

**Introduction:**

Birdsall Engineering, Inc. (BEI) has been retained by the Borough of Fair Lawn to investigate the feasibility of mitigating traffic volumes and traffic speeds at Broadway (NJ Route 4) and Midland Avenue (C.R. 67), including the existing local streets south of Broadway between Midland Avenue and Plaza Road. The Scope of Work for the Traffic Study focused on two specific areas more specifically described as follows:

- Area 1: Investigate Alternatives for Traffic Calming along Arcadia, Berkshire, Cambridge, Dorchester, and Ellington Roads between Midland Avenue (C.R. 67) and Plaza Road, including dead-ending some or all of the roadways.
  
- Area 2: Investigate the feasibility of modifying the existing signalized intersection of NJ Route 4 (Broadway) and Midland Avenue (C.R. 67) to provide a westbound left turn lane.

With respect to the requirements of each of the above tasks, our office conducted traffic data collection studies at various locations to obtain traffic volume and travel speed data. Based on the results of the data obtained, BEI investigated the feasibility of affecting improvements to both the intersection of Broadway and Midland Avenue as well as the aforementioned local streets to alleviate traffic volume and speeds in the area of the local streets. At the time the Scope of Work was developed, the preliminary mitigation alternatives were envisioned as including the following:

Consider closing some of all of the local streets under study (Ellington, Dorchester, Cambridge, Berkshire and Arcadia Roads) to through traffic by dead-ending the roads.

Implement traffic calming elements on the local roads to slow traffic speeds.

Modify the existing signalized intersection at Broadway and Midland Avenue to accommodate a westbound left turn lane, rerouting traffic presently traveling westbound on Broadway and turning left at Plaza Road and subsequently utilizing the aforementioned local roads to access Midland Avenue.

The following report presents the findings of our data collection and analyses and provides recommendations for the implementation of alternatives as required.

**Existing Roadway Conditions:**

The existing roadway configuration on Broadway at Midland Avenue and Broadway at Plaza Road does not accommodate north-south traffic across Broadway without affecting the existing residential streets located immediately south of Broadway. Broadway is a state highway, designated as NJ Route 4, which runs in an east-west direction through the Borough. The roadway is divided for its entire length within the Borough. Right turns onto and off of the road are permitted at all of the existing side street crossings (except for the one way roads in the area). Left turns onto and off of Broadway, as well as through movements crossing Broadway are restricted to specific locations at signalized intersections within the corridor.

Traffic signals exist on Broadway at Plaza Road and at 26th Street, located one block east of Plaza Road. The two signalized intersections act as a pair to provide u- and left turn access from various points on Broadway and local streets. One-way ramps exist on both sides of Broadway between these two side streets that act as near side jughandles, with Plaza Road serving southbound traffic only and 26th Street serving northbound traffic only across Broadway between the two ramps.

Midland Avenue is a county-jurisdiction roadway (C.R. 67) that runs in a north-south direction beginning at Broadway and extending in a southerly direction into Saddle Brook and other municipalities to the south. The intersection of Midland Avenue and Broadway is signalized as well, but left turns are not permitted from Broadway onto Midland Avenue. The Broadway approaches to the signal consist of two lanes in each direction. Midland Avenue contains one approach lane for all turning movements (left and right turns) and one receiving lane.

Plaza Road is a local-jurisdiction roadway located one block to the east of Midland Avenue. Although Plaza Road extends both north and south of Broadway, the southerly extension of the roadway terminates within a short distance of Broadway (at Schepis Avenue) and does not provide access for any traffic other than local destination trips. Consequently, through traffic originating from Broadway or points north of Broadway must travel along the local roadways connecting Plaza Road and Midland Avenue to continue traveling south. Northbound traffic originating from south of Broadway must travel from Midland Avenue and through the local roads to Plaza Road, and then must travel one block east of Plaza Road, via a ramp opposite Ellington Road, to 26th Street, to the signalized crossing at Broadway.

The existing local streets connecting Plaza Road and Midland Avenue are Arcadia Road, Berkshire Road, Cambridge Road, Dorchester Road and Ellington Road beginning one block south of Broadway and extending in a southerly direction in the order described above. These local streets are configured as one-way streets; beginning with Ellington Road running

westbound, and alternating direction proceeding south. Each of these streets is approximately 30 feet wide, and is aligned with a straight alignment and relatively flat profile.

Given the discontinuity of the north-south corridor streets, Plaza Road and Midland Avenue, and the connection of the parallel local streets, southbound traffic has a tendency to travel across Broadway at Plaza Road and utilize the existing local streets as a connection to Midland Avenue to access destinations located to the south.

**Traffic Data Collection:**

Given the dual assignment of evaluating traffic calming elements on the local streets and the left turn onto Midland Avenue directly from Broadway, our office conducted a traffic data collection program on the streets previously identified. Copies of the raw traffic count data are attached herein as an Appendix for reference. Also attached is a figure entitled Figure 1, Peak Hour Traffic Counts that identifies the peak morning and evening traffic volumes at the various locations for which data was collected. The traffic counts consisted of a combination of manual turning movement counts at select intersections during peak travel periods and continuous traffic counts taken with automatic traffic recorders. A summary of the traffic data collection efforts is as follows:

1. Morning and Evening Peak Period Turning Movement Counts taken at:
  - a. Broadway and Plaza Road
2. Automatic Traffic Recorder (ATR) Counts were taken at the following locations:
  - a. Ellington Road, between Midland Avenue and Plaza Road
  - b. Dorchester Road, between Midland Avenue and Plaza Road
  - c. Cambridge Road, between Midland Avenue and Plaza Road
  - d. Berkshire Road, between Midland Avenue and Plaza Road
  - e. Arcadia Road, between Midland Avenue and Plaza Road
  - f. Midland Avenue, between Broadway and Ellington Road
  - g. Midland Avenue, between Dorchester Road and Cambridge Road
  - h. Midland Avenue, just south of Arcadia Road
  - i. Plaza Road, between Broadway and Ellington Road
  - j. Plaza Road, between Dorchester Road and Cambridge Road

3. Sample Turning movement Counts, consisting of 30-minute counts during the peak periods, were taken at the following locations to establish turning movement patterns:
  - a. Midland Avenue and Ellington Road
  - b. Midland Avenue and Dorchester Road
  - c. Midland Avenue and Cambridge Road
  - d. Midland Avenue and Berkshire Road
  - e. Midland Avenue and Arcadia Road
  - f. Plaza Road and Ellington Road
  - g. Plaza Road and Dorchester Road
  - h. Plaza Road Cambridge Road
  - i. Plaza Road Berkshire Road
  
4. Additional sample counts taken at the intersection of Broadway and Plaza Road, including the jughandle for U- and left turns from Broadway. Based on these counts, southbound traffic at the Plaza Road approach to Broadway was classified as originating from the jughandle or originating from Plaza Road north.

The summary of traffic volumes and the various turning movement percentages/volumes are illustrated in Figures 2 through 5, attached hereto as an Appendix.

**Left-turn Lane Installation at NJ Route 4 (Broadway) and Midland Avenue:**

Westbound left turns at Midland Avenue cannot be accommodated with a jughandle configuration similar to the configuration at Plaza Road, because Banta Place and Hartley Place do not align with Midland Avenue. Realigning the north-south streets (Midland Avenue and Hartley/Banta Place) to accommodate a crossing movement would require extensive acquisition of right of way and demolition of buildings, which does not offer a practical solution.

An alternative provision for left turns would be to modify the median barrier and westbound lanes on Broadway to accommodate a left turn lane in the center of the Broadway median at the existing signal. The existing concrete jersey median barrier can be modified at the intersection to provide a 6-foot wide median (comprised of a 4-foot concrete island and 2-foot shoulder), and a westbound left turn lane can be provided. The existing roadway shoulders on Broadway are in excess of 13-foot wide in the vicinity of Midland Avenue. By reducing the width of these shoulders in both the eastbound and westbound directions, adequate width is available in the center of the roadway for the construction of 12-foot wide Westbound left turn lane and a 6-foot wide concrete island. The westbound travel lanes would shift approximately

7-feet to the north and the eastbound travel lanes would shift approximately 4-feet to the south to accommodate the left turn lane. A schematic roadway section is included in the Appendix of this report for reference.

The distance between Midland Avenue and Plaza Road along Broadway is approximately 700 feet. Constructing a shift taper on westbound Broadway to accommodate the westbound through traffic and constructing a left turn slot in accordance with NJDOT Design Standards, a left turn storage lane approximately 200 feet in length can be accommodated. A 200-foot storage lane will accommodate approximately 10 vehicles.

With respect to the traffic volumes anticipated at the westbound left turn lane, BEI evaluated the traffic volume at the Plaza Road southbound approach to Broadway and quantified the amount traffic at the approach that originated from the Plaza Road jughandle versus the volume of traffic originating from Plaza Road. Of the total approach volume of southbound traffic at the Plaza Road approach to Broadway, the amount of traffic originating from the jughandle is approximately 13% and 20% for the morning and evening peak hours respectively. Of that contributing percentage, approximately 7% of the total approach volume (AM Peak Hour, 44 vehicles; PM Peak Hour, 53 vehicles) continues across Broadway as a through movement. The other vehicles on the southbound approach that originate from the Broadway westbound jughandle turn left at the signal to constitute a u-turn movement. The balance of the traffic volume at this southbound approach, approximately 450 vehicles, originates from Plaza Road to the north.

Assuming a small percentage of traffic originating from the Plaza Road in the north and all of the left turning traffic originating as westbound traffic on Broadway being served by the proposed left turn lane, approximately 60 vehicles in the peak hour would be eliminated from the local roads between Midland Avenue and Plaza Road. Based on the traffic turning split percentages illustrated in Figure 3, the traffic volumes on the westbound local roads would be reduced by approximately 10%. While this reduction does not eliminate through traffic on these roads, a 10% reduction should offer a noticeable reduction in the volume on these streets. The 10% reduction equates to approximately 30 vehicles in the peak hour or one vehicle every two minutes.

The proposed traffic signal modifications should consist of a protected lead westbound phase, which consists of a green arrow permitting westbound left turns without opposing (eastbound) through volume. Since there is no eastbound left turn lane, the westbound through movement can proceed with the left turns so as not to delay the westbound traffic unnecessarily. The left turn lane would be constructed with conventional in-pavement loop detectors to offer a variable timing based on the demand of vehicles in the left turn lane. A sample Level of Service calculation included in the Appendix of this report indicates that a lead westbound turning phase of fifteen seconds maximum provides a Level of Service for the entire

intersection within reasonable performance standards. The sample calculation was developed with existing volumes at the intersection of Broadway and Midland Avenue, and an assumed westbound left turn lane volume of 60 vehicles. The Level of Service calculation shows the intersection operating at overall LOS D with the left turn lane operating at LOS C. The Level of Service calculation summary provides a Back of Queue analysis, which approximates the number of vehicles stopped at the signal approach during a given phase in the timing cycle. The 98<sup>th</sup> percentile Back of Queue illustrates a vehicle queue in the proposed westbound left turn lane of less than 5 vehicles, indicating that the 200-foot storage lane (10 car capacity) is adequate with left turning vehicles not expected to back up into the westbound through lanes. The actual timing of the signal would require coordination with the existing signals located along Broadway. A progressions analysis should be conducted with the final design of the traffic signal to provide the optimum timing of the signal with minimum residual queuing delay.

#### **Traffic Calming on Local Roads between Midland Avenue and Plaza Road:**

A second component to our Scope of Work was to evaluate the alternatives available for implementing traffic calming elements on the local streets connecting Midland Avenue and Plaza Road, (Ellington, Dorchester, Cambridge, Berkshire and Arcadia Roads). All five of these roads are one-way roads alternating in direction beginning with a westbound direction on Ellington Road. They all run in a straight alignment and a flat profile, and are relatively wide (approximately 30 feet) for one-way streets. The land uses adjacent to these streets are all residential, with a combination of on and off street parking.

Traffic Calming techniques consist of a varying range of treatments; with all of the techniques designed to slow (or calm) traffic through an area. The design intent is to slow traffic to the posted speed or just under the posted speed. Each of the many techniques available are effective only if used within certain specific conditions, and misplaced or misused traffic calming treatments can potentially create additional traffic problems, such as safety concerns, maintenance issues, and unwanted concentration of traffic to other locations. Often, effective traffic calming measures consist of a series of treatments, sometimes implemented over a period of time, to gradually offer a calming in traffic speeds and not cause traffic to instantly find an alternate route. The most effective treatments offer a combination of engineering, education and enforcement.

13EI was tasked with evaluating the potential benefits realized by implementing traffic calming techniques on the five local streets previously identified. One specific treatment we were asked to consider was to dead end these streets, which would eliminate the ability for these streets to serve as a connector between Midland Avenue and Plaza Road. Given that the proposed left turn lane at Midland Avenue will shift the westbound traffic directly to Midland

*NJ Route 4 (Broadway) and Midland Avenue  
Intersection Improvements and Traffic Calming Study*

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Avenue and not all of the traffic originating from Plaza Road in the north, the local roads are still needed to convey the traffic between Plaza Road and Midland Avenue.

The traffic counts obtained by our office on these local streets consisted of speed and gap counts utilizing Automatic Traffic Recorders, (ATR). The machines were set to provide a continuous traffic count for a seven-day period, with the speed of the vehicles recorded in addition to the volume. A summary of the traffic volumes and speeds recorded on the various streets are as follows:

Street Name	Directions of Travel	Peak Hour Volume		Average 24-Hour Volume (veh./day)	Percentage of Total Traffic Volume Traveling at Speed Ranges Indicated			
		AM Peak	PM Peak		0-20 mph	20-25 mph	25-30 mph	30-35 mph
Ellington Road	Westbound	287	293	2460	29%	61%	10%	0%
Dorchester Road	Eastbound	138	165	1420	17%	37%	37%	9%
Cambridge Road	Westbound	95	101	1120	14%	36%	45%	5%
Berkshire Road	Eastbound	184	241	1450	75%	24%	1%	0%
Arcadia Road	Westbound	120	109	930	95%	3%	1%	1%

As can be seen from the above summary, very few vehicles were recorded as traveling in excess of 30 miles per hour. Given a speed limit of 25 miles per hour, the majority of the traffic traveling between 20 and 30 miles per hour is considered compliant with the speed limit to the extent that slowing travel speeds is not required. Traffic Calming measures that could be employed on the streets in question are limited to "narrowing" techniques or Speed Humps, given the short lengths and straight alignment of the roads. Narrowing techniques such as neckdowns would not be effective, since these techniques rely on narrowing the driver's perception of the road as viewed from a distance. Speed humps may offer some additional reduction travel speeds, but their placement must be carefully considered. Speed humps would have to be placed near the middle of the street lengths, with at least two installations on the streets. Also, speed humps would be required on all of the streets. Our experience indicates that speed humps on isolated local through roads have a tendency to encourage traffic to find alternate routes, which is counter to the intended benefits of traffic calming techniques.

Also, the 24-hour volumes experienced on these roads are consistent with traffic volumes on local roads, as published in the Residential Site Improvement Standards (RSIS). The RSIS publishes standards for roads by various types (local, collector, arterial, etc.) that are statewide Standards applicable to new residential development in New Jersey. Although the local roads under study here already exist, these Standards are commonly used as a benchmark for

evaluating traffic conditions on existing roads serving residential development. The RSIS indicates that local roads (the lowest classification of roadways in terms of volume and use) should be limited to 1500 vehicles per day. It is noted that all of the local roads studied in this Report have daily volumes less than 1500 vehicles per day except Ellington Road. The next highest classification of road per RSIS is Minor Collector, which permits up to 3500 vehicles per day. The daily volume on Ellington is well below this limit, and will be closer to the local road classification with the expected 10% reduction in volume with the construction of the westbound left turn lane at Broadway and Midland Avenue. The higher volumes experienced on Ellington Road are due primarily to the proximity to the commercial development and the state highway.

Overall, the volumes experienced on these local roads are not excessive for residential streets, given the proximity to the state highway and commercial development. A significant reduction in volume is not warranted, and the travel speeds indicate that the majority of the traffic respects the posted/statutory limits. Dead-ending one or more of these streets would unnecessarily shift traffic to the other streets, significantly increasing traffic volumes over what is typically experienced on local roadways.

**Recommendations:**

Construction of a westbound left-turn lane at Broadway and Midland Avenue will offer an approximate 10% reduction in westbound peak-hour traffic on Ellington, Cambridge, and Arcadia Roads, by redirecting the traffic traveling westbound on Broadway and turning left at Plaza Road to access Midland Avenue through the local streets. Traffic southbound on Plaza Road and accessing Midland Avenue by crossing Broadway at Plaza Road and utilizing the local roads will not be significantly reduced with the proposed left turn lane, but some reduction is anticipated since an alternate route would be available. Modifying the existing shoulder widths and the median on Broadway at Midland Avenue will accommodate a westbound left turn lane with an approximate 200-foot storage lane and shift tapers conforming to NJDOT Standards. With a westbound protected lead phase providing up to 15 seconds, acceptable Levels of Service can be achieved at the intersection with the rerouted traffic, approximately 60 vehicles in the peak hour. Construction of the left turn lane should be accompanied with signage on westbound Broadway in advance of Plaza Road to redirect westbound traffic to the new signalized turn lane.

With respect to traffic calming on the local roads between Midland Avenue and Plaza Road, we do not recommend dead-ending the roads because the redirected traffic to the remaining streets would offer a detrimental effect to the traffic volumes and quality of life on those streets. However, we believe that the reduction in traffic volumes resulting from the construction of the westbound left turn lane at Broadway at Midland Avenue will offer a calming affect on the local streets by reducing overall volumes on these roads.

Since the traveling speeds the local roads are not in excess of the posted speeds on the road, an immediate need for additional reduction techniques are not recommended at this time. We recommend that the conditions be monitored after the installation of the left turn lane to observe the changes on traffic conditions. Traffic Calming measures consisting of physical deterrents are not advised at this time. Techniques such as speed humps may create negative impacts such as redirecting traffic to other streets. We recommend that travel speeds continue to be monitored and enforcement be increased at peak hours to determine its effectiveness in reducing travel speeds.