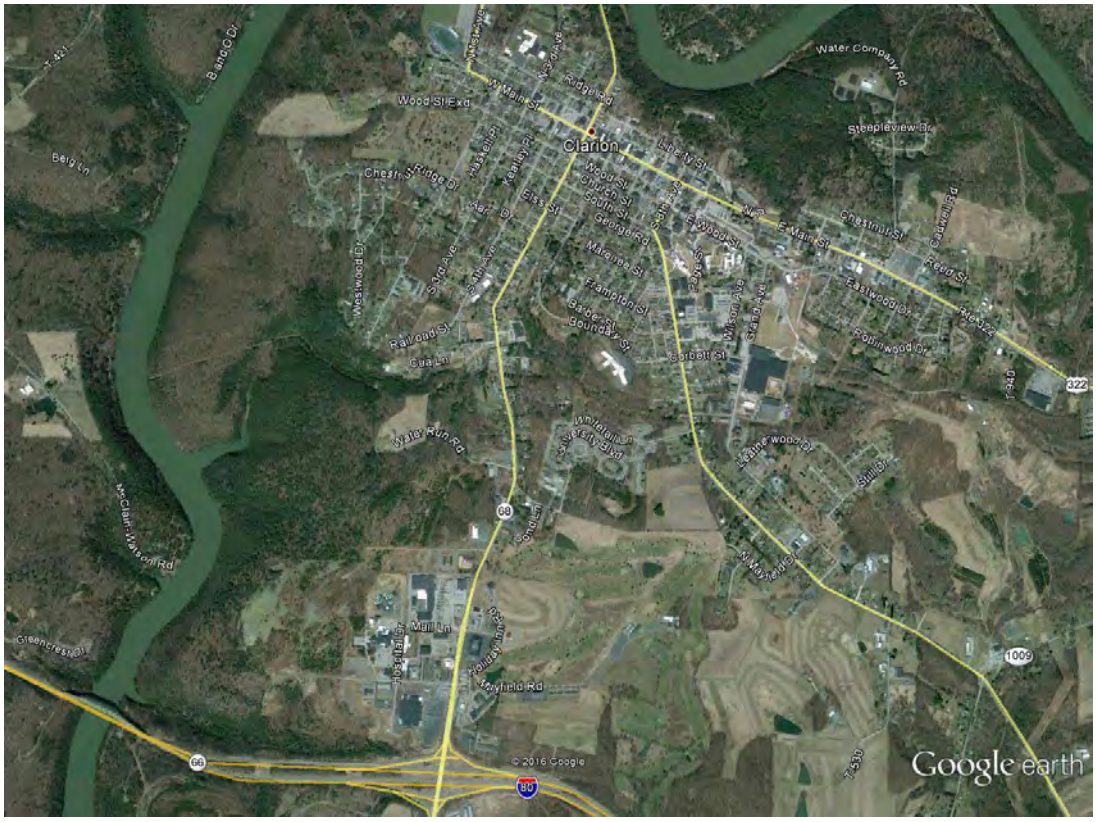
Clarion Area Relief Route Study

Clarion, Clarion County

June 30, 2016



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INTRODUCTION

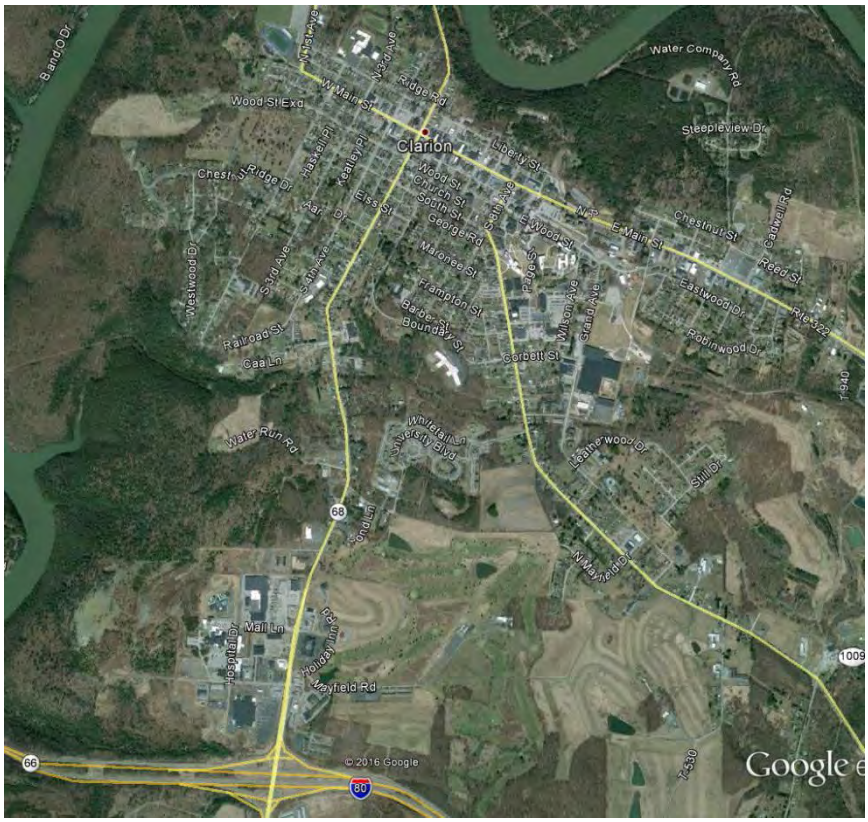
PURPOSE OF STUDY

The Clarion Area Relief Route Study evaluates the current traffic conditions along the 5th Avenue (SR 0068) corridor in order to determine and evaluate traffic congestion relief strategies. The study includes assessing the need for an evacuation or emergency route and any other improvements which will accommodate all local, visitor, and truck traffic.

AREA OF ANALYSIS

5th Avenue (SR 0068) is located within Clarion Borough, Clarion Township, and Monroe Township as seen in **Figure 1** to the right. In order to determine feasible relief strategies for the 5th Avenue (SR 0068) corridor, the following existing corridors and intersections were analyzed:

Figure 1 – Study Area Map



- 5th Avenue (SR 0068) – from Main Street (SR 0322) to the I-80 Interchange
- Main Street (SR 0322) – from Paint Boulevard (SR 0066) to 9th Avenue
- Paint Boulevard (SR 0066) – from Main Street (SR 0322) to the I-80 Interchange
- Greenville Pike (SR 1007) – from Main Street (SR 0322) to the I-80 Interchange
- Main Street (SR 0322) with 2nd Avenue
- Main Street (SR 0322) with 5th Avenue (SR 0068)
- Main Street (SR 0322) with 6th Avenue
- Main Street (SR 0322) with 7th Avenue
- Main Street (SR 0322) with 8th Avenue
- Main Street (SR 0322) with 9th Avenue
- 5th Avenue (SR 0068) with South Street
- 5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive
- 5th Avenue (SR 0068) with Perkins Drive / Commercial Drive

STAKEHOLDER MEETINGS

Three stakeholder's meetings were conducted during the project. All of the meetings were held at the Clarion County Administrative Building and were attended by the Steering Committee. Representatives of Clarion County, Clarion Borough, Clarion Township, Monroe Township, the Northwest Commission, and PennDOT District 10-0 were invited to the meetings. The first meeting was held on October 10, 2016, and introduced the study and obtained feedback from the participants. The second meeting was conducted on March 23, 2016 and reviewed the Existing Conditions analysis and discussed possible strategies to be analyzed. On June, 9, 2016, the third meeting was held and reviewed the analysis of the strategies and discussed the public meeting.

The meeting minutes from each of the three steering committee meetings are provided in **Appendix A**.

PUBLIC MEETING

One public meeting was conducted at the end of the project. The meeting was held on June 21, 2016, at the Clarion Borough Council Chambers. The public meeting presented the findings of the study and the relief strategies considered as part of the study. Comments from the public based on that meeting can be seen in **Appendix B**.

EXISTING YEAR 2015 CONDITIONS

EXISTING CORRIDORS DESCRIPTION

5th Avenue (SR 0068)

The 5th Avenue (SR 0068) corridor within the study area is an urban principal arterial which traverses through Clarion Borough, Clarion Township, and Monroe Township. The study area includes 5th Avenue (SR 0068) from Main Street (SR 0322) in Clarion Borough to the I-80 interchange in Monroe Township. The northern portion of the corridor services the downtown area of Clarion via one lane in each direction with auxiliary left turn lanes at the signalized intersections. The southern portion of the corridor services commercial businesses and the Clarion Hospital as well as provides access to I-80. The speed limit along the northern portion of the corridor is 25 mph and increases to 40 mph at the southern portion of the corridor. This study analyzes four signalized intersections along the 5th Avenue (SR 0068) corridor.

Main Street (SR 0322)

The Main Street (SR 0322) corridor within the study area traverses through Paint Township, Clarion Township, and Clarion Borough. The corridor consists of an urban principal arterial within the Clarion Borough limits and a rural principal arterial to the east and west of Clarion Borough. The study area includes Main Street (SR 0322) from Paint Boulevard (SR 0066) in Paint Township to 9th Avenue in Clarion Borough. The corridor services the downtown area of Clarion and provides a connection to points east and west of Clarion. The corridor also serves as a detour route for I-80. The speed limit along the western portion of the corridor from Paint Boulevard (SR 1007) to Liberty Street is 45 mph where it is then reduced to 35 mph from Liberty Street to 5th Avenue (SR 0068). East of 5th Avenue within the study area, the speed limit is 25 mph. This study analyzes five signalized intersections and one stop-controlled intersection along the Main Street (SR 0322) corridor.

Paint Boulevard (SR 0066)

The Paint Boulevard (SR 0066) corridor within the study area is a rural principal arterial located in Paint Township. The study area includes Paint Boulevard from Main Street (SR 0322) to the I-80 interchange. The corridor services a rural area which contains some commercial businesses and provides a connection to I-80. The speed limit along the corridor is 45 mph. This study does not analyze the operations of any intersections along this corridor, but this corridor will be considered in the alternative strategies for 5th Avenue (SR 0068).

Greenville Pike (SR 1007)

The Greenville Pike (SR 1007) corridor within the study area is an urban minor arterial which traverses through Clarion Borough and Clarion Township. The study area includes Greenville Pike (SR 1007) from Main Street (SR 0322) to the I-80 interchange. The corridor services the downtown area of Clarion and Clarion University along the northern portion of the corridor and services a rural area along the southern portion of the corridor. The speed limit along the northern portion of the corridor from Main Street (SR 0322) to South Street is 25 mph. From South Street to Mayfield Drive, the speed limit increases to 35 mph and along the southern

portion of the corridor from Mayfield Drive to the I-80 interchange, the speed limit is 45 mph. This study does not analyze the operations of any intersections along this corridor, but this corridor will be considered in the alternative strategies for 5th Avenue (SR 0068).

EXISTING STUDY INTERSECTIONS DESCRIPTION

Main Street (SR 0322) with 2nd Avenue

The intersection of Main Street (SR 0322) with 2nd Avenue is a four-legged signalized intersection located on the western end of Clarion Borough. Each approach consists of one lane that is used to make all possible movements. The traffic signal consists of a strain pole / span wire design and pedestrian facilities are present on all approaches.

Main Street (SR 0322) with 5th Avenue (SR 0068)

The intersection of Main Street (SR 0322) with 5th Avenue is a four-legged signalized intersection and serves as the main intersection in Clarion Borough. Each approach contains an auxiliary turn lane. The traffic signal consists of a mast arm design and pedestrian facilities are present on all approaches.

Main Street (SR 0322) with 6th Avenue

The intersection of Main Street (SR 0322) with 6th Avenue is a four-legged signalized intersection located within the business district of the Borough of Clarion. Each approach consists of one lane that is used to make all possible movements. The traffic signal consists of a strain pole / span wire design and pedestrian facilities are present on all approaches.

Main Street (SR 0322) with 7th Avenue

The intersection of Main Street (SR 0322) with 7th Avenue is a four-legged intersection that is stop-controlled and is located within the business district of the Borough of Clarion. The eastbound, westbound, and northbound approaches consist of one lane that is used to make all possible movements. The northern leg of the intersection is a one-way street northbound. Pedestrian facilities are present on all approaches.

Main Street (SR 0322) with 8th Avenue

Tfhe intersection of Main Street (SR 0322) with 8th Avenue is a four-legged signalized intersection located within the business district of the Borough of Clarion. The westbound approach (Main Street) consists of an auxiliary left turn lane and a shared through / right turn lane while the westbound (Main Street) and northbound (8th Avenue) approaches each consist of a shared left turn / through lane and an auxiliary right turn lane. The southbound approach (8th Avenue) consists of one lane that is used to make all possible movements. The traffic signal consists of a strain pole / span wire design and pedestrian facilities are present on all approaches.

Main Street (SR 0322) with 9th Avenue

The intersection of Main Street (SR 0322) with 9th Avenue is a four-legged signalized intersection located within the business district of the Borough of Clarion. The eastbound approach (Main Street) consists of an exclusive left turn lane and a shared through / right turn lane while the westbound approach (Main Street) consists of one lane that is used to make all possible movements. The northbound approach (9thAvenue) consists of a shared left turn / through lane and an exclusive right turn lane. The northern leg of the intersection is a one-way street northbound. The traffic signal consists of a strain pole / span wire design and pedestrian facilities are present on the westbound, northbound, and southbound approaches.

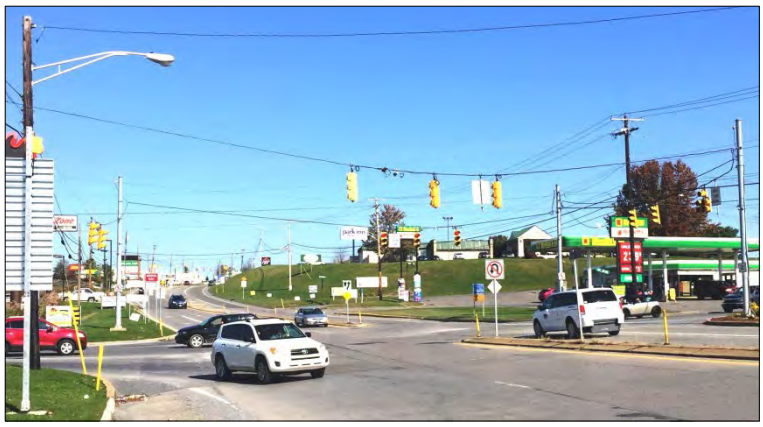
5th Avenue (SR 0068) with South Street

The intersection of 5th Avenue (SR 0068) with South Street is a four-legged signalized intersection located in Clarion Borough. The northbound and southbound approaches (5th Avenue) each consist of an exclusive left turn lane and a shared through / right turn lane while the eastbound and westbound approaches (South Street) each consist of one lane that is used to make all possible movements. The traffic signal consists of a mast arm design and pedestrian facilities are present on all approaches.

5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive

The intersection of 5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive is a four-legged signalized intersection located in Monroe Township. The northbound and southbound approaches (5th Avenue) each consist of an exclusive left turn lane and a shared through / right turn lane while the eastbound approach (Clarion Mall Drive) consists of a shared left turn / through lane and an exclusive right turn lane. The westbound approach (Kane Drive) consists of one lane that is used to make all possible movements. The traffic signal consists of a strain pole / span wire design and pedestrians are prohibited from traversing through the intersection.

5th Avenue (SR 0068) with Perkins Drive / Commercial Drive

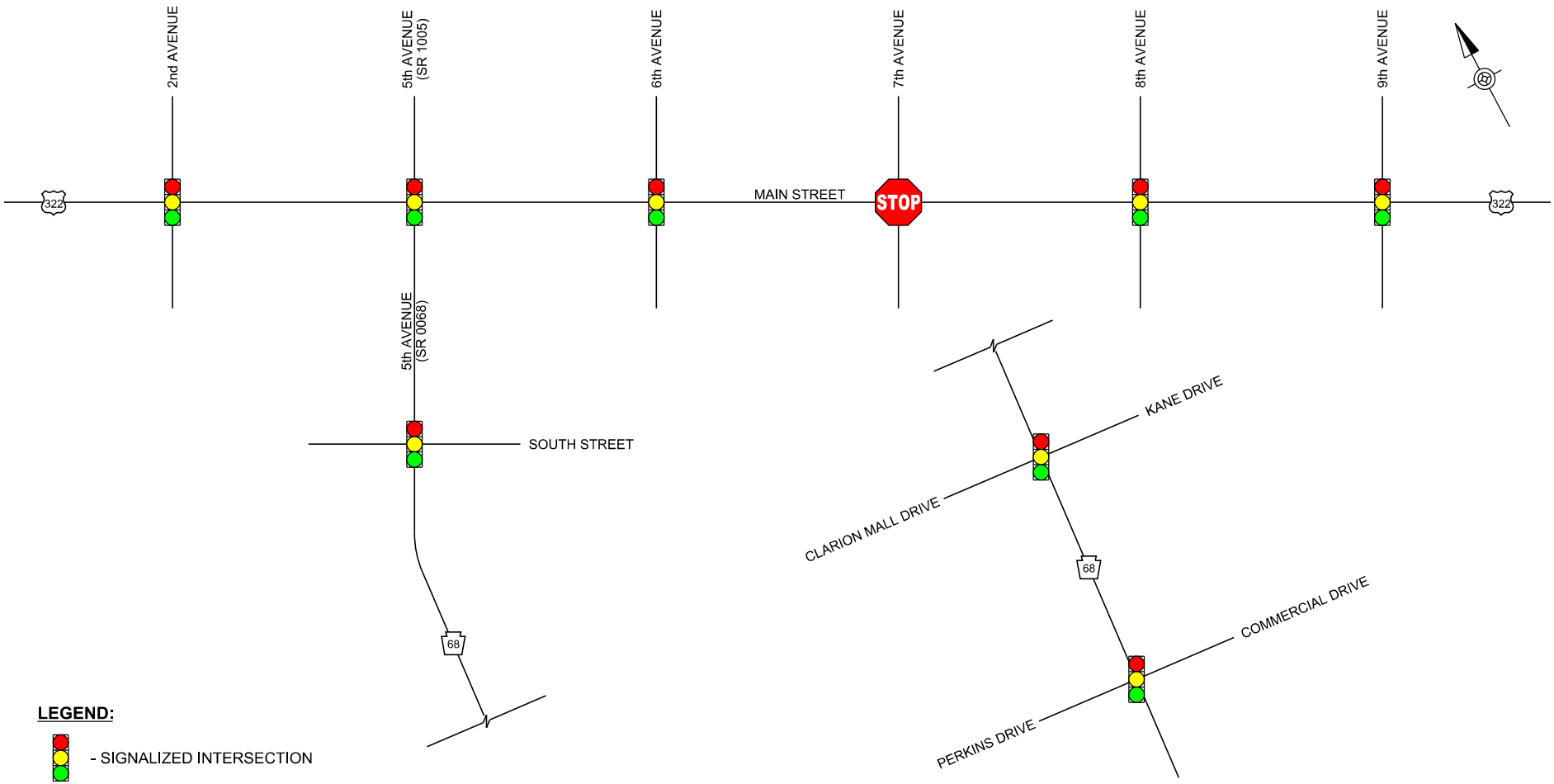


The intersection of 5th Avenue (SR 0068) with Perkins Drive / Commercial Drive is a four-legged signalized intersection located in Monroe Township. The northbound approach (5th Avenue) consists of an exclusive left turn lane and a shared through / right turn lane. The southbound approach (5th Avenue) consists of an exclusive left turn lane, an exclusive through lane, and an exclusive right turn lane. The eastbound approach (Perkins Drive) consists of a shared left turn / through lane and an exclusive right turn lane while the westbound approach (Commercial Drive) consists of one lane that is used to make all possible movements. The traffic signal consists of a strain pole / span wire design and pedestrians are prohibited from traversing through the intersection.

The existing traffic control at the study intersections can be seen graphically on **Figure 2** on the next page.

EXISTING DETOUR ROUTES

There are existing signed detour routes within the study area. Blue and orange detour signs are currently in place which direct traffic in cases when traffic on I-80 is detoured through Clarion.



LEGEND:

- SIGNALIZED INTERSECTION

STOP - TWO-WAY STOP-CONTROLLED INTERSECTION

Northwest COMMISSION

CLARION RELIEF STUDY

EXISTING INTERSECTION TRAFFIC CONTROL

FIGURE 2

AECOM

EXISTING LAND DEVELOPMENT

The Clarion area consists of many different types of land development. An urban business district is located along Main Street (SR 0322) which includes local shops, restaurants, and the Clarion Courthouse. Just east of this urban business district is the Clarion University campus. The urban business district and Clarion University are surrounded by residential areas. To the south of the urban business district and residential areas, a suburban shopping district is located along 5th Avenue (SR 0068). This shopping district consists of big box retail stores, restaurants, and hotels. Additionally, the Clarion Hospital is located to the west of this suburban shopping area along Hospital Drive. All of these areas are serviced by I-80 which is located to the south of these districts allowing access to points east and west of Clarion.

EXISTING YEAR 2015 AVERAGE DAILY TRAFFIC

PennDOT installed Automatic Traffic Recorders (ATRs) along 5th Avenue (SR 0068) from Tuesday, April 7, 2015 to Wednesday, April 15, 2015. The ATRs recorded the number and the classification of vehicles. Based upon the ATR data, the average daily traffic (ADT) (Tuesday through Thursday) was identified as follows:

- Northbound = 7,234
- Southbound = 7,514

The average truck percentage on an average weekday (Tuesday through Thursday) was identified as follows:

- Northbound = 1.2%
- Southbound = 1.6%

The PennDOT collected ATR data can be seen in **Appendix C**.

Although the average daily truck percentage is between 1% and 2%, when an incident occurs on I-80 and traffic is detoured through Clarion, truck traffic dramatically increases. According to PennDOT's Internet Traffic Monitoring System (iTMS), the daily truck percentage along I-80 ranges from 37% to 50%.

EXISTING YEAR 2015 PEAK HOUR TRAFFIC VOLUMES

In order to establish the Existing Year 2015 traffic volumes in the study area, manual turning movement counts were conducted at the study intersections on typical weekdays (Tuesday through Thursday) in 2008 and 2015 by PennDOT and AECOM.

PennDOT conducted manual turning movement counts at the intersections along Main Street (SR 0322) between 5th Avenue (SR 0068) and 9th Avenue during the AM, Midday, and PM peak hours in 2008. PennDOT also conducted manual turning movement counts at the intersections of 5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive and 5th Avenue (SR 0068) with Dolby Street during the Midday and PM peak hours in 2015.

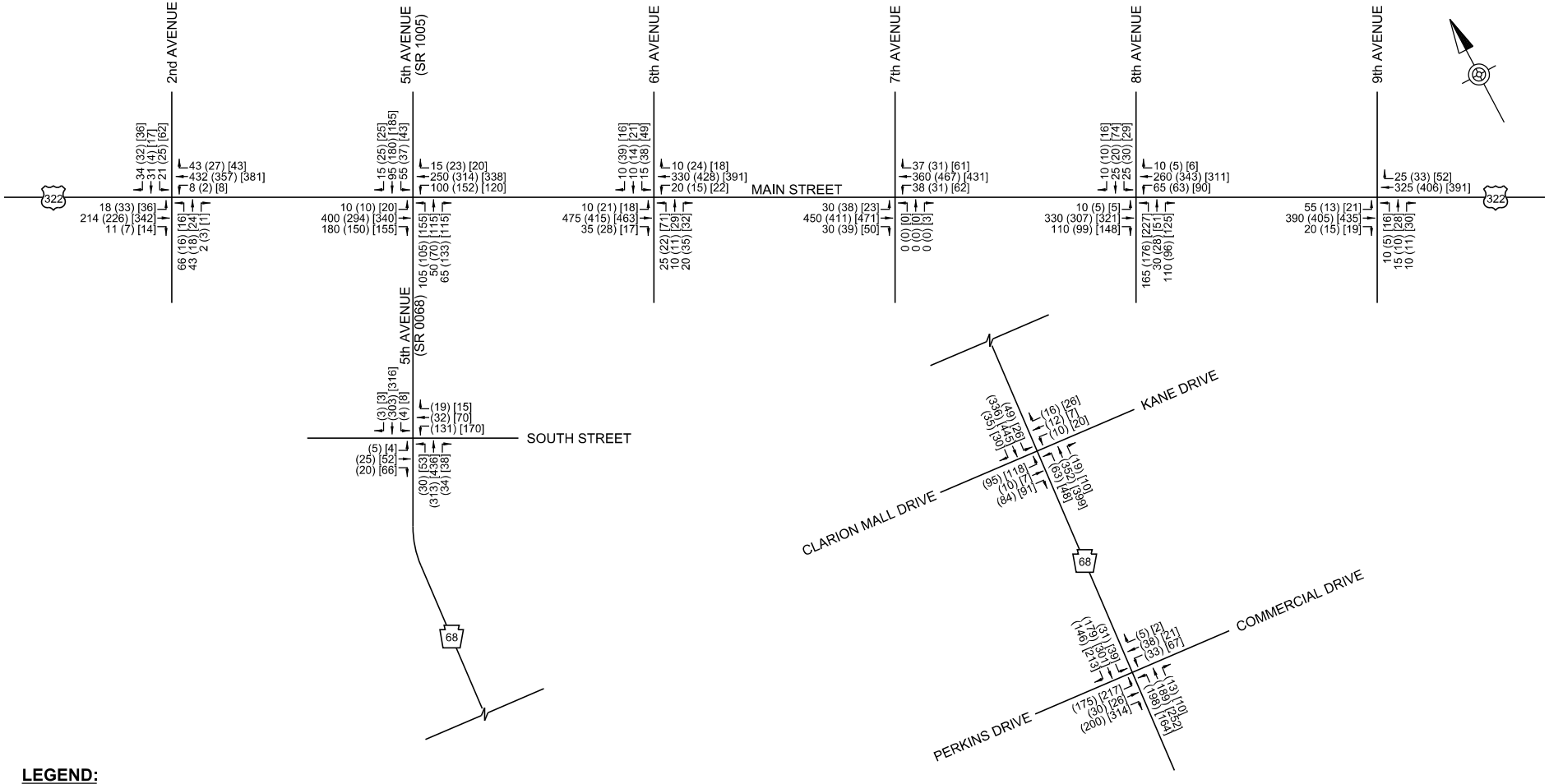
Manual turning movement counts were performed at the remaining intersections by AECOM in 2015 and included the following intersections:

- Main Street (SR 0322) with 2nd Avenue
- Main Street (SR 0322) with 5th Avenue (SR 0068)
- 5th Avenue (SR 0068) with South Street
- 5th Avenue (SR 0068) with Perkins Drive / Commercial Drive

Manual turning movement counts at the intersections of Main Street (SR 0322) with 2nd Avenue and Main Street (SR 0322) with 5th Avenue (SR 0068) were conducted between the hours of 7:00 a.m. and 9:00 a.m., 11:00 a.m. and 12:00 p.m., and 4:00 p.m. and 5:00 p.m. while the manual turning movement counts at the intersections of 5th Avenue (SR 0068) with South Street and 5th Avenue (SR 0068) with Perkins Drive / Commercial Drive were only conducted between the hours of 11:00 a.m. and 12:00 p.m. and between the hours of 4:00 p.m. and 5:00 p.m. Copies of the manual turning movement count data are provided in **Appendix D**.

The traffic volumes at the intersection of Main Street (SR 0322) with 5th Avenue (SR 0068) as determined by the 2015 manual turning movement counts conducted by AECOM were compared to the 2008 traffic volumes provided by PennDOT. Comparing the traffic volumes, several movements slightly decreased in the 2015 traffic volumes compared to the 2008 traffic volumes at the intersection; therefore, the 2008 traffic volumes provided by PennDOT were utilized for the Existing Year 2015 analysis.

The Existing Year 2015 Condition peak hour traffic volumes at the study intersections can be seen on **Figure 3** on the next page.



LEGEND:

XX (XX) [XX] - AM (MIDDAY) [PM] PEAK HOUR VOLUME

CLARION RELIEF STUDY

EXISTING YEAR 2015 TRAFFIC VOLUMES

FIGURE 3

EXISTING PEDESTRIAN / TRANSIT FACILITIES

Pedestrian Facilities

Pedestrian and transit facilities currently exist in portions of the Clarion area. Sidewalks are present in the urban business area along Main Street (SR 0322) and along some of the residential surrounding streets providing pedestrian connectivity. Additionally, sidewalks are present along 8th Avenue / Greenville Avenue (SR 1007). Sidewalks are not present along 5th Avenue (SR 0068) in the vicinity of the suburban shopping district or within the shopping district itself limiting pedestrian connectivity between the urban business district and the suburban shopping district.

Transit Facilities

The Area Transportation Authority (ATA) operates the Clarion Area Transit (CAT) in the Clarion area. Two bus routes operate in the study area. The Clarion Campus Loop services the Clarion University campus and Reinhard Village and operates on weekdays only with no night service on Fridays.

The second route is the Clarion Mall Loop, which can be seen on **Figure 4** on the next page. This route services the urban business district along Main Street (SR 0322), 8th Avenue / Greenville Pike (SR 1007), 5th Avenue (SR 0068) from Main Street (SR 0322) to south of I-80, and the suburban shopping district / Clarion Hospital located along 5th Avenue (SR 0068). This route runs Monday through Saturday with night service only available on Friday and Saturday. Ridership on the Clarion Mall Loop consists of equal parts of Clarion University student and non-students. Stops along this route are both fixed and flag stops. Fixed stops are stops that are shown on the map on Figure 4. Flag stops are stops that are requested by the riders at locations not shown on the map. Flag stops are prohibited along 5th Avenue (SR 0068) between the Clarion Mall and South Street due to heavy traffic and sight distance concerns. The only exception is that if the parking lot has adequate empty space, the bus will pull into the Comet Warehouse parking lot going northbound and stop for riders.

Figure 4 – Public Transportation Routes

EXISTING ENVIRONMENTAL CONDITIONS

Existing environmental conditions were explored in the area to the west of 5th Avenue (SR 0068) between the Clarion Mall area and 2nd Avenue. Environmental characteristics including identified include, but are not limited to, protected species, streams, parks, existing / abandoned mines, gas wells, and historic sites were investigated. The search yielded Trout Run that runs through the search area to the Clarion River. Additionally, there were soils identified to be close to wetlands near Trout Run.

EXISTING RIGHT-OF-WAY

Existing right-of-way limits along 5th Avenue (SR 0068) vary between Main Street (SR 0322) and the Clarion Mall. The right-of-way along 5th Avenue (SR 0068) at Main Street (SR 0322) is approximately 50 feet and approximately 60 feet near the Clarion mall area, but is limited to 33 feet in some areas in between. There are multiple overhead and underground utilities present along 5th Avenue (SR 0068) in addition to existing structures located close to 5th Avenue (SR 0068).

EXISTING YEAR 2015 CONDITIONS ANALYSIS

The following sections provide a summary of analyses for the existing conditions. This includes an analysis of travel times, origination – destination patterns, crash data within the study area, and analysis of the performance of the intersections with regard to levels of service (LOS) and queuing.

TRAVEL TIME ANALYSIS

In addition to manual turning movement counts at the study intersections, Bluetooth detectors were installed at the following five intersections:

- Main Street (SR 0322) with 2nd Avenue
- Main Street (SR 0322) with 5th Avenue
- Main Street (SR 0322) with 8th Avenue
- 5th Avenue (SR 1005) with 4th Avenue
- 5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive

The detectors were placed at each intersection and detected Bluetooth signals from passing vehicles. The detectors timestamp the signals as they are received. From the timestamped information, reports documenting speeds and travel times between detectors were generated.

Travel times along 5th Avenue (SR 0068) between Kane Drive and Main Street (SR 0322) were specifically documented via the Bluetooth detectors. In the graphic below, travel times along the corridor from Thursday, October 22, 2015, to Sunday, November 1, 2015, can be seen.

Data from the Bluetooth detectors indicate that the average travel times for the northbound and southbound directions along 5th Avenue (SR 0068) are 3.8 minutes and 3.5 minutes, respectively. As can be seen in **Figure 5** and **Figure 6**, about once a day the travel time northbound or southbound exceeds five minutes. When this occurs, the travel time exceeds five minutes for an average of 28 minutes northbound and 19 minutes southbound.

Figure 5 – Northbound 5th Avenue (SR 0068) Travel Times

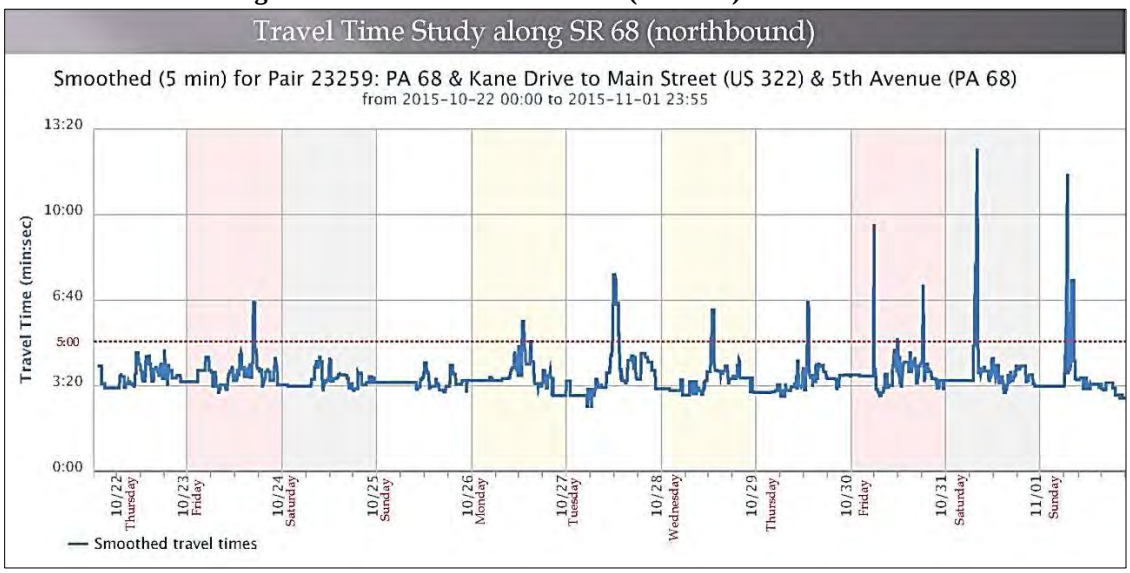
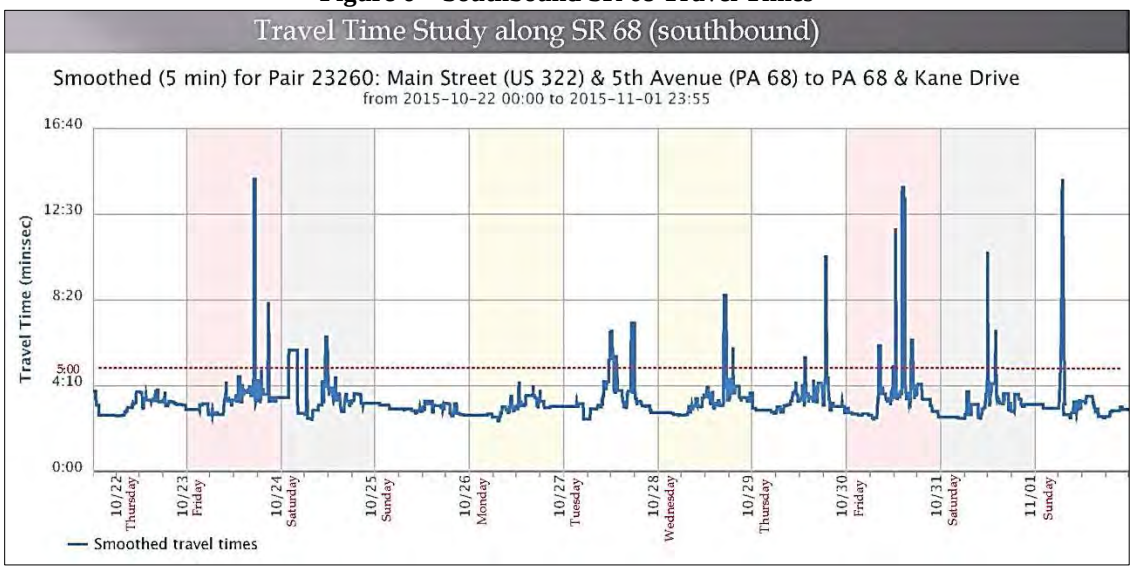


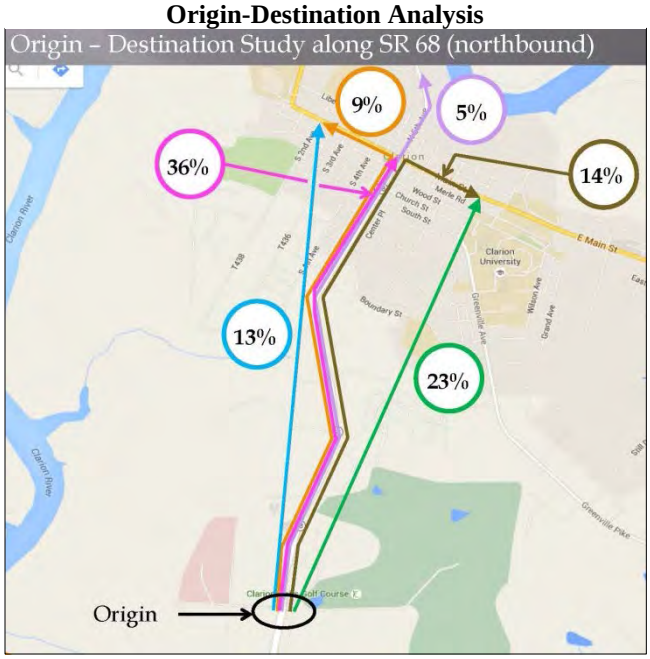
Figure 6 – Southbound SR 68 Travel Times



ORIGIN – DESTINATION ANALYSIS

An origin-destination analysis was performed within the study area to determine where vehicles are originating from and are destined to within the study area. As seen in **Figure 7** to the right, traffic originating from the intersection of 5th Avenue (SR 0068) with Mall Drive is destined to the following locations:

Figure 7 – Northbound 5th Avenue (SR 0068) Origin-Destination Analysis



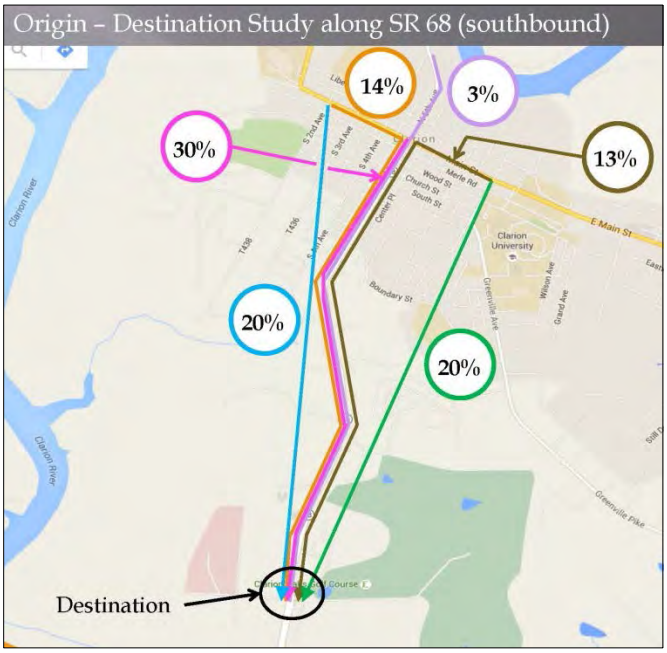
- Main Street (SR 0322) with 2nd Avenue
  - 13% via 5th Avenue (SR 0068) & side roads
  - 9% via Min Street (SR 0322) & 5th Avenue (SR 0068)
- Main Street (SR 0332) with 8th Avenue
  - 23% via 5th Avenue (SR 0068) & side roads
  - 14% via Main Street (SR 0322) & 5th Avenue (SR 0068)
- Main Street (SR 0322) with 5th Avenue (SR 0068)
  - 36% via 5th Avenue (SR 0068)
- 5th Avenue with 4th Avenue
  - 5% via Main Street (SR 0322) & 5th Avenue (SR 0068)

As seen in **Figure 8** to the right, traffic destined to the intersection of 5th Avenue (SR 0068) with Mall Drive originates from the following locations:

Main Street (SR 0322) with 2nd Avenue
- 20% via 5th Avenue (SR 0068) & side roads
- 14% via Main Street (SR 0322) & 5th Avenue (SR 0068)

- Main Street (SR 0332) with 8th Avenue
  - 20% via 5th Avenue (SR 0068) & side roads
  - 13% via Main Street (SR 0322) & 5th Avenue (SR 0068)
- Main Street (SR 0322) with 5th Avenue (SR 0068)
  - 30% via 5th Avenue (SR 0068)
- 5th Avenue with 4th Avenue
  - 3% via SR 0322 / SR 0068

Figure 8 – Southbound 5th Avenue (SR 0068) Origin-Destination Analysis



CRASH ANALYSIS

The Pennsylvania Department of Transportation (PennDOT) provided five years of crash data for the period from January 1, 2010 to December 31, 2014 obtained from PennDOT's Crash Reporting System (CRS). The limits of the data are as follows:

- SR 0322 from Segment 0270 / Offset 0000 to Segment 0350 / Offset 1699 (SR 0066 to SR 1007 – 8th Avenue) – Clarion Township, Clarion Borough, Paint Township
- SR 0068 from Segment 0560 / Offset 0000 to Segment 0610 / Offset 1328 (I-80 to SR 0322 / Main Street) – Clarion Borough, Monroe Township

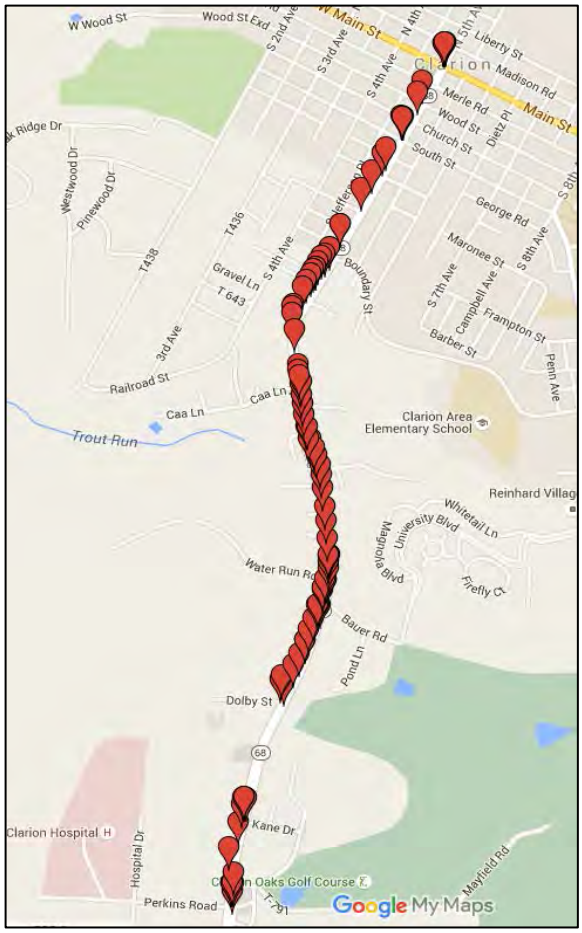
Reported crashes are events which involve injury or a fatality, or involve damage to a vehicle where it cannot be driven from the crash site. The reported crashes along 5th Avenue (SR 0068) were plotted on a map, and can be seen on **Figure 9** on the next page. As can be seen from the map, crashes occur all along the roadway and are not clustered at intersections.

The crashes were then analyzed utilizing the Highway Safety Manual (HSM) methodology. Given the five year crash data, there is an average of almost 20 crashes per year along the 5th Avenue (SR 0068) corridor within the study area. The HSM analysis indicated that the 5th Avenue (SR 0068) corridor experiences higher than average crash frequency for that classification of roadway.

HSM analysis was also performed at the signalized intersections along Main Street (0322) at 5th Avenue (SR 0068) and 8th Avenue. Similar to the 5th Avenue (SR 0068) corridor, the analysis also indicated that the observed crash frequency is higher than a typical intersection.

The results of the crash analysis for the analyzed sections can be found in **Appendix E**.

Figure 9 – 5th Avenue (SR 0068) Crash Locations



PERFORMANCE ANALYSIS

Levels of service and queuing at the study intersections have been determined for the AM, Midday, and PM peak hours. These levels of service (LOS) and queuing were determined through implementation of signalized and unsignalized capacity analysis methodologies presented in the 2010 Highway Capacity Manual published by the Transportation Research Board. The LOS ranges from A to F, comparable to a grading system in school, with LOS A being the best traffic conditions and LOS F being the worst. A summary of the LOS breakdown has been included in **Appendix F**. The existing signal permit plan timings were utilized in the signalized analyses and can be found in **Appendix G**.

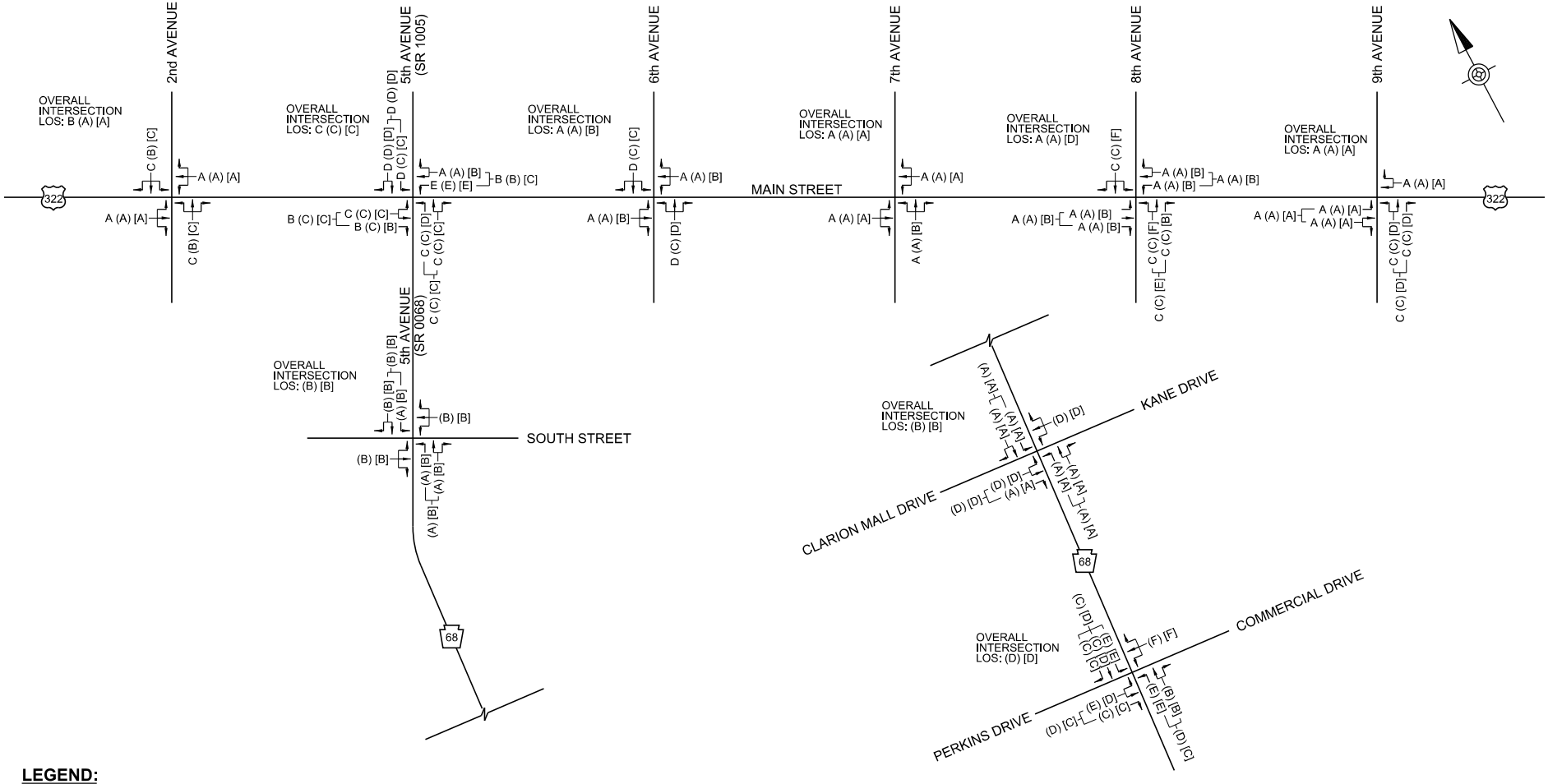
Levels of Service

The results of the Existing Year 2015 LOS analyses are provided in **Table 1** for the AM, Midday, and PM peak hour, and can be seen graphically on **Figure 10** on the next page.

Table 1 – Existing Year 2015 Level of Service Summary

Intersection	AM LOS	Midday LOS	PM LOS
	(LOS / Seconds of Delay per Vehicle)		
Main Street (SR 0322) with 2nd Avenue	B (10.0)	A (5.8)	A (7.7)
Main Street (SR 0322) with 5th Avenue (SR 0068)	C (23.7)	C (24.8)	C (30.4)
Main Street (SR 0322) with 6th Avenue	A (5.5)	A (6.7)	B (18.2)
Main Street (SR 0322) with 7th Avenue	A (0.6)	A (0.6)	A (0.7)
Main Street (SR 0322) with 8th Avenue	A (9.7)	A (9.4)	D (36.9)
Main Street (SR 0322) with 9th Avenue	A (4.7)	A (5.1)	A (7.2)
5th Avenue (SR 0068) with South Street		B (11.0)	B (14.7)
5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive		B (12.0)	B (12.4)
5th Avenue (SR 0068) with Perkins Drive / Commercial Drive		D (48.6)	D (39.1)

As can be seen in **Table 1**, the study intersections currently operate at acceptable LOS (LOS C or better) during the AM, Midday, and PM peak hours with the exception of the intersection of Main Street (SR 0322) with 8th Avenue during the PM peak hour, which operates at a LOS D, and the intersection of 5th Avenue (SR 0068) with Perkins Drive / Commercial Drive during the Midday and PM peak hours, which also operate at LOS D. The Existing Year 2015 capacity analysis printouts and a table with all intersection approach / lane group LOS are provided in **Appendix H** for the AM, Midday, and PM peak hours.



LEGEND:

XX (XX) [XX] - AM (MIDDAY) [PM] PEAK HOUR LOS

CLARION RELIEF STUDY

EXISTING YEAR 2015 LOS

FIGURE 10

Intersection Queuing

The Existing Year 2015 Conditions were modeled in Synchro and transferred to SimTraffic. Five (5) separate 60-minute simulations (utilizing a thirty-minute seeding interval) were performed in SimTraffic for each individual peak hour and averaged. Queuing analysis were performed to evaluate vehicular queuing within the study area. The results of the Existing Year 2015 queuing analysis are provided in **Appendix I** for the AM, Midday, and PM peak hours.

The Existing Year 2015 queue analysis shows that 95th percentile queues extend beyond the existing storage lengths of the auxiliary turn lanes at the intersection of Main Street (SR 0322) with 5th Avenue (SR 0068) during the AM, Midday, and PM peak hours. All other 95th percentile queues are within the available storage lengths at the remaining study intersections.

DESIGN YEAR 2035 CONDITIONS ANALYSIS

DESIGN YEAR 2035 PEAK HOUR TRAFFIC VOLUMES

AECOM contacted a representative of the Northwest Commission to determine the appropriate traffic growth rate that would be used for the study area. The representative indicated that the Northwest Commission does not analyze traffic growth rates in the area and that published PennDOT data should be utilized. A linear traffic growth rate of 0.4% for an urban non-interstate roadway in Clarion County was utilized. The traffic growth rate was applied to the Existing Year 2015 Condition AM, Midday, and PM peak hour traffic volumes to develop the Design Year 2035 traffic volumes. The forecasted Design Year 2035 AM, Midday, and PM peak hour traffic volumes can be seen on **Figure 11** on the next page.

PERFORMANCE ANALYSIS

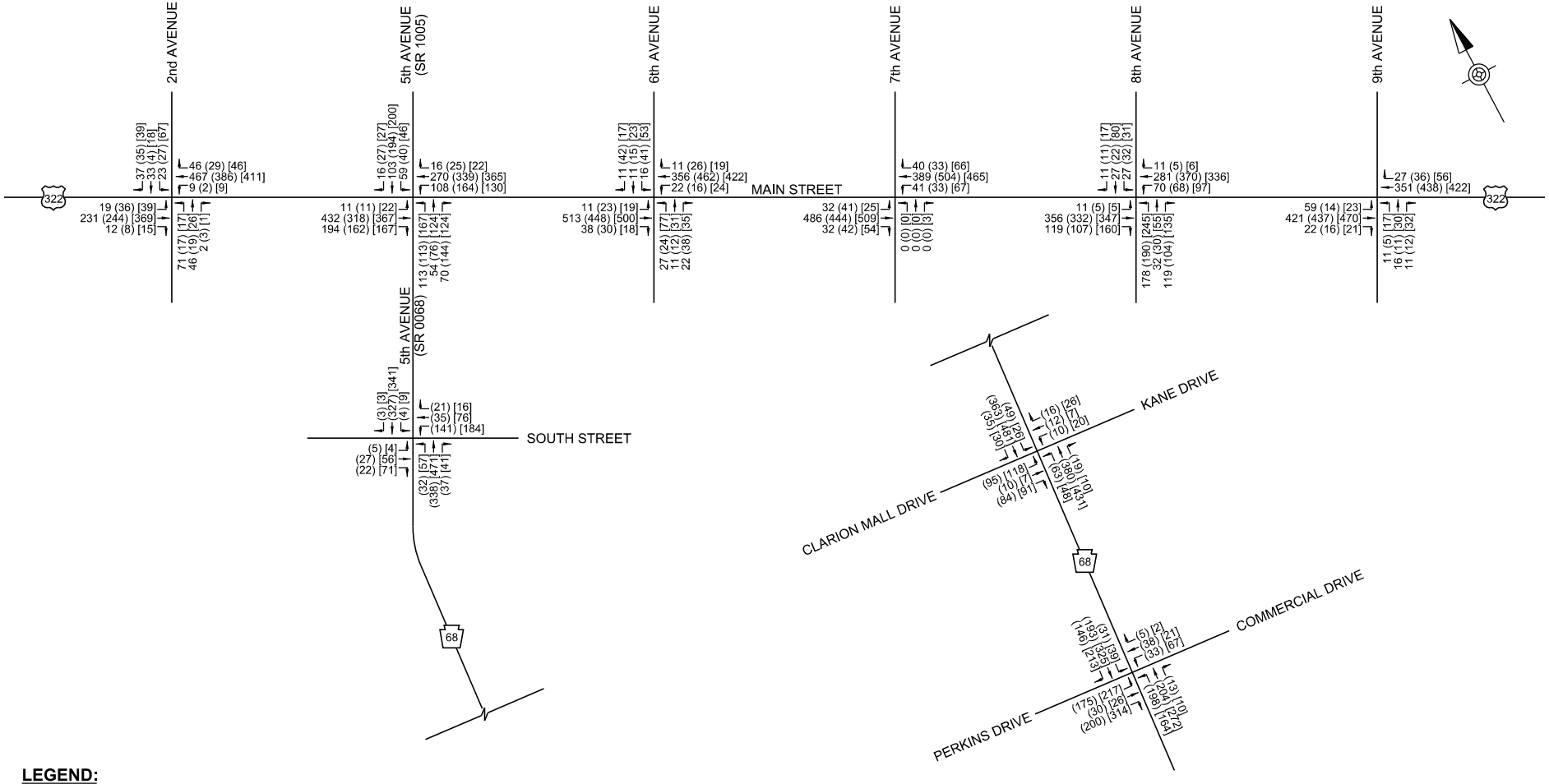
Levels of service and queuing at the study intersections were again determined for the AM, Midday, and PM peak hours under Design Year 2035 Conditions. The LOS and queuing were determined through implementation of signalized and unsignalized capacity analysis methodologies presented in the 2010 Highway Capacity Manual published by the Transportation Research Board.

Levels of Service

The results of the Design Year 2035 LOS analyses are provided in **Table 2** for the AM, Midday, and PM peak hour, and can be seen graphically on **Figure 12**.

Table 2. Design Year 2035 Level of Service Summary

Intersection	AM LOS	Midday LOS	PM LOS
	(LOS / Seconds of Delay per Vehicle)		
Main Street (SR 0322) with 2nd Avenue	B (10.8)	A (5.9)	A (8.2)
Main Street (SR 0322) with 5th Avenue (SR 0068)	D (40.9)	C (26.4)	C (32.7)
Main Street (SR 0322) with 6th Avenue	B (13.6)	B (10.7)	C (22.0)
Main Street (SR 0322) with 7th Avenue	A (0.6)	A (0.6)	A (0.7)
Main Street (SR 0322) with 8th Avenue	B (18.7)	A (9.5)	D (44.9)
Main Street (SR 0322) with 9th Avenue	A (6.3)	A (5.4)	A (7.4)
5th Avenue (SR 0068) with South Street		B (11.5)	B (16.5)
5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive		B (11.8)	B (12.2)
5th Avenue (SR 0068) with Perkins Drive / Commercial Drive		D (48.0)	D (36.8)



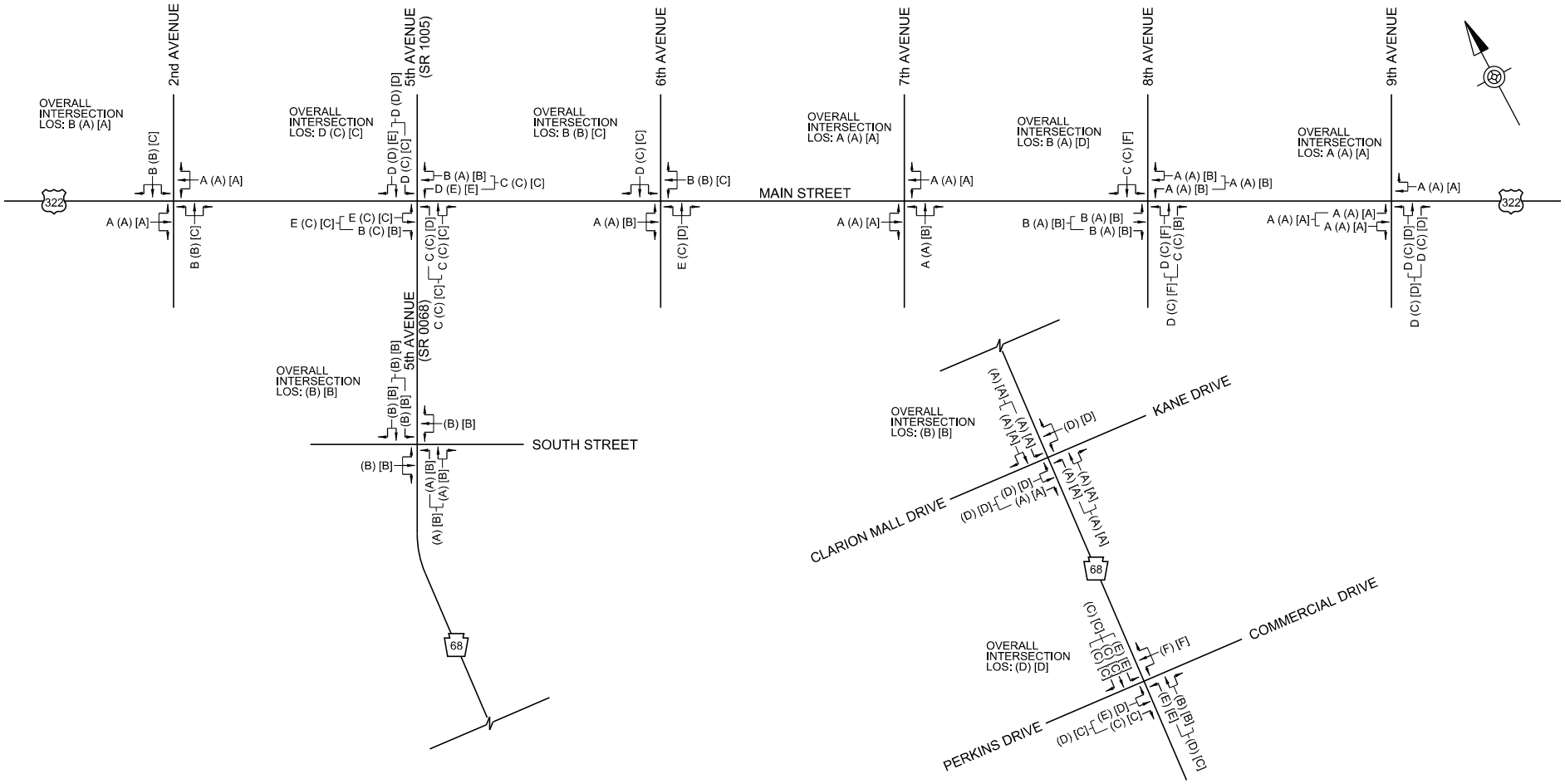
LEGEND:

XX (XX) [XX] - AM (MIDDAY) [PM] PEAK HOUR VOLUME

CLARION RELIEF STUDY

DESIGN YEAR 2035 TRAFFIC VOLUMES

FIGURE 11



CLARION RELIEF STUDY

DESIGN YEAR 2035 LOS

FIGURE 12

Northwest COMMISSION

AECOM

Similar to the existing conditions, **Table 2** indicates that the study intersections are anticipated to continue to operate at acceptable LOS (LOS C or better) during the AM, Midday, and PM peak hours with the exception of the intersection of Main Street (SR 0322) with 8th Avenue during the PM peak hour, which will operate at a LOS D, and the intersection of 5th Avenue (SR 0068) with Perkins Drive / Commercial Drive during the Midday and PM peak hours, which also will operate at LOS D. The Design Year 2035 capacity analysis printouts and a table with all intersection approach / lane group LOS are provided in **Appendix J** for the AM, Midday, and PM peak hours.

Intersection Queuing

The Design Year 2035 Conditions were again modeled in Synchro and transferred to SimTraffic. Five (5) separate 60-minute simulations (utilizing a thirty-minute seeding interval) were performed in SimTraffic for each individual peak hour and averaged. Queuing analysis were performed to evaluate vehicular queuing within the study area. The results of the Design Year 2035 queuing analysis are provided in **Appendix K** for the AM, Midday, and PM peak hours.

Similar patterns to the Existing Year 2015 queue analysis were seen in the Design Year 2035 Condition simulations. The 95th percentile queues continue to extend beyond the existing storage lengths of the auxiliary turn lanes at the intersection of Main Street (SR 0322) with 5th Avenue (SR 0068) during the AM, Midday, and PM peak hours while all other 95th percentile queues are within the available storage lengths at the remaining study intersections.

DATA COLLECTION / ANALYSIS CONCLUSIONS

The data collection and analysis performed for existing conditions indicates that the 5th Avenue (SR 0068) corridor frequently experiences congestion. The existing traffic volumes show that 5th Avenue (SR 0068) carries a high ADT for a typical two-lane road. Additionally, there is a low percentage of trucks on average on the roadway; however, when I-80 is detoured through Clarion, the truck percentage increases dramatically. On average, the intersections along 5th Avenue (SR 0068) and Main Street (SR 0322) within the study area operate at acceptable LOS, with the exception of a few intersections during the peak hours.

The travel time analysis indicates that the typical travel time between the Clarion Mall and Main Street (SR 0322) is less than four minutes; however, about once a day the typical travel time increases by approximately 3.5 times the average. Incidents are occurring causing travel time delays along the 5th Avenue (SR 0068) corridor. Incidents could range from a reportable or non-reportable crash, a water main break, a high number of left-turning vehicles, an I-80 detour, or a power outage affecting the traffic signals. When incidents occur, the two-lane roadway does not allow for traffic to continue flowing causing congestion. Additionally, there are limited alternate routes for traffic to utilize when incidents occur along 5th Avenue (SR 0068).

The origin-destination analysis of the traffic within the study area indicates that traffic is already utilizing the local streets to travel between 5th Avenue (SR 0068) and the eastern and western points of Main Street (SR 0322) within the study area and avoiding the downtown area of Clarion. Approximately a third of the traffic is destined to / originating from the downtown area of Clarion.

The crash analysis indicates that the 5th Avenue (SR 0068) corridor experiences higher than average crash frequency compared to a similar type roadway. The locations of the crashes are not clustered at intersections, but instead, are located at intersections and mid-block locations such as driveways.

Through the steering committee meetings and the public meeting, it was indicated that the community supports new access routes in order to provide increased travel time reliability. Additionally, the community desires better pedestrian connectivity between the urban business district and the suburban shopping area in order to increase pedestrian safety. The next section of the report analyzes several strategies to address the congestion concerns along 5th Avenue (SR 0068). These strategies were discussed and agreed upon during the Steering Committee Meetings.

STRATEGIES

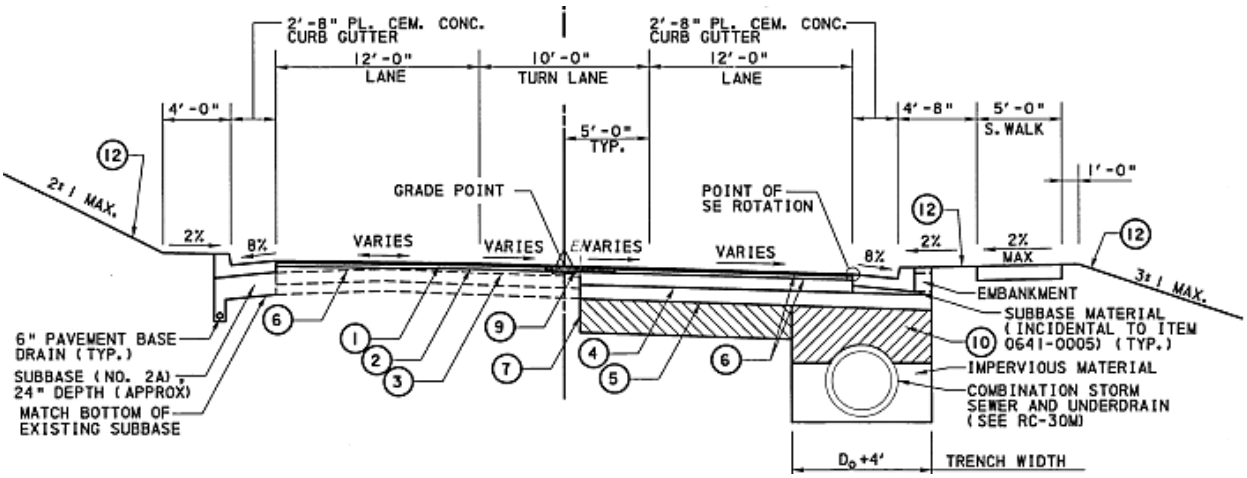
In order to relieve traffic congestion along 5th Avenue (SR 0068) between I-80 and Main Street (SR 0322), several strategies were considered. These strategies include roadway improvements along 5th Avenue (SR 0068), alternative access routes, access / incident management, traffic signal improvements, and multi-modal improvements.

INCREASING CAPACITY ALONG 5TH AVENUE (SR 0068)

Current PennDOT Project Under Construction

A PennDOT project is currently under construction along 5th Avenue (SR 0068). The project, known as the "Clarion Curve Project", straightens out an existing curve along 5th Avenue (SR 0068), north of Comet Food Warehouse and widens the road to a 3-lane section. One 12-foot lane in each direction will remain and a 10-foot center left-turn lane will also be constructed. Additionally, a 5-foot sidewalk will be installed on the eastern side of 5th Avenue (SR 0068) which will connect to the existing sidewalk at Boundary Street. **Figure 13** below shows a typical cross section of 5th Avenue (SR 0068).

Figure 13 – Typical Clarion Curve Project Roadway Section



The plans for this project were reviewed and taken into consideration for strategies determined in this report so that a consistent design along 5th Avenue (SR 0068) was established where possible.

Current PennDOT Project in Preliminary Engineering

There is a PennDOT project that is in the preliminary engineering stage along 5th Avenue (SR 0068) within the study area. The project will encompass 5th Avenue (SR 0068) from Dolby Street to the I-80 Interchange. PennDOT previously completed a traffic study that considered this area for possible roadway improvements. These roadway improvements included additional through lanes on 5th Avenue (SR 0068) and additional lanes on the cross streets at the signalized intersections at Clarion Mall Drive / Kane Drive and Perkins Drive / Commercial Drive.

Strategy #1 – Widen 5th Avenue (SR 0068)

The first strategy considered in relieving traffic congestion along 5th Avenue (SR 0068) involves increasing capacity. This strategy divides 5th Avenue (SR 0068) into three sections. Each section could be constructed as an individual project or could be combined into one project. The first section is from the I-80 Interchange to Perkins Drive. The second section is comprised of Perkins Drive to Dolby Street with the last section picking up at Dolby Street and connecting to PennDOT's current Clarion Curve project.

I-80 Interchange to Perkins Drive

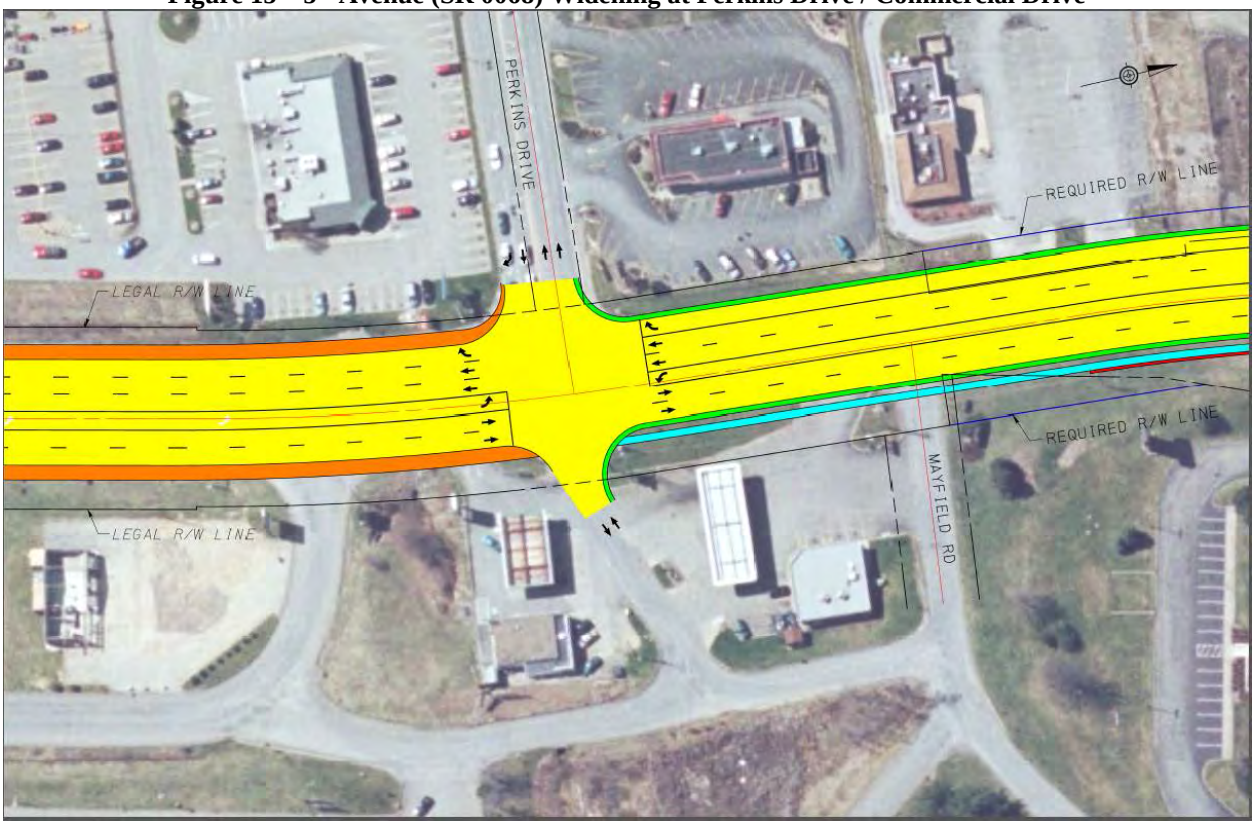
From the I-80 Interchange to Perkins Drive, 5th Avenue (SR 0068) currently consists of one through lane in each direction with auxiliary turn lanes at intersections as seen below in **Figure 14**.

Figure 14 – 5th Avenue (SR 0068) Existing Conditions at Perkins Drive / Commercial Drive

In order to add capacity to 5th Avenue (SR 0068), this strategy constructs an additional through lane in each direction and extends the existing auxiliary turn lanes on 5th Avenue (SR 0068). These additional lanes will require the existing traffic signal at 5th Avenue (SR 0068) with Perkins Drive / Commercial Drive to be updated or replaced. South of Perkins Drive / Commercial Drive, the existing right-of-way allows for paved shoulders, which are seen in orange on **Figure 15** on the next page. Right-of-way acquisition will be required along 5th Avenue (SR 0068), north of Perkins Drive / Commercial Drive in order to accommodate the widening. Therefore, the design includes curb and gutter, seen in green on Figure 15, in order to

reduce right-of-way acquisition costs. This strategy also includes a sidewalk on the eastern side of 5th Avenue (SR 0068), north of Perkins Drive / Commercial Drive, which can be seen in blue on Figure 15. Finally, due to the steep slope of the hillside on the eastern side of 5th Avenue (SR 0068), north of Perkins Drive / Commercial Drive, a retaining wall is shown in red on Figure 15.

Figure 15 – 5th Avenue (SR 0068) Widening at Perkins Drive / Commercial Drive



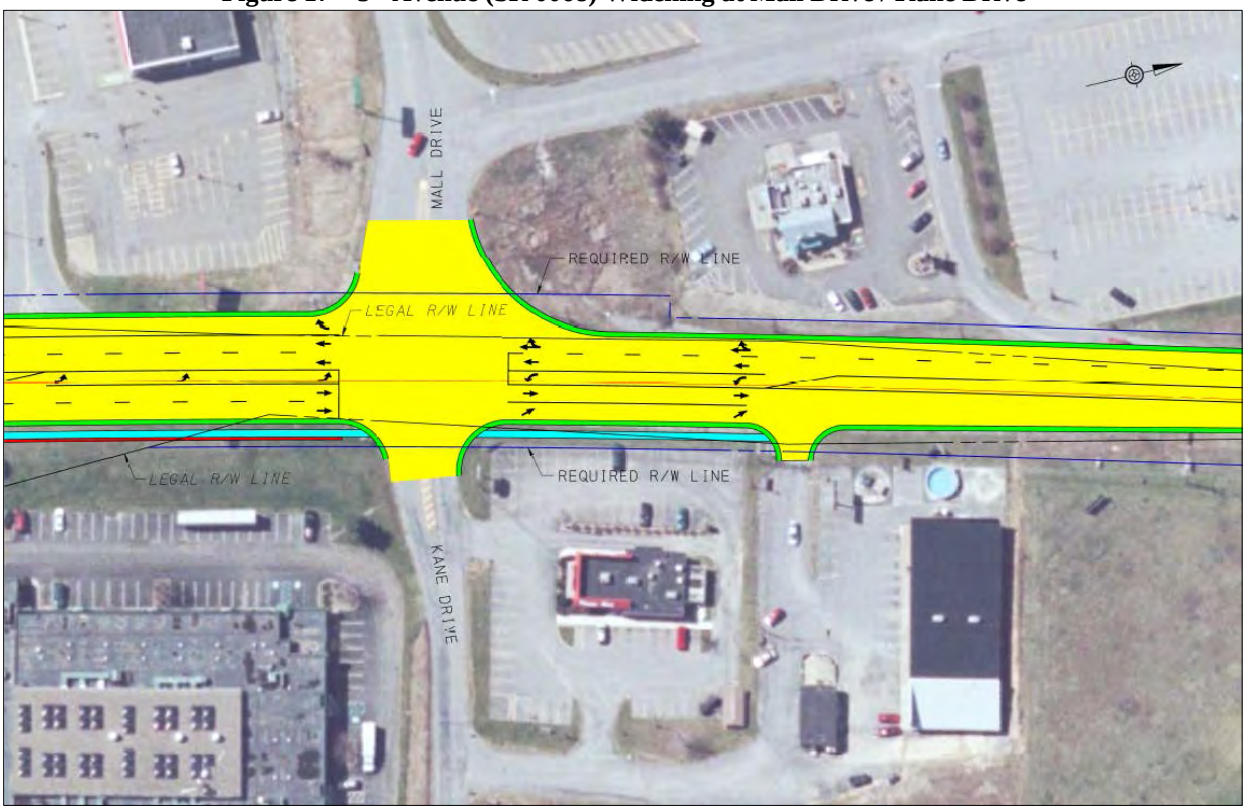
Perkins Drive to Dolby Street

The next section along 5th Avenue (SR 0068) extends from the first section at Perkins Drive to Dolby Street. In this section, 5th Avenue (SR 0068) currently consists of one through lane in each direction with auxiliary turn lanes at intersections as seen on the next page in **Figure 16**.

Figure 16 – 5th Avenue (SR 0068) Existing Conditions at Mall Drive / Kane Drive

Similar to the first section, this strategy also constructs an additional through lane in each direction and extends the existing auxiliary turn lanes on 5th Avenue (SR 0068). These additional lanes will require the existing traffic signal at 5th Avenue (SR 0068) with Mall Drive / Kane Drive to be updated or replaced. Right-of-way acquisition will again be required along 5th Avenue (SR 0068) in this section in order to accommodate the widening. Therefore, the design includes curb and gutter, seen in green on **Figure 17** on the next page, in order to reduce right-of-way acquisition costs. This strategy also includes a sidewalk on the eastern side of 5th Avenue (SR 0068), which can be seen in blue on Figure 17. Finally, due to the steep slope of the hillside on the eastern side of 5th Avenue (SR 0068), the retaining wall shown in the first section, continues in this section as shown in red on Figure 17. North of Mall Drive / Kane Drive, 5th Avenue (SR 0068) then transitions back to a three lane section.

Figure 17 – 5th Avenue (SR 0068) Widening at Mall Drive / Kane Drive

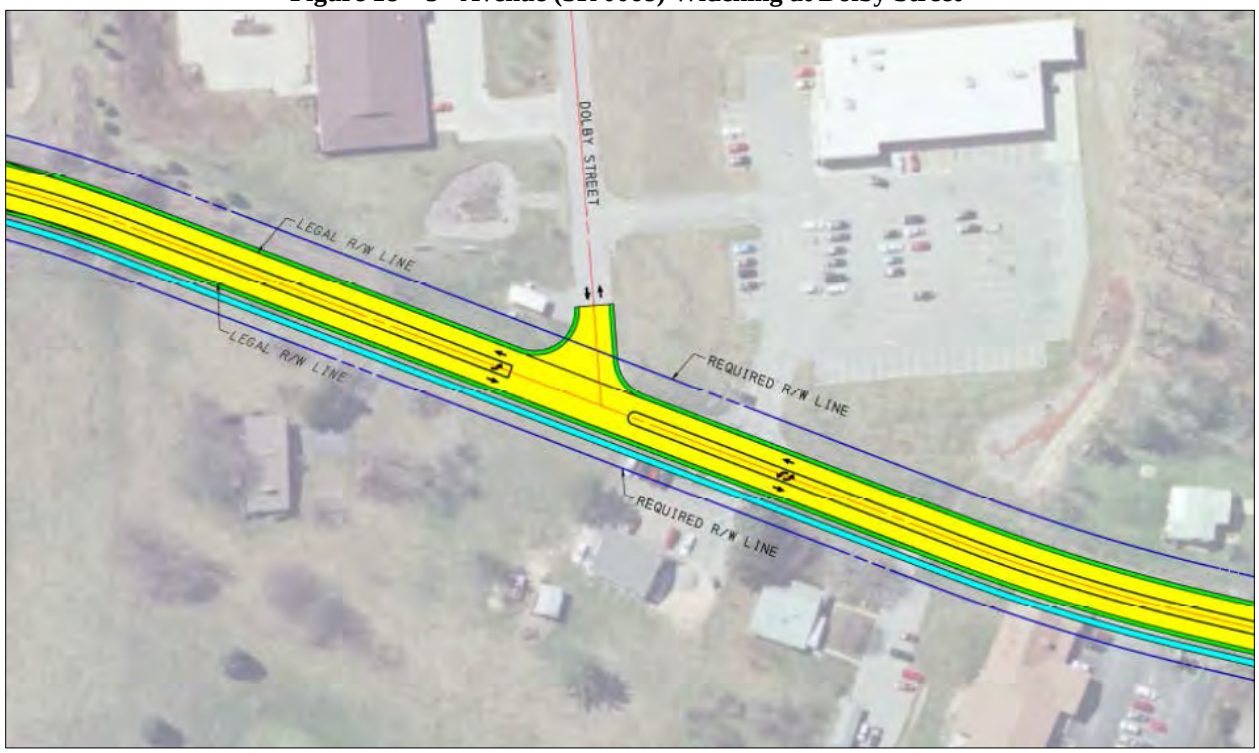


Dolby Street to Clarion Curve Project

The final section along 5th Avenue (SR 0068) extends from the section at Mall Drive / Kane Drive to the current PennDOT Clarion Curve project. In this section, 5th Avenue (SR 0068) currently consists of one through lane in each direction.

This strategy widens 5th Avenue (SR 0068) to consist of a 3-lane section. The section includes the existing through lane in each direction, but then constructs a two-way left turn lane. Right-of-way acquisition will again be required along 5th Avenue (SR 0068) in this section in order to accommodate the widening. Therefore, the design includes curb and gutter, seen in green on **Figure 18** on the next page, in order to reduce right-of-way acquisition costs. This strategy also continues the sidewalk on the eastern side of 5th Avenue (SR 0068), which can be seen in blue on Figure 18.

Figure 18 – 5th Avenue (SR 0068) Widening at Dolby Street



Capacity Analysis

In order to determine the anticipated impact of widening 5th Avenue (SR 0068), capacity analysis was performed. The intersections along 5th Avenue (SR 0068) at Clarion Mall Drive / Kane Drive and Perkins Drive / Commercial Drive are anticipated to operate at acceptable LOS (LOS C or better) as seen in **Table 3** below.

Table 3. Design Year 2035 Strategy #1 Level of Service Summary

Intersection	PM LOS (LOS / Seconds of Delay per Vehicle)
5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive	B (11.1)
5th Avenue (SR 0068) with Perkins Drive / Commercial Drive	C (32.7)

The Design Year 2035 capacity analysis printouts and a table with all intersection approach / lane group LOS for Strategy #1 are provided in **Appendix L** for the AM, Midday, and PM peak hours.

Strategy Estimated Cost

The estimated cost (2016 dollars) for all three sections of the 5th Avenue (SR 0068) widening is approximately $16.8 million. **Table 4** on the next page shows an itemized breakdown of the estimated costs for each section.

Table 4 – Strategy #1 Estimated Costs

Construction Items	I-80 Ramps to Perkins Drive	Perkins Drive to Dolby Street	Dolby Street to Clarion Curve Project	TOTAL
Estimated Design Cost	$418,000	$1,057,000	$728,000	
Estimated Construction Cost	$1,115,000	$2,819,000	$1,942,000	
Estimated Relocated Utility Cost	$279,000	$705,000	$486,000	
Estimated Right-of-Way Cost	$253,000	$1,035,000	$2,397,000	
Estimated Construction Inspection Cost	$168,000	$338,000	$233,000	
20% Contingency	$447,000	$1,191,000	$1,157,000	
Total	**$2,680,000**	**$7,145,000**	**$6,943,000**	**$16,768,000**

Strategy Summary

Widening 5th Avenue (SR 0068) addresses the congestion concerns of the corridor by increasing capacity. When incidents occur, the widened roadway will allow two-way traffic to flow with less delays and increased travel time reliability and safety. Constructing a two-way left turn lane has shown to reduce rear-end, head-on, and angle crashes by 20% -25%. This strategy can also be constructed in phases as funding becomes available. This strategy does not decrease the traffic volume along the 5th Avenue (SR 0068) corridor and will require right-of-way acquisition and utility relocation to occur. **Table 5** on the next page summarizes the advantages and disadvantages of the this strategy.

Table 5 – Strategy #1 Summary Table

Advantages	Disadvantages
Increases capacity to improve traffic flow and travel time reliability	Does not reduce traffic volume on 5th Avenue (SR 0068)
Can be constructed in phases	Right-of-way acquisition and utility relocation required
Will not require total property acquisition	
Center left-turn lane improves safety	

NEW ACCESS STRATEGIES

Considered Strategies

In addition to increasing the capacity on 5th Avenue (SR 0068), alternate accesses strategies were considered in order to relieve traffic congestion. At the second Steering Committee meeting, discussion ensued concerning possible existing and new connections within the area. There is an existing connection between 5th Avenue (SR 0068) and Greenville Pike (SR 1007) via University Boulevard / Bauer Road. Along this connection is Reinhard Village which is a student housing complex owned by Clarion University. This is a private road that is designed to promote pedestrian safety and limit the speed of vehicular traffic. Since the road is privately owned with no intention of changing that status, this strategy was not considered any further.

Two new access strategies were then explored. First, on the western side of 5th Avenue (SR 0068), there is unoccupied land between the shopping district at Perkins Drive and Clarion Mall Drive and 2nd Avenue. It was agreed upon that this connection would be further analyzed to determine the magnitude of traffic congestion relief along 5th Avenue (SR 0068). After the analysis on the 2nd Avenue new access was presented to the steering committee at the third Steering Committee meeting, it was decided that a second new access should be considered. The second new alternate route is located on the eastern side of 5th Avenue (SR 0068) and connects Greenville Pike (SR 1007) with Bauer Road, which then directly connects to 5th Avenue (SR 0068). This alternative was considered from a geometrical standpoint but was not analyzed to determine the anticipated traffic impacts on the surrounding intersections.

Strategy #2 – Connection between 2nd Avenue and Hospital Drive

Connection Design Parameters

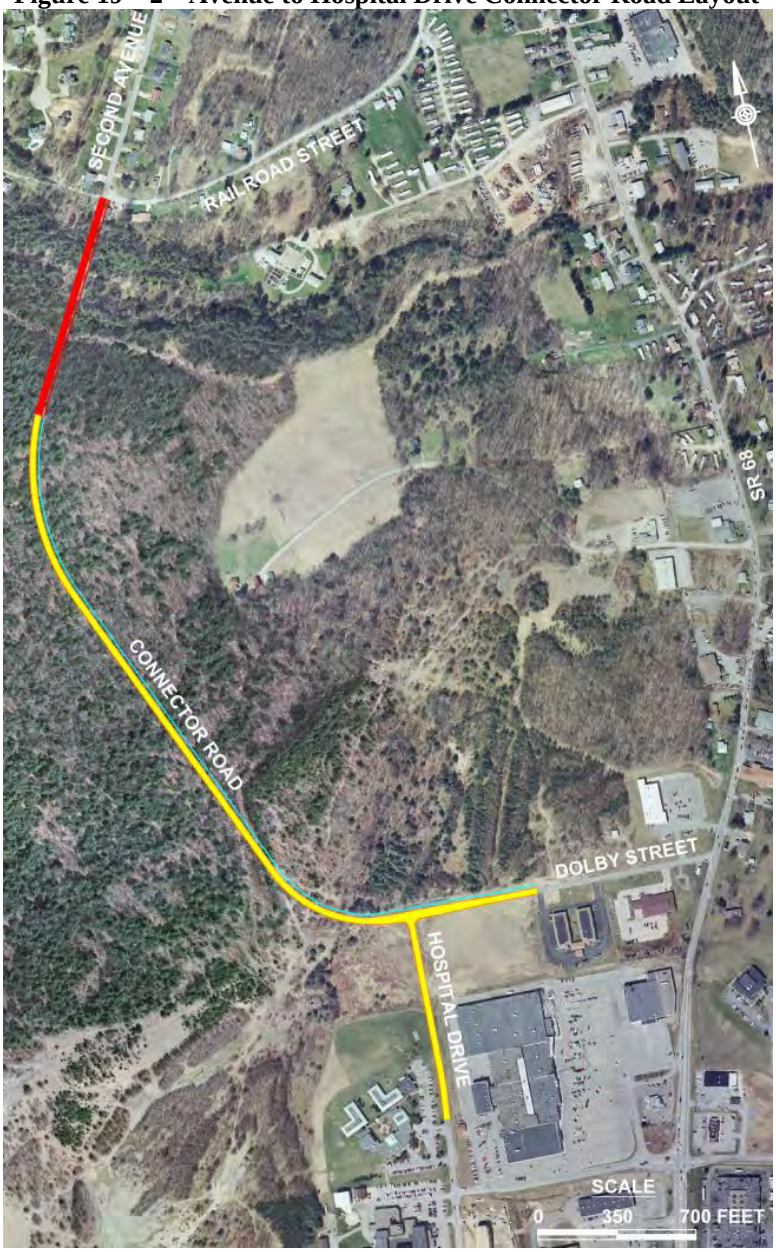
Certain design parameters for the considered strategy of constructing a new road between Hospital Drive and 2nd Avenue were established. First, a design speed of 35 mph was utilized in order to determine the geometric layout of the connector road. This allows the road to be posted at 25 mph or 30 mph. Next, the connector road was designed to include one 12-foot lane in each

direction with 4-foot shoulders on either side. Additionally, a sidewalk on one side of the road was included in the design. Finally, connections to Dolby Street and Hospital Drive from the Connector Road were included.

Connection Layout

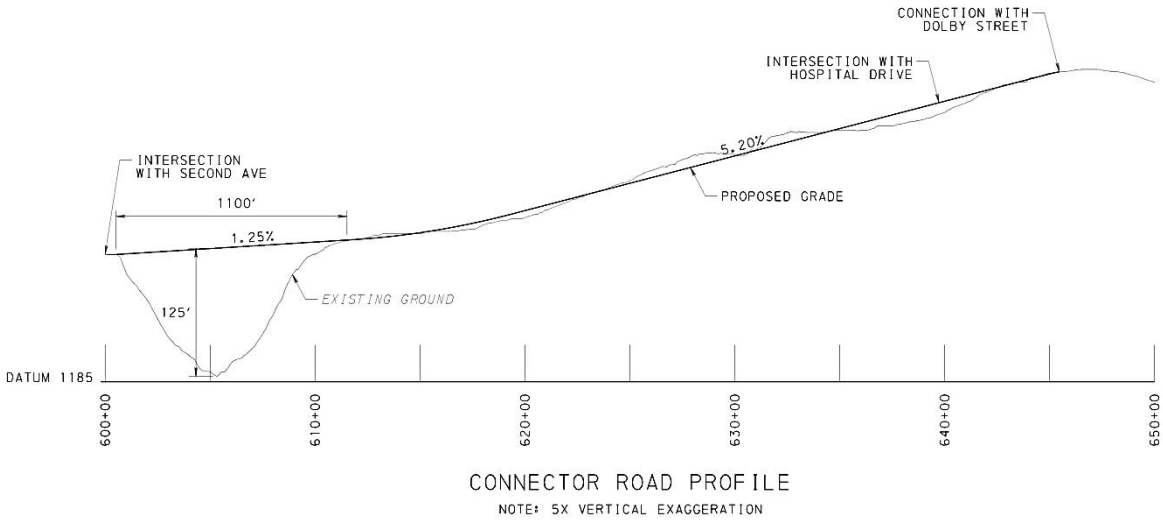
An optimal geometric layout was determined in order to limit the required right-of-way / property acquisition and environmental impacts. The parcel information gathered from Clarion County records was utilized to create an alignment which least impacted the existing property owners between the connection points. This optimal alignment connects to Dolby Street with a T-intersection at Hospital Drive as shown below in **Figure 19**.

Figure 19 – 2nd Avenue to Hospital Drive Connector Road Layout



With this Connector Road configuration, a structure will be required to span the existing ravine. In **Figure 19** on the previous page, the red segment is the required bridge structure and the yellow segments are roadway on existing land. The total length of the new Connector Road is approximately 4,700 feet and Hospital Drive will need to be extended approximately 900 feet. With this alignment, it is possible that one residential property may need to be acquired in order to make the connection at 2nd Avenue. The profile of the connector road can be seen below in **Figure 20**.

Figure 20 - 2nd Avenue to Hospital Drive Connector Road Profile

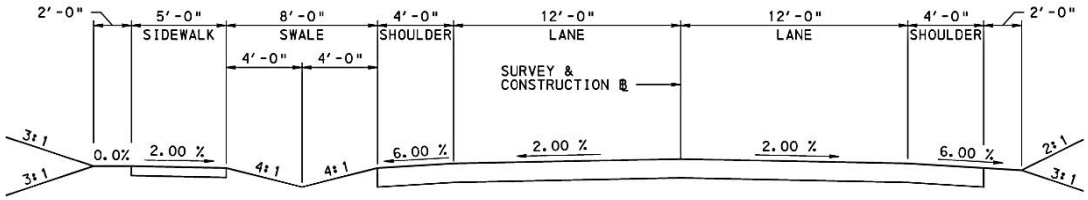


As can be seen in Figure 20 the there is a steep slope leading to Trout Run at the end of 2nd Avenue leading to the bridge spanning 1,100 feet. Additionally, at its highest point, the bridge will be 125 feet above Trout Run.

Connection Typical Sections

As previously described, the Connector Road was designed for a 2-lane roadway with shoulders and a sidewalk on one side. **Figure 21** shows a typical section of the Connector Road with 12-foot travel lanes and 4-foot shoulders on both sides. A 5-foot wide sidewalk is separated by an 8-foot swale that will direct stormwater away from the road and sidewalk.

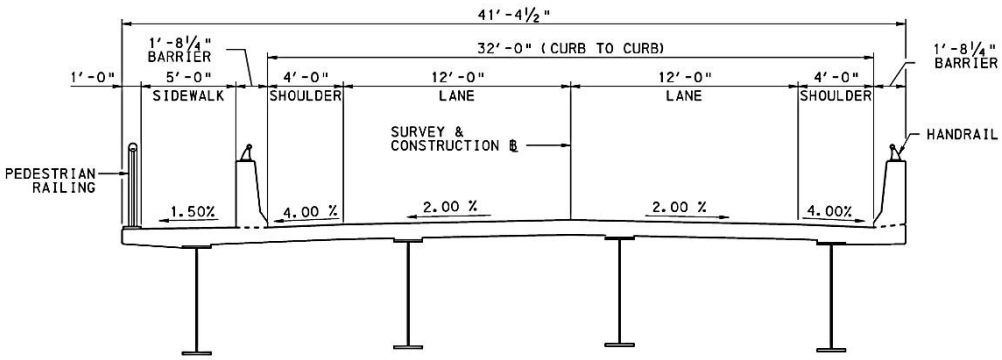
Figure 21 – 2nd Avenue to Hospital Drive Connector Roadway Typical Section



On the bridge, a similar cross section was maintained. **Figure 22** on the next page shows a typical bridge section of the Connector Road with the same 12-foot travel lanes and 4-foot

shoulders on both sides. Pedestrian access is also maintained on the bridge with a 5-foot sidewalk along the western side of the bridge.

Figure 22 – 2nd Avenue to Hospital Drive Connector Bridge Typical Section

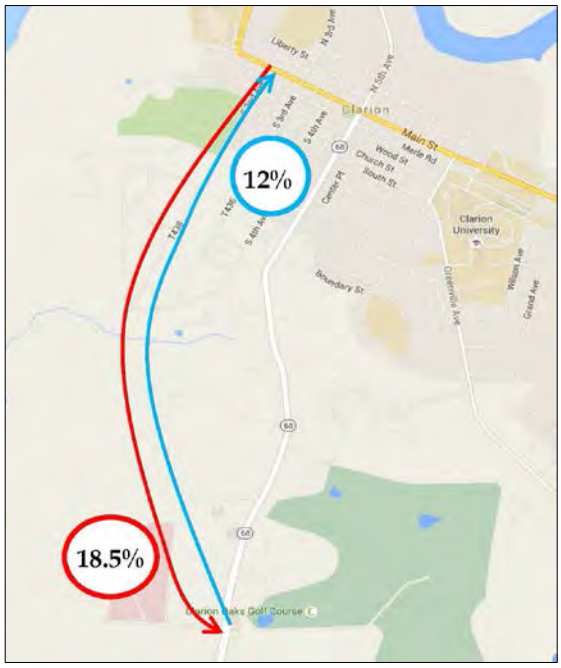


TYPICAL BRIDGE SECTION

Traffic Volumes

Since turning movement counts were not performed at the intersection of 5th Avenue (SR 0068) with Dolby Street, trip generation was performed in order to estimate the traffic volumes at the intersection. A hotel (Comfort Inn), grocery store (Aldi), and medical center (dialysis clinic) currently utilize Dolby Street for access. Trip generation for these uses was calculated utilizing the ITE Trip Generation Manual, 9th Edition.

Figure 23 – Connector Road Diversion Percentages



In order to determine the number of vehicles that are anticipated to utilize the new connection between the shopping district and 2nd Avenue, the distribution percentages determined from the Bluetooth data collection were utilized. As previously described in Origin-Destination Analysis section, 22% of the traffic at the intersection of 5th Avenue (SR 0068) with Clarion Mall Drive is destined to the west on Main Street (SR 0322) and 34% of the traffic originates from the west on Main Street (SR 0322). Of the vehicles currently using the intersection of Main Street (SR 0322) with 5th Avenue (SR 0068) to traverse between Main Street (SR 0322) and Clarion Mall Drive, it was assumed that 25% of those vehicles will utilize the new connection. It was also assumed that 75% of the vehicles that currently use the local streets to travel between those points will use the new connection. This methodology results in 12% of the northbound traffic on 5th Avenue (SR 0068) diverting off of 5th Avenue (SR 0068) and using the new Connector Road. Similarly, 18.5% of the southbound

traffic on 5th Avenue (SR 0068) will also utilizing the new Connector Road as seen in **Figure 23** on the previous page.

Applying these percentages to the ADT data described in the Existing Year 2015 Average Daily Traffic section of this report, approximately 2,300 vehicles per day are anticipated to utilize the new connection and be diverted off of 5th Avenue (SR 0068). The same methodology was applied to the PM peak hour traffic volumes and it was determined that approximately 190 vehicles are anticipated to use the connection in the PM peak hour.

Capacity Analysis

In order to determine the anticipated impact of the connection on the surrounding roadway network, capacity analysis with the redistributed traffic volumes was analyzed.

Table 6 – Design Year 2035 Strategy #2 Level of Service Summary

Intersection	PM LOS (LOS / Seconds of Delay per Vehicle)
Main Street (SR 0322) with 2nd Avenue	**A (9.0)**
Main Street (SR 0322) with 5th Avenue (SR 0068)	**C (28.8)**
5th Avenue (SR 0068) with South Street	**B (14.4)**
5th Avenue (SR 0068) with Clarion Mall Drive / Kane Drive	**B (11.8)**
5th Avenue (SR 0068) with Perkins Drive / Commercial Drive	**C (34.5)**

As can be seen above in **Table 6**, all of the study intersections are anticipated to operate at acceptable LOS (LOS C or better) during the PM peak hour with the new connection. The Design Year 2035 capacity analysis printouts and a table with all intersection approach / lane group LOS for Strategy #2 are provided in **Appendix M** for the AM, Midday, and PM peak hours.

Strategy Estimated Cost

The estimated cost (2016 dollars) for the 2nd Avenue to Hospital Drive new connector road is between approximately $32.9 million and $36.9 million. The cost for the bridge was based on square footage. For structures similar to the one required for this strategy, the costs typically vary between $350/sf and $400/sf. **Table 7** on the next page shows an itemized breakdown of the estimated costs based on a low range cost of $350/sf for the bridge and a high range cost of $400/sf.

Table 7 – Strategy #2 Estimated Costs

Second Avenue Alternative Costs		
	Low Range	High Range
Estimated Design Cost	$5,301,000	$5,983,000
Estimated Construction Cost	$1,722,000	$1,722,000
Estimated Structure Cost	$15,929,000	$18,205,000
Estimated Relocated Utility Cost	$17,000	$17,000
Estimated Right-of-Way Cost	$2,406,000	$2,406,000
Estimated Construction Inspection Cost	$2,120,000	$2,393,000
20% Contingency	$5,499,000	$6,145,000
Total	**$32,994,000**	**$36,871,000**

Intermediate Connection

Figure 24 – Hospital Drive / Dolby Street Connection

Given the large size of project that the connection between 2nd Avenue and Hospital Drive would entail, a smaller project could be more cost effective that would allow for a connection between Hospital Drive and Dolby Street. This connection, as seen to the right in **Figure 24**, would allow an alternate access to 5th Avenue (SR 0068) and could begin to open up economic development. Also, the connection could be designed and constructed to accommodate future expansion to the north, including a full connection to 2nd Avenue when the demand and funding becomes available. This option would cost approximately $2,374,000.

Strategy Summary

Constructing a new connection between 2nd Avenue and Hospital Drive addresses the congestion concerns of the corridor by providing an alternate route and decreasing the traffic volumes on 5th Avenue (SR 0068). The connection would provide a direct route from Clarion Borough to the Clarion Mall area and the Clarion Hospital, providing an alternate route in emergencies. Additionally, the connection would allow current vacant land to be available for economic development. This strategy would require a high capital investment and likely take several years to design and construct. Additionally, it would likely require at least one residential displacement. This strategy would also increase traffic on 2nd Avenue. Currently, 2nd Avenue is mostly a residential street with a low ADT. Providing such a connection would then make 2nd Avenue a through street and attracting more traffic. **Table 8** below summarizes the advantages and disadvantages of this strategy.

Table 8 – Strategy #2 Summary Table

Advantages	Disadvantages
Reduces Traffic on 5th Avenue (SR 0068)	High Cost and multi-year project
Provides Alternative Direct Access to / from Hospital / Mall area from/to Clarion Borough	Increase traffic on 2nd Avenue
Opens vacant land to economic development	Increase traffic on 2nd Avenue conflicts with current land use along roadway (primarily residential)
	At least one potential displacement

Strategy #3 – Connection between Greenville Pike (SR 1007) and Bauer Road

After the analysis on the 2nd Avenue new access was presented to the steering committee at the third Steering Committee meeting, it was decided that due to the high cost of the new connection between 2nd Avenue and Hospital Drive, a second new access should be considered. The second new alternate route is located on the eastern side of 5th Avenue (SR 0068) and connects Greenville Pike (SR 1007) with Bauer Road, which then directly connects to 5th Avenue (SR 0068). This alternative was considered from a geometrical standpoint but was not analyzed to determine the anticipated traffic impacts on the surrounding intersections.

The same design parameters utilized in the 2nd Avenue / Hospital drive connection where utilized in this connection as well, including a design speed of 35 mph and includes one 12-foot lane in each direction with 4-foot shoulders on either side. Additionally, a sidewalk on one side of the road was included in the design.

Figure 25 below shows the layout of the alternative. This alternative extends the existing Bauer Road to the east along the property line of the Clarion Oaks Golf Course. In order to make a connection to Greenville Pike (SR 1007), it is anticipated that one residential property would need to be acquired.

Figure 25 –Greenville Pike (SR 1007) to Bauer Road Connector Road Layout

The estimated cost (2016 dollars) for the Greenville Pike to Bauer Road new connector road is approximately $3.4 million. Although traffic analysis was not performed for this connector road, similar ADT is expected for this connector road as the 2nd Avenue / Hospital Drive connector road, or about 2,000 – 3,000 vehicles / day.

Strategy Summary

Constructing a new connection between Greenville Pike (SR 1007) and 5th Avenue (SR 0068) addresses the congestion concerns of the corridor by providing an alternate route and decreasing the traffic volumes on portions 5th Avenue (SR 0068). The connection would provide a direct route from Greenville Pike (SR 1007) and 5th Avenue (SR 0068), providing an alternate route in emergencies at a lower cost than the first new access strategy. This strategy, however, does not provide direct access to the Clarion Mall area. Traffic would still need to travel on 5th Avenue (SR 0068) in order to access those areas. In order for this strategy to be constructed, at least one residential displacement would likely be required and the intersection of 5th Avenue (SR 0068) with Bauer Road would likely need to be signalized. **Table 9** on the next page summarizes the advantages and disadvantages of this strategy.

Table 9 – Strategy #3 Summary Table

Advantages	Disadvantages
Reduces Traffic on portions of 5th Avenue (SR 0068)	At least one potential displacement
Provides Alternative Direct Access to / from Greenville Pike (SR 1007) and 5th Avenue (SR 0068)	Does not provide direct access to the Clarion Mall area
Lower cost of new access routes	

OTHER STRATEGIES

In addition to adding capacity to the existing roadway network, other strategies were also considered to address existing and future traffic congestion concerns.

Strategy #4 – Transit

Figure 26 – Bus Pull Off Area Example

As previously mentioned, Clarion Area Transit services 5th Avenue (SR 0068) within the study area. Flag stops are currently prohibited along 5th Avenue (SR 0068) between the Clarion Mall and South Street due to heavy traffic and sight distance concerns. Currently, there is a demand for stops at Comet Food Warehouse and Aldi. As projects along the 5th Avenue (SR 0068) corridor are programmed, coordination with the transit authorities should be made a priority in order to accommodate transit in the area where possible. Right-of-way acquisition would also need to be coordinated during the engineering phase of the project. Bus pull off areas, like the one shown in **Figure 26** could be designed in high demand areas to accommodate bus riders along the corridor and increase safety of the riders. The design should also include pedestrian access to and from the bus pull off areas, but may require pedestrians to cross at mid-block locations.

This strategy addresses the congestion concerns by providing safe refuge for buses and pedestrians along 5th Avenue (SR 0068) while maintaining traffic flow. **Table 10** below summarizes the advantages and disadvantages of this strategy.

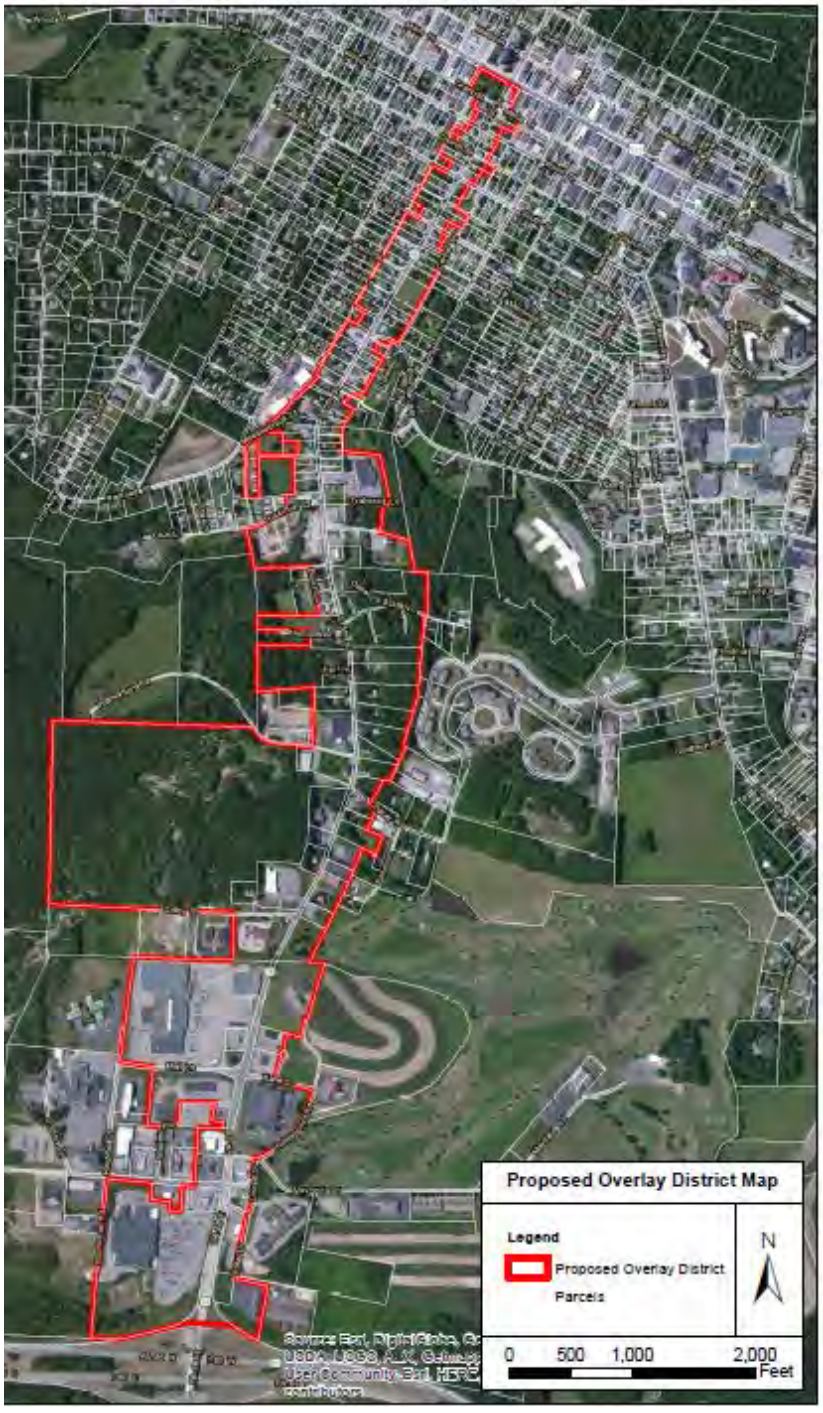
Table 10 – Strategy #4 Summary Table

Advantages	Disadvantages
Provides safer access for public transportation	Right-of-way acquisition is likely
Allows traffic to continue to flow when the bus stops	Potential mid-block pedestrian crossings
Increased access to businesses along the 5th Avenue (SR 0068) corridor	

Strategy #5 – Access Management

Access management consists of several techniques to control vehicular access along a particular route. In the Clarion area, an ordinance could be established which governed the access along 5th Avenue (SR 0068) and / or the new connector road. Such an ordinance could include specific criteria concerning new driveway locations and spacing to adjacent driveways / roads, driveway design, exclusive turn lanes, and median treatments. Existing access points would not be affected by the ordinance as those access points would be "grandfathered" in; however, any new access points would be required to satisfy the new ordinance criteria. These types of ordinances are often called overlay districts. An overlay district could be enacted for 5th Avenue (SR 0068), as seen to the right in **Figure 27**, and a separate overlay district could be enacted for the new connection road to Dolby Street. The overlay district along Dolby Street and the new connection road would be especially critical as the new connection would be likely to attract economic development in that area.

Figure 27 – Potential Overlay District



PennDOT Publication 574 (Access Management Model Ordinances for Pennsylvania Municipalities Handbook) contains direction on how to structure access management plans. These plans could be enacted by the municipalities or by the County for areas which do not currently have zoning ordinances. Access management ordinances typically contain "tiers" which address language

for individual parcels (Tier 1), language for roadways (Tier 2), and comprehensive traffic planning practices (Tier 3). Clarion County or the local municipalities could consider adopting portions of the Tier 1 and Tier 2 sections of Publication 574. Tier 3 could be enacted by Clarion County as an overlay district.

This strategy addresses the congestion concerns by providing definition for future developments along the 5th Avenue (SR 0068) corridor at a minimal cost. This strategy, however, would not relieve congestion immediately. Over time as the ordinances are developed and enforced, access would be controlled leading to increased safety along the corridor. **Table 11** below summarizes the advantages and disadvantages of this strategy.

Table 11 – Strategy #5 Summary Table

Advantages	Disadvantages
Provides definition for future development	Requires Municipal and / or County action
Cost is minimal	Provides no immediate congestion relief

Strategy #6 – Incident Management

As previously described, the data collection indicated that the travel time along 5th Avenue (SR 0068) exceeds the average travel time about once per day. That indicates that an incident is occurring along 5th Avenue (SR 0068) which is causing traffic to queue and be delayed. How incidents are reported and responded to can greatly affect travel time along the corridor and the reliability of the corridor.

In order to address the daily incidents that occur in this area, a Traffic Incident Management (TIM) plan could be established. Traffic Incident Management (TIM) is a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. When done effectively, a TIM plan reduces the duration and impacts of traffic incidents and improves the safety of motorists, crash victims, and emergency responders. In addition to incidents along the corridor, a TIM plan could also be implemented for special events or during an I-80 detour which forces traffic to traverse through Clarion.

In order to establish a TIM plan, a TIM team attends a half day TIM Responder Training Course. The course is led by trained trainers, such as the PennDOT Safety Engineer for District 10-0. Various entities could attend the course including, but not limited to, representatives of municipalities, police / fire, PennDOT, EMS, hazardous material handlers, road maintenance crews, and towing and recovery responders. After the initial half day course, the group attends periodic coordination meetings to address any other issues that arise.

A TIM plan does not prevent incidents from occurring and does require multiple agencies to fully participate, but with a good TIM plan in place, traffic can be restored to pre-incident

conditions quickly. This strategy also requires minimal cost. **Table 12** below summarizes the advantages and disadvantages of this strategy.

Table 12 – Strategy #6 Summary Table

Advantages	Disadvantages
Traffic restored to normal conditions quickly following an incident	Does not prevent incidents from occurring
Cost is minimal	Requires multiple entities to participate

Strategy #7 – Traffic Signal Improvements

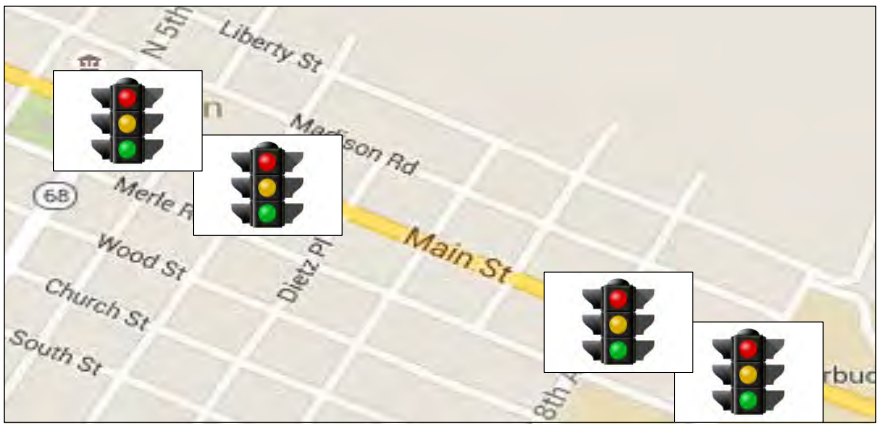
Traffic Signal Upgrades

Figure 28 – Existing Traffic Signal

As previously described, there are several existing traffic signals within the study area. There are four traffic signals along the urban business district on Main Street (SR 0322). Three of the traffic signals are supported by span wire and the fourth is supported by mast arms. The traffic signals along Main Street (SR 0322) at 6th Avenue and 8th Avenue are supported by diagonal span wire with four traffic signal heads fixed together at the center of the intersection, as seen in **Figure 28** to the right. There are also additional traffic signal heads mounted on the signal poles. Although that type of design was once typical, such a design does not meet current MUTCD traffic signal or PennDOT design criteria.

Adaptive Traffic Signal System

Figure 29 – Adaptive Traffic Signal Potential Locations



An adaptive traffic signal system is a recent technology that adjusts the traffic signal timings and phasing at an intersection or along a corridor according to the current traffic demand. Installing an adaptive traffic signal system along Main Street (SR 0322) within the urban business district would allow for the traffic signals to adjust the green, yellow, and red times according to the real-time traffic flow.

Strategy Summary

Replacing traffic signals with signals that satisfy current criteria would increase safety and better satisfy driver expectation, especially during times when I-80 experiences an incident and traffic is diverted through the business district in Clarion. Replacing traffic signals reduces crashes on average by 10%. Adaptive traffic signals would allow increased traffic to flow along Main Street (SR 0322) in the event of an incident on I-80 which forces traffic to divert through Clarion. This also limits the police presence necessary along detour routes. Since adaptive traffic signals adjust the timings and phasing based on real-time traffic, this also reduces delay for vehicular traffic during off-peak times and has been shown to reduce crashes by 15%-30%.

In order to fund the cost of upgrades traffic signals, municipalities may need to apply for available grants. Future costs must also be taken into consideration as adaptive traffic signals require more maintenance than traditional traffic signals. **Table 13** below summarizes the advantages and disadvantages of this strategy.

Table 13 – Strategy #7 Summary Table

Advantages	Disadvantages
Adaptive traffic signals change timings and phasing based on current traffic conditions	Adaptive signals require more maintenance than traditional traffic signals
Police present is reduced due to adaptive traffic signals adapting to changing traffic conditions	Municipalities may need to apply for grants to help alleviate cost of the signal upgrades
Increased safety for all users	No capacity is added to the network.

Strategy #8 – Parking Removal

Currently, on-street parking is present at the intersection of Main Street (SR 0322) with 5th Avenue (SR 0068). The removal of the on-street parking on the eastern side of 5th Avenue (SR 0068), south of Main Street (SR 0322), and the northern side of Main Street (SR 0322), west of 5th Avenue (SR 0068), would allow additional capacity to be added at the intersection with no roadway improvements.

With parking eliminated along 5th Avenue (SR 0068), the northbound approach (5th Avenue) would maintain the existing exclusive left turn lane but the existing shared through / right turn lane would be converted to an exclusive through lane and the existing parking lane would then become an exclusive right turn lane. Similarly, eliminating the parking along Main Street (SR 0322) would allow an exclusive left turn lane to be installed while the existing left lane would be converted to an exclusive through lane while maintaining the existing right turn lane.

The lane assignment changes would not require any roadway widening, but may require adjustments to be made to the existing traffic signal. After discussion at the second Steering Committee meeting, it was decided that on-street parking removal was not a favorable strategy and it would not be analyzed.

STRATEGY CONCLUSIONS

The data collection and analysis performed indicates that the 5th Avenue (SR 0068) corridor frequently experiences congestion. Travel times more than triple about once a day causing roadway unreliability. Strategies were developed and analyzed in order to manage congestion immediately and to provide options for congestion relief in the future. All strategies have advantages and disadvantages. As funding becomes available through the municipalities, county, state, and grant programs, projects can be programmed and implemented.

Strategy #1 – Widen 5th Avenue (SR 0068)

The 5th Avenue (SR 0068) widening project compliments the roadway widening that is currently under construction and also compliments the PennDOT project that is currently in preliminary engineering. As 5th Avenue (SR 0068) carries a high ADT and is anticipated to remain a main route in Clarion, widening the road will address the congestion concerns in the area. Part of the widening project described in this report already has funding in place in the next PennDOT Transportation Improvement Program (TIP) cycle. The remaining portions of the 5th Avenue (SR 0068) widening could be completed as funding becomes available to create at minimum of a three-lane section from I-80 to Main Street (SR 0322).

Strategy #2 – Connection between 2nd Avenue and Hospital Drive

The second strategy which creates a new connection between 2nd Avenue and Hospital Drive does address congestion concerns and creates a second direct access to and from the Clarion Mall area / Clarion Hospital. The cost in order to complete this connection is high. If this strategy is pursued, funding strategies would need to be further explored.

Strategy #3 – Connection between Greenville Pike (SR 1007) and Bauer Road

The new connection between Greenville Pike (SR 1007) and Bauer Road creates a second access to / from 5th Avenue (SR 0068); however, it does not provide direct access to the Clarion Mall area or the Clarion Hospital. As the cost for this new access is less than the new connection between 2nd Avenue and Hospital Drive, funding for the project could possibly be obtained before the new connection between 2nd Avenue and Hospital Drive.

Strategy #4 – Transit

The fourth strategy which addresses the transit concerns in the area should occur concurrently with the 5th Avenue (SR 0068) widening projects. Coordination between the transit authority and PennDOT during the preliminary engineering stages of the projects needs to occur in order to adequately address the transit concerns such as bus pull off areas for current demands and / or new stops. Providing such areas for safer transit access may require additional right-of-way, which could potentially increase the cost of the widening projects.

Strategy #5 – Access Management

Access management addresses the congestion concerns along 5th Avenue (SR 0068), although its affects would not be seen immediately. In order to implement access management, coordination

with the local municipalities and Clarion County is necessary. With the cost of access management plans being minimal, future funding is not a concern.

Strategy #6 – Incident Management

The sixth strategy, incident management, addresses incidents as they occur to limit the subsequent congestion, but does not prevent incidents from occurring. Incident management plans also require coordination between local municipalities and the local responders. With the cost of incident management plans being minimal, future funding is not an obstacle.

Strategy #7 – Traffic Signal Improvements

Traffic signal improvements would better meet driver expectations and the adaptive traffic signal technology adjusts to real time changes in traffic, such as increased traffic due to a detour. These projects do require a capital investment. Grants could potentially be sought after in order to provide some funding for these improvements.