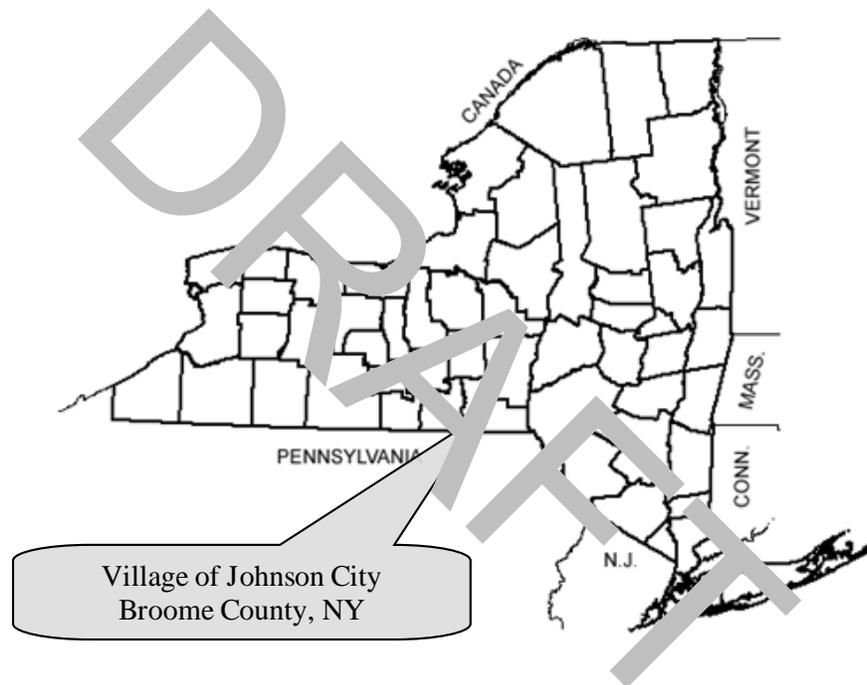


TRAFFIC SIGNAL STUDY

VILLAGE OF JOHNSON CITY
BROOME COUNTY, NY

June 2020



BMTS

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The preparation of this report was funded through grants from the Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA). The views expressed herein are solely those of the Binghamton Metropolitan Transportation Study, and do not represent and official position of the FTA or FHWA.

CONTENTS

INTRODUCTION..... 4
ANALYSIS CRITERIA 4
TRAFFIC CONTROL SIGNAL ROLE AND FUNCTION 4
TRAFFIC CONTROL SIGNAL WARRANTS..... 5
UNWARRANTED TRAFFIC SIGNALS..... 5
TRAFFIC SIGNAL STUDY METHODOLOGY 6
TRAFFIC SIGNAL RECOMMENDATIONS.....6
STUDY CONCLUSION..... 19

APPENDICES

APPENDIX A – VILLAGE OF JOHNSON CITY TRAFFIC SIGNALS

APPENDIX B – PEDESTRIAN HYDRID BEACON

APPENDIX C – TRAFFIC SIGNAL REMOVAL PROCEDURE

INTRODUCTION

At the request of the Village of Johnson City the Binghamton Metropolitan Transportation Study (BMTS) has undertaken a study to evaluate the traffic signals in the Village to see if they are still needed or require modification. Due to changing demographics, the closure of businesses and changes in traffic patterns, BMTS has analyzed the current inventory of Village traffic signals for improvements, upgrades and possible removal. Traffic signal maintenance represents a significant cost, and as such this study will determine if there are signal locations that no longer meet federal warrants. In addition, the study will make recommendations to improve the operation of the signal for vehicles as well as pedestrians. The goal of this study is to identify traffic signals within the Village for removal or modification. Recommendations are based on a variety of criteria to improve traffic operation, increase safety, and reduce maintenance costs.

In March 2018, BMTS adopted the Unified Planning Work Program (UPWP). The UPWP identifies the transportation planning activities that are to be undertaken in the BMTS metropolitan planning area for the State Fiscal Years 2018-2019. The Village of Johnson City Traffic Signal Study was one of the tasks included in this plan. Due to scheduling issues the study was delayed and moved to the 2019 -2020 UPWP.

ANALYSIS CRITERIA

The Federal Highway Administration (FHWA) publishes the Manual on Uniform Traffic Control Devices (MUTCD). This publication defines the standards for traffic control devices on all public streets in the United States. It is published under 23 Code of Federal Regulations (CFR), Part 655, Subpart F. For the purposes of this study the MUTCD 2009 Edition, will be used as the basis for all analysis pertaining to traffic signal use and removal in accordance with federal regulation.

TRAFFIC CONTROL SIGNAL ROLE AND FUNCTION

A traffic control signal's primary role is to assign the right-of-way to the various traffic movements at a given intersection. When properly used, traffic control signals are valuable devices for the control of vehicular and pedestrian traffic. The MUTCD describes the advantages and disadvantages of signals as follows:

- A. They provide for the orderly movement of traffic.
- B. They increase the traffic-handling capacity of the intersection if:
 - 1. Proper physical layouts and control measures are used, and
 - 2. The signal operational parameters are reviewed and updated (if needed) on a regular basis (as engineering judgment determines that significant traffic flow and/or land use changes have occurred) to maximize the ability of the traffic control signal to satisfy current traffic demands.
- C. They reduce the frequency and severity of certain types of crashes, especially right-angle collisions.
- D. They are coordinated to provide for continuous or nearly continuous movement of traffic at a definite speed along a given route under favorable conditions.
- E. They are used to interrupt heavy traffic at intervals to permit other traffic, vehicular or pedestrian, to cross."

In addition to the functions listed above, traffic control signals provide emphasis at hazardous locations, control some types of railroad-highway grade crossings, control travel lane use, and supplement certain signs. With the wide variety of functions and roles that traffic control signals perform, the MUTCD has necessarily provided strong and direct guidance for their justification and use.

TRAFFIC CONTROL SIGNAL WARRANTS

The MUTCD states that the selection and use of traffic control signals shall be based on an engineering study. The MUTCD identifies minimum situational warrants that must exist at a given location before a traffic control signal can be considered. The MUTCD further states that even in situations where minimum warrants are met, an engineering study should still be performed to confirm that the installation of a signal would improve overall safety or operation of the intersection. The nine warrants for traffic signal installation identified by the MUTCD are as follows:

Warrant 1, Eight-Hour Vehicular Volume

Warrant 2, Four-Hour Vehicular Volume

Warrant 3, Peak Hour

Warrant 4, Pedestrian Volume

Warrant 5, School Crossing

Warrant 6, Coordinated Signal System

Warrant 7, Crash Experience

Warrant 8, Roadway Network

Warrant 9, Intersection near a Grade Crossing

Refer to the MUTCD 2009 Edition, Chapter 4C for further explanation of these warrants and how they are applied. Traffic control signals that do not meet at least one of these warrants often have a variety of operational and safety related shortcomings that should be addressed.

UNWARRANTED TRAFFIC SIGNALS

The MUTCD addresses unnecessary traffic control signals as follows:

“Traffic control signals are often considered a panacea for all traffic problems at intersections. This belief has led to traffic control signals being installed at many locations where they are not needed, adversely affecting the safety and efficiency of vehicular, bicycle, and pedestrian traffic. Traffic control signals, even when justified by traffic and roadway conditions, can be ill-designed, ineffectively placed, improperly operated, or poorly maintained. Improper or unjustified traffic control signals can result in one or more of the following disadvantages:

- A. Excessive delay,
- B. Excessive disobedience of the signal indications, i.e. running red lights
- C. Increased use of less adequate routes as road users attempt to avoid the traffic control signals,
- D. Significant increases in the frequency of collisions (especially rear-end collisions).”

Traffic control signals that have been in place for many years may not meet the warrants outlined by the current edition of the MUTCD. This may be due to demographic change in the area, land use changes, altered traffic patterns, or updated warrants that are based on a more modern understanding of traffic operation. Locations where signals no longer meet warrants may represent safety hazards to the traveling public, may be causing undue delay for motorists and require ever scarcer maintenance funds to ensure their proper operation. Due to the many factors that decide if a signal is warranted, and beneficial, it is necessary to study each signal location using the most up to date methodology and understanding of traffic analysis.

TRAFFIC SIGNAL STUDY METHODOLOGY

Within the Village of Johnson City there are fourteen signals that are located on Village streets. The Village of Johnson City is responsible for the maintenance of 10 of the 14 signals. The remainder of the signals located within the Village of Johnson City are on streets owned and maintained by the New York State Department of Transportation (NYSDOT). The NYSDOT owned signals were not evaluated as part of this study. A complete list of the signals that were is included in Table 1.

BMTS has historically conducted traffic counts for all signalized intersections within its metropolitan planning area on a three-year reoccurring cycle. Counts were taken during the morning (AM) and evening (PM) peak hour period. These time periods typically represent the highest hourly traffic volumes for a given intersection. The peak periods are therefore a pertinent analysis tool when determining if the intersection meets signal warrants and is operating properly. During the fall of 2019 additional traffic counts were taken by a consultant, Traffic Databank, to supplement the counts that were already available. At the intersections targeted for removal, the traffic counts were analyzed using the traffic analysis software package SYNCHRO 9, with its plug-in module Warrants 9.

Vehicular and pedestrian traffic volumes are just four of the nine warrants for signal installation. The remaining five warrants are based on intersection location, classification, accident history, and the proximity of certain trip generators, such as schools. BMTS staff evaluated each intersection in the study to determine if it met the criteria for any of the remaining signal warrants. Site visits were conducted at all intersections to observe intersection traffic operation. The New York State Accident Information Location System (ALIS) was used to examine accident history over a three -year period (6/2016 - 7/2019) for each intersection included in the study.

TRAFFIC SIGNAL RECOMMENDATIONS

Table 1 contains a summary of the intersections that were evaluated and BMTS recommendations for signal removal or modifications based on the analysis described in this document. While some intersection might not meet the guidelines for a signal warrant there are other factors that are considered for signal retention. This will be explained for each signal that was studied.

Table 1 Traffic Signal Recommendations

	Description	Intersection Layout	Warrants 2009	Recommendation
1	Harry L Dr. /Lester Ave./Zoa Ave.	Four way	No	Retain, sight distance issues
2	Harry L Dr. / N. Broad St.	T	No	Retain, pedestrian crossing senior housing
3	Harry L. Dr. / N. Baldwin St.	Four way	No	Retain, sight distance issues
4	Harry L. Dr./Christmas Tree Plaza	T	No	Retain, for future development
5	Harry L. Dr./Oakdale Plaza/Friendly's	Four way	No	Retain, for future development
6	Harry L Dr. / Wegmans/ Mall	Four way	Yes	Retain, warrants met
7	Harry L. Dr./ Oakdale Rd.	Four way	No	Retain, geometry
8	Reynolds Rd. / JCHS	Four way	Yes	Retain school warrant
9	Reynolds Rd./S.Mall Ent. / Raymour	Four way	No	Retain for future development
10	Grand Ave. / Willow St.	Four way	No	Retain, sight distance
11	Grand Ave./ Baldwin St.	Four way	No	Retain, sight distance
12	Floral Ave./Burbank Ave.	Four way	No	Retain, sight distance
13	Floral Ave./ Ackley Ave./St. Charles St.	Four way	No	Retain, off set intersection
14	Lester Ave. / CFJ Blvd.	Four way	No	Retain, CFJ Park

Recommendations have also been made for pedestrian improvements at each intersection. These recommendations include information that was contained in the “*Village of Johnson City ADA Transition Plan: Pedestrian Facilities in the Public Right-of-Way 2019*”. The intersection rating system that was used in the 2019 report is included in Table 2 below.

Table 2: Rating System for Sidewalks, Curb Ramps, and Crossings*

Rating	Description of Rating
1 – Not Applicable	A facility not considered to require accessibility. For example, limited-access highways, or no sidewalk present.
2 – Not Accessible	Significant discontinuity, such as steps, no ramps, heaving, vertical displacement, flooding, excessive debris.
3 – Partially Accessible	Not designed to current standards. For example, problems with geometry of sidewalks, ramps, and landings, no detectable warnings, handrails, some debris present.
4 – Accessible	May need additional improvements, such as no detectable warnings at curb ramp locations or insufficient width.
5 – Fully Accessible	Designed to current standards, and presence of detectable warnings at curb ramp locations.

*This rating system was adapted from the New York State Department of Transportation's ADA Transition Plan.

SIGNAL RECOMMENDATIONS BY INTERSECTION

1. Harry L. Drive / Lester Avenue/ Zoa Avenue



Harry L. Drive / Lester Avenue / Zoa Avenue is a four-legged, slightly off-set intersection with Lester Avenue and Zoa Avenue being the minor street with low traffic volumes. None of the signal warrants are met. Traffic volumes are low and most crashes that occurred during the three-year period were not correctable with a signal. However, signal removal is not recommended due to the limited sight distance at the intersection. The signal is actuated, so the delays at the intersection are minimal. Pedestrian access at the intersection could be improved with count down pedestrian signals and ADA (Americans with Disabilities Act) accessible curb ramps on all corners. This intersection received a rating of 3 in the Johnson City ADA Transition Plan.

2. Harry L. Drive / N.Broad Street

Harry L. Drive and N.Broad Street is a T-intersection with a low volume of traffic on Broad Street. There were no crashes at the intersection that could be attributed to the traffic signal. Sight distance at the intersection is adequate. The signal warrants at the intersection are not met.

The intersection was probably signalized when the C Fred Johnson Elementary School was operational. The school has been closed and is now senior living housing. The signal is not being recommended for removal because of the pedestrian activity generated by this housing complex. The intersection has cross walks, some ADA curb ramps and countdown signals. It received an ADA rating of 3. The only other recommendation for this intersection is to consider the installation of a "No Right Turn on Red" sign for northbound N.Broad Street. A no right turn on red sign is recommended because of the seniors from the Harry L. Apartments and the residents of the apartment complex on the north east corner of the intersection. Section 2B.54, No Turn on Red Signs (R10-11), of the MUTCD, states that the signs should be considered if there are pedestrian conflicts, especially with children or older adults. Motorists tend to look to their left for approaching traffic and may not notice pedestrians on their right. Motorists tend to pull into the crosswalk to wait for a gap in traffic, blocking pedestrian crossings.

If the Village is interested in the future to remove this signal, they could consider the installation of a pedestrian hybrid beacon. This can be useful when signal warrants are not met, and there are not adequate gaps in traffic for pedestrians. A description and application of a pedestrian hybrid signal is included in Appendix B.



3. Harry L. Drive / N. Baldwin Street

Harry L. Drive / N. Baldwin Street is four-legged intersection with Baldwin Street being the minor road with low traffic volumes. The crash warrant is not met for this intersection, but there was one pedestrian crash during the study period. Overall, signal warrants are not met. The signal is not recommended for removal due to sight distance limitations caused by the buildings on the southside of the street. The signal is actuated so there are minimal delays at the intersection.

Pedestrian improvements that could be made are count down signals and high visibility cross walks and curb ramps. It received a rating of 3 in the ADA Plan.



4. Harry L. Drive / Christmas Tree Plaza



The intersection is a T-intersection of Harry L. Drive and the Christmas Tree Plaza driveway. This signal was installed when the retail development was first built and included Toys R Us. Toys R Us has since closed and the volume of traffic into this area has decreased. The signal warrants at this intersection are not met. The incidence of crashes is low with only 2 rear-end type accidents occurring in the three-year study period. The signal is actuated, so the vehicular

delays are minimal. There are pedestrian signals at the intersection, but they are not count down signals. ADA ramps are needed. It has an ADA rating of 1.

The signal is not recommended for removal at this time. However, if retail occupancy decreases or land use changes occur at this site, the signal need should be reevaluated. Count down pedestrian signals, ADA ramps and high visibility crosswalks should be added along with restriping worn pavement markings.

5. Harry L. Drive / Friendly's / Oakdale Plaza

Harry L. Drive / Friendly's / Oakdale Plaza is a four-legged intersection of two commercial driveways one on the north side and one on the south side of the intersection. The signal currently does not meet signal warrants due to the decrease in occupancy of the Oakdale Plaza and the low volumes from each driveway. The signal is actuated, so delays are minimal. There was one crash during the three years of data studied. There are pedestrian signals at the intersection, and they are count down signals. ADA ramps are needed. It has an ADA rating of 3.

At this time the signal is not recommended for removal in case the Plaza redevelops. If the land use changes, the need for a signal should be reevaluated.



6. Harry L. Drive / Wegmans Entrance / Oakdale Mall

This four-legged intersection is the main entrance to Wegmans on the south side of the intersection and on the north side of the intersection is one of the two main entrances to the Oakdale Mall. Traffic volumes at this intersection have decreased over the last few years because of retail closures at the Mall. However, signal warrants are met at this intersection due to the high volume of traffic generated by Wegmans. During peak periods traffic going into Wegmans sometimes creates long queues of vehicles sometimes even backing up to the adjacent Harry L. Drive Reynolds Road intersection. One possibility to mitigate this condition is

to create a double left into Wegmans. There are pedestrian signals at the intersection, but the intersection needs ADA upgrades. It has an ADA rating of 4.



7. Harry L. Drive / Oakdale Road



Harry L. Drive and Oakdale Road is a four-legged intersection but does not have the typical configuration. The westbound right turn is stop sign controlled and separated by an island from the signalized portion of the intersection. This intersection, while not totally meeting the signal warrants, does come close to the volume warrants, and while not meeting the accident warrant

there 6 right angle and 6 left turn accidents that occurred in the three-year study period. Due to these factors and the configuration of the intersection, signal removal is not recommended.

The intersection does need pedestrian improvements. There are no pedestrian signals, crosswalks or ADA curb ramps. There are sidewalks in this area and many pedestrian generators. The intersection has an ADA rating of 2.

This intersection would be an appropriate place for a roundabout if the Village was interested in a future project that could eliminate the awkward configuration of the intersection, eliminate the signal, improve pedestrian access and reduce accidents.

8. Reynolds Road / Johnson City School Complex



This signal was installed because it is at the entrance to the Johnson City School Complex that includes it's elementary, middle and high school. The signal is actuated with pedestrian signals. The pedestrian signals are old, and the walk symbol illumination is not very bright. These should be replaced with count down pedestrian signals with upgraded ADA curb ramps and high visibility crosswalks.

The signal is not recommended for removal.

9. Reynolds Road / Oakdale Mall Entrance / Raymour and Flannigan Entrance

The Reynolds Road, Mall Entrance and Raymour and Flannigan entrance create a four-legged intersection. Like the Oakdale Mall entrance on Harry L. Drive, the volume of traffic generated at this intersection has decreased with the closure of many retail businesses. Signal Warrants are not met at the intersection based on volumes or crash history. However, the geometry and the width of Reynolds Road with multiple lanes northbound and southbound would make the intersection difficult to drive through without a signal. The signal is actuated and creates minimal delays for traffic. Pedestrian signals and ADA accommodations are in place. It has an

ADA rating of 3. The signal is not recommended for removal, but it should continue to be periodically monitored and evaluated as changes in usage occur to the commercial/ retail businesses at the mall.



10. Grand Avenue / Willow Street

The intersection of Grand Avenue and Willow street is a four-legged intersection with fairly even traffic volumes on each approach. The intersection had one accident during the study period, and it was a bicycle accident. The signal warrants at the intersection are not met. However, because the sight distance at the intersection is limited the signal is not recommended for removal.

The signal at this intersection is fully actuated and it rests in an all red phase when there are no vehicles traveling through the intersection. It operates like an all way stop. The delays at the intersection are minimal. There are pedestrian signals and ADA curb ramps. High visibility crosswalks are recommended. It has an ADA rating of 5.



11. Grand Avenue / Baldwin Street

Grand Avenue and Baldwin Street is a four-legged intersection with Baldwin Street being the higher volume road. There were two accidents at the intersection during the study period with one being a pedestrian accident. Signal warrants are not met at this intersection. Like the intersection of Grand Avenue and Willow Street there is limited sight distance, so the signal is not recommended for removal.

The signal at this intersection was replaced at the same time as the signal at Grand Avenue and Willow Street. It operates in the same manner with the signal being fully actuated and resting in an all red phase. There are pedestrian signals and ADA curb ramps. Adding high visibility crosswalks is the only recommendation. It has an ADA rating of 4.



12. Floral Avenue / Burbank Avenue



Floral Avenue and Burbank Avenue is a four-legged intersection with restricted sight distance at the intersection from the stone wall at the Floral Avenue Cemetery. The signal does not meet warrants but is not recommended for removal because of the sight distance issue. During the study period there were 10 crashes at the intersection: 2 rear-end, 3 right-angle, 1 left turn, 2

parking/backing crashes and one bicycle crash and one overtaking/sideswipe crash. There were no clusters or patterns of crashes.

The operation of the signal could be improved with the installation of an actuated traffic signal. There are pedestrian signals, but these should be upgraded with countdown signals. ADA curb ramps are needed as are high visibility crosswalks. The ADA rating is 2.

13. Floral Avenue / St Charles St. / Ackley Avenue

Floral Avenue, St. Charles Street and Ackley Avenue is a four-legged off- set intersection. The volume of traffic on both St. Charles Street and Ackley Avenue are both low volume roadways. Signal warrants are not met at this intersection, but it is not recommended for removal because of the geometry of the intersection and the proximity to the Floral Avenue Park. The signal is actuated, so there are minimal delays to traffic on Floral Avenue. There are countdown pedestrian signals and ADA ramps. High visibility crosswalks are recommended. The ADA rating is 5.



14. Lester Avenue / CFJ Boulevard

Lester Avenue and CFJ Boulevard is a four-legged intersection, with the eastbound leg of the intersection being a very low volume commercial driveway. Located on the southeast corner of the intersection is the CFJ Park. The signal warrants at the intersection are not met, but the signal is not recommended for removal because of the Park. There are count down pedestrian signals at the intersection, but ADA upgrades are needed as are high visibility crosswalks. The ADA rating is 3.

The signal at this location is fixed time signal without vehicle actuation. In order to minimize vehicular delays, the signal should be upgraded with vehicle detection.



STUDY CONCLUSION

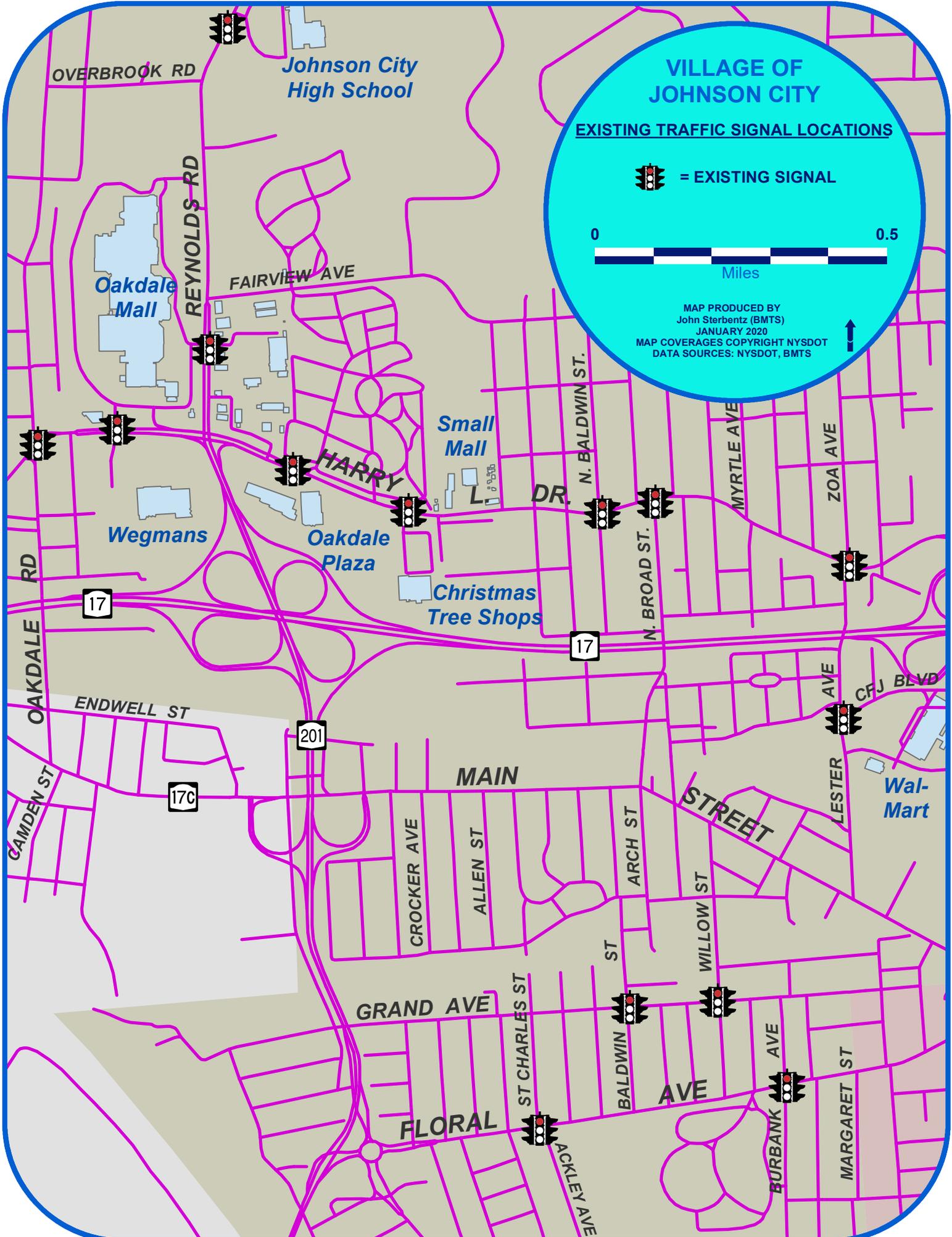
There are a few intersections that should be monitored as land uses change. It may be possible, as changes occur, to remove signals that are not currently being recommended for removal. Traffic control signals require maintenance, electrical power, and have a limited service life. The 2012 Traffic Signal Maintenance Consolidation Study conducted by BMTS lists the annual maintenance requirement for each signal as approximately 50 hours

The Transportation Research Board lists the estimated service life of various components of a traffic control signal as between 1.4 and 24.6 years. These components include bulbs, signs, signal heads, controller cabinets, detector loops etc. It is costly to continue to maintain traffic control signals, particularly those that are unwarranted and inefficient. If unneeded signals are removed the Village would save electrical operating costs as well as saving drivers operating costs and delay.

The Village of Johnson City has upgraded some traffic signals using Federal funds provided through the Binghamton Metropolitan Transportation Study's Transportation Improvement Program. But funds are limited, and the Village of Johnson City still has a few older traffic signals that need upgrades or replacement. The BMTS Planning and Policy Committees have decided that when new funds are programmed for signal replacement on the TIP, that the traffic signal must be warranted. An option that the Village of Johnson City may want to consider is to begin elimination of the unwarranted signals as the signals become obsolete. This can be handled with a variety of options: four-way stop signs (where warranted), pedestrian hybrid beacons and roundabouts or mini roundabouts. The Village has the justification based on this engineering study to remove the older signals, add detection for more signal efficiency and make upgrades to pedestrian signals to improve safety.

Appendix A

Traffic Signals in the Village of Johnson City



VILLAGE OF JOHNSON CITY
EXISTING TRAFFIC SIGNAL LOCATIONS

 = EXISTING SIGNAL

0  0.5
 Miles

MAP PRODUCED BY
 John Sterbentz (BMTS)
 JANUARY 2020
 MAP COVERAGES COPYRIGHT NYSDOT
 DATA SOURCES: NYSDOT, BMTS



OVERBROOK RD

Johnson City High School

Oakdale Mall

REYNOLDS RD

FAIRVIEW AVE

Small Mall

HARRY DR.

Wegmans

Oakdale Plaza

Christmas Tree Shops

N. BALDWIN ST.

MYRTLE AVE

ZOA AVE

OAKDALE RD

17

17

ENDWELL ST

201

MAIN STREET

LESTER AVE

CFJ BLVD

Wal-Mart

GAMDEN ST

17C

CROCKER AVE

ALLEN ST

ARCH ST

WILLOW ST

GRAND AVE

ST CHARLES ST

BALDWIN ST

AVE

FLORAL

ACKLEY AVE

BURBANK AVE

MARGARET ST

Appendix B

Pedestrian Hybrid Beacon

Section 4F.01 Application of Pedestrian Hybrid Beacons

Support:

- 01 A pedestrian hybrid beacon is a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

Option:

- 02 A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C), or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal.

Standard:

- 03 **If used, pedestrian hybrid beacons shall be used in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid beacon shall only be installed at a marked crosswalk.**

Guidance:

- 04 *If one of the signal warrants of Chapter 4C is met and a traffic control signal is justified by an engineering study, and if a decision is made to install a traffic control signal, it should be installed based upon the provisions of Chapters 4D and 4E.*
- 05 *If a traffic control signal is not justified under the signal warrants of Chapter 4C and if gaps in traffic are not adequate to permit pedestrians to cross, or if the speed for vehicles approaching on the major street is too high to permit pedestrians to cross, or if pedestrian delay is excessive, the need for a pedestrian hybrid beacon should be considered on the basis of an engineering study that considers major-street volumes, speeds, widths, and gaps in conjunction with pedestrian volumes, walking speeds, and delay.*
- 06 *For a major street where the posted or statutory speed limit or the 85th-percentile speed is 35 mph or less, the need for a pedestrian hybrid beacon should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-1 for the length of the crosswalk.*
- 07 *For a major street where the posted or statutory speed limit or the 85th-percentile speed exceeds 35 mph, the need for a pedestrian hybrid beacon should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-2 for the length of the crosswalk.*
- 08 *For crosswalks that have lengths other than the four that are specifically shown in Figures 4F-1 and 4F-2, the values should be interpolated between the curves.*

Section 4F.02 Design of Pedestrian Hybrid Beacons

Standard:

- 01 **Except as otherwise provided in this Section, a pedestrian hybrid beacon shall meet the provisions of Chapters 4D and 4E.**
- 02 **A pedestrian hybrid beacon face shall consist of three signal sections, with a CIRCULAR YELLOW signal indication centered below two horizontally aligned CIRCULAR RED signal indications (see Figure 4F-3).**
- 03 **When an engineering study finds that installation of a pedestrian hybrid beacon is justified, then:**
- A. At least two pedestrian hybrid beacon faces shall be installed for each approach of the major street,**
 - B. A stop line shall be installed for each approach to the crosswalk,**
 - C. A pedestrian signal head conforming to the provisions set forth in Chapter 4E shall be installed at each end of the marked crosswalk, and**
 - D. The pedestrian hybrid beacon shall be pedestrian actuated.**

Guidance:

- 04 *When an engineering study finds that installation of a pedestrian hybrid beacon is justified, then:*
- A. The pedestrian hybrid beacon should be installed at least 100 feet from side streets or driveways that are controlled by STOP or YIELD signs,*

Figure 4F-1. Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways

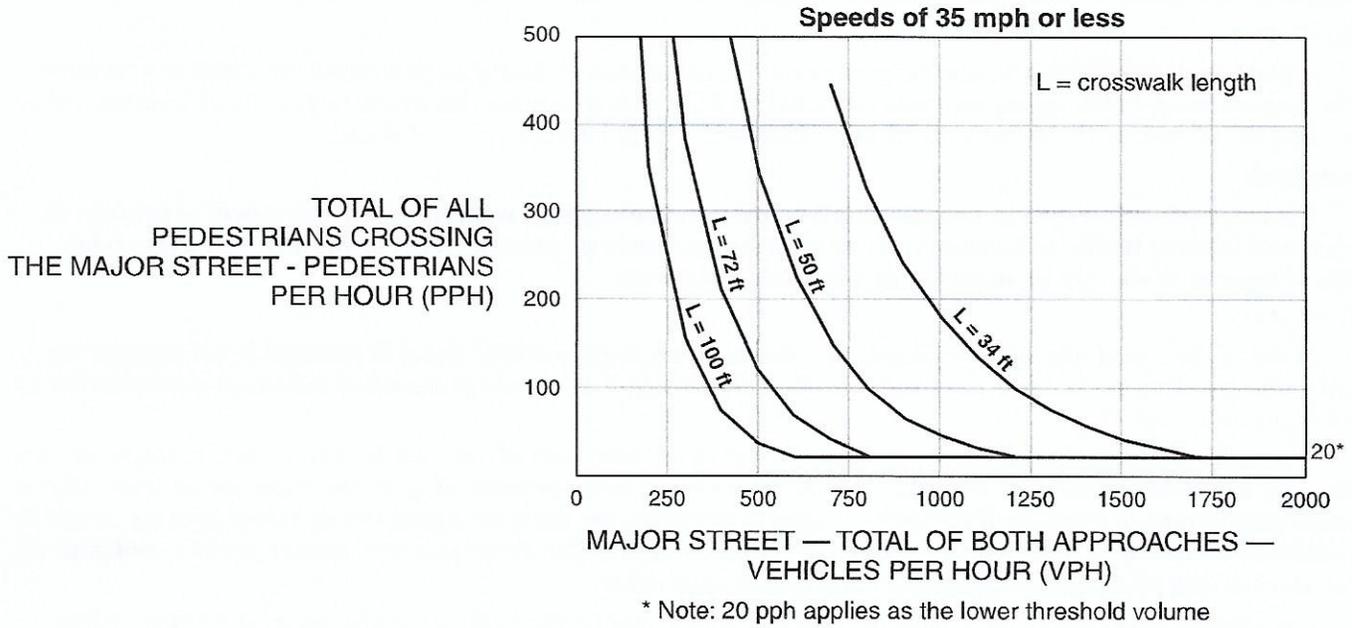


Figure 4F-2. Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways

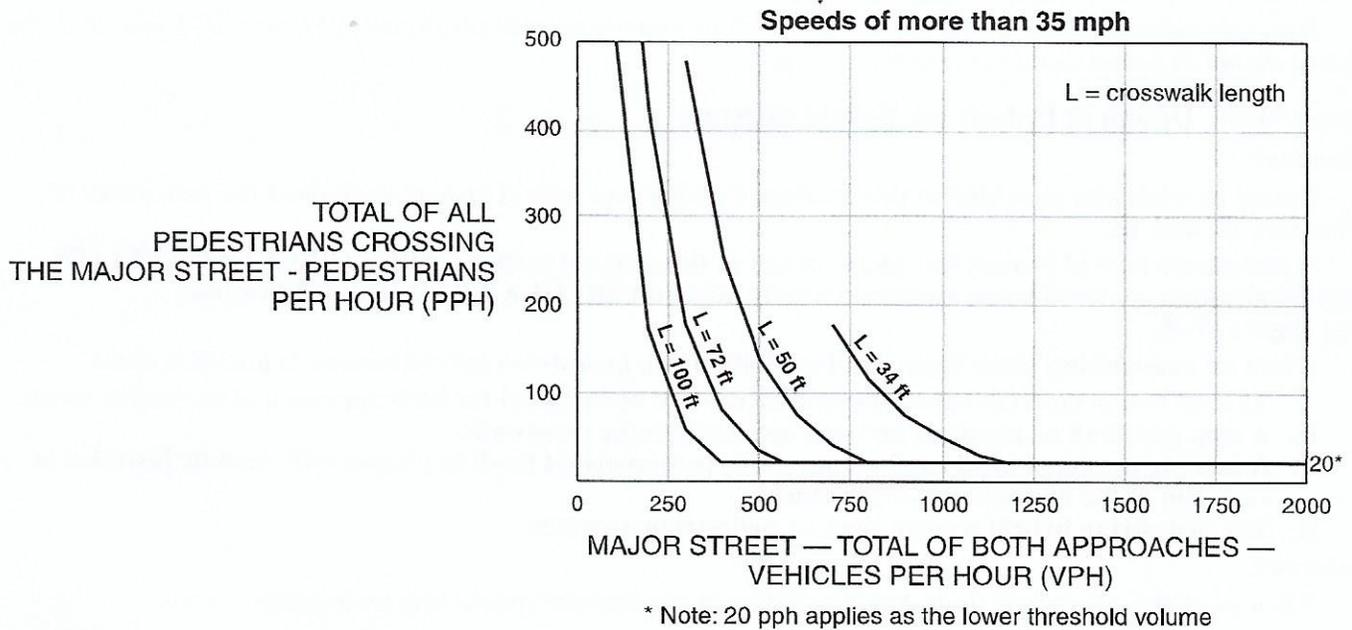
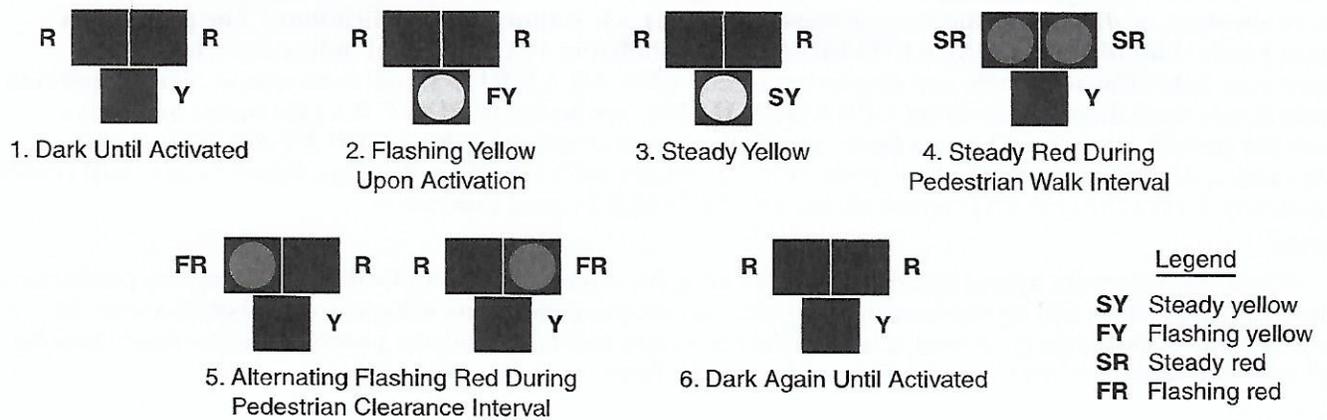


Figure 4F-3. Sequence for a Pedestrian Hybrid Beacon



- B. *Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk, or site accommodations should be made through curb extensions or other techniques to provide adequate sight distance,*
- C. *The installation should include suitable standard signs and pavement markings, and*
- D. *If installed within a signal system, the pedestrian hybrid beacon should be coordinated.*

- 05 *On approaches having posted or statutory speed limits or 85th-percentile speeds in excess of 35 mph and on approaches having traffic or operating conditions that would tend to obscure visibility of roadside hybrid beacon face locations, both of the minimum of two pedestrian hybrid beacon faces should be installed over the roadway.*
- 06 *On multi-lane approaches having a posted or statutory speed limits or 85th-percentile speeds of 35 mph or less, either a pedestrian hybrid beacon face should be installed on each side of the approach (if a median of sufficient width exists) or at least one of the pedestrian hybrid beacon faces should be installed over the roadway.*
- 07 *A pedestrian hybrid beacon should comply with the signal face location provisions described in Sections 4D.11 through 4D.16.*

Standard:

- 08 **A CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign (see Section 2B.53) shall be mounted adjacent to a pedestrian hybrid beacon face on each major street approach. If an overhead pedestrian hybrid beacon face is provided, the sign shall be mounted adjacent to the overhead signal face.**
Option:

- 09 *A Pedestrian (W11-2) warning sign (see Section 2C.50) with an AHEAD (W16-9P) supplemental plaque may be placed in advance of a pedestrian hybrid beacon. A warning beacon may be installed to supplement the W11-2 sign.*

Guidance:

- 10 *If a warning beacon supplements a W11-2 sign in advance of a pedestrian hybrid beacon, it should be programmed to flash only when the pedestrian hybrid beacon is not in the dark mode.*

Standard:

- 11 **If a warning beacon is installed to supplement the W11-2 sign, the design and location of the warning beacon shall comply with the provisions of Sections 4L.01 and 4L.03.**

Section 4F.03 Operation of Pedestrian Hybrid Beacons

Standard:

- 01 **Pedestrian hybrid beacon indications shall be dark (not illuminated) during periods between actuations.**
- 02 **Upon actuation by a pedestrian, a pedestrian hybrid beacon face shall display a flashing CIRCULAR yellow signal indication, followed by a steady CIRCULAR yellow signal indication, followed by both steady CIRCULAR RED signal indications during the pedestrian walk interval, followed by alternating flashing CIRCULAR RED signal indications during the pedestrian clearance interval (see Figure 4F-3). Upon termination of the pedestrian clearance interval, the pedestrian hybrid beacon faces shall revert to a dark (not illuminated) condition.**

UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid beacon faces are either dark or displaying flashing or steady CIRCULAR yellow signal indications. The pedestrian signal heads shall display a WALKING PERSON (symbolizing WALK) signal indication when the pedestrian hybrid beacon faces are displaying steady CIRCULAR RED signal indications. The pedestrian signal heads shall display a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid beacon faces are displaying alternating flashing CIRCULAR RED signal indications. Upon termination of the pedestrian clearance interval, the pedestrian signal heads shall revert to a steady UPRAISED HAND (symbolizing DONT WALK) signal indication.

Option:

- 04 Where the pedestrian hybrid beacon is installed adjacent to a roundabout to facilitate crossings by pedestrians with visual disabilities and an engineering study determines that pedestrians without visual disabilities can be allowed to cross the roadway without actuating the pedestrian hybrid beacon, the pedestrian signal heads may be dark (not illuminated) when the pedestrian hybrid beacon faces are dark.

Guidance:

- 05 *The duration of the flashing yellow interval should be determined by engineering judgment.*

Standard:

- 06 **The duration of the steady yellow change interval shall be determined using engineering practices.**

Guidance:

- 07 *The steady yellow interval should have a minimum duration of 3 seconds and a maximum duration of 6 seconds (see Section 4D.26). The longer intervals should be reserved for use on approaches with higher speeds.*

Appendix C

Traffic Signal Removal Process

Traffic Signal Transition - Closure Procedure

The evaluation and removal of Village Traffic Signals will follow and conform to ITE Guidelines approval This procedure will include:

1. Public Notification - Newspaper notification to the public will be issued in addition to a direct outreach to businesses, institutions and residents within a two-block proximity to the intersection under evaluation.
2. Advance Notification Signs - Signal under Study signs will be installed at the evaluation intersection and will remain in place for at least a 30-day period. During this period a survey of the intersection will be performed to determine appropriate traffic control signs to be used after signal removal. The survey will also identify any changes necessary affecting line of sight or any sight distance restriction. Implementation of those changes will occur prior to the covering of the signal lights.



3. Covered Signal Evaluation - Following the installation of required traffic control signs and road markings, an evaluation period of 90 days or longer will be utilized to assess impact on traffic flow. An alternative procedure for the 90-day period may include a flashing period for part or all of the 90-day evaluation. The flashing configuration will reflect either a four way or two way stop.

Stop signs will be installed prior to the start of the 90 day evaluation period. This will include "STOP AHEAD" signs some distance before the intersection. Signal Under Study notification signs will be removed at the time stop sign installation.

At the time of stop sign installation, a temporary secondary sign "CROSS STREET DOES NOT STOP" sign will be added and mounted under the intersection stop sign. This sign will remain for a period no less than one month.

4. 90 Day Observation Period - Data collection during this period will include intersection observation and solicitation of general traffic flow performance from public input. Periodic observations will be made at various times during a 24-hour cycle with a focus on peak demand hours. The Village web site will be utilized to allow public feedback of intersection traffic flow or any observations by Village residents. Businesses and residents living in near proximity to the intersection will be requested to provide concerns, opinions and observations.

At 30 days prior to the removal of the signal, temporary signs “SIGNAL TO BE REMOVE On (date)” will be posted.

5. Signal Removal– The removal of the traffic signal will be based on acceptable results from the observation period. Signal poles and related wiring will remain in place for a minimum of one year.