	22.9	C	22.9	C	28	61	0.47	22.6	C	22.6	C	28	61	0.47	22.6	C	22.6	C	28
		WB	LTR	LTR		125	0.53	27.4	C	27.4	C	25	132	0.55	27.5	C	27.5	C	26	132	0.55	27.5	C	27.5	C	26
		NB	L	L	350	78	0.36	17.1	B	17.8	B	30	83	0.41	19.1	B	19.7	B	29	83	0.41	18.9	B	16.4	B	73
			TR	TR		972	0.63	17.8	B			160	1038	0.68	19.8	B			155	1038	0.68	16.2	B			406
		SB	L	L	120	25	0.28	40.3	D	6.4	A	35	27	0.30	38.7	D	7.2	A	35	27	0.30	40.1	D	6.8	A	36
			TR	TR		869	0.43	4.9	A			129	929	0.46	5.9	A			160	929	0.46	5.4	A			142
		Overall Intersection								**14.4**	**B**						**15.7**	**B**						**13.9**	**B**	
12	Grand Avenue at Stanton Avenue	EB	LTR	LTR		91	0.47	18.2	B	18.2	B	17	96	0.46	17.4	B	17.4	B	17	96	0.46	17.4	B	17.4	B	17
		WB	LTR	LTR		120	0.71	38.8	D	38.8	D	74	127	0.73	40.8	D	40.8	D	80	127	0.73	40.8	D	40.8	D	80
		NB	LTR	LTR		1015	0.65	6.9	A	6.9	A	25	1084	0.71	7.4	A	7.4	A	53	1084	0.71	6.9	A	6.9	A	83
		SB	LTR	LTR		814	0.57	9.2	A	9.2	A	207	871	0.63	10.6	B	10.6	B	244	871	0.63	10.6	B	10.6	B	244
		Overall Intersection								**10.6**	**B**						**11.4**	**B**						**11.1**	**B**	
13	Grand Avenue at McKenna Place	WB	LR	LR																105	0.48	26.1	C	26.1	C	77
		NB	TR	TR																717	0.71	7.9	A	7.9	A	191
		SB	L	L																175	0.47	4.5	A	12.1	B	23
			T	T																798	0.76	13.9	B			592
		Overall Intersection																						**11.2**	**B**	

LiRo Engineers, Inc.
A LiRo Group Company

GRAND AVENUE COMPLETE STREETS TRAFFIC STUDY

CAPACITY ANALYSIS AND LEVEL OF SERVICE (LOS) SUMMARY

WEEKDAY MIDDAY PEAK HOUR

TABLE 2

Intersection		Approach	Existing/ No-Build Lane Group	Build Lane Group	Storage Length (ft)	EXISTING 2014 CONDITIONS							FUTURE 2024 NO-BUILD CONDITIONS							FUTURE 2024 BUILD CONDITIONS						
						Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)	Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)	Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)
1	Grand Avenue at Merrick Road	EB	L	L	200	89	0.28	16.3	B	20.8	C	63	94	0.34	18.2	B	23.3	C	64	94	0.39	19.6	B	24.3	C	71
			T	T		384	0.41	28.1	C			168	415	0.51	31.5	C			178	415	0.49	30.8	C			186
			R	R	100	114	0.09	0.1	A			0	125	0.10	0.1	A			0	125	0.26	6.5	A			45
		WB	L	L	100	127	0.37	17.4	B	21.8	C	89	137	0.45	20.1	C	24.5	C	92	137	0.45	20.7	C	29.7	C	102
			T	TR		413	0.42	27.4	C			182	453	0.53	31.2	C			195	553	0.64	32.1	C			247
			R		40	84	0.07	0.1	A			0	100	0.08	0.1	A			0							
		NB	L	L	150	100	0.40	22.8	C	38.0	D	72	121	0.46	23.0	C	37.8	D	88	121	0.49	23.6	C	34.8	C	80
			TR	TR		478	0.80	41.0	D			213	519	0.81	41.0	D			277	519	0.79	37.3	D			210
		SB	L	L	150	79	0.36	21.9	C	41.1	D	60	89	0.39	21.3	C	41.2	D	70	89	0.41	21.3	C	37.1	D	63
			TR	TR		463	0.83	44.5	D			234	502	0.85	44.9	D			282	502	0.82	40.0	D			213
		Overall Intersection								**30.0**	**C**						**31.4**	**C**						**31.4**	**C**	
2	Grand Avenue at Prospect Street	EB	LTR	LTR		24	0.10	15.5	B	15.5	B	16	35	0.16	16.6	B	16.6	B	21	35	0.19	18.6	B	18.6	B	23
		WB	LTR	LTR		46	0.17	8.0	A	8.0	A	0	48	0.19	8.0	A	8.0	A	0	48	0.22	9.1	A	9.1	A	0
		NB	LTR	L		517	0.44	8.8	A	8.8	A	80	551	0.45	8.6	A	8.6	A	86	2	0.03	5.5	A	20.0	C	1
				TR																549	0.81	20.2	C			330
		SB	LTR	L		585	0.63	11.7	B	11.7	B	104	648	0.66	12.1	B	12.1	B	122	58	0.22	7.6	A	31.4	C	24
				TR																590	0.93	33.8	C			378
		Overall Intersection								**10.4**	**B**						**10.7**	**B**						**25.1**	**C**	
3	Grand Avenue at Sunrise Highway	EB	L	L	300	177	0.90	93.2	F	55.0	D	285	188	0.93	99.0	F	71.3	E	311	188	0.93	99.0	F	71.3	E	311
			TR	TR		1155	0.91	49.5	D			475	1230	1.01	67.3	E			528	1230	1.01	67.3	E			528
		WB	L	L	400	147	0.78	78.0	E	45.5	D	221	163	0.83	83.6	F	49.6	D	255	163	0.83	83.6	F	49.6	D	255
			TR	TR		951	0.74	40.4	D			323	1009	0.81	44.0	D			348	1009	0.81	44.0	D			348
		NB	L	L	150	74	0.87	117.2	F	62.5	E	157	79	0.93	130.1	F	65.7	E	169	79	0.93	130.1	F	65.8	E	169
			TR	TR		508	0.79	53.6	D			283	551	0.83	55.4	E			325	551	0.83	55.5	E			325
		SB	L	L	150	114	1.32	241.2	F	96.1	F	251	121	1.40	269.3	F	106.6	F	266	121	1.40	269.3	F	106.9	F	266
			TR	TR		497	0.91	64.5	E			294	545	0.96	72.4	E			349	545	0.97	72.7	E			350
		Overall Intersection								**61.1**	**E**						**70.9**	**E**						**71.0**	**E**	
4	Grand Avenue at Baldwin Avenue/ Miller Place	EB	LTR	LTR		43	0.40	27.2	C	27.2	C	38	45	0.41	27.6	C	27.6	C	40	45	0.37	24.2	C	24.2	C	36
		WB	LTR	LTR		17	0.21	26.7	C	26.7	C	8	17	0.21	26.6	C	26.6	C	8	17	0.25	33.7	C	33.7	C	10
		NB	LTR	L		535	0.36	10.4	B	10.4	B	177	577	0.40	10.9	B	10.9	B	197	13	0.07	8.5	A	14.4	B	11
				TR																564	0.63	14.6	B			504
		SB	LTR	L		647	0.42	19.1	B	19.1	B	228	704	0.46	20.3	C	20.3	C	248	8	0.03	9.6	A	16.5	B	4
				TR																696	0.77	16.6	B			665
		Overall Intersection								**16.0**	**B**						**16.7**	**B**						**16.3**	**B**	
5	Grand Avenue at Milburn Avenue	WB	T	T		221	0.37	12.3	B	12.3	B	95	235	0.39	12.5	B	12.5	B	102	235	0.68	37.1	D	37.1	D	189
		NB	TR	TR		576	0.71	27.4	C	27.4	C	217	620	0.78	30.2	C	30.2	C	247	620	0.39	9.0	A	9.0	A	74
		SB	L		80	180	0.48	15.1	B	10.5	B	123	191	0.52	15.0	B	11.2	B	130					7.0	A	
			T	T		700	0.52	9.2	A			39	760	0.56	10.2	B			42	951	0.64	7.0	A			25
		Overall Intersection								**16.5**	**B**						**17.8**	**B**						**11.5**	**B**	
6	Grand Avenue at Lorenz Avenue	WB	LR	LR		11	0.11	30.1	C	30.1	C	13	11	0.11	30.1	C	30.1	C	13	11	0.11	30.1	C	30.1	C	13
		NB	TR	TR		745	0.35	2.7	A	2.7	A	52	799	0.38	2.9	A	2.9	A	56	799	0.38	3.7	A	3.7	A	144
		SB	LT	LT		887	0.45	3.2	A	3.2	A	79	959	0.48	3.4	A	3.4	A	84	959	0.48	3.6	A	3.6	A	82
		Overall Intersection								**3.3**	**A**						**3.4**	**A**						**3.9**	**A**	
7	Grand Avenue at West Seaman Avenue	EB	LR	LR		160	0.68	40.0	D	40.0	D	136	172	0.70	39.9	D	39.9	D	143	172	0.70	39.9	D	39.9	D	143
		NB	LT	L		664	0.59	11.0	B	11.0	B	18	713	0.66	11.8	B	11.8	B	36	50	0.29	9.1	A	7.2	A	8
				T																663	0.48	7.0	A			33
		SB	TR	TR		923	0.56	8.8	A	8.8	A	74	1011	0.63	8.3	A	8.3	A	78	1011	0.63	6.6	A	6.6	A	80
		Overall Intersection								**12.9**	**B**						**12.9**	**B**						**10.2**	**B**	
8	Grand Avenue at East Seaman Avenue	WB	LR	LR		207	0.72	39.4	D	39.4	D	148	222	0.73	39.1	D	39.1	D	156	222	0.73	39.1	D	39.1	D	156
		NB	LR	LR		834	0.57	8.8	A	8.8	A	75	893	0.62	7.6	A	7.6	A	83	893	0.62	7.2	A	7.2	A	65
		SB	LT	L		908	0.76	13.8	B	13.8	B	348	978	0.87	19.8	B	19.8	B	407	89	0.42	7.4	A	4.6	A	11
				T																889	0.57	4.3	A			39
		Overall Intersection								**14.6**	**B**						**16.8**	**B**						**9.8**	**A**	
9	Grand Avenue at St. Lukes Place	EB	LR	LR		119	0.59	39.0	D	39.0	D	104	127	0.61	39.5	D	39.5	D	111	127	0.61	39.5	D	39.5	D	111
		NB	LT	L		805	0.57	8.1	A	8.1	A	81	862	0.63	7.7	A	7.7	A	82	34	0.19	4.2	A	3.7	A	8
				T																828	0.50	3.6	A			66
		SB	TR	TR		957	0.55	4.9	A	4.9	A	2	1030	0.60	4.4	A	4.4	A	2	1030	0.60	4.8	A	4.8	A	2
		Overall Intersection								**8.8**	**A**						**8.4**	**A**						**6.9**	**A**	
10	Grand Avenue at High School Driveway	EB	LTR	LTR		8	0.05	0.2	A	0.2	A	0	8	0.05	0.2	A	0.3	A	0	8	0.05	0.2	A	0.3	A	0
		WB	LTR	LTR		26	0.14	1.4	A	1.4	A	0	28	0.15	1.9	A	1.9	A	0	28	0.15	1.9	A	1.9	A	0
		NB	L	L	150	6	0.04	21.2	C	17.6	B	9	6	0.04	20.2	C	17.7	B	8	6	0.04	19.3	B	16.4	B	10
			TR	TR		884	0.45	17.5	B			272	945	0.48	17.7	B			296	945	0.48	16.3	B			305
		SB	L	L	200	11	0.16	38.1	D	8.6	A	19	12	0.17	37.8	D	9.2	A	20	12	0.17	37.8	D	9.2	A	20
			TR	TR		987	0.47	8.1	A			211	1061	0.51	8.7	A			217	1061	0.51	8.7	A			217
		Overall Intersection								**12.4**	**B**						**12.8**	**B**						**12.2**	**B**	
11	Grand Avenue at Stowe Avenue	EB	LTR	LTR		195	0.79	38.5	D	38.5	D	57	206	0.81	40.3	D	40.3	D	62	206	0.81	40.3	D	40.3	D	62
		WB	LTR	LTR		80	0.24	17.5	B	17.5	B	20	86	0.25	17.2	B	17.2	B	21	86	0.25	17.2	B	17.2	B	21
		NB	L	L	350	130	0.56	24.4	C	16.9	B	156	138	0.65	31.6	C	19.9	B	175	138	0.65	31.0	C	18.5	B	175
			TR	TR		912	0.66	15.9	B			156	975	0.72	18.3	B			372	975	0.72	16.8	B			372
		SB	L	L	120	26	0.30	46.1	D	9.3	A	37	28	0.31	44.7	D	10.2	B	39	28	0.31	44.7	D	10.2	B	39
			TR	TR		800	0.47	7.5	A			144	864	0.52	8.5	A			163	864	0.52	8.5	A			163
		Overall Intersection								**16.2**	**B**						**18.1**	**B**						**17.4**	**B**	
12	Grand Avenue at Stanton Avenue	EB	LTR	LTR		48	0.35	21.8	C	21.8	C	32	50	0.36	21.9	C	21.9	C	33	50	0.36	21.9	C	21.9	C	33
		WB	LTR	LTR		89	0.49	28.2	C	28.2	C	29	94	0.51	28.6	C	28.6	C	30	94	0.51	28.6	C	28.6	C	30
		NB	LTR	LTR		908	0.48	2.0	A	2.0	A	33	971	0.52	3.0	A	3.0	A	43	971	0.52	3.0	A	3.0	A	43
		SB	LTR	LTR		1017	0.61	8.3	A	8.3	A	265	1094	0.66	9.8	A	9.8	A	314	1094	0.66	9.8	A	9.8	A	314
		Overall Intersection								**6.9**	**A**						**8.1**	**A**						**8.1**	**A**	
13	Grand Avenue at McKenna Place	WB	LR	LR																72	0.33	19.1	B	19.1	B	50
		NB	TR	TR																573	0.57	4.3	A	4.3	A	59
		SB	L	L																191	0.42	2.6	A	10.7	B	15
			T	T																760	0.75	12.9	B			487
		Overall Intersection																						**8.8**	**A**	

GRAND AVENUE COMPLETE STREETS TRAFFIC STUDY

CAPACITY ANALYSIS AND LEVEL OF SERVICE (LOS) SUMMARY

WEEKDAY PM PEAK HOUR

TABLE 3

Intersection		Approach	Existing/ No-Build Lane Group	Build Lane Group	Storage Length (ft)	EXISTING 2014 CONDITIONS							FUTURE 2024 NO-BUILD CONDITIONS							FUTURE 2024 BUILD CONDITIONS						
						Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)	Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)	Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)
1	Grand Avenue at Merrick Road	EB	L	L	200	129	0.43	19.4	B	35.3	D	86	137	0.48	20.3	C	39.2	D	91	137	0.53	21.7	C	39.0	D	89
			T	T		720	0.89	47.5	D			354	769	0.94	53.0	D			394	769	0.91	48.6	D			383
			R	R	100	182	0.15	0.2	A			0	196	0.16	0.2	A			0	196	0.44	14.5	B			101
		WB	L	L	100	216	0.90	57.8	E	35.4	D	240	230	0.99	81.5	F	41.9	D	279	230	0.94	67.9	E	41.5	D	270
			T	TR		506	0.59	32.1	C			218	545	0.63	32.9	C			238	640	0.70	32.3	C			271
			R		40	84	0.07	0.1	A			0	95	0.08	0.1	A			0							
		NB	L	L	150	103	0.48	24.4	C	44.8	D	79	117	0.58	28.4	C	57.6	E	88	117	0.70	41.4	D	43.2	D	103
			TR	TR		556	0.87	49.0	D			308	596	0.97	63.9	E			342	596	0.86	43.6	D			287
		SB	L	L	150	143	0.55	25.9	C	51.7	D	109	156	0.64	29.8	C	72.5	E	117	156	0.77	45.9	D	52.8	D	159
			TR	TR		638	0.94	57.8	E			367	684	1.04	82.8	F			404	684	0.94	54.4	D			348
		Overall Intersection								**41.1**	**D**						**51.4**	**D**						**43.7**	**D**	
2	Grand Avenue at Prospect Street	EB	LTR	LTR		52	0.17	16.6	B	16.6	B	35	62	0.20	17.1	B	17.1	B	39	62	0.34	32.0	C	32.0	C	58
		WB	LTR	LTR		86	0.31	8.5	A	8.5	A	0	91	0.33	8.5	A	8.5	A	0	91	0.46	15.6	B	15.6	B	0
		NB	LTR	L		620	0.51	9.0	A	9.0	A	102	660	0.54	9.4	A	9.4	A	112	4	0.04	4.2	A	19.2	B	3
				TR																656	0.84	19.4	B			503
		SB	LTR	L		868	0.89	23.2	C	23.3	C	245	935	0.97	35.6	D	35.6	D	281	93	0.30	7.3	A	53.8	D	38
				TR																842	1.05	58.4	E			681
		Overall Intersection								**16.7**	**B**						**23.5**	**C**						**37.7**	**D**	
3	Grand Avenue at Sunrise Highway	EB	L	L	300	165	0.82	89.5	F	87.4	F	260	175	0.85	91.0	F	110.5	F	291	175	0.85	91.0	F	110.5	F	291
			TR	TR		1911	1.08	87.2	F			890	2028	1.15	112.4	F			981	2028	1.15	112.4	F			981
		WB	L	L	400	256	1.14	152.7	F	58.9	E	513	277	1.23	184.1	F	68.4	E	565	277	1.23	184.1	F	68.4	E	565
			TR	TR		1621	0.86	43.0	D			625	1721	0.92	48.3	D			723	1721	0.92	48.3	D			723
		NB	L	L	150	70	0.89	136.2	F	180.8	F	180	74	0.93	146.1	F	215.8	F	190	74	0.93	146.1	F	215.8	F	190
			TR	TR		595	1.27	186.5	F			533	640	1.37	224.4	F			586	640	1.37	224.4	F			586
		SB	L	L	150	108	1.41	288.3	F	232.0	F	293	115	1.51	323.1	F	272.9	F	313	115	1.51	323.1	F	272.9	F	313
			TR	TR		601	1.37	222.0	F			559	647	1.47	264.1	F			616	647	1.47	264.1	F			616
		Overall Intersection								**109.7**	**F**						**132.4**	**F**						**132.4**	**F**	
4	Grand Avenue at Baldwin Avenue/ Miller Place	EB	LTR	LTR		61	0.48	32.4	C	32.4	C	57	65	0.49	32.5	C	32.5	C	59	65	0.54	40.1	D	40.1	D	69
		WB	LTR	LTR		16	0.18	23.0	C	23.0	C	13	16	0.18	23.0	C	23.0	C	13	16	0.30	36.2	D	36.3	D	19
		NB	LTR	L		736	0.54	14.6	B	14.6	B	329	787	0.58	15.7	B	15.7	B	369	24	0.25	13.4	B	31.0	C	20
				TR																763	0.91	31.8	C			788
		SB	LTR	L		792	0.60	24.6	C	24.6	C	323	850	0.65	26.2	C	26.2	C	368	11	0.08	8.9	A	49.9	D	6
				TR																839	1.04	50.8	D			845
		Overall Intersection								**20.6**	**C**						**21.9**	**C**						**41.2**	**D**	
5	Grand Avenue at Milburn Avenue	WB	T	T		332	0.48	13.1	B	13.1	B	161	352	0.50	13.4	B	13.4	B	174	352	0.90	54.9	D	54.9	D	359
		NB	TR	TR		736	0.99	55.2	E	55.2	E	334	787	1.07	77.3	E	77.3	E	365	787	0.53	14.0	B	14.0	B	136
		SB	L		80	267	0.68	18.1	B	12.0	B	164	283	0.72	19.3	B	13.2	B	159					20.8	C	
			T	T		850	0.64	10.1	B			48	911	0.68	11.3	B			51	1194	0.86	20.8	C			484
		Overall Intersection								**26.7**	**C**						**34.8**	**C**						**23.8**	**C**	
6	Grand Avenue at Lorenz Avenue	WB	LR	LR		14	0.09	29.6	C	29.6	C	21	14	0.09	29.6	C	29.6	C	21	14	0.10	34.9	C	34.9	C	24
		NB	TR	TR		1163	0.55	4.2	A	4.2	A	107	1241	0.58	5.2	A	5.2	A	110	1241	0.57	3.9	A	3.9	A	211
		SB	LT	LT		1424	0.72	7.7	A	7.7	A	552	1521	0.77	9.7	A	9.7	A	554	1521	0.76	8.7	A	8.7	A	634
		Overall Intersection								**6.3**	**A**						**7.8**	**A**						**6.7**	**A**	
7	Grand Avenue at West Seaman Avenue	EB	LR	LR		267	0.80	40.6	D	40.6	D	191	285	0.82	41.9	D	41.9	D	206	285	0.85	49.8	D	49.8	D	239
		NB	LT	L		994	0.91	35.1	D	35.1	D	417	1061	1.06	75.6	E	75.6	E	477	56	0.66	41.1	D	11.5	B	27
				T																1005	0.66	9.7	A			39
		SB	TR	TR		1207	0.87	59.1	E	59.1	E	105	1289	0.95	59.4	E	59.4	E	98	1289	0.91	19.6	B	19.6	B	557
		Overall Intersection								**47.6**	**D**						**63.5**	**E**						**20.2**	**C**	
8	Grand Avenue at East Seaman Avenue	WB	LR	LR		310	0.81	45.4	D	45.4	D	237	330	0.83	91.6	F	91.6	F	255	330	0.86	64.0	E	64.0	E	320
		NB	LR	LR		1171	0.82	24.5	C	24.5	C	126	1249	0.88	59.7	E	59.7	E	95	1249	0.85	14.7	B	14.7	B	486
		SB	LT	L		1074	1.21	119.3	F	119.3	F	516	1148	1.40	200.7	F	200.7	F	575	113	0.96	73.9	E	16.3	B	130
				T																1035	0.68	9.4	A			66
		Overall Intersection								**66.4**	**E**						**122.3**	**F**						**21.7**	**C**	
9	Grand Avenue at St. Lukes Place	EB	LR	LR		181	0.69	39.3	D	39.3	D	148	193	0.70	39.2	D	39.2	D	154	193	0.72	45.1	D	45.1	D	175
		NB	LT	L		996	0.82	12.4	B	12.4	B	397	1061	0.92	19.8	B	19.8	B	447	41	0.41	10.6	B	7.2	A	14
				T																1020	0.64	7.0	A			122
		SB	TR	TR		1149	0.72	15.8	B	15.8	B	25	1227	0.78	54.9	D	54.9	D	50	1227	0.76	15.1	B	15.1	B	416
		Overall Intersection								**16.3**	**B**						**38.2**	**D**						**14.2**	**B**	
10	Grand Avenue at High School Driveway	EB	LTR	LTR		6	0.06	0.3	A	0.3	A	0	6	0.06	0.3	A	0.3	A	0	6	0.06	0.3	A	0.3	A	0
		WB	LTR	LTR		104	0.64	30.8	C	30.8	C	13	110	0.66	32.5	C	32.5	C	14	110	0.66	32.5	C	32.5	C	14
		NB	L	L	150	6	0.09	27.3	C	35.0	C	9	6	0.10	28.7	C	42.1	D	8	6	0.10	20.8	C	44.3	D	9
			TR	TR		1104	0.90	35.1	D			566	1176	0.97	42.2	D			561	1176	0.97	44.6	D			631
		SB	L	L	200	68	0.51	42.0	D	14.2	B	71	72	0.52	42.1	D	15.0	B	74	72	0.52	42.1	D	15.0	B	74
			TR	TR		1205	0.66	12.2	B			256	1286	0.71	13.1	B			270	1286	0.71	13.1	B			270
		Overall Intersection								**24.5**	**C**						**28.2**	**C**						**29.2**	**C**	
11	Grand Avenue at Stowe Avenue	EB	LTR	LTR		268	0.88	45.5	D	45.5	D	249	286	0.91	50.0	D	50.0	D	281	286	0.91	50.0	D	50.0	D	281
		WB	LTR	LTR		128	0.30	16.9	B	16.9	B	27	136	0.31	16.6	B	16.6	B	28	136	0.31	16.6	B	16.6	B	28
		NB	L	L	350	182	0.94	65.0	E	33.7	C	187	193	1.10	108.6	F	53.7	D	196	193	1.10	108.4	F	53.3	D	196
			TR	TR		1161	0.92	28.6	C			502	1236	1.01	44.8	D			525	1236	1.01	44.4	D			525
		SB	L	L	120	43	0.36	39.4	D	12.7	B	33	46	0.37	38.4	D	13.6	B	33	46	0.37	38.4	D	13.6	B	33
			TR	TR		888	0.52	11.1	B			155	948	0.57	12.1	B			154	948	0.57	12.1	B			154
		Overall Intersection								**27.3**	**C**						**38.4**	**D**						**38.2**	**D**	
12	Grand Avenue at Stanton Avenue	EB	LTR	LTR		75	0.34	22.2	C	22.2	C	38	79	0.36	23.2	C	23.2	C	41	79	0.36	23.2	C	23.2	C	41
		WB	LTR	LTR		131	0.69	37.6	D	37.6	D	65	139	0.71	38.5	D	38.5	D	68	139	0.71	38.5	D	38.5	D	68
		NB	LTR	LTR		1102	0.69	6.7	A	6.7	A	65	1173	0.75	8.5	A	8.5	A	63	1173	0.75	8.5	A	8.5	A	63
		SB	LTR	LTR		1259	0.94	29.3	C	29.3	C	550	1343	1.03	49.6	D	49.6	D	614	1343	1.03	49.6	D	49.6	D	614
		Overall Intersection								**20.5**	**C**						**31.3**	**C**						**31.3**	**C**	
13	Grand Avenue at McKenna Place	WB	LR	LR																100	0.47	29.1	C	29.1	C	80
		NB	TR	TR																786	0.77	7.2	A	7.2	A	79
		SB	L	L																283	0.81	21.1	C	54.9	D	73
			T	T																911	0.89	65.1	E			279
		Overall Intersection																						**35.6**	**D**	

GRAND AVENUE COMPLETE STREETS TRAFFIC STUDY

CAPACITY ANALYSIS AND LEVEL OF SERVICE (LOS) SUMMARY

WEEKDAY SATURDAY PEAK HOUR

TABLE 4

Intersection		Approach	Existing/ No-Build Lane Group	Build Lane Group	Storage Length (ft)	EXISTING 2014 CONDITIONS							FUTURE 2024 NO-BUILD CONDITIONS							FUTURE 2024 BUILD CONDITIONS						
						Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)	Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)	Volume (veh/hr)	V/C Ratio	Delay (sec)	LOS	Delay (sec)	LOS	Queue Length 95th (ft)
1	Grand Avenue at Merrick Road	EB	L	L	200	134	0.63	26.8	C	25.7	C	84	142	0.69	29.3	C	26.0	C	90	142	0.85	53.3	D	32.2	C	111
			T	T		420	0.54	33.8	C			169	453	0.56	33.5	C			183	453	0.53	32.1	C			186
			R	R	100	127	0.10	0.1	A			0	139	0.11	0.2	A			0	139	0.30	6.0	A			41
		WB	L	L	100	148	0.52	22.7	C	29.6	C	97	159	0.56	23.3	C	30.1	C	104	159	0.58	24.9	C	47.8	D	112
			T	TR		453	0.73	39.2	D			188	496	0.77	40.0	D			207	645	0.94	53.2	D			269
			R		40	130	0.11	0.2	A			0	149	0.13	0.2	A			0							
		NB	L	L	150	144	0.59	26.0	C	37.1	D	108	168	0.75	39.9	D	48.5	D	167	168	0.86	53.7	D	42.3	D	158
			TR	TR		620	0.80	40.0	D			332	670	0.91	50.9	D			373	670	0.83	39.2	D			287
		SB	L	L	150	107	0.47	22.0	C	49.8	D	80	119	0.57	25.8	C	79.3	E	88	119	0.62	28.8	C	49.4	D	83
			TR	TR		588	0.94	55.2	E			340	635	1.07	90.1	F			380	635	0.95	53.6	D			306
		Overall Intersection								**35.7**	**D**						**46.1**	**D**						**43.3**	**D**	
2	Grand Avenue at Prospect Street	EB	LTR	LTR		62	0.27	18.0	B	18.0	B	30	75	0.33	19.1	B	19.1	B	35	75	0.47	32.4	C	32.4	C	48
		WB	LTR	LTR		80	0.23	7.5	A	7.5	A	17	84	0.24	7.4	A	7.4	A	17	84	0.34	11.7	B	11.7	B	21
		NB	LTR	L		723	0.55	9.8	A	9.8	A	121	769	0.59	10.3	B	10.3	B	132	3	0.02	4.0	A	33.0	C	3
				TR																766	0.95	33.1	C			581
		SB	LTR	L		859	0.90	25.8	C	25.8	C	263	938	1.01	47.9	D	47.9	D	306	111	0.53	15.2	B	44.3	D	63
				TR																827	1.01	48.6	D			640
		Overall Intersection								**17.9**	**B**						**29.0**	**C**						**37.4**	**D**	
3	Grand Avenue at Sunrise Highway	EB	L	L	300	202	1.04	121.6	F	67.4	E	338	214	1.10	138.9	F	81.6	F	365	214	1.10	138.9	F	81.6	F	365
			TR	TR		1298	0.96	57.9	E			502	1380	1.02	71.6	E			556	1380	1.02	71.6	E			556
		WB	L	L	400	230	1.13	146.5	F	62.6	E	409	252	1.23	181.5	F	72.0	E	456	252	1.23	181.5	F	72.0	E	456
			TR	TR		1182	0.84	45.1	D			396	1254	0.89	48.5	D			428	1254	0.89	48.5	D			428
		NB	L	L	150	67	0.72	92.6	F	106.3	F	135	71	0.76	97.5	F	135.8	F	145	71	0.76	97.5	F	135.8	F	145
			TR	TR		735	1.10	107.6	F			510	792	1.19	139.5	F			568	792	1.19	139.5	F			568
		SB	L	L	150	116	1.46	290.8	F	109.9	F	246	123	1.54	323.9	F	131.2	F	261	123	1.54	323.9	F	131.2	F	261
			TR	TR		633	0.96	70.4	E			424	689	1.04	90.2	F			479	689	1.04	90.2	F			479
		Overall Intersection								**80.4**	**F**						**97.4**	**F**						**97.4**	**F**	
4	Grand Avenue at Baldwin Avenue/ Miller Place	EB	LTR	LTR		63	0.53	26.8	C	26.8	C	29	68	0.55	27.1	C	27.1	C	30	68	0.58	32.5	C	32.5	C	35
		WB	LTR	LTR		27	0.33	27.7	C	27.7	C	18	29	0.35	28.3	C	28.3	C	19	29	0.46	43.1	D	43.1	D	25
		NB	LTR	L		789	0.49	13.7	B	13.7	B	308	846	0.53	14.9	B	14.9	B	350	11	0.10	10.0	A	32.8	C	10
				TR																835	0.92	33.3	C			832
		SB	LTR	L		854	0.54	23.0	C	23.0	C	341	923	0.59	24.9	C	24.9	C	393	6	0.03	7.5	A	57.6	E	2
				TR																917	1.05	58.0	E			979
		Overall Intersection								**19.3**	**B**						**20.8**	**C**						**45.2**	**D**	
5	Grand Avenue at Milburn Avenue	WB	T	T		230	0.43	12.9	B	12.9	B	101	244	0.45	13.1	B	13.1	B	107	244	0.79	46.0	D	46.0	D	208
		NB	TR	TR		758	0.99	54.5	D	54.5	D	348	813	1.08	79.0	E	79.0	E	384	813	0.55	10.0	B	10.0	A	160
		SB	L		80	210	0.60	16.8	B	11.0	B	131	223	0.64	18.3	B	12.3	B	142	0	0.00	0.0	0.00	8.9	A	0
			T	T		818	0.61	9.5	A			54	885	0.66	10.8	B			57	1108	0.74	8.9	A			174
		Overall Intersection								**27.7**	**C**						**37.6**	**D**						**13.9**	**B**	
6	Grand Avenue at Lorenz Avenue	WB	LR	LR		26	0.24	32.3	C	32.3	C	30	27	0.24	32.4	C	32.4	C	30	27	0.27	38.2	D	38.2	D	35
		NB	TR	TR		1146	0.56	5.1	A	5.1	A	80	1225	0.60	6.0	A	6.0	A	81	1225	0.59	4.7	A	4.7	A	189
		SB	LT	LT		1113	0.55	3.5	A	3.5	A	85	1199	0.59	3.8	A	3.8	A	93	1199	0.58	2.8	A	2.8	A	91
		Overall Intersection								**4.8**	**A**						**5.4**	**A**						**4.4**	**A**	
7	Grand Avenue at West Seaman Avenue	EB	LR	LR		184	0.70	39.3	D	39.3	D	137	197	0.72	39.0	D	39.0	D	144	197	0.74	45.1	D	45.1	D	162
		NB	LT	L		1098	0.81	13.2	B	13.2	B	423	1173	0.90	21.6	C	21.6	C	488	39	0.33	8.4	A	7.9	A	7
				T																1134	0.68	7.9	A			54
		SB	TR	TR		1125	0.70	43.6	D	43.6	D	60	1210	0.76	55.0	D	55.0	D	57	1210	0.73	7.1	A	7.1	A	86
		Overall Intersection								**29.4**	**C**						**38.4**	**D**						**10.9**	**B**	
8	Grand Avenue at East Seaman Avenue	WB	LR	LR		233	0.73	38.8	D	38.8	D	178	249	0.74	38.6	D	38.6	D	187	249	0.77	45.5	D	45.5	D	215
		NB	LR	LR		1195	0.75	10.2	B	10.2	B	98	1276	0.81	17.1	B	17.1	B	162	1276	0.78	11.7	B	11.7	B	104
		SB	LT	L		1101	1.21	117.3	F	117.3	F	555	1183	1.40	200.3	F	200.3	F	629	116	0.97	71.2	E	14.5	B	79
				T																1067	0.66	7.4	A			73
		Overall Intersection								**60.2**	**E**						**100.2**	**F**						**16.2**	**B**	
9	Grand Avenue at St. Lukes Place	EB	LR	LR		134	0.61	39.5	D	39.5	D	109	143	0.63	40.0	D	40.0	D	116	143	0.66	46.0	D	46.0	D	129
		NB	LT	L		1140	0.76	7.4	A	7.4	A	107	1218	0.83	9.4	A	9.4	A	461	27	0.23	5.4	A	4.5	A	6
				T																1191	0.67	4.5	A			110
		SB	TR	TR		1220	0.71	9.5	A	9.5	A	15	1309	0.77	53.1	D	53.1	D	41	1309	0.74	12.3	B	12.3	B	394
		Overall Intersection								**10.3**	**B**						**32.2**	**C**						**10.8**	**B**	
10	Grand Avenue at High School Driveway	EB	LTR	LTR		8	0.06	0.4	A	0.4	A	0	8	0.06	0.4	A	0.4	A	0	8	0.06	0.4	A	0.4	A	0
		WB	LTR	LTR		45	0.24	4.8	A	4.8	A	0	48	0.26	5.8	A	5.8	A	0	48	0.26	5.8	A	5.8	A	0
		NB	L	L	150	5	0.06	17.2	B	17.9	B	8	5	0.07	17.2	B	18.6	B	8	5	0.07	12.2	B	14.8	B	6
			TR	TR		1227	0.60	17.9	B			487	1309	0.64	18.6	B			538	1309	0.64	14.8	B			548
		SB	L	L	200	13	0.15	36.2	D	8.8	A	18	14	0.17	35.7	D	9.3	A	18	14	0.17	35.7	D	9.3	A	18
			TR	TR		1163	0.54	8.4	A			210	1248	0.57	8.8	A			234	1248	0.57	8.8	A			234
		Overall Intersection								**13.1**	**B**						**13.7**	**B**						**11.8**	**B**	
11	Grand Avenue at Stowe Avenue	EB	LTR	LTR		87	0.81	52.7	D	52.7	D	41	93	0.86	58.8	E	58.8	E	44	93	0.86	58.8	E	58.8	E	44
		WB	LTR	LTR		311	0.64	16.4	B	16.4	B	34	332	0.64	16.0	B	16.0	B	35	332	0.64	16.0	B	16.0	B	35
		NB	L	L	350	44	0.29	16.0	B	27.1	C	14	47	0.36	18.4	B	40.3	D	14	47	0.36	17.6	B	38.3	D	14
			TR	TR		1133	0.88	27.5	C			462	1210	0.98	41.1	D			509	1210	0.98	39.1	D			510
		SB	L	L	120	206	0.69	45.5	D	13.8	B	147	219	0.72	45.4	D	14.9	B	144	219	0.72	45.4	D	14.9	B	144
			TR	TR		1152	0.58	8.2	A			204	1236	0.63	9.5	A			205	1236	0.63	9.5	A			205
		Overall Intersection								**21.2**	**C**						**27.1**	**C**						**26.3**	**C**	
12	Grand Avenue at Stanton Avenue	EB	LTR	LTR		77	0.48	26.7	C	26.7	C	70	81	0.49	28.7	C	28.7	C	77	81	0.49	28.7	C	28.7	C	77
		WB	LTR	LTR		132	0.65	35.7	D	35.7	D	89	141	0.67	37.0	D	37.0	D	96	141	0.67	37.0	D	37.0	D	96
		NB	LTR	LTR		1261	0.88	18.5	B	18.5	B	283	1346	0.99	45.5	D	45.5	D	526	1346	0.99	45.5	D	45.5	D	526
		SB	LTR	LTR		1262	0.84	17.3	B	17.3	B	486	1352	0.93	26.2	C	26.2	C	557	1352	0.93	26.2	C	26.2	C	557
		Overall Intersection								**19.1**	**B**						**35.9**	**D**						**36.0**	**D**	
13	Grand Avenue at McKenna Place	WB	LR	LR																100	0.44	25.8	C	25.8	C	75
		NB	TR	TR																812	0.62	5.4	A	5.4	A	145
		SB	L	L																223	0.67	15.2	B	8.1	A	77
			T	T																885	0.66	6.2	A			180
		Overall Intersection																						**7.8**	**A**	

GRAND AVENUE COMPLETE STREETS TRAFFIC STUDY

PUBLIC OUTREACH COMMENTS SUMMARY

Table 5

Comment Type/ Concern	Specific Location	Description	Number of Comments
Beautification			
Aesthetics	NA	Install more aesthetically pleasing features	1
Brick Pavers	NA	Install brick sidewalks/crosswalks	1
Flower Boxes	NA	Install flower boxes/planters	4
Lamp Posts/Planters	NA	Improved lamp post, preferably with planters, and outlets for Christmas decoration	2
Land/Streetscaping	NA	Landscaping/streetscaping would enhance visual appeal	2
Lighting	NA	Install lighting (one specified solar powered lights)	2
Plant Trees	NA	Plant trees in median with road diet (reducing 4 lanes to 2)	1
Plant Trees/Greenery	NA	Plant trees and greenery - it has calming affect, make Baldwin a destination to visit	2
Storefronts	NA	Giving the storefronts a more cohesive look could help with businesses as well	1
Street Furniture	NA	Install benches and additional seating along Grand Ave	4
Trash Cans	NA	Install trash cans (one specified solar powered trash cans)	2
Bicycles			
Bike Lanes	NA	Install bike lanes (some say if possible) / bike lanes are needed	11
Bike Path	South of Sunrise Hwy	Install bike paths south of Sunrise Hwy to Baldwin Park	1
Bike Racks	NA	Install bike racks (library is planning to get an additional rack, others should do the same)	4
Encourage Bike Use	NA	Less traffic on roadways by encouraging bicycling, especially on the weekends	1
Shared Use	NA	Install shared pedestrian/biking pathways like in Montreal	1
Buses			
Bus Shelters, Seating	NA	Provide better bus stands with shelters and seating along Grand Ave	2
Bus Shelters, Seating	Merrick Rd	Provide larger bus shelters with seating at Merrick Rd and Grand Ave (north and south)	2
Bus Stop, Solar Kiosk	1980 Grand Ave	Install bus stop/solar kiosk at the municipal parking lot/museum/community garden	1
Enforcement			
Signal Timing/Camera	Merrick Rd	Study red light camera/signal timing - SB left turn green/yellow/red sequences vary	1
Speeding	NA	Install speed cameras	1
Speeding, Safety	NA	What is the rate of speeding tickets in 3 years? Lack of NCPD officers is detriment to safety	1
General			
Assistance	NA	Real estate agency - would like to offer their assistance in this effort	1
Blight	NA	If Baldwin is a "blight" will this negatively impact traffic study implementation/grants?	1
Circulation, Parking	Post Office	Move combined post office to Merrick and Grand with sufficient parking for users/USPS	1
Circulation, Safety	Post Office	Post office on Grand Ave south of Sunrise Hwy is tiny, dangerous and difficult to use	1
Implementation	NA	In the short-term would like something to be done right now	1
Miscellaneous	Merrick Rd	Grand to Merrick WB is a hill with hidden school zone, photo enforced with 12+ signs	1
Outdoor Dining	NA	Want to see outside eating areas for restaurants	1
Parking Lot Access/Use	Behind ACE Hardware	Provide parking lot access from Grand Ave, students should use it as they can't park at HS	1
Parking, Speeding	Outside Study Area	Businesses suffer due to narrow parking lanes and speeding along Merrick Rd	1
Pedestrian Bridge	Sunrise Hwy	Are elevated pedestrian walkways over Sunrise Highway feasible?	1
Project Benefits	NA	Similar project in Long Beach increased community pride, decreased littering/loitering	1
Revitalization	Merrick Rd to Sunrise Hwy	Revitalization of this area has been discussed for many years, and has yet to happen	2
Safety, Circulation	Outside Study Area	Merrick Rd at Central Ave is dangerous	1
Sidewalk, Crossing	Outside Study Area	Improve sidewalks, curb cuts, ped crossings at Milburn Ave and Sunrise Hwy/LIRR	1
Telephone Poles	NA	Can telephone poles be replaced?	1
Through Truck Traffic	NA	Too many through trucks and drivers from other towns - less traffic, more shoppers	1
Green Infrastructure			
Drains/Drain water	NA	Drain water goes directly into Silver Lake - undam the lake or install a filtering system	1
Flooding/Bioswales	NA	Green infrastructure can help drainage (one specified bioswales)	2
Green Median	Merrick Rd to Sunrise Hwy	Provide median, eliminate on-street parking, maximize parking behind Library/Apartments	1
Islands/Benches	NA	Consider pedestrian islands with benches - help elderly and people with disabilities	1
Permeable Sidewalks	NA	Install permeable sidewalks (one specified where they need to be widened)	2
Land Use			
Mixed Use Benefits	NA	Mixed use housing for young people and commercial would benefit economically	1
Legislation			
Left Turns	Brooklyn Ave	Prohibit left turns to/from Brooklyn Ave, congestion/restricted sight line are concerns	1
Left Turns/Safety	Dunkin Donut Dwy	Prohibit left turns onto Grand Ave to make it safer, customers may not be happy	1

GRAND AVENUE COMPLETE STREETS TRAFFIC STUDY

PUBLIC OUTREACH COMMENTS SUMMARY

Table 5

Comment Type/ Concern	Specific Location	Description	Number of Comments
Speed Limit	NA	Speed limit should be decreased	2
Through Trucks	NA	Truck ban on Long Beach Rd by Oceanside increases through trucks on Grand Ave	1
Truck Volume	NA	Reduce truck traffic - restrict access on Grand Ave, limit to local delivery only	2
Truck Volume, Safety	NA	RVC should allow trucks on Long Beach Rd, reducing traffic on Grand Ave/making safer	2
Trucks	NA	Limit trucks to a certain time of day to reduce congestion/improve pedestrian safety	1
Parking			
Municipal Parking	NA	Provide free town parking lots to make it easier for shoppers and help small businesses	1
Narrow Lanes	Merrick Rd	Cars park partially on sidewalks, reduce one EB lane on Merrick Rd east of Grand Ave	1
Narrow Parking Spaces	NA	Create wider parking spaces with road diet (reducing 4 lanes to 2)	2
On-Street Parking	NA	Motorists are reluctant to park behind stores and park on-street holding up traffic	1
On-Street Parking	LIRR Station (NY Ave)	Expand LIRR parking to reduce on-street demand - resident (NY Ave) face severe difficulty	1
Parking Supply	NA	Provide more parking	2
Parking Use	NA	Put parking on one side only, centralize it in clusters/bays for business/cleaner look	1
Pedestrian Circulation			
Multiple Driveways	West Side of Grand	Too many driveways on the west side of Grand Ave make it difficult for pedestrians	1
Sidewalk Width	NA	Some sidewalks are quite narrow	1
Sidewalks	NA	Improve sidewalks	2
Walkability	Library, High School	Areas near library and High School need to be more walkable	1
Pedestrian Safety			
Crosswalk	Merrick Rd	(East) crosswalk is away from the corner, NB right turns can't see people crossing	1
High School Students	Atlantic Ave to High School	More students walk since two plus mile radius lost school transportation	1
Islands	NA	Islands can help pedestrian safety, raised planter in medians seen in Bronx look nice	1
Islands, Curb Extensions	NA	Add/widen islands, extend sidewalks for safety	1
Medians	NA	Install medians	1
Medians	Merrick Rd, Sunrise Hwy	Provide large pedestrian medians along Grand Ave at Merrick Rd and Sunrise Hwy	1
Safer Pathways	NA	Would like to see safer pedestrian pathways	2
Speeding	NA	Do not feel safe walking along sidewalk due to high speed of traffic	1
Street Crossing	NA	Not enough crosswalks, traffic signals are spaced far apart	1
Street Crossing	Merrick Rd to Sunrise Hwy	Create crosswalks along Grand Ave between Merrick Rd and Sunrise Hwy	1
Street Crossing	LIRR Station, Merrick Rd	Crossing streets is dangerous	2
Street Crossing	Merrick Rd, Sunrise Hwy	Improve safety for pedestrians crossing Sunrise Hwy and Merrick Rd	2
Street Crossing	LIRR Overpass	Overpass access is on one side, adding on other side will eliminate crossing Grand Ave	1
Street Crossing	Brooklyn Ave	Brooklyn Ave and Grand Ave is dangerous for pedestrians to cross	1
Street Crossing	1980 Grand Ave	Install crosswalk for safer crossing for kids going to community garden/museum	1
Storage Length			
Left Turns	Merrick Rd	Longer left turn lane at Merrick Rd	1
Left Turns	Milburn Ave (Valero)	High volumes of left turns block one lane - make one left and one through lane	1
Left Turns	Milburn Ave	Turn lane to Milburn Ave is short, traffic backs up in SB through lane - increase storage	2
Left Turns	Stowe Ave	Longer left turn lanes at Stowe Ave	1
Study Corridor			
Study Limits	NA	Extend traffic study to include Merrick Rd east and west of Grand Ave	1
Study Limits	NA	Extend traffic study corridor north (some specify to the Southern State Parkway)	10
Traffic Signal			
Crossing Time	NA	Not enough time to cross, increase pedestrian crossing time at intersections	1
Crossing Time	Sunrise Hwy	Increase signal time to cross Sunrise Highway	2
Left Turns	Smith St	Install a traffic signal north of Wicks Florist (Smith St) for left turn onto Grand Ave	1
Left Turns	Seaman Ave	Install left turn lane/signal at Seaman Ave (some specified NB/SB direction)	10
Left Turns	St Lukes Pl	Install left turn signal at St Lukes Pl	3
Left Turns	Baldwin Manor Co-op	Install a left turn signal for the Baldwin Manor Co-op complex	1
Left Turns	High School Dwy	Provide SB left turn lane and signal at the High School driveway	1
Left Turns	Pathmark Driveway	Install traffic light with left turn signal at Pathmark driveway (auto/pedestrians)	2
Left Turns	Stanton Ave	Can we have a turning signal from Grand Ave to Stanton Ave (southbound)?	1
Left Turns, Safety	Stanton Ave	Stanton Ave needs left turn lanes/signals, cars use narrow hatched median, dangerous	2
Left Turns, Sight Line	Mc Kenna Pl/Grand Ave	Install a signal to reduce cut through traffic, illegally parked vehicles obstruct sight line	1

GRAND AVENUE COMPLETE STREETS TRAFFIC STUDY

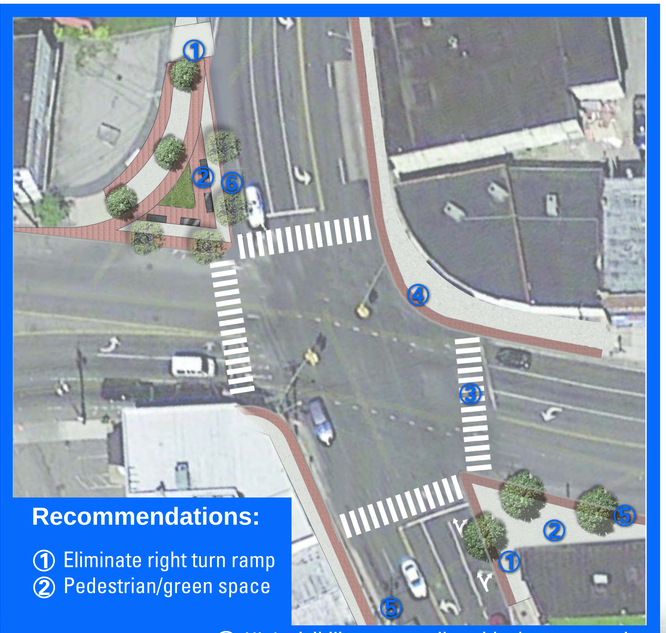
PUBLIC OUTREACH COMMENTS SUMMARY

Table 5

Comment Type/ Concern	Specific Location	Description	Number of Comments
Pedestrian Phase	Merrick Rd	Why is there no exclusive pedestrian phase of app. 25 seconds to cross all approaches?	1
Right Turns	High School Dwy	Provide a right turn lane and signal for Grand Ave NB at the High School driveway	1
Safety, Circulation	Pathmark Driveway	Install traffic signal at Pathmark driveway	6
Turn Arrows	Seaman Ave	Right turn arrows not needed - right turn on red permitted, install left turn arrows	2
Turn Lane			
Left Turns	Prospect St	Left turn lane is needed at the Library (Prospect St)	1
Left Turns	LIRR, Brooklyn Ave	Provide left turning lane southbound by LIRR station, Brooklyn Ave	2
Left Turns	Movie Theater	Extend left turn lane 10 feet on Grand Ave SB to enter movie theater parking lot	1
Left Turns	Stanton Ave	Provide a left turn lane on Grand Ave SB at Stanton Ave	1
Left Turns	Stanton Ave	Provide a left turn lane on Grand Ave NB at Stanton Ave	1
Right Turns	Sunrise Hwy	Grand Ave NB at Sunrise Hwy should have a right turn only lane in AM and PM peaks	1
Safety, Circulation	BFCU Driveway	Turning lane needed to enter the new Bethpage Federal Credit Union facility	1
Traffic Volume	North of Sunrise Hwy	Area north of Sunrise Hwy has more traffic and needs a turning lane	1
Vehicle Circulation			
Congestion, Safety	Seaman Ave, St Lukes Pl	Fix congestion for success, a number of accidents also occur at these intersections	1
Cut Through Traffic	Baldwin Square (Mall)	EB Sunrise Hwy traffic cuts through Mall parking lot to avoid Grand Ave signal	1
Cut Through Traffic	Seaman Ave	NB Grand Ave traffic cuts through Walgreens parking lot to avoid Seaman Ave signal	1
Fire Department Trucks	Baldwin Ave	Hose Co. 3 trucks from Baldwin Ave conflict with Grand Ave FD N/S trucks on Grand Ave	1
Restricted Access	Baldwin Square (Mall)	Median restricts mall access from WB Sunrise, increasing Grand Ave access use	1
Road Diet	NA	Consider road diet along Grand Ave (some specified 2 lanes instead of 4)	5
Road Diet	Merrick Rd to Sunrise Hwy	Grand Ave between Merrick Rd and Sunrise Hwy should be 2 lanes instead of 4	1
Road Diet, Left Turn	Near Library	One lane with a left turn lane would be an improvement, left turn to Prospect is an issue	1
Signage	Baldwin Square (Mall)	Improve signage at Grand Ave for entrance to Best Buy shopping center (Mall)	1
Traffic Flow	Merrick Rd	Install a rotary intersection at Merrick Rd and Grand Ave Similar to one in Buffalo, NY	1
Traffic Signs	NA	Improve road signage	1
Traffic Signs	CVS, Movie Theater	Improve signage for entrances and exits of CVS and movie theater parking lots	1
Unnecessary Turns	Mc Kenna, Milburn Ave	Many N/S cars not making the traffic light turn onto Mc Kenna instead of waiting	1
Vehicle Circulation / Blockage			
Left Turns	Seaman Ave, St Lukes Pl	SB left turns hold up through vehicles, and also block NB left turn onto St Lukes Pl	2
Side Streets	McKenna/Milburn	NB vehicles waiting for signal at Milburn frequently block side streets	1
Traffic Signs	Mc Kenna Ave/Pl	Install signs to keep the intersection clear from the vehicles stopped for the signal	1
Vehicle Circulation / Safety			
Aggressive Driving	NA	Install speed bumps (where applicable)	2
Bus Traffic	NA	Cars swerve in and out of traffic to avoid buses in the morning and 3 to 5 pm	1
Curve, Speeding	Baldwin Manor Co-op	Improve road signage for the curve between St. Lukes Pl and High School driveway	1
Left Turns, Sight Line	Lincoln Ave, Millburn Ave	Milburn has a signal, but SB left turn to Lincoln is dangerous - difficult to see NB traffic	1
One-Way/Safety	Milburn Ave to Atlantic Ave	Make Grand Ave one-way SB and Milburn Ave one-way NB from Milburn to Atlantic	1
Speeding	NA	Speeding and aggressive driving prevails during peak/off-peak - decrease speeding	3
Speeding, Signage	NA	Install large signs warning motorists to slow down	1
Vehicles, Pedestrians	Merrick Rd	Merrick Rd at Grand Ave is a dangerous intersection and needs to be improved	1
		Total Comments	**207**

Note: written comments were received during Public Information / Public Outreach Meeting on February 24, 2015 and via Email

MERRICK ROAD



Recommendations:

① Eliminate right turn ramp
② Pedestrian/green space
③ High visibility crosswalks with shorter crossing distance and pedestrian enhancements
④ Extend curb, improve pedestrian space
⑤ Extend curb, improve bus stop shelter/seating
⑥ Provide a right turn lane

PROSPECT STREET

Recommendations:

① Extend curb, improve pedestrian space/circulation
② High visibility crosswalks with shorter crossing distance and pedestrian enhancements

EDNA COURT

Recommendations:

① Extend curb, improve pedestrian space/circulation
② High visibility crosswalks with shorter crossing distance and pedestrian enhancements
③ Appropriate signs and flashing beacons

Additional (unsignalized) pedestrian crossing(s) Edna Ct/ School St/ midblock - location(s) to be finalized in final design

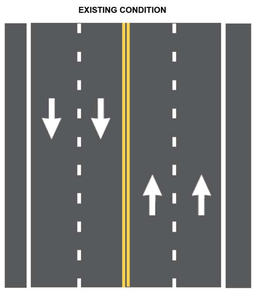
EXISTING CONDITION

Road Diet Limits

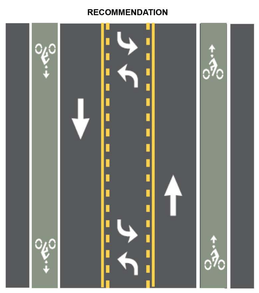
Recommendations: ROAD DIET

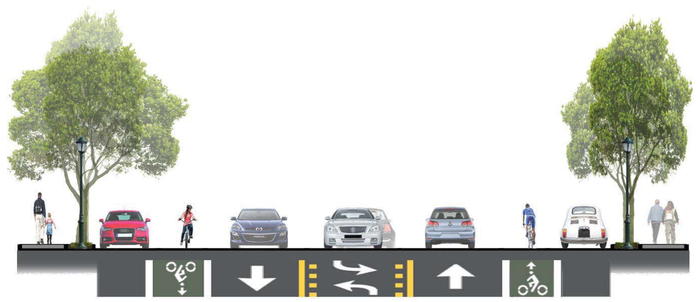
OPTION 1: Reduce 4 Lanes To 3 Lanes, with added Bike Lanes

EXISTING CONDITION



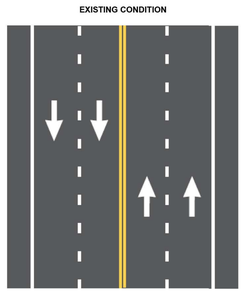
RECOMMENDATION



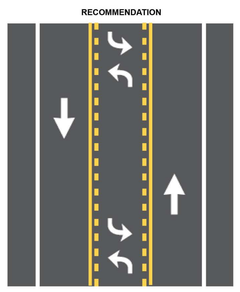


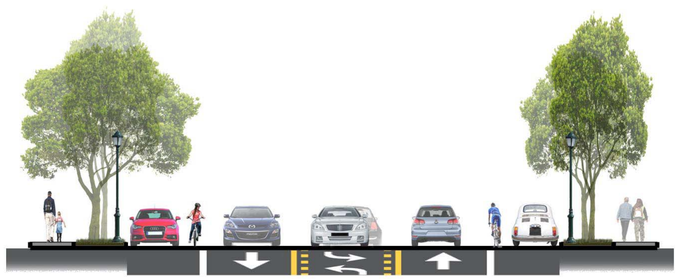
OPTION 2: Reduce 4 Lanes To 3 Lanes, with wider shared Bike/Parking Lanes

EXISTING CONDITION

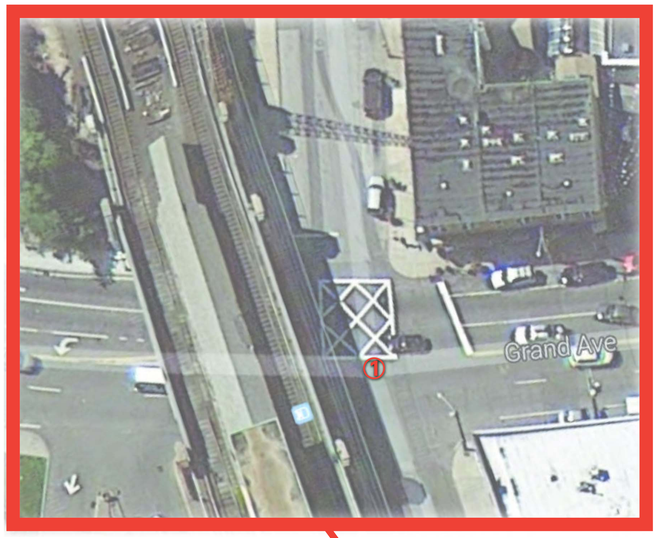


RECOMMENDATION





BROOKLYN AVENUE



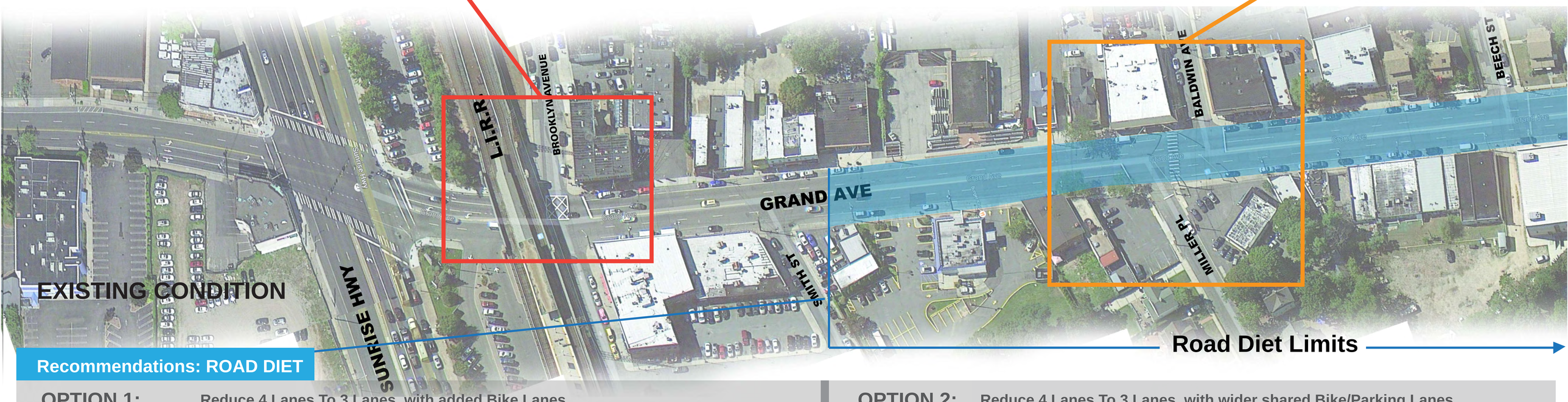
Recommendations:

① Further study for a potential traffic signal synchronized with the signal at Sunrise Highway

MILLER PLACE

Recommendations:

① Extend curb, improve pedestrian space/circulation
② Improve bus stop shelter/seating
③ High visibility crosswalks with shorter crossing distance and pedestrian enhancements

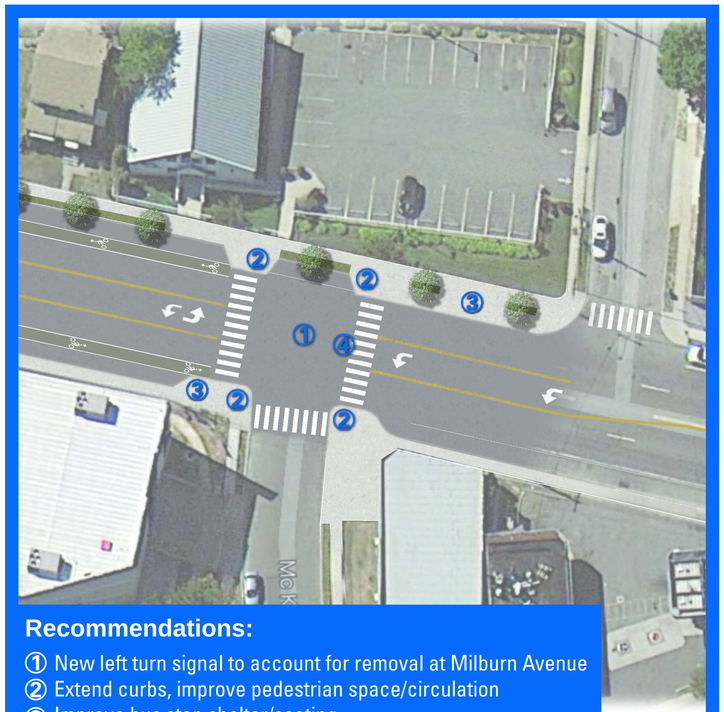


Recommendations: ROAD DIET

OPTION 1: Reduce 4 Lanes To 3 Lanes, with added Bike Lanes

OPTION 2: Reduce 4 Lanes To 3 Lanes, with wider shared Bike/Parking Lanes

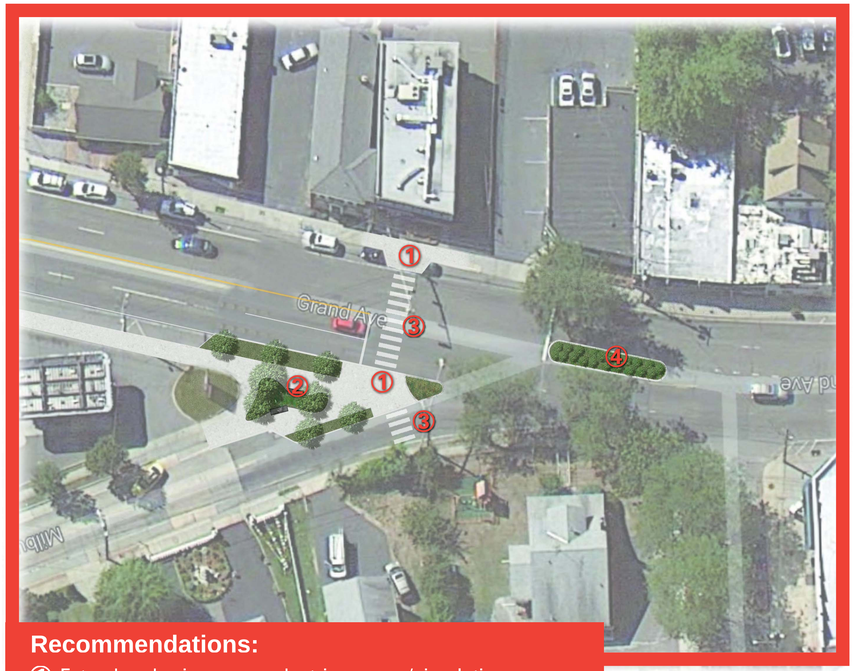
MCKENNA PLACE



Recommendations:

① New left turn signal to account for removal at Milburn Avenue
② Extend curbs, improve pedestrian space/circulation
③ Improve bus stop shelter/seating
④ High visibility crosswalks with shorter crossing distance and pedestrian enhancements

MILBURN AVENUE



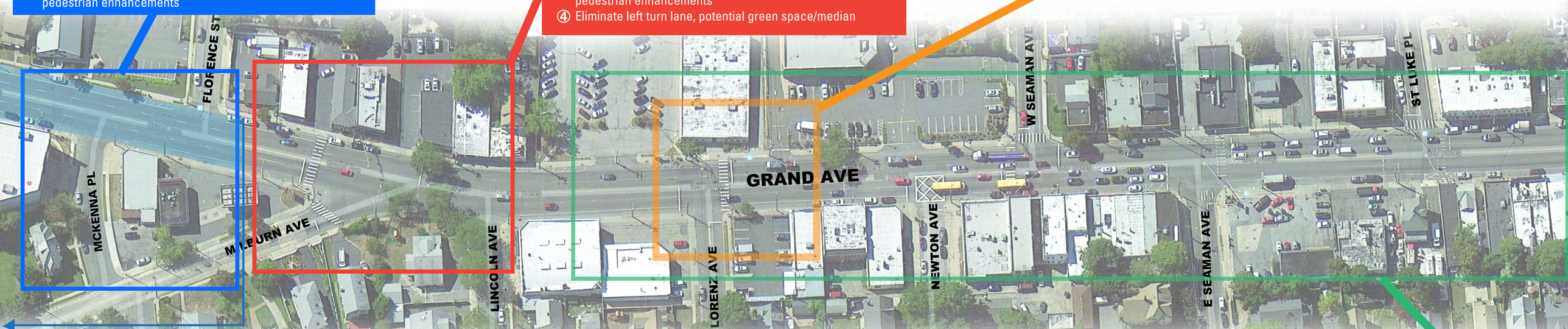
Recommendations:

① Extend curbs, improve pedestrian space/circulation
② Pedestrian/green space
③ High visibility crosswalks with shorter crossing distance and pedestrian enhancements
④ Eliminate left turn lane, potential green space/median

LORENZ AVENUE

Recommendations:

① Extend curbs, improve pedestrian space/circulation
② Improve bus stop shelter/seating
③ High visibility crosswalks with shorter crossing distance and pedestrian enhancements

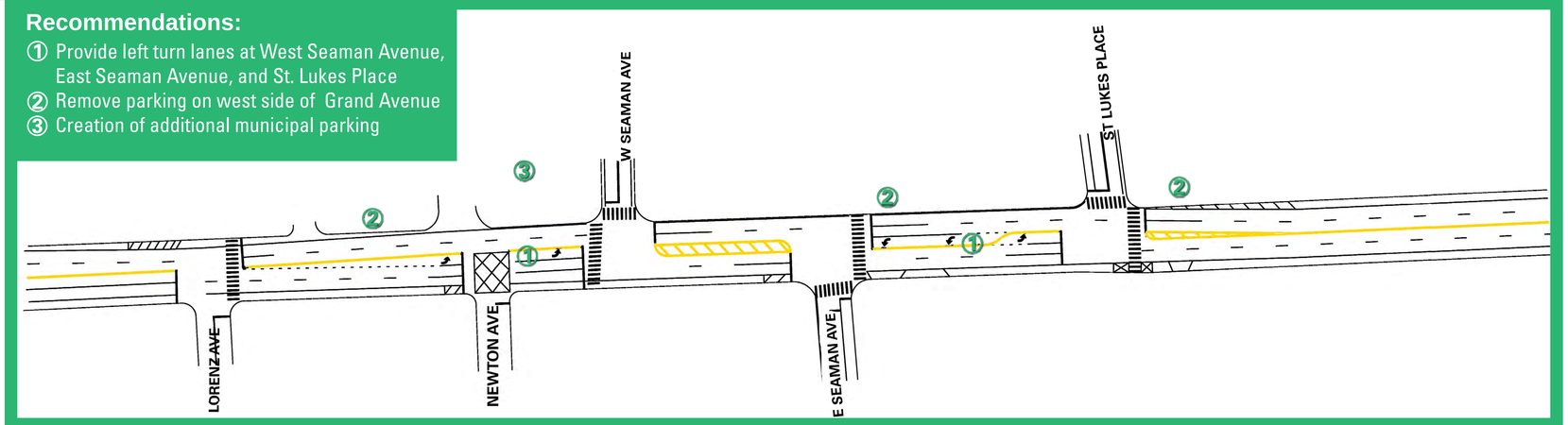


Road Diet Limits

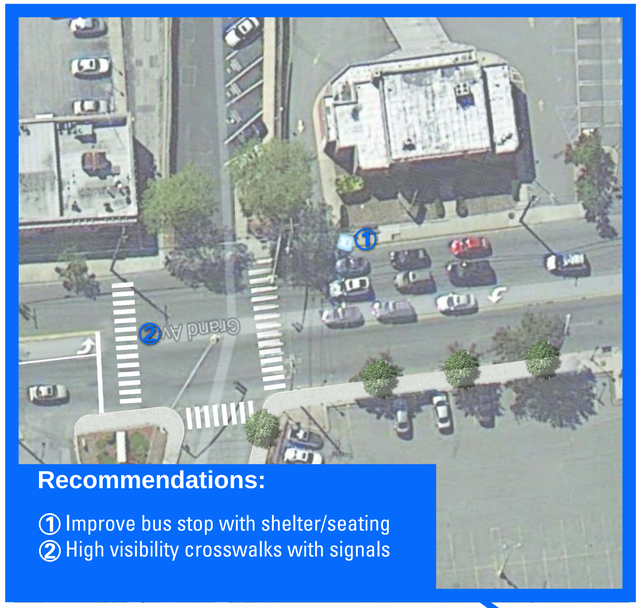
WEST SEAMAN AVENUE/EAST SEAMAN AVENUE/ST. LUKES PLACE

Recommendations:

① Provide left turn lanes at West Seaman Avenue, East Seaman Avenue, and St. Lukes Place
② Remove parking on west side of Grand Avenue
③ Creation of additional municipal parking



HIGH SCHOOL DRIVE



Recommendations:

① Improve bus stop with shelter/seating
② High visibility crosswalks with signals

PATHMARK DRIVEWAY

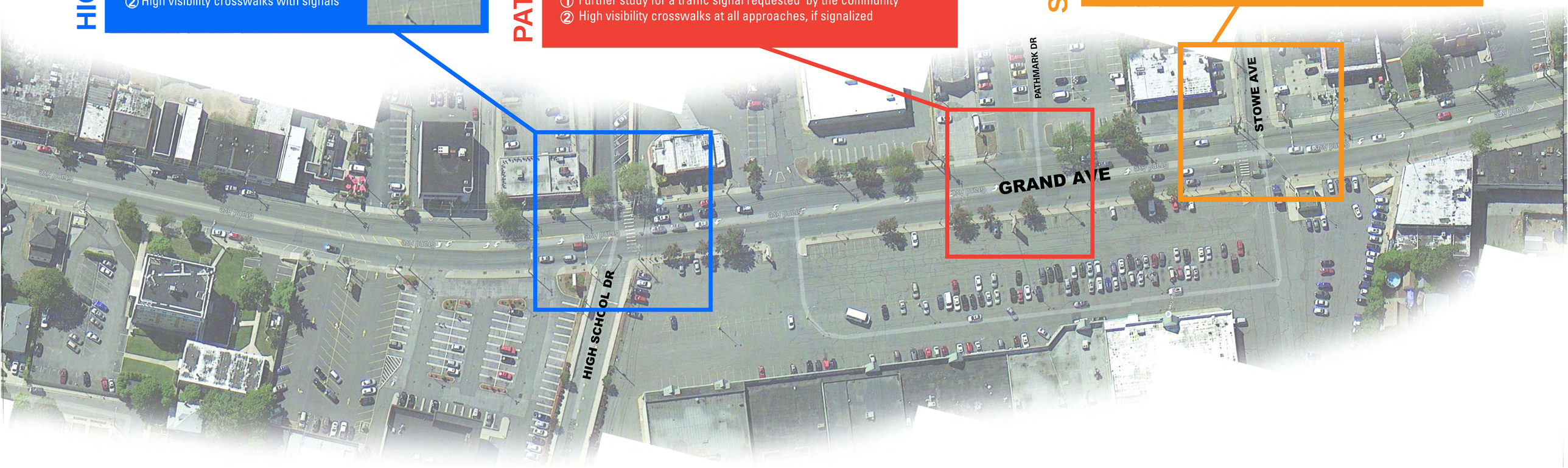
Recommendations:

① Further study for a traffic signal requested by the community
② High visibility crosswalks at all approaches, if signalized

STOWE AVENUE

Recommendations:

① High visibility crosswalks at all approaches



EXISTING CONDITION

Recommendations:

① Extend curbs, improve pedestrian space/circulation
② Improve bus stop with shelter/seating
③ High visibility crosswalks with shorter crossing distance and pedestrian enhancements