Feeding Hills Center Transportation and Safety Study

Final Report

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Prepared under the direction of the
Pioneer Valley Metropolitan Planning Organization for: Town of Agawam

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I. INTRODUCTION

The Massachusetts Highway Department (MassHighway) District 2 Office requested the Pioneer Valley Planning Commission (PVPC) perform a safety study at the intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187) as part of the FY 2005 Unified Planning Work Program. A combination of high peak hour traffic volumes and a history of safety problems at the intersection prompted the Town of Agawam to petition MassHighway District 2 to advance plans for the proposed project to extend the limited access portion of Route 57 from its current terminus at Route 187 to the Southwick Town Line. While plans for the Route 57 extension project continue to advance, it will be important to provide safe and efficient access through the center of Feeding Hills. This study examines the existing problems experienced at the intersection and provides a series of short-term recommendations to improve existing traffic operations and increase safety.

A. STUDY AREA

The intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187) is located in the Feeding Hills Center of Agawam, Massachusetts. This intersection is the main access route to Interstate 91, The City of Westfield and the Town of Southwick. The limited access portion of Route 57 terminates at its exit with Route 187 to the south of the intersection. Figure I-2 presents a map of the study area.

Southwick Street (Route 57) is a minor arterial roadway and intersects with North and South Westfield Street (Route 187) and Springfield Street to form a four-way signalized intersection with push button activated pedestrian signals. Southwick Street serves a mix of residential and commercial land uses. In the vicinity of the intersection, Southwick Street provides an exclusive right turn lane and one combined through movement and left-turn lane. Right turns from Southwick Street are permitted during the left turn phase. A "No Turn on Red" sign is posted for this approach, however, right turns are permitted during certain phases by a green right arrow signal. Sidewalks are provided on this approach and a pedestrian crosswalk is located at the intersection. The posted speed limit is 25 miles per hour. A small shopping plaza and coffee shop are located in the north-west corner of the intersection. Access is provided on Southwick Street by a curb cut 170 feet west of the intersection. A gas station is located on the southwest corner of the intersection. Access is provided by two curb cuts 120 feet and 190 feet west from the intersection.

Springfield Street can be defined as a principal arterial roadway and serves a wide variety of commercial and residential land uses. This approach was originally designed to operate as a one-lane approach. However, it was noted during the field inventory that this approach is wide enough for two vehicles to approach the intersection. Therefore, this approach is currently operated as a two-lane approach with an exclusive left turn lane and a combined through and right-turn lane. However, when larger vehicles such as trucks approach the intersection, this approach can only accommodate one vehicle. "No Turn on Red" signs are posted at this approach and a pedestrian crosswalk and sidewalks are also provided. The posted speed limit is 25 miles per hour for this approach. The Clifford M. Granger Elementary School is located to the south-east of the intersection. Access to the school is via a curb cut 210 feet east of the intersection.

Two other curb cuts provide access to the gas station on the northeast corner, one 59 feet and the other 266 feet east of the intersection.

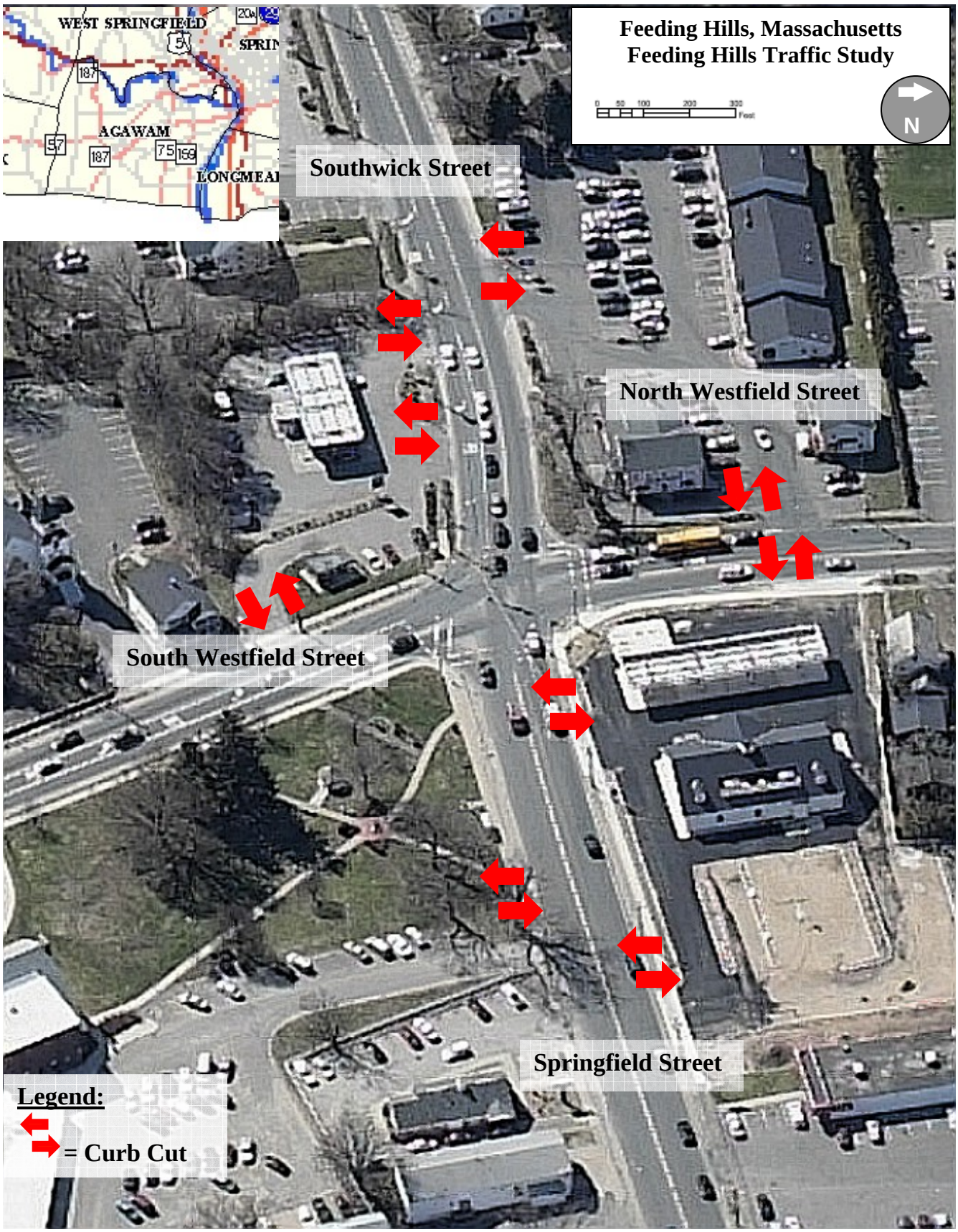
North Westfield Street (Route 187) can be defined as a minor arterial roadway that serves a wide variety of residential and commercial land uses. This approach provides one 13 foot combined through and right turn lane and one 11 foot exclusive left turn lane. Left turning traffic on this approach is protected by an exclusive left-turn phase in the signal timing plan. The speed limit on this approach is posted at 25 miles per hour. "No Turn on Red" signs are posted along this approach and pedestrian crosswalks and sidewalks are provided. Existing curb cuts are located 93 feet north of the intersection for a small shopping plaza and coffee shop to the west and a gas station to the east.

South Westfield Street (Route 187) can be defined as a minor arterial roadway that primarily serves residential land uses. A 13 foot combined through and right turn lane as well as a 9 foot exclusive left-turn lane are provided at this approach. "No Turn on Red" signs are posted, the posted speed limit is 25 miles per hour and sidewalks and crosswalks are provided. An ATM machine is located to the south of the intersection. Access is provided by a curb cut 70 feet from the intersection. A second mid-block crosswalk is provided on South Westfield Street in front of the elementary school. A bus stop turnaround is also located in front of the elementary school. Figure I-1 presents the main entrance to the elementary school.

Figure I-1 – The Clifford M. Granger Elementary School

Land uses in the vicinity of the intersection include a "Sunoco" gas station on the southwest corner, a "Pride" gas station and convenience store on the northeast corner, a "Dunkin Donuts" on the northwest corner, and a small park and the Granger Elementary School on the southeast corner. As a result, there are numerous curb cuts in the immediate vicinity of the intersection. A curb cut for pick ups and drop offs for the elementary school on Springfield Street was observed to interfere with intersection operations due to vehicle queues. At the time of the field inventory, it was noted that the pavement markings were very faded at this intersection.

Figure I-2 Feeding Hills Intersection Study Area



II. EXISTING TRANSPORTATION CONDITIONS

This section provides a technical evaluation of the transportation components for the intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187). It includes a presentation of the data collected, analysis of traffic operations, and a series of short-term recommendations to improve the overall performance and safety of the corridor.

A. DATA COLLECTION

Comprehensive data collection activity was conducted for this study to identify existing deficiencies. This activity consisted of obtaining traffic volumes, crash experience and a capacity analysis. PVPC staff collected a large portion of the data used in this report. Additional data was obtained from the Massachusetts Highway Department (MassHighway) and the Town of Agawam.

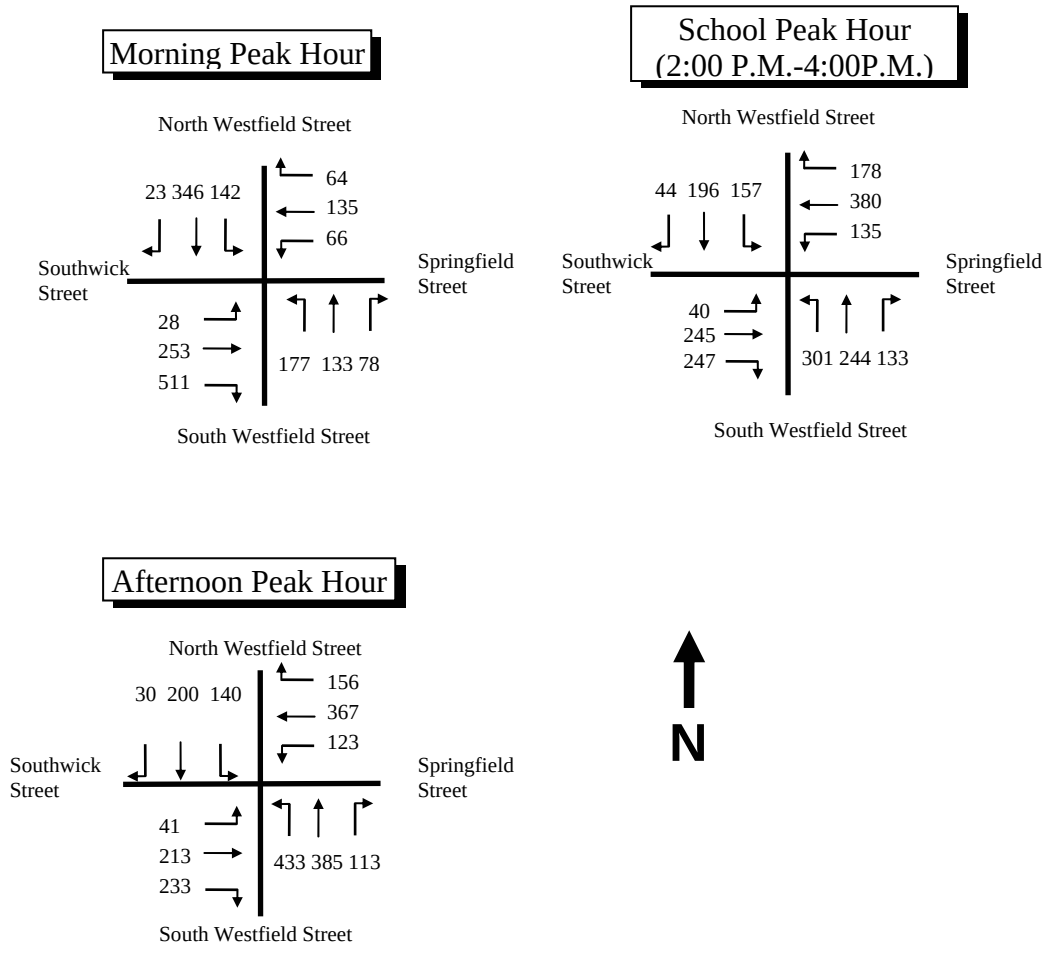
1. Hourly Vehicle Volume

Manual Turning Movement Counts (TMC's) were conducted for the intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187). TMC's were conducted during the peak commuter periods. The weekday peak commuter period occurs during the morning hours of 7:00 AM to 9:00 AM and the afternoon hours of 4:00 PM to 6:00 PM. A TMC was also conducted from 2:00 P.M. to 4:00 P.M. to analyze the effects of school traffic at this intersection. The TMC's were conducted to identify the peak four consecutive 15-minute periods of traffic through the intersection. These consecutive peak 15-minute periods constitute a location's Peak Hour Volume. The peak hour of traffic volume represents the most critical period for operations and will be the focus for some of the analyses conducted in this study.

The TMC data also identifies the number of heavy vehicles and pedestrians on the roadway. Heavy vehicles include trucks, recreational vehicles and buses. The percentage of heavy vehicles in the traffic flow is an important component in calculating the serviceability of a corridor or intersection. Trucks impact traffic flow because they occupy more roadway space than passenger cars and have poorer operating capabilities with respect to acceleration, deceleration and maneuverability.

The TMC data were obtained during weekday peak periods. As traffic volumes tend to fluctuate over the course of the year, the Massachusetts Highway Department (MassHighway) develops traffic volume adjustment factors to reflect monthly variations. These factors were examined to determine how traffic conditions at the intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187) compare to average month conditions. Turning movement count data for the morning, afternoon and after-school hours are summarized on Figure II-1.

Figure II-1 Morning and Afternoon Peak Hour Volumes



Source: PVPC

2. Crash Experience

A crash history of the intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187) was provided by the Massachusetts Highway Department (MassHighway) and the Agawam Police Department. The crash history from January of 2002 to December of 2002 was provided by MassHighway records. The crash history from January of 2003 to December of 2004 was provided by The Agawam Police Department. The history of the crash data is summarized in Table II-1. This intersection averaged 28 crashes per year over this three-year period. However, the crash data provided by the Agawam Police Department presented the number of crashes within a quarter of a mile radius from each approach. Therefore, some of the crashes did not occur at the intersection.

Table II-1 Crash History of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187)

Year	Total Number of Crashes	Type	Number of Crashes	Number of Fatalities		Weather Conditions		Road Conditions	
2002	27	Angle	11	Property	23	Clear	21	Wet	7
		Sideswipe	4	Injury	4	Rain	4	Dry	20
		Rear End	8			Snow		Ice	
		Fixed Object	4			Fog			
		Head On				Overcast	2		
2003	32	Angle	16	Property	27	Clear	23	Wet	6
		Sideswipe	3	Injury	5	Rain	1	Dry	25
		Rear End	10			Snow	2	Ice	1
		Fixed Object	3			Fog			
		Head On				Overcast	6		
2004	24	Angle	16	Property	20	Clear	18	Wet	6
		Sideswipe	0	Injury	4	Rain	2	Dry	18
		Rear End	5			Snow	0	Ice	
		Fixed Object	3			Fog	4		
		Head On				Overcast			

Source: Agawam Police Department

As can be seen from the table, the most predominant crash type were angle-type crashes, which contribute to nearly 50% of all crashes over the three-year period. A total of 26% of the crashes resulted in a vehicle hitting a fixed object. It is likely that many of these crashes occurred away from the actual intersection. Only 16% of the crashes resulted in an injury and no fatalities were reported. Most crashes (76%) occurred during clear weather and dry roadway conditions.

B. ANALYSIS PROCEDURES

The intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187) was examined with regard to capacity and delay characteristics to determine the existing Level of Service (LOS). LOS is an indicator of the operating conditions which occur on a roadway under different volumes of traffic and is defined in the 2000 Highway Capacity Manual by six levels, "A" through "F". A number of operational factors can influence the LOS including geometry, travel speeds, delay, and the number of pedestrians. Table II-2 presents the LOS designations for a signalized intersection.

Table II-2 Level of Service (LOS) Designations - Signalized Intersections

Category	**Description**	**Delay** (in seconds)
LOS A	Describes a condition of free flow, with low volumes and relatively high speeds. There is little or no reduction in maneuverability due to the presence of other vehicles and drivers can maintain their desired speeds. Little or no delays result for side street motorists.	< 10.0
LOS B	Describes a condition of stable flow, with desired operating speeds relatively unaffected, but with a slight deterioration of maneuverability within the traffic stream. Side street motorists experience short delays.	>10.0 to 20.0
LOS C	Describes a condition still representing stable flow, but speeds and maneuverability begin to be restricted. Motorists entering from side streets experience average delays.	>20.0 to 35.0
LOS D	Describes a high-density traffic condition approaching unstable flow. Speeds and maneuverability become more restricted. Side street motorists may experience longer delays.	>35.0 to 55.0
LOS E	Represents conditions at or near the capacity of the facility. Flow is usually unstable, and freedom to maneuver within the traffic stream becomes extremely difficult. Very long delays may result for side street motorists.	>55.0 to 80.0
LOS F	Describes forced flow or breakdown conditions with significant queuing along critical approaches. Operating conditions are highly unstable as characterized by erratic vehicle movements along each approach.	> 80.0

Depending on the time of day and year, a roadway may operate at varying levels. Level of Service "A" represents the best operating conditions and is an indicator of ideal travel conditions with vehicles operating at or above posted speed limits with little or no delays. Conversely, LOS "F", or failure, generally indicates forced flow conditions illustrated by long delays and vehicle queues. Level of Service "C" indicates a condition of stable flow and is generally considered satisfactory in rural areas. Under LOS "D" conditions, delays are considerably longer than under LOS "C", but are considered acceptable in urban areas. At LOS "E" the roadway begins to operate at unstable flow conditions as the facility is operating at or near its capacity. Using Synchro software, the LOS for the intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street

(Route 57) and South Westfield Street (Route 187) was determined. Table II-3 presents the LOS for the morning, afternoon and school peak hours.

Table II-3 Existing Level of Service

Movement	AM Peak		PM Peak		2-4 Peak	
	Delay*	LOS**	Delay*	LOS**	Delay*	LOS**
EB Through/Left	22.5	C	16.6	B	14.7	B
EB Right Turn	8.8	A	4.8	A	1.1	A
WB Left Turn	18.4	B	15.7	B	14.5	B
WB Through/Right	19.6	B	27.7	C	22.2	C
NB Left Turn	25.4	C	182.5	F	135.8	F
NB Through/Right	19.5	B	73.7	E	170.6	F
SB Left Turn	25.2	C	35.8	C	43.0	D
SB Through/Right	34.0	C	34.8	C	53.0	D
Overall	**20.7**	**C**	**63.6**	**E**	**63.7**	**E**

**** = In Seconds***
***** = Level of Service***

As can be seen from the table, the movement with the highest amount of delay is the northbound left turn from South Westfield Street (Route 187) to Southwick Street (Route 57). This movement was calculated to operate at LOS "C" in the morning and LOS "F" in the afternoon and can experience queues that extend back to the elementary school. The through and right movement from South Westfield Street does not suffer much delay in the morning; however, the northbound approach was calculated to operate at LOS "F" during school hours. The drop off/pick up area for the elementary school on Springfield Street contributes to this delay during school dismissal and creates traffic congestion on the eastbound and northbound approaches to the intersection.

III. CONCLUSIONS

Based on the results of the study, high traffic volumes combined with narrow lanes and a high concentration of curb cuts contribute to congestion and safety problems. The Pioneer Valley Planning Commission met with representatives from both the Massachusetts Highway Department District 2 Office and the Town of Agawam to discuss potential improvement options for this intersection. The following sections summarize recommendations to improve both congestion and safety at the Feeding Hills Center.

1. Traffic Signs

The Town of Agawam should consider the following improvements to traffic signs in the vicinity of the intersection.

- Many vehicles were observed to end up in the wrong travel lane on the Southwick Street approach to the intersection. The installation of advance lane usage signs in combination with painted arrows could assist in directing motorists to the correct travel lane.
- It is recommended that improved pedestrian crossing signs be installed at the intersection to provide more information on how the pedestrian signals operate. Many pedestrians do not use the push buttons or fail to wait for the exclusive pedestrian phase to begin before attempting to cross the street.

2. Springfield Street

It was noted at the time of the field inventory that although Springfield Street is designed to operate as a one-lane approach, most automobiles have enough room to drive it as a two-lane approach. This changes when larger vehicles approach the intersection, often resulting in a combination of one and two travel lanes being formed at the intersection. The PVPC analyzed the intersection based on the travel patterns observed in the field. This resulted in an improved level of service for the Springfield Street approach to the intersection. It is recommended that the Town of Agawam consider the re-design of this approach to determine if it is possible to provide two travel lanes and address the existing alignment issues on the Springfield Street approach to the intersection.

3. Private Curb Cuts

The gas station on the southwest corner of the intersection has two curb cuts on the eastbound approach of the intersection. Consolidation of these curb cuts could improve safety and reduce driver confusion. This will require permission from the property owner.

4. Clifford M. Granger Elementary School

The Clifford M. Granger Elementary School has a curb cut on Springfield Street within close proximity to the intersection that is used as the parent drop off/pick up area for students. Long queues can develop out of this driveway and onto the shoulder of Springfield Street during the afternoon. This interferes with eastbound traffic operations, particularly right turning traffic from South Westfield Street. To alleviate this problem, it

is recommended that the Town of Agawam consult with both the school and the school committee to determine if an alternate circulation pattern could be developed that would not negatively impact the intersection.

5. Pavement Markings

At the time of the field inventory, it was observed that the pavement markings and crosswalks were very faded. The Town of Agawam should consider re-painting the pavement markings to decrease driver confusion at the intersection. Improved pavement markings with a more defined shoulder on Springfield Street approach to the intersection would also direct motorists to form one lane of travel.

6. Signal Timing Plan Changes

PVPC analyzed the impact of changes to the existing traffic signal timing plan on intersection operations. This is recommended as a short term solution to reduce delay. Currently, the eastbound and westbound approaches are allocated nearly twice as much time as the northbound and southbound approaches in the signal timing plan. This contributes to the long delays experienced in the northbound and southbound directions during the 2-4 Peak and PM peak hour. No changes were proposed for the AM peak hour as this intersection currently operates at acceptable Levels of Service (LOS) during this time period. Table III-1 presents a summary of the LOS at this intersection with proposed changes to the signal timing plan.

Table III-1 Level of Service with Changes to Timing Plan

	PM Peak		2-4 Peak	
Movement	**Delay***	**LOS****	**Delay***	**LOS****
Eastbound Through/Left	33.4	C	40.8	D
Eastbound Right Turn	4.1	A	1.2	A
Westbound Left Turn	24	C	24.2	C
Westbound Through/Right	43.5	D	41.7	D
Northbound Left Turn	47.7	D	40.2	D
Northbound Through/Right	40.2	D	56.2	E
Southbound Left Turn	40.8	D	39.4	D
Southbound Through/Right	47.4	D	51.7	D
Overall	**38.2**	**D**	**39.5**	**D**

**** = In Seconds***
***** = Level of Service***

The proposed changes to traffic signal timings result in a reduction in delay for traffic traveling northbound which currently experiences the longest delays. The Level of Service (LOS) for northbound left turns improved from LOS “F” to LOS “D” and northbound through traffic improved from LOS “E” to LOS “D” during the PM peak hour. This in turn reduces the overall delay experienced at the intersection, but at the expense of the other three approaches to the intersection. Delay was observed to increase for eastbound traffic from LOS “B” to LOS “C” and for westbound traffic from LOS “C” to LOS “D” during the PM peak hour. The new timing plan had similar results on operations during the 2-4 Peak.

It is recommended that the Town of Agawam consider the implementation of a new timing plan for the 2-4 Peak and PM peak hour to address the long delays experienced by northbound traffic in the short term. It is also recommended that the intersection be monitored on a regular basis to gauge the effectiveness of the intersection as traffic volumes fluctuate over time.

In addition to the proposed signal timing changes, the following improvements to the existing traffic signal timing are also recommended.

- Consider increasing the all-red phase from one to two seconds. This could reduce crashes at the intersection, particularly those related to traffic signal violations.
- The Town of Agawam should consider researching the capabilities of the existing traffic signal control unit for this intersection. Many controllers have features to optimize the signal timing length based on traffic demand. Use of more advanced features could maximize the efficiency of the intersection.
- Currently, the signal timing plan allocates 20 seconds for pedestrians to cross the street. This may not be sufficient time for younger school children to cross the street. It is recommended that the Town of Agawam consider increasing the pedestrian walk time to assist younger children in crossing the street.

7. Safety

It is recommended that a collision diagram be developed for the intersection. A collision diagram is a detailed map that plots the most recent crash history of the intersection. This requires research from the actual reports filed for each of the crashes at the intersection. Information from the collision diagram will help to establish ongoing trends and crash patterns and could assist in the development of additional recommendations to increase safety. The PVPC will include the development of a collision diagram for this intersection as a task in a future Unified Planning Work Program (UPWP).

8. Proposed Shoemaker Lane Development

An 8,400 square foot retail development is proposed at the intersection of Route 57 with Shoemaker Lane. This project could include mitigation measures to improve the intersection of Springfield Street, North Westfield Street (Route 187), Southwick Street (Route 57) and South Westfield Street (Route 187). It is recommended that the Town of Agawam continue communications with both MassHighway and the project proponent to coordinate all ongoing improvements to the study area intersection.

9. Route 187 Improvement Project

A reconstruction project for a section of Route 187 in Agawam is included as part of the Transportation Improvement Program (TIP) for the Pioneer Valley. Currently in the design process, this project is estimated to begin construction in 2009. The project includes minor alignment modifications as well as traffic signal and geometric improvements for the Feeding Hills Center intersection. It is recommended that the Town of Agawam continue to advance the design of this project with MassHighway to improve existing traffic congestion and safety at this intersection.

B. ROUTE 57 PHASE II

The Town of Agawam requested that additional information be included as part of this study on the proposed Route 57 Phase II extension project. This project consists of the extension of the existing limited access portion of Route 57 from Route 187 to the Agawam/Southwick line, creating a new bypass to the Feeding Hills Center intersection.

The PVPC performed an additional analysis on the impacts of the Route 57 Phase II project using the regional transportation model. Results from the regional model indicate that the project would reduce left turns from North Westfield Street by 85%. In addition, right turns from Southwick Street are reduced by 32% and left turns from Springfield Street are reduced by 24%. The lowest reductions occur for traffic on South Westfield Street which was estimated to have 15% less traffic based in the future years of the regional transportation model.

Information from the Massachusetts Highway Department shows that the design of Phase II of the Route 57 Phase II project was suspended under the Commonwealth's Fix-It-First policy. An updated estimate of the construction cost for this project is approximately $42.0 million. However, there is currently no design contract for the project and the design would have to be updated to meet current standards. Environmental permits that still need to be obtained include:

- Superseding Order of Conditions from DEP
- Wetland Variance from DEP
- Water Quality Certificate from DEP
- Individual Section 404 Permit from US Army Corps of Engineers
- NPDES permit from US EPA
- Agreement from MA Department of Agriculture on farmland mitigation
- Massachusetts Endangered Species Act approval.

The Right of Way that has been acquired to date to construct the project includes mainly residential parcels that required the relocation of owners. Approximately 201 acres of other land still would need to be acquired to construct the project. The project is currently included as part of the Regional Transportation Plan as a long range improvement, but does not appear as part of the region's Transportation Improvement Program.