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Transportation Improvement Study

Lakewood Township
Ocean County, New Jersey

May 2017

Prepared For

Township of Lakewood
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I. EXECUTIVE SUMMARY

This comprehensive Transportation Improvement Study has been prepared for the Township of Lakewood to evaluate transportation facilities, circulation, parking, and policy within the Township. The Transportation Improvement Study identifies existing problematic traffic conditions and recommends infrastructure solutions. This Study offers an opportunity to determine potential short-term, medium-term, and long-term improvement goals. By evaluating the improvements by priority, simple yet beneficial improvements can be quickly implemented and long-term improvements can be planned appropriately.

Community Outreach was and continues to be a key component to the success of the Transportation Improvement Study. The input and interest from business owners, community leaders, and residents had a beneficial effect to determine critical capacity and operational issues, recommendations and future operations. The following community outreach tools were implemented since January 2017:

- Communication through Phone Text Line established for the project.
- Communication through Voicemail established for the project.
- Communication through email established for the project.
- Tri-fold Brochures were provided to the public.
- Community Meetings with Senior Citizen Groups, Business Owners, Education Institutions, and the Local Press.
- Meetings with NJDOT on Ocean County Engineering Department.
- A public Traffic Relief Workshop held at the Township Municipal Building.

The public outreach provided insight from participants to collaborate with on solutions, ideas, and opportunities to help improve traffic operations throughout Lakewood Township. Using this information, previous traffic study data and field observations, the priorities of recommended improvements was established. The following categories of improvements have been recommended:

- Short-Term Parking Solutions
- Intersections that may benefit from All-Way Stop Control
- Intersection that may benefit from Traffic Signal Control
- Intersections that may benefit from Striping Improvements to Increase Capacity
- Intersections that may benefit from Pedestrian, Safety and Traffic Calming Upgrades
- Intersections that may benefit from Significant Traffic Signal or Roadway Widening.
- Potential Roadway Corridor Improvements
- Roadway Extensions and Bypasses
- Downtown Circulation
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- Designated Bus Stops

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- Residential Site Improvement Standards
- Development Management
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II. LAKEWOOD HISTORY

Image of Lake Carasaljo

The Township of Lakewood is a municipality located in Ocean County, New Jersey and neighbors Howell Township, Monmouth County to the north, Brick Township to the east, Jackson Township to the west and Toms River to the south. The primary regional highways traversing through Lakewood Township are Route 9, Route 70, Route 88 and the Garden State Parkway.

The Township of Lakewood is ranked as the 7th largest municipality in New Jersey, in terms of population. Based upon the US Census, the population has raised from 60,352 residents in 2000 to 92,843 residents in 2010. The estimated 2015 population is 99,262 residents. The Lakewood Township population increase consists of an increase in of Orthodox Jewish, Latino and senior citizen communities over the past 10 years. The Orthodox Jewish population comprises more than half of Lakewood Township's population. Lakewood Township is the center to one of the largest Yeshivas in the world, Beth Medrash Govoha.

Lakewood Township contains several parks, lake and recreational areas. Within Lakewood, there is Lake Carasaljo, the Ocean County Park, Lake Shenandoah County Park, Pine Park, the John F. Patrick Sports Complex and other municipal parks.

Lakewood Township is home to many art, cultural and sporting venues. The Strand, located at the intersection of Clifton Avenue and 4th Street, is a local theater and arts center established in 1922. The Lakewood BlueClaws, minor baseball league, play at the FirstEnergy Park, which is located between Pine Street and Cedar Bridge Avenue (CR 528) at the roadways' intersections with New Hampshire Avenue (CR 623). Lakewood Township also has an airport for private planes located off of Cedar Bridge Avenue (CR 528).

There is a significant mix of residential, educational, small business, commercial and industrial land uses throughout the Township. Many municipal services are provided throughout the Township including the municipal government building, post office, police, fire and emergency services.

The mix of historical areas, recreational areas and mixed-use developments makes traffic infrastructure and operations important to quality of life and sustainability.

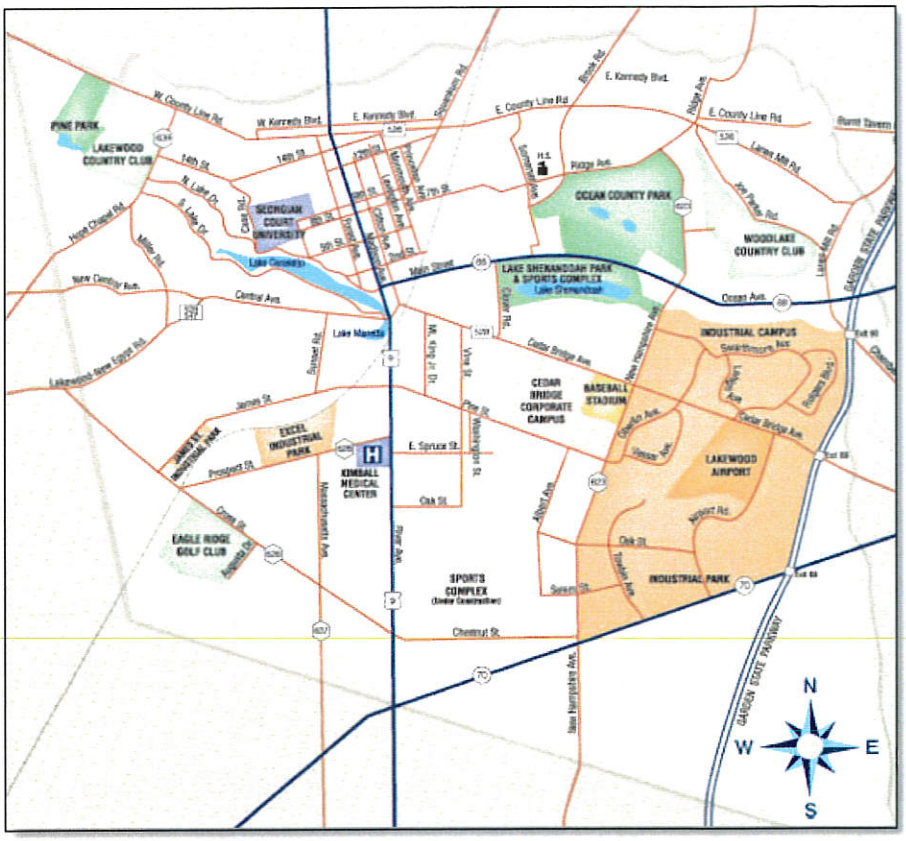
III. PROBLEM STATEMENT

Traffic Congestion

The unprecedented demographic growth brings many challenges, namely, traffic congestion to the Township. Traffic congestion can occur within roadway networks when the travel demand begins to exceed the roadway or intersection capacity. When traffic congestions occurs typical impacts include slower vehicular speeds, longer travel times, increased vehicular queueing, reduced gas mileage, increased emissions, and a reduction in safety.

There is a need for improved operations and safety along major roadways within the study area to improve local and regional traffic progression and reduce diversions into residential and local areas.

Lakewood Township Street Hierarchy Map[1]



Short-Term Parking Conflicts at Intersections

Locations where on-street parking may block existing roadway or intersection capacity have been identified within this study. Intersection efficiency and capacity can be impacted when existing roadway pavement is blocked. Therefore, short-term solutions have been identified to allow the capacity of the existing infrastructure to operate as designed.

Specific Oversaturated Intersections and Roadways

The efficiency with which an intersection and roadway operates is a function of volume and capacity. The capacity of an intersection is the volume of vehicles it can accommodate during a peak hour. Operational level of service of an intersection and roadway is based upon characteristics such as freedom to maneuver, traffic interruption, comfort and convenience.

Traffic congestion can originate from specific oversaturated intersections or roadway bottlenecks that create a queue interaction known as "spillback." A primary focus of this Transportation

[1] http://www.lakewoodnj.gov/maps.php

Improvement Study is to identify the oversaturated intersections that once improved, may have a significant benefit to traffic operations throughout a corridor or other intersections.
Left-turn maneuvers off of mainline corridors can also increase queueing when there are not dedicated turning spaces or a by-pass shoulder. Locations where striping improvements can be retrofitted into the existing pavement width as well as locations where widening and potential property dedication may be required have been identified.

Incomplete Corridors

The Township of Lakewood has many primary routes throughout the study area that service both regional and local traffic. However, several of the primary routes terminate and originate at various intersections. The termination of regional routes requires multiple turning maneuvers at other intersections to allow motorists to get to their ultimate destination. Route 9 is the only north-south corridor that traverses from the northern municipal boundary to the southern municipal boundary. This study reviews other north-south routes that may alleviate the traffic burden on Route 9 if extended.

Downtown Circulation

Lakewood Township has a grid street system encompassing Route 88 to the south, Kennedy Boulevard to the north, Lakewood Avenue/Forest Avenue to the west and Princeton Avenue/Shafto Avenue to the east. North of Carey Street the land uses are primarily residential. South of Carey Street is the downtown area where there is a mix of land uses. The primary north-south roadways are Forest Avenue, Route 9, Clifton Avenue, Lexington Avenue, Monmouth Avenue and Princeton Avenue.

The majority of the roadways are two-way streets in the downtown area with a few exceptions where there is a change between one-way and two-way traffic flow. 2nd Street is one-way eastbound between Clifton Avenue and Lexington Avenue. 3rd Street is one-way westbound between Clifton Avenue and Lexington Avenue. Lexington Avenue is one-way southbound between 1st Street and Route 88.

Downtown Parking

Maser Consulting reviewed previous reports by others containing parking occupancy counts throughout the downtown area. There is on-street parking on blocks within the downtown area that are at capacity. Over capacity parking typically leads to additional traffic when a vehicle is circulating for a vacant on-street parking space.

Other Considerations

This Study also reviews other notable concerns such as community bussing/mass transit, alternate modes of transportation and commuting, and policy.

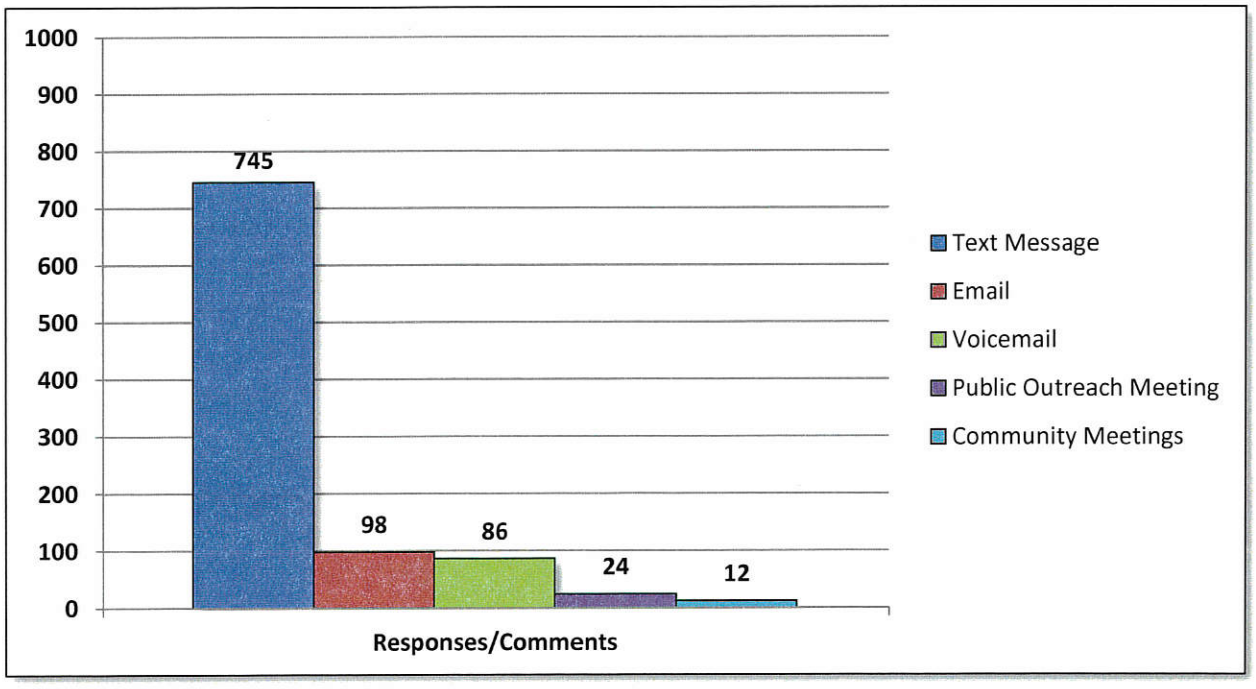
IV. PUBLIC OUTREACH

Community Outreach was and continues to be a key component to the success of the Transportation Improvement Study. The input and interest from business owners, community leaders, and residents had a beneficial effect to determine critical capacity and operational issues, recommendations and future operations. The following community outreach tools were implemented since January 2017:

- Communication through Phone Text Line established for the project.
- Communication through Voicemail established for the project.
- Communication through email established for the project.
- Tri-fold Brochures were provided to the public.
- Community Meetings with:
  - Senior Citizen Groups
  - Business Owners
  - Education Institutions
  - Local Press.
- Meetings with NJDOT and Ocean County Engineering Department.
- A public Traffic Relief Workshop held at the Township Municipal Building.

The public outreach provided insight from participants to collaborate with on solutions, ideas, and opportunities to help improve traffic operations throughout Lakewood Township. In total, over 1074 individual comments were obtained from the public between January 2017 and April 2017. The graph below details the forms of commutation that were received by the public.

Graph – Public Outreach Forms of Communication



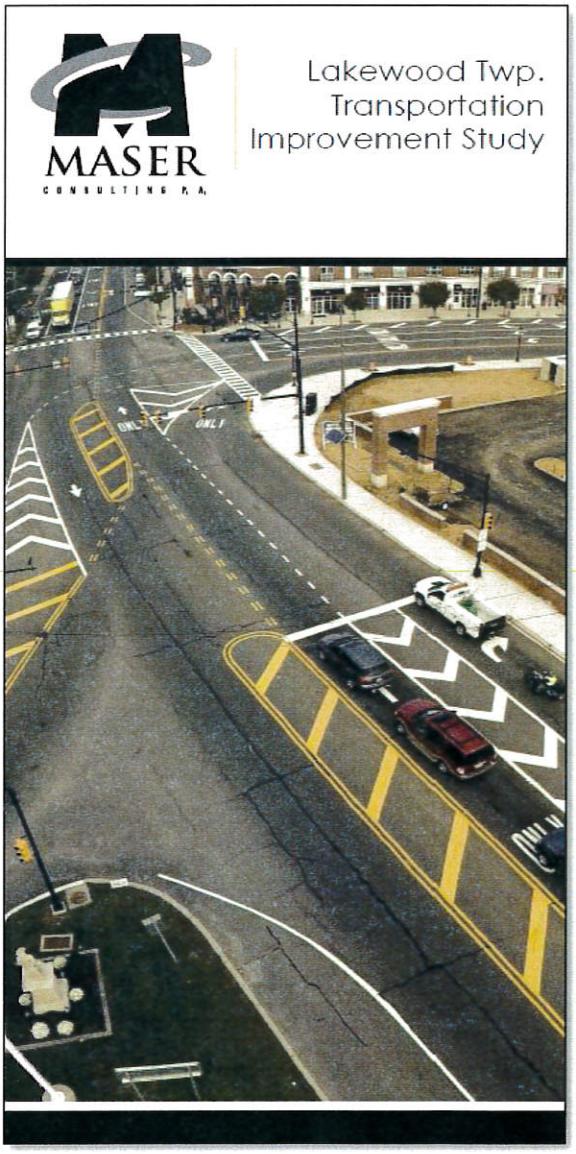
Phone Text/Voicemail and Email

A phone number with the ability to receive texts and voicemails was specifically created for the Transportation Improvement Study. The phone number was provided to the municipality, local press, local communities and groups, and provided in a tri-fold brochure that was available to the public since January.

The public accessible phone number and email was established to obtain ideas, recommendations, concerns and any traffic related information important to each resident. Our project team provided guidance to the public to be as specific as possible and to include details such as: the exact subject location(s), turning movements (i.e. eastbound left-turn), improvement ideas, and any other important factors.

At the end of April 2017, 745 text messages, 98 emails and 86 voicemails were received from the public.

Tri-Fold Brochure for the Transportation Improvement Study



Community Meetings

Approximately twelve community meeting were held with Senior Citizen Groups, Business Owners, Educational Institutions, and the Local Press.

Meetings with NJDOT and Ocean County

Maser Consulting, Lakewood Township officials and the Lakewood Township Police Department met with NJDOT as well as Ocean County over several meetings to discuss improvements to intersections along State and County Routes. Short-term and long-term improvements were formally recommended to NJDOT and Ocean County.

Public Traffic Relief Workshop

A collaborative public traffic relief workshop was held in the Auditorium of the Lakewood Township Municipal Building on Wednesday, March 25, 2017 from 7PM to 9PM. Multiple committeemen from Lakewood Township, Maser Consulting professionals and members of the public worked together to discuss ideas, strategies, and action items to improve transportation in Lakewood Township.

The Traffic Relief Workshop was scheduled for the half-way milestone between the project initiation and the preparation of this study to present current idea and concept formulate by Maser Consulting and obtain feedback from the public. Additionally, new information was gathered and discussed, which strengthened the recommendations and findings of the Transportation Improvement Study.

Two workshop groups were formed based upon geographic location. Members of the public were encouraged to redline large aerials, discuss transportation strategies and recommendations were written down and included within this study. A member of the public in each group was designated a "spokesperson" for the group and presented the findings. The two inset images to the right are of the two discussion groups at the Traffic Relief Workshop.

Traffic Relief Workshop – Group 'A' Discussion Session

Traffic Relief Workshop – Group 'B' Discussion Session

V. EXISTING AND FUTURE CONSIDERATIONS

Existing Information and Field Investigations

Existing conditions information other than provided by the public was obtained from other transportation related studies commissioned by the Township of Lakewood as well as field investigations and traffic audits.

Previous Traffic Studies

The Township of Lakewood has commissioned many comprehensive traffic studies over the past years. These studies were reviewed and found to be consistent with nationally acceptable engineering principles. Additionally, the regional planning study for Route 9 prepared by the North Jersey Transportation Planning Authority (NJTPA) was reviewed. The following studies were reviewed:

- Township of Lakewood – Capital Improvement Plan for Transportation Infrastructure – Transportation Improvement Districts 1 & 2, prepared for the Township of Lakewood, prepared by T&M Associates, dated August 12, 2014.
- Downtown Parking Strategic Plan, prepared for the Township of Lakewood, prepared by T&M Associates, dated April 28, 2011.
- Downtown Lakewood – Traffic and Pedestrian Circulation Study, prepared for the Township of Lakewood, prepared by T&M Associates, dated July 16, 2009.
- US Route 9 Corridor Study – Managing and Accommodating Growth in Lakewood and Toms River, prepared by the North Jersey Transportation Planning Authority, Draft Format.

Field Investigation and Traffic Audit

Approximately five separate on-site field investigations occurred from January 2017 to April 2017. The field investigations were conducted within the Township of Lakewood to obtain an inventory of existing roadway conditions, posted traffic controls, adjacent land uses, lane configurations, and existing vehicular/pedestrian traffic patterns as well as perform photo logs.

Photograph of Field Audit along 7th Street

Photograph of Field Audit along Oak Street

A comprehensive traffic audit was conducted on March 2, 2017 during the morning and mid-day peak hours with engineers from Maser Consulting and members of the Lakewood Township Police Department. The traffic audit began at the Lakewood Township Municipal Building around 8:00 AM. Congested traffic area were observed and photo logged in the downtown area, along the east-west corridors (e.g. Pine Street, Oak Street, Route 88, County Line Road, Cedar Bridge Avenue, Cross Street, etc.) and the north-south corridors (e.g. Route 9, New Hampshire Avenue, Vine Street, Lexington Avenue, Clifton Avenue, Clover Street, etc.). Additionally, the traffic conditions west of Route 9 including Forest Avenue, N. Lake Drive, and Lakewood Avenue were also observed.

Future Developments to Consider

Developments Currently in Construction

Commercial Development Locations

- Northeast corner of County Line Road (CR 526) & Brook Road

Residential Development Locations

- County Line Road (CR 526) between Brook Road and Ridge Avenue (CR 623)
- Lanes Mill Road (CR 526) between Alamitos Drive and Lanes Mill Road (CR 549)
- New Hampshire Avenue (CR 623) between America Avenue and Cedar Bridge Avenue (CR 528)
- Cross Street (CR 626) between Damiano Way and Route 9
- Prospect Street (CR 628) between Cross Street (CR 626) and Havenwood Court
- Prospect Street (CR 628) between Havenwood Court and Summer Avenue
- Oak Street just east of Route 9

Approved or Anticipated Developments

Commercial Development Locations

- Wawa Convenience Market along Route 9 between Prospect Street (CR 628) and Buttell Avenue

Residential Development Locations

- Prospect Street (CR 628) between Williams Street and Massachusetts Avenue (CR 637)
- Oak Street between Route9 and Vine Street (Two developments)
- Mixed residential-retail land use at the southwest corner of Route 9 & Cross Street (CR 626)
- Mixed residential-retail land use at along Route 70 adjacent to Vermont Avenue (Two developments)
- Route 70 between Vermont Avenue and Route 9
- Pine Street between Eagle Lane and Albert Avenue

Pending Developments

- CAFRA application along Cross Street
- Campus application along Cross Street
- Retail Center along Avenue of the States

Specific consideration as given to the infrastructure surrounding these areas to account for future traffic growth.

VI. SHORT-TERM PARKING SOLUTIONS AT INTERSECTIONS

Locations where on-street parking may block existing roadway or intersection capacity have been identified within this study. Intersection efficiency and capacity can be impacted when existing roadway pavement is blocked. Therefore, short-term solutions have been identified to allow the capacity of the existing infrastructure to operate as designed.

Parking Prohibition at Stop Signs

Parking should be prohibited adjacent to any the turn lanes with a storage length and access driveways. Additionally, based upon Section 39:4-138 of the New Jersey Administrative Code (NJAC), parking within 50' of a stop sign is prohibited. NJAC Section 39:4-138 states:

> *"Except when necessary to avoid conflict with other traffic or in compliance with the directions of a traffic or police officer or traffic sign or signal, no operator of a vehicle shall stand or park the vehicle in any of the following places: Within 50 feet of a "stop" sign."*

To improve the effectiveness of this regulation, parking should be prohibited by using MUTCD (R7-1) "No Parking Anytime ←" signs at the beginning of the parking prohibition and yellow painted curb should be implemented from the sign to the intersection.

Yellow No Parking Curb Paint[2]

MUTCD (R7-1)

[2] https://safety.fhwa.dot.gov/intersection/conventional/signalized/fhwasa13027/images/e93.png

Parking Prohibitions at Congested Intersections

Additional parking prohibition distances were based upon the anticipated existing demand and queueing at the intersection. Parking should be prohibited by using MUTCD (R7-1) "No Parking Anytime ←" signs at the beginning of the parking prohibition and yellow painted curb should be implemented from the sign to the intersection.

The following table details the roadway location, cross street and length of recommended parking prohibition. Please note, recommendations to significantly modify corridor cross-sections are provided in a later section of this report.

Table 1 – Short-Term Parking Prohibition at Intersections

Roadway to Prohibit Parking	Roadway's Intersection with	Parking Prohibition Length	Jurisdictional Note
Cross Street / Chestnut Street	Route 9	Adjacent to turning lanes + 150' from intersection	May require NJDOT notification
Finchley Boulevard / Ford Avenue	Route 9	100' from intersection	May require NJDOT notification
Oak Street	Route 9	250' from intersection	May require NJDOT notification
Spruce Street	Route 9	250' from intersection	May require NJDOT notification
James Street	Route 9	250' from intersection	May require NJDOT notification
1st Street	Route 9	100' from intersection	May require NJDOT notification
2nd Street	Route 9	100' from intersection	May require NJDOT notification
3rd Street	Route 9	100' from intersection	May require NJDOT notification
4th Street	Route 9	100' from intersection	May require NJDOT notification
5th Street	Route 9	100' from intersection	May require NJDOT notification
6th Street	Route 9	100' from intersection	May require NJDOT notification
7th Street	Route 9	100' from intersection	May require NJDOT notification
8th Street	Route 9	100' from intersection	May require NJDOT notification
9th Street	Route 9	100' from intersection	May require NJDOT notification
10th Street	Route 9	100' from intersection	May require NJDOT notification
11th Street	Route 9	100' from intersection	May require NJDOT notification
Chestnut Street	New Hampshire Avenue	500' from intersection	May require County notification
Oak Street	New Hampshire Avenue	250' from intersection	May require County notification
Spruce Street	New Hampshire Avenue	250' from intersection	May require County notification
Pine Street	New Hampshire Avenue	Adjacent to turning lanes + 250' from intersection	May require County notification
7th Street	Ridge Avenue	100' from intersection	May require County notification
Ridge Avenue	7th Street	100' from intersection	May require County notification
7th Street	Somerset Avenue	100' from intersection	May require County notification
Somerset Avenue	7th Street	100' from intersection	May require County notification
Park Avenue	Route 88	100' from intersection	May require NJDOT notification
Clover Street	Route 88	(NB) 300' from intersection, (SB) 150' from intersection	May require NJDOT notification
Holly Street	Route 88	100' from intersection	May require NJDOT notification
Linden Avenue	Route 88	100' from intersection	May require NJDOT notification
Park Avenue	County Line Road	200' from Intersection	May require County notification
Clover Street	Cedar Bridge Avenue	350' from intersection	May require County notification
MLK Drive	Cedar Bridge Avenue	250' from intersection	May require County notification
Pine Street	MLK Drive	150' from intersection	-
14th Street	Hope Chapel Road	150' from intersection	-

VII. POTENTIAL INTERSECTION IMPROVEMENTS

Transportation Improvements to specific intersections were reviewed at over 100 locations within the Township of Lakewood. The priority of improving existing intersections was based upon amount of public input, anticipated cost, right-of-way impact, time to implement, anticipated enhancement to traffic operations, and amount of vehicles that the improvements will benefit. The following subsections are categorized in the following manner:

- Intersections that may benefit from All-Way Stop Control;
- Intersections that may benefit from a Traffic Signal;
- Intersections that may benefit from Striping Improvements to increase Capacity;
- Intersections that may benefit from Pedestrian, Safety and Traffic Calming Upgrades; and
- Intersections that may benefit from Significant Traffic Signal or Roadway Widening.

Intersections that may benefit from All-Way Stop Control

A motorist approaching an all-way stop is required to come to a full stop, yield the right-of-way to any other vehicles stopped and then can enter the intersection. Pedestrians have right-of-way priority at a crosswalk at an all-way stop controlled intersection. All-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. Safety concerns associated with all-way stops include pedestrians and all road users expecting other road users to stop. All-way stop control is used where the volume of traffic on the intersecting roads is approximately equal.

The Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) defines the warrant standards required for the application of all-way stops. The MUTCD provides guidance and other considerations to warrant an All Way Stop Control (ASWC) application. MUTCD Section 2B.07 provides the following guidance:

> *"The decision to install multi-way stop control should be based on an engineering study. The following criteria should be considered in the engineering study for a multi-way STOP sign installation:*
>
> *B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*
>
> *C. Minimum volumes:*
>
> *1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*
>
> *2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour."*

Section 2B.07 of the MUTCD states the following criteria may be considered to warrant an AWSC application:

A. *The need to control left-turn conflicts;*
B. *The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;*
C. *Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and*
D. *An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-stop control would improve traffic operational characteristics of the intersection.*

STOP Sign and ALL WAY Plaque

If an all-way stop has been determined to be warranted based upon volume, operation or safety, the intersection can be signed at all approaches to the intersection with a "Stop" (R1-1) sign and a supplemental "ALL WAY" (R1-3P) plaque. Additionally, if warranted, it also recommended to stripe stop bars. Sight distance shall be provided so that a motorist stopped at any approach can see at least one car at all of the other approaches.

According to the New Jersey Administrative Code, local municipalities have the authority to establish all-way stop control (AWSC) at local intersections but the MUTCD warrant shall be met. Installation of an all-way stop should be based on a traffic engineering study to determine if minimum warrant criteria are satisfied. Therefore, it is recommended for the Township of Lakewood to commission warrant reports, engineer certifications, and design plans for the following intersections in support of AWSC to improve safety and/or operations. The intersections are listed by priority based upon reviewed volumes, street hierarchy and public input.

Clifton Avenue & 7th Street

In reviewing the street hierarchy in the downtown area, 7th Street is a major collector roadway providing access from Route 9 to Ridge Avenue and then to Lanes Mill Road (CR 526). Currently, 7th Street has stop control and Clifton Avenue, another major collector roadway, does not stop. Since the roadways both support local and regional traffic, it is anticipated that the volumes are fairly balanced and would warrant an AWSC.

Clifton Avenue & 7th Street and Lexington Avenue & 7th Street

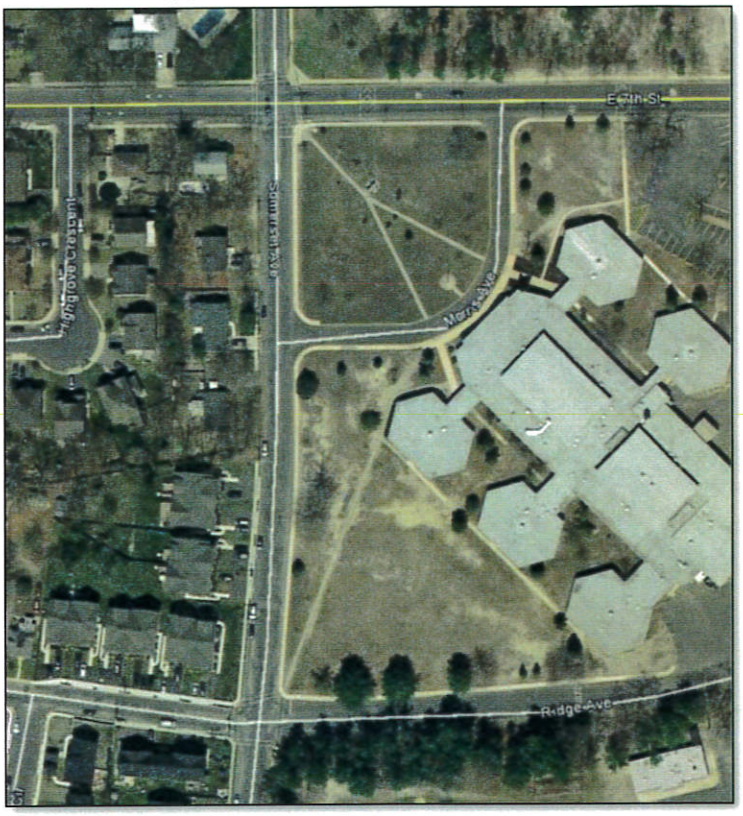
Lexington Avenue & 7th Street

In reviewing the street hierarchy in the downtown area, 7th Street is a major collector roadway providing access from Route 9 to Ridge Avenue and then to Lanes Mill Road (CR 526). Currently, 7th Street has stop control and Lexington Avenue, another major collector roadway, does not stop. Since the roadways both support local and regional traffic, it is anticipated that the volumes are fairly balanced and would warrant an AWSC.

Somerset Avenue & Ridge Avenue

Somerset Avenue and Ridge Avenue both have frontage along the Lakewood Township Middle School. This area has significant pedestrian activity as there are residential land uses to the west. Additionally, both roadways operate at major collector roadways proving access to County Line Road to the north and Route 88 to the south. Based upon the proximately to the Lakewood Township Middle School and mix of pedestrian and balanced vehicular demand, it is anticipated that AWSC could be justified and improve pedestrian mobility. The certification for this intersection will have to reflect the proximity of the school as required in the New Jersey Administrative Code.

Somerset Avenue & Ridge Road and Somerset Avenue & 7th Street



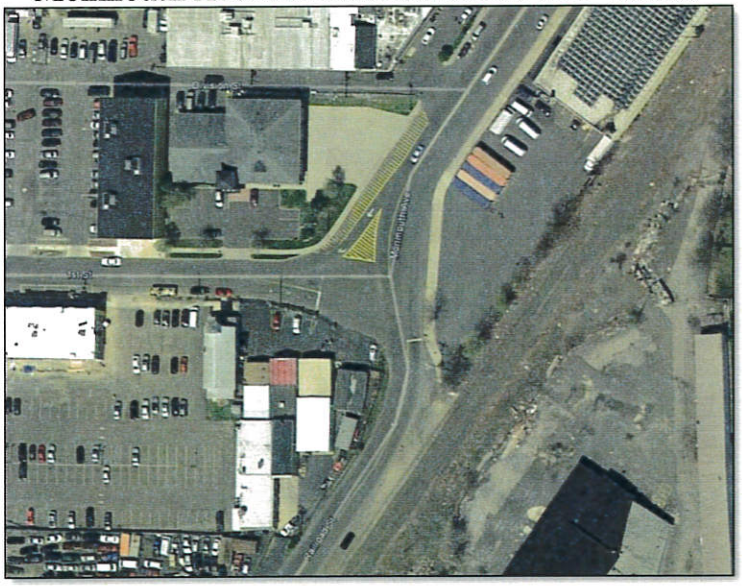
Somerset Avenue & 7th Street

Somerset Avenue and 7th Street both have frontage along the Lakewood Township High School. This area has significant pedestrian activity as there are residential land uses to the southwest. Additionally, both roadways operate at major collector roadways proving access to County Line Road to the north and Route 88 to the south. Based upon the proximately to the Lakewood Township High School and mix of pedestrian and balanced vehicular demand, it is anticipated that AWSC could be justified and improve pedestrian mobility. The certification for this intersection will have to reflect the proximity of the school as required in the New Jersey Administrative Code.

Monmouth Avenue / Railroad Street & 1st Street

Monmouth Avenue / Railroad Street has horizontal 'S' curve bend at the intersection with 1st Street creating a 'Y' shaped intersection. Currently, there is stop control on 1st Street EB and Railroad Street NB but Monmouth Avenue SB is free. This unconventional traffic control at a location where the horizontal alignment of the roadway shifts poses safety concerns. The current configuration may be confusing to motorists traversing through the intersection. Due to safety concerns, it is recommended to move forward with a warrant analysis to implement AWSC.

Monmouth Avenue / Railroad Street & 1st Street



Washington Avenue & Spruce Street

Currently, Washington Avenue has two-way stop control at Spruce Street. The primary commuter pattern through this intersection is Washington Street SB right and Spruce Street EB left. However, Washington Avenue provides access to a residential land use to the south. Spruce Street WB does not have a significant traffic volume.

Washington Avenue & Spruce Street

The Vine Street extension is anticipated to intersect Spruce Street just west of this intersection, potentially reducing the amount of Spruce Street EB left-turns. At this time, it is **not** recommended to install an AWSC due to the close proximity to the future Vine Street extension. However, it is critical to reevaluate the future design and control of this intersection during the Vine Street extension project.

Intersections that may benefit from Traffic Signals

In order to install a traffic signal at a given intersection, consideration is given to Chapter 4C, "Traffic Control Signal Needs Studies" of the MUTCD. This manual provides a standard for traffic control devices (such as traffic signals) in order to present a recognizable, predictable traffic control throughout the United States. Specifically, the MUTCD requires that specific traffic warrants be met in order to justify the installation of a traffic signal. According to the MUTCD, at least one of the eight traffic signal warrants must be met in order to consider an intersection for the installation of a traffic signal.

These traffic control signal warrants are the following:

- *Warrant 1 - Eight Hour Vehicular Volume*
- *Warrant 2 - Four-Hour Vehicular Volume*
- *Warrant 3 - Peak Hour*
- *Warrant 4 - Pedestrian Volume*
- *Warrant 5 - School Crossing*
- *Warrant 6 - Coordinated Signal System*
- *Warrant 7 - Crash Experience*
- *Warrant 8 - Roadway Network*

It should be noted that engineering judgment must be applied to the respective warrant criteria to ensure proper application in particular instances. According to the New Jersey Administrative Code, local municipalities have the authority to establish traffic signals at local intersections but the MUTCD warrant shall be met. Ocean County and/or NJDOT will have to permit and approve the installation of any traffic signals at intersections under their jurisdiction.

Installation of a traffic signal should be based on a traffic engineering study to determine if minimum warrant criteria are satisfied. Therefore, it is recommended for the Township of Lakewood to commission traffic signal warrant reports, engineer certifications and design plans for the following intersections in support of traffic signal control improve safety and/or operations. The intersections are listed by priority based upon reviewed volumes, public input, safety, jurisdiction, costs and right-of-way impacts.

Local Intersections

Pine Street & Dr. Martin Luther King Drive

Pine Street & Dr. Martin Luther King Drive is a three-leg intersection controlled by all-way stop signs under Lakewood Township Jurisdiction. Reviewed traffic volumes and field observations determined that there are extensive queue along Dr. Martin Luther King Drive SB and Pine Street WB.

For short-term, parking should be prohibited along Pine Street and MLK Drive SB adjacent to the turn lanes within 150' of the intersection. Utilization of MUTCD (R7-1) "No Parking Anytime ←" signs as well as yellow painted curb are recommended to properly enforce the parking regulations.

It is recommended to conduct a traffic signal warrant analysis. If warranted, construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. Within the existing pavement width, it is suggested to review the ability to construct a Pine Street WB right-turn lane with an overlap phase and a Pine Street EB by-pass shoulder. The Pine Street WB right-turn lane will mitigate queue along Pine Street and the Pine Street EB by-pass shoulder will provide a safety opportunity for through vehicles to maneuver around left-turn vehicles.

In conjunction with a traffic signal at Pine Street & MLK Drive, it is also recommended to implement "DO NOT BLOCK THE BOX" striping and signage along Pine Street at Marc Drive and Forest Park Circle. Due to the anticipated operation, it is recommended to review the installation of a traffic signal at Pine Street & Washington Avenue in conjunction with the Vine Street Extension Project.

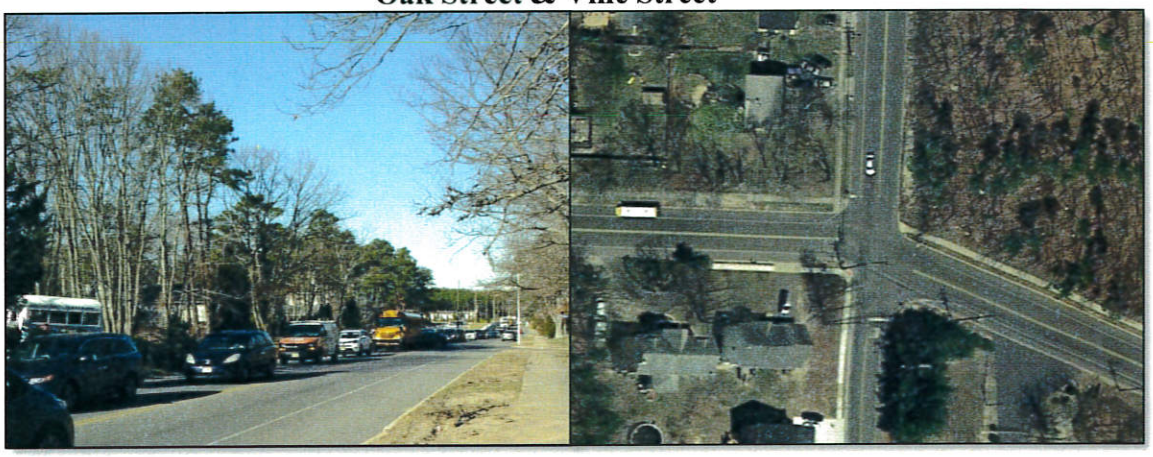
Pine Street & MLK Drive

Oak Street & Vine Street

Oak Street & Vine Street is a four-leg intersection controlled by all-way stop signs under Lakewood Township Jurisdiction. Reviewed traffic volumes and field observations determined that there are extensive queue and failing operations along all four approaches during AM and PM peak hours. Oak Street WB queue lengths over ½ mile observed during AM peak hour. It is recommended to conduct a traffic signal warrant analysis. If warranted, construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. Within the existing pavement width, it is suggested to review the ability to construct an Oak Street EB and WB left-turn lane. Preliminary review indicates it may be feasible to construct either a Vine Street SB left-turn or right-turn lane. Operationally, a Vine Street SB left-turn is preferred; however, geometric roadway conflicts may preclude a left-turn lane. If a Vine Street SB left-turn lane is not feasible from a design standpoint, then a Vine Street SB right-turn lane could be implemented within the existing pavement width.

Parking should be prohibited along Oak Street and Vine Street SB adjacent to the turn lanes and along Vine Street NB within 150' of the intersection. Utilization of MUTCD (R7-1) "No Parking Anytime ←" signs as well as yellow painted curb are recommended to properly enforce the parking regulations.

Oak Street & Vine Street



Oak Street & Albert Avenue

Oak Street & Albert Avenue is a four-leg intersection controlled by all-way stop signs under Lakewood Township Jurisdiction. This intersection has an existing "roundabout-style" circular median. Field observations determined there is extensive queue along Oak Street EB/WB during AM peak hour. The intersection is currently unconventionally designed with a "roundabout-style" circle median but contains typical all-way intersection geometry and control. It is recommended to conduct a traffic signal warrant analysis. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. Within the existing pavement width, it is suggested to review the ability to construct an Oak Street EB and WB left-turn lane. Within the existing pavement width, it is also recommended to stripe the Albert Avenue NB and SB approaches with adequate capacity for right-turn vehicles to stack adjacent to left-turn and through vehicles.

Parking should be prohibited along Oak Street adjacent to the left-turn lanes and along Albert Avenue within 150' of the intersection. Utilization of MUTCD (R7-1) "No Parking Anytime ←" signs as well as yellow painted curb are recommended to properly enforce the parking regulations.

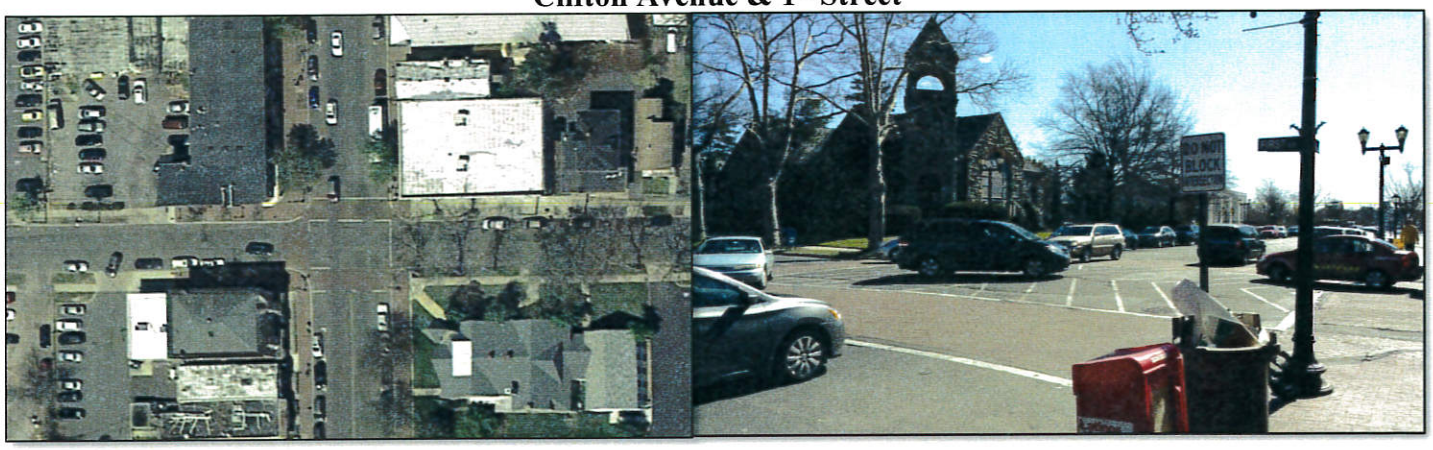
Oak Street & Albert Avenue

Clifton Avenue & 1st Street

Clifton Avenue & 1st Street is a four-leg intersection controlled by two-way stop signs on 1st Street under Lakewood Township Jurisdiction. Field observations determined there is a large commuter pattern between Route 9 and Route 88 that utilize this intersection. Traffic demand is added to 1st Street to traverse between Route 9 and Route 88. It is recommended to conduct a traffic signal warrant analysis. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. Within the existing pavement width, it is suggested to review the ability to construct a Clifton Avenue NB and SB left-turn lane.

Please note, the intersection of Clifton Avenue & 1st Street is located within 500' of Route 88, which will require approval by the NJDOT commissioner. This approval should be obtained via submitting the warrant analysis report and design plans.

Clifton Avenue & 1st Street

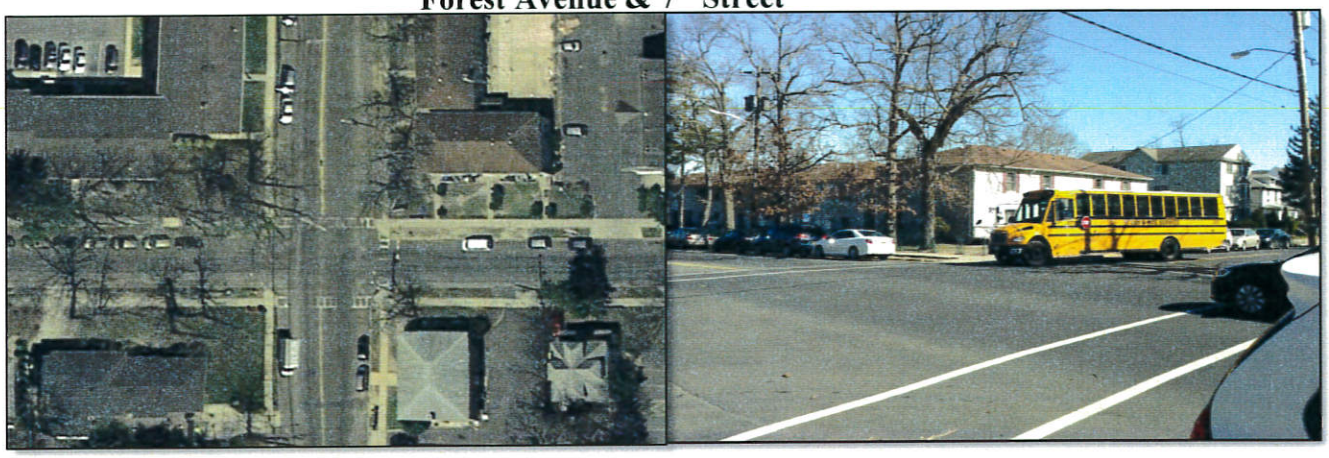


Forest Avenue & 7th Street

Forest Avenue & 7th Street is a four-leg intersection controlled by two-way stop signs on 7th Street under Lakewood Township Jurisdiction. Field observations determined there is a significant pedestrian presence and periodic peaks of traffic flow throughout the daily along both roadways. This intersection serves as a gateway point between traffic flow demands generated by residential and educational institutions. It is recommended to conduct a traffic signal warrant analysis. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. Within the existing pavement width, it is suggested to review the ability to construct a Forest Avenue NB/SB left-turn lane.

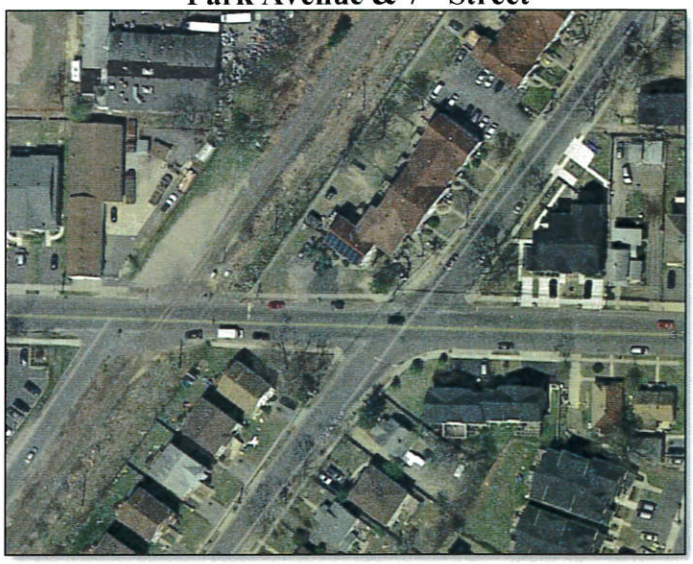
Please note, the intersection of Forest Avenue & 7th Street is located within 580' of Route 9, which typically does not require approval by the NJDOT commissioner unless queue lengths impact Route 9. The operation of a traffic signal should be reviewed in the warrant report to determine if NJDOT approval is or is not needed. Parking prohibitions along all four approaches should be reviewed.

Forest Avenue & 7th Street



Park Avenue & 7th Street

Park Avenue & 7th Street



Park Avenue & 7th Street is a four-leg intersection controlled by stop signs. There is an existing railroad crossing located approximately 200' west of the intersection. Both Park Avenue and 7th Street are major collector roadways. Park Avenue provides connectivity between Route 88 and County Line Road (CR 526). 7th Street provides access from Route 9 to Ridge Avenue and then to Lanes Mill Road (CR 526). A traffic signal is anticipated to enhance right-of-way for Park Avenue.

It is recommended to conduct a traffic signal warrant analysis for the intersection. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. Railroad crossing upgrades including gates and coordination with the traffic signal are anticipated to be necessary to meet current standards, protect the motoring public, and enhance safety. NJDOT commissioner approval and an FRA inventory update will be necessary for the improvements to the railroad crossing.

Park Avenue & 4th Street & Ridge Avenue

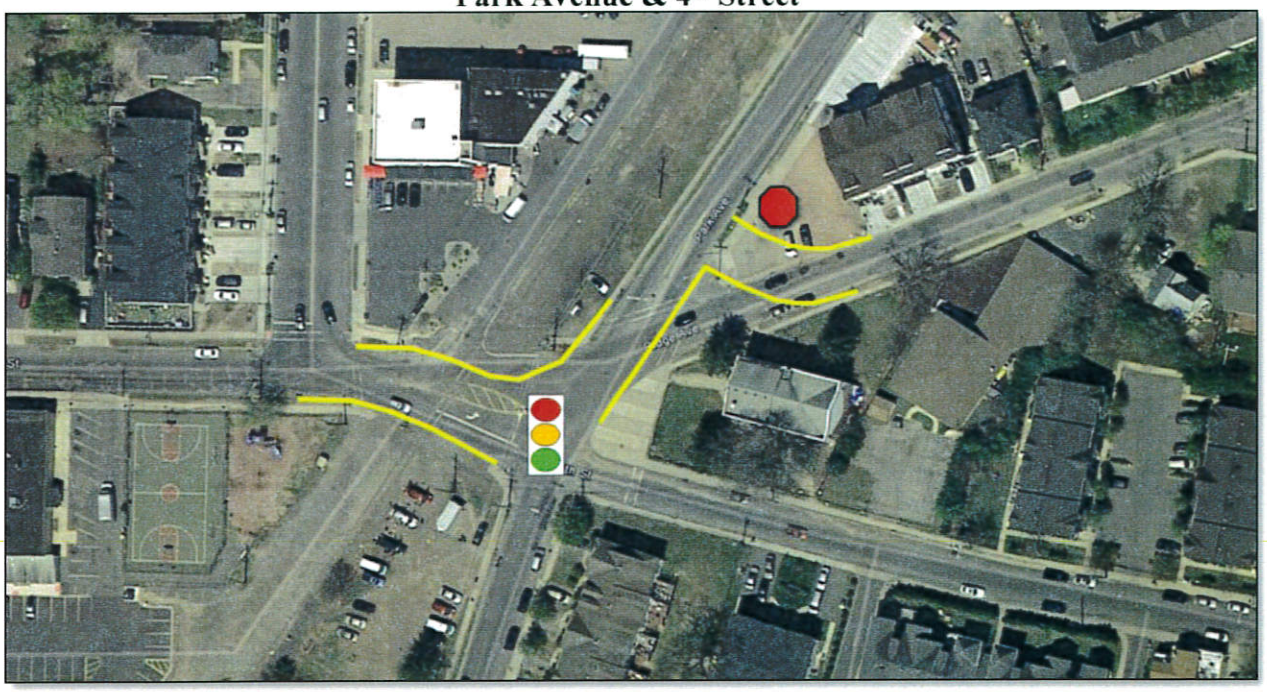
Park Avenue & 4th Street is a multi-leg intersection controlled by stop signs under Lakewood Township Jurisdiction. There are five approaches where Park Avenue, 4th Street and Ridge Avenue intersect. Marys Lane is located 75' from the intersection point and Princeton Avenue is located 150' from the intersection point. Additionally, there is a railroad crossing along 4th Street between Marys Lane and Park Avenue. There is impacted visibility of approaching vehicles and a convoluted interpretation of vehicular right-of-way due to the various angles that the roadways intersect.

Prior to a traffic signal it is recommended to reconfigure the intersections. Park Avenue and 4th Street service the primary transient thoroughfare. Therefore, it is recommended to realign Ridge Avenue to create a separate intersection with Park Avenue. Doing so, creates a proper four-leg intersection with Park Avenue and 4th Street. Partial property dedication will be required for the realignment of Ridge Avenue. Additionally, to reduce conflict it is recommended to terminate Marys Lane prior to Park Avenue.

It is recommended to conduct a traffic signal warrant analysis for the future layout of the Park Avenue & 4th Street intersection. If warranted, it is recommended to construct a traffic signal

with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. Railroad crossing upgrades including gates and coordination with the traffic signal are anticipated to be necessary to meet current standards, protect the motoring public, and enhance safety. NJDOT commissioner approval and an FRA inventory update will be necessary for the improvements to the railroad crossing.

Park Avenue & 4th Street



County Intersections

Any proposed traffic signal will require approval by Ocean County Engineering. All traffic signal warrants and designs are subject to Ocean County Review.

Hope Chapel Road (CR 639) & Miller Road

Hope Chapel Road (CR 639) & Miller Road

A traffic signal at the intersection of Hope Chapel Road (CR 639) & Miller Road is currently in the analysis and design stages with Ocean County. The signalized intersection is anticipated to be coordinated with the two intersections to the north, Hope Chapel Road (CR 639) & N. Lake Drive and Hope Chapel Road (CR 639) & S. Lake Drive.

Approximately half of the peak hour traffic volumes along Hope Chapel Road (CR 639) turn off at Miller Road. As this intersection supports both regional and local Lakewood Township traffic, it is recommended for the Township to continue coordination with Ocean County.

Prospect Street (CR 628) & Massachusetts Avenue (CR 637)

Prospect Street (CR 628) & Massachusetts Ave (CR 637)

A traffic signal at the intersection of Prospect Street (CR 628) & Massachusetts Avenue (CR 637) is currently in the analysis and design stages with Ocean County. The signalized intersection is anticipated to provide dedicated time for left-turn maneuvers.

As this intersection supports both regional and local Lakewood Township traffic, it is recommended for the Township to continue coordination with Ocean County.

Chestnut Street (CR 40) & New Hampshire Avenue (CR 623)

A traffic signal at the intersection of Chestnut Street (CR 40) & New Hampshire Avenue (CR 623) has been discussed with Ocean County. There is a significant need to provide a traffic signal at this location. Chestnut Street (CR 40) EB has been observed to have over 800' of vehicular queue from this intersection during the AM peak hour. The constraint at this intersection is its proximity to Route 70 & New Hampshire Avenue (CR 623).

Chestnut Street (CR 40) & New Hampshire Avenue (CR 623)

It is recommended meeting with the Ocean County Engineer's Office and also to move forward with a traffic impact analysis that analyzes both the intersections of Chestnut Street (CR 40) & New Hampshire Avenue (CR 623) and Route 70 & New Hampshire Avenue (CR 623) to simulate and analyze the queue and operational interaction between the two intersections. This analysis could determine a feasible solution with coordination and advanced clearance intervals. Providing a formal traffic analysis to Ocean County and the NJDOT may significantly progress the installation of a traffic signal.

James Street (CR 32) & Williams Street

James Street (CR 32) & Williams Street is a three-leg intersection controlled by a stop sign on the Williams Street NB approach. There is an existing railroad crossing located approximately 280' west of the intersection crossing James Street (CR 32). Williams Street provides connectivity to residential land uses south of James Street (CR 32). Williams Street is also an alternate route between Route 9 and Prospect Street (CR 628).

James Street (CR 32) & Williams Street

The James Street (CR 32) traffic stream was observed to be very steady during the weekday peak hours. Based upon observation, there were minimal acceptable gaps available for vehicles to enter the mainline traffic stream from Williams Street.

It is recommended to conduct a traffic signal warrant analysis for the intersection. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. The potential to provide a James Street (CR 32) WB left-turn lane within the existing pavement width should be reviewed. Railroad crossing upgrades including gates and coordination with the traffic signal are anticipated to be necessary to meet current standards, protect the motoring public, and enhance safety. NJDOT commissioner approval and an FRA inventory update will be necessary for the improvements to the railroad crossing. All traffic signal warrants and designs are subject to Ocean County Review and Approval.

Prospect Street (CR 628) & Cross Street (CR 626)

Prospect Street (CR 628) & Cross Street (CR 626) is a three-leg intersection controlled by a stop sign on the Cross Street (CR 626) WB approach. Cross Street (CR 626) intersects Prospect Street (CR 628) at an approximate 45 degree angle. There is an existing railroad crossing virtually within the existing intersection crossing Prospect Street (CR 628). Due to potential future developments in the vicinity of this intersection, it is anticipated that the future traffic demand will exceed capacity as all approaches are only one lane.

Prospect Street (CR 628) & Cross Street (CR 626)

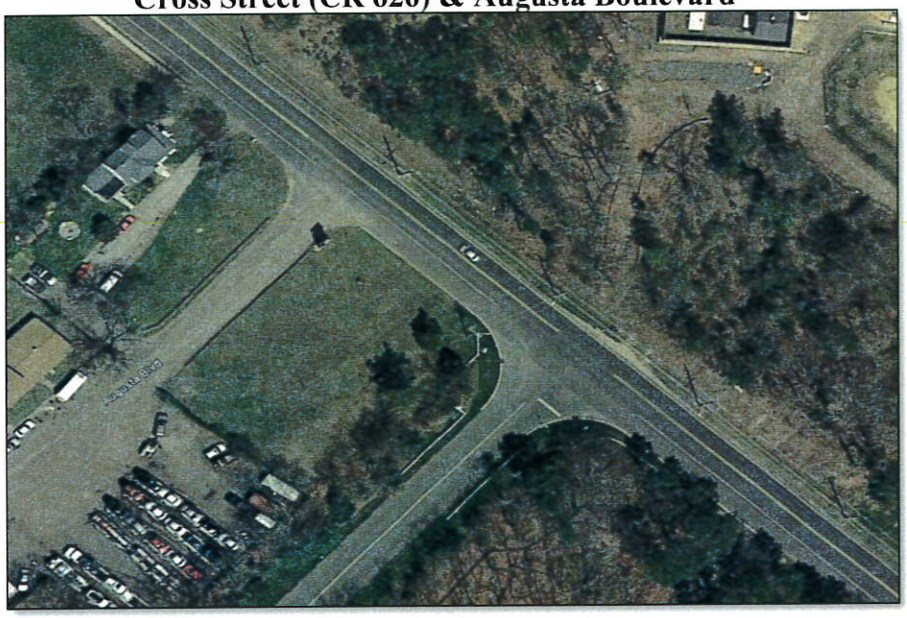
It is recommended to conduct a traffic signal warrant analysis for the intersection. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. Railroad crossing upgrades including gates and coordination with the traffic signal are anticipated to be necessary to meet current standards, protect the motoring public, and enhance safety. NJDOT commissioner approval and an FRA inventory update will be necessary for the improvements to the railroad crossing. All traffic signal warrants and designs are subject to Ocean County Review and Approval.

Cross Street (CR 626) & Augusta Boulevard

Cross Street (CR 626) & Augusta Blvd is a three-leg intersection controlled by a stop sign on the Augusta Blvd NB approach. Augusta Boulevard provides direct access to a large age-restricted community and golf course. Opposite to Augusta Boulevard is a residential community that was recently approved. This access driveway is utilized for connectivity to the west towards New Egypt Road (CR 547).

Due to estimated traffic from future development and that this intersection is utilized by a large age-restricted community, it is recommended to conduct a traffic signal warrant analysis for the intersection. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. All traffic signal warrants and designs are subject to Ocean County Review and Approval.

Cross Street (CR 626) & Augusta Boulevard



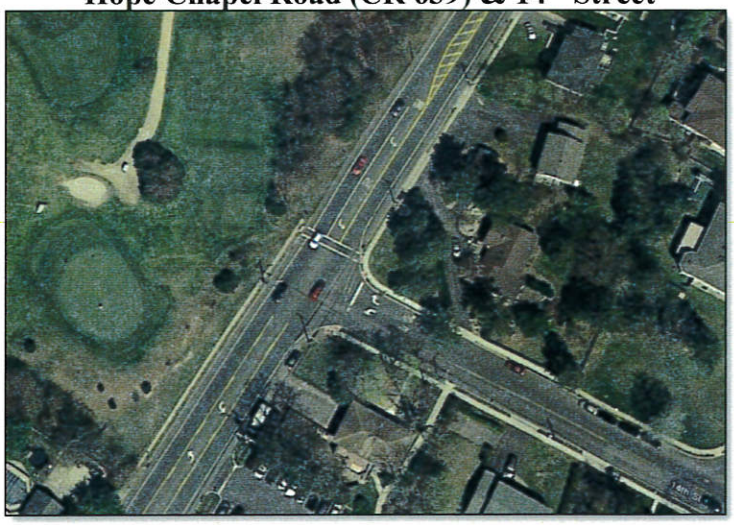
Hope Chapel Road (CR 639) & 14th Street

Hope Chapel Road (CR 639) & 14th Street is a three-leg intersection controlled by a stop sign on the 14th Street WB. The intersection currently has a Hope Chapel Road (CR 639) SB left-turn lane and separate left-turn and right-turn lane on 14th Street WB.

Regional access to this corridor of Hope Chapel Road (CR 639) from Lakewood Township to the east is provided via four roadways, which are: 14th Street, N. Lake Drive, S. Lake Drive and Miller Road. Currently, the intersections of Hope Chapel Road (CR 639) with S. Lake Drive and N. Lake Drive are signalized. Ocean County is in the design process of signalizing the intersection of Hope Chapel Road (CR 639) & Miller Road. Therefore, the only east-west collector roadway to not have signalized access to Hope Chapel Road (CR 639) is 14th Street. 14th Street is an important roadway in the street hierarchy as the roadway provides connectivity between Hope Chapel Road (CR 639) and Route 9.

Based upon public input and the importance of 14th Street regional connectivity, it is recommended to conduct a traffic signal warrant analysis for the intersection. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. All traffic signal warrants and designs are subject to Ocean County Review and Approval.

Hope Chapel Road (CR 639) & 14th Street



State Intersections

Any proposed traffic signal will require a Street Intersection Permit and approval by NJDOT. Based upon observation and review of existing queueing conditions along Route 9, the priority for the intersection under NJDOT jurisdiction are three unsignalized intersection on Route 9. The operations on Route 9 create safety concerns where major collectors intersect Route 9 without signalization.

Route 9 & Oak Street

Route 9 & Oak Street is a three-leg intersection controlled by a stop sign on the Oak Street WB approach. There is a one-way ingress access offset from Oak Street intersecting Route 9. There is one lane for each approach. Based upon field observations during peak hours, the Route 9 corridor has extensive vehicular queue, which consistently blocks Oak Street. Oak Street is an east-west collector roadway providing connectivity between Route 9, residential land uses and New Hampshire Avenue (CR 623). During peak hours, Oak Street WB operates under failing conditions and vehicles cannot adequately enter the Route 9 traffic stream. Furthermore, there are planned developments proposed along the Oak Street corridor, which are anticipated to increase traffic demand.

It is recommended for the medium-term to discuss with NJDOT restriping Oak Street WB with a dedicated left-turn lane and a dedicated right-turn lane and prohibiting parking adjacent to the lanes. Traffic signal improvements may be necessary.

Due to current failing conditions and estimated traffic from future development, it is recommended to conduct a traffic signal warrant analysis for the intersection. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. An NJDOT Street Intersection Permit will be required. Please note, a traffic signal installation at Route 9 & Oak Street would require a progression analysis and advanced signal coordination as it does not meet the spacing requirements of the NJDOT.

Route 9 & Oak Street

Route 9 & 7th Street

Route 9 & 7th Street

Route 9 & 7th Street is a four-leg intersection controlled by stop signs on 7th Street. Based upon field observations during peak hours, the Route 9 corridor has extensive vehicular queue caused at the intersection Route 9 & Route 88, which consistently blocks 7th Street. 7th Street is an east-west collector roadway providing connectivity between Route 9, residential land uses and County Line Road (CR 623). There are many turning vehicles between Route 9 and 7th Street, which were observed to be difficult to maneuver during peak hours.

Due to the identified traffic flow and operational issues at this intersection, it is recommended to conduct a traffic signal warrant analysis for the intersection. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. An NJDOT Street Intersection Permit will be required. Please note, a traffic signal installation at Route 9 & 7th Street would require a progression analysis and advanced signal coordination as it does not meet the spacing requirements of the NJDOT.

Route 9 & Finchley Blvd / Ford Avenue

Route 9 and Finchley Boulevard / Ford Avenue

Route 9 and Finchley Boulevard / Ford Avenue is a four-leg intersection controlled by two-way stop signs under NJDOT Jurisdiction. Ford Avenue WB approach is right-turn only. There was recently a pedestrian fatality at this intersection. There are no striped pedestrian crosswalks and the curb ramps at the corners of the intersection appear non-comforting with the ADA PROWAG.

Recommended Medium-Term Improvements to discuss with NJDOT

- Stripe pedestrian crosswalks and provide appropriate signage and regulation as per the MUTCD. Implement rapid flashing beacons for crosswalk along Route 9 if the intersection remains unsignalized.
- Provide new ADA compliant curb ramps at all four corners.
- An NJDOT Highway Occupancy Permit (HOP) will be required.

Recommended Long-Term Improvements

- It is recommended to conduct a traffic signal warrant analysis for the intersection. If warranted, it is recommended to construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements. An NJDOT Street Intersection Permit will be required. Please note, a traffic signal installation at Route 9 and Finchley Boulevard / Ford Avenue would require a progression analysis and advanced signal coordination as it does not meet the spacing requirements of the NJDOT.

Route 88 and Clover Street

Route 88 and Clover Street is a four-leg intersection controlled by a traffic signal under NJDOT Jurisdiction. Currently, the traffic signal operates with two phases. The Clover Street Northbound left-turns block Northbound through and right-turn maneuvers during peak hour operations. The Clover Street Southbound left-turns block Southbound through and right-turn maneuvers during peak hour operations. Additionally, there have been conflicts between the Clover Street Southbound stop bar location and Route 88 turning maneuvers.

Recommended Medium-Term Improvements

- Optimize traffic signal timings.
- Pull back stop bar along Clover Street SB to permit safer Route 88 Eastbound left-turns and Route 88 WB right-turns.
- Lead Clover Street NB Phase.
- Will require an NJDOT Street Intersection Permit.

Recommended Long-Term Improvements

- Significant roadway widening on all approaches and potential property acquisition to provide the following improvements.
    - Provide a dedicated Clover Street NB left-turn lane.
    - Provide a dedicated Clover Street SB left-turn lane.
    - Provide a dedicated Route 88 EB left-turn lane.
    - Provide a dedicated Route 88 WB left turn lane.
    - Increase radii at northeast corner.
- Modify traffic signal phasing from two-phase to three-phase.
- Will require an NJDOT Street Intersection Permit.

Route 88 and Linden Avenue

Route 88 and Linden Avenue is a three-leg intersection with a stop sign on Linden Avenue under NJDOT Jurisdiction. During peak hour, the Route 88 EB left-turns block through maneuvers during peak hour operations. Please note, a traffic signal installation at Route 88 and Linden Avenue would require a progression analysis and advanced signal coordination as it does not meet the spacing requirements of the NJDOT.

Recommended Medium-Term Improvements

- Construct a Route 88 EB dedicated left-turn lane. Currently, the Route 88 pavement width is 30'. Based upon discussion with NJDOT, a design exception could potentially be granted for shoulders but it is anticipated 35' would be required at a minimum to construct the left-turn lanes.
- Will require an NJDOT Street Intersection Permit.

Recommended Long-Term Improvements

- Conduct a traffic signal warrant analysis. If warranted, construct a three-phase traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements.
- Will require an NJDOT Street Intersection Permit.

Route 88 and Park Avenue

Route 88 and Park Avenue is a three-leg intersection with a stop sign on Park Avenue under NJDOT Jurisdiction. During peak hours, the Route 88 EB left-turns block through maneuvers during peak hour operations. Please note, a traffic signal installation at Route 88 and Park Avenue would require a progression analysis and advanced signal coordination as it does not meet the spacing requirements of the NJDOT.

Recommended Medium-Term Improvements

- Construct a Route 88 EB dedicated left-turn lane. Currently, the Route 88 pavement width is 30'. Based upon discussion with NJDOT, a design exception could potentially be granted for shoulders but it is anticipated 35' would be required at a minimum to construct the left-turn lanes.
- Will require an NJDOT Street Intersection Permit.

Recommended Long-Term Improvements

- Conduct a traffic signal warrant analysis. If warranted, construct a three-phase traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements.
- Will require an NJDOT Street Intersection Permit.

Route 88 and Lexington Avenue

Route 88 and Lexington Avenue is a three-leg intersection with a stop sign on Lexington Avenue under NJDOT Jurisdiction. Lexington Avenue is a one way southbound roadway. Traffic on Lexington Avenue SB queues during peak hours. Based upon observations, there are not enough adequate gaps for left-turns to enter the Route 88 traffic stream during peak hours. Please note, a traffic signal installation at Route 88 and Lexington Avenue would require a progression analysis and advanced signal coordination as it does not meet the spacing requirements of the NJDOT.

Recommended Long-Term Improvements

- Conduct a traffic signal warrant analysis. If warranted, construct a two-phase traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements.
- Will require an NJDOT Street Intersection Permit and improvements should be coordinated with the intersection of Route 88 & Railroad Street.

Route 88 and Holly Street

Route 88 and Holly Street is a four-leg intersection controlled by two-way stop signs under NJDOT Jurisdiction. Holly Street SB queues during peak hour operations. The Route 88 EB left-turns block through maneuvers during peak hour operations. The Route 88 WB left-turns block through maneuvers during peak hour operations. Please note, a traffic signal installation at Route 88 and Holly Street would require a progression analysis and advanced signal coordination as it does not meet the spacing requirements of the NJDOT.

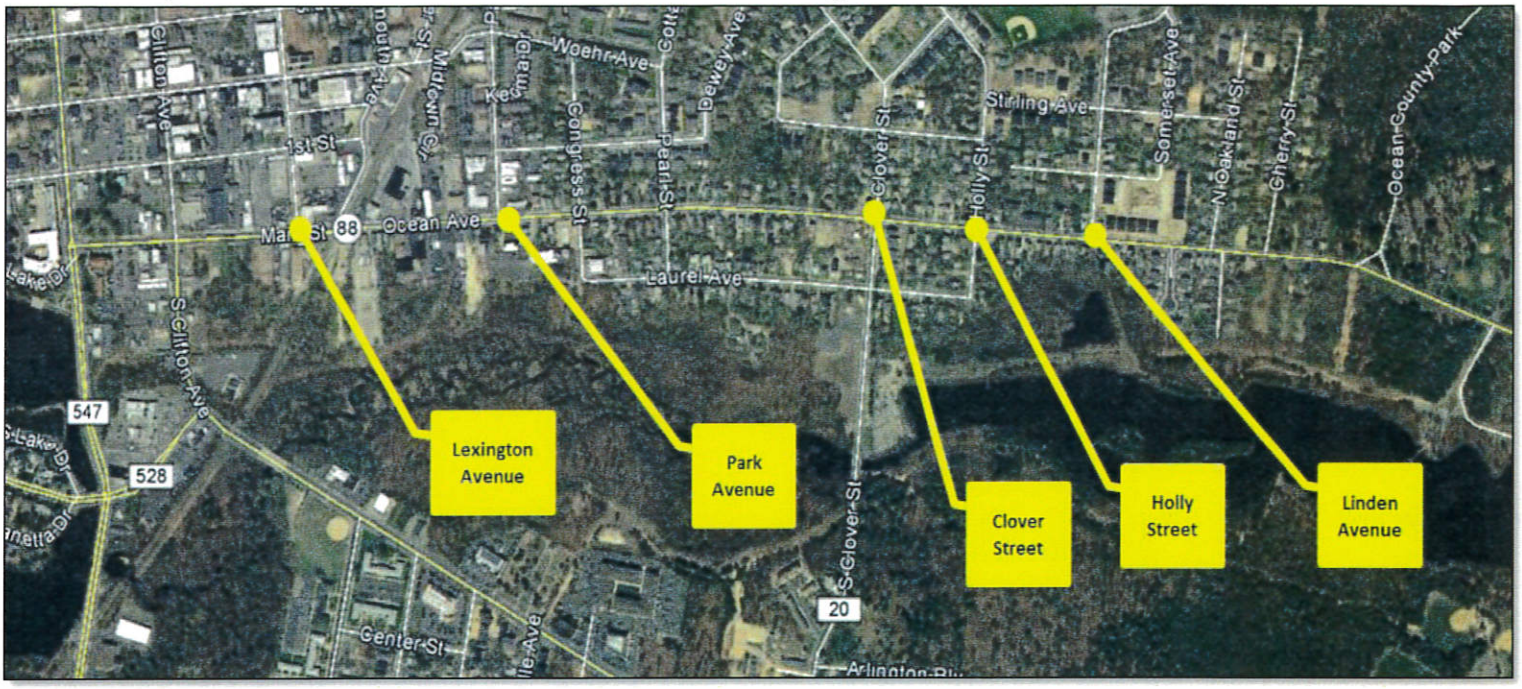
Recommended Medium-Term Improvements

- Provide dedicated Route 88 EB/WB left-turn lanes. Currently, the Route 88 pavement width is 30'. Based upon discussion with NJDOT, a design exception could potentially be granted for shoulders but it is anticipated 35' would be required at a minimum to construct the left-turn lanes.
- Will require an NJDOT Street Intersection Permit.

Recommended Long-Term Improvements

- Provide dedicated Holly Street NB/SB left-turn lanes.
- Conduct a traffic signal warrant analysis. If warranted, construct a traffic signal with ADA pedestrian curb ramps, visual motion detectors with actuation, and MUTCD improvements.
- Will require an NJDOT Street Intersection Permit.

Recommended Route 88 Signalized Corridor



Intersections that may benefit from Striping Improvements to Increase Capacity

Locations where existing pavement width could potentially support additional travel lanes capacity without roadway widening were investigated. These locations include converting shoulders and/or on-street parking into travel lanes where operations will significantly benefit.

Table 2 – Recommended Striping Improvements to Increase Capacity

Location	Striping Recommendations	Jurisdictional Notes
Route 88 & New Hampshire Avenue (CR 623)	Review extending the New Hampshire Avenue (CR 623) NB left-turn lane. Extending the lane will require the lane shift taper to be extended but can be partially accommodated in existing shoulder. It is recommended to meet the gore striped median to the south.	NJDOT Street Intersection Permit Required and County coordination.
Princeton Avenue Corridor	Review providing 75' long dedicated right-turn lanes at intersections in lieu of parking from 4th Street to 6th Street.	-
Monmouth Avenue Corridor	Review providing 75' long dedicated right-turn lanes at intersections in lieu of parking from 2nd Street to 7th Street.	-
Clifton Avenue Corridor	Review providing alternating left-turns lanes at intersections from 6th Street to Courtney Road	-
Princeton Avenue & 7th Street	Princeton NB/SB approaches are 26' wide. Review providing a shared left-turn/through lane and a dedicated right-turn lane to both approaches. Prohibit parking within 75'.	-
Route 9 & Spruce Street	Review striping Route 9 NB/SB with left-turn lanes. Will lose shoulder at intersection and require signal upgrades.	NJDOT Street Intersection Permit Required. May require shoulder waiver.
Forest Avenue & 6th Street	Review providing Forest Avenue NB/SB left-turn lanes.	-
Gudz Road & Miller Road	Review providing two 10' approach lanes and a 12' receiving lane on Gudz Road EB.	-
Pine Street & Warren Street / Pondersoa Drive	Review providing left-turn lanes in lieu of shoulders at Warren Street / Pondersoa Drive.	-
Squankum Road (CR 547) & Princeton Avenue	Princeton Avenue NB approach is 26' wide. Review providing a dedicated through lane and a dedicated right-turn lane. Prohibit parking within 100'.	County Approval Required.
Route 9 & Sherwood Drive	Implement a DO NOT BLOCK THE BOX striping on Route 9 due to the proximity to Prospect Street.	NJDOT HOP Permit Required.
Shafto Avenue & 12th Street	Missing stop bars at stop signs. Stripe stop bars.	-

Review of Roundabouts

Additionally, the intersections of Princeton Avenue & 7th Street and Clifton Avenue & 9th Street were reviewed to see if roundabout are feasible. To properly design an urban roundabout in accordance with FHWA standards, the inscribed circle diameter would have to be 90-feet minimum. The desirable inscribed circle diameter is up to 150-feet. Significant right-of-way acquisition would be necessary at these locations to install even the minimum size roundabout to properly operate. Therefore, at this time, it is recommended to implement the striping capacity improvements detailed in **Table 2** at these two intersections.

Intersections that may benefit from Pedestrian, Safety and Traffic Calming Upgrades

The following pedestrian, safety and traffic calming measures were provided by the public and were found to benefit the community.

Pedestrian Improvements

Example of Rapid Flashing Beacon Designed by Maser

- Install pedestrian signal equipment and restripe the existing crosswalks at Monmouth Avenue & 4th Street.
- Improve the existing ADA curb ramps and crosswalks as well as stripe stop bars at Monmouth Avenue & 2nd Street.
- Installation of Rapid Flashing Beacons with solar panels at crosswalks along Route 9 at unsignalized intersections. This improvement will require an NJDOT Highway Occupancy Permit (HOP). Rapid Flashing Beacons have proved to be successful in providing advanced warning to motorists that a pedestrian is crossing the roadway.
- Install crosswalks on all four approaches with signage at Lexington Avenue & 10th Street and Lexington Avenue & 9th Street.
- It was recommended by a member of the public to install a 'right-turns yield to pedestrians' sign at the egress driveway of the Shopping Center across from James Street as well as on Sunset Road SB at James Street. The existing condition of the crosswalk striping at the intersection of Sunset Road & James Street should be reviewed.

Pot Holes

Recently, a Township website and app for reporting pot holes was created (Lakewood.mobile311.com). The Township should provide flyers, brochures or reach out to the press to inform the public of the website and app. Public input will assist the Township in identifying existing street conditions or where significant pot holes require immediate repair. Based upon discussion with the public, the following roadways are currently in need of mill and overlay:

- Congress Street;
- Stirling Avenue;
- Somerset Avenue;
- Ridge Avenue;
- Oak Street (Between Albert Avenue and New Hampshire Avenue).

Sight Distance and Operation

The driveway of Chateau Drive intersecting Route 9 opposite to Broadway is currently designed with a mountable curb right-in/right-out driveway. NJDOT has plans to construct a traffic signal at this location. However, the geometry at this does not physical precludes a vehicle from maneuvering a left-in or a left-out. Additionally, a large tree obstructs the visibility of Route 9 for motorists who illegally maneuver left-turns out. Therefore, it is recommended improve sight distance to the south and install additional no-left turn signs on the Route 9 NB side and install a new stop bar for Chateau Drive EB. These minor improvements will increase safety during the interim time before a traffic signal is constructed by NJDOT. An NJDOT Highway Occupancy Permit will be required for the minor improvements.

Traffic Calming

During peak hours, Central Avenue (CR 528) EB backs up at the roadway's intersection with Route 9. When there is a significant queue, cut-through traffic has been identified to traverse Caranetta Drive and/or S. Lake Drive. Speed humps are a traffic calming measure applicable to local roadways. Caranetta Drive and S. Lake Drive between Freeman Road and Central Avenue (CR 528) are suitable candidate locations to implement speed humps to reduce cut-through traffic in residential areas.

Intersections that may benefit from Traffic Signal Upgrades or Roadway Widening.

Locations where either significant traffic signal improvements or roadway widening with and without property dedication were reviewed. Most of these highly traveled intersections are maintained and owned by either Ocean County or the NJDOT. Improvements without significant widening or property acquisition have been identified as "medium-term." NJDOT permitting for significant improvements could take one to two years to obtain approval prior to commencing construction. These improvements are identified as "long-term." **Tables 3 - 5** detail the locations where Significant Traffic Signal or Roadway Widening are anticipated to have a large benefit to the motoring public.

Table 3 – Recommended Traffic Signal Upgrades or Roadway Widening – Medium-Term

Location	Improvement	Jurisdictional Notes
Medium-Term		
County Line Road (CR 526) & East End Avenue / Twin Oaks Drive	*Short-Term:* Review the implementation of a Twin Oaks Drive SB right-turn overlap phase during the County Line Road EB/WB left-turn phase and install associated traffic signal equipment. *Medium Term:* Review partial property dedication of either the southwest adjacent lot to provide an East End Avenue NB left-turn lane. The existing East End Avenue pavement width is 30' where 35' would be required to have a SB receiving lane, a NB dedicated left-turn lane and a shared through/right-turn lane. Reconstruct traffic signal and optimize timings.	Requires County Approval.
Cedar Bridge Avenue (CR 528) & Clover Street	Implement a Cedar Bridge Avenue EB lead left phase. Restripe and update traffic signal equipment to support a Clover Street SB left-turn and right-turn lane.	Requires County Approval.
County Line Road (CR 526) & Ridge Avenue	Review phasing at signal to enhance left-turn mobility.	Requires County Approval.
County Line Road (CR 526) & Princeton Avenue	Coordinate with County to determine if opposing NB/SB left-turn lanes are feasible. Based upon preliminary analysis, a dedicated left-turn and a through/right-turn lane for the NB/SB approach may fit into the existing pavement width.	Requires County Approval.
County Line Road (CR 526) & Lexington Avenue		Requires County Approval.
County Line Road (CR 526) & Monmouth Avenue		Requires County Approval.
Kennedy Boulevard & Princeton Avenue	Coordinate with County to determine if opposing NB/SB left-turn lanes are feasible. Based upon preliminary analysis, a dedicated left-turn and a through/right-turn lane for the NB/SB approach may fit into the existing pavement width.	-
Kennedy Boulevard & Lexington Avenue		-
Kennedy Boulevard & Monmouth Avenue		-
Route 9 & County Line Road (CR 526)	Review providing EB/WB left-turn protected/permitted phasing. The EB/WB approaches at both intersections have left-turn lanes but the traffic signal only provides a permitted ROW phase.	Requires an NJDOT Street Intersection Permit.
Route 9 & Kennedy Blvd		

Table 4 – Recommended Traffic Signal Upgrades or Roadway Widening – Medium-Term

Location	Improvement	Location
Medium-Term		
Route 9 and Pine Street / James Street (CR 32)	Preform a traffic analysis on protected/permitting left-turn phasing and left-turn arrow signal heads for all approaches.	Requires an NJDOT Street Intersection Permit.
Pine Street & Washington Avenue	Review converting the shoulder along Pine Street to provide a Pine Street WB left-turn lane. Recommended to widen Washington Avenue to provide a NB left-turn and a right-turn. Consider new traffic signal during the Vine Street Extension Project.	-
Squankum Road (CR 547) & Kennedy Blvd	Review implementing a Kennedy Blvd EB No Turn on Red Regulation but install signal equipment to support an EB right-turn overlap phase.	Requires County Approval.
Squankum Road (CR 547) & County Line Road (CR 526)	Review installing signal equipment to support a County Line Road (CR 526) WB right-turn overlap phase.	Requires County Approval.
Route 9 & Cross Street (CR 626) / Chestnut Street (CR 40)	Review Cross Street EB (CR 626) lane configuration and storage length. Associated with removing parking on the north side of Cross Street (CR 626) additional capacity or longer storage lengths may be obtained. The Chestnut Street (CR 40) WB lanes assignment should be reviewed to make sure approach and receiving lanes are lined up with Cross Street (CR 626) EB.	Requires an NJDOT Street Intersection Permit.
Oak Street & New Hampshire Avenue (CR 623)	Review restriping Oak Street EB to remove shoulders and provide two approach lanes. The Oak Street WB lanes assignment should be reviewed to make sure approach and receiving lanes are lined up with Oak Street EB. New signal equipment would be required.	Requires County Approval.
Cedar Bridge Avenue (CR 528) & MLK Drive	Review restriping MLK Drive NB to provide a dedicated left-turn lane and a dedicated right-turn lane. New signal equipment would be required.	Requires County Approval.

Table 5 – Recommended Traffic Signal Upgrades or Roadway Widening – Long-Term

Location	Improvement	Jurisdictional Notes
Long-Term		
New Hampshire Avenue (CR 623) & Cedar Bridge Avenue (CR 528)	Review extending New Hampshire Avenue (CR 623) NB left-turn lane. Due to the existing lane shift configuration, it is anticipated roadway widening will be required.	Requires County Approval.
New Hampshire Avenue (CR 623) & Ridge Avenue	Review constructing a Ridge Avenue WB left-turn and a New Hampshire Avenue (CR 623) dedicated left-turn lane and a dedicated right-turn lane.	Requires County Approval.
Central Avenue (CR 528) & Sunset Road	Review dedication and widening on Sunset Road (southwest corner) to provide for a NB left-turn lane	Requires County Approval.
James Street (CR 32) and Cross Street (CR 626)	Review roadway widening along James Street and Cross Street. Recommended to increase capacity by providing Cross Street NB/SB left-turn lanes and providing a James Street WB left-turn lane and a shared through/right-turn lane. This improvement will also reduce the offset between James Street and Franklin Boulevard. New signal equipment would be required.	Requires County Approval.
Cedar Bridge Avenue (CR 528) & Avenue of the States	Recommended to review traffic signal warrants and/or performing analyses at this intersection. Currently, the northbound approach fails during the AM peak hour and police presence is needed during events at FirstEnergy Park. This signal may benefit from having "adaptive" control due to events at FirstEnergy Park.	Requires County Approval.
Route 9 & Route 88 / 1st Street	Review prohibiting Route 9 NB left-turns onto 1st Street and convert the NB left-turn lane into additional left-turn storage for Route 9 SB at Route 88.	Requires an NJDOT Street Intersection Permit.
Route 88 & Clifton Avenue	Review converting the Clifton Avenue SB right-turn lane to a SB shared through/right-turn lane, remove parking on Clifton Ave SB just south of Route 88, and restripe parking area as travel lane. Additionally, it is highly recommended to stripe lane termination symbols and additional lane termination signage for the Clifton Avenue NB right lane termination.	Requires an NJDOT Street Intersection Permit.
Cedar Bridge Avenue (CR 528) & Hurley Avenue (CR 528)	Roadway widening along Cedar Bridge Avenue to provide a WB left-turn lane and two through lanes. Currently, the inside through lane terminates into the left-turn lane; however, there are two receiving lanes. This improvement will require shifting both travel lanes and widening. An existing rail crossing exists 200' southeast of the intersection crossing Cedar Bridge Avenue (CR 528).	Requires County Approval and NJDOT/FRA approval for modifications to the rail crossing.

VIII. POTENTIAL ROADWAY CORRIDOR IMPROVEMENTS

Within the Township of Lakewood, there are many regional corridor roadways that over time the access and land uses surrounding the corridors have increased. This section of the Transportation Improvement Study reviews several collector and arterial roadways to determine if there are improvements to increase capacity and mitigate parking conflicts.

Oak Street Corridor

Oak Street provides connectivity between Route 9 and New Hampshire Avenue (CR 623). Oak Street provides access to multiple schools and is anticipated to provide access to future residential subdivisions. The pavement width of Oak Street varies in some areas but in general is approximately 40'. The current typical cross section of Oak Street is two (2) 12' wide travel lanes with shoulders/parking.

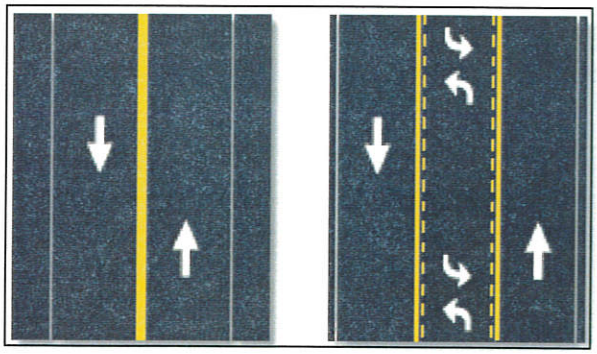
Example of TWLTL Corridor Conversion[3]

Implementing a Two-Way-Left-Turn (TWLTL) lane along Oak Street will provide a safe turning space for traffic bound towards the adjacent school and residential areas. Two (2) 12' wide travel lanes with a 14' wide TWLTL can be accommodated using the existing pavement width of Oak Street. The TWLTL should convert into a dedicated left-turn lane at signalized intersections.

Pine Street Corridor

Pine Street provides connectivity between Route 9 and New Hampshire Avenue (CR 623). Pine Street primarily provides access to residential subdivisions. Between Marc Drive and the Avenue of the States, the pavement width of Pine Street varies is approximately 40'. The current typical cross section of Pine Street is two (2) 12' wide travel lanes with shoulders/parking.

Detail of TWLTL Corridor Conversion[3]



Implementing a Two-Way-Left-Turn (TWLTL) lane along Pine Street between Marc Drive and the Avenue of the States will provide a safe turning space for traffic bound towards the adjacent residential areas. Two (2) 12' wide travel lanes with a 14' wide TWLTL can be accommodated using the existing pavement width of Pine Street between Marc Drive and the Avenue of the State. The TWLTL should convert into a dedicated left-turn lane at signalized intersections.

[3] https://safety.fhwa.dot.gov/road_diets/info_guide/

Prospect Street (CR 628) Corridor

Prospect Street (CR 628) originates at Route 9 and extends to Cross Street (CR 626). Over time, numerous industrial and residential developments have been constructed along Prospect Street (CR 628). The pavement width of Prospect Street (CR 628) varies in some areas but in general is approximately 40' – 42'. The current typical cross section of Prospect Street (CR 628) is two (2) 13' wide travel lanes with shoulders.

Implementing a Two-Way-Left-Turn (TWLTL) lane along Prospect Street (CR 628) will reduce large tractor trailer turning, deceleration and acceleration impacts to transient traffic. With other residential projects in construction along Prospect Street (CR 628) the demand for additional capacity increases. Two (2) 12' wide travel lanes with a 14' wide TWLTL can be accommodated using the existing pavement width of Prospect Street (CR 628). The TWLTL should convert into a dedicated left-turn lane at signalized intersections.

Kennedy Boulevard

Kennedy Boulevard originates at Laurel Wood Avenue and extends to Squankum Road (CR 547). Kennedy Boulevard serves an important gateway roadway into Lakewood from Route 9 as Route 9 SB left-turns are prohibited onto County Line Road (CR 526).

Kennedy Boulevard east of Route 9 provides access to commercial properties and residential subdivisions. Kennedy Boulevard east of Route 9 is approximately 52' wide. The current typical cross section of Kennedy Boulevard is two extra wide travel lanes with on-street parking. It is recommended to restriped Kennedy Boulevard east of Route 9 with 7' wide on-street parking, two 12' wide travel lanes and a 13' wide TWLTL. The TWLTL should convert into a dedicated left-turn lane at signalized intersections.

Spruce Street

Spruce Street provides connectivity between Route 9 and Vine Street. The pavement width of Spruce Street varies between 24' to 32'. In areas where Spruce Street is 32', it is acceptable to provide on-street parking on one side of the roadway to maintain 12' minimum travel lanes. Parking on both side of Spruce Street presents conflicts when two opposing vehicles pass on-street parked vehicles.

Lexington Avenue

Lexington Avenue provides connectivity between Route 88 and County Line Road (CR 526). Between County Line Road (CR 526) and 9th Street, the pavement width of Lexington Avenue is 34'. It is acceptable to provide on-street parking on one side of the roadway to maintain 12' minimum travel lanes. Parking on both side of Lexington Avenue between County Line Road (CR 526) and 9th Street presents conflicts when two opposing vehicles pass on-street parked vehicles.

Clifton Avenue

As detailed earlier in **Table 2**, it is recommended to review providing alternating Clifton Avenue NB/SB left-turn lanes at the intersections from 6th Street to Courtney Road. South of 6th Street, Clifton Avenue has parallel on-street parking and extra wide lanes. Many of the intersection have curb bulb-outs reducing the pavement width. Providing angled parking may allow improved parking maneuverability; however, it will reduce the corridor to two (2) lanes without room to install left-turn lanes at intersections. Many of the left-turn lanes along Clifton Avenue NB/SB may need to be removed with angled parking. From an operational standpoint, it is recommended to maintain the left-turn lanes. It is recommended to review installing NB/SB left-turn lanes at the proposed traffic signal installation at Clifton Avenue & 1st Street as well as the a Clifton Avenue NB left-turn lane at 3rd Street.

Route 88

Route 88 from mile post 0.30 (Intersection with Railroad Street) to mile post 2.03 (Intersection with New Hampshire Avenue – CR 623) has an NJDOT DTS of 2C, which is defined as:

"2 lanes, without shoulders, with 14' two-way left-turn lane."

It is recommended to prepare Conceptual Plans to understand the magnitude of partial dedications necessary to install a 14' two-way-left-turn lane throughout the Route 88 corridor from Railroad Street to New Hampshire Avenue (CR 623). Currently, the Route 88 pavement width is 30'. Based upon the New Jersey Access Code and discussion with NJDOT, it is anticipated 38' would be required at a minimum to provide two (2) travel lanes and a TWLTL. Route 88 would have dedicated left-turn lanes at traffic signals in the vicinity.

Route 9

Route 9 serves as the primary north-south arterial highway for Lakewood Township. However, the corridor of Route 9 in Lakewood is currently operating under failing conditions. According to the NJTPA report "US 9 Corridor Study – Managing and Accommodating Growth in Lakewood and Toms River, Ocean Co.", all approaches at the following intersection fail during one of the critical weekday peak hours:

- Route 9 & Route 88.
  - LOS "F" 96.9 seconds during the AM peak hour and LOS "F" 158.5 seconds during the PM peak hour.
- Route 9 & Central Avenue.
  - LOS "F" 220.0 seconds during the AM peak hour and LOS "F" 234.0 seconds during the PM peak hour.
- Route 9 & Pine Street.
  - LOS "F" 116.0 seconds during the PM peak hour.
- Route 9 & Prospect Street.
  - LOS "F" 131.9 seconds during the PM peak hour.
- Route 9 & Chestnut Street / Cross Street.
  - LOS "F" 192.5 seconds during the PM peak hour.

The NJTPA performed an existing conditions crash analysis along Route 9 from the Lakewood Municipal Line to Route 88. From January 1, 2011 to December 31, 2013, 235 average crashes per year occurred on U.S. Route 9 within the study area. The resultant crash rate was 9.4 crashes per million vehicle-miles travelled, which is more than 3.5 times the statewide average crash rate of 2.6 crashes per million vehicle-miles travelled on roadways with similar geometries. Geometry constraints, pedestrian conflicts and traffic congestion are anticipated to be the primary causes of the highway crash rate exposure in the Route 9 corridor. The NJTPA report outlined the primary concerns of the public for Route 9, which are as follows:

- Over 80% of the public wants to maintain left turns to and from U.S. Route 9, and prefers a two-way left turn lane.
- The public wants sidewalks and bus stops with shelters and sidewalk.
- Ranking concerns by most important, order was: reducing travel time, reducing crashes, improving pedestrian crossings.

The report recommends a two-way left turn lane (TWLTL). The desired TWLTL width is 14 feet, but a minimum acceptable width of 12 feet could be provided. Travel lanes for roads the section of U.S. Route 9 have a desired width of 12 feet, but an acceptable width of 11 feet could be provided. Shoulders have a desired width of 12 feet, but an acceptable width of 8 feet could be provided. Shoulders were recommended to accommodate bicycles and buses in addition to providing stormwater storage in rain events and separating moving traffic from obstructions. Shoulders narrower than 8 feet require design exceptions. In addition to the cross-section elements, the NJTPA report reviewed significant capacity improvements to the following intersections:

- Route 9 and Main Street / Central Avenue / Hurley Avenue
- Route 9 and John Street (Hybrid Pedestrian Beacon)
- Route 9 and James Street / Pine Street
- Route 9 and Oak Street
- Route 9 and Chateau Drive/ Broadway
- Route 9 and Cross Street / Chestnut Street
- Route 9 and Locust Street

Recently, Route 9 in Lakewood Township was included in the Fiscal Year 2017 Supplemental Appropriation Project List of the NJDOT. The NJDOT description of work is "Concept Development for Widening of Rt. 9."During the Concept Development Phase, it is highly recommended to share the communities' main concerns along Route 9 to provide the most appropriate and beneficial design. The following items should be discussed with the NJDOT during their Concept Development Phase:

- The installation of the TWLTL and all improvements outlined in the NJTPA study.
- The bottleneck of Route 9 between Route 88 and Central Avenue (CR 528).
- Lack of left-turn phasing at Route 9 & James Street (CR 32)
- Potential to construct a Route 9 SB right-turn lane at Prospect Street (CR 628) to support future development.
- Route 9 SB left-turn congestion at Route 88
- Route 9 SB left-turn congestion at Kennedy Boulevard as well as County Line Road (CR 526). Route 9 SB left-turns are prohibited at County Line Road (CR 526) due to limited spacing between the two intersections.
- Route 9 & Oak Street.
- Route 9 & Chateau Drive/Broadway traffic signal and/or at Route 9 & Finchley Boulevard traffic signal (due to proximity only one traffic signal may be feasible).
- Route 9 & 7th Street traffic signal.

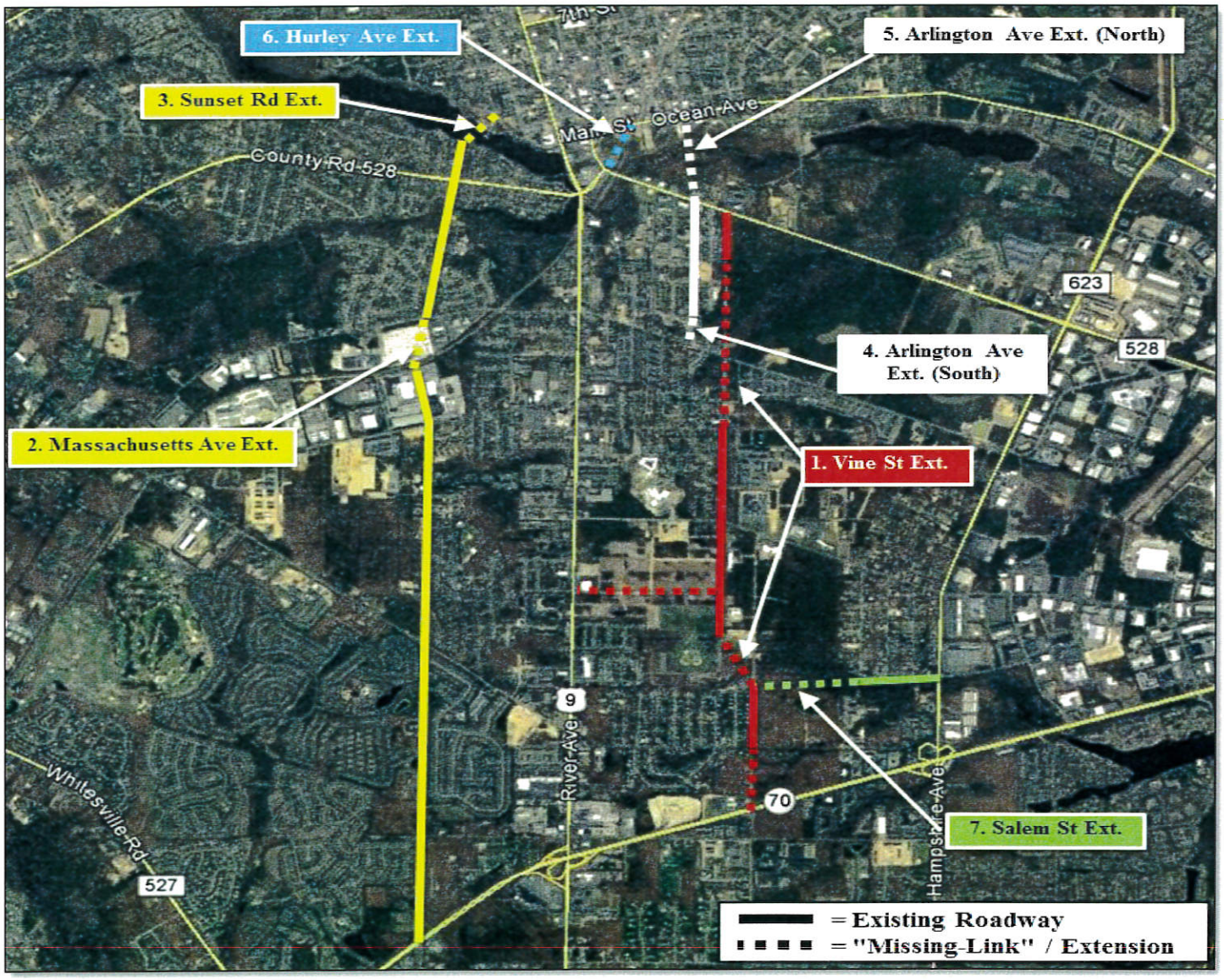
IX. POTENTIAL ROADWAY EXTENSIONS AND BY-PASS

The Township of Lakewood has many primary routes throughout the study area that service both regional and local traffic. However, several of the primary routes terminate and originate at various intersections causing 'missing links' in the north-south infrastructure. The termination of regional routes requires multiple turning maneuvers at other intersections to allow motorists to get to their ultimate destination. Route 9 is the only north-south corridor that traverses from the northern municipal boundary to the southern municipal boundary. This study reviews other north-south routes that may alleviate the traffic burden on Route 9 if extended.

Extensions

Seven (7) extensions of existing roadways through either paper streets or parcels were investigated. The extensions generally run north-south to alleviate the traffic burden on Route 9 with one of the extensions running east-west to alleviate the traffic burden on Chestnut Street (CR 40) and Oak Street. An image depicting the seven potential extensions is provided below.

Potential Roadway Extensions



1. Vine Street Extension from Cedar Bridge Avenue (CR 528) to Pine Street and Vermont Avenue Extension to Route 70

Benefits

The Vine Street Extension is included in the Township's smart growth plan and was identified in the T&M TID Report. The Vine Street Extension will provide a significant benefit to the Route 9 corridor and the east-west corridors of Pine Street, Spruce Street, Oak Street and Chestnut Street (CR 40).

Impacts

The proposed roadway extension will cross a substantial portion of freshwater wetlands.

Other Considerations

According to the T&M TID Report, the Vine Street Extension will trigger the need for traffic signals at Pine Street, Spruce Street, Oak Street, the Broadway connection, Chestnut Street (CR 40) and at Route 70 with Vermont Avenue. If or when the Vine Street Extension program is being designed, the adjacent intersections in the area should be accounted for to make sure there is not an adverse impact. Specifically, the adjacent intersections of Pine Street & Washington Avenue and Washington Avenue & Spruce Street should be reviewed. The intersection of Washington Avenue & Spruce Street may need to be reconfigured due to a new traffic signal at Vine Street & Spruce Street.

2/3. Massachusetts Avenue and Sunset Road Extension from Route 70 to N. Lake Drive

Benefits

The Massachusetts Avenue (CR 637) and Sunset Road Extension will provide a benefit to the Route 9 corridor and the east-west corridors of James Street (CR 32) and Prospect Street (CR 628). The Massachusetts Avenue (CR 637) extension between Prospect Street (CR 628) and James Street (CR 32) is anticipated to divert traffic from Williams Street and James Street (CR 32). With new developments proposed west of this corridor, the extension is anticipated to support future growth.

Impacts

The Massachusetts Avenue (CR 637) extension between Prospect Street (CR 628) and James Street (CR 32) will require property acquisition of the Woodhaven Lumber and Millwork Facility and other properties as well as the establishment of a railroad crossing. A new railroad crossing will require approval by the NJDOT.

The Sunset Road extension from S. Lake Drive to N. Lake Drive will require a bridge structure over Lake Carasaljo. A new bridge will need to either be a fixed vertical structure or a moveable bridge to permit the passing of boats. A fixed bridge will require a minimum 12' clearance (final approvable clearance value will require a feasibility study) from the mean high water. A moveable bridge will not require the same clearance from the mean high water but will need to be able move and close vehicular access at times for boats to pass. Either bridge is estimated to cost millions of dollars to construct.

Other Considerations

Due to anticipated future growth in the western section of Lakewood Township, it is recommended to perform a feasibility study for the Massachusetts Avenue (CR 637) extension, analyze the potential property acquisition, and discuss the project with the current property owner of the Woodhaven Lumber and Millwork Facility.

Although the Sunset Road extension would connect the northern and southern sections of Lakewood Township, the following items should be considered:

- Sunset Road would become a major collector or arterial roadway within the Township and would be connecting to N. Lake Drive or Private Way, which are local roadways that require crossing through multiple intersections to get to Forest Avenue or Route 9.
- The cost of a multi-million dollar bridge may not outweigh the traffic benefit from the connection.
- A fixed bridge, which would be the least impactful to vehicle and boat traffic, would need to have a significant clearance over the mean high water, which would require Sunset Road and the N. Lake Drive connection to begin vertically ascending prior to the water body. This may require property acquisition and change the residential character along Sunset Drive.

Based upon preliminary analysis only, the Sunset Road extension may not be warranted.

4. Arlington Avenue Extension (South)

Benefits

Provide regional connectivity between Pine Street and Cedar Bridge Avenue (CR 528) and alleviate the traffic burden on MLK Drive.

Impacts

Arlington Avenue is currently a residential roadway with direct access to residential driveways. With the south extension, Arlington Avenue would be a thoroughfare and support additional traffic volumes.

Other Considerations

The pavement width of Arlington Avenue varies between 24' to 32' wide with on-street parking on both side of the roadway. In order to make Arlington Avenue a thoroughfare roadway, on-street parking would have be prohibited on one side of the roadway where the roadway is 32' wide and prohibited on both sides of the roadway where the roadway is 24'.

It is recommended to review the feasibility of extending Arlington Avenue to the south after the Vine Street Extension is constructed. At that time, the amount of traffic that will utilize Arlington Avenue can be more properly estimated and the potential need for traffic signal at Pine Street or Cedar Bridge Avenue (CR 528) can be determined.

5. Arlington Avenue Extension (North)

Benefits

Provide regional connectivity between Cedar Bridge Avenue (CR 528) and Route 88 across from Park Avenue, which would connect the north and south sections of Lakewood Township.

Impacts

There is a waterbody between Route 88 and Cedar Bridge Avenue (CR 528) that will require NJDEP permitting. Major property acquisition will be needed for properties along the northern side of Cedar Bridge Avenue (CR 528) and the southern side of Route 88.

Other Considerations

The waterbody at this location is significantly wider than the waterbody north of Cedar Bridge Avenue (CR 528) opposite to Hurley Avenue (CR 528). Additionally, even if Arlington Avenue eventually provides connection to Pine Street it does not continue south of Pine Street. Therefore, if a north-south connection between Cedar Bridge Avenue (CR 528) and Route 88 is sought, it is recommended to review the connection at Hurley Avenue (CR 528).

6. Hurley Avenue (CR 528) Extension

Benefits

Provide regional connectivity between Cedar Bridge Avenue (CR 528) and Route 88 across from Lexington Avenue/Railroad Street, which would connect the north and south sections of Lakewood Township. The Hurley Avenue (CR 528) extension is anticipated to alleviate some of the traffic conditions at Route 88 & Clifton Avenue.

Impacts

There is a waterbody between Route 88 and Cedar Bridge Avenue (CR 528) that will require NJDEP permitting. Property acquisition will be needed for properties along the northern side of Cedar Bridge Avenue (CR 528) and the southern side of Route 88.

Other Considerations

The waterbody at this location is not as wide as the waterbody north of Cedar Bridge Avenue (CR 528) opposite to Arlington Avenue. It is recommended to perform a feasibility study of this extension.

7. Salem Street Extension

Benefits

Provide regional connectivity between the Vine Street / Vermont Avenue extension and Vermont Avenue as well as alleviate traffic congestion on Chestnut Street (CR 40) and Oak Street.

Impacts

There is a small northwest-southeast waterbody that the Salem Street extension would have to cross. NJDEP permitting would be required. However, based upon review of the area there are other roadways that cross the same waterbody.

Other Considerations

A feasibility of the Salem Street Extension is recommended after the Vine Street Extension is constructed.

Lakewood By-Pass

The feasibility of a long-term bypass around the Lakewood Route 9 corridor to access New Hampshire Avenue (CR 623) was preliminarily studied. The two primary north-south arterial roadways for Lakewood Township are Route 9 and New Hampshire Avenue (CR 623). However, New Hampshire Avenue (CR 623) terminates at Ridge Avenue (CR 623). Therefore, any traffic traversing through Howell Township to or from Lakewood Township utilizes Route 9 or Lakewood-Farmingdale Road (CR 547).

A by-pass roadway providing access between Route 9, Lakewood-Farmingdale Road (CR 547) and New Hampshire Avenue (CR 623) is anticipated to significantly enhance regional mobility and reduce the traffic burden on Route 9 as well as Route 88. This regional improvement would necessitate a long-term regional planning study with the collaboration of Lakewood Township, Howell Township, Ocean County, NJDOT and potentially the NJTPA. This Lakewood by-pass would be expected to be under the jurisdiction of either Ocean County or the NJDOT.

The long-term planning study would need review regional benefits and impacts to Route 9, Route 88, Lakewood-Farmingdale Road (CR 547) and New Hampshire Avenue (CR 623). The regional north to south and north to east transient traffic patterns would bypass the Lakewood Township Downtown Area surrounding Route 9. Additional traffic is anticipated to utilize New Hampshire Avenue (CR 623); therefore, the existing capacity and potential to support additional demand on New Hampshire Avenue (CR 623) will need to be a key focus of the regional planning study. The number of travel lanes and type of intersection traffic control to provide acceptable operations will needed to be investigated.

The Lakewood Bypass should be implemented in multiple phases with at least two phases, if the bypass is found to be feasible. Phase One (1) could potentially include extending New Hampshire Avenue (CR 623) to County Line Road / Lanes Mill Road (CR 526). Due to recently constructed or in construction development the horizontal alignment is limited; however, the roadway may be able to access Brook Road. Brook Road south of County Line Road (CR 526) would have to be realigned. Environmental and permitting concerns include an existing overhead utility line / easement crossing and a water body.

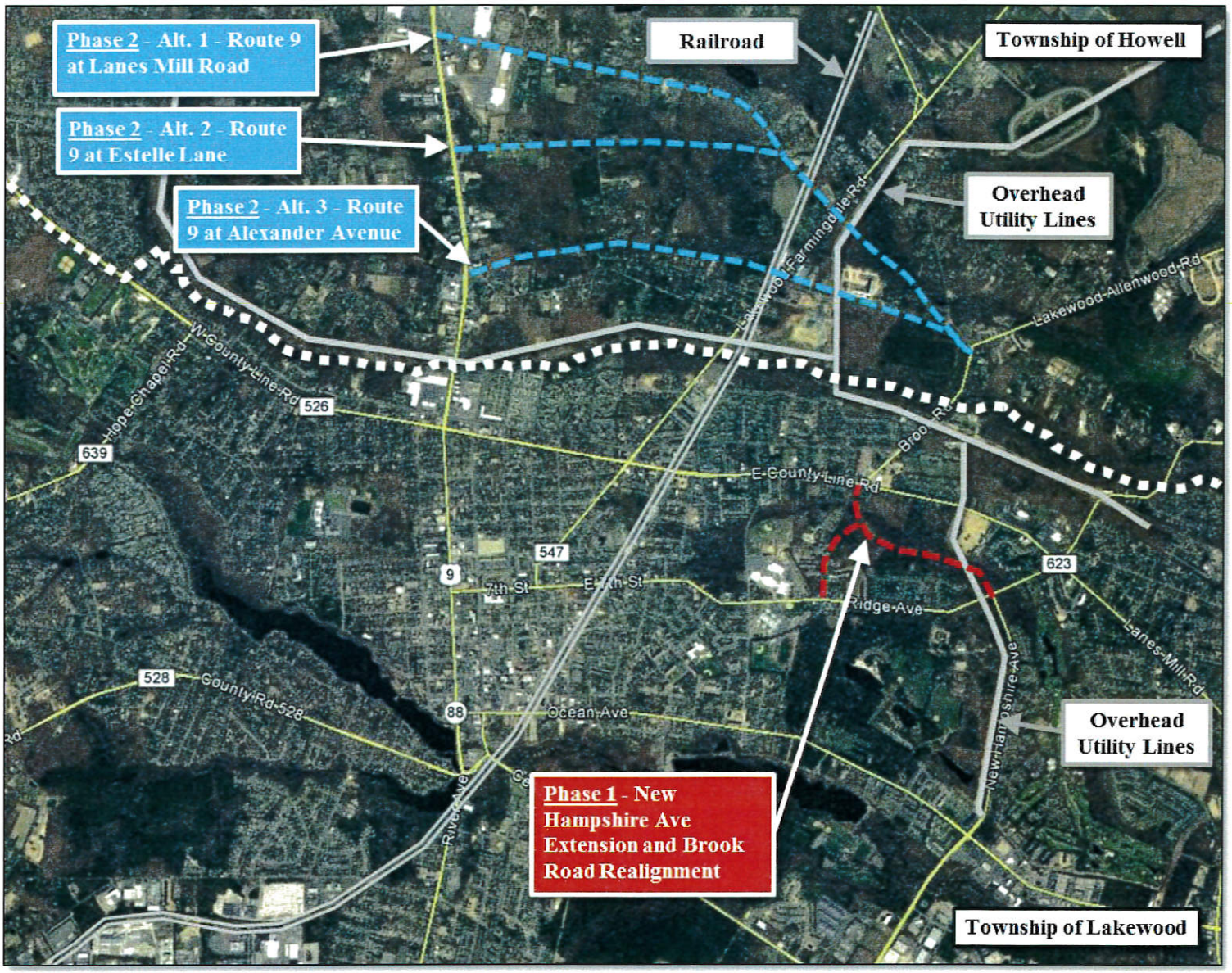
Phase Two (2) could potentially include connecting Brook Road to Lakewood Farmingdale Road (CR 547) and then to Route 9. The segment of Route 9 in Howell Township where street access could be gained is designated as Access Level 3. Access Level 3 only permits right-turn access with provision for left-turn access via a jughandle. There are three signalized intersections with jughandles along Route 9 north of Lakewood Township within one-mile of each other. The construction of a new traffic signal in this area may not be feasible do to NJDOT spacing requirements. Therefore, the regional planning study should review utilizing one of the following three existing signals to gain connectivity to Route 9:

- Route 9 & Lanes Mill Road
- Route 9 & Estelle Lane
- Route 9 & Alexander Avenue

The regional planning study will need to review environmental constraints and permitting, property impacts and dedication, regional traffic benefits and impacts, costs, and viability. The bypass would need to cross over railroad, overhead utility lines / easements and may have environmental crossings.

It is strongly recommended to initiate discussions with Ocean County and Howell Township on a long-term Lakewood bypass. A sketch of potential Lakewood Bypass locations is provided below. Please note, actual location of the bypass alignments will need to be analyzed and confirmed.

Long-Term Lakewood Bypass Sketch



X. DOWNTOWN CIRCULATION

Existing Circulation

Lakewood Township has a grid street system encompassing Route 88 to the south, Kennedy Boulevard to the north, Lakewood Avenue/Forest Avenue to the west and Princeton Avenue/Shafto Avenue to the east. North of Carey Street the land uses are primarily residential. South of Carey Street is the downtown area where there is a mix of land uses. The primary north-south roadways are Forest Avenue, Route 9, Clifton Avenue, Lexington Avenue, Monmouth Avenue and Princeton Avenue.

The majority of the roadways are two-way streets in the downtown area with a few exceptions where there is a change between one-way and two-way traffic flow. 2nd Street is one-way eastbound between Clifton Avenue and Lexington Avenue. 3rd Street is one-way westbound between Clifton Avenue and Lexington Avenue. Lexington Avenue is one-way southbound between 1st Street and Route 88.

Current Issues

Many of the east-west numbered streets provide one travel lane in each direction with on-street parking on both sides. Most of the east-west numbered streets have a pavement width of approximately 30' providing only 16' to two lanes of traffic (8' in each direction). The typical minimum acceptable travel lane is 10' on local streets. When two vehicles traveling in opposite directions pass at a location where both sides of on-street parking are occupied, one vehicle has to yield to the other vehicle.

Study Reviewed

Maser Consulting reviewed the Downtown Lakewood – Traffic and Pedestrian Circulation Study, prepared for the Township of Lakewood, prepared by T&M Associates, dated July 16, 2009. The study was based upon sound engineering judgement and was conducted using national acceptable standards. The study concluded:

> *"Additional one-way streets within the Downtown Area are not recommended because the demand of east-west traffic within the Downtown requires that the fully capacity of these existing east-west streets be preserved. The east-west traffic volumes currently exceed the east-west street capacity. Turning movements from the unsignalized side street approaches at Route 9 operate at LOS F. If Second Street, Fourth Street, Fifth Street and Sixth Street were converted to one-way streets, that would reduce the capacity of east-west travel by four lanes. This would result in unacceptable traffic operations for cross-town traffic."*

Recommendations

The T&M Study was based upon sound engineering judgement and was conducted using national acceptable standards. However, a complete future analysis of one-way street conditions was not analyzed in a capacity model. In general, reducing roadway capacity is anticipated to exacerbate the already failing conditions in the study area. Therefore, it is not recommended to reconfigure the east-west numbered streets to have only one (1) one-way travel lane with on-street parking on both sides.

However, reconfiguring *some* of the roadways to one-way may promote a more defined and orderly circulation pattern in the downtown area. To convert some of the roadways, it may require two (2) one-way lanes with a reduction in on-street parking. A reduction in parking may be supported with the construction of a parking garage, which is detailed in the following section. At this time, it is recommended to perform a downtown circulation feasibility study that provides a capacity model for the entire downtown area using one-way circulation patterns.

XI. DOWNTOWN PARKING

Based upon the report "Downtown Lakewood – Traffic and Pedestrian Circulation Study," on-street parking in the central business district and downtown area is over parked. Additionally, the on-street parking and off-street parking lots located along 7th Street west of Forest Avenue are over capacity. Photos of the on-street parking and off-street parking lots are provided below.

Over Capacity Parking Lots

Due to parking demand exceeding the supply, vehicles begin to illegally park or block other parked vehicles. This is an unsafe condition were sight distance can be obstructed or roadway capacity can be impacted. Additionally, this condition results in vehicles continuing to circulated to find vacant parking, which creates additional traffic.

A very effective solution is to propose two parking garages within Lakewood Township. The two potential feasible locations are:

- Existing parking lot at 7th Street and Private Way; and
- Existing parking lot at the Municipal Building along Clifton Avenue between 4th Street and 3rd Street.

These locations are central to highly demanded land uses and are in close proximity to the downtown area. The exact location of a parking garage should be confirmed in a feasibility analysis. Downtown parking lots can be designed with aesthetically appealing facades, reducing any visual impact. A tree line and other vegetation could also be planted.

The parking garages could consist of retail use on the ground level, employee parking on the second level and visitor pay-by-space on the upper level(s). The money received from the paid parking could go directly back towards the parking garage construction bonds or costs.

According to *Parking Matters*, a nationally accepted handbook that details structured parking in smart growth communities, the cost for a parking structure typical ranges from $15,000 to $25,000 per space.

The cost to park shall be determined by the Parking Service Agency and should be revisited every month for the first year to determine if a decrease or increase in cost is needed. The value of a parking space is dependent on the location and surrounding operations. Funding for the structured parking is available through the following options:

1. Special Improvement District Budget;
2. Revenue Bond Financing (Federal and/or State);
3. Tax Financing;
4. Payment in Lieu of Parking;
5. Rental Income Subsidy;
6. Sale of Development Rights;
7. State and Federal Grants; and/or,
8. Developer Incentives.

It is recommended to initiate planning for a structured parking and launch an awareness campaign to the public detailing the benefits of the structured parking such as:

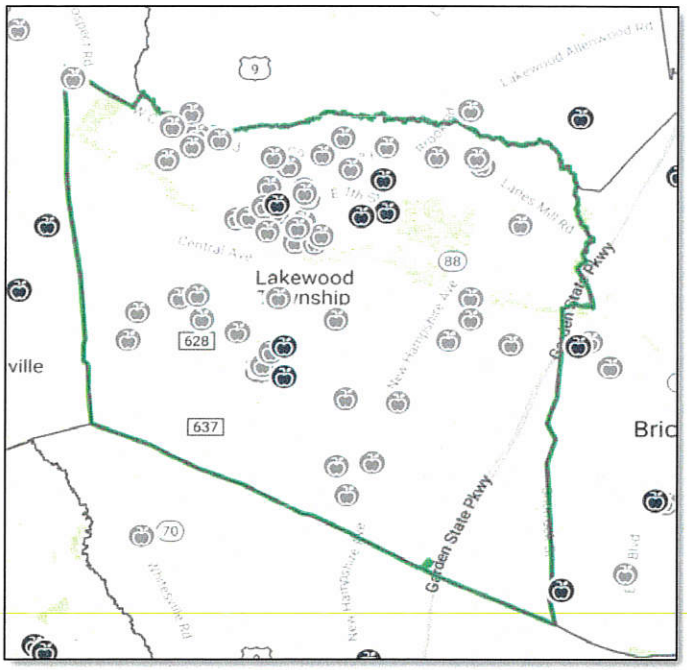
1. Large increase in parking supply;
2. The addition of new retail establishments;
3. Safer and long-term parking locations;
4. Less traffic demand and conflict in the Downtown Area;
5. Ability to mitigate visual impacts with trees and other vegetation; and,
6. Ability to finance and develop the parking structure.

XII. BUSSING CONSIDERATIONS

Unified and Coordinated Bussing System

Lakewood has approximately 150 schools within its boundaries. The map to the right obtained from www.trulia.com includes partial listings of the schools, and it shows that schools are spread throughout the Township.

Partial Listing of Lakewood Schools[4]



The busing/transportation need for these schools is very significant and has a major impact on the already burdened roadway system. It is estimated that over 100 bus companies travel the local roadways to transport students to and from the schools. Many of the buses travel with low occupancy, and most run very inefficiently due to the origin/destination constraints they have.

It is recommended that the Township explore streamlining the bus operations by adopting a unified and coordinated system that services all the schools in a synchronized fashion. This may significantly alleviate traffic congestion during the school opening and closing hours.

A unified and coordinated system is anticipated to be more efficient for students, more cost efficient and have less of an impact to traffic and the environment.

Designated Bus Stops

Designated bus stops will reduce the frequency of bus stops at individual residencies; therefore, will improve bus efficiency and reduce bus acceleration and deceleration impacts to transient travel. Designated bus stop should be explored along with the unified and coordinated bus system. With one unified bus system, the most efficient routes and effective bus stop locations can be determined.

[4] www.trulia.com

XIII. POTENTIAL POLICY, REGULATIONS, AND FIELD INVESTIGATIONS

This section provides support for policies and regulations that may strengthen Township ordinances and/or practices. These items have been recommended to enhance Township policy in a manner that is fair and defensible.

Parking

The parking requirements for land uses should be reviewed to provide adequate parking supply. A shortage of parking not only affects the functionality of the site in question but affects circulation in the surrounding area as people circulate looking for on street parking, hold up traffic as they parallel park, narrows travel lanes due to parking on both sides of the street, and in some instances park illegally (especially near intersections causing safety concerns). Some of the land use parking recommendations include:

- The downtown area (B-2) does not require on-street parking. However, many of the previous land uses this requirement was based upon are being redevelopment with more intense retail and office land uses. Specific intense land uses in the B-2 area may require additional parking supply to enhance on-site and off-site operations.
- Worship and office land use parking requirement should be reviewed to reflect current demand.
- The requirements for schools are based on classrooms and offices and are geared towards elementary and high schools. There are no alternate requirements for Post-High schools. Most Post-High School Yeshivas have large study halls but few classrooms. The parking requirement for Post-High Schools should be reviewed to reflect current demand.
- There are no requirements for catering facilities.

Roadway Widening for New Developments

Often when a project is proposed with frontage on a roadway that does not have a sufficient right-of-way width and roadway widening easement is provided on-site instead of a dedication. However, due to access and parking design as well as bulk and setback requirements, widening in the future is a difficult task that may not even be feasible after the developments have been constructed.

Therefore, it is recommended that where widening is anticipated in the future along frontage roadways for new developments, that the access, parking and setbacks are designed appropriately to the board's satisfaction so future widening is feasible.

Residential Site Improvement Standards

It is recommended for the Township to request that in new subdivision applications with proposed residential streets that the following New Jersey Residential Site Improvement Standards (RSIS) calculations are provided:

- Street Classification(s)
- Average Daily Traffic for all new residential streets
- Development Intensity
    - Low – Less than or equal to 4 dwellings per acre
    - Medium – More than 4 units per acre and less than or equal to 8 units per acre
    - High – More than 8 units per acre

These calculations, which should be performed by a Licensed Engineer, define the required cartway, pavement width, and on-street parking design. This will ensure that new roadways are designed in accordance with the New Jersey RSIS and adequate pavement width is provided.

Development Management

It was recommended by the public to issue a two (2) year moratorium on development. The intent of their recommendation was to allow traffic improvements to be constructed over two years before additional development traffic demand is generated.

Transportation Demand Management

A Transportation Demand Management (TDM) study could be conducted. A TDM market study would determine the feasibility of programs such as telecommuting, carpool and off-peak work hours. A TDM study can provide insight on the applicability of these forms of traffic management and their potential success in Lakewood Township.

Waze Connected Citizen Program

The Waze Connected Citizens (CCP) is a data exchange program between municipalities and Waze. Municipalities share available incident and road closure reports, enabling Waze's government partners to respond more immediately to accidents and congestion. In turn, Waze provides current up-to-date travel information to the municipality including speed, congestion areas and accidents.

Field Investigations

ADA Audit within Downtown Area

An audit of curb ramps and crosswalks within the Downtown Area for compliance with the Americans' with Disabilities Act (ADT) Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) is recommended.

Township and County Audit of Traffic Signal Detection

Lakewood Township should coordinate with Ocean County to perform an audit on all loop and video detectors at traffic signals. Should any detectors be failing, it is recommended to fix or replace detection with video detection.

Stop Sign Parking Prohibition Audit

As outlined earlier in this report, the New Jersey Administrative Code prohibits parking within 50' of a stop sign. Therefore, it is recommended to review locations where this is being violated and install MUTCD R7-1 signs and yellow curb where appropriate.

XIV. SUMMARY AND CONCLUSIONS

This comprehensive Transportation Improvement Study evaluated transportation facilities, circulation, parking, and policy within the Township. The Transportation Improvement Study identified existing problematic traffic conditions and recommends infrastructure solutions. This Study offers an opportunity to determine potential short-term, medium-term, and long-term improvement goals. By evaluating the improvements by priority, simple yet beneficial improvements can be quickly implemented and long-term improvements can be planned appropriately.

The public outreach provided insight from participants to collaborate with on solutions, ideas, and opportunities to help improve traffic operations throughout Lakewood Township. Using this information, previous traffic study data and field observations, the priorities of recommended improvements was established. The following categories of improvements have been reviewed and recommendations were issued:

- Short-Term Parking Solutions
- Intersections that may benefit from All-Way Stop Control
- Intersection that may benefit from Traffic Signal Control
- Intersections that may benefit from Striping Improvements to Increase Capacity
- Intersections that may benefit from Pedestrian, Safety and Traffic Calming Upgrades
- Intersections that may benefit from Significant Traffic Signal or Roadway Widening.
- Potential Roadway Corridor Improvements
- Roadway Extensions and Bypasses
- Downtown Circulation
- Downtown Parking
- Unified and Coordinated Bussing System
- Designated Bus Stops
- Parking Requirements
- Roadway Widening for New Developments
- Residential Site Improvement Standards
- Development Management
- Waze Connected Citizen Program