REQUESTED BY:
GREATHOUSE - LARSON

LAW DEPARTMENT
DRAFT NO. 0054

TITLE

AN ORDINANCE FOR THE PURPOSE OF ADOPTING THE RECOMMENDATIONS AND FINDINGS ATTACHED HERETO AS "EXHIBIT A" AND AS FULLY REWRITTEN HEREIN OF THE 2020 TRAFFIC CONTROL WARRANT STUDY BASED ON THE RECOMMENDATION OF THE WARREN TRAFFIC COMMISSION AND HEREBY AMENDING THE TRAFFIC CONTROL MAP AND FILES ESTABLISHED BY SECTIONS 305.01 AND 305.02 OF THE TRAFFIC CODE OF THE CODIFIED ORDINANCES OF THE CITY OF WARREN, OHIO, AND DECLARING AN EMERGENCY.

ORDINANCE NO. 12974/2020

WHEREAS, the Warren Traffic Commission, at a meeting held on August 17, 2020 reviewed the 2020 Traffic Control Warrant Study as prepared by the City of Warren's contractor, Burgess & Niple relative to various traffic control devices and unanimously supported said recommendations; and

WHEREAS, This Council has reviewed said recommendations and finds the same to be in accord with the public good; and

WHEREAS, Council desires to adopt and implement the recommendations of the 2020 Traffic Control Warrant Study attached hereto as "Exhibit A" and as fully rewritten herein; NOW THEREFORE

BE IT ORDAINED by the Council of the City of Warren, State of Ohio:

Section 1: That the recommendations and findings attached hereto as "Exhibit A" and as fully written herein be, and hereby are implemented.

Section 2: That the Traffic Control Map and Files established by Sections 307.01 and 307.02 of the Traffic Code of the Codified Ordinances of the City of Warren shall be, and hereby are, amended as follows:

By the removal of the following traffic signals:

Parkman Road N.W. and Southern Boulevard
Parkman Road N.W. and Coit Avenue
Parkman Road N.W. and Drexel Avenue
Mahoning Avenue N.W. and Hall Street N.W.
West Market Street and Southern Boulevard
West Market Street and Nevada Avenue
South Street and Park Avenue
East Market Street and Belvedere Avenue
East Market Street and Country Club Drive
High Street and Mid-Block Pedestrian Crossing
N. Park Avenue and Washington Street
N. Park Avenue and Dana Street
Woodland Street and Laird Avenue
Woodland Street and Genesee Avenue
Atlantic Street and Paige Avenue
Atlantic Street and Laird Avenue
Elm Road and Dana Street/Edgewood Street
Main Avenue and Fulton Street
Pine Avenue and Industrial Park Driveway

Section 3: That the 2020 Traffic Control Warrant Study recommended and the Traffic Commission unanimously supported the removal of the following three traffic signals to be placed out of operation and monitored at the intersections of:

Parkman Road - Denison/Northwest Boulevard
High Street - Mahoning Avenue
Tod Avenue - Palmyra Road

Section 4: That the Traffic Control Map and Files established by Sections 307.01 and 307.02 of the Traffic Code of the Codified Ordinances of the City of Warren, shall be, and hereby are, amended as follows:

By the removal of the following stop signs:

Nevada Avenue S.W. and Union Street S.W.
Nevada Avenue S.W. and Hamilton Street S.W.
Nevada Avenue S.W. and Oak Street S.W.
Palmyra Road S.W. and Risher Road
Hamilton Street S.W. and York Avenue S.W.
Jefferson Street S.W. and York Avenue S.W.
Oak Street S.W. and York Avenue S.W.
Palmyra Road S.W. and Austin Avenue S.W.
Lane Drive S.W. and Valley Avenue S.W.
Beal Street N.W. and Midwae Drive N.W.
Southern Boulevard N.W. and Solar Street N.W.
Northwest Boulevard N.W. and Commerce Avenue N.W.
Northfield Avenue N.W. and Norwood Street N.W.
Oakdale Drive N.W. and Drexel Avenue N.W.
Norwood Street N.W. and Drexel Avenue N.W.
Riverview Street N.W. and Niblock Avenue N.W.
Ohio Avenue N.W. and Ward Street N.W.
Dickey Avenue N.W. and Taylor Street N.W.
Dickey Avenue N.W. and Ward Street N.W.
Comstock Street N.W. and Vernon Avenue N.W.
Federal Street N.W. and Arlington Avenue N.W.
Porter Street N.E. and Vine Avenue N.E.
Edgewood Street N.E. and Bonnie Brae N.E.
Hollywood Street N.E. and Kenilworth Avenue N.E.
Edgewood Street N.E. and Kenilworth Avenue N.E.
Wilard Avenue N.E. and Montclair Street N.E.
Perkinswood Boulevard N.E. and Woodland Street N.E.
Butler Road N.E. and Woodland Street N.E./Overlook Drive N.E.
Kenilworth Avenue S.E. and South Street S.E.
Woodbine Avenue S.E. and South Street S.E.
Oak Knoll Avenue S.E. and Belle Street S.E.
Adelaide Avenue S.E. and Belle Street S.E.
Belvedere Avenue S.E. and Grandview Street S.E.
Kenmore Avenue S.E. and South Street S.E.
Trumbull Avenue S.E. and Catalpa Street S.E.
Meadowbrook Avenue S.E. and Catalpa Street S.E.
Eastland Avenue S.E. and Catalpa Street S.E.
Homewood Avenue S.E. and Clarence Street S.E.
Kenilworth Avenue S.E. and Clarence Street S.E.
Francis Avenue S.E. and Sussex Street S.E.
Kenmore Avenue S.E. and Sussex Street S.E.
Hazelwood Avenue S.E. and Colonial Street S.E.
Milton Street S.E. and Hazelwood Avenue S.E.
Wallace Street S.E. and Duke Avenue S.E.
Brier Street S.E. and Duke Avenue S.E.
Brier Street S.E. and Willard Avenue S.E.
Burton Street S.E. and Willard Avenue S.E.
Meadowbrook Avenue S.E. and Surrey Road S.E.
Martha Street N.E. and Mazda Avenue N.E.
Jackson Street S.W. and Nevada Avenue S.W.
Wick Street S.E. and Duke Avenue S.E.
Willard Street S.E. and Sussex Street S.E.
Meadowbrook Avenue S.E. and Sussex Street S.E.
Eastland Avenue S.E. and Sussex Street S.E.
Brighton Avenue N.E. and Martha Street N.E.
Glenwood Street N.E. and Mazda Avenue N.E.
Southern Boulevard N.W. and Linda Drive N.W.
Homewood Avenue S.E. and South Street S.E.
Perkinswood Boulevard S.E. and Sussex Street S.E.

By the removal of the following traffic caution signals:

Comstock Street @ West Avenue N.W.
Forest Street @ Vine Avenue N.E.
Grandview @ Homewood Avenue S.E.
Grandview Street @ Kenilworth Avenue S.E.
Griswold Street @ Fremont Avenue N.E.
Griswold Street @ Paige Avenue N.E.
Highland Avenue @ Fourth Street S.W.
Laird Avenue near Atlantic Street N.E.
Laird Avenue @ South Street S.E.
Main Avenue @ Third Street S.W.
McMyler Street near York Avenue N.W.
Nevada Avenue @ Union Street S.W.
Palmyra Road @ Austin Avenue S.W.
Palmyra Road @ Risher Road S.W.
Parkman Road near Northfield Avenue N.W.
Parkman Road @ Trumbull Plaza Entrance
Perkinswood Boulevard S.E. @ curve (Somerset Street)
Pine Avenue S.E. @ WCI (north gate)
Robert Avenue near Garden Street N.W.
Tod Avenue near Palmyra Road S.W.
Tod Avenue @ Riverview Street N.W.
Washington Street @ Olive Avenue N.E.
Washington Street near Prospect Avenue N.W.
Grandview @ Laird

Section 5: That this Ordinance is hereby declared to be an emergency measure necessary for the immediate preservation of the public peace, health, welfare and safety, and for the further reason that the public's safe and reasonably use of the public streets, avenues and highways within the City of Warren may be more greatly insured at the earliest possible time and without undue delay. WHEREFORE, this Ordinance shall go into immediate effect.

Passed in Council this 28TH day of OCTOBER, 2020.

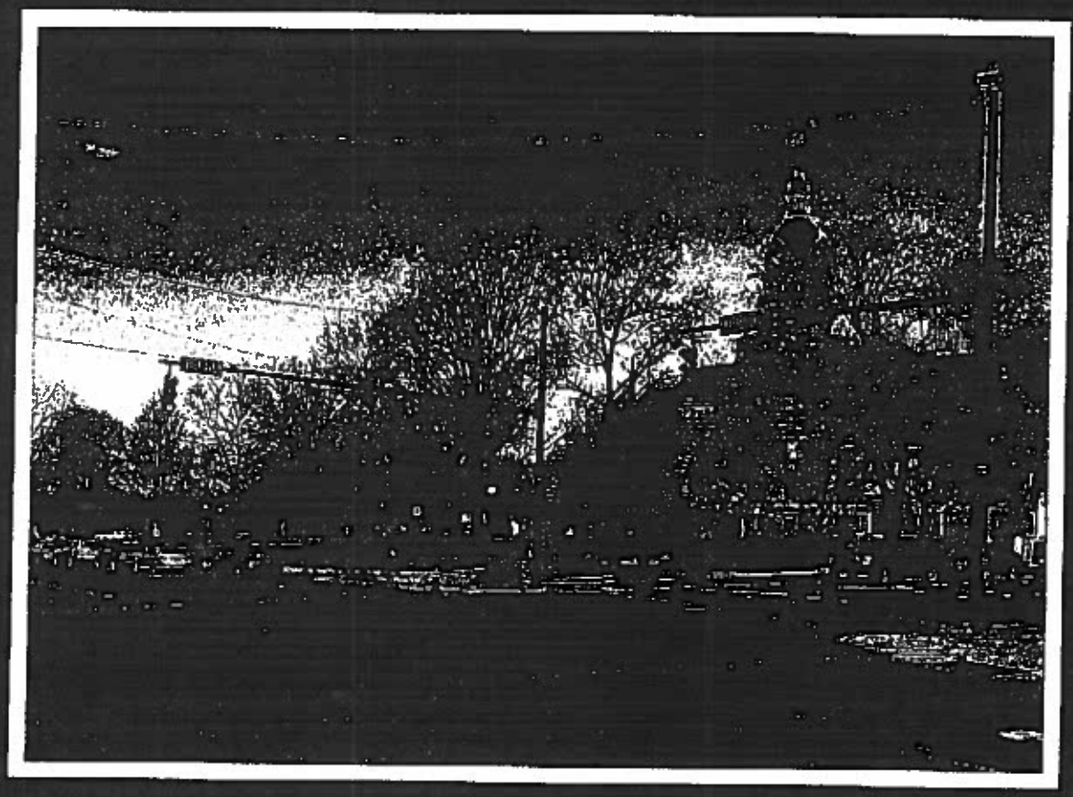
SIGNED: _____ ATTEST: _____
PRESIDENT OF COUNCIL CLERK

FILED WITH THE MAYOR: 10-28-2020

DATE APPROVED: 10-28-2020

_____
MAYOR, CITY OF WARREN, OHIO

TRAFFIC CONTROL WARRANT STUDY
PID 107235



City of Warren
Trumbull County, Ohio

July, 2020

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Table of Contents

Sections

Appendices

1. Introduction and Purpose

The City of Warren's traffic signal system is comprised of 61 signalized intersections. The last major system upgrade took place in 2003. During this project 27 unwarranted signals were removed, three new signals were installed, 18 signals were reconstructed, and the remaining signals received equipment upgrades including new controllers, improved vehicle detections, fiber-optic interconnect and emergency vehicle preemption. This project also installed new coordinated traffic signal timings.

Several elements of the current signal system are reaching their useful life expectancy and are no longer functioning as originally intended. Over the nearly 20-year period, traffic volumes around and through the City have significantly changed, resulting in less than optimal coordination timings.

This study serves as the first step in the City's plan to improve traffic flow by removing unwarranted traffic signals and upgrading the remaining signals. Additional traffic flow improvements will be realized through the removal of unwarranted multi-way stop-controlled intersections. At multi-way stop-controlled intersections, traffic on all approaches to the intersection must come to a stop before traveling through the intersection. Where determined to be unwarranted, the stop signs on the major street approaches to these intersections will be removed, and only side-street traffic will be required to stop.

This document contains the data we have collected, our methodology in analyzing the data and the results of our analysis.

2. Data Collection

Turning Movement Traffic Counts at Signalized Intersections

Weekday turning movement traffic counts were collected using video cameras for a 12-hour period on October 22 and October 23, 2019. The video was processed for nine hours (7:00 AM to 10 00 AM), (11:00 AM to 2:00 PM), and (3:00 PM to 6.00 PM) for use in the analysis. A list of the signalized study intersections is provided below, the raw traffic count data is contained in **Appendix A**.

1) Parkman Rad NW & Leavitt Road NW
2) Parkman Road NW & Tod Avenue NW / Lovers Lane
3) Parkman Road NW & Southern Boulevard
4) Parkman Road NW & Coit Avenue
5) Parkman Road NW & Denison Drive NW / Northwest Boulevard NW
6) Parkman Road NW & Drexel Avenue
7) Parkman Road NW & Summit Street NW
8) Summit Street NW & Tod Avenue NW
9) Summit Street NW & Mahoning Avenue NW
10) Mahoning Avenue NW & Hall Street NW
11) Tod Avenue & Dunstan Drive NW / Bridge Road
12) West Market Street & Southern Boulevard
13) West Market Street & Nevada Avenue
14) West Market Street & Austin Avenue
15) West Market Street & Parkman Road
16) West Market Street & Tod Avenue
17) West Market Street & South Street / Highland Avenue
18) South Street & Main Avenue
19) South Street & Park Avenue
20) South Street & Pine Avenue
21) South Street & Elm Road
22) South Street & Chestnut Avenue / Niles Road
23) Youngstown Road & Laird Avenue
24) Youngtown Road & Central Parkway
25) Youngstown Road & Ridge Avenue
26) West Market Street & Main Avenue / Mahoning Avenue
27) West Market Street & S Park Avenue / N Park Avenue
28) East Market Street & Pine Avenue
29) East Market Street & Elm Road
30) East Market Street & Chestnut Avenue
31) East Market Street & Laird Avenue
32) East Market Street & Genesee Avenue
33) East Market Street & Belvedere Avenue
34) East Market Street & Perkinswood Boulevard
35) East Market Street & Eastland Avenue
36) East Market Street & Country Club Drive
37) East Market Street & North Road
38) High Street & Mahoning Avenue
39) High Street & Mid-Block Pedestrian Crossing

40) High Street & N Park Avenue
41) High Street & Elm Road
42) N Park Avenue & Washington Street
43) N Park Avenue & Atlantic Street
44) N Park Avenue & Dana Street
45) Woodland Street & Elm Road
46) Woodland Street & Laird Avenue
47) Woodland Street & Genesee Avenue
48) Atlantic Street & Paige Avenue
49) Atlantic Street & Elm Road
50) Atlantic Street & Laird Avenue
51) Atlantic Street & Genesee Avenue
52) Atlantic Street & North Road
53) Elm Road & Dana Street / Edgewood Street
54) Elm Road & Larchmont Avenue
55) Elm Road & Gretchen Drive
56) Reeves Road & North Road
57) Tod Avenue & Palmyra Road
58) Tod Avenue & 5th Street
59) Main Avenue & Fulton Street
60) Pine Avenue & Industrial Park Driveway
61) Youngstown Road and Willard Avenue

A preliminary review of the traffic count data was conducted with respect to the traffic signal warrant criteria. After this review, additional hours of traffic count data were processed for 17 of the study intersections. This information has been integrated into the count data contained in **Appendix A**.

Multi-Way Stop Intersection Traffic Count Data

Traffic count information at the City's multi-way stop-controlled intersections was obtained using StreetLight Data. StreetLight collects real-time geospatial data from smart phones and navigation devices in connected cars and commercial trucks. This data is then processed through StreetLight's Route Science AADT model using machine learning based on inputs such as: parcel data, digital road network data, road network maps, weather, urban density speed limit and census data. StreetLight uses permanent traffic recording stations to validate the model output.

The Average Annual Daily Traffic (AADT) output report from StreetLight includes a confidence range for the AADT data. A confidence range, commonly referred to as a prediction interval in statistics, is an estimated range, within a given probability confidence, in which the true value will fall. StreetLight uses a 90 percent confidence range for AADT analysis. This means there is a 90 percent certainty that the true AADT value for a StreetLight zone is between the low and high end of the confidence range. For example, if StreetLight reports an AADT value of 5,000 for a roadway with a confidence range of (-16 percent, 10 percent), StreetLight is 90 percent confident that the true AADT value is between 4,200 and 5,500. This percentage range will differ across different AADT analyses and even across zones within the same AADT analysis.

StreetLight AADT volume and confidence range information can be found in **Appendix B**.

3. Traffic Signal Warrant and Removal Analysis

A signal warrant analysis was completed for the 61 existing signals to assess the need for continued signalization per guidance in the *Manual on Uniform Traffic Control Devices* (MUTCD). The MUTCD has nine warrants to determine whether an intersection merits consideration for a traditional traffic control signal based on the existing operations and safety of the study location. The warrants are as follows:

- **Warrant 1. Eight-Hour Vehicular Volume:** Warrant 1, the Eight-Hour Vehicular Volume signal warrant, assesses two conditions regarding intersecting traffic. The Minimum Vehicular Volume, Condition A, is intended for application where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal. The Interruption of Continuous Traffic, Condition B, is intended for application where the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street. Warrant 1 must be met for eight hours of the day.
- **Warrant 2. Four-Hour Vehicular Volume:** The Four-Hour Vehicular Volume signal warrant conditions are intended for application where the volume of intersecting traffic is the principal reason to consider installing a traffic signal. Volumes must be met for four hours of the day.
- **Warrant 3. Peak Hour:** The Peak Hour signal warrant applies only to "special case" locations serving a facility that attracts or discharges a large number of vehicles over a short time. At these locations, Warrant 3 is satisfied if traffic conditions are such that for a minimum of one hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street.
- **Warrant 4. Pedestrian Volume:** The Pedestrian Volume signal warrant is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street. The need for a traffic control signal at an intersection or midblock crossing would be considered if:
  - Pedestrian volume crossing the major street during an average day is more than 107 for any four hours or 133 during any one hour; and
  - The distance to the nearest traffic control signal or stop sign controlled crossing is greater than 300 feet.
- **Warrant 5. School Crossing:** This warrant is intended for application where the principal reason to consider installing a traffic control signal is where schoolchildren are crossing the major street. In order for Warrant 5 to be met, there must be a minimum of 20 schoolchildren crossing the major street during the highest crossing hour and an engineering study shows a lack in the frequency of adequate gaps in the vehicular traffic stream.
- **Warrant 6. Coordinated Signal System:** Warrant 6 considers progressive movement in a coordinated signal system, which sometimes necessitates installing traffic control signals at intersections where they would not otherwise be needed to maintain proper platooning of vehicles.
- **Warrant 7. Crash Experience.** The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal. The warrant is satisfied if all the following criteria are met:

- The intersection has been observed and enforcement has not reduced crash frequency,
- Five or more crashes that could be corrected by a traffic control signal have occurred at the intersection within a 12-month period; and
- Vehicular volume or pedestrian volume thresholds are met.

- **Warrant 8. Roadway Network:** Warrant 8 applies to the intersection of two or more major routes where a traffic control signal might be justified to encourage concentration and organization of traffic flow on a roadway network.
- **Warrant 9. Intersection Near a Grade Crossing:** Warrant 9 is intended for use at a location where none of the other eight warrants are satisfied, but the intersection is near a grade crossing.

Upon completion of evaluating signal warrants 1 through 9 following the MUTCD criteria, each intersection not meeting the warrant criteria was evaluated pe Section 402-3.2 of ODOT's Traffic Engineering Manual (TEM). The TEM states that for retention of existing signals, warrants 1, 2 and 3 can be based on the 70 percent values (MUTCD Chapter 4C) and engineering judgment, regardless of the speed on the major street and regardless of proximity to an isolated community with a populations of less than 10,000.

Following the warrant evaluations, a traffic signal removal analysis was completed for each intersection not meeting the MUTCD and TEM criteria. The *User Guide for the Removal of Not Needed Traffic Signal* outlines the process for analyzing signalized intersections for possible removal. The first step, once an intersection inventory has been taken, is completion of a screening checklist. This screening is made up of four criteria, each with a yes/no decision.

- Intersection sight distance
- Special site considerations precluding removal – located near major traffic or pedestrian generator
- Will future traffic volumes meet traffic signal installation warrants
- Special justification for original signal installation still exists

The user guide states that if any of the above criteria are answered with a "yes", the signal removal at that intersection should be deferred.

Traffic Signal Warrant sheets and Traffic Signal Removal Analysis worksheets can be found in **Appendix C.**

Traffic Signals Warranted Based on 8-Hour Warrants

The following 20 traffic signals are warranted based on MUTCD Warrant 1 (Eight-Hour Vehicular Volume):

1) Intersection 1: Parkman Road NW & Leavitt Road NW
2) Intersection 7: Parkman Road NW & Summit Street NW
3) Intersection 15: West Market Street & Parkman Road
4) Intersection 16: West Market Street & Tod Avenue
5) Intersection 17: West Market Street & West Market Street
6) Intersection 18: South Street & Main Avenue
7) Intersection 21: South Street & Elm Road
8) Intersection 22: South Street & Chestnut Avenue
9) Intersection 24: Youngstown Road & Central Parkway

10) Intersection 25: Youngstown Road & Ridge Avenue
11) Intersection 26: West Market Street & Main Avenue
12) Intersection 29: East Market Street & Elm Road
13) Intersection 30: East Market Street & Chestnut Avenue
14) Intersection 32. East Market Street & Genesee Avenue
15) Intersection 34: East Market Street & Perkinswood Boulevard
16) Intersection 35: East Market Street & Eastland Avenue
17) Intersection 37: East Market Street & North Road
18) Intersection 49: Atlantic Street & Elm Road
19) Intersection 52: Atlantic Street & North Road
20) Intersection 55: Elm Road & Gretchen Drive

Traffic Signals Warranted Based on Four-Hour Warrants

The following four traffic signals are warranted based on MUTCD Warrant 2 (Four-Hour Vehicular Volume):

1) Intersection 9: Summit Street NW & Mahoning Avenue NW
2) Intersection 20: South Street & Pine Avenue
3) Intersection 31: East Market Street & Laird Avenue
4) Intersection 54: Elm Road & Larchmont Avenue

Traffic Signals Warranted Based on Walking Routes to Schools

The following traffic signal is warranted based on MUTCD Warrant 5 (School Crossing):

1) Intersection 58: Tod Avenue & Fifth Street

Traffic Signals Recommended for Retention Based on ODOT Traffic Engineering Manual 402-3.2

Section 402-3.2 of ODOT's Traffic Engineering Manual states that for retention of existing signals, warrants 1, 2 and 3 can be based on the 70 percent values (OMUTCD Chapter 4C) and engineering judgment, regardless of the speed on the major street and regardless of proximity to an isolated community with a populations of less than 10,000. The following nine traffic signals may be retained based on 70 percent warrant values and engineering judgement:

1) Intersection 5: Parkman Road NW & Denison Drive NW / Northwest Boulevard NW
2) Intersection 11: Tod Avenue & Dunstan Drive NW / Bridge Road
3) Intersection 28: East Market Street & Pine Avenue
4) Intersection 38: High Street & Mahoning Avenue
5) Intersection 41: High Street & Elm Road
6) Intersection 43: N Park Avenue & Atlantic Street
7) Intersection 51: Atlantic Street & Genesee Avenue
8) Intersection 57: Tod Avenue & Palmyra Road
9) Intersection 61: Youngstown Road & Willard Avenue

In addition to meeting the 70 percent warrants, the intersections of Tod Avenue & Dunstan Drive (#11), East Market Street & Pine Avenue (#28) and High Street and Elm Road (41) each have sight distance limitations that were factored into the signal retention recommendations. Similarly, the proximity of the Willard PK-8

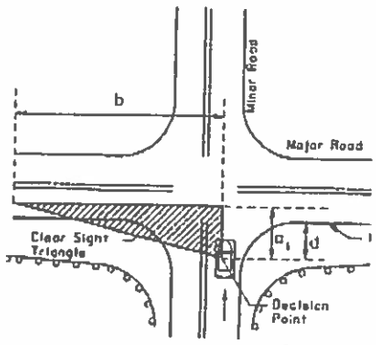
school in relation to the intersection of Youngstown Road & Willard Avenue (#61), was a factor in the recommendation to retain the traffic signal at that location.

The City could consider placing the signals at the remaining five locations in flash-mode, at the same time as the unwarranted signals are placed in flash-mode, for additional evaluation and to make the final retain/remove determination.

Traffic Signals Warranted Based on Intersection Geometry and Sight Distance Limitations

The following seven traffic signals are not warranted based on traffic volumes, but are recommended to remain installed based on the intersection geometry and/or sight distance limitations:

1) Intersection 2: Parkman Road NW & Tod Avenue NW
2) Intersection 8: Summit Street NW & Tod Avenue NW
3) Intersection 14: West Market Street & Austin Avenue
4) Intersection 23: Youngstown Road & Laird Avenue
5) Intersection 27: West Market Street & S Park Avenue
6) Intersection 40: High Street & N Park Avenue
7) Intersection 45: Elm Road & Woodland Street



Ohio Department of Transportation Location and Design Manual, Figure 201-4 Intersection Sight Triangle

Unwarranted Traffic Signals

The following 19 traffic signals are recommended for removal:

1) Intersection 3: Parkman Road NW & Southern Boulevard
2) Intersection 4: Parkman Road NW & Coit Avenue
3) Intersection 6: Parkman Road NW & Drexel Avenue
4) Intersection 10: Mahoning Avenue NW & Hall Street NW
5) Intersection 12: West Market Street & Southern Boulevard
6) Intersection 13: West Market Street & Nevada Avenue
7) Intersection 19: South Street & Park Avenue
8) Intersection 33: East Market Street & Belvedere Avenue
9) Intersection 36: East Market Street & Country Club Drive
10) Intersection 39: High Street & Mid-Block Pedestrian Crossing
11) Intersection 42: N Park Avenue & Washington Street
12) Intersection 44: N Park Avenue & Dana Street
13) Intersection 46: Woodland Street & Laird Avenue
14) Intersection 47: Woodland Street & Genesee Avenue
15) Intersection 48: Atlantic Street & Paige Avenue
16) Intersection 50: Atlantic Street & Laird Avenue
17) Intersection 53: Elm Road & Dana Street / Edgewood Street
18) Intersection 59: Main Avenue & Fulton Street
19) Intersection 60: Pine Avenue & Industrial Park Driveway

Prior to removing the traffic signals at these locations, the City could elect to place the signals in flash-mode, flashing yellow on the main street and flashing red on the side street, and monitor the operation of the intersection. Monitoring could include field observations and a review of crash reports.

4. Traffic Flow Analysis

Capacity Analysis

Capacity analysis was conducted using Synchro software with results reported using the *Highway Capacity Manual* methodology for the Existing and Proposed conditions during the AM and PM peak hours. Existing represents the current conditions and Proposed represents the current volumes under stop control, or with proposed improvements.

Analysis results for the for the AM and PM peak hours are illustrated in **Tables 1-10**. Output from Synchro is provided in **Appendix D.**

As outlined in the *State Highway Access Management Manual,* the goals for the traffic analysis are a minimum Level of Service (LOS) of D for the overall intersection and LOS D for each individual movement during the peak hour. As shown in Tables 1-10, all of the study intersections currently meet operational goals under existing conditions with the following exceptions:

- Intersection 37: East Market Street & North Road
  - Northbound a.m. Peak: LOS F
  - Northbound p.m. Peak: LOS E
  - Southbound p.m. Peak: LOS E

As shown in Tables 1-10, all of the study intersections are expected to continue to meet operational goals under the proposed conditions with the following exceptions:

- Intersection 36: East Market Street & Country Club Drive
  - Southbound a.m. Peak: LOS E
  - Southbound p.m. Peak: LOS E

Intersection 36 does not currently meet traffic signal warrants and was identified as an intersection for signal removal. LOS E is common on minor streets with major thoroughfares and it is not recommended to retain this signal based on capacity.

Under the proposed conditions, the following improvements were made in order to meet the operational goal of LOS D or better at Intersection 37: East Market Street & North Road:

- Construct a westbound right-turn lane on East Market Street
- Modify the signal phasing from split phase operation to a traditional eight phase operation with protected-permitted side street left-turns

The County Engineer has obtained Congestion, Mitigation and Air Quality (CMAQ) funding to construct these improvements The project is currently in the design phase.

Table 1: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 1-6)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
1. Parkman Road NW & Leavitt Road NW (Signal Retained)				
Eastbound	B / 13.7	B / 12.2	B / 14.6	B / 13.0
Westbound	B / 14.1	B / 12.5	B / 15.0	B / 13.2
Northbound	B / 11.3	B / 12.6	B / 12.2	B / 13.7
Southbound	B / 11.6	B / 13.0	B / 12.2	B / 13.7
Overall	B / 13.1	B / 12.5	B / 13.9	B / 13.3
2. Parkman Road NW & Tod Avenue / Lovers Lane (Signal Retained)				
Eastbound	B / 17.1	B / 14.9	C / 24.3	C / 21.6
Westbound	A / 2.8	B / 11.6	A / 9.9	B / 16.7
Northbound	B / 14.1	B / 13.3	C / 21.4	C / 21.4
Southbound	B / 13.0	B / 12.3	C / 21.2	C / 21.2
Overall	B / 11.5	B / 13.3	B / 18.7	B / 19.8
3. Parkman Road NW & Southern Boulevard (Signal Removed)				
Eastbound	A / 3.6	--	A / 2.1	--
Westbound	B / 11.1	[A / 7.9]	A / 9.9	[A / 8.6]
Northbound (Stop)	B / 12.1	B / 11.2	B / 14.6	B / 14.6
Overall	A / 7.3	A / 1.3	A / 6.3	A / 1.4
4. Parkman Road NW & Coit Avenue (Signal Removed)				
Eastbound	A / 8.6	[A / 7.8]	B / 10.7	[A / 8.3]
Westbound	B / 18.6	[A / 7.8]	C / 23.6	[A / 8.2]
Northbound (Stop)	B / 14.8	B / 12.2	B / 13.5	C / 16.2
Southbound (Stop)	B / 16.1	B / 11.1	B / 14.7	B / 14.2
Overall	B / 13.6	A / 2.1	B / 16.3	A / 2.1
5. Parkman Road NW & Denison Drive NW / Northwest Boulevard NW (Signal Retained)				
Eastbound	B / 10.4	B / 12.6	B / 14.9	C / 22.4
Westbound	A / 9.9	B / 12.0	B / 15.3	C / 21.1
Northbound (Stop)	B / 15.5	B / 13.2	C / 26.5	C / 21.6
Southbound (Stop)	B / 14.4	B / 12.3	C / 24.0	C / 20.1
Overall	B / 11.2	B / 12.5	B / 16.4	C / 21.7
6. Parkman Road NW & Drexel Avenue (Signal Removed)				
Eastbound	B / 10.9	[A / 7.8]	A / 9.5	[A / 8.4]
Westbound	A / 10.0	--	A / 9.8	--
Southbound (Stop)	B / 14.1	B / 11.4	B / 17.5	B / 14.0
Overall	B / 10.6	A / 0.6	B / 10.1	A / 0.9

Table 2: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 6-12)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
7. Parkman Road NW & Summit Street NW (Signal Retained)				
Eastbound	B / 14.0	B / 14.0	B / 13.1	B / 14.8
Westbound	C / 24.1	C / 24.1	C / 30.3	D / 39.2
Northbound	C / 21.3	C / 21.3	C / 24.5	C / 233 3
Southbound	C / 23.7	C / 23.7	D / 42.3	C / 34.9
Overall	B / 18.8	B / 18.8	C / 26.0	C / 27.3
8. Summit Street NW & Tod Avenue NW (Signal Retained)				
Eastbound	C / 28.8	C / 23.4	C / 31.8	C / 28.0
Westbound	B / 15.5	B / 14.7	C / 14.6	B / 16.9
Northbound	C / 21.7	C / 23.0	C / 25.8	C / 27.8
Southbound	B / 11.1	B/ 11.7	B / 12.0	B / 13.0
Overall	B / 19.5	B / 18.2	C / 20.0	C / 20.8
9. Summit Street NW & Mahoning Avenue NW (Signal Retained)				
Eastbound	B / 10.9	B / 10.7	B / 11.5	B / 12.4
Westbound	C / 23.1	C / 24.7	C / 23.7	C / 23.7
Northbound	B / 12.4	B / 12.0	B / 19.4	B / 18.2
Southbound	D / 37.6	C / 24.4	C / 30.9	C / 24.3
Overall	C / 22.0	B / 17.5	C / 20.4	B / 18.9
10. Mahoning Avenue NW & Hall Street NW (Signal Removed)				
Eastbound (Stop)	B / 13.9	B / 14.3	B / 16.9	C / 18.4
Westbound (Stop)	B / 14.0	B / 12.4	C / 17.6	C / 16.4
Northbound	A / 0.9	[A / 8.1]	C / 18.9	[A / 8.1]
Southbound	B / 10 4	[A / 7.8]	A / 8.7	[A / 8.6]
Overall	A / 7.2	A / 0.8	B / 14.5	A / 1.3
11. Tod Avenue & Dunstan Drive NW / Bridge Road (Signal Retained)				
Eastbound	B / 13.5	B / 11.8	A / 6.2	B / 10.8
Westbound	B / 13.8	B / 12.1	A / 9.1	B / 16.4
Northbound	A / 10.0	B / 11.5	C / 25.7	B / 16.1
Southbound	A / 9.2	B / 10.5	C / 20.9	B / 14.0
Overall	B / 12.2	B / 11.6	B / 13.4	B / 15.0
12. West Market Street & Southern Boulevard (Signal Removed)				
Eastbound	B / 12.1	[A / 7.6]	B / 11.5	[A / 8.3]
Westbound	B / 11 9	--	B / 13.6	--
Southbound (Stop)	B / 11.4	B / 10.8	B / 14.1	B / 12 9
Overall	B / 11 9	A / 1.9	B / 13.0	A / 2.7

Table 3: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 13-18)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
13. West Market Street & Nevada Avenue (Signal Removed)				
Eastbound	B / 18.5	[A / 7.6]	B / 19.2	[A / 8.1]
Westbound	B / 12.6	[A / 7.8]	B / 12.9	[A / 8.2]
Northbound (Stop)	C / 23.8	B / 10.2	C / 30.1	B / 12.8
Southbound (Stop)	C / 21.0	B / 11.3	C / 23.7	C / 15.8
Overall	B / 16.6	A / 1.3	B / 17.3	A / 2.0
14. West Market Street & Austin Avenue (Signal Retained)				
Eastbound	B / 17.3	B / 11.9	B / 16.3	B / 12.5
Westbound	B / 10.7	B / 11.3	A / 9.7	B / 13.1
Northbound	B / 12.6	B / 12.0	B / 16.8	B / 13.2
Southbound	B / 12.1	B / 11.5	B / 15.7	B / 12.4
Overall	B / 14.4	B / 11.7	B / 13.1	B / 12.8
15. West Market Street & Parkman Road (Signal Retained)				
Eastbound	A / 5.3	A / 4.5	A / 2.8	A / 3.5
Westbound	B / 13.4	B / 12.6	B / 13.4	B / 14.2
Northbound	B / 10.8	B / 11.4	B / 14.6	B / 13.9
Southbound	B / 11.2	B / 11.8	B / 14.9	B / 14.1
Overall	A / 9.6	A / 9.2	B / 10.7	B / 11.0
16. West Market Street & Tod Avenue (Signal Retained)				
Eastbound	C / 23.7	C / 23.7	C / 20.5	C / 24.5
Westbound	B / 12.7	B / 12.7	B / 14.8	B / 16.8
Northbound	C / 23.8	C / 23.8	C / 28.8	C / 23.0
Southbound	C / 21.0	C / 21.0	C / 26.8	C / 22.5
Overall	B / 19.8	B / 19.8	C / 20.9	C / 21.0
17. West Market Street & West Market Street / Highland Avenue (Signal Retained)				
Eastbound	B / 12.9	B / 14.1	B / 13.5	B / 16.8
Westbound	C / 20.1	C / 20.1	C / 20.7	C / 25.0
Northbound	B / 18.9	B / 17.2	C / 24.3	B / 19.3
Southbound	C / 22.7	C / 20.1	D / 47.7	C / 25.9
Overall	B / 16.5	B/ 16.7	C / 22.5	C / 21.3
18. South Street & Main Avenue (Signal Retained)				
Eastbound	C / 25.0	C / 21.1	C / 24.6	C / 23.9
Westbound	B / 19.2	B / 14.1	B / 19.9	A / 9.1
Northbound	B / 19.7	B / 19.7	C / 22.8	C / 22.8
Southbound	B / 19.3	B / 19.3	C / 23.5	C / 23.5
Overall	C / 21.5	B / 18.3	C / 22.4	B / 18.2

Table 4: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 19-24)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
19. South Street & Park Avenue (Signal Removed)				
Eastbound	C / 22.3	[A / 8.3]	C / 22.2	[A / 9.2]
Westbound	C / 22.1	[A / 8.4]	A / 26.4	[A / 8.8]
Northbound (Stop)	B / 19.6	C / 19.9	C / 21.4	D / 27.6
Southbound (Stop)	C / 20.2	C / 16.9	C / 22.8	D / 33.6
Overall	C / 22.1	A / 1.5	B / 14.3	A / 3.2
20. South Street & Pine Avenue (Signal Retained)				
Eastbound	C / 25.4	B / 17.7	A / 7.4	C / 22.0
Westbound	C / 25.2	B / 17.3	C / 25.2	C / 22.5
Northbound	B / 13.4	B / 15.2	B / 18.1	B / 19.2
Southbound	B / 16.3	B / 17.5	C / 21.1	C / 21.3
Overall	C / 23.9	B / 17.3	B / 17.3	C / 21.9
21. South Street & Elm Road (Signal Retained)				
Eastbound	A / 0.7	B / 12.9	A / 1.3	A / 5.8
Westbound	A / 6.6	B / 13.3	A / 6.8	B / 14.4
Southbound	C / 20.8	B / 13.1	C / 26.9	B / 15.0
Overall	A / 5.9	B / 12.7	A / 7.6	B / 10.8
22. South Street & Chestnut Avenue / Niles Road (Signal Retained)				
Eastbound	C / 27.8	C / 25.5	B / 18.6	C / 29.3
Westbound	B / 18.4	B / 16.5	B / 15.4	B / 18.0
Northbound	C / 23.0	C / 24.6	D / 54.3	C / 29.4
Southbound	C / 23.9	C / 25.5	C / 27.7	C / 29.8
Overall	C / 24.1	C / 23.1	C / 25.3	C / 26.3
23. Youngstown Road & Laird Avenue (Signal Retained)				
Eastbound	B / 17.3	B / 17.3	C / 21.0	C / 21.0
Westbound	C / 25.7	C / 21.6	C / 23.2	C / 24.5
Northbound	B / 18.0	C / 22.4	C / 25.1	C / 23.5
Southbound	B / 17.8	C / 21.0	C / 23.6	C / 22.2
Overall	B / 18.6	C / 21.2	C / 24.1.	C / 23.0
24. Youngtown Road & Central Parkway (Signal Retained)				
Eastbound	C / 20.3	C / 20.4	B / 19.8	C / 24.1
Westbound	C / 21.2	B / 18.8	B / 19.9	B / 17.9
Northbound	C / 20.4	C / 20.4	C / 23.6	C / 23.6
Southbound	C / 20.9	C / 20.9	C / 24.7	C / 24.7
Overall	C / 20.8	B / 19.8	C / 20.8	C / 21.5

Table 5: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 25-30)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
25. Youngstown Road & Ridge Avenue (Signal Retained)				
Eastbound	B / 19.4	B / 15.6	C / 21.0	B / 18.3
Westbound	B / 12.5	A/ 8.5	B / 11.1	A / 8.6
Northbound	B / 11.7	B / 15.9	B / 15.8	B / 18.9
Overall	B / 16.0	B / 12.6	B / 16.8	B / 14.6
26. West Market Street & Main Avenue / Mahoning Avenue (Signal Retained)				
Eastbound	A / 6.8	B / 11.9	A / 7.1	B / 14.3
Westbound	A / 6.7	B / 11.7	A / 7.2	B / 14.4
Northbound	C / 20.5	B / 12.5	C / 27.3	B / 14.1
Southbound	B / 19.4	B / 12.0	C / 24.4	B / 13.4
Overall	B / 12.0	B / 12.0	B / 14.9	B / 14.1
27. West Market Street & S Park Avenue / N Park Avenue (Signal Retained)				
Eastbound	B / 18.5	B / 14.8	C / 21.7	B / 15.4
Westbound	B / 13.1	A / 8.9	B / 15.1	B / 11.9
Northbound	A / 9.8	B / 13.9	B / 10.5	B / 13.2
Southbound	B / 10.0	B / 14.2	B / 10.7	B / 13.5
Overall	B / 14.5	B / 12.5	B / 16.5	B / 13.7
28. East Market Street & Pine Avenue (Signal Retained)				
Eastbound	A / 4.3	A / 3.5	A / 3.4	A / 4.2
Westbound	B / 12.2	B / 11.4	B / 11.9	B / 12.6
Northbound	B / 11.0	B / 11.7	B / 13.3	B / 12.6
Southbound	B / 10.9	B / 11.5	B / 12.8	B / 12.2
Overall	A / 8.7	A / 8.1	A / 8.3	A / 8.8
29. East Market Street & Elm Road (Signal Retained)				
Eastbound	B / 10.6	B / 12.0	A / 1.3	A / 5.9
Westbound	A / 9.9	B / 11.2	A / 8.9	B / 12.7
Northbound	B / 13.3	B / 11.7	B / 19.5	B / 13.6
Southbound	B / 13.8	B / 12.2	B / 17.7	B / 12.5
Overall	B / 12.5	B / 11.9	B / 13.2	B / 11.3
30. East Market Street & Chestnut Avenue (Signal Retained)				
Eastbound	C / 27.1	C / 22.6	C / 33.5	C / 27.3
Westbound	C / 33.1	C / 27.1	C / 34.0	C / 29.9
Northbound	C / 25.1	C / 26.5	C / 30.7	C / 30.8
Southbound	C / 20.4	C / 21.6	C / 24.1	C / 24.9
Overall	C / 28.6	C / 25.0	C / 31.6	C / 28.1

Table 6: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 31-36)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
31 .East Market Street & Laird Avenue (Signal Retained)				
Eastbound	B / 14.3	B / 10.7	C / 20.3	B / 18.2
Westbound	B / 10.8	B / 13.4	B / 11.9	A / 9.8
Northbound	B / 14.8	B / 12.4	B / 14.9	B / 17.5
Southbound	B / 15.0	B / 12.7	B / 15.4	B / 18.0
Overall	B / 12.6	B / 12.6	B / 16.3	B / 15.3
32. East Market Street & Genesee Avenue (Signal Retained)				
Eastbound	B / 16.2	B / 16.2	C / 21.9	C / 21.9
Westbound	B / 12.0	B / 12.0	C / 10.3	B / 10.3
Southbound	B / 17.0	B / 17.0	C / 21.0	C / 21.0
Overall	B / 14.0	B / 14.0	B / 17.8	B / 17.8
33.East Market Street & Belvedere Avenue (Signal Removed)				
Eastbound	A / 7.4	[A / 9.7]	A / 8.3	[A / 8.8]
Westbound	B / 19.4	[A / 8.7]	B / 14.1	[B / 10.4]
Northbound (stop)	C / 20.4	C / 22.0	C / 22.8	D / 31.2
Southbound (stop)	C / 21.3	D / 32.8	C / 23.1	D / 27.2
Overall	B / 14.7	A / 1.1	B / 10.7	A / 0.8
34. East Market Street & Perkinswood Boulevard (Signal Retained)				
Eastbound	A / 1.3	A / 8.9	A / 3.0	A / 6.1
Westbound	B / 11.2	B / 14.1	B / 10.8	B / 13.1
Northbound	B / 15.5	B / 13.1	B / 15.7	B / 13.4
Southbound	B / 15.9	B / 13.4	B / 16.0	B / 13.6
Overall	A / 8.4	B / 12.2	A / 7.3	A / 9.4
35. East Market Street & Eastland Avenue (Signal Retained)				
Eastbound	A / 0.9	A / 2.2	A / 3.4	A / 5.5
Westbound	B / 10.1	B / 15.7	B / 13.1	B / 15.1
Northbound	C / 20.9	B / 15.4	B / 18.4	B / 16.3
Overall	A / 7.4	B / 10.6	A / 8.7	B / 10.3
36. East Market Street & Country Club Drive (Signal Removed)				
Eastbound	A / 8.9	[B / 10.3]	A / 7.2	[A / 9.5]
Westbound	B / 10.7	[A / 9.2]	A / 9.3	[B / 11.2]
Northbound	B / 15.6	C / 22.1	B / 17.3	D / 27.8
Southbound	B / 15.7	E / 36.1	B / 17.2	E / 40.0
Overall	B / 10.1	A / 0.9	A / 8.2	A / 0.9

Table 7: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 37-42)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
37. East Market Street & North Road (Signal Retained)				
Eastbound	B / 14.0	D / 35.6	C / 22.0	D / 41.8
Westbound	D / 49.7	D / 36.0	D / 48.8	C / 29.6
Northbound	F / 88.8	C / 33.4	E / 55.4	D / 40.1
Southbound	D / 54.3	D / 38.5	E / 65.4	D / 41.8
Overall	D / 50.2	D / 35.7	D / 43.9	D / 37.4
38. High Street & Mahoning Avenue (Signal Retained)				
Westbound	B / 14.5	B / 13.3	B / 17.9	B / 15.7
Northbound	C / 21.1	B / 15.6	C / 23.0	B / 17.8
Southbound	A / 7.0	A / 8.1	A / 6.7	A / 7.7
Overall	B / 12.3	B / 11.1	B / 14.5	B / 12.8
40. High Street & N Park Avenue (Signal Retained)				
Eastbound	B / 18.3	B / 18.3	B / 17.4	B / 17.4
Westbound	B / 18.1	B / 18.1	B / 18.2	B / 18.2
Northbound	B / 15.1	B / 15.1	B / 16.2	B / 16.2
Southbound	A / 6.1	A / 6.1	A / 2.2	A / 2.2
Overall	B / 14.0	B / 14.0	B / 12.8	B / 12.8
41. High Street & Elm Road (Signal Retained)				
Eastbound	A / 8.7	B / 14.7	B / 12.9	B / 13.6
Westbound	A / 8.5	B / 14.5	B / 11.6	B / 12.2
Northbound	B / 15.2	A / 8.4	B / 14.0	B / 13.3
Southbound	C / 20.4	B / 14.5	B / 15.0	B / 14.2
Overall	B / 15.8	B / 12.6	B / 13.9	B / 13.6
42. N Park Avenue & Washington Street (Signal Removed)				
Eastbound (Stop)	B / 11.0	B / 12.1	B / 11.4	C / 15.6
Westbound (Stop)	B / 11.6	B / 11.9	B / 12.2	B / 13.6
Northbound	A / 9.7	[A / 7.6]	B / 10.4	[A / 7.7]
Southbound	A / 10.0	[A / 7.6]	B / 10.2	[A / 7.9]
Overall	B / 10.5	A / 5.3	B / 10.9	A / 5.5

Table 8: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 43-48)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
43. N Park Avenue & Atlantic Street (Signal Retained)				
Eastbound (Stop)	B / 10.9	B / 10.9	B / 12.0	B / 12.0
Westbound (Stop)	B / 11.1	B / 11.1	B / 12.0	B / 12.0
Northbound	B / 11.1	B / 11.1	B /12.1	B / 12.1
Southbound	B / 11.8	B / 11.8	B / 12.1	B / 12.1
Overall	B / 11.3	B / 11.3	B / 12.1	B / 12.1
44. N Park Avenue & Dana Street (Signal Removed)				
Westbound (Stop)	B / 16.0	B / 10.0	B / 16.6	B / 13.2
Northbound	C / 22.0	--	C / 26.2	--
Southbound	A / 6.3	[A / 7.6]	A / 6.6	[A / 8.0]
Overall	B / 12.7	A / 0.2	B / 16.7	A / 0.7
45. Woodland Street & Elm Road (Signal Retained)				
Eastbound	C / 21.4	C / 21.4	C / 22.7	C / 22.7
Westbound	C / 21.1	C / 21.1	C / 24.9	C / 21.8
Northbound	B / 19.4	B / 19.4	B / 19.5	C / 22.2
Southbound	C / 20.5	C / 20.5	B /18.5	C / 20.7
Overall	C / 20.4	C / 20.4	C / 20.3	C / 21.7
46. Woodland Street & Laird Avenue (Signal Removed)				
Eastbound	B / 10.5	[A / 7.5]	B / 12.4	[A / 7.4]
Westbound	B / 11.8	[A / 7.4]	B / 11.6	[A / 7.5]
Northbound (Stop)	B / 12.5	B / 13.4	B / 12.8	B / 12.9
Southbound (Stop)	B / 13.2	B / 14.5	B / 12.7	B / 13.2
Overall	B / 12.4	A / 9.2	B / 12.5	A / 8.0
47. Woodland Street & Genesee Avenue (Signal Removed)				
Eastbound (Stop)	B / 10.2	B / 12.2	B / 10.4	C / 17.8
Westbound (Stop)	B / 10.0	B / 12.0	B / 10.1	B / 13.8
Northbound	B / 12.6	[A / 7.7]	B / 15.2	[A / 7.9]
Southbound	B / 13.9	[A / 7.5]	B / 17.3	[A / 7.6]
Overall	B / 11.3	A / 4.4	B / 14.3	A / 5.9
48. Atlantic Street & Paige Avenue (Signal Removed)				
Eastbound	A / 9.7	[A / 7.7]	A / 8.6	[A / 7.8]
Westbound	A / 1.4	[A / 7.8]	B / 16.3	[A / 8.0]
Northbound (Stop)	B / 13.4	B / 12.3	B / 18.3	B / 13.5
Southbound (Stop)	B / 13.6	B / 12.7	B / 18.4	B / 14.1
Overall	A / 6.7	A / 1.6	B / 12.9	A / 1.7

Table 9: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 49-54)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
49. Atlantic Street & Elm Road (Signal Retained)				
Eastbound	B / 19.2	B / 15.7	A / 4.8	B / 13.7
Westbound	B / 14.9	B / 16.7	B / 14.5	B / 15.3
Northbound	B / 18.2	B / 16.8	B / 14.4	B / 14.5
Southbound	B / 10.8	A / 9.5	A / 4.6	B / 14.1
Overall	B / 16.2	B / 15.2	B / 10.1	B / 14.5
50. Atlantic Street & Laird Avenue (Signal Removed)				
Eastbound	A / 2.9	[A / 7.7]	B / 18.8	[A / 7.5]
Westbound	B / 10.8	[A / 7.7]	B / 11.4	[A / 7.6]
Northbound (Stop)	B / 12.7	B / 14.4	B / 14.7	B / 13.4
Southbound (Stop)	B / 13.0	B / 14.6	B / 14.0	B / 12.8
Overall	A / 8.5	A / 4.2	B / 15.1	A / 5.4
51. Atlantic Street & Genesee Avenue (Signal Retained)				
Eastbound	B / 18.9	B / 12.5	B / 11.8	B / 13.3
Westbound	B / 14.5	B / 13.4	B / 13.5	B / 15.3
Northbound	B / 16.9	B / 12.3	C / 23.0	B / 14.7
Southbound	B / 12.4	B / 12.9	B / 18.4	B / 15.9
Overall	B / 15.4	B / 12.9	B / 17.2	B / 15.0
52. Atlantic Street & North Road (Signal Retained)				
Eastbound	B / 13.1	B / 14.1	B / 14.4	B / 16.6
Northbound	B / 15.7	B / 14.5	B / 17.2	B / 14.3
Southbound	B / 14.1	B / 13.0	B / 15.3	B / 12.8
Overall	B / 14.7	B / 13.9	B / 16.1	B / 14.1
53. Elm Road & Dana Street / Edgewood Street (Signal Removed)				
Eastbound (Stop)	B / 12.9	C / 17.0	B / 14.5	D / 29.7
Westbound (Stop)	B / 12.7	C / 15.4	B / 13.9	D / 29.3
Northbound	B / 14.9	[A / 8.6]	A / 9.3	[A / 8.7]
Southbound	B / 10.7	[A / 7.8]	B / 12.5	[A / 8.9]
Overall	B / 12.2	A / 1.2	B / 11.1	A / 2.4
54. Elm Road & Larchmont Avenue (Signal Retained)				
Eastbound	D / 38.5	C / 34.3	D / 38.9	C / 23.0
Northbound	A / 1.9	A / 2.3	A / 1.6	A / 2.4
Southbound	C / 32.9	D / 35.1	B / 17.9	C / 24.7
Overall	C / 22.5	C / 23.1	B / 12.9	B / 13.5

Table 10: Weekday AM and PM Peak Hour Traffic Analysis Results (Intersections 55-61)				
Movement	Existing 2019 AM Peak Hour LOS/Delay	Proposed 2019 AM Peak Hour LOS/Delay	Existing 2019 PM Peak Hour LOS/Delay	Proposed 2019 PM Peak Hour LOS/Delay
55. Elm Road & Gretchen Drive (Signal Retained)				
Westbound	B / 10.1	B / 10.1	B /11.9	B / 12.9
Northbound	A / 9.7	A / 9.7	B /13.3	B/ 11.8
Southbound	B / 11.3	B / 11.3	A / 9.6	A / 8.7
Overall	B / 10.7	B / 10.7	B / 11.7	B / 10.6
56. Reeves Road & North Road (Signal Retained)				
Eastbound	B / 17.3	B / 13.7	B / 17.3	B / 15.1
Westbound	B / 13.0	B / 10.9	B / 13.0	B / 11.6
Northbound	B / 13.3	B / 13.8	B / 13.3	B / 16.5
Southbound	B / 10.7	B / 11.0	B / 10.7	B / 12.6
Overall	B / 13.1	B / 12.9	B / 13.1	B / 14.8
57. Tod Avenue & Palmyra Road (Signal Retained)				
Eastbound (Stop)	B / 13.0	B / 13.0	B / 15.9	B / 14.3
Northbound	B / 11.6	B / 11.6	B / 12.5	B / 14.0
Southbound	B / 11.8	B / 11.8	B / 12.8	B / 14.3
Overall	B / 11.9	B / 11.9	B / 13.2	B / 14.2
58. Tod Avenue & 5th Street (Signal Retained)				
Eastbound	B / 11.9	B / 11.9	B / 14.4	B / 13.1
Westbound	B / 12.5	B / 12.5	B / 14.8	B / 13.4
Northbound	B / 11.8	B / 11.8	B / 11.4	B / 12.8
Southbound	B / 12.1	B / 12.1	B / 11.8	B / 13.3
Overall	B / 12.0	B / 12.0	B / 12.1	B / 13.1
59. Main Avenue & Fulton Street (Signal Removed)				
Westbound (Stop)	B / 12.6	B / 10.4	B / 12.9	B / 12.8
Northbound	B / 11.1	--	B / 12.9	--
Southbound	B / 10.7	[A / 8.0]	B / 13.0	[A / 8.0]
Overall	B / 11.2	A / 2.6	B / 12.9	A / 3.8
60. Pine Avenue & Industrial Park Driveway (Signal Removed)				
Eastbound (Stop)	B / 13.3	A / 9.1	B / 16.3	A / 9.9
Northbound	A / 9.1	[A / 7.5]	A / 8.1	[A / 7.7]
Southbound	A / 9.0	--	A / 8.2	--
Overall	A / 9.1	A / 0.1	A / 8.2	A / 0.0
61. Youngstown Road & Willard Avenue (Signal Retained)				
Eastbound	A / 9.1	B / 12.5	B / 11.1	B / 13.3
Westbound	A / 9.0	B / 12.3	B / 11.1	B / 13.3
Northbound	B / 15.1	B / 11.7	B / 16.5	B / 14.3
Southbound	B / 15.6	B / 12.1	B / 15.7	B / 13.6
Overall	A / 9.7	B / 12.4	B / 11.7	B / 13.4

South Street Lane-Use Analysis

Based on discussion with the City, the left-turn phasing was evaluated at the intersections of South Street & Main Avenue, South Street & Park Avenue, and South Street & Pine Avenue (Intersections 18, 19, and 20). Currently, these signals have protected-only phasing on South Street because of the offset left-turns. In order to allow protected-permitted phasing, two pavement marking options were developed.

Option 1:

The pavement is currently striped to allow long left-turn lanes in the eastbound and westbound directions. Option 1 shortens the left-turn lanes and shifts the eastbound left-turn lanes into the existing painted medians as shown in the image below.

The distance from stop bar to stop bar between Main Avenue and Park Avenue is approximately 475 feet, and between Park Avenue and Pine Avenue is approximately 350 feet. The South Street left-turn queuing was evaluated to determine if the current storages can be shortened.

To evaluate the queuing, the intersection was analyzed in Synchro/SimTraffic. The following assumptions/methodologies were used:

- SimTraffic was run three times with different number seeds
- Interval parameters from Figure 401-14c of the ODOT L&D Manual, Volume 1 were used
- Queues reported from SimTraffic are the 95th percentile queues

The required storage length for the southbound left-turn lane was also calculated according to the procedures described in Section 400 of the ODOT *Location and Design Manual, Volume 1*. The calculations are summarized in **Table 11**. Also, *SimTraffic* shows that the existing queue lengths are less than the existing storage. Output from SimTraffic is provided in **Appendix E**.

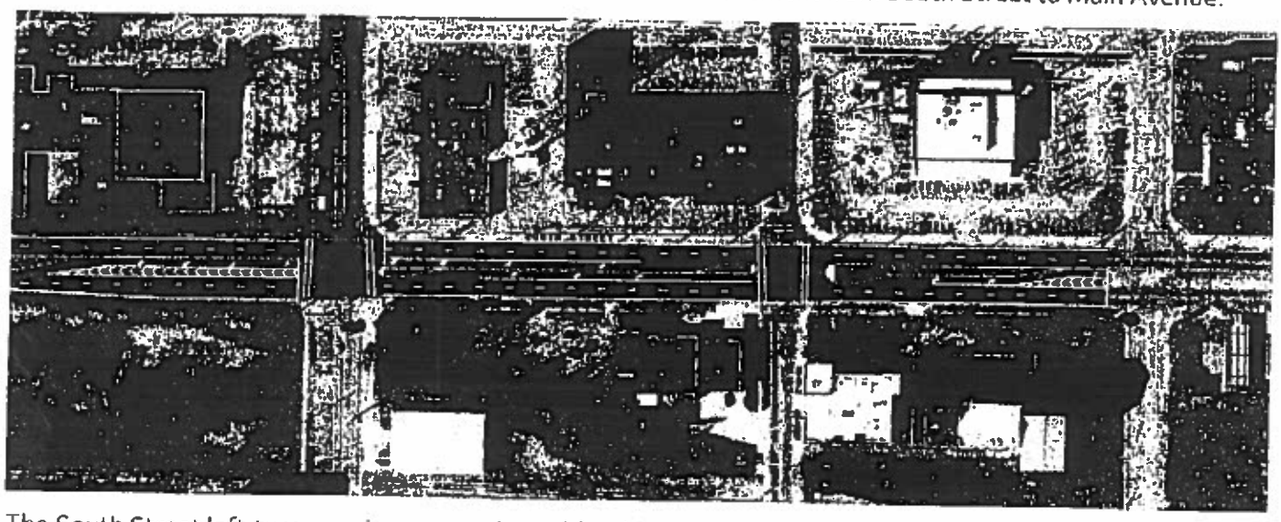
Queueing analysis indicates that the storage lanes can be shorted to the proposed lengths shown in **Table 11** and will fit within the respective 475 and 350 feet of available space.

Table 11: Storage Length Calculations (Option 1)

Intersection/ Turn Lane	AM Peak	PM Peak	Calculated Turn Lane Length (AM)	Calculated Turn Lane Length (PM)	SimTraffic Queue (AM)	SimTraffic Queue (PM)	Existing Turn Lane Length (including taper)	Proposed Turn Lane Length (including 50' taper)
	Left Turn							
Intersection 18: South St & Main Ave	60 Second Cycle							
WBL (Condition A) (25 mph)	58	73	100'	150'	59'	67'	450'	375'
Intersection 19: South St & S Park Ave	Unsignalized							
EBL (Condition A) (25 mph)	16	7	100'	100'	28'	15'	440'	440'
WBL (Condition A) (25 mph)	8	19	100'	100'	15'	30'	325'	275'
Intersection 20: South St & Pine Ave	60 Second Cycle							
EBL (Condition A) (25 mph)	12	15	100'	100'	29'	40'	320'	320'

Option 2:

Alternatively, the westbound left-turn movement at the intersection of South Street & Park Avenue could be prohibited and redirected to Main Avenue. This option would require less pavement marking modification because the existing pavement markings between Main Avenue and Park Avenue would be retained as shown in the image below. During the hours in which traffic count data was collected at this intersection, an average of ten vehicles per hour completed the westbound left-turn movement from South Street to Main Avenue.



The South Street left-turn queuing was evaluated for this option to determine if the existing westbound left-turn storage can accommodate the additional volume from Park Avenue.

Queueing analysis indicates that the existing storage lengths can accommodate the additional volume and this pavement marking plan allows the existing storage lengths to be retained as shown in Table 12. Output from SimTraffic is provided in Appendix E.

Table 12: Storage Length Calculations (Option 2)

Intersection/ Turn Lane	AM Peak	PM Peak	Calculated Turn Lane Length (AM)	Calculated Turn Lane Length (PM)	SimTraffic Queue (AM)	SimTraffic Queue (PM)	Existing Turn Lane Length (including taper)	Proposed Turn Lane Length (including 50' taper)
Intersection 18: South St & Main Ave	60 Second Cycle							
WBL (Condition A) (25 mph)	66	91	100'	150'	71'	71'	450'	450'
Intersection 19: South St & S Park Ave	Unsignalized							
EBL (Condition A) (25 mph)	16	7	100'	100'	26'	27'	440'	440'
Intersection 20: South St & Pine Ave	60 Second Cycle							
EBL (Condition A) (25 mph)	12	15	100'	100'	34'	35'	320'	320'

Capacity Analysis:

Capacity analysis for both options was conducted using permitted-protected left-turn phasing along South Street. Option 1 was further analyzed to with permitted phasing to evaluate the impacts of removing the protected left-turn signal phases. A comparison of Option 1 with protected left-turn phases, Option 2 with protected left-turn phases and Option 1 without protected left-turn phases is shown in **Table 13**. Output from Synchro is provided in **Appendix E**.

Table 13: Capacity Analysis Comparison

Movement	Option 1 AM Peak Hr LOS/Delay	Option 2 AM Peak Hr LOS/Delay	Permitted Phasing AM Peak Hr LOS/Delay	Option 1 PM Peak Hr LOS/Delay	Option 2 PM Peak Hr LOS/Delay	Permitted Phasing PM Peak Hr LOS/Delay
18. South Street & Main Avenue (Signal Retained)						
Eastbound	C / 22.7	C / 22.7	B / 16.3	C / 23.9	C / 23.9	A / 3.2
Westbound	C / 20.1	C / 20.0	B / 13.0	A / 9.1	A / 9.2	B / 16.7
Northbound	B / 19.7	B / 19.7	B / 15.4	C / 22.8	C / 22.8	B / 14.9
Southbound	B / 19.3	B / 19.3	B / 15.2	C / 23.5	C / 23.5	B / 15.2
Overall	C / 20.9	C / 20.9	B / 14.9	B / 18.2	B / 18.1	B / 12.1
19. South Street & Park Avenue (Signal Removed)						
Eastbound	[A / 8.3]	[A / 8.4]	[A / 8.3]	[A / 9.2]	[A / 9.3]	[A / 9.2]
Westbound	[A / 8.4]	--	[A / 8.4]	[A / 8.8]	--	[A / 8.8]
Northbound (Stop)	C / 19.9	C / 19.5	C / 19.9	D / 27.6	D / 26.3	D / 27.6
Southbound (Stop)	C / 16.9	C / 16.6	C / 16.9	D / 33.6	D / 31.4	D / 33.6
Overall	A / 1.5	A / 1.4	A / 1.5	A / 3.2	A / 2.9	A / 3.2
20. South Street & Pine Avenue (Signal Retained)						
Eastbound	C / 20.8	C / 20.8	B / 13.7	C / 23.5	C / 23.5	A / 16.2
Westbound	C / 20.3	C / 20.3	A / 1.9	C / 24.1	C / 24.1	A / 3.0
Northbound	B / 16.0	B / 16.0	B / 14.2	B / 18.1	B / 18.1	B / 14.8
Southbound	B / 17.7	B / 17.7	B / 13.6	C / 21.1	C / 21.1	B / 14.2
Overall	B / 20.0	B / 20.0	A / 8.5	C / 23.2	C / 23.2	A / 9.8

As shown in the table above, both options would operate acceptably and will allow for protected-permitted phasing once the left-turn offsets are mitigated. Option 2 allows for the longest storage lengths, the least amount of restriping, and capacity analysis shows that the westbound left-turn lane has enough excess capacity to absorb the westbound left-turns from Park Avenue.

5. Multi-Way Stop Analysis

Methodology

Multi-way stop control can be useful as a safety measure at intersections if certain traffic conditions exist. In general, the decision to install multi-way stop control should be based on an engineering study following the criteria outlined in Section 2B.07 of the *Ohio Manual of Uniform Traffic Control Devices* (OMUTCD). The criteria for consideration include the following:

A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.
B. A location with five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.
C. Minimum Volumes:
    a. The vehicular volume entering the intersection from the major street approach (total of both approaches) averages as least 300 vehicles per hour for any eight hours of an average day, and
    b. The combined vehicular, pedestrian and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same eight hours, with an average vehicle delay to minor-street traffic of at least 30 seconds per vehicle during the highest hours, but
    c. If the 85th-percentile approach speed on the major-street traffic exceeds 40 mph, the minimum volume warrants are 70 percent of the values listed above.
D. Other criteria that may be considered in the study include: the need to control left-turn conflicts; the need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes; locations where road users, after stopping, cannot see conflicting traffic and are not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and an intersection of two residential collector (through) street of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

The analysis contained in this report evaluates the City's multi-way stop-controlled intersections against the Minimum Volume criteria. We were provided with a map showing a total of 65 multi-way stop-controlled intersections throughout the City, which we used to conduct a preliminary review of each intersection. During this initial site visit we noted that intersection #6 had been converted from a multi-way stop-controlled to two-way stop-controlled. In addition, seven multi-way stop-controlled intersections not on the map were located. This brings the total of multi-way stop-controlled intersections in the City to 71. The analysis will determine which intersections are not warranted based on traffic volumes.

Based on a site visit to each intersection, a list of intersections where road users, after stopping, cannot see conflicting traffic and are not able to negotiate the intersection unless conflicting cross traffic is also required to stop, will be generated.

Volume Analysis

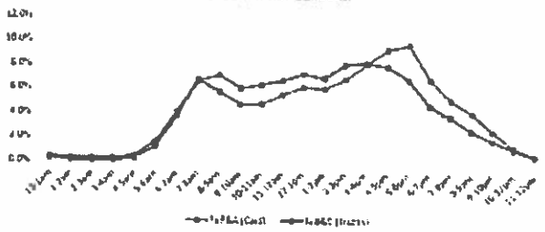
To begin the volume analysis, the upper confidence AADT values were calculated by increasing the StreetLight AADT values by the upper confidence range value provided by the StreetLight analysis. This method provides an AADT value at the upper range of the prediction interval. Using the upper range value provides a conservative approach when performing analyses to show that a multi-way stop is not warranted. Conversely, using the lower range values would provide a conservative approach if the analyses were being completed to show that a multi-way stop is warranted.

Hourly Percent By Vehicle Type
Urban Minor Collector

Hour	Hour of Day	PEA (Cars)	% PEA (Cars)	B&C (Trucks)	% B&C (Trucks)	Total	% Total
0	12-1am	1,059	0.2%	115	0.4%	1,174	0.2%
1	1-2am	520	0.1%	77	0.3%	597	0.1%
2	2-3am	298	0.1%	65	0.2%	363	0.1%
3	3-4am	301	0.1%	62	0.2%	363	0.1%
4	4-5am	1,333	0.3%	133	0.5%	1,466	0.3%
5	5-6am	5,278	1.3%	473	1.6%	5,751	1.2%
6	6-7am	16,379	3.7%	1,207	4.1%	17,586	3.7%
7	7-8am	29,781	6.7%	1,946	6.6%	31,727	6.7%
8	8-9am	25,459	5.8%	2,101	7.1%	27,560	5.8%
9	9-10am	20,908	4.7%	1,784	6.0%	22,692	4.8%
10	10-11am	23,029	4.8%	1,861	6.3%	22,890	4.9%
11	11-12am	24,340	5.5%	1,981	6.7%	26,321	5.6%
12	12-1pm	27,207	6.2%	2,139	7.2%	29,343	6.2%
13	1-2pm	26,606	6.0%	2,036	6.9%	28,642	6.1%
14	2-3pm	30,127	6.8%	2,389	8.1%	32,516	6.9%
15	3-4pm	35,947	8.1%	2,432	8.2%	38,379	8.1%
16	4-5pm	41,147	9.3%	2,347	8.0%	43,494	9.2%
17	5-6pm	42,956	9.7%	2,012	6.8%	44,968	9.5%
18	6-7pm	30,362	6.9%	1,388	4.7%	31,750	6.7%
19	7-8pm	22,737	5.1%	1,116	3.8%	23,853	5.1%
20	8-9pm	18,103	4.1%	784	2.7%	18,987	4.0%
21	9-10pm	11,563	2.6%	549	1.9%	12,112	2.6%
22	10-11pm	5,701	1.3%	347	1.2%	6,048	1.3%
23	11-12pm	2,745	0.6%	179	0.6%	2,924	0.6%
	Total	441,782	100%	29,570	100%	471,307	100%

Sample of 103 permanent ATR's and portable counts taken in 2018

Urban Minor Collector



The upper range AADT values were converted to hourly volumes using ODOT's *Hourly Percent by Vehicle Type* tables for urban local roadways. This table shows that the eight highest hours of traffic volumes occur between 11 AM to 7 PM. The hourly volumes during these hours vary from 6.2 to 9.0 percent of the AADT volumes. The average hourly volume for these eight hours is 7.4 percent of the AADT volume. A table listing the eighth highest hour volume using the 6.2 percent value and the average hourly volume for the highest eight hours of the day using the 7.4 percent value is contained in **Appendix E**. The hourly values calculated using the 7.4 percent factor will be used as it provides a conservative approach when performing analyses to show that a multi-way stop is not warranted.

Minimum Volume Warrant

The average of the eight highest hourly volumes were compared to the 300 vehicle per hour and 200 vehicle per hour thresholds outlined in the OMUTCD. This comparison found that 64 of the City's 71 multi-way stop-controlled intersections do not meet the minimum vehicular volume warrant. The volumes at three additional intersections are close to the threshold values and were recommended for further study. At the City's request, the Trumbull County Engineer's Office conducted 24-hour traffic counts at these intersections. The traffic counts are contained in **Appendix B**. A review of the additional count information confirms that the traffic volumes at each of these intersections are below the multi-way stop warrant threshold volumes and that stop signs should be removed from the major street approaches. Tabled summarizing the results can be found on the following pages.

Sight Distance and Intersection Geometric Review

A field review of each intersection not meeting the minimum vehicular volume warrant was conducted. Based on this field review, the multi-way stop control at eight of the 71 intersections should be retained as a result of sight distance, geometric limitations and other influencing factors such as schools and multi-use trails. The following tables include a column noting the intersections that should remain under multi-way stop control based on the field review.

Intersection Number	Major Street		Minor Street		Volume Thresholds, Streetlight Data			Result of Additional Study	Retain Due to Field Conditions
	Street Name	Average of 8 Highest Hours (7.4% of AADT)	Street Name	Average of 8 Highest Hours (7.4% of AADT)	Below threshold, REMOVE	Below Threshold, Recommend for Additional Study	Retain Due to Volumes		
1	Delaware Avenue SW	59 162	Hamilton Street SW	107					Retain
2	Nevada Avenue SW	197 198	Union Street SW	46 58	Remove				
3	Nevada Avenue SW	198 197	Hamilton Street SW	106 59	Remove				
4	Nevada Avenue SW	190 189	Oak Street SW	189 154	Remove				
5	Palmyra Road SW	365 374	Risher Road	106	Remove				
6	Front Street SW	58 106	Penn Avenue SW	59 58	Currently two-way stop controlled				
7	Hamilton Street SW	59 95	York Avenue SW	59 59	Remove				
8	Jefferson Street SW	66 189	York Avenue SW	59 58	Remove				
9	Oak Street SW	154 191	York Avenue SW	58 80	Remove				
10	Palmyra Road SW	392 390	Austin Avenue SW	118 45	Remove				
11	Lane Drive SW	59 138	Valley Ave SW	107 54	Remove				
12	Beal Street NW	197 198	Midwae Drive NW	186	Remove				
13	Southern Boulevard NW	266 265	Solar Street NW	69	Remove				
14	Northwest Boulevard NW	185 196	Commerce Avenue NW	50 107	Remove				

Intersection Number	Major Street		Minor Street		Volume Thresholds, Streetlight Data			Result of Additional Study	Retain Due to Field Conditions
	Street Name	Average of 8 Highest Hours (7.4% of AADT)	Street Name	Average of 8 Highest Hours (7.4% of AADT)	Below Threshold, REMOVE	Below Threshold, Recommend for Additional Study	Retain Due to Volumes		
15	Southern Boulevard NW	219 265	Linda Drive NW	187 266		Additional Study		Remove	
16	Deal Street NW / Dunstan Drive NW	197 297	Montgomery Avenue NW	120 198			Retain		
17	Northfield Avenue NW	108 185	Norwood Street NW	48 108	Remove				
18	Oakdale Drive NW	108 59	Drexel Avenue NW	132 189	Remove				
19	Norwood Street NW	189 189	Drexel Avenue NW	190 189	Remove				
20	Drexel Avenue NW	189 197	Moncrest Drive NW	184 192					Retain, School
21	Westwood Drive NW	84 197	Monticello Avenue NW	59 189					Retain
22	Moncrest Drive NW	192 184	Monticello Avenue NW	189					Retain
23	Riverview Street NW	106 106	Niblock Avenue NW	45 59	Remove				
24	Ohio Avenue NW	189 189	Ward Street NW	59 59	Remove				
25	Dickey Avenue NW	58 59	Taylor Street NW	48 59	Remove				
26	Dickey Avenue NW	59 59	Ward Street NW	59 59	Remove				
27	Comstock Street NW	266 335	Vernon Avenue NW	107 58	Remove				
28	Federal Street NW	94 78	Arlington Avenue NW	192 189	Remove				
29	Porter Street NE	189 190	Vine Avenue NE	185 197	Remove				
30	Laird Avenue NE	335 334	Edgewood Street NE	190 106			Retain		
31	Edgewood Street NE	106 106	Bonnie Brae Avenue NE	73 185	Remove				
32	Hollywood Street NE	108 119	Kenilworth Avenue NE	162 190	Remove				
33	Edgewood Street NE	106 103	Kenilworth Avenue NE	190 189	Remove				
34	Charles Avenue NE	189 190	High Street NE	55 55					Retain, Trail
35	Willard Avenue NE	189 190	Montclair Street NE	55 190	Remove				
36	Perkinswood Boulevard NE	198 196	Woodland Street NE	185 161	Remove				
37	Butler Road NE	184 185	Foster Drive NE	82 116					Retain
38	Butler Road NE	190 189	Woodland Street NE / Overlook Drive NE	108 108	Remove				
39	Fairway Drive NE	191 108	Butler Road NE	190					Retain
40	Homewood Avenue SE	261 197	South Street SE	198 189		Additional Study		Remove	
41	Kenilworth Avenue SE	184 95	South Street SE	189 116	Remove				
42	Woodbine Avenue SE	162 162	South Street SE	116 106	Remove				
43	Oak Knoll Avenue SE	169 151	Belle Street SE	55 43	Remove				

Intersection Number	Major Street		Minor Street		Volume Thresholds, StreetLight Data			Result of Additional Study	Retain Due to Field Conditions
	Street Name	Average of 8 Highest Hours (7.4% of AADT)	Street Name	Average of 8 Highest Hours (7.4% of AADT)	Below Threshold, REMOVE	Below Threshold, Recommend for Additional Study	Retain Due to Volumes		
44	Adelaide Avenue SE	189 184	Belle Street SE	43 53	Remove				
45	Belvedere Avenue SE	187 162	Grandview Street SE	59 59	Remove				
46	Kenmore Avenue SE	194 185	South Street SE	120 107	Remove				
47	Trumbull Avenue SE	198 196	Catalpa Street SE	58 59	Remove				
48	Meadowbrook Avenue SE	189 197	Catalpa Street SE	59 106	Remove				
49	Eastland Avenue SE	515 336	Catalpa Street SE	106	Remove				
50	Homewood Avenue SE	103 106	Clarence Street SE	69	Remove				
51	Kenilworth Avenue SE	190 162	Clarence Street SE	69 59	Remove				
52	Francis Avenue SE	94 225	Sussex Street SE	189	Remove				
53	Kenmore Avenue SE	184 190	Sussex Street SE	189 184	Remove				
54	Perkinswood Boulevard SE	265 265	Sussex Street SE	185 106		Additional Study		Remove	
55	Hazelwood Avenue SE	190 189	Colonial Street SE	72 82	Remove				
56	Milton Street SE	189 185	Hazelwood Avenue SE	190 162	Remove				
57	Wallace Street SE	48 48	Duke Avenue SE	59 59	Remove				
58	Brier Street SE	48 59	Duke Avenue SE	81 59	Remove				
59	Brier Street SE	69 94	Willard Avenue SE	118 95	Remove				
60	Burton Street SE	189 190	Willard Avenue SE	185 118	Remove				
61	Milton Street SE	189 162	Willard Avenue SE	184 185					Retain, School
62	Meadowbrook Avenue SE	184 189	Surrey Road SE	106 187	Remove				
63	Eastland Avenue SE	266 335	Surrey Road SE	187 185			Retain		
64	Central Parkway Avenue SE	106 295	Perkinswood Boulevard SE / Trumbull Avenue SE	197 197			Retain		
65	Martha Street NE	55 58	Mazda Avenue NE	58 81	Remove				
66	Jackson Street SW	187 80	Nevada Avenue SW	162	Remove				
67	Wick Street SE	42 42	Duke Avenue SE	59 59	Remove				
68	Willard Street SE	199 197	Sussex Street SE	184 189	Remove				
69	Meadowbrook Avenue SE	198 189	Sussex Street SE	73 185	Remove				
70	Eastland Avenue SE	335 335	Sussex Street SE	93	Remove				
71	Brighton Avenue NE	45 59	Martha Street NE	55 45	Remove				
72	Glenwood Street NE	50 95	Mazda Avenue NE	5 6	Remove				

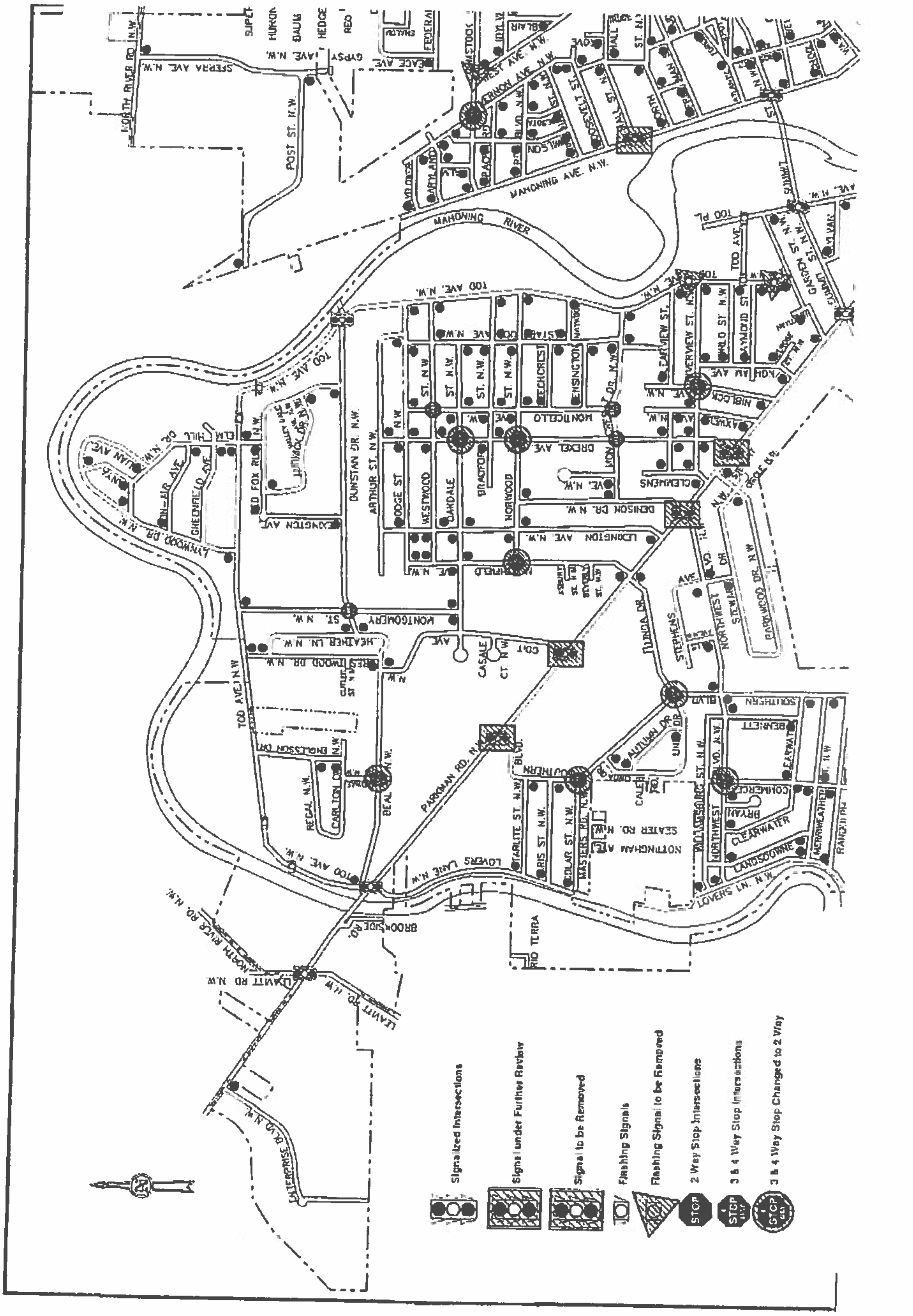
The major street and minor street designations in the previous tables are based on a combination of traffic volumes and roadway profiles.

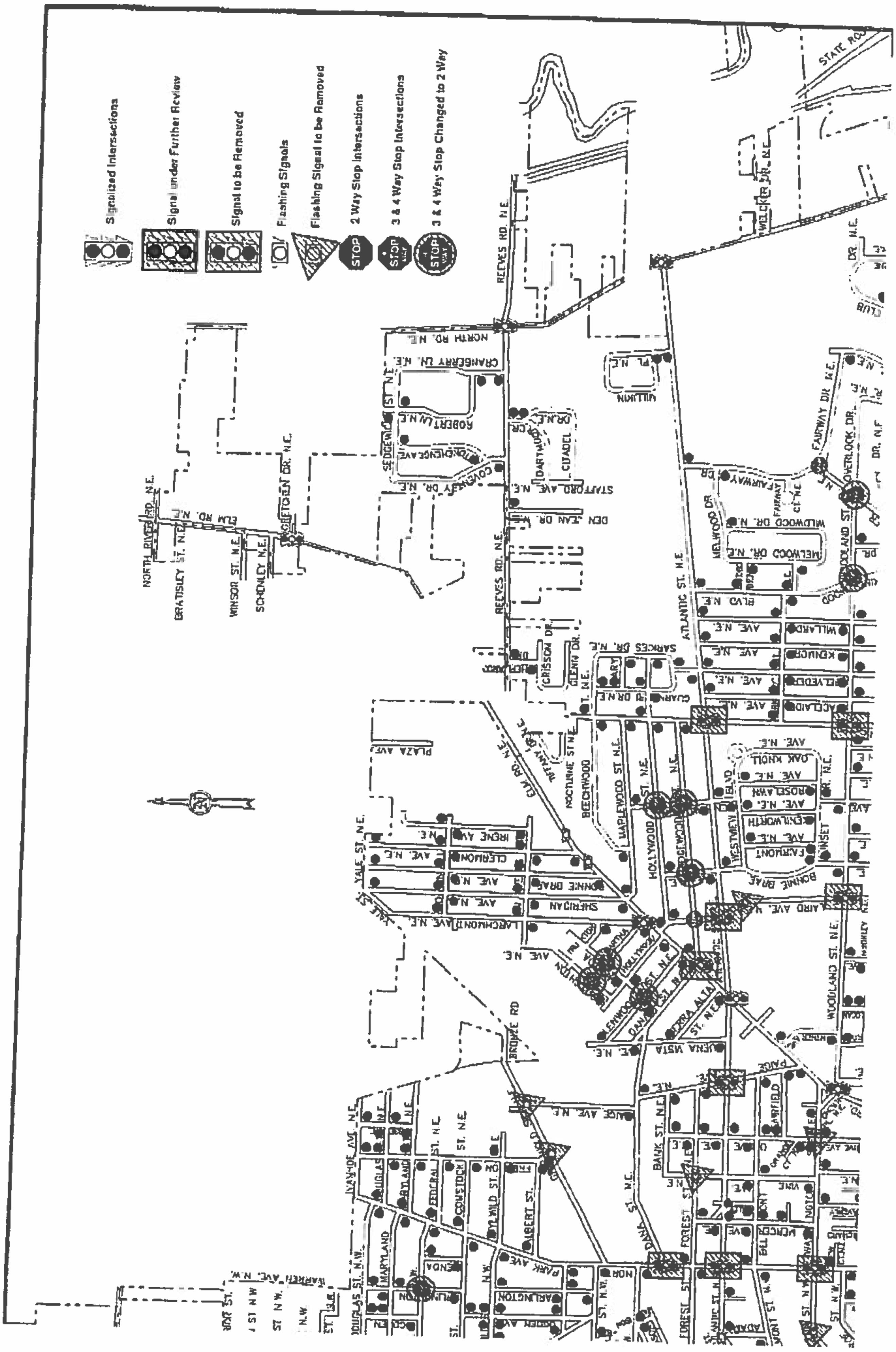
Overhead flashing beacons are currently installed at Intersection 2, Nevada Avenue and Union Street; Intersection 5, Palmyra Road and Risher Road; and at Intersection 10, Palmyra Road and Austin Avenue. With the proposed removal of the multi-way stop control at these three intersections, the all-red flashing beacons should be removed or retrofitted with a yellow lens on the uncontrolled approaches.

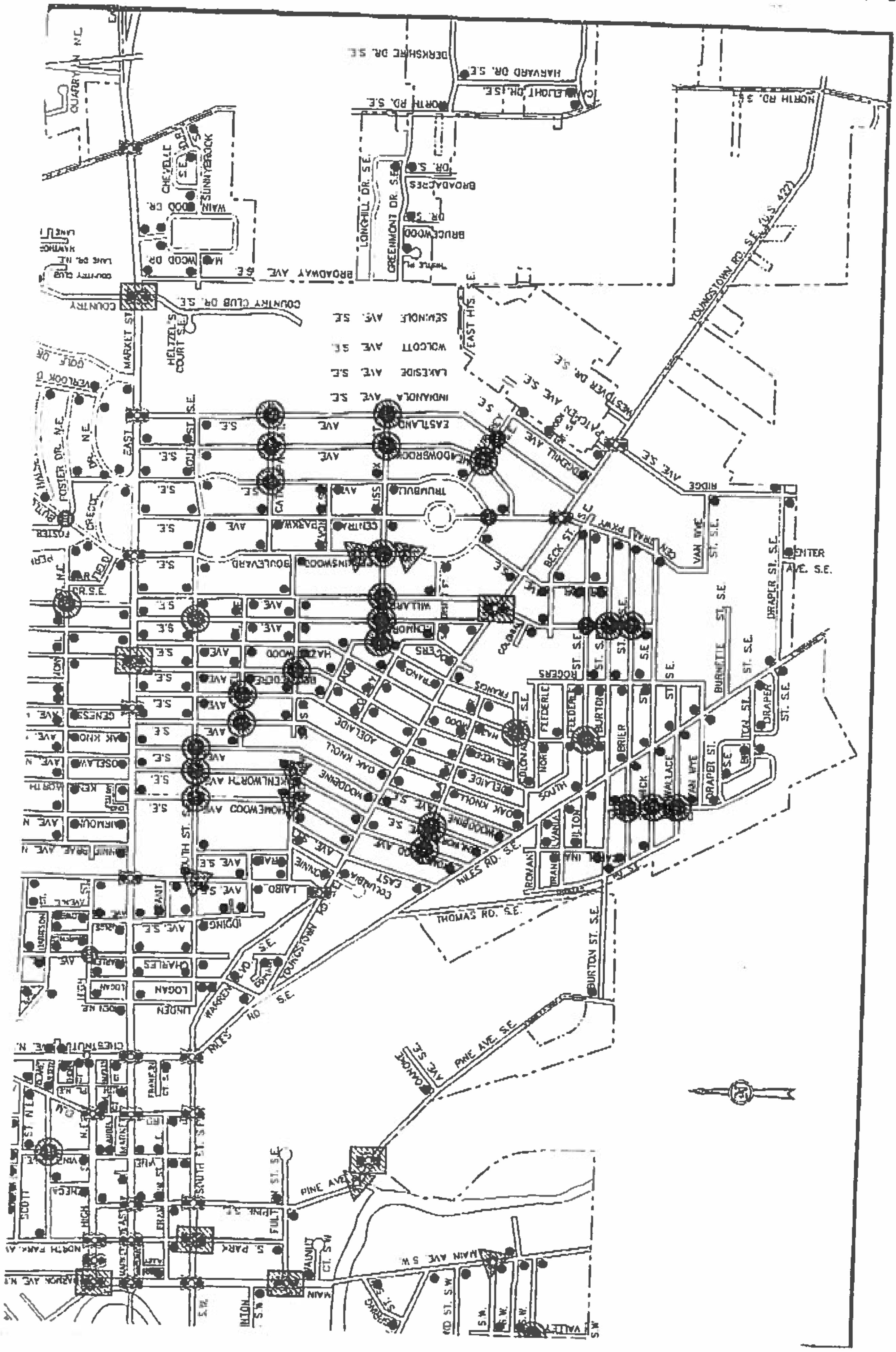
When converting multi-way stop-controlled intersections to two-way stop-controlled intersections any placards indicating "ALL WAY" stop should be removed from beneath the stop signs that are to remain. Furthermore, consideration should be given to installing "CROSS TRAFFIC DOES NOT STOP" signs beneath stop signs that are to remain. This should avoid confusion to motorists who may have become accustomed to the multi-way stop traffic control that had previously been in place at the intersection.

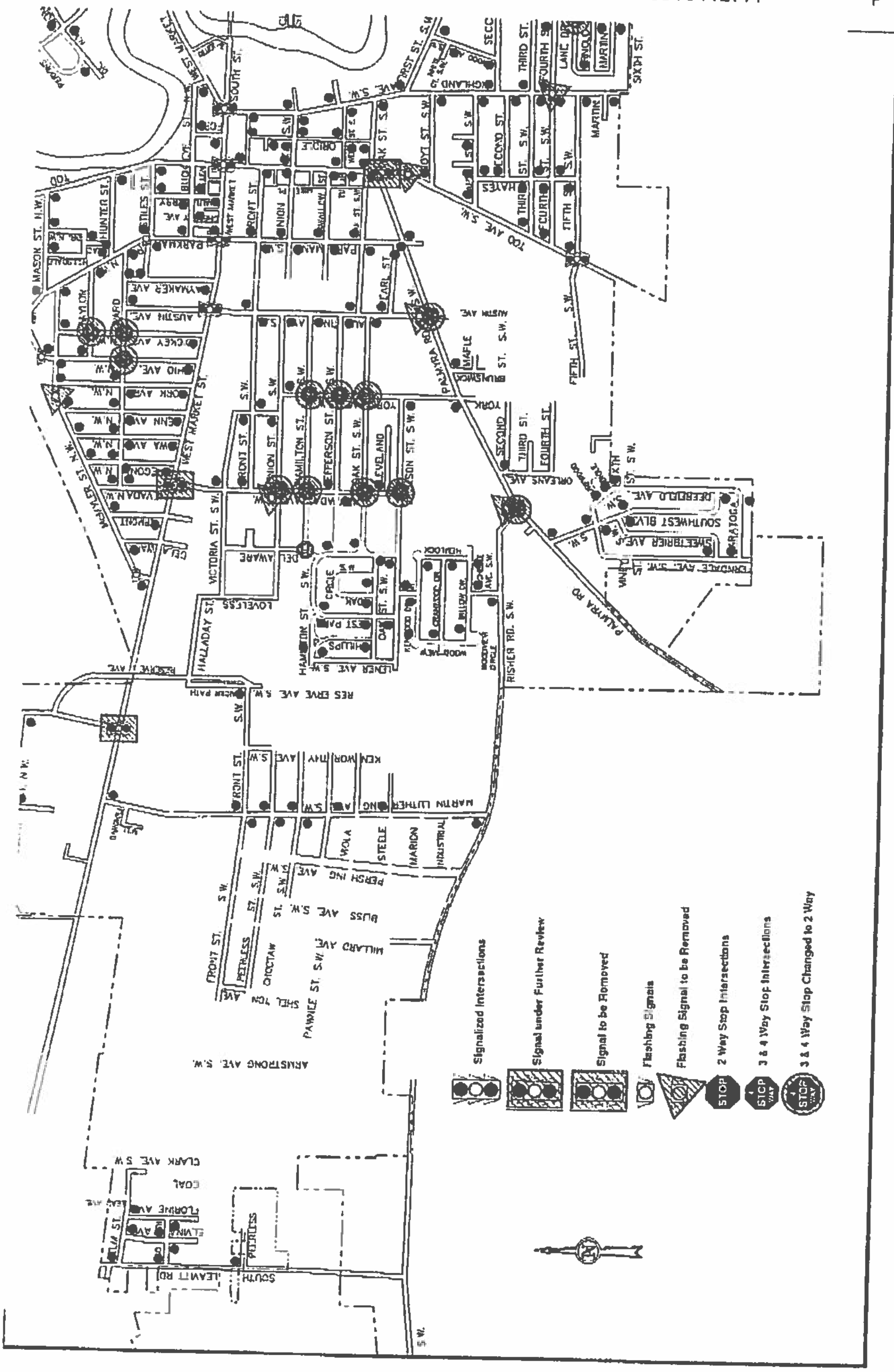
Overhead flashing beacons are typically used where the traffic volumes or physical conditions do not justify a conventional traffic signal, but crash rates indicate the possibility of a special need. There is no specific warrant for the installation of a flashing beacon; the *Manual of Uniform Traffic Control Devices* describes a beacon as a supplement to the regulatory signing at a stop-controlled intersection.

The FHWA's Safety Evaluation of Flashing Beacons at Stop-Controlled Intersections report published in 2008 concluded that flashing beacons at unsignalized intersections can be a cost-effective safety improvement. The report indicates a potential reduction of 4 percent in angle crashes and a 1 percent reduction of injury and fatal crashes when flashing beacons are installed.


Signalized Intersections
Signal under Further Review
Signal to be Removed
Flashing Signals
Flashing Signal to be Removed
2 Way Stop Intersections
3 & 4 Way Stop Intersections
3 & 4 Way Stop Changed to 2 Way
MAHONING RIVER
MAHONING AVE. N.W.
TOD AVE. N.W.
PARKMAN RD. N.W.
LOVERS LANE N.W.
MONTGOMERY ST. N.W.
LEXINGTON AVE. N.W.
DENISON DR. N.W.
DREXEL AVE.
MONTICELLO
CLEMMENS
NIBLOCK
DUNSTAN DR. N.W.
ARTHUR ST. N.W.
WESTWOOD
OAKDALE
BRADFORD
NORWOOD
BEECHCREST
KENSINGTON
HEATHER LN. N.W.
CRESTWOOD DR. N.W.
REGAL N.W.
CARLTON
BEAL N.W.
LINDA DR.
STEPHENS
NORTHWEST
PARKWOOD DR. N.W.
SOUTHERN
BENNETT
FAIRWAY
COMMERCE
BRYAN
CLEARWATER
LANDSDOWNE
MERRIWEATHER
SEATER RD. N.W.
NOTTINGHAM AVE.
AUTUMN DR.
BROOKSIDE RD.
RIO TERRA
NORTH RIVER RD. N.W.
LEAVITT RD. N.W.
ENTERPRISE
POST ST. N.W.
SFERRA AVE. N.W.
GYPSY AVE. N.W.
FAIRVIEW ST.
RIVERVIEW ST.
GARDEN ST. N.W.
SUMMIT


Signalized Intersections
Signal under Further Review
Signal to be Removed
Flashing Signals
Flashing Signal to be Removed
2 Way Stop Intersections
3 & 4 Way Stop Intersections
3 & 4 Way Stop Changed to 2 Way


YOUNGSTOWN RD. S.E. (U.S. 422)
NILES RD. S.E.
THOMAS RD. S.E.
PINE AVE. S.E.
BURTON ST. S.E.
CENTER AVE. S.E.
DRAPER ST. S.E.
MARKET ST.


Signalized Intersections
Signal under Further Review
Signal to be Removed
Flashing Signals
Flashing Signal to be Removed
2 Way Stop Intersections
3 & 4 Way Stop Intersections
3 & 4 Way Stop Changed to 2 Way