CENTRAL MASSACHUSETTS METROPOLITAN PLANNING ORGANIZATION (CMMPO)

Holden - Paxton - Spencer
Route 31 Corridor Profile
Technical Appendix

Central Massachusetts Metropolitan Planning Organization
2 Washington Square - Union Station
Worcester, MA 01604-4016

Prepared by the transportation staff of the

Central Massachusetts Regional Planning Commission

September 2014

Prepared in cooperation with the Massachusetts Department of Transportation and the U.S. Department of Transportation – Federal Highway Administration and the Federal Transit Administration. The views and opinions of the Central Massachusetts Regional Planning Commission expressed herein do not necessarily reflect those of the Massachusetts Department of Transportation or the U.S. Department of Transportation.

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Route 31 Corridor Profile
Letters of Support

- Massachusetts Legislatures
- Adam Gaudette, Town of Spencer

The Commonwealth of Massachusetts

HOUSE OF REPRESENTATIVES
STATE HOUSE, BOSTON 02133-1054

PETER J. DURANT
STATE REPRESENTATIVE
6TH WORCESTER DISTRICT

Committees:
Transportation
Elder Affairs

STATE HOUSE, ROOM 33
TEL. (617) 722-2060
Peter.Durant@MAhouse.gov

November 26, 2012

Richard A. Rydant
Principal Transportation Planner
CMMPO/CMRPC
2 Washington Square, Union Station
Worcester, MA 01604-4016

RE: Route 31 Corridor Study

Dear Mr. Rydant:

I am pleased write to express my support for the request that the Central Massachusetts Regional Planning Commission (CMRPC) perform a sub-regional corridor profile on Route 31 through Charlton/Spencer/Paxton.

Route 31 serves as a primary road in Central Massachusetts for North-South travel. Those dependent on this road include emergency responders, private citizens, local businesses, those commuting to work, schools, product transportation and more. This is a heavily traveled road that is essential to the local community and its economy.

Also crucial to the Rt. 31 corridor is Meadow Road, serving as a northward connection to Rt. 31 from Rt. 9 when traveling east. This is also very heavily travelled; therefore I respectfully request that Meadow Road in Spencer be included in any potential Corridor Study on Rt. 31.

The increased attention and potential funding that a CMRPC corridor study would provide to the region is crucial. I enthusiastically support all efforts to improve the area's transportation infrastructure and urge the CMRPC to strongly consider action on this request.

I want to thank the CMRPC and staff for your continued support and assistance in addressing regional transportation infrastructure and for considering worthy projects such as the Rt. 31 Corridor Study described above.

If you have any questions or concerns regarding this proposal, or if the Town of Spencer can be of any further assistance, please contact my office at (617) 722-2060.

Very Truly Yours,

Peter J. Durant
State Representative,
Sixth Worcester District

THE GENERAL COURT OF MASSACHUSETTS
STATE HOUSE, BOSTON 02133-1053

November 27, 2012

Richard A. Rydant
Principal Transportation Planner
CMMPO/CMRPC
2 Washington Square, Union Station
Worcester, MA 01604-4016

RE: Route 31 Corridor Study

Dear Mr. Rydant:

Our offices would like to formally express our support of the Central Massachusetts Regional Planning Commission (CMRPC) performing a sub-regional corridor profile on Route 31 through Charlton, Spencer and Paxton.

Route 31 is an important North/South course servicing the region and many of its businesses, employees, and their respective shipping/receiving operations. Also important to Route 31 corridor is the Meadow Road connection to Route 31 from Route 9. Including Meadow Road in the Corridor study is of the utmost importance so that it may be included in your recommendations for future improvements.

We would like to thank the CMRPC and staff for their continued support and assistance in addressing regional transportation infrastructure needs and for considering the worthy projects such as the Route 31 Corridor Study described above.

If you require additional information or if the Town can be of any further assistance, please contact Brian Ferrarese in Rep. Gobi's office (617-722-2210), Joseph Sullivan in Sen. Brewer's office (617-722-1540), or Alexander Rittershaus in Rep. Ferguson's office (617-722-2263).

Sincerely,

Anne M. Gobi
5th Worcester District

Stephen M. Brewer
Worcester, Hampden, Hampshire, Franklin

Kimberly N. Ferguson
1st Worcester District

TOWN OF SPENCER
MASSACHUSETTS
BOARD OF SELECTMEN

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December 12, 2012

Richard A. Rydant
Principal Transportation Planner
CMMPO/CMRPC
2 Washington Square, Union Station
Worcester, MA 01604-4016

Re: Route 31 Corridor Study

Dear Mr. Rydant:

The purpose of this letter is to advise the Central Massachusetts Regional Planning Commission (CMRPC) that this office and the Spencer Board of Selectmen are in support of CMRPC performing a sub-regional corridor profile on Route 31 through Charlton/Spencer/Paxton.

Route 31 is an important north/south arterial/collector servicing the region and many local businesses, residents and nearby communities.

Also, important to the corridor is the Meadow Road connection to Route 31 from Route 9. We therefore respectively highlight the need for and request that Meadow Road from Route 9 (W. Main Street) to Route 31 (Pleasant Street/N. Spencer Road) be included in the Corridor Study so that it may be appropriately included in your recommendations for future improvements.

On behalf of the Spencer board of Selectmen and the entire Town, I would like to thank the CMRPC for their continued support and assistance addressing our transportation infrastructure needs and for considering the worthy projects such as the Route 31 Corridor Study described above.

If you require additional information, or if the Town can be of further assistance, please contact me at (508) 885-7500 ext. 155.

Best Regards,

Adam D. Gaudette (bls)

Adam D. Gaudette, AICP
Town Administrator

Route 31 Corridor Profile
Technical Advisory Group

Meeting Agendas

Spencer - February 5, 2013
Paxton - April 9, 2013
Holden - June 4, 2013
Spencer - August 13, 2013
Paxton - October 8, 2013
Holden - December 10, 2013
Spencer - February 11, 2014
Paxton - April 8, 2014
Holden - June 10, 2014
Spencer - August 12, 2014

Central Massachusetts
Metropolitan Planning Organization

Date:	February 5, 2013 at 10:00 AM
Topic:	Route 31 Corridor Profile: Host Communities of Holden, Paxton, and Spencer
Location:	Spencer Town Hall
Invited Participants:	Rich Rydant, CMRPC transportation staff Steve Tyler, Town of Spencer Town of Holden Town of Paxton

AGENDA

1.) Welcome & Introductions

2.) Corridor Profile Overview & Previous Work Examples

3.) Route 31 Corridor Profile Study Proposal & Letters of Support

4.) Study Area Maps

5.) Traffic Volumes

6.) Bridge Management System (BMS)

7.) Safety Management System (SMS)

8.) Public Transportation

9.) Environmental Profile

10.) TIP Development Schedule & Status Update Materials

11.) Next Meeting: April 2013

12.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date:	April 9, 2013 at 10:00 AM
Topic:	**Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location:	Paxton Town Hall
Invited Participants:	Rich Rydant, CMRPC transportation staff Town of Holden Town of Paxton Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Host Community Contact Information

3.) Host Community Base Maps

4.) Host Community Observations

5.) Planned Traffic Volume Data Collection Effort

6.) Alternative Modes

7.) Pavement & Safety Management Systems

8.) Environmental Profile

9.) Bridge Management System (BMS)

10.) Related Efforts

11.) Next Meeting: June 2013, Town of Holden (TBD)

12.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date:	June 4, 2013 at 10:00 AM
Topic:	**Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location:	Holden Town Hall
Invited Participants:	Rich Rydant, CMRPC transportation staff Town of Holden Town of Paxton Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Host Community Contact Information

3.) Host Community Base Map

4.) Traffic Volume Data Collection Effort

5.) Travel Time & Delay Studies

6.) Environmental Profile

7.) Host Community Observations

8.) Pavement & Safety Management Systems

9.) Related Efforts

10.) Next Meeting: August 13, 2013, Spencer Town Hall

11.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date:	August 13, 2013 at 10:00 AM
Topic:	**Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location:	Spencer Town Hall
Invited Participants:	Rich Rydant, CMRPC transportation staff Kevin Krasnecky, CMRPC transportation staff Town of Holden Town of Paxton Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Host Community Contact Information

3.) Host Community Base Map

4.) Traffic Volume Data Collection & Analysis

5.) Environmental Profile: Major Roadway Drainage Structures

6.) Vehicle Crash Research

7.) Host Community Related Topics

8.) Next Meeting: October 8, 2013, Paxton Senior Center

9.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date:	October 8, 2013 at 10:00 AM
Topic:	**Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location:	Paxton Council on Aging, White Building 17 West Street
Invited Participants:	Rich Rydant, CMRPC transportation staff Town of Holden Town of Paxton Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Host Community Contact Information

3.) Host Community Base Maps

4.) Traffic Volume Data Collection & Analysis

5.) MassDOT Seasonal Factors for Traffic Volumes

6.) Environmental Profile: Major Roadway Drainage Structures

7.) Vehicle Crash Research

8.) Host Community Observations

9.) Host Community Related Topics

10.) Next Meeting: December 10, 2013, Holden Town Hall

11.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date:	December 10, 2013 at 1:00 PM
Topic:	**Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location:	Holden Town Hall, 1196 Main Street
Invited Participants:	Rich Rydant, CMRPC transportation staff Kevin Krasnecky, CMRPC transportation staff Town of Holden Town of Paxton Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Host Community Contact Information

3.) Host Community Base Maps

4.) Traffic Volume Analysis

5.) Site Specific Trip Generation

6.) Pavement Management System (PMS) Regional Program

7.) Environmental Profile: Major Roadway Drainage Structures

8.) Host Community Observations

9.) Corridor Profile Report Document Compilation

10.) Host Community Related Topics

11.) Next Meeting: February 11, 2014, Spencer Town Hall at 1:00 PM

12.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date:	February 11, 2014 at 1:00 PM
Topic:	**Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location:	Spencer Town Hall
Invited Participants:	Rich Rydant, CMRPC transportation staff Kevin Krasnecky, CMRPC transportation staff Town of Holden Town of Paxton Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Host Community Contact Information

3.) Host Community Base Maps

4.) Major Employers, Trucking Generators, and other Significant Land Uses

5.) Site Specific Background Development

6.) Vehicle Classification

7.) Safety Management System Report Chapter

8.) Water Features Intersecting Route 31

9.) Identified Corridor Deficiencies

10.) Overall Corridor Profile Findings Matrixes

11.) Overall Corridor Profile Suggested Improvement Options Matrixes

12.) Next Meeting: April 8, 2014, Paxton Senior Center at 1:00 PM

13.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date:	April 8, 2014 at 1:00 PM
Topic:	**Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location:	Paxton Senior Center
Invited Participants:	Rich Rydant, CMRPC transportation staff Kevin Krasnecky, CMRPC transportation staff Town of Holden Town of Paxton Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Congestion Management Process: Future Year 2023 Projected Operations

3.) MassDOT Safety Initiative

4.) Bridge Management System

5.) Community Identified Deficiencies

6.) Management System Analysis Findings

7.) Suggested Improvement Options

8.) Next Meeting: June 10, 2014, Holden Town Hall at 1:00 PM

9.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date:	June 10, 2014 at 1:00 PM
Topic:	**Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location:	Holden Town Hall
Invited Participants:	Rich Rydant, CMRPC transportation staff Kevin Krasnecky, CMRPC transportation staff Town of Holden Town of Paxton Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Annual Environmental Consultation Session

3.) Congestion Management Process: 2023 Level of Service with Improvements

4.) Report Compilation Introduction

5.) Suggested Improvement Options for Host Community Consideration

6.) Last Meeting: August 12, 2014, Spencer Town Hall at 1:00 PM

7.) Adjournment

Central Massachusetts
Metropolitan Planning Organization

Date: August 12, 2014 at 1:00 PM
Topic: **Route 31 Corridor Profile**: Host Communities of Holden, Paxton, and Spencer
Location: Spencer Town Hall

Invited Participants: Rich Rydant, CMRPC transportation staff
Kevin Krasnecky, CMRPC transportation staff
Town of Holden
Town of Paxton
Town of Spencer

AGENDA

1.) Welcome & Introductions

2.) Corridor Profile Report Series

3.) Report Compilation Update

4.) MassDOT Strategic Highway Safety Plan (SHSP): Reduction of Lane Departure Crashes at Locally-Owned, High Crash Curve Locations

5.) Refined Suggested Improvement Options: Host Community Project Prioritization & Preliminary Cost Estimates

6.) Future Host Meetings: Holden
Paxton
Spencer

7.) Adjournment

Host Community
Transportation Topics

- **Town of Holden**
- **Town of Paxton**
- **Town of Spencer**

Town of Holden

- Neighborhood SAFE Report
- News Articles

Neighborhood SAFE

Holden, Massachusetts

CMMPO
Central Massachusetts Metropolitan Planning Organization

May 2014 -
Prepared by

CMRPC
Central Massachusetts Regional Planning Commission

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Prepared in cooperation with the Massachusetts Department of Transportation and the U.S. Department of Transportation – Federal Highway Administration and the Federal Transit Administration. The views and opinions of the Central Massachusetts Regional Planning Commission expressed herein do not necessarily reflect those of the Massachusetts Department of Transportation or the U.S. Department of Transportation.

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1.0: Introduction - What is Neighborhood SAFE?

Neighborhood SAFE is a new, proactive approach that CMRPC is undertaking in order to provide communities with small area infrastructure assessments from a pedestrian and bicyclist safety perspective. CMRPC has launched this effort to achieve the following objectives:

- **Increase awareness of walkability in communities throughout the region**
- **Identify safety issues that pedestrians and bicyclists face**
- **Provide neighborhood safety analysis for all users of the transportation system**
- **Generate enthusiasm for alternative modes of travel**

This report will provide a summary of existing issues and potential improvements that are intended to make walking and biking safer and more attractive modes for transportation system users. Particular emphasis has been placed on walking and biking accessibility for school aged children. Elements of the Safe Routes to School (SRTS) program and the Road Safety Audit (RSA) program will play a part in each neighborhood assessment, a brief overview of both programs is provided in the following section. This assessment includes recommendations that can be implemented through municipal, state, or federal funding, depending on the size and scope of the future project. This report will detail the conditions of the selected area, and provide a toolbox for a range of improvements that vary in complexity and cost.

Neighborhood SAFE combines elements of Safe Routes to School (SRTS) Assessments and Road Safety Audits (RSAs) to provide communities with guidance related to infrastructure issues and improvements for selected focus areas.

1.1 Neighborhood SAFE - Background

Safe Routes to School

The Federally funded SRTS program is administered through the Massachusetts Department of Transportation (MassDOT). Safe Routes to School is a program that has the following purpose:

- To enable and encourage children, including those with disabilities, to walk and bicycle to school;
- To make bicycling and walking to school a safer and more appealing transportation alternative, thereby encouraging a healthy and active lifestyle from an early age; and
- To facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools.

In Massachusetts, the SRTS program has two components: MassRIDES, the Commonwealth's travel option service, provides an educational and encouragement program to school age children; while the infrastructure component is handled by MassDOT. MassDOT seeks to promote healthy lifestyles among the next generation of Massachusetts residents. It is MassDOT's desire that the SRTS program not only creates healthy habits that will last a lifetime, but also to help educate school children on the importance of ensuring opportunities for active transportation in the way that it builds and operates the Commonwealth's transportation system.

Road Safety Audits (RSAs)

The Federal Highway Administration defines a Road Safety Audit (RSA) as the formal examination of an existing or future road or intersection by an independent, multidisciplinary team. The purpose of an RSA is to identify potential safety issues and possible opportunities for safety improvements considering all roadway users. The Neighborhood SAFE project will incorporate certain aspects of an RSA, without a specific project taking place.

The entrance to Hopedale Junior-Senior High School which is a MassRIDES partner school. No schools in Holden currently participate in this program.

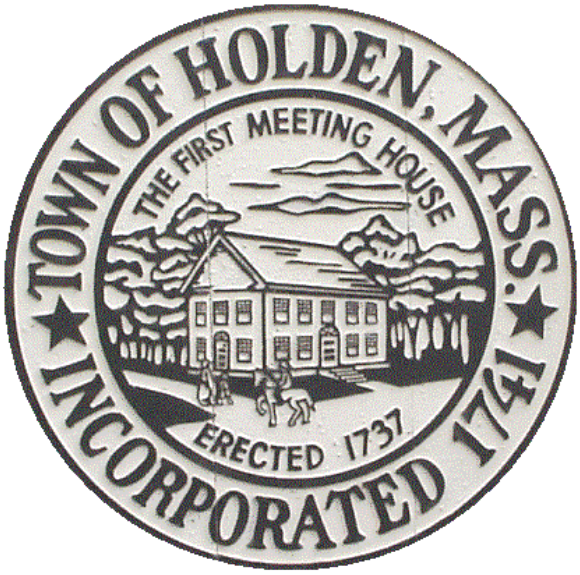
1.2: State Policy related to Neighborhood SAFE

massDOT
Massachusetts Department of Transportation

GreenDOT

Global Warming Solution Act 2008
GreenDOT
Healthy Transportation Compact

1.3: Town of Holden – Study Area



Neighborhood SAFE - Holden, MA
Figure I: Town Center

0 0.05 0.1 0.2 Miles

N

CMRPC
Central Massachusetts Regional Planning Commission

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution intrepreting positional accuracy.

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Worcester, MA 01604

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Neighborhood SAFE - Holden, MA
Figure II: Analysis Area

0 0.05 0.1 0.2 Miles

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Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

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2.0: Field Assessment - Introduction

CMRPC Staff, consisting of Dan Daniska and Nick Burnham, performed a preliminary field assessment of conditions surrounding Town Hall and Davis Hill Elementary School on August 14, 2013. This preliminary site visit allows CMRPC Staff to get a feel for conditions surrounding the targeted locale. Infrastructure is assessed in order to determine impediments to safe bicycling and walking in the area.

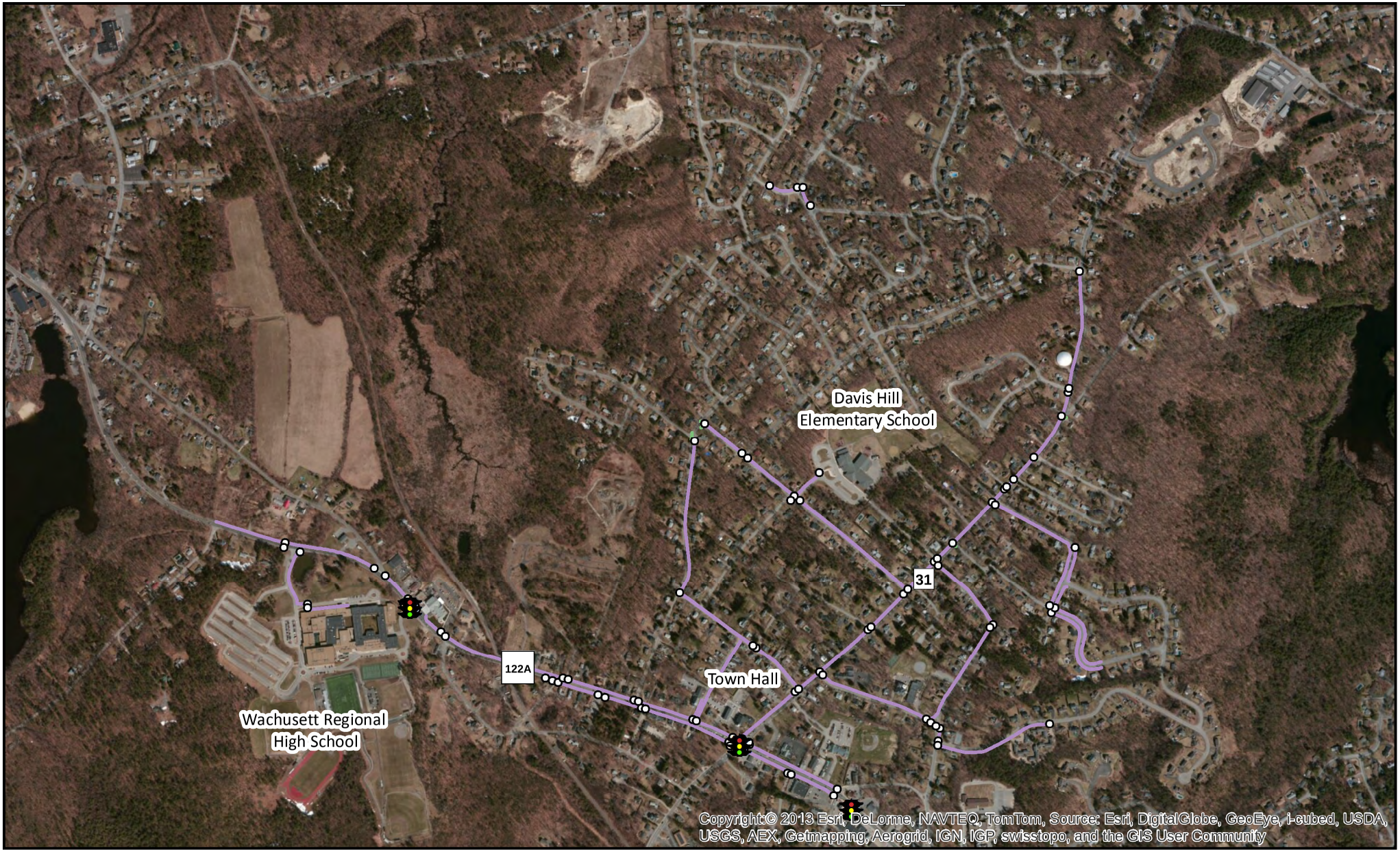
The pre-assessment consists of cataloging the location of major streets and key walking and bicycling infrastructure including: sidewalks, crosswalks, traffic signals, pathways, and other factors related to traffic control. Field measurements were taken of crosswalk width as well as sidewalk width and condition. Pedestrian signals were timed to see how long people have to make it safely across the intersection of MA-31 (Highland/Reservoir Sts.) and MA-122A (Main St.).

Map 3 depicts the bicycling and walking infrastructure (where present) analyzed by CMRPC staff, including the location of sidewalks, crosswalks, and traffic signals. It should be noted that staff analysis and the Walking Audit occurred during the summer months; snow removal and issues relating to walkability in the winter season are not covered in this report. However, local stakeholders should take pedestrian and bicyclist accommodation and safety under consideration during the time of the year when children are in school. Additionally, due to the timing of the project, staff were unable to observe arrival and dismissal at the Davis Hill Elementary School. Town stakeholders should take these two times of day under consideration when planning for improvements.

The following section of the report will provide initial observations from CMRPC staff regarding the field visit and infrastructure assessment. Analysis has been broken down into three separate categories: Sidewalks/Crosswalks and other related infrastructure, Traffic Volumes, and Auto/Bike/Pedestrian Crashes.

The utility pole and overgrown shrubbery in the sidewalk are impediments to all transportation users.

Crosswalk lines at the Davis Hill School that have faded away over time.



Legend

- Signalized Intersections
- ADA_Ramps
- Crosswalk
- Sidewalks

Neighborhood SAFE - Holden, MA
Figure III: Infrastructure

0 0.05 0.1 0.2 Miles

N

CMRPC
Central Massachusetts Regional Planning Commission

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution intrepreting positional accuracy.

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Pre-Walking Audit Observations (CMRPC Staff)

- Overall, the condition of the sidewalks in the study area varies from excellent to poor, with moderate issues along isolated segments of various streets.
- The area has an extensive sidewalk network for a smaller municipality; many streets in the study have a sidewalk on at least one side of the street.
- Sidewalk construction and width varies greatly throughout the area. There are segments that are wide toward the center of Town, while some residential areas are extremely narrow.
- The narrow sidewalks in the neighborhoods to the east of MA-31 present accessibility issues for persons with disabilities.
- There is a lack of ADA compliant access ramps and panels throughout the study area.
- On street parking is almost non-existent in the neighborhoods, as the majority of homes have driveways. However, the high number of driveways does present a safety issue for small children.

2.0: Field Assessment - Continued

Sidewalks, Crosswalks, and other related infrastructure.

This portion of sidewalk on Main Street is in good condition. The brick buffer provides space between the sidewalk and the roadway.

The sidewalk on Highland Avenue starts at 6' in width and then drastically reduces to 3' in width. The sudden change in width can cause accessibility issues and may force users to travel in the roadway.

The sidewalk at the corner of Highland Street and Jamieson Road is in poor condition. Severe rutting and heavy cracking can cause potential tripping hazards.

2.0: Field Assessment - Continued

Pre-Walking Audit Observations (CMRPC Staff) Continued:

- High levels of fast moving traffic on MA-122A and MA-31 present safety issues for crossing pedestrians.
- There is no safe storage area for bicycles on the Davis Hill Elementary School property, Town Hall, or the Public Library.
- The pedestrian signal heads at the intersection of MA-122A / MA-31 lack timers, certain legs of the intersection are extremely wide to cross, a visible counter would aid pedestrians in decision-making.
- Crosswalk striping at the Davis Hill School is nearly faded away entirely due to traffic, school bus, and pedestrian use.
- Crosswalk striping at the MA-122A / MA-31 intersection is faded due to heavy traffic.
- A local resident informed CMRPC staff that a good amount of children walk to school from neighborhoods to the east of MA-31, they are led by parents across the street in the vicinity of Jamieson Road and Damon Road.
- Crosswalks along MA-31 lack Pedestrian warning signage; this is a concern considering the amount of walking schoolchildren in the area. It should be noted that Yield to Pedestrians has been painted on the roadway. Additional signage would provide motorists with a higher warning level.
- A business owner located adjacent to Holden Town Hall indicated to CMRPC Staff the desire for additional crosswalks to safely access the businesses across from Town Hall. The owner stated their foot traffic consists of children and adolescents from nearby schools as well as town staff.

Crosswalk striping at the Davis Hill School that has faded away due to heavy activity throughout the school year.

The 'Yield to Pedestrian' marking that has been placed on Highland Street to warn motorists of the crosswalk nearby.

Traffic Speeds and Volumes:

- *Based on Traffic Volumes collected by CMRPC in 2013, MA-122A South of MA-31 carries approximately 20,000 vehicles per day.*
- *Based on Traffic Volumes collected by CMRPC in 2013, MA-31 South of MA-122A carries approximately 12,500 vehicles per day.*
- *Based on Traffic Volumes collected by CMRPC in 2013, MA-31 North of MA-122A carries approximately 8,000 vehicles per day.*

Crash Analysis:

- There are approximately 20 Automobile Crash Clusters located within the analysis area. All clusters are concentrated along MA-31 and MA-122A.
- There is a Crash Cluster at the intersection of MA-31 & MA-122A that is in the Top 5% of locations region wide. The intersection is ranked #44 in the CMRPC region, with 38 crashes from 2007-2009. There were 11 injury crashes, 27 non-injury crashes. The Crash Cluster has an Equivalent Property Damage Only (EPDO) score of 82. The trend continues in the 2009-2011 timeframe, the updated cluster contains 36 crashes. There were 6 injury crashes, 30 non-injury crashes. The Crash Cluster had a EPDO score of 60 for 2009-2011.
- Between 2007 and 2009, there were 107 automobile crashes in the study area. Twenty-eight of the crashes were of the non-fatal injury type, seventy-six were property damage only crashes (no injuries), and two had no report.
- Between 2009 and 2011, there were 113 automobile crashes in the study area. Fourteen of the crashes were of the non-fatal injury type, ninety-eight were property damage only crashes (no injuries), and one had no report.

2.0: Field Assessment - Continued

Traffic Speeds / Volume Crash Analysis

See Map #4 for Crash Analysis Visualization.

There is a Bicycle Crash Cluster located near Highland Street (MA-31) and Orchard Road.

- 2 Crashes between 2002-2011; 1 Injury, 1 Non-Injury, EPDO = 6

There is a Pedestrian Crash Cluster located at the intersection of Highland Street (MA-31) and Main Street (MA-122A).

- 3 Crashes between 2002-2011; 3 Injury, EPDO = 15.

Individual Bike & Pedestrian Crashes are visualized for 2002-2011.

Legend

- HSIP Clusters 09-11
- Ped Cluster 02-11
- Bike Cluster 02-11
- Crash Cluster 09-11
- Bike Crashes 02-11
- Ped Crashes 02-11

Neighborhood SAFE - Holden, MA
Figure IV: Crash Analysis

0 0.05 0.1 0.2 Miles

N

CMRPC
Central Massachusetts Regional Planning Commission

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

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2 Washington Square, Union Station
Worcester, MA 01604

Z:\GIS Library\GIS Workspaces\Management systems GIS\Safety\Neighborhood SAFE Pilot Project\Neighborhood SAFE - Holden - 8-2013\Map-4-Crash Analysis.mxd

3.0 Audit Meeting

In a meeting hosted by the town of Holden on August 27, 2013, CMRPC Staff held a Walkable Communities/Neighborhood SAFE workshop. The first hour of the workshop was an overview of what makes up a walkable community as well as an introduction to the Neighborhood SAFE pilot project.

The objectives for the meeting were as follows: to increase awareness of walkability, identify safety issues that pedestrians and bicyclists face, provide neighborhood safety analysis, and to generate enthusiasm. CMRPC staff discussed what makes neighborhoods walkable, challenges to walkability, and potential design solutions. Neighborhood SAFE was introduced as a hybrid of Road Safety Audits (RSAs), Bike/Pedestrian Audits, Safe Routes to School (SRTS), and other programs to conduct a "neighborhood" safety audit for non-motorized users of the transportation system.

A broad spectrum of stakeholders attended the meeting, including members of the following:

- Town Manager
- Town Planning Board
- Board of Selectmen
- Transportation & Circulation Committee
- Recreation Director
- Fire Chief
- Town Planner
- DPW Director
- Senior Civil Engineer
- MassDOT District III
- MassRIDES/Safe Routes to School
- Historic Commission
- Interested Citizens

Holden Center

Holden Recreation Area

4.0 Audit Observations

Walking Audit

Participants were given brief instructions as to what they should be on the lookout for during the "walk" around the targeted area. Map #5 on the following page outlines the walking route. Issues related to the following topics were stressed:

- Traffic/Motorists, including speed, sightlines, failure to yield for pedestrians or bicyclists.
- Pedestrian, including line of sight, overall feeling of comfort/safety, sidewalks and lighting.
- Crosswalks and Intersections, including width of streets, pavement conditions, line of sight, and time it takes to safely cross.
- Bicycling issues, including shoulder width, presence of marked bike lanes, signage, and perceived level of comfort.

Meeting attendees during the walking audit observing Jamieson Road.

The focus of the August 27th workshop was on a pre-defined walkability route near the center of Holden and Davis Hill Elementary school, however, concerns and ideas generated at the audit were applied to the larger geographic area during the analysis phase.

Audit Observations

General, area-wide observations:

- There are a great deal of school age children that walk to and from school.
- Children that live within one mile of the schools in Town are supposed to walk to school.
- There are gaps in the sidewalk network in important locations, safety of pedestrians should be a primary concern.
- Inconsistent sidewalk network, it varies in material and width.
- Lack of curb-cuts on the corners of intersections, Main and Maple Streets as an example.
- Striping/Signage/Crosswalks have been recently updated/restriped.

A crosswalk near the Davis Hill School that has been restriped and a pothole that has been patched over before the start of a new school year.

Neighborhood SAFE - Holden, MA
Figure V: Walkability Audit Route

0 0.05 0.1 Miles

N

CMRPC
Central Massachusetts Regional Planning Commission

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

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Z:\GIS Library\GIS Workspaces\Management systems GIS\Safety\Neighborhood SAFE Pilot Project\Neighborhood SAFE - Holden - 8-2013\Map-5-Walking Audit Route.mxd

Highlighted Locations:

Lovell Road: Main Street to Jamieson Road

- House on Lovell Rd with a Dead-End Sidewalk, Crosswalks to nowhere near Dorothy & Jamieson.
- Main Street to Walnut , no sidewalks, heavy use by school children.
- Speed is an issue on Lovell, it is a narrow residential street.

Elementary School Area

- Quite busy in the morning and afternoon with commuters and after-school activities. The group was in agreement that this area needs more attention, and improvements are warranted.
- Discussion regarding alternative entrances to the school, non-motorized transportation options.
- Speed is an issue on Jamieson, it is a somewhat narrow residential street, with heavy levels of school-related traffic.

Highland Street Corridor

- Sidewalk on Highland, Damon, and Armington is narrow.
- Sight line issues at Highland and Union.
- The driveway from the Mobil gas station onto MA-31 is a safety issue.
- The Crosswalk has been improved at the intersection of MA-31 and MA-122A, but the pedestrian cycle is short for such a large section of asphalt.
- Issues of speeding near the crosswalk to the municipal/library parking lot on Highland Street. There is an orange barrel with a sign in the middle of the road to warn motorists.

4.0 Audit Observations

A pedestrian entrance to the Davis Hill School from Damon Road. The chain-link fence and concrete pole are in place to deter any motorists from entering.

A crosswalk on Lovell Road near the Davis Hill School with signage to warn oncoming motorists of pedestrians crossing.

Neighborhood SAFE - Holden, MA
Figure VI: Highlighted Areas

0 0.05 0.1 Miles

N

CMRPC
Central Massachusetts Regional Planning Commission

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution intrepreting positional accuracy.

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Worcester, MA 01604

Z:\GIS Library\GIS Workspaces\Management systems GIS\Safety\Neighborhood SAFE Pilot Project\Neighborhood SAFE - Holden - 8-2013\Map-6-Highlighted Areas.mxd

5.0 Summary and Short-Term Potential Enhancements

The intent of this report is to provide a summary of existing issues and potential improvements that could make walking and biking safer and more attractive modes for transportation system users. Particular emphasis was placed on walking and biking accessibility for school aged children. Elements of the Safe Routes to School (SRTS) program and the Road Safety Audit (RSA) program played a part in the assessment. The included recommendations can be implemented through municipal, state, or federal funding, depending on the size and scope of the future project. The recommendations have been broken into three categories: Short, Mid, and Long Term. These categories are loosely based on project scope and anticipated costs.

Estimated Enhancement Timeline & Costs			
Time Period		Costs	
Short-Term	< 1 Year	Low	< $10,000
Mid-Term	1-3 Years	Medium	$10,000-$50,000
Long-Term	> 3 Years	High	> $50,000

- **Short-Term**: Consider signage and possibly shared lane markings along streets that are more heavily traveled by bicyclists.
- **Short-Term**: Ensure that there is adequate street lighting surrounding areas in the town center that see nighttime activities.
- **Short-Term**: Traffic enforcement throughout the town-center area, especially on neighborhood roads that are used by schoolchildren. Ensure that the Speed Limit is clearly posted.
- **Short-Term**: Repaint and enhance crosswalks and related roadway markings so that they are easier to see for motorists and pedestrians. (The Town of Holden had accomplished this in between CMRPC's initial field work and the Neighborhood SAFE meeting.)
- **Short-Term**: Monitor snow removal efforts to provide adequate clear paths along sidewalks and walking routes. This is important to encourage safe walking during the school year.

- **Mid-Term**: Study intersections along MA-31 north of MA-122A, focus on pedestrian needs and safe crossing.
- **Mid-Term**: Study the possibility of mid-block crossings where heavy foot traffic exists.
- **Mid-Term**: Install related safety signage in concert with crossing upgrades along MA-31 North. Advance warning signage for crosswalks can consist of W11-2 Pedestrian warning signs with a supplemental "AHEAD" plaque.
- **Long-Term**: Consider providing or enhancing pedestrian crossings with curb extensions, pedestrian hybrid beacons (MA-31/MA-122A corridors), and/or raised crosswalks to increase pedestrian safety, comfort, and compliance.
- **Long-Term**: Consider constructing raised intersections in areas with high pedestrian traffic in order to calm vehicular traffic, improve pedestrian comfort and safety, and improve conditions for pedestrians with disabilities.
- **Long-Term**: Allow for consistent visual and physical treatments of pedestrian related infrastructure, as this will help users easily identify and use facilities.
- **Long-Term**: Consider installing standard width, ADA compliant sidewalks along MA-31 in the town center.
- **Long-Term**: Work with area residents to bring neighborhood sidewalks into compliance with ADA.
- **Long-Term**: Consider widening MA-31 to allow for bicycle lanes when the road is due for rehabilitation.
- **Long-Term**: Consider providing additional sidewalks in neighborhoods as streets are reconstructed. Prioritize streets that serve school age children.

5.1 Mid and Long-Term Potential Enhancements

Estimated Enhancement Timeline & Costs			
Time Period		Costs	
Short-Term	< 1 Year	Low	< $10,000
Mid-Term	1-3 Years	Medium	$10,000-$50,000
Long-Term	> 3 Years	High	> $50,000

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Article published Aug 17, 2014

Wachusett Street, Paxton Road being repaved in Holden

HOLDEN — Portions of Wachusett Street and Paxton Road (Route 31) will be under construction this week. Motorists are encouraged to seek alternate routes.

A contractor for the Department of Public Works will be milling and paving portions of Wachusett Street, between Union Street and Malden Street, beginning Monday, weather permitting. Traffic advisories are in place.

Contractors will also be resurfacing Paxton Road (Route 31), beginning Monday.

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The Landmark

So many cars, so much time

Holden Main Street traffic topping 20,000 vehicles daily

October 10, 2013
BY PATRICIA ROY
PROY@THELANDMARK.COM

Solutions are being considered for increased Main Street traffic. Steven King photo HOLDEN — Main Street has its own weekday rush hours: The before and after work times when cars are bumper-to-bumper and shooting across two lanes of traffic to make a left turn can be a heart-thumping experience.

A traffic count taken in August by the Central Mass. Regional Planning Authority revealed that 20,700 vehicles travel Main Street each day, passing just south of the intersection with Route 31 in the center of town.

The information augments a traffic report the CMRPC undertook in 2011. However, this most recent count was completed in a single day and was not an average of multiple traffic counts, as in the 2011 report. Town manager Jacquelyn Kelly estimated that traffic during the school year could be as much as 20 percent higher.

Based on regional travel demand models, the CMRPC predicts a one percent increase in traffic volume each year, Kevin Krasnecky, principal transportation planner, said.

The CMRPC considers that small increase to be healthy growth, but warned in a traffic study completed in 2011 that increased congestion and delay could still be expected.

The town faces a particular challenge with traffic congestion because of the high number of driveways from businesses and residences along the stretch of Route 122A from Shrewsbury Street to Mt. Pleasant Avenue.

One hundred seventy-eight driveways dot the most densely traveled section of Main Street, spread evenly over 3.38 miles on both sides of the roadway. The 2011 report recommended adding continuous two-way left turn lanes to increase roadway capacity and reduce crashes. Delay times for traffic would decrease, since left-turning traffic would be segregated in its own lane.

The report also pointed out several lots along Main Street, including the Mobil Station, the Damon House, commercial lots across from Boyden Road and McDonald's, among others, that could revise their entrance and exit points or work with adjoining businesses to create vehicle access between parking lots. This could reduce the number of driveways or curbcuts along Main Street.

Kelly said that many years ago town meeting voters defeated a motion that would increase the number of traffic lanes on Main Street. This coincided with the upgrades voters approved to rebuild sidewalks, improve street lighting and bury utility wires.

As the towns around Holden have grown, Route 122A has absorbed more traffic, and Main St. congestion increases.

While all agree that the traffic is a problem, there has been no consensus of opinion on a next step, Kelly said.

"Main St. is mostly controlled by the state Department of Transportation. In the big picture, the traffic counts relate to Chapter 90 money," she said. Chapter 90 is the money the state provides local highway departments for road maintenance.

Meanwhile the CMRPC is also currently working with Holden, Paxton and Spencer on a Route 31 Corridor profile. In Holden, the study will take place from the Paxton line to the Main Street intersection.

The profile will identify potential operational and physical improvements, Krasnecky said, and identify areas for further study.

The CMRPC also conducted a Walkability Workshop and Neighborhood Safe Project in August for the Main Street and Route 31 intersection. The report is expected to be completed in December, he said.

The Landmark

Manning Street bridge work could slow traffic

October 10, 2013

The Holden Department of Public Works has begun repairs to the Manning Street bridge over Trout Brook.

Repair work will take up to two months to complete and will result in the closing of one lane of traffic on Manning Street. Two-way traffic will be maintained through the use of temporary traffic signals that may cause traffic delays, particularly in the morning and afternoon commuting hours. Motorists using Manning Street should plan accordingly, the DPW advises.

In June, a partial lane closing was put into place on the bridge due to the discovery of deterioration in the bridge decking and underlying concrete beam. The work this fall will provide a longterm fix to the bridge. For more information, call 508-210-5550 or visit holdenma.gov or the Town of Holden Facebook page

Town of Paxton

- Route 31(Holden Road) Project Need Form
- Paxton Shuttle Bus Schedule
- Neighborhood SAFE Report
- News Articles

TOWN OF PAXTON
Carol L. Riches
Town Administrator
697 Pleasant Street, Paxton, MA 01612
508-754-7638 Ext: 20 Fax: 508-797-0966
criches@townofpaxton.net

April 19, 2012

Mr. Ronald Dionne, P.E.
Interim District Highway Director
MassDOT District 3
403 Belmont Street
Worcester, MA 01604

RE: Holden Road (Route 31) Reconstruction
Paxton, MA
Project Need Form

Dear Mr. Dionne:

The Town of Paxton is pleased to submit the enclosed Project Need Form for the Reconstruction of Holden Road (Route 31) in the Town of Paxton beginning at Grove Street and continuing to the Holden town line for a distance of approximately 0.8 miles. At this time, the Town of Paxton wishes to proceed with the design development process to complete the reconstruction of this vital roadway. This important project is needed to improve mobility and safety of roadway users, extend the service life of the roadway pavement, address drainage issues, and enhance pedestrian accessibility.

The Town of Paxton is committed to this project and is prepared to do all that is necessary to complete the design of this project in accordance with MassDOT guidelines. We look forward to working closely with the District on this important local project. Please do not hesitate to contact us if you have any questions regarding the contents of this Project Need Form.

Sincerely,

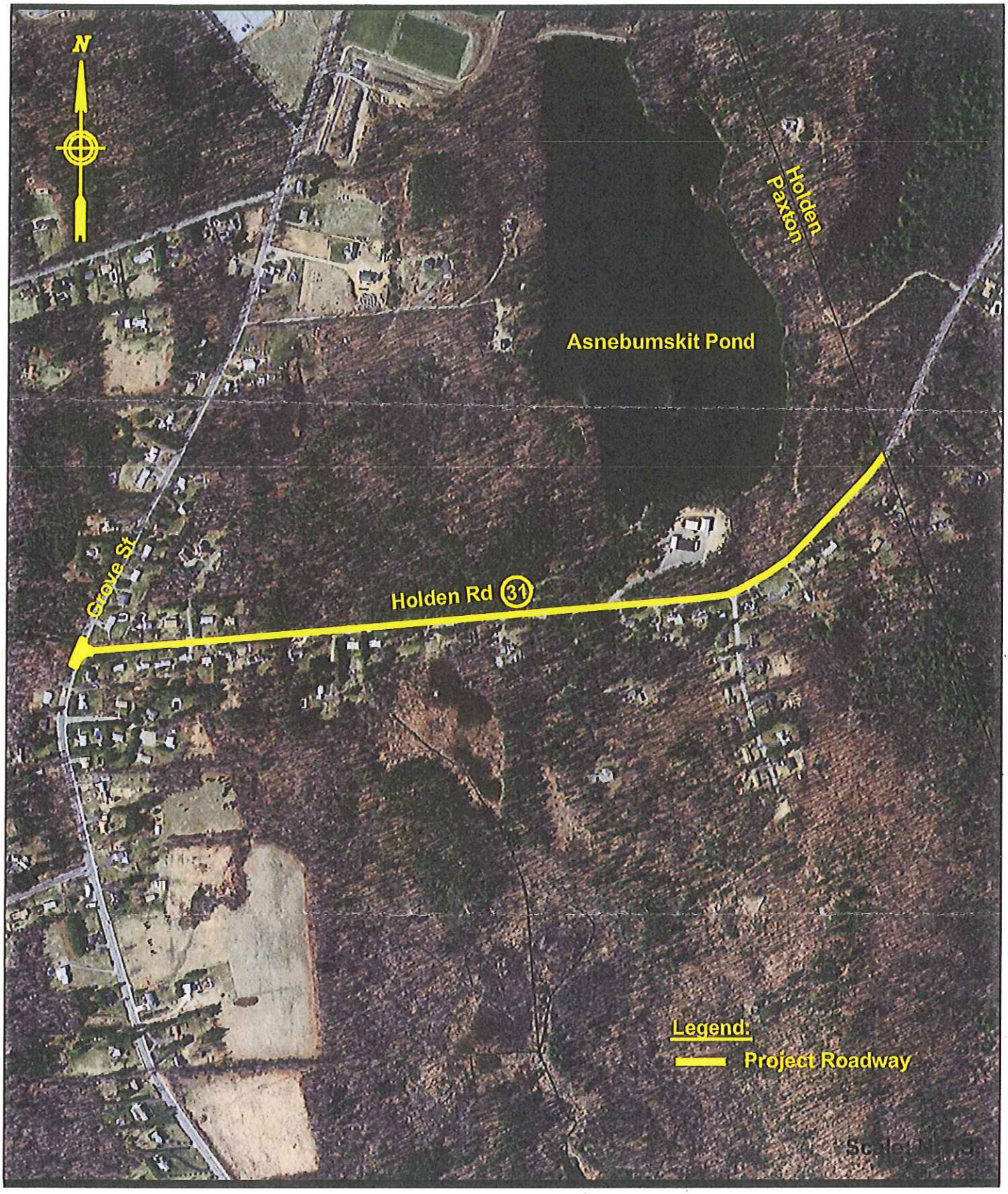
C Riches

Carol Riches
Town Administrator
Town of Paxton

cc: Lawrence B. Adams – CMRPC Director

Enclosures

The Town of Paxton is an Equal Opportunity Provider and Employer



COLER & COLANTONIO INC
ENGINEERS AND SCIENTISTS

LOCUS MAP

Holden Road
Paxton, Massachusetts

Figure 1

COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

PROJECT NEED FORM

Part I: Summary Information

A. Proponent Information

Municipality/Agency submitting form: **Town of Paxton**

Municipal Contact:	**Michael Putnam**	Completed by:	**John Morgan**
Title:	**Public Works Director**	Title:	**Transportation Manager**
Department:	**Dept. of Public Works**	Representing:	**Coler & Colantonio, Inc.**
Email:	**MPutnam@townofpaxton.net**	Email:	**jmorgan@col-col.com**
Phone:	**508-753-9077**	Phone:	**781-982-5437**

B. Geographic Location of Transportation Need and/or Opportunity (check all that apply)

Highway Division District:

- Statewide ☐
- District 1 ☐
- District 2 ☐
- District 3 ☒
- District 4 ☐
- District 5 ☐
- District 6 ☐

MPO:

- Statewide ☐
- Berkshire MPO ☐
- Boston Region MPO ☐
- Cape Cod MPO ☐
- Central Mass MPO ☒
- Franklin TPPO ☐
- Martha's Vineyard ☐
- Merrimack Valley MPO ☐
- Montachusett MPO ☐
- Nantucket ☐
- N. Middlesex MPO ☐
- Old Colony MPO ☐
- Pioneer Valley MPO ☐
- Southeastern Mass MPO ☐

Municipality(ies): **Paxton**

C. Maximum Geographic Extent or Coverage of the Project or Program (Check one)

- Statewide ☐
- MassDOT Highway Division Districtwide ☐
- Entire Metropolitan Planning Organization ☐
- Regional Transit Authority district ☐
- Municipality(ies) only ☒

D. Facility Location

If the need and/or opportunity is related to a particular facility, please complete as much of the following information that applies. Please include a locus map if available.

Route Number(s): **Route 31**

Street Name(s): **Holden Road**

From Cross Street: **Grove Street**

To Cross Street: **Holden town line**

Mile Marker: From: _____ To: _____

Intersection of: _____ and _____

Address: _____

Other Location Info: See attached Locus Map for project limits

If work is proposed on a bridge or bridges as part of the project, please complete the following:

Bridge ID Number(s): _____

Facility Carried on Bridge: _____

Facility Bridge is Over: _____

Part II: Project or Program Description

A. Summary of Need and/or Opportunity

Please briefly describe the issues, deficiencies, need, or opportunities that may warrant a transportation project or program:

Holden Road runs east-west and provides the primary connection between the communities of Paxton and Holden. Functionally classified as urban minor arterial, the roadway is owned and maintained by the Town. A locus map is attached depicting the proposed limits of the project. The total length of the project is approximately 0.8 miles.

Holden Road has a paved width of 26 feet with no sidewalk or curbing. Portions of the roadway include a worn bituminous berm. The pavement surface is generally in fair/poor condition and exhibits advanced states of deterioration. Moderate to heavy longitudinal and alligator cracking is evident along several portions of the corridor. Light rutting is evident along longitudinal

trenches near the wheel path of the travelway. Edge failure and patching is prevalent throughout the corridor.

Drainage upgrades are needed along the Holden Road corridor. Two culverts are in poor condition and need to be replaced. The lack of a closed drainage system is resulting in edge failures in the pavement.

Pedestrian accessibility improvements are required. At a minimum the Town would like to add a sidewalk between Grove Street and a proposed senior housing development which will have a driveway on the north side of Holden Road.

Signage along the corridor that is faded or non-compliant with current standards will be removed or replaced as required. New signage will be proposed where applicable.

B. Summary of Possible Alternatives to Address the Need and/or Opportunity

Please briefly describe possible transportation project(s) or program(s) that may address the need and/or opportunity summarized in the previous section. Please note if solutions have not yet been identified, or if there is more than one alternative.

The Holden Road corridor is a major route connecting the Town of Paxton and the Town of Holden. Pavement reclamation and reconstruction is likely needed along the corridor due to the condition of the pavement. As part of the project, pavement cores will be performed and a detailed pavement design prepared to determine the best method of rehabilitation.

Pedestrian accessibility improvements are planned. At a minimum the Town would like to add a 1000' section of sidewalk between Grove Street and a proposed senior housing development, which will have a driveway on the north side of Holden Road. The sidewalk will provide a pedestrian connection to Grove Street for the new senior residences as well as existing residents at the western end of the corridor, which is densely populated. Sidewalks, ramps and crosswalks will be designed for ADA and MassDOT compliance.

Drainage infrastructure improvements are proposed. Two existing culverts, one at the low point near the DPW and one near the Holden town line, are in poor condition and in need of replacement. New collection systems are proposed at several areas where stormwater is

causing edge failure due to ponding. There are several areas along the corridor where side slopes do not allow water to runoff the roadway.

Signing and pavement marking upgrades will be implemented in order to better delineate the travelways to address safety along the corridor and at intersections. Signage and pavement markings will be installed to improve bicycle awareness and safety.

C. Estimated Costs

If a transportation project(s) and/or program(s) has been identified, please include any available cost estimates or estimated cost ranges in current-year dollars:

Estimated Construction Costs:		*Estimated Other Costs:*	
Construction Items:	$1,250,000	Planning/Design:	$150,000
Contingencies (@10%):	$125,000	Right-of-way:	
Other Constr. Costs (@10%):	$125,000	Env. Mitigation:	
Total Est. Construction Cost:	$1,500,000	Total Other Costs:	$150,000

D. Funding

Please identify any current or expected funding related to this need or opportunity, including federal earmarks in legislation, budget acts, or programs; state earmarks in bond bills, budget acts, or programs; funding provided by the municipality or other local agency; and/or funding provided by private entities:

Federal:		Year(s)	Amount:
Federal:		Year(s)	Amount:
State:		Year(s)	Amount:
State:		Year(s)	Amount:
Municipal:	Design (Chapter 90 funds)	Year(s) 2012-2015	Amount: $150,000
Private:		Year(s)	Amount:
Other:		Year(s)	Amount:

Part III: Detailed Project or Program Need Information

Please complete all applicable parts of Part II to the extent possible.

A. Condition of Existing Facilities

1. Please describe the surface condition of the roadway, path, or other horizontal facility, such as type of cracking (alligator, reflective, etc.), extent of cracking (percentage of surface, etc.), ride-ability, structural adequacy, or other surface defects such as raveling, shoving, bleeding, etc. This can be based on visual inspection or automatic detection methods.

The pavement surface of Holden Road is generally in fair/poor condition and exhibits advanced states of deterioration. Moderate to heavy alligator cracking is evident along several portions of the corridor. Light rutting is evident along longitudinal trenches near the wheel path of the travelway. Edge failure is prevalent along much of the corridor due to poor drainage. Patching is evident in many of the areas where deterioration is greatest.

2. Please describe the condition of any roadside/facility appurtenances, such as signs, signals, lighting, median barriers, guardrail, pavement markings, drainage facilities, curbs/sidewalks, fences, etc.

The existing bituminous berm located along portions of the corridor is in poor condition. Many roadway signs are faded or are not in compliance with current standards. The drainage system includes two culverts and several structures in poor condition. Pavement markings are worn and shoulders are not delineated.

3. If the project/program includes a bridge or bridges, please describe its/their condition, such as bridge ratings, dates of inspection, weight restrictions, closings, structural adequacy, functional obsolescence, condition of other bridge elements, etc.

There are no bridges within the project limits.

4. Please describe the condition of other facilities, structures, or equipment (buildings, noise barriers, bus shelters, bike racks, etc.)

The are no other facilities such as bus shelters or bike racks along the corridor.

5. Please describe the most recent repairs, preventive maintenance, rehabilitation, reconstruction, or replacement of the facility, including the extent and date.

Over the years, patching have been conducted including hot patching in 2002. The date of last roadway reconstruction is unknown.

B. Mobility and/or Usage Issues/Opportunities

1. Please describe any existing or prospective highway congestion issues or opportunities for improvement related to level-of-service, duration of congestion, delay, travel time, etc., and any opportunities related to the implementation of Intelligent Transportation System components, such as cameras, traffic detectors, etc.

The most recent traffic count data for Holden Road indicated an ADT of 5200vpd in 2004. Safety and level of service will be evaluated at the intersection of Holden Road at Grove Street. Implementation of Intelligent Transportation Systems for this corridor is unlikely.

2. Please describe usage issues or opportunities for improvement to other facilities related to crowding, occupancy rates, usage, trucks, access, etc.

Access issues will be reviewed and addressed as part of the project. Truck and bus turning radii at side streets will be reviewed.

C. Safety and Security Issues/Opportunities

1. Please describe any highway safety concerns, such as number and severity of crashes, crash rates, fatalities, etc.

Research of the MassDOT database for the years of 2007 through 2009 indicate that there were a total of four (4) crashes reported along this 0.8 mile section of roadway during the three year period. One of the crashes involved injuries. The intersection at Grove Street also had two (2) crashes over the three year period. Sight distance improvements at the intersection will be explored as part of this project.

2. Please describe any safety issues for other users such as pedestrians, bicyclists, persons with disabilities, transit riders, trucks, school children, etc.

The lack of sidewalks and crosswalks are of concern for pedestrian safety. At a minimum sidewalk is proposed for the western end of the project. The lack of delineated shoulders and signage will be addressed to improve travel for bicyclists.

3. Please describe any issues or deficiencies related to security, such as vulnerability, evacuation procedures, hazardous materials, etc.

Holden Road is not known to have deficiencies related to security.

D. Land Use and Economic Development Issues/Opportunities

Please describe any issues or opportunities that the project or program will address or impact such as land use and economic development, such as job creation, housing, freight access, parking availability, transit-oriented development, smart growth, etc.

Holden Road is primarily a residential roadway. Much of the north side of the road is Town owned land that includes the DPW and a reservoir. No economic development, other than construction jobs, is expected as a result of the project.

E. Environmental Quality Issues/Opportunities

Please describe any environmental quality issues or opportunities that the project or program will address or impact such as air quality, climate change, water quality, water supply, wetlands, historic or cultural resources, hazardous materials, noise, wildlife habitat, endangered species, etc.

Upgrades to the drainage system will improve water quality of stormwater discharge. Improving the quality of discharge to the reservoir (Asnebumskit Pond) will represent a environmental benefit. No negative impacts to the environment are anticipated as a result of the project.

F. Community Issues/Opportunities

Please describe any community or neighborhood issues or opportunities that the project or program may address or impact such as emergency vehicle access, land takings, access to schools, cut-through traffic, environmental justice, etc.

The project will have a tremendous improvement upon the roadway conditions along the corridor, which will improve the overall quality of the neighborhood. No land takings are anticipated as part of the project.

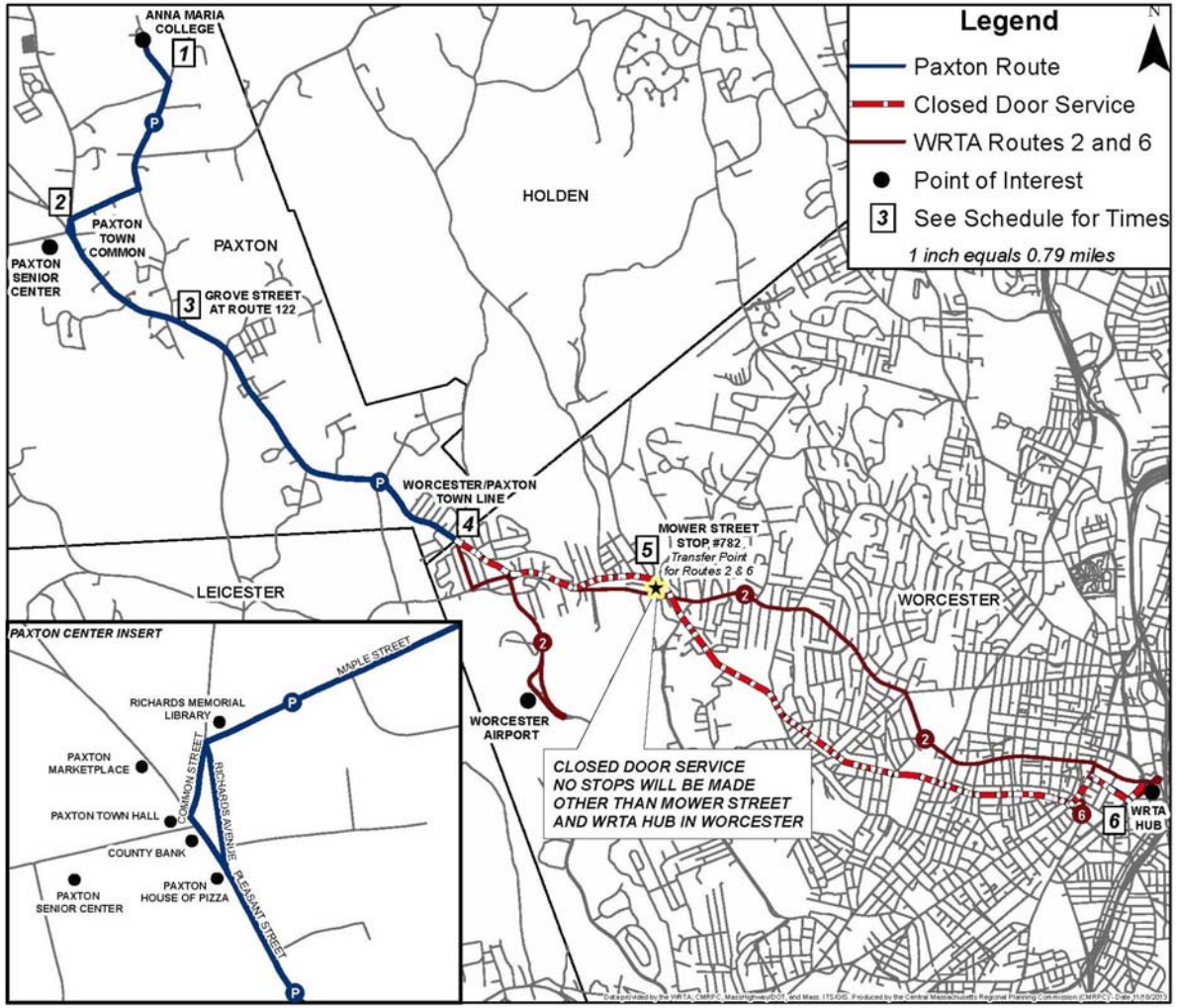
Thank you for completing this form. Please contact your MassDOT Highway Division District office to submit the form.

ROUTE MAP

PAXTON SHUTTLE

Effective Date: March 12, 2014

UPDATED



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- **The Hills at Paxton Village**
- **Route 122 (Pleasant Street)**
- **Tatnuck Square**
- **Union Station—Worcester**

For Transit Information, call 508-791-9782 or visit www.therta.com

Worcester Regional Transit Authority

How to Ride the Bus

If this is your first trip on the bus, you may be a little nervous. Don't worry — WRTA personnel are ready to help you! Here are a few tips:

- It is best to arrive at the curbside at least five minutes early. Buses will stop if they are waved down and if it is safe to stop at that location.
- When boarding the bus, give exact cash fare to the driver (if you qualify for reduced fare, show your identification card to the driver).
- As the bus approaches your stop, let the driver know where you want to leave the bus.

For more information on How to Ride the Bus, visit ***www.therta.com/faqs/how-to-ride-the-bus*** or call **508-791-9782**

Welcome aboard the WRTA!

This route timetable shows the times of departure at major stops along the route and contains route maps and other important information. Additional information be can obtained by calling the WRTA Information Line at **(508) 791-WRTA (9782)** or visit our website at **www.therta.com**.

Weekday Service is provided on Martin Luther King, Jr. Day, President's Day, Patriot's Day, Columbus Day and Veteran's Day.

NO SERVICE ON: New Years Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Christmas Day

Please, NO Music, Smoking, Eating, or Drinking

INBOUND — WEDNESDAYS AND FRIDAYS

See the map for matching time point locations

1	2	3	4	5	6	
BUS STARTS	**BUS LEAVES**	**BUS LEAVES**	**BUS LEAVES**	**BUS LEAVES**	**BUS ENDS**	**MBTA Commuter Rail Connection (Leaves Union Station)**
Anna Maria College	**Town Common**	**Grove Street/ Route 122**	**Paxton Town Line**	**Mower Street**	**Union Station Hub***	
6:25	6:30	6:32	6:35	6:39	6:50	*7:00*
7:15	7:20	7:24	7:28	7:32	7:45	*8:40*
8:15	8:20	8:24	8:28	8:32	8:45	
2:40	**2:45**	**2:50**	**2:55**	**3:00**	**3:15**	*3:55*
3:55	**4:00**	**4:05**	**4:10**	**4:15**	**4:30**	*4:40*
5:20	**5:25**	**5:30**	**5:35**	**5:40**	**5:45**	*5:50*

Connection with MBTA Commuter Rail

OUTBOUND — WEDNESDAYS AND FRIDAYS

See the map for matching time point locations

	6	5	4	3	2	1
MBTA Commuter Rail Connection (Arrives at Union Station)	**BUS STARTS**	**BUS LEAVES**	**BUS LEAVES**	**BUS LEAVES**	**BUS LEAVES**	**BUS ENDS**
	Union Station Hub*	**Mower Street**	**Paxton Town Line**	**Grove Street/ Route 122**	**Town Common**	**Anna Maria College**
	6:50	7:02	7:05	7:09	7:11	7:15
7:13	7:45	7:57	8:00	8:05	8:10	8:15
8:27	8:45	8:57	9:00	9:05	9:10	9:15
2:36	**3:15**	**3:35**	**3:40**	**3:45**	**3:50**	**3:55**
4:28	**4:40**	**5:00**	**5:05**	**5:10**	**5:15**	**5:20**
5:25	**5:45**	**6:05**	**6:10**	**6:15**	**6:20**	**6:25**

FARE IS CASH ONLY. PLEASE HAVE EXACT FARE READY WHEN BOARDING THE BUS. DRIVERS DO NOT MAKE CHANGE.

WRTA FARE INFORMATION

Full Cash Fare (Adults age 14 and up) **$1.50**

Elderly/Disabled Cash Fare **$0.75**

Children 5-13 years of age accompanied by an adult **$0.75**

Children under 5 with adult ..... **FREE**

ACCESSIBILITY: All WRTA buses are wheelchair accessible. For TTY service call Massachusetts Relay TTY (800) 439-2370.

PROPER IDENTIFICATION: One of the following valid identification cards must be shown to the driver each time you board:

ELDERLY. . . . . WRTA Senior I.D. card
DISABLED . . . . .Statewide Access Pass/WRTA ADA Photo I.D. / MCB I.D.
MEDICARE. . . . . Medicare card with Photo I.D.

SERVICE DOES NOT RUN ON MONDAY, TUESDAY, THURSDAY, SATURDAY OR SUNDAY

Flexible Routing

For ADA eligible persons, buses can leave the route and "flex" to locations within 3/4 of a mile off the route. Please call **508-752-9283 or 1-877-743-3852** at least 2 days in advance to request a flex between the hours of 8:00am and 4:30pm.

WRTA will limit the number of flexes on each trip. Two by-request flexes are permitted on each trip to most locations within 3/4 mile of the route. If a flex is not available for your desired trip time, you can choose another time or get to a bus stop along the route.

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Neighborhood SAFE

Paxton, Massachusetts

CMMPO
Central Massachusetts
Metropolitan Planning Organization

June 2014 -
Prepared by

CMRPC
Central Massachusetts Regional Planning Commission

2 Washington Square, Union Station
Worcester, MA 01604-4016
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Prepared in cooperation with the Massachusetts Department of Transportation and the U.S. Department of Transportation – Federal Highway Administration and the Federal Transit Administration. The views and opinions of the Central Massachusetts Regional Planning Commission expressed herein do not necessarily reflect those of the Massachusetts Department of Transportation or the U.S. Department of Transportation.

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Neighborhood SAFE is a new, proactive approach that CMRPC is undertaking in order to provide communities with small area infrastructure assessments from a pedestrian and bicyclist safety perspective. CMRPC has launched this effort to achieve the following objectives:

- **Increase awareness of walkability in communities throughout the region**
- **Identify safety issues that pedestrians and bicyclists face**
- **Provide neighborhood safety analysis for all users of the transportation system**
- **Generate enthusiasm for alternative modes of travel**

This report will provide a summary of existing issues and potential improvements that are intended to make walking and biking safer and more attractive modes for transportation system users. Particular emphasis has been placed on walking and biking accessibility for school aged children. Elements of the Safe Routes to School (SRTS) program and the Road Safety Audit (RSA) program will play a part in each neighborhood assessment, a brief overview of both programs is provided in the following section. This assessment includes recommendations that can be implemented through municipal, state, or federal funding, depending on the size and scope of the future project. This report will detail the conditions of the selected area, and provide a toolbox for a range of improvements that vary in complexity and cost.

1.0: Introduction - What is Neighborhood SAFE?

Neighborhood SAFE combines elements of Safe Routes to School (SRTS) Assessments and Road Safety Audits (RSAs) to provide communities with guidance related to infrastructure issues and improvements for selected focus areas.

1.1 Neighborhood SAFE - Background

Safe Routes to School

The Federally funded SRTS program is administered through the Massachusetts Department of Transportation (MassDOT). Safe Routes to School is a program that has the following purpose:

- To enable and encourage children, including those with disabilities, to walk and bicycle to school;
- To make bicycling and walking to school a safer and more appealing transportation alternative, thereby encouraging a healthy and active lifestyle from an early age; and
- To facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools.

In Massachusetts, the SRTS program has two components: MassRIDES, the Commonwealth's travel option service, provides an educational and encouragement program to school age children; while the infrastructure component is handled by MassDOT. MassDOT seeks to promote healthy lifestyles among the next generation of Massachusetts residents. It is MassDOT's desire that the SRTS program not only creates healthy habits that will last a lifetime, but also to help educate school children on the importance of ensuring opportunities for active transportation in the way that it builds and operates the Commonwealth's transportation system.

Road Safety Audits (RSAs)

The Federal Highway Administration defines a Road Safety Audit (RSA) as the formal examination of an existing or future road or intersection by an independent, multidisciplinary team. The purpose of an RSA is to identify potential safety issues and possible opportunities for safety improvements considering all roadway users. The Neighborhood SAFE project will incorporate certain aspects of an RSA, without a specific project taking place.

The entrance to Hopedale Junior-Senior High School which is a MassRIDES partner school. No schools in Paxton currently participate in this program.

1.2: State Policy related to Neighborhood SAFE

massDOT
Massachusetts Department of Transportation

GreenDOT

Global Warming Solution Act 2008
GreenDOT
Healthy Transportation Compact

1.3: Town of Paxton – Study Area

Neighborhood SAFE - Paxton, MA
Figure I: Town Center

0 0.05 0.1 0.2 Miles

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

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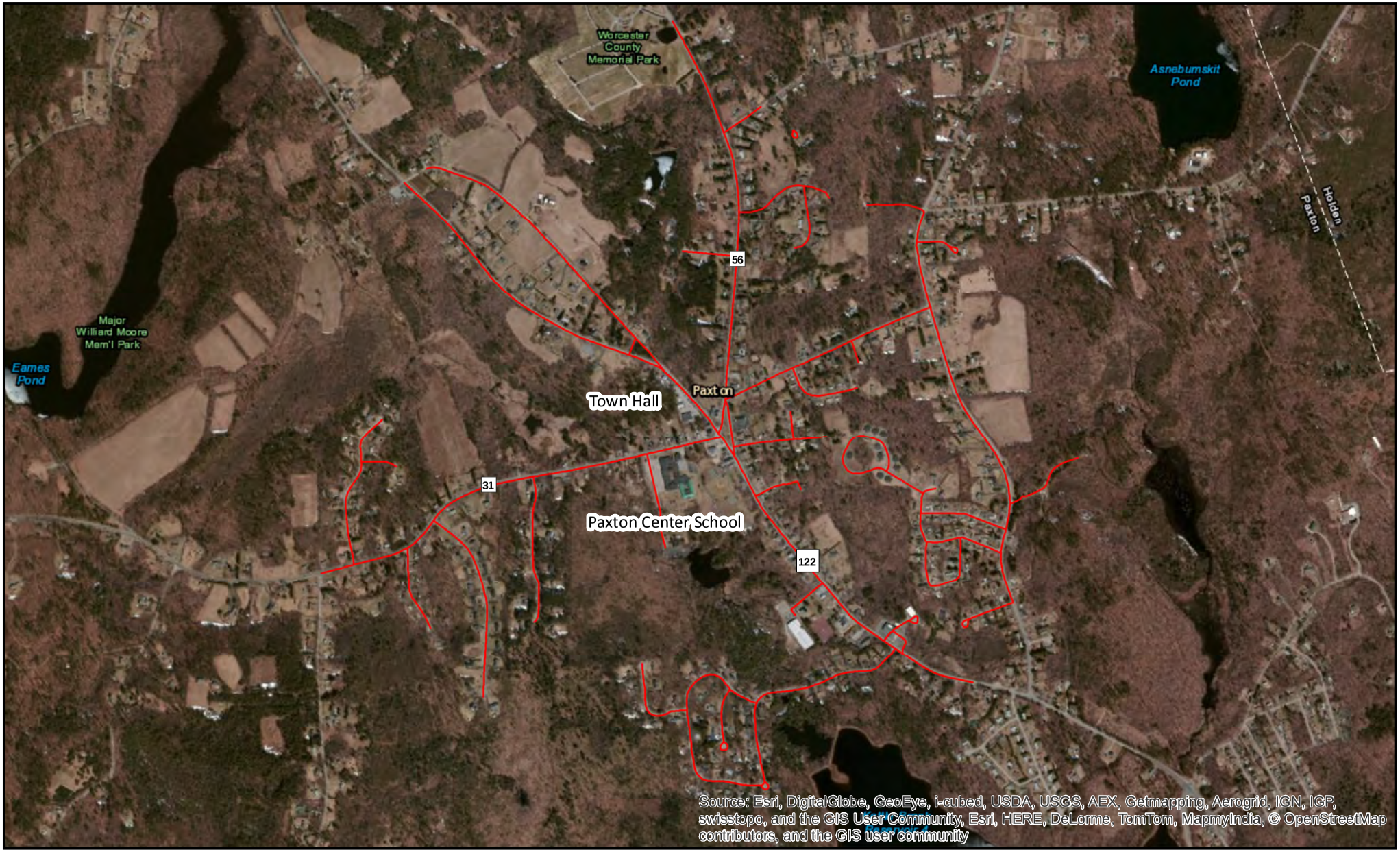

Neighborhood SAFE - Paxton, MA
Figure II: Analysis Area

0 0.05 0.1 0.2 Miles

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

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2.0: Field Assessment - Introduction

CMRPC Staff, consisting of Dan Daniska and Nick Burnham, performed a preliminary field assessment of conditions surrounding Town Hall and the Paxton Center School on May 13, 2014. This preliminary site visit allows CMRPC Staff to get a feel for conditions surrounding the targeted locale. Infrastructure is assessed in order to determine impediments to safe bicycling and walking in the area.

The pre-assessment consists of cataloging the location of major streets and key walking and bicycling infrastructure including: sidewalks, crosswalks, traffic signals, pathways, and other factors related to traffic control. Field measurements were taken of crosswalk width as well as sidewalk width and condition. Pedestrian signals were timed to see how long people have to make it safely across the intersection of MA-31 (West St.) and MA-122/MA-56 (Pleasant St.).

Map 3 depicts the bicycling and walking infrastructure (where present) analyzed by CMRPC staff, including the location of sidewalks, crosswalks, and traffic signals. It should be noted that staff analysis and the Walking Audit occurred during the summer months; snow removal and issues relating to walkability in the winter season are not covered in this report. However, local stakeholders should take pedestrian and bicyclist accommodation and safety under consideration during the time of the year when children are in school. Staff was able to observe afternoon dismissal from the Paxton Center School during the field assessment. Town stakeholders should take arrival and dismissal logistics under consideration when planning for improvements.

The following section of the report will provide initial observations from CMRPC staff regarding the field visit and infrastructure assessment. Analysis has been broken down into three separate categories: Sidewalks/Crosswalks and other related infrastructure, Traffic Volumes, and Auto/Bike/Pedestrian Crashes.

The view of Paxton Center at the intersection of Route 122 (Pleasant Street) and Route 31 (West Street).

Crosswalk lines at the Country Bank driveway on Route 31 (West Street) that have faded away over time.

Legend

- Signalized Intersections
- ADA_Ramps
- Crosswalk
- Sidewalks

Neighborhood SAFE - Paxton, MA
Figure III: Infrastructure

0 0.05 0.1 0.2 Miles

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

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Pre-Walking Audit Observations (CMRPC Staff)

- Overall, the condition of the sidewalks in the study area varies from excellent to poor, with moderate issues along isolated segments of various streets.
- The area has an suitable sidewalk network for a smaller municipality; most of the main streets in the study have a sidewalk on at least one side of the street.
- Sidewalk construction and width varies greatly throughout the area. There are segments that are wide toward the center of Town, while some areas are extremely narrow.
- The abrupt transition to narrow , dirt "sidewalks" along the section of MA-122/56 to the south of the town center presents accessibility issues for persons with disabilities.
- There is a lack of ADA compliant access ramps and panels throughout the study area.
- On street parking is almost non-existent in the neighborhoods, as the majority of homes have driveways. However, the high number of driveways does present a safety issue for small children.

2.0: Field Assessment - Continued

Sidewalks, Crosswalks, and other related infrastructure.

While crosswalks are prevalent throughout Paxton Center, many are starting to fade and could be re-painted.

The sidewalk on Pleasant Street starts as a concrete sidewalk and then drastically reduces in width and becomes a narrow dirt path. The sudden change in width and sidewalk type can cause accessibility issues and may force users to travel in the roadway.

The sidewalk at the corner of Richards Avenue and Pleasant Street is in poor condition. Uneven and cracked panels can cause potential tripping hazards.

Pre-Walking Audit Observations (CMRPC Staff) Continued:

- High levels of fast moving traffic on MA-122/56 and MA-31 present safety issues for crossing pedestrians.
- The triangular configuration of the town common lends itself to sight line issues at multiple intersections.
- The pedestrian signal heads at the intersection of MA-122/56 and MA-31 lack timers, certain legs of the intersection are extremely wide to cross, a visible counter would aid pedestrians in decision-making.
- Crosswalk striping at the Paxton Center School is faded due to traffic, school bus, and pedestrian use. It is also extremely narrow, measuring 5' in width.
- The "SCHOOL" warning symbol painted on MA-31 is faded due to traffic.
- The steps leading to the Paxton Center School from MA-31 are in a state of disrepair.
- Crosswalk striping at the driveway of the Country Bank on MA-31 is faded.
- Crosswalk striping at the MA-122/56 and MA-31 intersection is faded due to heavy traffic.
- Staff had the opportunity to speak with a crossing guard and the Principal of Paxton Center School during afternoon dismissal. They stated that it was necessary to walk children up MA-31 and across the Town Common from the Paxton Center School due to concerns regarding safety at the main intersection.

2.0: Field Assessment - Continued

The steps leading to the Paxton Center School from West Street are in need of repair. A lack of handrails can be dangerous to users.

This flashing school sign just to the south of the Paxton Center School entrance alerts motorists to slow down while traveling along Route 31 (West Street).

2.0: Field Assessment - Continued

Traffic Speeds / Volume Crash Analysis

See **Map #4** for Crash Analysis Visualization.

Individual Bike & Pedestrian Crashes are visualized for 2002-2011.

Traffic Speeds and Volumes:

- Based on Traffic Volumes collected by CMRPC in 2013, MA-122/56 (Pleasant Street) South of MA-31 (West Street) carries approximately 11,144 vehicles per day.
- Based on Traffic Volumes collected by CMRPC in 2013, MA-31 West (West Street) of MA-122 (Pleasant Street) carries approximately 5,913 vehicles per day.
- Based on Traffic Volumes collected by CMRPC in 2013, MA-31 East (Maple Street) of MA-56 (Richards Avenue) carries approximately 3,929 vehicles per day.

Crash Analysis:

- There are approximately 15 Automobile Crash Clusters located within the analysis area. The clusters are concentrated along MA-122, MA-56, MA-31, and Grove Street.
- Between 2009 and 2011, there were 66 automobile crashes in the study area. There was one fatal crash in April of 2010. Seven of the crashes were of the non-fatal injury type, while fifty-eight were property damage only crashes (no injuries).
- Sixteen of the accidents were angle crashes, three were head-on, thirteen were rear-end, nine were sideswipe, twenty four were single vehicle crashes, and one was reported as unknown.
- There was a Pedestrian Crash just outside of the analysis area on MA-31(East of Grove Street) in 2008.

Legend

- Crash Cluster 09-11
- Ped Crashes 02-11

Neighborhood SAFE - Paxton, MA
Figure IV: Crash Analysis

0 0.05 0.1 0.2 Miles

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CMRPC Central Massachusetts Regional Planning Commission

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

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3.0 Audit Meeting

In a meeting hosted by the town of Paxton on May 29, 2014, CMRPC Staff held a Neighborhood SAFE workshop. The first portion of the workshop was an overview of what makes up a walkable community as well as an introduction to the Neighborhood SAFE project.

The objectives for the meeting were as follows: to increase awareness of walkability, identify safety issues that pedestrians and bicyclists face, provide neighborhood safety analysis, and to generate enthusiasm. CMRPC staff discussed what makes neighborhoods walkable, challenges to walkability, and potential design solutions. Neighborhood SAFE was introduced as a hybrid of Road Safety Audits (RSAs), Bicycle/Pedestrian Audits, Safe Routes to School (SRTS), and other programs to conduct a "neighborhood" safety audit for non-motorized users of the transportation system.

A broad spectrum of stakeholders attended the meeting, including members of the following:

- Town Administrator
- Paxton Police
- Board of Selectmen
- Route 122 Scenic Byway Committee
- Paxton Fire Department / EMS
- Town Service Coordinator

Paxton Town Common

Route 122 (Pleasant Street) heading north towards Paxton Center and the Town Common.

4.0 Audit Observations

Walking Audit

Participants were given brief instructions as to what they should be on the lookout for during the "walk" around the targeted area. **Map #5** on the following page outlines the walking route. Issues related to the following topics were stressed:

- Traffic/Motorists, including speed, sightlines, failure to yield for pedestrians or bicyclists.
- Pedestrian, including line of sight, overall feeling of comfort/safety, sidewalks and lighting.
- Crosswalks and Intersections, including width of streets, pavement conditions, line of sight, and time it takes to safely cross.
- Bicycling issues, including shoulder width, presence of marked bike lanes, signage, and perceived level of comfort.

Meeting attendees during the walking audit observing Route 31 (West Street).

The focus of the May 29th workshop was on a pre-defined walkability route near the center of Paxton and the Paxton Center school, however, concerns and ideas generated at the audit were applied to the larger geographic area during the analysis phase.

Audit Observations

General, area-wide observations:

- There are a number of school age children that walk to and from school.
- There are gaps in the sidewalk network in important locations, safety of pedestrians should be a primary concern.
- Inconsistent sidewalk network, it varies in material and width.
- Concerns about speeding and the safety of pedestrians crossing the street.

Meeting attendees discussing pedestrian crossings at the intersection of Route 122 (Pleasant Street and Route 31 (West Street).

Neighborhood SAFE - Paxton, MA
Figure V: Walkability Audit Route

0 0.05 0.1 0.2 Miles

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Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), EOT/MHD and the Executive Office of Environmental Affairs/MassGIS (EOEA/MassGIS).

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4.0 Audit Observations

Highlighted Locations:

Paxton Center School

- Oversized crosswalks on MA-31 near the school and the Senior Center, they are unsigned and are not ADA compliant.
- The crosswalk at the Paxton Center School driveway is undersized and faded. ADA compliant curb ramps are lacking at this location.
- Issues regarding drop off and pick up at the Senior Center, parents will wait in that lot for their children.
- As mentioned previously, the stairs from MA-31 to the school are in a state of disrepair.

Town Center Area

- Quite busy in the morning and afternoon with commuters and after-school activities. The group was in agreement that this area needs more attention, and improvements are warranted.
- Sightline issues around the town green due to geometry, it is very difficult to see certain traffic movements at either end of the green.
- The intersection of MA-122 & MA-31 is quite large, it is difficult to cross as a pedestrian, and creates an issue with right turns on red.

MA-122/56 (Pleasant Street)

- Sidewalk along MA-122/56 South of the Town Center is inconsistent in width and construction material. It has a large gap where it turns into a two foot wide dirt path.
- Audit participants thought it would be a great benefit if the town could compete "the loop" of sidewalks along Pleasant, Grove, and possibly Maple. This would allow for connectivity to the Anna Maria College, and recreational opportunities for residents.
- Audit participants raised questions regarding bicycle friendly shoulders along MA-31 and MA-122/56.

ADA-compliant curb ramps are lacking throughout Paxton Center, especially at crossings for the Paxton Senior Center and Paxton Center School.

Bicycle accommodations were discussed during the walking audit. Meeting attendees observed a bicycle ride through the Town Center, which occurs frequently in the warmer months.

Neighborhood SAFE - Paxton, MA
Figure VI: Highlighted Areas

0 0.05 0.1 0.2 Miles

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Estimated Enhancement Timeline & Costs			
Time Period		Costs	
Short-Term	< 1 Year	Low	< $10,000
Mid-Term	1-3 Years	Medium	$10,000-$50,000
Long-Term	> 3 Years	High	> $50,000

- **Short-Term**: Consider signage and possibly shared lane markings along streets that are more heavily traveled by bicyclists.
- **Short-Term**: Ensure that there is adequate street lighting surrounding areas in the Town Center that see nighttime activities. Ensure that there is pedestrian level lighting where necessary.
- **Short-Term**: Traffic enforcement throughout the Town-Center area, especially on neighborhood roads that are used by schoolchildren.
- **Short-Term**: Repaint and enhance crosswalks and related roadway markings so that they are easier to see for motorists and pedestrians.
- **Short-Term**: Monitor snow removal efforts to provide adequate clear paths along sidewalks and walking routes. This is important to encourage safe walking during the school year.
- **Short-Term**: Work with the School Department to ensure access to the Paxton Center School is in a state of good repair.

5.0 Summary and Short-Term Potential Enhancements

The intent of this report is to provide a summary of existing issues and potential improvements that could make walking and biking safer and more attractive modes for transportation system users.

Particular emphasis was placed on walking and biking accessibility for school aged children. Elements of the Safe Routes to School (SRTS) program and the Road Safety Audit (RSA) program played a part in the assessment. The included recommendations can be implemented through municipal, state, or federal funding, depending on the size and scope of the future project.

The recommendations have been broken into three categories: **Short**, **Mid**, and **Long** Term. These categories are loosely based on project scope and anticipated costs.

- **Mid-Term**: Study intersections along MA-31 and MA-122/56, focus on pedestrian needs and safe crossing.
- **Mid-Term**: Consider "closing in the loop" of the sidewalk network along MA-122/56 to the south of the Town Common.
- **Mid-Term**: Install related safety signage in concert with crossing upgrades along MA-31 and MA-122/56. Advance warning signage for crosswalks can consist of W11-2 Pedestrian warning signs with a supplemental "AHEAD" plaque.
- **Long-Term**: Consider providing or enhancing pedestrian crossings with curb extensions, pedestrian hybrid beacons (Town Center), and/or raised crosswalks to increase pedestrian safety, comfort, and compliance.
- **Long-Term**: Consider constructing raised intersections in areas with high pedestrian traffic in order to calm vehicular traffic, improve pedestrian comfort and safety, and improve conditions for pedestrians with disabilities.
- **Long-Term**: Allow for consistent visual and physical treatments of pedestrian related infrastructure, as this will help users easily identify and use facilities.
- **Long-Term**: Consider installing standard width, ADA compliant sidewalks along MA-31 and MA-122/56 in the Town Center.
- **Long-Term**: Consider widening MA-31 (Maple St) to allow for bicycle lanes and sidewalks when the road is due for rehabilitation.
- **Long-Term**: Consider providing additional sidewalks in neighborhoods as streets are reconstructed. Prioritize streets that serve school age children.

5.1 Mid and Long-Term Potential Enhancements

Estimated Enhancement Timeline & Costs			
Time Period		Costs	
Short-Term	< 1 Year	Low	< $10,000
Mid-Term	1-3 Years	Medium	$10,000-$50,000
Long-Term	> 3 Years	High	> $50,000

Worcester Telegram & Gazette

Monday, November 18, 2013

Grove Street redesign plans outlined in Paxton

By Jeremy Shulkin, CORRESPONDENT
Add a comment

PAXTON — The Board of Selectmen heard testimony Monday night regarding the first steps in the process of redesigning a 1.8-mile stretch of Grove Street/Route 31 toward the Holden town line.

John G. Morgan, section manager from CHA Consulting of Norwell, told the board that the design process will seek federal and state money from the Transportation Improvement Program to repave and widen the road. The project will also aim to improve the drainage and water quality before it's released into the surrounding wetlands and reservoir.

Paxton is responsible for funding the design and permitting of the project submission.

"We're looking at more than just a maintenance project," Mr. Morgan said.

Mr. Morgan added that the project is in an initial phase, and the final design plans will be submitted to the Massachusetts Department of Transportation for further review this winter.

Though it did not come up during the meeting, Selectman Jack F. Malone afterward addressed a Sunday Telegram & Gazette story on Paxton's ambulance service since severing ties with nonprofit Spencer Emergency and Rescue Squad.

Despite losing Advanced Life Support-licensed ambulances as primary responders as a result of the move, Mr. Malone said, "From everything I've been told everything is going well."

He added that the number of calls has gone down, and that Paxton will seek to have its two ambulances ALS licensed.

"If anything we're seeing an improvement in service," he said.

In other business the board renewed the Paxton Police Department's mutual aid policy with Worcester and surrounding towns. Town Administrator Carol Riches also informed selectmen that Moody's held Paxton's bond rating at A3, praising town officials for what Moody's called "very strong" financial management.

Mr. Malone announced that the town's tax rate will be set at the Dec. 2 meeting.

The Landmark

Bus service to, from Worcester to begin in December

October 10, 2013
BY CHRISTINE SMITH
PAXTON CORRESPONDENT
CHRISBETH2000@VERIZON.NET

Beginning Dec. 1, residents have another option of getting to Worcester. Bus service provided by the Worcester Regional Transit Authority (WRTA) will begin that date as a trial service.

The trial period for the bus service will last until the end of June next year to see if residents are truly interested and whether it is a needed service in town. At the end of the trial, town officials will determine whether to continue the service.

The bus service will be offered two days of the week, Wednesdays and Fridays, 6 to 9 a.m. and 3 to 7 p.m. both days. The route will begin at Anna Maria College on Sunset Lane in Paxton, continue with stops in the center of town and at Tatnuck Square in Worcester and finish at Worcester's Union Station Hub. Return back to Paxton will be the same route in reverse.

One-way fare on the 7-passenger bus will be $1.50.

Paxton officials had met in July with representatives of WRTA to discuss the possibility of implementing bus service in town, something that up to this point had never been offered in the town. WRTA had previously conducted a month long online and paper survey in June and had found that 67 percent of residents were in favor of bus service that would include stops at Tatnuck Square and Union station.

The town already pays for regional services provided by WRTA and the additional bus through town will come from these funds, with no additional cost to the town. WRTA Administrator Stephen O'Neil had noted during the meeting with Selectmen in July that adding Paxton will help build a more "robust" transportation system in central Massachusetts.

Telegram & Gazette

Friday, August 16, 2013

WRTA predicts bus service will get faster

MOVING FORWARD

WRTA patrons wait under cover at the new hub in Worcester when it opened earlier this year. (T&G Staff/DAN GOULD)

By Alli Knothe, TELEGRAM & GAZETTE STAFF
Add a comment

The Worcester Regional Transit Authority is gearing up for what officials promise will be vast improvements to bus service starting Aug. 24.

The WRTA board met Thursday and reiterated that the pending changes will help make buses run on time.

At its July meeting, the authority reported that about 50 percent of trips were late during the last week of June. The board scolded the authority for the delays, which Chairman William J. Lehtola of Spencer said were "totally unacceptable."

Those problems began after June 1, when the bus system shifted operations about three blocks from City Hall to the hub, a $16.3 million bus facility next to Union Station.

A major change Aug. 24 will be a cut to service on bus Route 2, which goes from the hub to Tatnuck Square via Pleasant Street. The service for that route will drop from once every 30 minutes to once per hour — but will now include the Worcester Regional Airport and Sunny Hill Drive on each run rather than going to those destinations once every two hours.

At the Thursday meeting, a representative from Proterra, the company that is selling six new electric buses to the authority, made a short presentation.

One bus has been delivered, with two to follow next week and the other three to come in September. They will be added to the fleet in the fall, said administrator Stephen F. O'Neil.

The authority also voted to add service in Paxton, bringing the total communities served to 36, Mr. O'Neil said.

Details of service in Paxton will be decided over the next several months, he said.

Additional information on the schedule changes is available at the WRTA website, www.therta.com

Telegram & Gazette

Monday, July 29, 2013

WRTA shuttle route to Paxton proposed

By Richard J. Hafey, CORRESPONDENT
Add a comment

PAXTON — A proposed route for WRTA shuttle service, which has been discussed for months, would begin at Anna Maria College, continue to Paxton Center and Tatnuck Square, and end at Union Station, Jonathan Church of the Central Massachusetts Regional Planning Commission told the Board of Selectmen last night.

In other business, the board canceled the proposed special town meeting scheduled for Aug. 19 and moved to hold it at an unspecified date, probably in September. Board members agreed with Chairman John F. Malone that a summer meeting might not be convenient for voters.

In a slide show based on a survey answered by 67 residents, Mr. Church of the CMRPC said that respondents found a fixed shuttle route the most desirable.

Calling the discussions "very, very preliminary," Mr. Malone said, "If it doesn't work, it doesn't work" after a one-year trial.

For years the state has required Paxton to pay a $31,400 yearly assessment to the Massachusetts Bay Transit Authority under the assumption the town is served by the WRTA.

Because of that, Mr. Malone and Town Administrator Carol L. Riches began discussions with the WRTA and the CMRPC.

Selectmen also discussed special permits requested by Sweetpea Friends of Rutland for a kennel near the old Palatine Kennels, and from Theo's Restaurant to increase the number of chairs allowed from 28 to 40.

Both requests will go before the Zoning Board of Appeals in August.

The board also approved Gary Kellaher as deputy tree warden and Tenley Goodwin as a part-time dispatcher.

The Landmark

Paxtonites would like WRTA service to Union Station, Tatnuck Square

July 11, 2013
BY PATRICIA ROY
PROY@THELANDMARK.COM

Selectmen are asking town residents respond to a survey of public transportation needs in town, part of an effort to bring Worcester Regional Transit Authority van service to Paxton.

The survey is on the town Web site or may be picked up at Town Hall or Richards Memorial Library. Surveys must be submitted to Town Hall by Wednesday, July 17. The public is invited to an information meeting with WRTA officials and a member of the Central Mass. Regional Planning Commission at the selectmen's July 29 meeting in the White Building.

Of the surveys turned in so far, 57 percent of respondents believe there is a need for public transportation in town, town administrator Carol Riches said. The most requested destination was Union Station, followed by Tatnuck Square for shopping, she said.

The current plan is for a seven-passenger van to pick up riders several times a day in town, board members said, and transport them to Union Station via Worcester State University. The van presents no additional cost to taxpayers, since it will be covered by the $31,400 yearly assessment the town already pays the Mass. Bay Transportation Authority for regional transportation available in Worcester.

A recent information meeting with WRTA officials was very positive, board chair John Malone said.

"It's an exciting thing [that] I think Paxton would benefit from," he said.

The route would call for three part-time bus drivers, working a total of 40 hours per week. The town would be in charge of hiring them, Riches said. Proposed stops include Anna Maria College and the senior housing development that is being built off Grove Street.

Malone said he would like to outline WRTA's transit proposal on local cable television before the July 29 public meeting.

Telegram & Gazette

Thursday, July 11, 2013

Paxton to survey residents about bus service

By Richard J. Hafey, CORRESPONDENT
Add a comment

CORRECTIONS / AMPLIFICATIONS

This story has been changed to reflect the correct amount for Paxton's yearly assessment to the MBTA.

PAXTON — The town is looking for input from residents on the establishment of bus service by the Worcester Regional Transit Authority.

Residents are asked to fill out a questionnaire on the town website, www.townofpaxton.net, by July 17 in preparation for a meeting with WRTA representatives July 29.

The 15-question survey asks about the type of bus service needed, destinations, times of day and how often it would be used.

For years the state has required Paxton to pay a $31,400 yearly assessment to the Massachusetts Bay Transit Authority under the assumption the town is serviced by the MBTA.

Because of that, John F. Malone, who is chairman of the Board of Selectmen, and Town Administrator Carol L. Riches began discussions with the WRTA.

Preliminary discussion topics have included a seven-passenger van to provide daily service on still-undetermined routes. The cost would be covered by the assessment.

The Landmark

Bus service from Worcester to Paxton explored

June 27, 2013
BY PATRICIA ROY
PROY@THELANDMARK.COM

PAXTON _Each year, the town pays $31,400 as its assessment to the Massachusetts Bay Transit Authority, although the closest available public transportation is miles away in Worcester.

In a bid to lower the assessment, town administrator Carol Riches met with regional transportation authorities who said they will be able to provide passenger service from Anna Maria College and the senior housing development to Worcester State University and Union Station, a regional transportation hub, in Worcester.

A seven-passenger van will make the round trip several times daily, Riches told selectmen at their June 24 meeting.

There will be no additional charge to the town, Riches said. Its cost will be covered the town's MBTA assessment.

The towns of Northbridge and Grafton have a similar arrangement, she said.

Selectman John Malone urged residents to complete the town's bus service survey online. Copies are also at Town Hall and the Richards Memorial Library.

Selectmen also heard from Anita Fenton, chair of the town's 250th anniversary committee that is planning celebratory events to take place during 2015.

Initial fundraising efforts have "not been overwhelming," Fenton said, with few residents responding to the committee's postcard campaign requesting donations.

Fenton asked for permission to place a fundraising thermometer by the Town Hall or elsewhere in the center of town in September. The sign will be four feet high and one and a half feet wide, she said.

"If people have a constant reminder, maybe it will build momentum," she said.

Expenses for the proposed celebrations will total about $25,000 including a parade with bands. Bands can cost up to $6,500, where in years past, they cost in the neighborhood of $500, Fenton said.

In order to secure them, the committee has to start signing contracts soon, she said.

The committee is also holding a pancake breakfast and spaghetti supper for fundraising, as well as selling commemorative glassware and blankets.

"If each of the 1,500 residences in town sent $25, wow," Fenton said.

Telegram & Gazette

Tuesday, June 25, 2013

Paxton to pursue WRTA bus service

By Richard J. Hafey, CORRESPONDENT
Add a comment

PAXTON — The Board of Selectmen agreed Monday night to pursue bus service in town with the Worcester Regional Transit Authority.

The town is seeking a seven-passenger van with a route and schedule to be determined.

The board also approved Diony Nuney as a part-time dispatcher, Jayne McTigue and Chris Starbard as poll workers, and the erection of a thermometer fundraising sign for the town's 250th anniversary celebration in 2015.

Town Administrator Carol L. Riches told the board she and Treasurer-collector Deirdre Malone have appointed Kim Peloquin of Rutland as part-time treasurer-collector from among 36 applicants.

She said the seven applicants for the Council on Aging's part-time outreach coordinator's position will be interviewed next week.

Town of Spencer

- Status Update for Pending TIP Projects and Proposals
- Steven Tyler Memorandum
- News Articles

TOWN OF SPENCER
MASSACHUSETTS
BOARD OF SELECTMEN

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MEMORIAL TOWN HALL
157 MAIN STREET
SPENCER, MA 01562
TEL: 508-885-7500 x155
FAX: 508-885-7528
TTY: 508-885-7503
www.spencerma.gov

May 8, 2012

Richard A. Rydant
Principal Transportation Planner
CMMPO/CMRPC
2 Washington Square, Union Station
Worcester, MA 01604-4016

RE: SPENCER - Status Update for Pending Spencer TIP Projects and Proposals

Dear Mr. Rydant:

The purpose of this letter is in response to the CMMPO's March 28, 2012 request for project updates from the Town of Spencer for pending TIP projects and proposals. As requested, the following is the Town of Spencer's prioritized list of projects with project status updates provided for each. The Town of Spencer respectfully requests that the CMMPO prioritize the following projects for inclusion on the TIP as indicated below.

1. **Main Street (Route 9/31) from Grove Street to Elm/High Street:** This approximately 0.4 mile downtown section of Route 9/31, with two major signalized intersections, is in need of traffic improvements, design upgrades and general repair including rectifying poor pavement condition with significant cracking, numerous patches and severe roadway ruts. The existing signalized intersections at Maple Street and Pleasant Street are also in need of design changes, traffic LOS improvements and interconnection. Pedestrian safety improvements are also necessary including reconstructing sidewalks in conformance of current ADA/MAAB requirements and establishing safer pedestrian crossings for Route 9 in Town Center.

   As you are aware this segment of Route 9 through downtown Spencer has longstanding corridor bottleneck issues. The pre-existing bottleneck concerns combined with the normal growth of commerce and the opening several new major traffic generating developments along Route 9 in Spencer and Leicester (e.g., Wal-Mart, Tractor Supply, etc.) have caused additional increases in traffic volumes along the Route 9 corridor through Spencer center. The inclusion of this project on the TIP in a nearby future year is critical to the management of traffic and economic growth for the region and especially the central business district of downtown Spencer.

This project will include traffic and safety improvements at the Pleasant Street/Elm Street intersection and the Maple Street intersection. The traffic signals and controller at the Pleasant Street/Elm Street intersection will be replaced and will be interconnected with the traffic signals and controller at the Maple Street intersection. The traffic signals at the Maple Street intersection will also be replaced, however, the new traffic signal controller installed under the recently completed Maple Street project (#604485) will be retained and reused by the Main Street project and will be interconnected with the new controller at the Pleasant Street/Elm Street intersection. The estimated cost of this project, including replacement/upgraded traffic signals at two downtown Spencer locations, is $3,400,000.

This project will have a positive impact on vehicular and pedestrian movement through the Town's center and is an essential component of the Town's downtown revitalization efforts which are progressing well. The Maple Street reconstruction project was completed in 2011 and has provided long overdue vehicular and pedestrian infrastructure improvements on the urban segment of Route 31 South. In addition, the Town recently completed a downtown economic and redevelopment master plan and also completed $550,000 of housing rehabilitation improvements in the downtown area. These projects were funded by the Town's Community Development Block Grant award and the Town will be looking to continue the housing rehabilitation program in next several year's CDBG project requests, as well as adding a commercial façade rehabilitation program. The Town is also planning roadway and sidewalks improvements on Mechanic Street, a very economically active commercial side street intersecting the Main Street project between the two signalized intersections. The Town also recently invested approximately $1,250,000 into Memorial Town Hall, located at the intersection of Main Street and Maple Street, renovating our most important public building in the downtown area. The infrastructure improvements requested for Main Street are essential if Spencer's present and future downtown revitalization efforts are to succeed. It is because of this overall vision of downtown revitalization that the Town has made this Main Street project its highest priority.

The Town has already funded and completed a detailed topographic survey base plan for the entire project limits. A Project Need Form (PNF) for this project was submitted to MHD on March 30, 2006. The Town also submitted a Project Information Form (PIF) on May 18, 2010 to MassDOT Highway District 3, which completed their Project Review process in August of 2010, and upon receiving a positive evaluation was assigned as MassDOT Project No. 606207.

The Town has also committed financial resources towards the design of this project. The designer selection process was completed in the fall of 2010 and the Town entered into an Agreement for Design Services with VHB, issuing a Notice to Proceed in January of 2011. A project kick-off meeting was held in March of 2011. The design team has since completed data collection efforts, assembled existing Town plans and information, verified the field survey, performed roadway and parking inventories, analyzed traffic demand, and assessed utilities and completed the existing conditions assessment.

There was a slight delay in progress in 2011 due to a change in the Town's highway engineering leadership including design management of this project. The Town's new Highway Superintendent Steven J. Tyler, P.E., came on board as of July 2011. Recent work completed since that time include summarizing all of the above described research and analysis at our first public design review meeting for the project held in December 2011 (see

attached flyer/notice and news article). Based upon feedback received during the public meeting the Town authorized the designer to proceed with the conceptual development of three alternatives including a round-about option (copies of the 3 alternatives are attached for reference). Next steps include meeting with downtown businesses in the next 8 weeks and MassDOT District 3, respectively, to select and refine the preferred alternative for 25% design development. Once the preferred alternative has been adequately defined and agreed upon we expect a 25% design submission in approximately 6 months with a current 25% design submission goal of December 2012. Estimated dates for the next milestones include: Public Hearing March-April 2013; 75% design submission October 2013; 100% design submission April 2014; with the goal of completing final design by the later part of 2014. Because of the anticipated traffic congestion mitigation that would be provided by this project, it should also be eligible for CMAQ funding under the TIP. Traffic and pedestrian safety improvements are also an integral part of the project.

It is anticipated that all design, ROW and permitting for the Main Street project will be completed by the end of 2014 at the latest. The Town therefore respectfully requests that this project be programmed on the 2015 or 2016 TIP.

2. **Bridge Nos. S-23-012 (1DE) and S-23-002 (1XW) both carrying Route 31 (North Spencer Road) over the Seven Mile River:** Both of these two bridges are located on Route 31 North (North Spencer Road), approximately 3 miles apart from one anther (see Figure 2 – Two N. Spencer Road Bridges Project Locus Map). This section of Route 31 is classified as a Rural Major Collector roadway and serves as a critical travel way for many Towns within and beyond the central region. In addition, the corridor and these two bridges are critical to transportation and delivery for many commercial entities. Including but not limited to the New England Automotive Gateway operated by the East Brookfield and Spencer Railroad (EBSR), St. Joseph's Abby retail shipping/distribution, Bond Construction, Holden Construction, Bemis Nursery and many other businesses in the area.

   As an example to the regional significance commercially for these two bridges please see the attached May 4, 2012 letter from the East Brookfield and Spencer Railroad (EBSR) / New England Automotive Gateway regarding the importance of the two bridges and the Route 31 corridor to their business operations. Also, as described above the corridor is just as vital to many other businesses and commuters within and beyond the region.

   Our concern is with maintaining the functional operation/condition of these two bridges as they continue to deteriorate. Bridge S-23-012 in the northerly segment of Route 31 Town has safety issues, poor railings and a significantly deteriorated deck (above and below). The deck has numerous areas of cracking and efflorescence with hairline cracking indicating that the concrete deck is quickly approaching the end of its useful life and requires replacement. In addition, the bridge parapet has extensive deterioration likely due to roadway salt penetration. The steel stringers have surface rusting throughout and require thorough cleaning (sand blasting) and painting to preserve the beams for future use (if applicable). The abutments are in decent condition with a few spalls and scour at the waterline. The wing walls show deterioration to the cap and wall faces, which require repairs that are more serious. The wing wall caps need replacing and all spalls require patching. The above

repairs should be addressed as soon as possible to avoid significant deterioration further affecting the capacity or safety of the bridge structure.

The Town of Spencer retained a bridge consultant to investigate Bridge No. S-23-012 and make recommendations for repairs or replacement. Because the rehabilitation of the existing bridge super-structure may require extensive environmental permitting to properly de-lead the steel beams and reinforce the beams with cover plates, a lengthy process with an often extensive permitting review and monitoring (before and during construction), is likely required to rehabilitate the existing steel superstructure. With respect to environmental permitting, it would be ideal if no work was done directly within or affecting the water. Furthermore, the volume of traffic and wide ranging commercial and commuter uses indicates that stage construction across the bridge will be necessary. Stage construction can also be a lengthy process when a deck replacement and substructure rehabilitation is required. Concrete takes time to set and cure. Depending upon the bridge type or rehabilitation method selected stage construction can result in a lower quality finish due to traffic traveling over half of the bridge while the other half has concrete trying to set. It would be more time consuming and expensive to rehabilitate the existing superstructure compared to replacing the existing superstructure in stages as recommended below.

Because of the above noted environmental and construction concerns associated with rehabilitating the existing Bridge No. S-23-012 superstructure, our bridge consultant has recommended that the bridge be replaced with a butted deck beam bridge type with a crash tested/approved steel bridge rails. The existing abutments and wing walls can be modified and utilized by the reconstruction. A butted box beam bridge is one of the fastest bridge types to erect. This bridge type also produces a better product when erecting in stages. This recommendation also reduces or eliminates costly work in the waterway, de-leading requirements, and has minimal environmental impacts at this location. Estimated Engineering Services and Construction Cost for Bridge No. S-23-012 is approximately $850,000.00 depending on the year of construction.

Based upon the latest bridge inspection report dated April 5, 2012 Bridge No. S-23-002 has similar deficiencies as S-23-012 with the deck and superstructure. However, additional concerns with this structure include its posted weight restrictions and concerns with structural cracks in the substructure abutments and wing walls as noted in the bridge inspection report. We have not been able to fund further investigation for repair recommendations as of this date to develop recommendations or estimated costs for repairs or replacement of Bridge No. S-23-002.

The Town of Spencer has invested considerable time and public funds to repair and maintain these bridges including several deck repairs over the years. The Town does not have funds to pay for design, reconstruction, rehabilitation or replacement of these two bridges. The Town of Spencer respectfully requests that the design and construction for these two bridge rehabilitations and/or replacements be paid for under an existing footprint bridge, deck replacement or other similar State/Federal bridge design contract(s), with construction funding paid under the TIP and approved through CMMPO/CMRPC. Because of the vital nature of these two bridges to maintaining the North Spencer Road corridor the Town has assigned both of these two bridges as our second highest TIP assistance priority.

A Project Need Form (PNF) for Bridge No. S-23-012 was submitted to the CMRPC and the MHD on March 30, 2006, but the project is not listed on the current TIP. The Town is in the process of completing an updated PNF for Bridge No. S-23-012 and a new PNF for Bridge No. S-23-002 for project consideration.

Due to the critical nature of the Route 31 corridor and these two bridges for commuters and businesses, the Town respectfully requests that these two bridge projects be considered for programming on the TIP as soon as possible.

3. **Charlton Road/Maple Street (Route 31) from Bemis Street to the Charlton Town Line (Project No. 602291):** This approximately 3.5 mile section of Route 31 is in poor to very poor pavement condition including significant alligator cracking, numerous patches and severe pavement edge degradation at many locations along the road. This project has been listed on the TIP under the "unprogrammed projects recognized by the CMMPO" category (subject to available funding).

   Recommended roadway improvements include full depth reclamation and minor box widening with geometric design/safety improvements including correcting safety concerns at several intersections. Recommended pedestrian improvements include extending the existing sidewalk along the section of the road from Bemis Street to Howe Road (approx. 3,400 linear feet) to resolve a longstanding pedestrian safety concern. The proposed sidewalk extension is located completely within the Town of Spencer's "Federal Urban Area Boundary." The proposed sidewalk will provide safe pedestrian access to/from an existing elderly/assisted living housing complex and Howe Road. Howe Road provides direct access to the Spencer State Forest Recreational area. The proposed sidewalk extension will also allow residents of the elderly housing/assisted living complex to safely walk to/from downtown Spencer, churches, and schools and connect other residences to the same.

   The Town has paid for and obtained a detailed topographic survey base plan for the entire project limits, therefore design can begin at any time. The Town is willing to consider segmentation of this project in an effort to address the financial constraints of the TIP. Upon request the Town is available to work MassDOT and CMRPC to develop a manageable segmentation strategy from both engineering perspective and cost management perspective.

   Given the linkage this road provides to Charlton, Route 20, and points southerly, the Town has assigned this project as their third priority. The Town respectfully requests that this project be programmed on the TIP for a specific year or, at a minimum, continue to list it as a recognized project on the TIP in the category where it currently is listed. The Town is willing to commit financial resources toward the design of this project immediately if it is programmed on the TIP and construction is imminent.

4. **Meadow Road from West Main Street to North Spencer Road (Route 31):** This section of Meadow Road is classified as an Urban Minor Arterial and serves as a critical travel way for many Towns and businesses in the central region. Similar to the two North Spencer Road bridge projects described above this section of road is a vital commuter and commercial transportation link to many other cities and towns within and beyond the central region. This section of Meadow Road serves as a vital commercial transportation and commuter connection to/from Route 49 and Route 9 on the western side of Town including businesses and commuters travelling to/from the west and southwest to the north central and northeast areas of our region. This section of Meadow Road is deteriorated and in need of full-depth reclamation and possibly the addition of sidewalks in select sections to improve vehicular and pedestrian safety. The Town has funded the development of survey base plans for this project. The survey base plans have been completed and are suitable to begin design as soon as construction funding becomes available. Given the higher importance of the projects listed above, the Town has given this their fourth priority within this request. The Town is currently in the process of completing a PNF for project consideration.

   Due to the important nature of this corridor commuters and businesses, the Town respectfully requests that this project be considered for future programming on the TIP.

On behalf of the Spencer Board of Selectmen and the entire Town, I would like to thank the CMMPO, CMRPC and MassDOT for their continued support and assistance in addressing our transportation infrastructure needs and for considering the worthy projects described above.

If you require additional information or if the Town can be of any further assistance, please contact me directly at (508) 885-7500 ext. 155.

Best regards,

Adam Gaudette, AICP
Town Administrator

Enclosures

cc: Ronald Dionne, P.E., District 3 Highway Director
Steven J. Tyler, P.E., Spencer Superintendent of Utilities & Facilities
Spencer Board of Selectmen

SPENCER MAIN ST. PROJECT ORTHOPHOTO & PROJECT LOCUS MAP

REHABILITATION OF MAIN ST. (ROUTES 9/31) FROM ELM ST. /HIGH ST. TO TOWN HALL IN SPENCER, MA

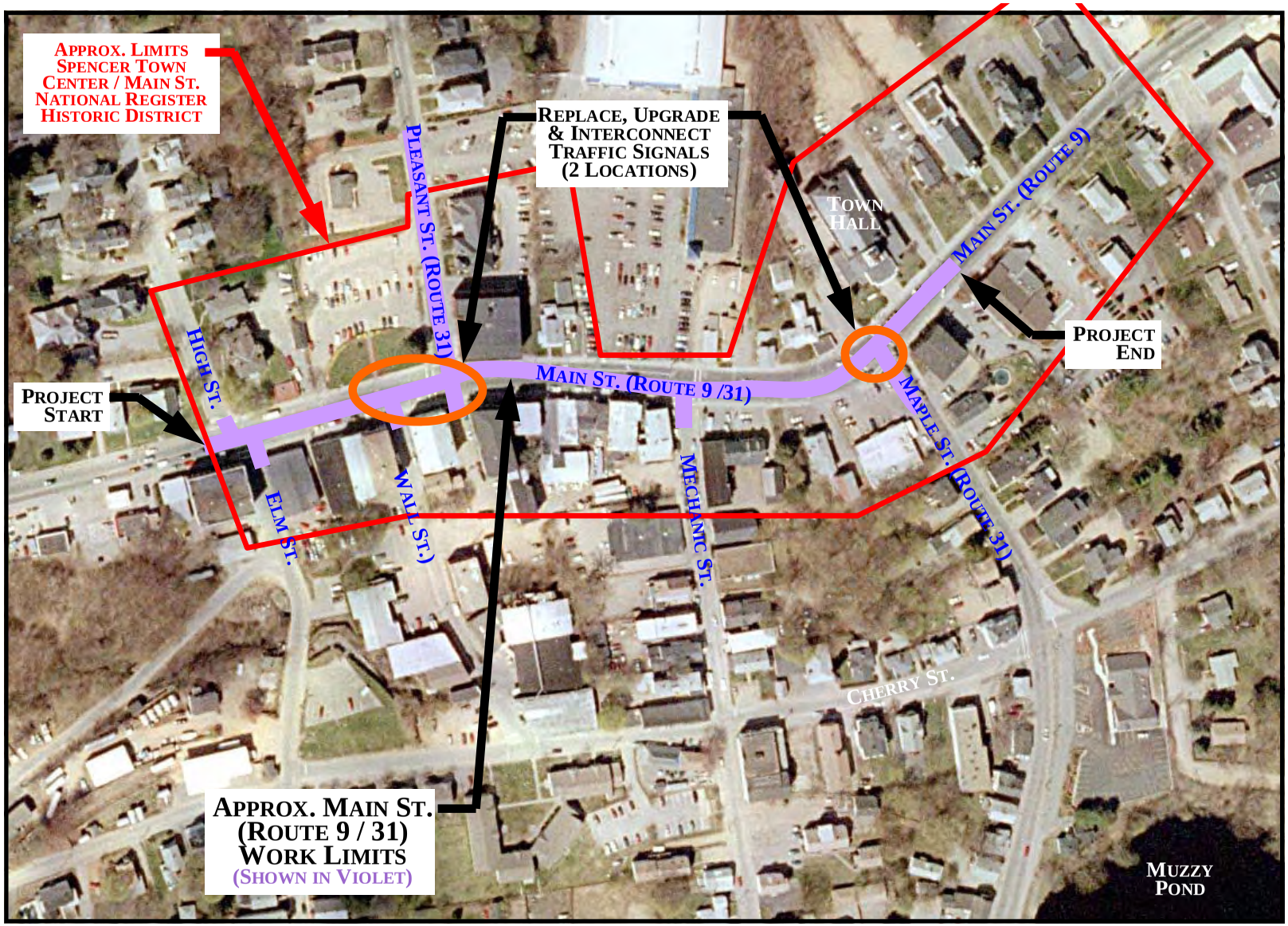


Image Source: MassGIS Color Orthophoto

Downtown reconstruction to enter design phase

IDEAS DISCUSSED AT PUBLIC HEARING IN SPENCER

BY DAVID DORE
NEW LEADER STAFF WRITER

SPENCER — People who attended a Dec. 6 public hearing were excited at the possibility of more trees and benches along Main Street (Route 9) in downtown Spencer.

They were less excited, though, about moving Pleasant Street (Route 31) so its intersection with Route 9 is across from Wall Street — especially if it means losing valuable parking spaces.

Half a dozen people joined town officials and representatives from Vanasse Hangen Brustlin, Inc. in Worcester to discuss the project, which Town Administrator Adam Gaudette said is entering the design phase.

Town Meeting voters approved spending up to $300,000 for the study, he said, with the hope the town would get $3.25 million in state and federal funding for construction. The project is eligible, Gaudette said, but the design must be completed first.

VHB employees have looked at traffic counts and signals, accident data, the depth of asphalt on downtown streets and sidewalks.

"It's strictly all about existing conditions," said VHB Project Manager Brian Brosnan. "We haven't put pen to paper yet."

As part of the process, he explained, the state Department of Transportation must approve the design. That means it must include accommodations for bicyclists, pedestrians, vehicles and handicapped and disabled people.

Shoulders would be created for cyclists, Brosnan said, which would likely mean narrowing sidewalks in certain locations.

"You're probably going to see a little bit of change in the width of the roadway compared to the width of the sidewalk," he said.

Brosnan hinted the traffic lights at the intersection of Main and Maple streets and the intersection of Main, Pleasant, Elm and Wall streets could be synchronized.

VHB traffic engineer Matthew Chase said the current traffic light configuration has caused "a lot of rear-end collisions" over the last five years. His study "didn't see a high crash rate" at the Maple Street and Pleasant Street intersections, he said, but a "significant number of crashes" in between along Main Street.

There have been four instances of pedestrians being struck as they crossed Main Street at Mechanic Street, Chase said. An 85-year-old woman died in July 2007 when she was struck by a dump truck while crossing in front of the Price Chopper entrance.

As part of the design process, Chase said, VHB must determine if a relocated Pleasant Street intersection is a good location for a rotary and if nearby streets should be made one way.

Gaudette said the relocation of Pleasant Street was suggested because of the "staggered" traffic signals at Wall and Elm streets and the "very difficult" turning radius for trucks and buses taking a right turn from Main Street to Pleasant Street.

But, a couple of people in the audience mentioned, moving Pleasant Street would eliminate some of the spaces in the Sovereign Bank-owned parking lot across from the Richard Sugden Library.

The town's 2003 Master Plan calls for the Town of Spencer to buy the lot, which it now leases from the bank.

Other ideas floated at last week's hearing included turning Wall Street into either a dead end street or one-way street, keeping the "chirping" pedestrian signals at Maple Street and Pleasant Street, building a parking garage, moving one of the entrances into the Price Chopper shopping plaza so the crosswalk at Mechanic Street could be moved and not on a hill, keeping the right turn lane from Main Street to Pleasant Street, putting in a crosswalk between the library and the town parking lot, either burying utility lines or moving them behind buildings, and raising the road bed of Main Street to eliminate the double sidewalk issue (although it would steepen the approach from Elm Street and Wall Street to Main Street).

Audience members liked the idea of planting trees and installing decorative lighting and park benches downtown. Parks and Recreation Commission Co-Chairman William Shemeth III wondered if his board would be responsible for maintenance.

Shemeth, also a member of the Disability Commission, asked if that panel could be involved in the design process to ensure there are no accessibility issues.

Gaudette said another public hearing would be held once 25 percent of the design is completed, possibly in the spring. He added it would be four or five years before construction starts.

David Dore may be reached at (508) 909-4140, or by e-mail at ddore@stonebridgepress.com.

MEETING NOTICE

Spencer Town Center

Main St. Workshop

Topic: **Main Street Reconstruction Design**

When: Tuesday, December 6, 2011
Open House 5:30 PM to 6:00 PM and
Working Meeting 6:00 PM to 7:30 PM

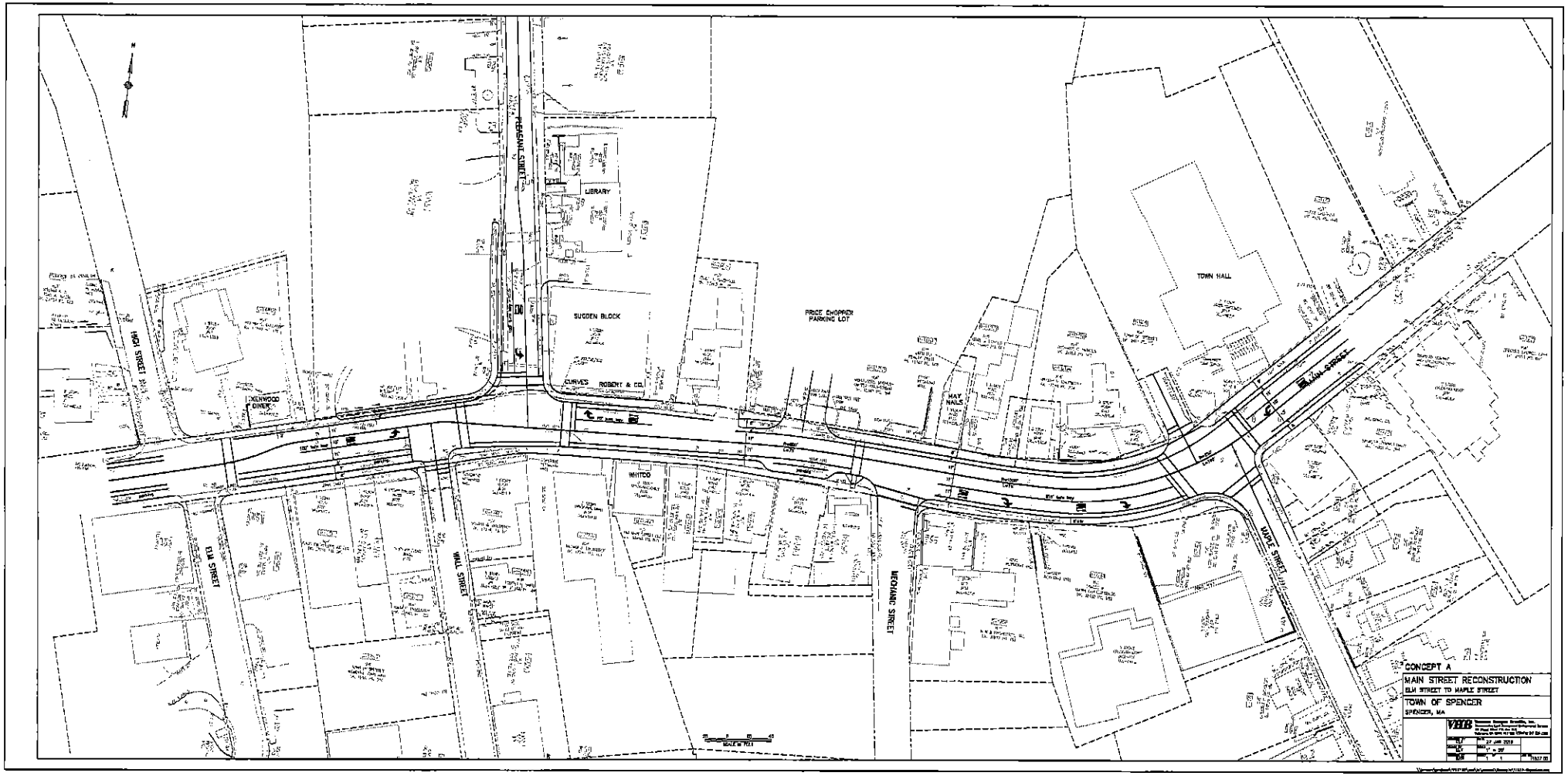
Where: McCourt Social Hall, Town Hall,
157 Main Street, Spencer, MA

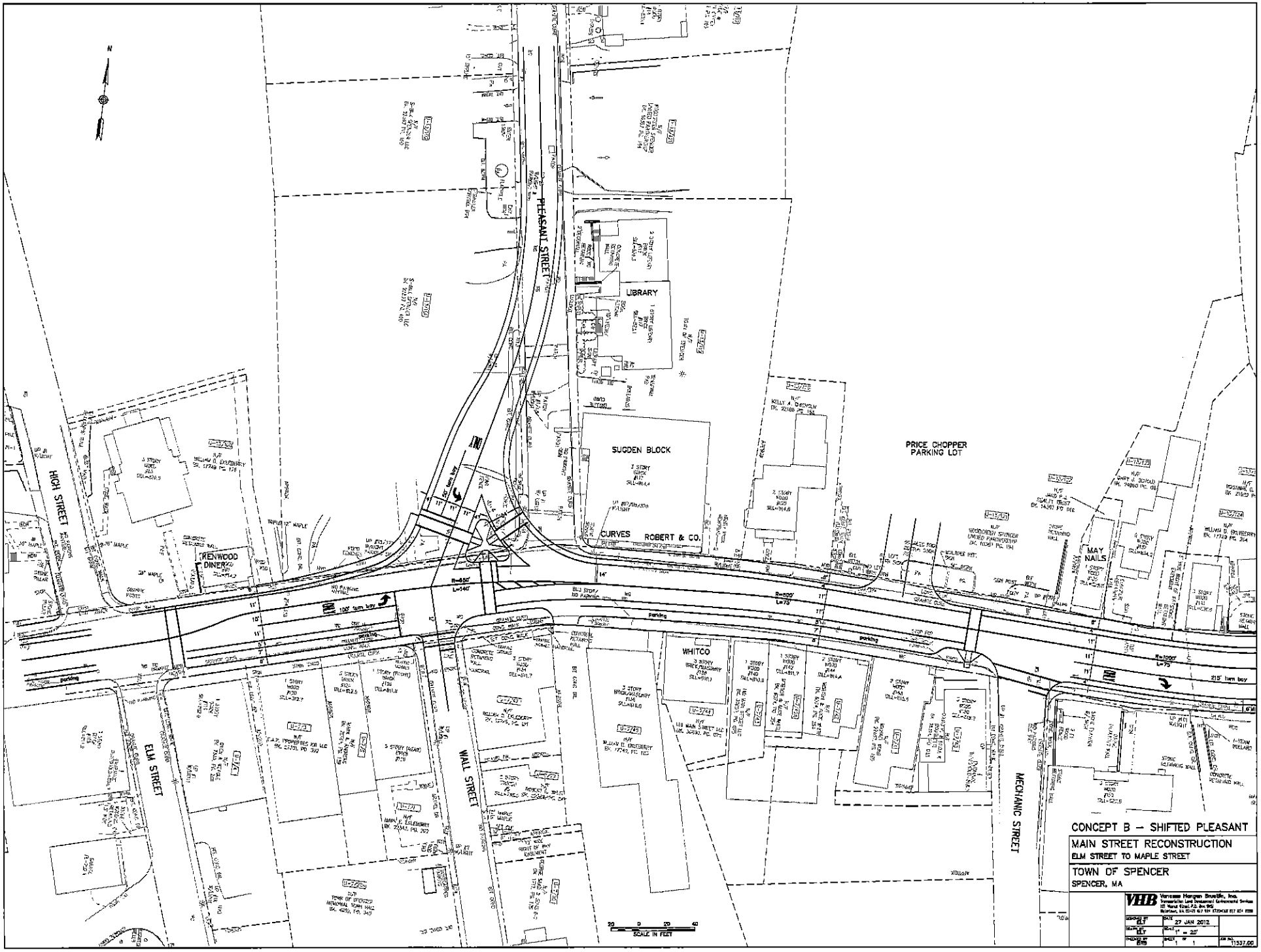
What: The Town of Spencer and VHB will be presenting conceptual analysis data, design criteria and soliciting design input.

Who Should Attend: Business owners, property owners, residents, & Town officials.

Advancing the project beyond the planning stage after several months research and analysis, the Town and VHB will be presenting design parameters and preliminary concepts for review and discussion. Feel free to either drop in during the open house or come work with us later at the working meeting.

For information call Adam Gaudette at 508-885-7500 ex. 180.


HIGH STREET
PEREGRINE STREET
LIBRARY
SUGDEN BLOCK
PRICE CHOPPER PARKING LOT
TOWN HALL
MAIN STREET
KENWOOD DINER
CURVES
ROBERT & CO.
HAY NAILS
WHITCO
ELM STREET
WALL STREET
MECHANIC STREET
MAPLE STREET
CONCEPT A
MAIN STREET RECONSTRUCTION
ELM STREET TO MAPLE STREET
TOWN OF SPENCER
SPENCER, MA
VHB


CONCEPT B – SHIFTED PLEASANT
MAIN STREET RECONSTRUCTION
ELM STREET TO MAPLE STREET
TOWN OF SPENCER
SPENCER, MA
VHB
Vanasse Hangen Brustlin, Inc.
27 JAN 2012
1" = 20'
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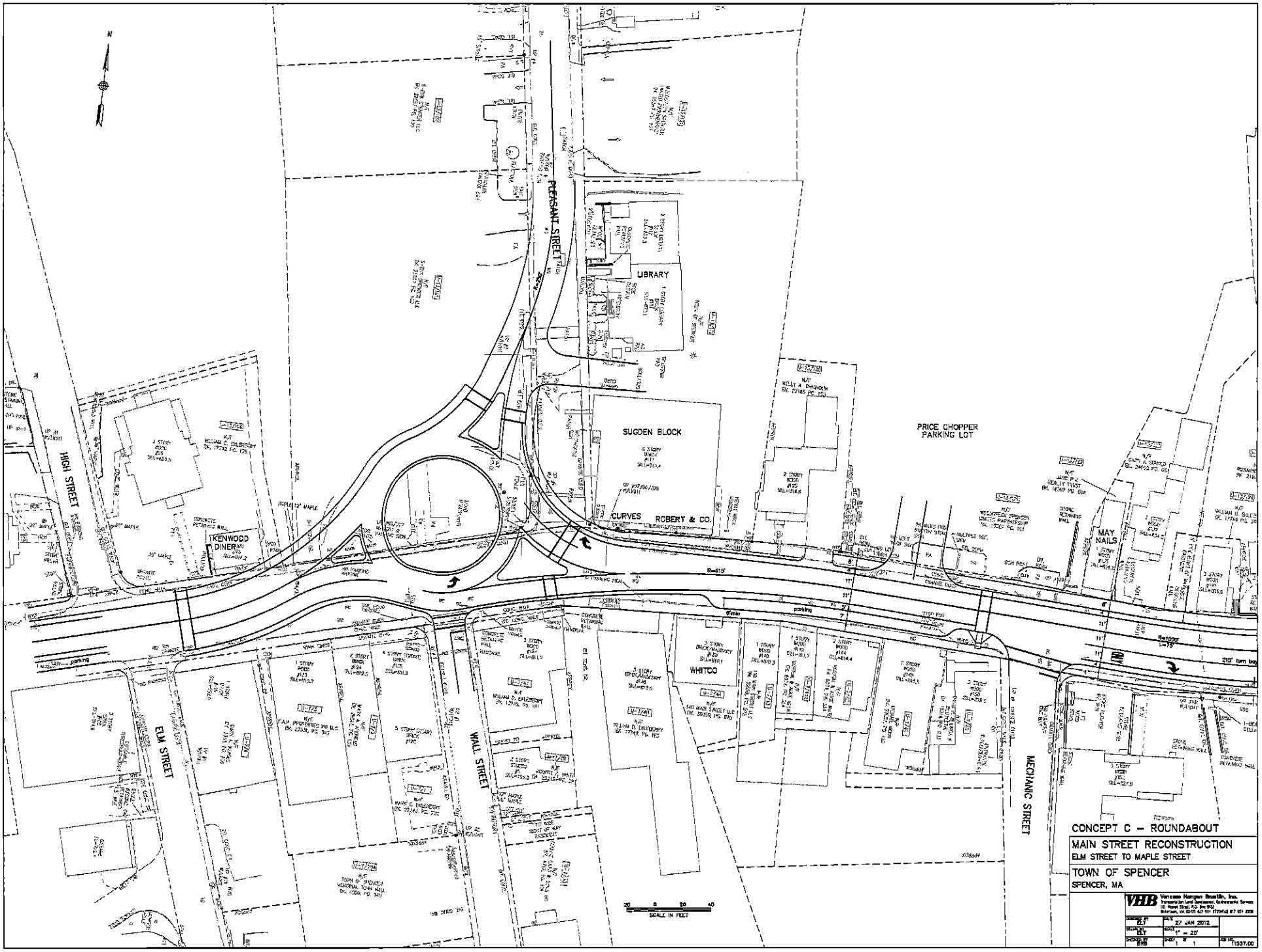
LIBRARY
SUGDEN BLOCK
PRICE CHOPPER PARKING LOT
KENWOOD DINER
CURVES
ROBERT & CO.
WHITCO
MAY NAILS
SCALE IN FEET


N
HIGH STREET
PLEASANT STREET
LIBRARY
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NAILS
WHITCO
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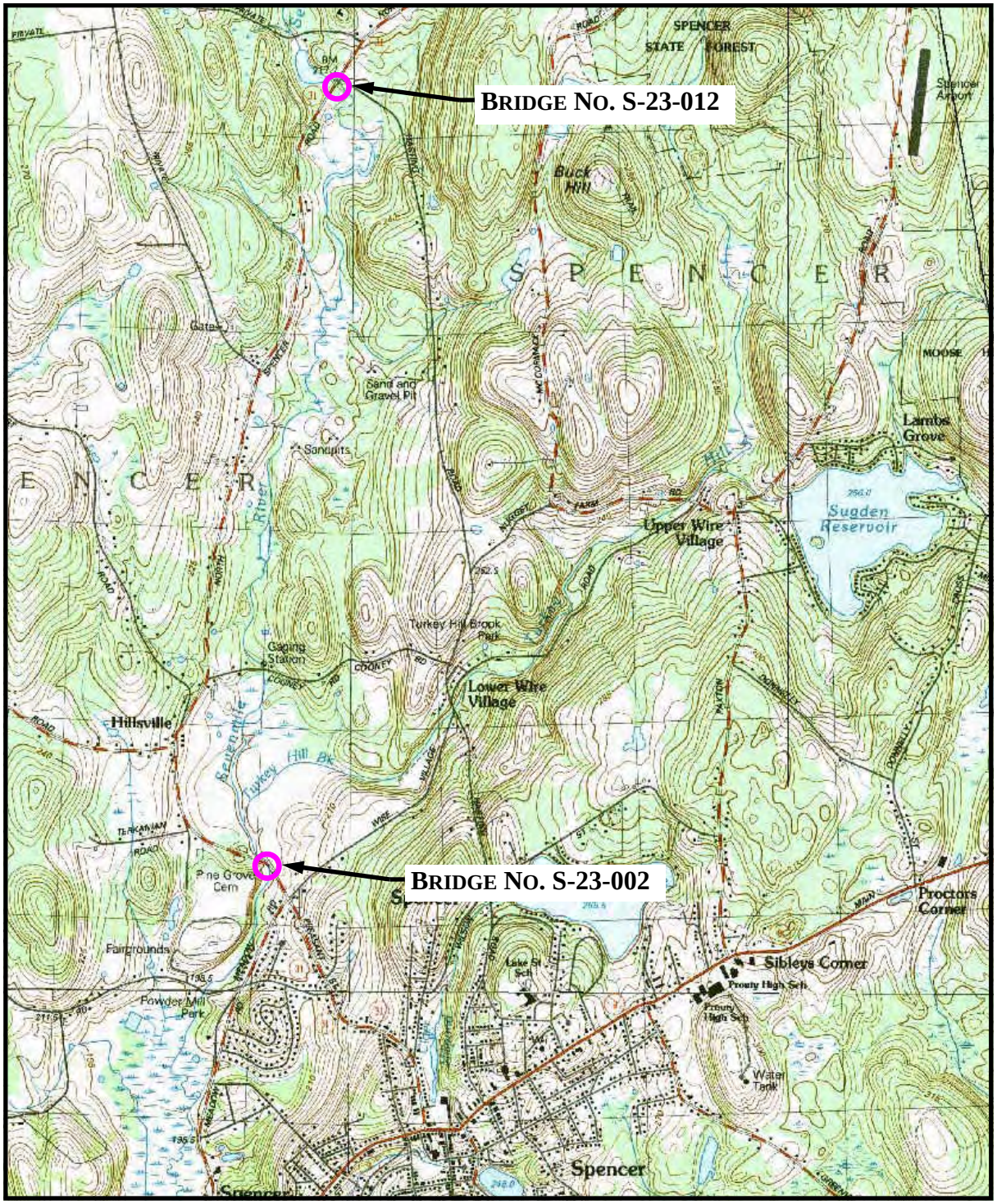
WALL STREET
MECHANIC STREET
R=615'
R=100'
L=75'
215' turn lane
parking
20 0 20 40
SCALE IN FEET
CONCEPT C – ROUNDABOUT
MAIN STREET RECONSTRUCTION
ELM STREET TO MAPLE STREET
TOWN OF SPENCER
SPENCER, MA
VHB
Vanasse Hangen Brustlin, Inc.
DESIGNED BY ELT
DRAWN BY ELT
CHECKED BY BHB
DATE 27 JAN 2012
SCALE 1" = 20'
SHEET 1 OF 1
JOB NO. 11537.00

FIGURE 2 – TWO N. SPENCER ROAD BRIDGES PROJECT LOCUS MAP

REHABILITATION OF BRIDGE NOS. S-23-002 (1XW) AND S-23-012 (1DE) ROUTE 31 (SPENCER ROAD) OVER THE SEVEN MILE RIVER, SPENCER, MA



Reference: USGS TopoQuad – North Brookfield, Spencer (& Paxton) Quadrangles

EAST BROOKFIELD & SPENCER RAILROAD

22 PHILLIP A. QUINN MEMORIAL HIGHWAY – ROUTE 49 • SPENCER, MA 01562 • PHONE: 508-885-4664 • FAX: 508-885-1299

May 4, 2012

Mr. Steven J. Tyler, P.E., Superintendent,
Utilities & Facilities Mgmt. Office
Town of Spencer
3 Old Meadow Road
Spencer, MA. 01562

RE: EBSR Commercial Trucking Delivery Usage of the Route 31 / North Spencer Road Corridor and Bridges over the Seven Mile River

Dear Steve,

Thank you for contacting me about New England Automotive Gateway's use of the Route 31 (North Spencer Road) corridor thru north Spencer and for the operational and cost impacts in the event that weight restrictions or potential closure for reconstruction or repair of either of the two bridges over the Seven Mile River is required. Foremost, for the purpose of maintaining present operations and deliveries is of highest concern. I would like to communicate our concerns regarding the need for maintaining loading capacity and keeping the Route 31 corridor and the bridges over the Seven Mile River open to commercial truck traffic.

As background, the East Brookfield & Spencer Railroad (EBSRR) operates the New England Automotive Gateway rail redistribution center off of Route 49 in Spencer. Our operation receives approximately 100 railcars filled with 1,200 automobiles daily for offload and distribution by truck to auto dealers located throughout the six New England states. In the process of delivering the vehicles to local dealers northeast of the facility, Route 31 NB is a primary route. Based on 5-10% of our traffic utilizing this route, as many as 30 trucks per day egress our facility over the two Route 31 Bridges crossing the Seven Mile River.

If either of these bridges were to be closed to our trucks there would be no alternative but to backtrack down Route 49, to Route 20, to Interstate Route 290, tripling the expense to deliver said vehicles. In addition, my concern would be that trucks unknowingly would attempt to take Route 9 east thru downtown Spencer toward Worcester to the local dealers to the northeast.

Both these alternatives would create unacceptable conditions, not only for the significant additional costs involved to the trucking companies and auto manufacturers who have found favor with our facility, but also for the residents of Spencer as they attempt to frequent the downtown district along Route 9.

Please I ask for your help in assuring that the bridges in question are properly maintained, repaired or rehabilitated as needed so as to keep this important truck route open for all users including the Gateway facility.

Thank you for your concerns and anticipated support of this effort.

Respectfully yours,

George W. Bell, II
President

SPENCER OFFICE OF UTILITIES & FACILITIES

MEMORANDUM

To: Richard A. Rydant, Principal Transportation Planner, CMMPO/CMRPC

From: Steven J. Tyler, P.E., Superintendent, Spencer Utilities & Facilities Office

CC: Adam D. Gaudette, Town Administrator

Date: June 10, 2013

Re: **Route 31 Corridor Profile – June 4, 2013 Review Meeting**
Spencer Review Comments

The purpose of this memo is to provide the Central Massachusetts Regional Planning Commission (CMRPC) Spencer's review comments on the June 4, 2013 regional corridor profile for Route 31 through Charlton/ Spencer/ Paxton.

Meadow Road: Need for Roadway Safety Audit (RSA) and Speed/Congestion Study

Spencer would very much like to see a Roadway Safety Audit (RSA) for Meadow Road and for the Route 9 segment that connects Route 49 to Meadow Road. Even if not part of this corridor profile we ask that it be considered as a product/recommendation for a future study. We plan to pursue Meadow Road as a future TIP project to include adding a pedestrian sidewalk, shared bike shoulder and WRTA stops/shelters in coordination with the other future Route 9 at Meadow Road and South Spencer Road intersection improvements including peak hour geometric upgrades, sidewalk/accessibility improvements and WRTA facilities coordinated with the employers Big Y Plaza and Flexicon.

Likewise we would like to see this corridor study do or recommend a near future congestion and speed study on Meadow Road? We are concerned with speed through this mixed commercial and residential area and the close proximity of car and truck hazards to the unprotected/unaccomodated pedestrians and bikes.

This section of Meadow Road has high pedestrian and bike use with higher speed traffic, many trucks and related traffic hazards due to lack of existing multi-modal accommodations. The current WRTA stop accommodations are poor to non-existent and could be improved. The intersection at Route 9 lacks pedestrian, MAAB/ADA and direct WRTA accommodations, especially considering the close proximity to the shopping center, Flexcon (high employer), WRTA route and high pedestrian/bike usage (relatively high for Spencer).

In addition there is substantial increase in current high pedestrian use associated with the Spencer Fair and other Fairground events. In addition, Powder Mill Park playground is heavily used from spring to fall with people of all ages present.

Life-Cycle and Conditions of Route 31 Roadway and Bridges

Note the proposed expansion of the New England Automatic Gateway (NEAG) equals added wear and tear on Meadow Road and all the Route 31 corridor roadway and bridges.

Also note the recently damaged Bridge No. S-23-010 Hastings Road over Turkey Hill Brook has caused that crossing to be reduced to single lane and therefore is now an even worse option for an alternate truck detour (i.e. Railroad yard/NEAG) when more significant deterioration and loading problems eventually occur on the Route 31 bridges. Also, the need to use limited town funds to repair Bridge No. S-23-010 Hastings Road over Turkey Hill Brook further reduces the un-likelihood that Spencer could ever address the Route 31 bridges on our own. Basically the Route 31 bridges are problems waiting to happen and those problems will have an adverse impact on region traffic and commerce.

Future Study: Regarding Planned Sidewalk Betterments

The town is presently developing a town wide sidewalk betterment plan. The Pleasant Street (Route 31) and Meadow Road segments of this corridor profile represent a significant portion of the long-term sidewalk improvement areas. Based on that near future development need we would like to see walkability study of the Pleasant Street (Route 31) and Meadow Road segments included in this corridor profile or recommended for future study.

Spencer Street Name Corrections

Fix Street name to "Meadow Road" several maps.

Spencer Water Features Corrections

Need to include Muzzy Brook culvert under Meadow Road near W. Main Street (behind Spencer Furniture).

Other Misc. Comments

Additional turning movements including commercial trucks anticipated at the Spencer Abbey due to new brewery under construction and nearly completed.

Feel free to contact me directly if any further questions regarding the above comments, concerns or requirements.

Prepared by:

Steven J. Tyler, P.E., Superintendent
Town of Spencer - Utilities and Facilities Office
styler@spencerma.gov

W:\HIGHWAY\TIP\Route 31 Corridor Study\2013-06-10 Spencer Route 31 Corridor Study Comments.doc

Automotive Gateway to grow

6/26/13

By Kim Ring
TELEGRAM & GAZETTE STAFF

T&G STAFF

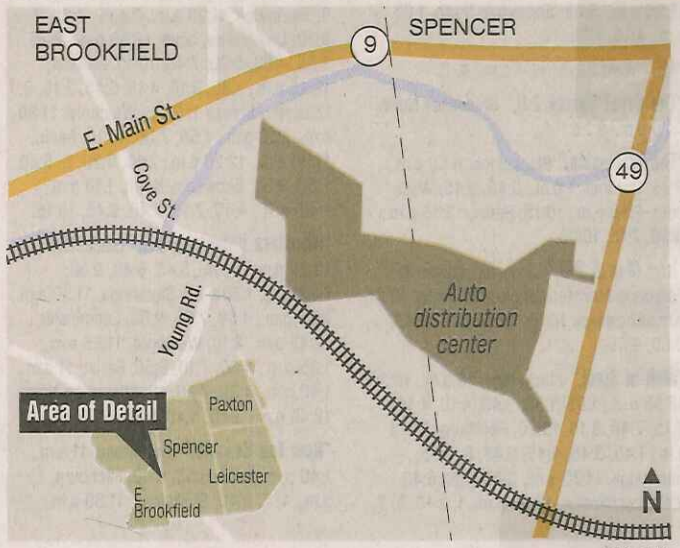
The New England Automotive Gateway is seen in a aerial photograph shot in 2008. The facility receives new automobiles on railroad car carriers from CSX.

SPENCER — A planned expansion at the New England Automotive Gateway will add more bays for automobiles being brought to and from the site so that the facility can meet the needs of customers.

A second phase of the project will allow for future growth of the business and the addition of new customers. The total project encompasses just less than 37 acres of the facility's 254 acres. Most of the land being used for the expansion is in Spencer.

Representatives from the project will meet with Spencer conservation commis-

Turn to **Autos**/Page B9



T&G Staff

Autos

From **Page B8**

sioners on Wednesday and have already secured from the Zoning Board of Appeals a needed special permit. They will also seek approval from the town's Planning Board.

Documents submitted to the state Executive Officer of Energy and Environmental Affairs show a plan to add 797 vehicle bays/parking spaces bringing the total for the facility to 5,265.

An eight-track addition, which includes a "multi-level loading rack" and a small storage area for rail equipment will be included.

A storm water management system will be put in place, as well.

The first phase of the project is set to begin this year, once permits are in place. It will end sometime in 2014, though Christopher Taylor, a civil engineer with Beals and Thomas Inc., consultants based in Southboro, said it would be difficult to predict an exact timeline during the early phase of the project.

Phase two would run from 2015 to 2016 if the planned schedule does not change.

The New England Automotive Gateway opened in 2004. At the site, off Route 49, cars and trucks are brought in by rail, off-loaded to trucks and distributed throughout New England.

Original plans for the site included a technology park, warehousing, industrial and office space, though those were never developed.

The expansion will increase traffic slightly, according to the Zoning Board of Appeals documents, but will not create "undue traffic congestion."

Attempts to reach a representative from the New England Automotive Gateway on Tuesday were unsuccessful.

Contact Kim Ring at kring@telegram.com. Follow her on Twitter @kimmring

Spencer

Motorist on Route 31 runs over bobcat

SPENCER — A bobcat was struck and killed on Route 31 north Monday night, Spencer police said.

The animal weighed around 30 pounds, police said.

Animal Control Officer Carol Gaucher said she has been working for the town for many years and has never seen a bobcat hit in town, though she has had several reports of sightings. The animal was near St. Joseph's Abbey when it was struck, police said.

A motorist on Route 9 struck and killed a deer Monday night, as well. The animal was struck by a car headed west and thrown into the eastbound lane, where it was hit a second time.

Officials said wild animals are moving around during the fall and motorists should use caution.

– Kim Ring

Telegram & Gazette

Thursday, November 15, 2012

Problem Spencer intersection prompts plea to state

SPENCER — Local officials have asked the state to look at the intersection of Meadow Road and Route 31 (Pleasant Street) and recommend ways to make it safer, selectmen told Carl Kwiatkowski, who lives near the area.

Mr. Kwiatkowski asked selectmen last night if it's possible to have a flashing light placed near the crossroads because there have been several accidents there.

"There was one last week," he said. "There were two ambulances there. It's a bad intersection."

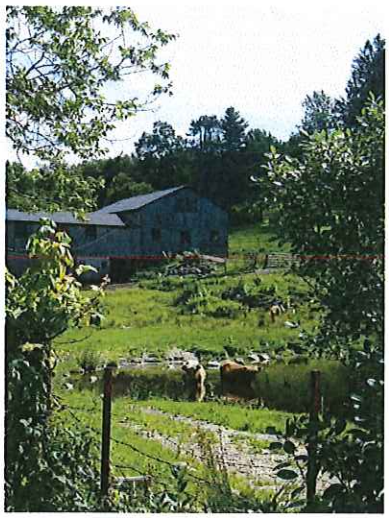
Town Administrator Adam D. Gaudette said the head of the Utilities and Facilities Department, Steven J. Tyler, had sent a letter to the state Highway Department asking for a review of the area, but the process is likely to take some time. The state will review reports from the crashes and decide if anything could be done to improve public safety.

— Kim Ring

Related Efforts

- Central Thirteen Prioritization Project Materials
- Community Development Prioritization Projects
- Choose Growth: Transportation Investment Map
- MassDOT Engineering Directive for Bicycle and Pedestrian Accommodations
- Crosswalk Information
- High Friction Surface Treatments
- MassDOT Safety and Traffic Engineering Memorandum re: HSIP Funded Systematic Approach to Safety for Curves along Roadways

What is the Vision for economic prosperity, open space and historic preservation, and improved infrastructure in the CENTRAL THIRTEEN region of Worcester County?



You are invited to a public meeting to see the results of the Central Thirteen Prioritization Project and hear what changes we can make to advance our priorities.

Wednesday, November 28, 2012
Union Hall—Second Floor
Union Station
Worcester, MA
Open Housing 6—7 p.m.
Public Meeting 7—9 p.m.

Join us for presentations about a regional vision for economic prosperity, preservation of open space and historic resources, and improved infrastructure in the central region of southern Worcester County. The Central Thirteen Prioritization Project kicked off in the Spring of 2012. Through meetings with each town and a regional forum, input was gathered on priorities for preservation and development. That input is the foundation for a regional vision intended to guide the future investment of limited public sector resources.

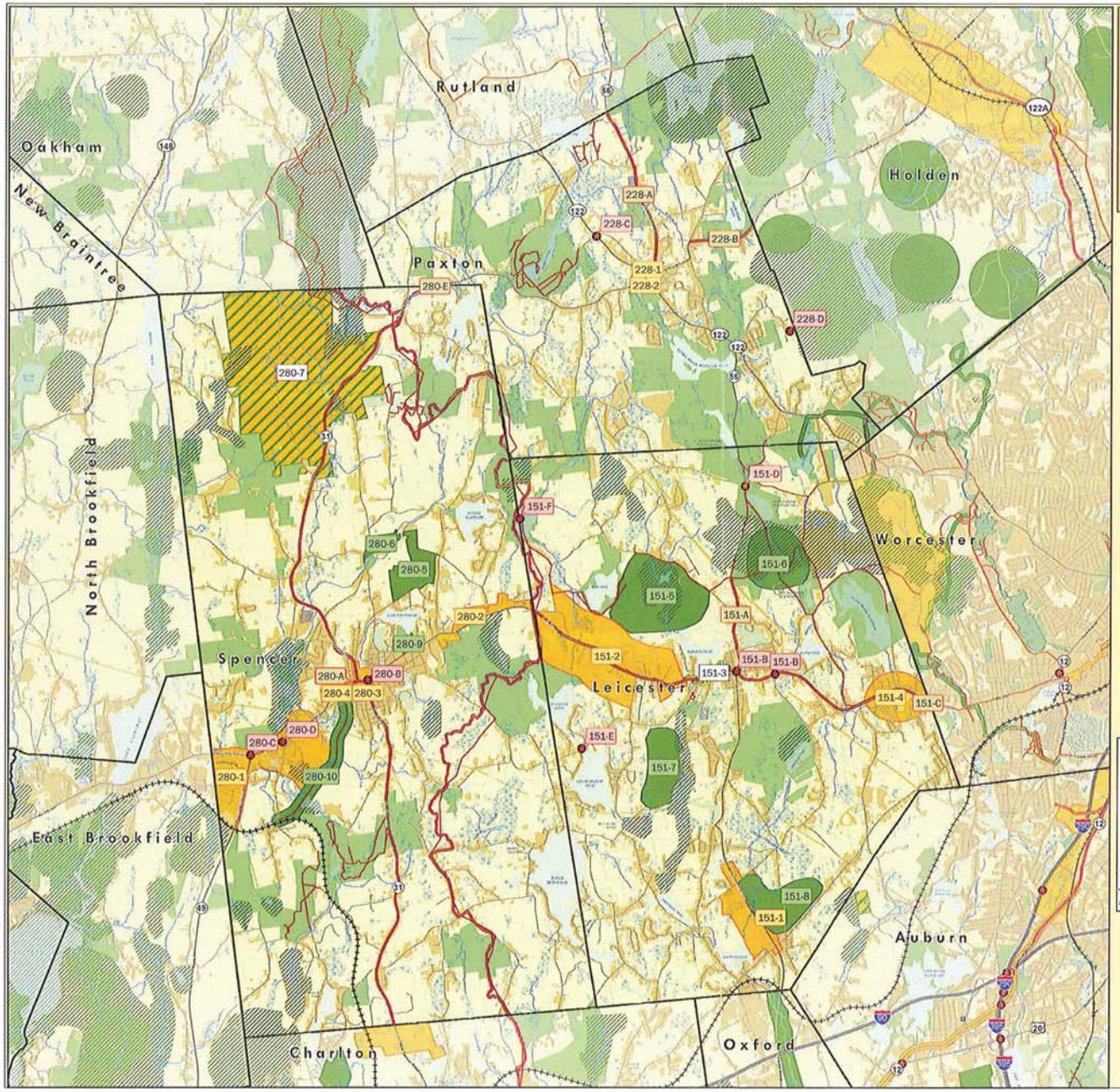
At this presentation:

- learn more about this vision for the Central Thirteen region;
- see maps and other information that informed the plan;
- hear perspectives from a panel of experts in conservation, transportation, local government, and private sector development;
- and discuss next steps.

RSVP to vkolias@cmrpc.org

The Central Thirteen Prioritization Project is an initiative to create a shared framework for state, regional, and local strategies for priority development and land preservation as well as transportation and other infrastructure investments in the 13 communities in the study area: Auburn, Boylston, Charlton, Dudley, Holden, Leicester, Oxford, Paxton, Southbridge, Spencer, Sturbridge, Webster, and West Boylston.

CMRPC
Central Massachusetts Regional Planning Commission



Priority Development and Preservation Base Map:

LEICESTER, PAXTON, SPENCER

Priority Areas
- Development
- Preservation
- Preservation/ Development

Significant Transportation Investments
- Corridors (Roadways, Trails, Transit, etc.)
- Spot Locations (Interchanges, Intersections, etc.)

Water Features
- Perennial Stream
- Water Bodies
- Wetlands

Open Space
- Permanently Protected
- Limited Protection (with Municipal, State or Federal Ownership)

Roads
- Highways
- State and US Routes
- Major Roads
- Minor Roads

Commuter Rail
- Station
- Commuter Rail Line
- Train Tracks

- Municipal Boundaries
- Parcel Lines
- Park and Ride Lots
- Existing Trails
- BioMap2 Core Habitat and Critical Natural Landscape

Land Use (2005)
- Undeveloped
- Developed

N

0 0.475 0.95 1.9 Miles

The information displayed on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.

This project is funded by the District Local Technical Assistance Program (DLTA).

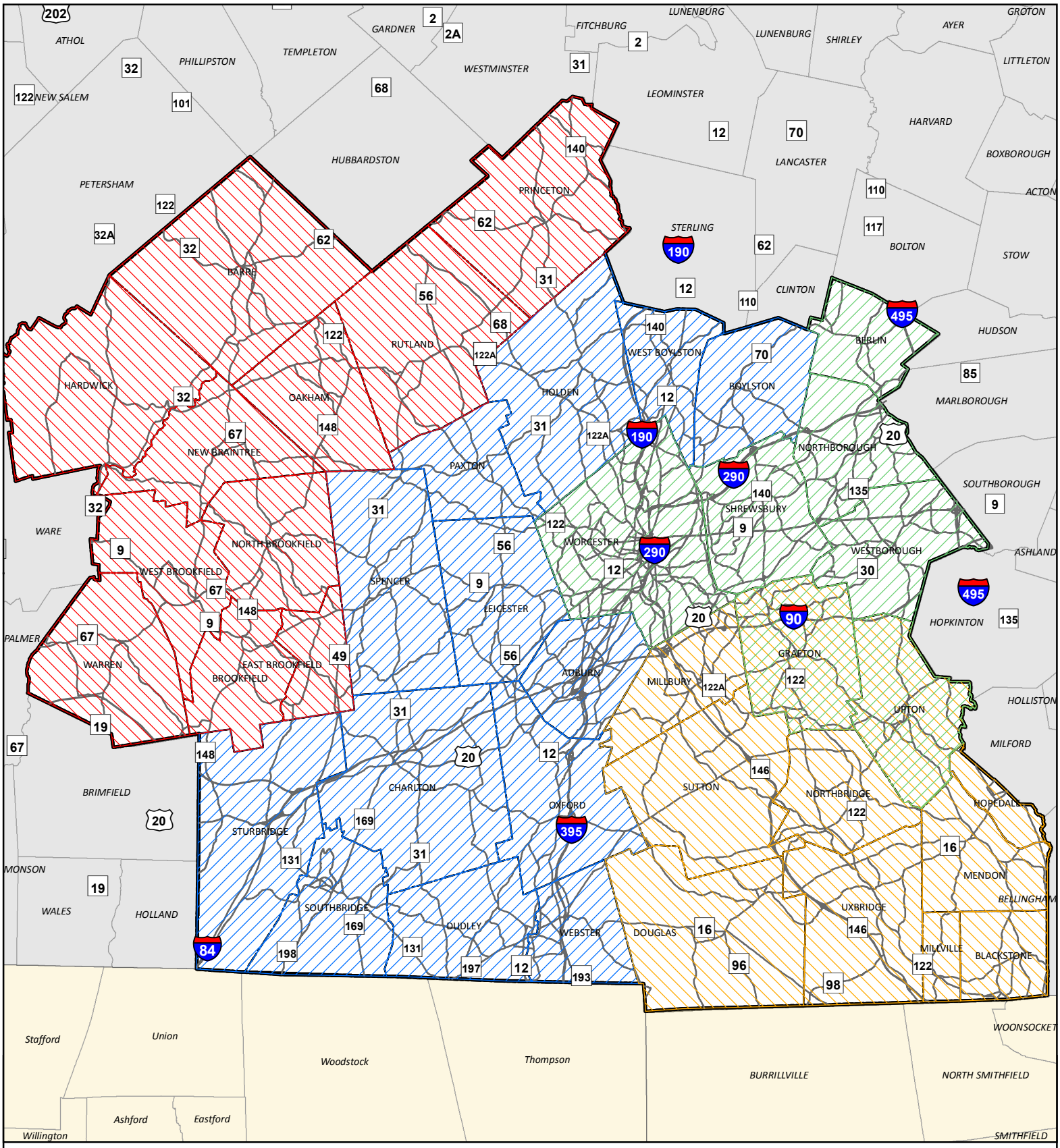
Produced by:
Central Massachusetts Regional Planning Commission (CMRPC)
2 Washington Square, Union Station, Worcester MA 01604

Data Sources:
Roads and Train Tracks/Stations: Massachusetts Department of Transportation (MassDOT)
Massachusetts Geographic Information System (MassGIS)
Wetlands: Massachusetts Department of Environmental Protection (DEP)
BioMap2: MA Natural Heritage & Endangered Species Program
Metropolitan Area Planning Council (MAPC)
Central Massachusetts Regional Planning Commission (CMRPC)

Date: 1/11/2013

CMRPC
Central Massachusetts Regional Planning Commission

CENTRAL THIRTEEN PRIORITIZATION PROJECT



Community Development Prioritization Projects

- 495/MetroWest Compact
- Blackstone Valley Prioritization Project
- Central 13 Prioritization Project
- Rural 11 Prioritization Project

CMRPC
Central Massachusetts Regional Planning Commission

0 1.25 2.5 5 Miles

N

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), massDOT/Office Of Transportation Planning Geospatial Resources Section and the Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division.

Information depicted on this map is for planning purposes only. This information is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analysis. Use caution intrepreting positional accuracy.

Produced by the Central Massachusetts Regional Planning Commission (CMRPC)
2 Washington Square, Union Station
Worcester, MA 01604

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Choose Growth: Transportation Investments

Sen. Michael O. Moore (D)
Second Worcester

Projects: **$ 140,438,320**
Chap.90 10-yr Total: **$ 118,006,438**
RTA 10-yr Total: **$ 198,940,000**

Legend

Transportation Projects

- Roadway
- Rail Expansion
- Bike and Pedestrian Facilities
- Bridge
- Intersection Project

Note: Due to space constraints, some transportation projects may not be labeled. Rail projects and large regional roadway projects not included in district project totals.

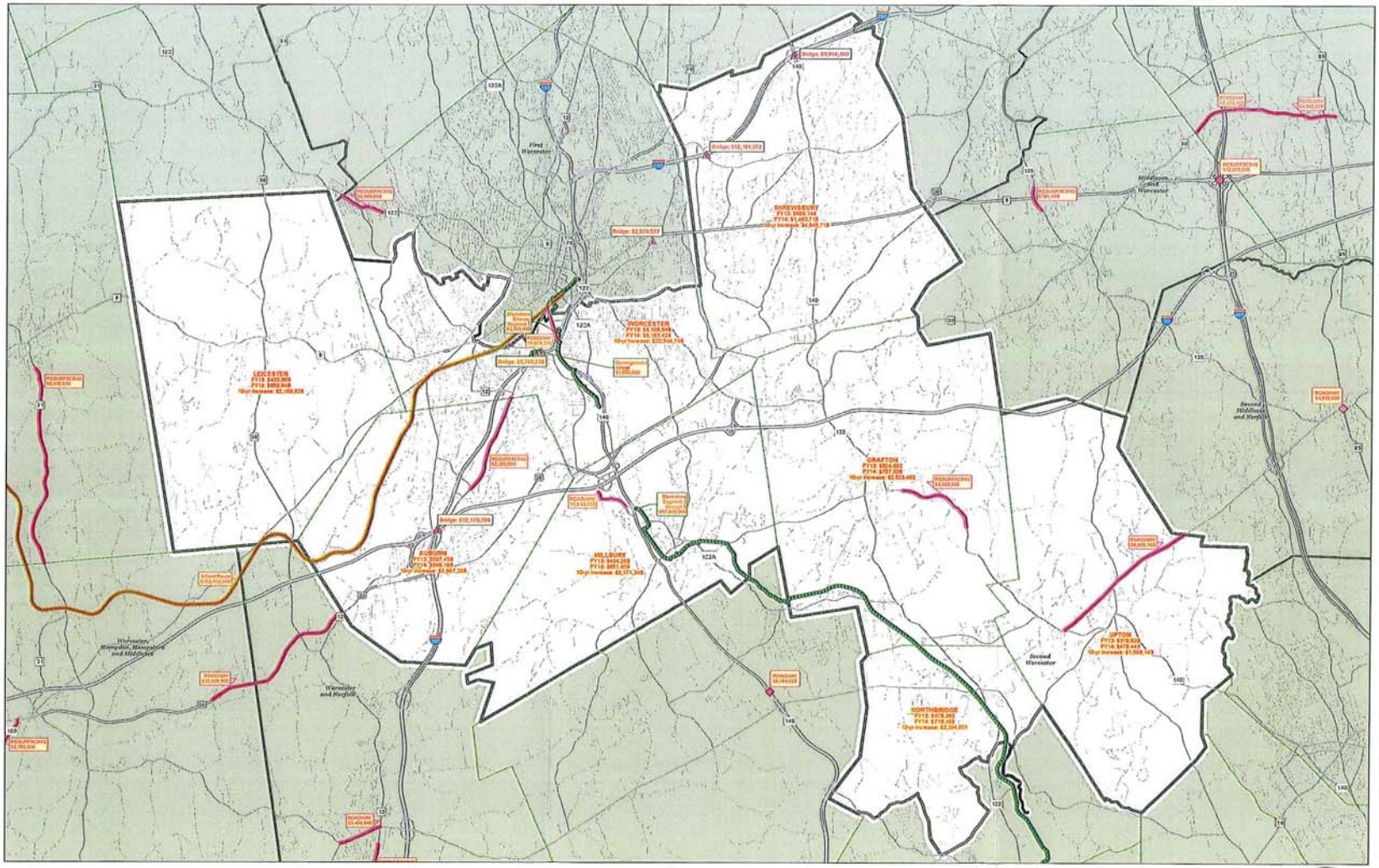
- **Focus Senate District**
- **Other Senate Districts**
- **Municipal Boundary**

Communities are labeled with their Chapter 90 funds for FY13, FY14 and their 10-year increase.

MassDOT Roads

- Limited Access Highway
- Multi-lane Hwy, not limited access
- Other Numbered Highway
- Major Road, Collector; Ramp
- Minor Road, Arterial
- Tunnel

Chapter 90 Program
Chapter 90 is the state's bond-funded program that reimburses cities and towns for the costs related to maintaining, repairing, improving and constructing municipal roads and bridges.



0 1 2 3 4 5 Miles

N W E S

Map produced by the Office of Geographic Information (MassGIS), ANF-ITD, 2/22/2013

Data source: MassDOT Planning

Number: E-14-001

Date: 2/4/14

INTERIM

Patricia A. Leavenworth, P.E. (signature on original)

CHIEF ENGINEER

This Directive is effective immediately for all projects not yet advertised for construction. Projects that have received 25% Project Approval as of this date are exempt from meeting the pedestrian and bicycle accommodation requirements of this Directive, unless directed otherwise by MassDOT on a case-by-case basis. However, designers are encouraged to apply all elements of this Directive, where practical, to every project regardless of design status.

Design Criteria for MassDOT Highway Division Projects

The purpose of this Engineering Directive is to clarify the design criteria that shall be applied to MassDOT Highway Division projects, as listed below. This Directive introduces new controlling criteria for pedestrian and bicycle accommodation that will be used together with FHWA's 13 controlling criteria for roadways and bridges. This Directive supersedes Engineering Directive E-09-005, dated 8/21/09, and supports MassDOT Healthy Transportation Policy Directive P-13-0001, dated 9/9/13.

As stated in the *MassHighway Project Development and Design Guide* (Guide), the design criteria and processes contained herein apply when:

1. MassDOT Highway Division is the project proponent, or
2. MassDOT Highway Division is responsible for project funding (state or federal aid), or
3. MassDOT Highway Division controls the affected infrastructure (State Highway).

Design Criteria for Roadways and Bridges (FHWA's 13 Controlling Criteria)

1. For projects not on the NHS, the design criteria shall be in accordance with the Guide.

2. For projects on the NHS, the design criteria shall be as follows:
    a. For projects on NHS Interstate Highways:
        i. For Interstate non-3R* projects, the design criteria shall be in accordance with the latest edition of the *AASHTO, A Policy on Design Standards, Interstate System* (AASHTO Interstate).
        ii. For Interstate 3R* projects, the minimum design criteria for horizontal alignment, vertical alignment and widths of median, traveled way and

shoulders remain the standards that were in effect at the time of original construction or inclusion into the Interstate System.

b. For projects on other NHS freeways (other than Interstate) the design criteria shall be in accordance with the latest edition of the *AASHTO, A Policy on Geometric Design of Highways and Streets* (Green Book). 3R* allowances for NHS freeways are included in the Green Book.

c. For projects on non-freeway NHS roadways:

   i. For non-freeway non-3R* projects, the design criteria shall be in accordance with the Green Book.
   ii. For non-freeway 3R* projects, the design criteria shall be in accordance with the Guide.

** 3R projects are projects that are primarily resurfacing, restoration or rehabilitation projects that extend the service life of highways, bridges and related appurtenances; and/or restore safe, efficient travel on an existing facility. Normally, 3R projects include most of MassDOT's resurfacing projects and most bridge preservation and rehabilitation projects. They also include roadway projects where box widening is proposed to widen shoulders for improved bicycle accommodation and safety. 3R projects generally have no significant geometric changes to horizontal or vertical alignment and generally have no significant widening such as widening for additional capacity. Projects that include minor lane and/or shoulder widening may be considered to be 3R projects. Projects that are beyond the 3R definition are normally defined as reconstruction projects and new construction projects which are subject to the respective standards identified above and their established design exception approval process.*

DESIGN CRITERIA for ARTERIAL TRAVEL LANES AND SHOULDERS

ROADWAY TYPE	PROJECT TYPE	BOOK	EXHIBIT NUMBER	ARTERIAL MINIMUM WIDTHS[1,3]		
				TRAVEL LANE	LEFT SHOULDER	RIGHT SHOULDER[2]
Interstate	Non 3R[4]	Interstate	2005 Page 3	12'	4' (to 12')[2]	10' (to 12')
Interstate	3R[4]	Interstate	1956 or later	12'	3.5' offset	10' (to 12')
NHS Freeway	All	Green	7-3	12'	4'[2]	10'
NHS Non-Freeway	Non 3R[4]	Green	7-3	12'	2' offset	8'
NHS Non-Freeway	3R[4] Only	Guide	5-12 5-14	11'	2' offset	4'
Non NHS	All	Guide	5-12 5-14	11'	2' offset	4'

1. These are the minimum widths below which a Design Exception is normally required.
2. These dimensions are for usable shoulder. Add a 2' offset for objects over 6" high, such as guardrail.
3. These criteria apply regardless of project funding.
4. "3R" stands for resurfacing, restoration or rehabilitation.

Design Criteria for Pedestrian and Bicycle Accommodation

Pedestrian Accommodation

- Pedestrian accommodation shall be in accordance with Chapter 5 of the Guide and the *AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities*.
- Wherever adjacent land uses include commercial or residential development greater than 5 units per acre, a sidewalk shall be provided along the roadway adjacent to the use. (See P-13-0001, Section 2C.)
- For projects in urbanized areas on roadways where pedestrians are legally allowed, sidewalks shall be provided on both sides of the roadway. (See P-13-0001, Section 2E. Refer to MassDOT's Road Inventory Maps for urbanized area boundaries.)
- For bridge projects, sidewalks shall be provided on both sides of the roadway if pedestrians are legally allowed. (See P-13-0001, Section 2E.)
- For projects on roadways that pass under bridges and where pedestrians are legally allowed, sidewalks shall be provided on both sides of the roadway beneath each bridge. (See P-13-0001, Section 2E.)
- The minimum sidewalk width below which a design exception is required is 5', exclusive of curb.

Bicycle Accommodation

- Bicycle accommodation shall be in accordance with Chapter 5 of the Guide and the *AASHTO Guide for the Development of Bicycle Facilities*.
- For all freeways, arterials and collectors where bicycles are legally allowed, a paved outside shoulder or designated bicycle lane shall be provided on both sides of the roadway.
- The minimum paved outside shoulder or designated bicycle lane width below which a design exception is required is 5', exclusive of any parking lane.
- In lieu of paved outside shoulders or designated bicycle lanes, protected bicycle facilities (i.e. cycle tracks, side paths, shared-use paths, bicycle paths, etc.) may provide accommodation for bicycles. However, the presence of such facilities does not relieve the designer of the need to properly consider applicable design criteria for outside (right) shoulder width.
- Refer to the *AASHTO Guide for the Development of Bicycle Facilities* and other current guidance documents for design criteria for off-road paths and cycle tracks.

Design Exceptions

- Criteria proposed below minimum values may be considered after providing sufficient justification and documentation while following the Design Exception process outlined in Chapter 2 of the Guide.
- In determining the standards for horizontal alignment, the minimum length of curve criteria need not be met on 3R projects.
- Lane and shoulder widths are the most common criteria subject to Design Exceptions. Refer to the guidance in the previous sections of this Directive to determine design criteria for lane and shoulder widths. When using the Guide, the values in Exhibits 5-12 and 5-14 shall apply. When using the Green Book, the values in Exhibit 7-3 shall apply. Additional

language in the Green Book, particularly for constraints associated with Urban Arterials, may be used to support justification for a Design Exception.

- In using the AASHTO Interstate standards, the shoulder width criteria, regardless of the terminology used, such as "shall", "should be considered", etc., by virtue of their adoption by FHWA, are the minimum values for each condition described. Design Exceptions are therefore required for projects that do not provide applicable widths.
- In some cases, the minimum shoulder width criterion for bicycle accommodation exceeds the minimum right shoulder width criterion for roadways. Regardless, the designer must consider each element independently, and must document any necessary design exceptions accordingly. In cases where design exceptions are required for both elements, the discussion and justification of these exceptions may be combined in the Design Exception Report.
- The designer shall prepare and submit any necessary Design Exception Reports as part of the 25% design submission, or for permit projects, as part of the permit application.
- The primary project reviewer, typically the District office, shall review the Design Exception Report. In addition, the Complete Streets Engineer shall review the 25% design submission, including the Design Exception Report, for all projects on roadways where pedestrians and bicyclists are allowed, including projects to be completed under a permit.
- If all reviewers recommend approval of the Design Exception Report, the Project Manager shall forward the signed Design Exception Report to the Chief Engineer for approval. If the Design Exception Report includes exceptions to the design criteria for Pedestrian and Bicycle Accommodation, the Project Manager shall subsequently request project sign off by the Secretary and CEO of Transportation, in accordance with P-13-0001. The approved Design Exception Report shall be used as justification for the Secretary's sign off. If the project is subject to FHWA oversight, the Project Manager shall subsequently forward the approved Design Exception Report to FHWA for final approval.
- Projects should not be advanced beyond the 25% design stage until all necessary Design Exception approvals and project sign offs are secured. Highway Access Permits should not be approved by District Highway Directors until all necessary Design Exception approvals and project sign offs are secured.
- Upon receipt of a Design Exception Report, the Project Manager shall provide by email a copy of the Report to the Chair of the Design Exception Review Committee. The Committee shall discuss project elements and offer advice or endorsements to the Project Manager and the project reviewers for each issue. The Committee is responsible for tracking and reporting on all Design Exception issues, and for ensuring consistency in the application of design standards and in the documentation of Design Exceptions.

Exemptions from Controlling Criteria

Design Criteria for Roadways and Bridges (FHWA's 13 Controlling Criteria)

The following types of projects are exempt from the need to comply with FHWA's 13 controlling criteria. When design criteria for these types of projects are not in compliance, a formal Design Exception Report is not required; however, geometric deficiencies should be identified in a Functional Design Report or other documentation:

- 3R projects within the existing roadway footprint where the project Purpose and Need is solely to maintain the roadway surface or bridge structure and the crash history does not indicate any apparent geometric deficiency.

- Interstate 3R projects (if the roadway meets the standards used for horizontal alignment, vertical alignment and widths of median, traveled way and shoulders that were in effect at the time of original construction or inclusion into the Interstate System, and the crash history does not indicate any apparent geometric deficiency).
- Non-NHS Footprint Bridge projects in accordance with the Footprint Bridge Policy.
- Isolated single intersection safety improvement projects (with minimal work on approach roadways).
- Routine roadway maintenance projects such as crack sealing, joint repair, micro surfacing, chip seals, etc.
- Non-roadway maintenance projects such as catch basin cleaning, street sweeping, grass mowing, etc.
- Bridge maintenance projects such as joint repair, deck repair, superstructure repair, substructure repair, etc.
- Sidewalk and curb ramp only projects.
- Drainage only projects.
- Noise barrier only projects (provided sight distance and horizontal clearance met).
- Guardrail only projects (provided sight distance and horizontal clearance met).
- Landscape only projects (provided sight distance, vertical clearance and horizontal clearance met).
- Highway lighting only projects (provided sight distance, vertical clearance and horizontal clearance met).
- Signing only projects (provided sight distance, vertical clearance and horizontal clearance met).
- Pavement marking only projects.
- Traffic signal equipment only projects (provided horizontal and vertical clearance met).
- Vertical construction and other non-roadway/bridge projects.
- Projects done under Minor Vehicle Access Permits or Non-Vehicular Access Permits.

<u>Design Criteria for Pedestrian and Bicycle Accommodation</u>

The following types of projects are exempt from the need to comply with Pedestrian and Bicycle Accommodation design criteria:

- All projects on facilities where bicyclists and pedestrians are prohibited, such as Interstates and freeways.
- Routine roadway maintenance projects that don’t involve application of new pavement markings, such as crack sealing, pothole patching and joint repair.
- Bridge maintenance projects such as joint repair, deck repair, superstructure repair, substructure repair, etc.
- Drainage only projects.
- Noise barrier only projects.
- Guardrail only projects.
- Lighting only projects.
- Traffic Signal Equipment only projects.
- Signing only projects.
- Landscape only projects.
- Vertical construction and other non-roadway/bridge projects.
- Projects done under Minor Vehicle Access Permits or Non-Vehicular Access Permits.

EXEMPTIONS FROM CONTROLLING CRITERIA SUMMARY TABLE		
Project Type[1]	**Exemption Type**	
	FHWA's 13 Controlling Criteria	**Pedestrian and Bicycle Accommodation Criteria**
3R Roadway (Non-Interstate)[1]	✓	
3R Interstate[1]	✓	✓
Non-NHS Footprint Bridge[1]	✓	
Isolated Intersection[1]	✓	
Routine Roadway Maintenance[1]	✓	
Routine Roadway Maintenance – No New Pavement Markings[1]	✓	✓
Non-Roadway Maintenance[1]	✓	✓
Bridge Maintenance[1]	✓	✓
Sidewalk and/or Curb Ramp Only[2]	✓	
Pavement Marking Only[3]	✓	
Drainage Only	✓	✓
Noise Barrier Only[1]	✓	✓
Guardrail Only[1]	✓	✓
Lighting Only[1]	✓	✓
Traffic Signal Equipment Only[1]	✓	✓
Signing Only[1]	✓	✓
Landscape Only[1]	✓	✓
Non-Vehicular or Minor Vehicle Access Permit	✓	✓
Vertical Construction and other Non-Roadway/Bridge	✓	✓
On Facilities where Bicycles and Pedestrians are Prohibited		✓

Notes

[1] See expanded Project Type descriptions above.

[2] These projects are also exempt from Bicycle Accommodation Criteria.

[3] These projects are also exempt from Pedestrian Accommodation Criteria.

Crosswalks

Installing Crosswalks
Crosswalks are typically installed at intersections where pedestrian delineation proves beneficial. At non-intersection locations, crosswalks should only be added when there is both a significant pedestrian presence and after an engineering study deems it safe.

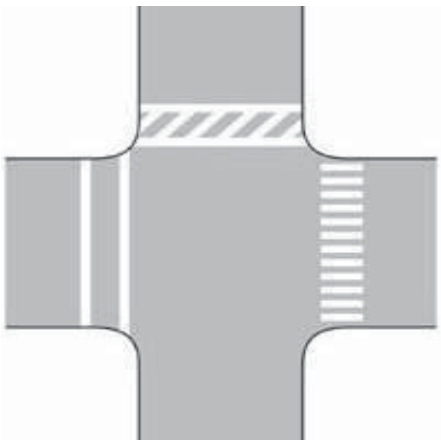
Continental Crosswalk Markings *(Source: www.pedbikeimages.org)*

Background

In 2006, pedestrians accounted for fourteen percent of total roadway fatalities in Massachusetts. Nationwide there were 4,784 pedestrian fatalities accounting for eleven percent of all roadway fatalities. Based upon these statistics, pedestrian accommodation should be a critical element of transportation safety, and, in fact, is required under Massachusetts General Law. One common practice for accommodating pedestrians is the use of crosswalks.

Roadways must accommodate a wide variety of pedestrians who behave differently and have a variety of physical, cognitive, and sensory abilities. From a crossing perspective, this is important as some pedestrians may require more time to cross a street and desire more predictable surfaces. Similarly, pedestrians who are visually impaired may require audible and tactile cues. Pedestrians using wheelchairs may cross the street more quickly, but are also more difficult to see from a vehicle.

Design of a Crosswalk



Source: MUTCD

Crosswalk markings provide guidance for pedestrians who are crossing roadways. Minimally, crosswalks must consist of two parallel lines that shall not be less than 6 inches or greater than 24 inches in width. The crosswalk should have a width of no less than six feet.

For added visibility additional marking opportunities exist. For example, the preferred type of crosswalk marking in many municipalities is the ladder, or "continental" pattern consisting of white longitudinal lines parallel to traffic flow, however "zebra" (diagonal) striping may also be used. Longitudinal or diagonal lines should be 12 to 24 inches wide and spaced 12 to 60 inches apart. Crosswalk markings should be spaced so that the lines are not in wheel paths. In addition, the spacing should not exceed 2.5 times the width of the lines. See the Manual on Uniform Traffic Control Devices (MUTCD Section 3B.17) for more information.

For more information contact:
MassHighway
Traffic Engineering
(617) 973-8484

Last Revised:
January 2008

Crosswalks

Pedestrian Crossing Warning Sign

When to Install Crosswalks

Crosswalks should be marked at all intersections with substantial conflicts between vehicles and pedestrians, as well as at other appropriate points of pedestrian concentration, including non-intersection locations with a significant pedestrian presence. As per the MUTCD Section 3B.17, an engineering study should be performed before installing marked crosswalks away from traffic signals or STOP signs. Warning signs should be installed at non-intersection crosswalks, and added visibility should be provided through parking prohibitions on the crosswalk approaches. Worth noting is that some municipalities have established quantitative guidelines (e.g., number of pedestrians per some specified time period) for installing crosswalks at non-intersection locations.

Crosswalks at Intersections

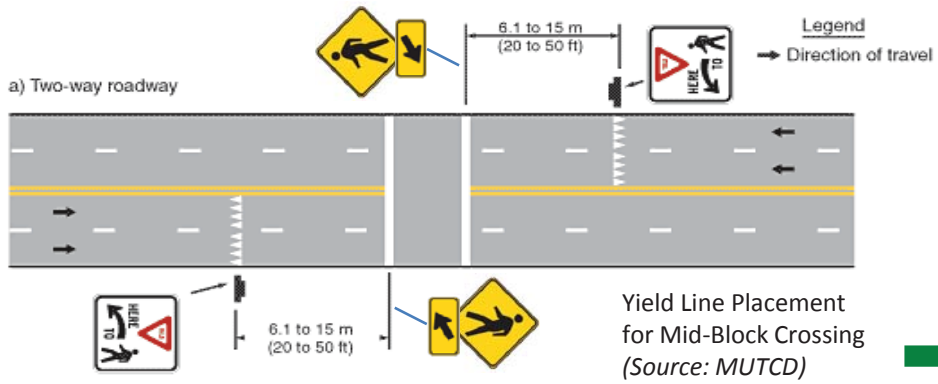
Crosswalks should be marked at intersections when they:

- Help pedestrians find their way across a complex intersection;
- Show pedestrians a safe route across traffic;
- Minimize exposure to motor vehicles, bicycles, and traffic conflicts; and
- Position pedestrians where they can best be seen by oncoming traffic.

Crosswalks located at intersections should be no more than 26 feet from the edge of the intersections. When crosswalks are located on a street with a stop line or with traffic signals, there should be a minimum spacing of 4 feet between the outer edge of the crosswalk and the nearest edge of the stop bar.

Non-Intersection Crosswalks

At non-intersection locations, in addition to the crosswalk markings, yield lines may be used to indicate the point at which vehicles should yield to pedestrians. Yield lines consist of solid white isosceles triangles pointing toward approaching vehicles and extend across the approach lane. The individual triangles have a base 12 to 24 inches wide and a height of 1.5 times the base, and are spaced 3 to 12 inches apart. If used, yield lines should be placed next to a "Yield Here to Pedestrians" (R1-5) sign. Please see MUTCD Section 3B.16 for additional details at these locations.



Yield Line Placement for Mid-Block Crossing
(Source: MUTCD)

For more information contact:
MassHighway
Traffic Engineering
(617) 973-8484

Last Revised:
January 2008

Crosswalks

Post-mounted Regulatory Pedestrian Sign
(Source: MassHighway Traffic Engineering)

Unsignalized Pedestrian Crossing Sign
(Source: MUTCD)

Pedestrian Laws and Regulations

•Massachusetts General Law (MGL) Chapter 89, Section 11 requires, among other things, that when traffic control signals are not in place or not in operation the driver of a vehicle shall yield the right of way to a pedestrian crossing the roadway within a marked crosswalk;

•Regulations promulgated under MGL Chapter 90, Section 18A, by MassHighway, require every pedestrian crossing a roadway at any point other than a marked crosswalk shall yield the right-of-way to all vehicles upon the roadway;

•As per the MUTCD Section 2B.12 in-street pedestrian crossing signage shall not be used at signalized intersections, and if it is placed in the roadway the sign support shall comply with the breakaway requirements.

Crosswalk Enhancements on Local Roadways

Raised Crosswalks

Raised crosswalks bring the roadway up to the level of the sidewalk at the crosswalk. They improve the visibility of the crosswalk and pedestrian, and by acting as a speed hump they can be effective at reducing vehicle speeds.

In-Roadway Warning Lights

In-roadway warning lights are amber lights embedded in the roadway on both sides of a crosswalk that begin flashing when activated by a pedestrian, thereby alerting drivers that a pedestrian is in the vicinity of the crosswalk.

Roadway Lighting

Although street lighting provides a benefit at many locations, it is particularly beneficial at crosswalks where lighting increases the visibility of pedestrians to passing motorists.

Refuge Islands and/or Medians

The addition of refuge islands and/or medians may be an effective design technique that affords pedestrians the opportunity to cross a roadway in stages.

Resources

The Manual on Uniform Traffic Control Devices (MUTCD)

Published by the FHWA, the MUTCD defines the standards used by transportation professionals nationwide to install and maintain traffic control devices on all streets and highways. The most recent version (2003) can be found at http://mutcd.fhwa.dot.gov/

The Pedestrian and Bicycle Information Center (PBIC)

The PBIC is a national clearinghouse for information about health, safety, engineering, advocacy, education, enforcement, access, and mobility for pedestrians and bicyclists. Information can be found at http://www.walkinginfo.org/index.cfm

For more information contact:
MassHighway
Traffic Engineering
(617) 973-8484

Last Revised:
January 2008

Section 10A-6 Pedestrian Regulations

Chapter 90, Section 18A of the General Laws authorizes the Department and cities and towns to regulate the use by pedestrians of ways within their respective control. Pedestrian control regulations have been adopted by the Department for all State Highways. A sample regulation suitable for adoption by the municipalities is shown in Appendix B, "Sample Pedestrian Regulations." This regulation may be expanded to cover special situations in the larger cities. Particular attention is directed to the fact that municipalities that do not have these regulations will no longer receive traffic control signal permits that contain a pedestrian period in the cycle. This is necessitated by the discontinuance as standard of the red-yellow indication shown together and in its place the substitution of the WALK and DON'T WALK pedestrian control indications.

In order that cities and towns may legally control pedestrians, the following steps are necessary:

(1) Acceptance of the enabling act.
(2) Adoption of pedestrian control regulations.
(3) Approval of the regulations by the Department.
(4) Advertisement of the regulations.

Section 10A-7 Towing on City and Town Ways

Under the provisions of Chapter 40, Section 22D of the General Laws (Tercentenary Edition) cities and towns are enabled to adopt regulation providing for the towing of vehicles parked in violation of a regulation prohibiting parking or in such manner as to impede snow cleaning operations. A sample regulation suitable for adoption by these municipalities is shown in Appendix C. (TOW-AWAY ZONE REGULATIONS). The steps to be followed for implementation are:

(1) Acceptance of the law by the city or town.
(2) Adoption of the regulations by the rule making body.
(3) Posting of signs in certain specified areas.
(4) Advertisement of the regulation.

Section 10A-8 Speed Control

Of the special regulations adopted by municipalities under the provisions of Chapter 90, Section 18 of the General Laws, the most commonly used is the special regulation of the speed of motor vehicles. Considerable data including speed observations and trial runs must be obtained by municipal officials, usually the Police Department. The final determination is based upon the 85-percentile method, which is that speed at or below which 85% of the vehicles observed were actually traveling. Department representatives are available to demonstrate the proper method for conducting the necessary studies and drafting the covering regulation, upon written request of local officials.

Procedure for Establishment of Legal Speed Zones

(1) The municipality is to conduct proper studies and submit data to the Department. (Municipalities usually accept the available services of the Department in conducting studies and assembling the data).

APPENDIX B

Sample

Pedestrian Regulations

Voted:

In accordance with the provisions of Chapter 90, Section 18A of the General Laws (Ter. Ed.) and in accordance with the Pedestrian Control Standards of the Department, the City Council (Board of Selectmen) (Traffic Commission) of the City (Town) of ..... hereby enact the following regulations to govern the use of ways by pedestrians. These regulations are to become effective on .....

PEDESTRIAN CONTROL REGULATIONS

SECTION 1: Pedestrian Crossing Ways or Roadways

Pedestrians shall obey the direction of police officers directing traffic and whenever there is an officer directing traffic, a traffic control signal or a marked crosswalk within three hundred (300) feet of a pedestrian, no such pedestrian shall cross a way or roadway except within the limits of a marked crosswalk and as hereinafter provided in these regulations. For the purpose of these regulations, a marked crosswalk shall only be construed to be that area of a roadway reserved for pedestrian crossing located between two solid white reflectorized 12 inch pavement markings in rural areas or markings not less than six inches wide in urban areas, said markings or lines being no less than six feet apart.

SECTION 2: Pedestrian Actuation

a. At a traffic control signal location where pedestrian indications are provided but which are shown only upon actuation by means of a pedestrian push button, no pedestrian shall cross a roadway unless or until the pedestrian control signal push button has been actuated and then cross only on the proper pedestrian signal indication.

b. At a traffic control signal location, pedestrians shall yield the right of way to vehicles of a funeral or other procession or authorized emergency vehicle while in performance of emergency duties regardless of the signal indication given, and they shall not attempt to cross the roadway until such vehicles or procession has passed at which time pedestrians shall then cross the roadway only as provided in these regulations.

SECTION 3: Pedestrian Obedience to Traffic Control Signals

Traffic control signal color indications and legends shall have the commands ascribed to them in this section and no other meanings, and every pedestrian shall comply therewith, except when otherwise directed by an officer.

a. Red Alone or "Don't Walk" - Whenever the words "Don't Walk" or a similar indication are illuminated in a traffic control signal where pedestrian indications are provided, pedestrians approaching or facing such indication shall wait on the sidewalk, edge of roadway or in the pedestrian refuge area of a traffic island and shall not enter upon or cross a roadway until the proper indication is illuminated in the traffic control signal, but any pedestrian who has partially completed his crossing on the walk indication shall proceed or return to the nearest sidewalk or safety island on the yellow indication, the red indication or when the phrase "Don't Walk" are illuminated by rapid intermittent flashes.

b. Green Alone - At traffic control signal locations where no pedestrian indication is given or provided pedestrians facing the signal may proceed across the roadway within any marked crosswalk in the direction of the green indication.

c. Yellow Alone, Red Alone or Flashing "Don't Walk" - Pedestrians approaching or facing a yellow, red or flashing "Don't Walk" illuminated indication shall not start to cross a roadway.

d. Flashing Red, Yellow or Green - At any traffic control signal location where a flashing red or flashing yellow is facing a crosswalk, pedestrians shall actuate, where provided, the pedestrian signal indication and cross the roadway only on the red-yellow or "Walk" indication when such indication is in operation. If no pedestrian signal is provided, pedestrians shall cross within crosswalks with due care.

SECTION 4: Pedestrian Crossings and Use of Roadways

a. No pedestrian shall suddenly leave a side or safety island and walk or run into the path of a vehicle which is so close that it is impossible for the driver to yield the right of way.

b. Pedestrians shall at all times attempt to cross a roadway using the right half of crosswalks.

c. Where sidewalks are provided, it shall be unlawful for any pedestrian to walk along and upon an adjacent roadway whenever the sidewalk is open to pedestrian use.

d. Where sidewalks are not provided, any pedestrian walking along and upon a highway shall, when practicable, walk only on the left side of the roadway on its unfinished shoulder facing traffic which may approach from the opposite direction.

e. Persons exiting from the roadway side of any vehicle parked at the curb or edge of roadway shall proceed immediately to the sidewalk or edge of roadway adjacent to vehicle, and shall cross the roadway only as authorized by these regulations.

f. It shall be unlawful for any person to actuate a pedestrian control signal or to enter a marked crosswalk unless a crossing of the roadway is intended.

SECTION 5: Crossing at Non-Signalized Locations

Every pedestrian crossing a roadway at any point other than within a marked crosswalk shall yield the right of way to all vehicles upon the roadway. At a point where a pedestrian tunnel or overpass has been provided pedestrians shall cross the roadway only by the proper use of the tunnel or overpass.

SECTION 6: Operators to Exercise Due Care

The provisions of these regulations shall in no way abrogate the provisions of Chapter 90, Section 14 and 14A of the General Laws (Ter. Ed.) which provide: "Precautions for Safety of Other Travelers" and for the "Protection of Blind Persons Crossing Ways." Furthermore, notwithstanding the provisions of these regulations every operator of a vehicle shall exercise due care to avoid colliding with any pedestrian upon the roadway and shall give warning by sounding the horn when necessary, and shall exercise proper precautions which may become necessary for safe operation.

SECTION 7: Pedestrians Soliciting Rides or Business

No person shall stand in a roadway for the purpose of soliciting a ride, employment or business from the operator or occupant of any vehicle without the written permission of the board or officer having control of such roadway or highway.

SECTION 8: Officers to Enforce Pedestrian Regulations

These pedestrian control regulations shall be enforced by all officers of
the Town (City) of ..... on and after
.....

SECTION 9: Exemptions

The provisions of these rules and regulations governing the use of ways by pedestrians shall not apply to pedestrians actually engaged in work upon a roadway closed to travel or under construction or repair, to municipal, state, federal or public service corporation employees while in the performance of their duties, to officers engaged in the performance of their public duties or to pedestrians acting in an emergency when such emergency necessitates departure from any part of these rules and regulations.

SECTION 10: Penalties

Any person who violates the provisions of this Article which deal with the proper use of ways by pedestrians shall be punished as provided in Chapter 90, Section 15A of the General Laws (Ter. Ed.).

SECTION 11: Effect of Regulation

All existing rules and regulations governing the operation of vehicles or the use of ways by pedestrians which are inconsistent herewith are hereby expressly repealed. This repeal shall not, however, affect any punishment or penalty imposed or any complaint or prosecution pending at the time of passage hereof for any offense committed under any of the said rules and regulations hereby repealed.

If any section, sub-section, sentence, clause or phrase of these rules and regulations is for any reason unconstitutional, such decision shall not affect the validity of the remaining portion of these rules and regulations. The City Council (Board of Selectman) of the City of (Town of)..... hereby declare that they would have passed these rules and regulations and each section, sub-section, sentence, clause or phrase thereof, irrespective of the fact that any one or more sections, sub-sections, sentences, clauses or phrases be declared unconstitutional.

Date of passage_____

Signatures _____

Board of Selectmen _____

Attest: City / Town Clerk _____

High Friction Surface Treatments

Frequently Asked Questions

Frequently Asked Questions about High Friction Surface Treatments (HFST)

- SAFETY
- MAINTENANCE AND OPERATIONS
- COST
- ENVIRONMENTAL IMPACTS
- SITE CONDITIONS
- MATERIAL SPECIFICATIONS / DURABILITY
- LESSONS LEARNED
- INSTALLATION

1. What is a High Friction Surface Treatment (HFST)?

- High Friction Surface Treatments place a thin layer of specially engineered, durable, high friction aggregates as a topping on a thermosetting polymer resin binder - usually epoxy, modified polyester, or urethane. These aggregate systems have long lasting skid resistance, while also making the overlay much more resistant to wear and polishing. The resin or polymer binder combination locks the aggregate firmly in place, creating an extremely rough, hard, durable surface capable of withstanding everyday roadway demands, such as heavy braking and even snowplowing. HFST restores pavement surface friction characteristics where traffic has worn down existing pavement surface aggregates. HFST can also help compensate for inadequate geometric designs such as sharp curves and/or substandard or variable superelevations.
- Aggregates used in an HFST, by definition, have a higher Polished Stone Value (PSV). This is a laboratory test that measures the friction value after wear from an abrasive wheel. This test is used to predict the friction serviceability after it is exposed to traffic. These values have been correlated with successful HFST performance in field installations. Depending on the version of the PSV test used (ASTM or AASHTO), this value may be different, and so the same version of the test must be used to compare aggregate selections. Although several aggregates have been evaluated, only Calcined Bauxite aggregate has met the threshold for performance necessary to be called an HFST.
- An HFST Aggregate Durability Study will be published later this year (2014) in cooperation with FHWA and NCAT.

2. What is the purpose of HFST?

- HFST can enhance the ability of a road surface to provide pavement friction to vehicles in critical braking or cornering maneuvers. Maintaining the appropriate amount of pavement friction is critical for safe driving. Compared to vehicles driving on a tangent section of road, vehicles traversing horizontal curves require a greater side force friction; and vehicles at intersections require greater longitudinal force friction. In locations such as sharp horizontal curves where vehicles may brake excessively, the road surface of standard pavements may become prematurely polished, thereby reducing the available pavement friction. This friction

reduction can contribute to vehicles losing control or skidding when they speed, turn abruptly, or brake excessively. Negotiating a sharper curve demands more friction to keep vehicles on track, and that greater demand causes greater shear forces, thereby leading to even more polishing of the surface aggregate.

3. Where are HFSTs likely to be beneficial?

- HFST technology is unique in its ability to address site-specific issues. While the largest numbers of problem locations are likely to be on the local and collector systems, there are also high volume intersections, interchange ramps, and selected segments of interstate alignments where these treatments would also be beneficial. This innovation has application to State DOTs, counties, cities, tribes, and federal lands agencies across the country.

4. Are there guidelines for the limits on HFST installations?

- Typically, HFST should be installed at a point where vehicles start to brake. At horizontal curves, brake lights are a good indication of where treatment should start, as the intention is to slow down the drivers as they are going into the curve. Most states will end their treatment at the Point of Tangent (PT).
- The Texas Transportation Institute published a paper titled, "Using High Friction Surface Treatments to Improve Safety at Horizontal Curves," that provides recommendations on how to select start and end points for HFST installation.
  http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/TTI-2012-8.pdf

SAFETY

1. Are there any Crash Modification Factors (CMF) available for HFST?

- There are few CMFs available related to HFST at this time.
- Turner-Fairbank Highway Research Center (TFHRC), as part of the FHWA's Evaluations of Low Cost Safety Improvements Pooled Fund Study, will convert the results of participating states' projects into crash modification factors for these types of treatments. The report will be available in spring 2014.
- The Pennsylvania, Kentucky, and South Carolina DOTs report a before/after total crash reduction of 100%, 90%, and 57%, respectively, for their signature trial projects, for which the after periods equal approximately three to five years. Kentucky went on to install and measure 60 additional HFST applications in 2010-2012: these sites are showing total crash reductions of 78% for the group, with wet-weather crash reductions of 85%.

2. What are the advantages for HFST as compared to traditional safety treatments at horizontal curves?

- A HFST should be the next treatment when delineation treatments are not reducing crashes. Generally, signs and markings are effective for prudent drivers who are trying to drive carefully, but when vehicles enter a curve too fast it is generally too late for those devices to help the driver. Whether some drivers are willfully speeding or maybe are not focused on the driving task and the curve surprises them, speed is a major contributing factor for crashes in curves. Many studies have shown that a pavement with high friction capability can give drivers a hidden advantage and help them survive their mistakes. Everything has a maximum, but studies have shown in general that doubling the friction reduces the crashes by half. Obviously if the pavement is polished the problem even extends to a greater number of prudent drivers, particularly when the pavement is wet, so placing HFST provides the curve with a pavement that is polish-resistant in addition to having excellent friction. Otherwise, safety improvements may require geometric improvements, which can take a long time, be expensive, and have

environmental consequences. HFSTs are low cost compared to geometric improvements. The square yard cost of an HFST is not cheap compared to other pavement treatments, but it provides greater durability and safety, making it a good investment since the life-cycle cost is excellent.

- HFSTs have potential, and in many instances are providing, higher crash reduction than is generally expected with lower-cost safety treatments such as chevron and rumble strip application on horizontal curves. As mentioned previously, several states are experiencing large crash reductions of 50-100% after application of an HFST at specific sites. A recent before and after study from the South Carolina DOT for a series of curve installations indicates cost-benefit ratios of about 24 to 1. Kentucky placed HFSTs on 26 curves and to date has seen an average reduction from 6.2 to 1.9 crashes per year at those locations. Additionally, the National Cooperative Highway Research Program (NCHRP) Report 617 indicates a crash reduction of 20% for all intersection crashes.

3. What is the safety effect of these surfaces for motorcycles and bicycles?

- There are no negative safety effects for motorcycles and bicycles. HFST provides a smoother riding surface and improved friction. HFST has been used for treatment of miles of bike lanes in the USA, and it has been applied as a safety countermeasure to specifically address curves and intersections with motorcycle crashes in the United Kingdom. Braking and cornering on a motorcycle demands more friction than passenger vehicles.

4. Has there been an increase in rollovers after installation?

- No increase in rollovers has been reported from any HFST installations, and studies done by FHWA in the past have shown that increases in friction help reduce truck rollover.

5. Has accelerated tire wear from HFST been studied?

- Because HFST is utilized only at spot locations for smaller areas, excessive tire wear should not be a major issue. Getting people home safely far outweighs this as a concern.

MAINTENANCE AND OPERATIONS

1. Does HFST promote higher operating speed?

- HNTB Corporation monitored speeds after an HFST installation for the Florida DOT and found that speeds post-installation were actually lower. The report can be found at: *http://www.dot.state.fl.us/research-center/Completed_Proj/Summary_SF/BD500/BD500_v3_rpt.pdf*
- The installation of HFST at curves does not increase driver comfort. Increasing superelevation does increase driver comfort. Improving driver comfort usually does increase speeds. HFST only satisfies the friction demand to help the vehicle stay on the road.
- It should also be noted that regardless of speed considerations, there has been no reported increase in crashes after HFST application; and in fact, all of the crash evaluations to date have shown remarkable crash reductions, which is the bottom line.

2. What is the effect of snow plows on this pavement treatment?

- The treatment consists of a thin overlay designed to be less than 1/4 - inch in thickness. As such, the effect from snow plows has been minimal, even where bare pavement policies are followed in locations such as Illinois, Vermont, and Michigan.
- The bauxite surface wears very well under heavy snow plowing.
- No deterioration from steel-tipped plows has been observed.

3. Can you apply HFST over existing striping?

- In general, HFST can be applied over painted lines, but thermoplastic lines should be removed by grinding. If the existing pavement markings are in good condition, it is recommended that the markings be retained by covering with tape prior to HFST placement.

COST

1. What is the average unit cost for HFST?

- Installed costs vary widely, depending on the size of the project, the prevailing labor costs in the jurisdiction, and the various components of the projects such as traffic control, treatment of pavement markings, etc. Projects accordingly have ranged from $25/SY to $35/SY as of a couple years ago. However the per SY price has been steadily going down for larger projects and where small installations have been bundled. In addition, only including work pertinent to the HFST project, and therefore increasing the chance of contracting directly with an installer instead of general contractors (GC), can give a better price.
- In comparing installation costs, there are several factors to consider. For example, the Kentucky Transportation Cabinet (KYTC), which has the most HFST projects (well over 100), had a significant number of projects on two-lane roads. On two-lane roads they averaged 750 SY each with an average installation price between $14,000 and $16,000 per project.
- A recent project in another state with multiple locations that totaled about 77,000 SY cost about $19 per SY. Multiple projects in California and New York recently were priced about the same. All of these projects included the total project cost in the unit prices, which included mobilization, traffic control, striping, remedial crack sealing, and patching in some cases. Also, they exclusively used Calcined Bauxite as aggregate.
- Most of the aggregates generally used for HFST (flint, granite, bauxite) are fairly expensive ($350 - $500 per ton). However, the aggregate is not the largest part of the HFST cost. The binder and the installation is the larger cost.

2. Is there a certification process for contractors who want to perform this type of work?

- Not at this time. It would be beneficial to have a certification process since, during installation, we have experienced some good contractors but also a few who were not quite as knowledgeable. The best way to address this is to develop a good specification that requires several quality checks and holds the bidders accountable to meet the specifications for a proper installation. We are working diligently to try to help State DOTs write a better specification to cover some of these concerns.
- FHWA participated, along with the ATSSA High Friction Council, in developing a guide specification for HFSTs. The document has recently been approved for inclusion in the AASHTO Guide Specifications.

3. Is there a list of approved contractors?

- No. It is against FHWA policy to recommend contractors. However, ATSSA is compiling a list of members that install HFST, and it will be made available on their website in the near future.

4. What is the cost-benefit ratio for HFST?

- A recent before and after study from the South Carolina DOT for a series of curve installations indicates cost-benefit ratios of about 24 to 1. Kentucky placed HFST on 26 curves and to date has seen an average reduction from 6.2 to 1.9 crashes per year at those locations. Additionally, the National Cooperative Highway Research Program (NCHRP) Report 617 indicates a crash reduction of 20% for all intersection crashes.

ENVIRONMENTAL IMPACTS

1. What effect does HFST have on road noise?

- Increases or decreases in road noise will depend on the original surface. In general, it will be less noisy than transversely tined concrete pavement, chip seals, and possibly dense-graded asphalt, but may be noisier than open graded surfaces. There is no established "rule of thumb" for what effect it will have on noise. While the HFST does increase the mean texture depth (MTD) and mean profile depth (MPD), the relationship (for all types of pavement surfaces) between MPD and noise level is extremely weak, and it is even worse for MTD. Therefore, it is not a valid conclusion that higher texture depth will always lead to more noise.
- Some noise reductions and/or pavement color changes may be perceived and/or observed by drivers, especially on curves, which may tend to cause a reduction in average speeds. Additional research in this area is needed to substantiate or refute this.
- Overall, since most high friction installations only span from PC to PT of the curve section, the difference in audible level over the HFST will only be for a few seconds, and then the vehicle will be back on the regular pavement surface.
- Tire-pavement noise was measured by the Transtec Group, the contractor for the projects on two HFST sections (one in Kansas and one in Montana) approximately one year after they were installed. Kansas was a dense graded asphalt pavement and Montana a chip seal.

  For the chip seal, HFST was slightly quieter (Overall OBSI levels, dBA):

  - Chip seal: ~104.4
  - HFST: ~101.95

  For the HMA, HFST was slightly louder (Overall OBSI levels, dBA):

  - HMA: ~98.75
  - HFST: ~100.05

Note: 3 dBA is essentially the minimum threshold for human-perceived change in noise level.

2. There has been some discussion of placing HFST in a double layer. Why is this done?

- Double layers are most commonly applied to bridge decks. The common treatment is to apply a double layer of polymer/resin and aggregate for insurance against water penetration of the deck, and to provide added durability to the installation. This is common for bridge deck preservation after a bridge deck is sealed and the treatment is used to restore friction, so the aggregate friction is generally not as important as aggregate hardness, so the aggregates used may not all meet the PSV qualification for HFST, but the concept is the same. If this same bridge was in a curve and also identified to have a crash problem, the bridge deck could substitute Calcined Bauxite and accomplish both purposes. This has been done in many locations across the country.
- Double layers may also be used on roads where snow chains or studded tires are common or as a treatment for pavement with an existing open grade friction course.
- A double layer should not affect noise any more than a single layer, as the surface texture generally remains the same.

3. Is there any data on the effectiveness of colored aggregates?

- This is a specialized area that uses the same application process as HFST but uses colored binder with either a dyed aggregate or an arttifical aggregate made from reformulated recycled glass. The dyed aggregate does show color wear on the aggregate eventually,

which can cause a faded appearance, but the recycled glass addresses the wear issue since the aggregate is translucent and the color from the back side of the aggregate can be seen through the aggregate since it does not receive tire wear and it retains the color rather well. Both are much more durable than a surface coating such as paint, because the HFST aggregates retain their color throughout the aggregate. These will not have the friction of an HFST, but the PSV of the glass is higher than most conventional aggregates. These good friction characteristics are beneficial where traffic either crosses a bike lane or in bus lanes or crosswalks.

- The question of whether a colored lane is effective at separating and encouraging specific vehicle paths is not related to colored aggregates, but to the general strategy of coloring the paths. Regarding that measure of effectiveness, there are some published studies that report colored bike lanes and on entrances to small towns as traffic calming.

4. Bike groups have expressed concerns about the abrasiveness of HFST. How is this being addressed across the country?

- To date there has not been any identified problems regarding bicycle use on HFST. This product has been used widely for many years in Europe and in many other countries that have large bicycle populations and this has not been an issue. In fact the HFST process is being used to install colored aggregate that serves as delineation. This product has been requested by bicycle groups for bike lane surfaces. The texture provides a superior smoothness and should help reduce the problem of tires sliding when wet that is common on some demarcation treatments.

SITE CONDITIONS

1. What pavement conditions caused failures that have been reported?

- In North Carolina and in Colorado, two different problems combined to cause the underlying asphalt pavement to be delaminated: poorly draining pavement that trapped water underneath the HFST and cracking of the underlying asphalt pavement that reflected through the HFST. However, the HFST remained intact on the asphalt material.
- It should be noted that other sites in Colorado where the same overlay material was applied have maintained their integrity, despite being installed at altitudes of over 8,000 feet and being subjected to repetitive snow plowing.

MATERIAL SPECIFICATIONS / DURABILITY

1. What is the life expectancy of HFST?

- Life expectancy will vary with type of roadway, geometry of roadway, volume of and mix of traffic types, and nature of traffic movements. Accordingly, it is difficult to generalize. International experience indicates at least 7-12 years of service can be expected with correctly applied installations. Some USA data indicates a service life of over 15 years in bridge deck applications.
- Vendors have reported from 5-8 years for 15,000 vehicles per day, and up to 5 years with 50,000 vehicles per day.
- Just like pavement performance, HFST wear is dependent on many things such as initial construction quality, friction demand, and traffic volume as well as the severity of the climate and the weight and number of heavy truck axles.
- Michigan reports 12-15 years of durability for bridge deck sites, including interstate highways with 48,000-62,000 ADT.

2. Are these materials resistant to fuels and common de-icing agents?

- The polymer binder is unaffected unless it is flooded with diesel fuel or solvents. They are resistant to common de-icing agents.

3. How does microsurfacing compare to HFST?

- As a pavement preservation technique, microsurfacing is far superior to HFST, and can actually extend the life of a poor pavement. In contrast, HFST is not a pavement preservation technique and is not recommended for application on poor pavement.
- As a friction-providing technique, HFST is far superior to microsurfacing. HFST aggregate by definition begins with PSV that rate much higher than the aggregates used for microsurfacing. The installed HFST supplies friction numbers (skid-testing) over 70 and many times in the high 80s or low 90s, which is well above those found with microsurfacing. Calcined Bauxite in particular can be expected to maintain a very high friction reading for many years into the future. Microsurfacing, by contrast, generally produces good initial friction readings in the low 60s or high 50s but then deteriorates within two years to the high 40s or low 50s (Michigan data).

4. Are HFSTs proprietary? Are there any good examples of generic specification?

- Virtually all HFST products are non-proprietary. However a product similar to HFST is Cargill's SafeLane, and it is patented and proprietary. The binder materials such as epoxy materials/ blends are generally trade secrets of the manufacturer, and certain application machines are patented.
- Currently, numerous states such as Florida DOT, South Carolina DOT, Maryland DOT, California DOT, and Texas DOT have developed specifications or special provisions for high friction surfacing.

5. What is the difference between this treatment and a typical chip seal?

- Chip seals are a pavement treatment that can have some safety benefits but generally it is placed in large quantities to extend the life of the pavement, while HFST is a safety treatment that happens to be a pavement application, and it is placed in relatively small spots that are critical for safety.
- HFST is made for locations with high friction demand (shear forces) such as severe curves and braking areas, while chip seals don't perform well in those locations.
- The primary difference is the types of materials used. The HFST "binder" material is a polymer-based material as opposed to emulsions used for chip seals.
- The aggregate in HFST is much smaller (1-3 mm nominal size) than typical chip seal aggregate, and is specifically a very polish- and abrasion-resistant material.
- In terms of service,
  - Chip seal is a 5-7 year pavement preservation technique that can actually extend the life of a poor pavement. In contrast, HFST is not recommended for application on poor pavement.
  - HFST is an 8-12 year friction enhancing technique that supplies friction numbers (skid-testing) beyond conventional aggregates. Bauxite in particular can be expected to maintain this high friction reading for many years after installation. Chip seal, by contrast, produces initial friction readings lower than HFST, and the less polish-resistant aggregate typically used in chip seals generally loses its friction properties much more quickly than bauxite.

6. Is it always worth the investment to use HFST compared to other friction treatments?

- The answer to this question likely depends on (1) the condition of the existing pavement since HFST only lasts as long as the pavement it is placed on and (2) the severity and type of crashes. If you have a deteriorating pavement with substandard friction characteristics and minimal pavement life, you may solve that problem with more conventional pavement treatments by just restoring standard friction characteristics, at least for a short term. However, HFST may still be a good idea if the location has severe geometric features and high speeds, since this tends to escalate pavement polishing, so the problem may return even if you placed new pavement.
- It is understood that many pavement preservation treatments (microsurfacing, chip seal, etc.) can improve available friction, especially on a polished pavement, and we are currently working to establish and quantify the beneficial impacts of improved and enhanced friction as a result of the installation of selected pavement preservation treatments.
- It may not always be necessary to apply the treatment that provides the highest, most sustained friction at a particular site; that would depend on the nature and severity of existing traction problems, life expectancy desired for the installation, and the friction demand produced by the traffic at the location.

7. Do these materials crack? If so, how do they resist crack erosion?

- The materials typically do not crack on their own, but any cracks in the underlying pavement will generally reflect through.
- The polymer overlay can be repaired, using the same materials as used originally. The de-bonded area must be cleaned until both the area to be patched and all overlay areas surrounding the area to be patched are solidly bonded to the road surface. If the repair is to be made manually, or with mixing apparatus designed to be used with a hand-held or mounted wand and/or notched squeegee, then a suitable quantity of epoxy should be mixed and applied to the patch area. In order to avoid a ridge around the patched area, care should be taken that the polymer only be applied within the area to be patched. Once the resin is applied, it should be spread as necessary using a notched squeegee so that the correct thickness is achieved. Aggregate should then be broadcast at the specified rate and the area allowed to fully cure. Once cured, the repaired area should be swept or vacuumed to remove loose aggregate before the roadway is reopened to traffic. If repair is to be made using mechanical equipment designed for full lane width dispensing and application of the polymer, then the area to be patched should be identified, and the equipment then operated over the area with a length of approximately 1 - 2 feet of roadway before and after the patch area.

8. Are there any issues with thermoplastic on HFST?

- None – thermoplastic bonds extremely well and will in fact last longer when applied to the textured surface of HFST. Other marking materials also bond well but pavement marking tape should be avoided since it does not adhere well due the texture.

9. What aggregates are appropriate for HFST and what sources are available?

- The HFST surface texture is formed from a crushed clean aggregate with an extremely low moisture content that is adhered to the roadway by a high quality, durable polymer resin. The aggregate undergoes a rigorous washing, drying, and grading before being bagged to assure it is clean and can be shipped and stored with low moisture content. Generally, the vendors that sell the HFST system procure the aggregate from mineral companies that specialize in this crushing and preparation process for such specialized aggregates.

- The aggregate must be a polish- and wear-resistant aggregate such as Calcined Bauxite.
- Other aggregates such as flint, basalt and granite have been evaluated but have not performed as well as Calcined Bauxite. The other aggregate can be placed in a similar manner and may perform adequately in a less demanding environment, but in critical locations they have not provided the duration of friction service to be classified as an HFST. Other aggregates are being evaluated for performance, but at this time only Calcined Bauxite is recommended to provide the expected safety performance and durability.
- Although bauxite is a natural resource mined in three states in the USA, most of the bauxite used for HFST originates in either China or India. Bauxite is abundant in many countries around the world, with Australia producing the most bauxite of any country. Four of the largest international mineral companies (or subsidiaries) in the world are wholesale bauxite distributors in the USA. They typically import in large quantities and stockpile for distribution. The product is also resold at regional businesses. These are generally not the local quarry that paving contractors typically deal with, but the professional HFST installers have contacts that can supply any project need. The U.S. Geological Survey report states that a world bauxite shortage is not foreseen for the next century. *http://minerals.usgs.gov/minerals/*

10. If a large amount of bauxite comes from international sources, does the Buy America provision apply when using federal funds for HFST?

- No, Buy America applies only to steel products.

11. How do these products compare to Verglimit?

- Based on our knowledge, Verglimit is a de-icing additive added to a paving mix and is not a surface treatment like HFST. Cargill's SafeLane product uses a similar process in that the HFST aggregate is infused with de-icing chemicals.

12. Is a performance-based specification for HFST available?

- A draft performance-based specification is available but more refinement is needed and can be provided to any user upon request to the EDC2 HFST Team.
- The performance-based specification will require the contracting agency to own or obtain services for a friction-measurement device to be applied to the installed product to ensure the performance standard will be achieved.

13. What are some typical polish stone values (PSV) for HFST aggregates using ASTM E 303 British Portable Pendulum and ASTM D 3319, Accelerated Polishing Machine?

- PSV is a value applicable to a particular aggregate, not the road surface. Aggregate that has a PSV value over 60 is regarded as a High Friction Aggregate. The higher the PSV figure, the greater the resistance the aggregate has to polishing and the greater the ability the aggregate has to retain its own natural very fine texture (roughness). Typical values for a high quality, durable aggregate such as Calcined Bauxite generally exceed 70.

LESSONS LEARNED

1. Can patches that de-bond be fixed?

- This is not extremely common. However if small localized sections of HFST de-bond from the pavement, it can easily be repaired by cutting back to a well-bonded area and using hand application of polymer resin and stone to blend the patch in with the existing material. This can be caused by an isolated spot on the pavement that was not cleaned well, or maybe an undetected solvent on the pavement.

- This may not appear immediately, but it is possible that the binder does not adhere well initially and the resin cannot transfer the tensile load to the structural pavement as traffic loads are transferred from the material and the force is pulling the material lose, or this could appear as the weather changed and thermal stress caused a release due to a poor bond. This is usually due to poor preparation like dust on the pavement, undetected solvents, or, specifically in the case of concrete, a lack of shot blasting as part of the preparation.
- More common is a small section pops out but the HFST is perfectly attached to a fragment of pavement. If this is a limited occurrence, this is not catastrophic event. Generally this means the underlying pavement had a weak spot and lost its bond. Again, the pavement can be fixed and HFST reapplied. If asphalt is used to patch the pavement, HFST should not be placed for at least 30 days, and if concrete is used then any curing compound must be removed and the surface cleaned before applying the HFST, since curing compounds act as bond breakers.

2. Will the polymer have a reaction with magnesium on a bridge deck?

- The issue is possible reaction with magnesium phosphate based patching like Set 45, not with magnesium chloride deicer.

3. What negative issues have occurred with HFST installation?

- There have been a few projects across the country where there have been failures. For a short time, one major epoxy manufacturer had a flaw in their formulation and this lead to some failed projects. In most of the installations the manufacturer corrected the problem and this issue has been corrected. More often the issues have stemmed from poor installation practices. A good, rigorously enforced, specification and a skilled installation crew will help prevent installation-related issued from occurring.
- Common contributing issues for installation problems appear to be due to a combination of four primary issues.
  - Improper mixing of the 2-part epoxy, either manually or by the automated equipment that did not have fail safes or monitoring devices.
  - The roadway may have had significant cracking, so that over time the asphalt or concrete gave way – in these instances the epoxy and aggregate have remained completely bonded but the underlying pavement failed so it was a poor candidate for HFST.
  - Many polymers such as epoxy resins will not reach their fully designed strengths when cured at lower temperatures. This can result in early loss of aggregates and premature wear in the wheel path.
  - Third, ambient requirements were ignored – the roadway must be dry at time of installation, and the ambient temperature must be above the manufacturer's recommendations. For most epoxies this is a minimum of 50 degrees F and rising while some recommend even higher minimum temperatures. Other polymer binders are available that can be installed at lower temperatures per the manufacturers direction.
  - The HFST should not be applied to asphalt that is less than 30 days old, and in the case of concrete, all curing compounds must be removed prior to overlay application. Also, it is just better to have all concrete shot blasted.

INSTALLATION

1. What surface preparation and installation conditions are required?

General

- Surface preparation is the key for all successful HFST installations. Best practice is a clean and dry surface above 50 degrees F (and rising), preferably 60F - 95F. Temperatures outside this range may affect working time for installing the material and/or material curing time as well as strength of the final product. However, some manufacturers have developed polymer resin binders that perform well at lower temperatures.
- Placement of the polymer resin can be installed by machine at a similar rate to other paving surface treatments, or can also be applied by hand or by tools. The selection of different methodologies is dependent on size of the installation, site specific conditions like storage and ready access, and availability of acceptable detour route or traffic restriction.
- It is generally not practical to remove small oil spots, but very large or heavily saturated oil spots may need to be removed by removing and replacing the surface layer.
- For bridge decks there should be no visible moisture present on the surface at the time of the binder application. Compressed air may be used to dry the deck surface. A plastic sheet left taped in place for a minimum of two hours, according to ASTM D 4263, should be used to identify moisture in the deck.
- Utilities, drainage structures, curbs, joints and any other structure within or adjacent to the treatment location should be protected against the application of the surface treatment materials. Existing pavement markings that are adjacent to the application surfaces to be preserved should be covered or care taken that the binder does not cover the markings.
- High-tack adhesive tape can be used to outline the perimeter of the application area, cover pavement markings, or to protect joints etc.
- Pavement markings that are not covered or consist of material other than paint should be removed. The method should be grinding, water blasting or other treatments; the surface should then be dried and swept clean prior to the polymer binder application. Pavement marking lines should be considered clean when the pavement has exposed aggregate showing through the existing marking. HFST will not fully adhere to thermoplastic road markings.
- Pavement cracks greater than 1/4 inch in width and depth should be sealed 30 days prior to HFST installation if rubberized asphalt or similar products are used. Otherwise pre-treat joints and cracks with the mixed polymer resin. Once the epoxy in the pre-treated areas has gelled, the HFST binder and aggregate topping installation may proceed.
- Repair all pavement defects such as spalls, pot holes, raveling and rutting prior to placing an HFST. Contact the manufacturer's Technical Service Department to review which materials will permit proper adhesion of HFST system. Clean and fill all inadequately sealed joints, including shoulder areas. HFST may be applied over pavements exhibiting minor rutting or heaving; however, the product is not intended as a repair for these conditions and will not level pavements.

Concrete Surface

- The polymer resin overlay should not be placed on Portland cement concrete that is less than 28 days in place. Patching and cleaning operations should be inspected and approved prior to placing each layer of the overlay. Any contamination of the deck or intermediate courses, after initial cleaning, should be removed. Both courses should be applied within 24 hours following the final cleaning and prior to opening the area to traffic.

- Concrete surface should be abrasively cleaned by shot blasting or other means to remove oils, dirt, rubber, curing compounds, paint carbonation, laitance, weak surface mortar and other potentially detrimental contaminants, which may interfere with the bonding or curing of the overlay.

Asphalt Surface

- Before placement of HFS on an asphalt concrete deck surface the entire deck surface should be cleaned to remove oils, dirt, rubber, curing compounds, paint carbonation, laitance, and other potentially detrimental contaminants which may interfere with the bonding or curing of the overlay. Acceptable cleaning is recognized as a surface with no oil spots, dirt or debris and the beginning exposure of coarse aggregate particles in the asphalt concrete.
- Areas of asphalt larger than one inch in diameter, or smaller areas spaced less than six inches apart, should be removed. High pressure air or a vacuum should be used to remove all dust and other loose material. Brooms should not be used.
- For applications on new asphalt pavements, it is recommended to wait a minimum of 30 days after paving before placement of HFST. On open graded friction course asphalt surfaces, stone mastic asphalt or pavement that has been treated with prior surface treatments, contact the manufacturer's Technical Service department for guidance.

2. Is installation over an open graded pavement an issue?

- Many HFST applications have been successfully installed on OGFC. However OGFC are relatively thin and vary in strength based on the aggregate used and the condition of the pavement. This has led to a few problematic installations since it often difficult to detect existing pavement issues. Successful installations over OGFC have used a double layer treatment in order to seal the voids with the first layer and maintain the proper binder depth of the top course with the second layer which is necessary for the aggregate embedment of the HFST riding surface.
- A new method to seal the pores promises many advantages and is being investigated. Although this new technique shows promise it is premature to say that it is proven at this time.
- If you are placing HFST over OGFC, it may require the shoulder on the high side of the superelevation to be sealed to keep water from running through the OGFC and under the HFST, which can cause failure. It may also be necessary to extend the HFST further when the curve is on a grade in order to seal the OGFC to prevent water from running down the grade and under the HFST as well. This adds to the quantity of HFST so be aware.

For additional information, please contact:

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Every Day Counts (EDC), a State-based initiative of FHWA's Center for Accelerating Innovation, works with State, local and private sector partners to encourage the adoption of proven technologies and innovations aimed at shortening and enhancing project delivery

www.fhwa.dot.gov/everydaycounts

U.S. Department of Transportation
Federal Highway Administration

FHWA-CAI-14-019

massDOT
Massachusetts Department of Transportation
Highway Division

Safety and Traffic Engineering
MEMORANDUM

TO:	**MARPA TMG, Mass Highway Association, Mass Municipal Association**
FROM:	**Bonnie Polin**
DATE:	**February 27, 2014**
RE:	**HSIP Funded Systematic Approach to Safety for Curves along Roadways**

Between 2004 – 2011, 55% of all road fatalities and 24% of all incapacitating injuries involved lane departure crashes. Based on national statistics and earlier studies, the majority of lane departure crashes occurred on curves. The Commonwealth's Strategic Highway Safety Plan (http://www.mhd.state.ma.us/default.asp?pgid=content/traffic/shsp&sid=level2) includes Lane Departures as a strategic emphasis area with a goal of reducing lane departure related fatalities and incapacitating injuries by 20% in 5 years. These fatalities and injuries occur on State and locally owned roadways. MassDOT is developing a systematic low cost strategy to address lane departures based on input from local town engineers and community officials as well as the Regional Planning Agencies.

Cities and towns, that are interested in participating, must submit a brief application (see attached) for each high crash curve to:

Bonnie Polin
Traffic Engineering and Safety
MassDOT - Highway Division
10 Park Plaza, Room 7210
Boston, MA 02116
Phone: 857-368-9636
Fax: 857-368-0628
Bonnie.Polin@state.ma.us

MassDOT staff or consultant (Stantec) will contact the community and set up a time to visit the location and sketch up a sign plan. The sign plan will then be submitted to the applicant for approval. Once approved, MassDOT would provide the community with the materials (signs and posts) and the sketch plan (MassDOT's sign shop will prepare the signs). It will be up to the community to install the signs and submit photos of the completed project. In the future, there will be an evaluation of the effectiveness of the sign installation. The community must submit 3 years of post-installation crash data.

We have approval from FHWA to use HSIP funds and are just awaiting the FHWA obligation letter. We envision this program starting in mid-March and applications will be accepted for one month from the start date (anticipate through April 15th, 2014). If MassDOT receives more locations than anticipated, MassDOT will prioritize the locations based on crash information. Please make all of your communities aware of this upcoming program.

massDOT
Massachusetts Department of Transportation
Highway Division

Application for Signage Improvements Along High Crash Curves

MassDOT is working with the MPOs to assist communities to reduce crashes along curves in roadways. The program involves communities completing this application and submitting it to MassDOT. MassDOT has retained a consultant to evaluate each curve location. The consultant will sketch up a sign plan and submit to the city/town for review and approval. Once approved, MassDOT will provide the signs and posts for communities to install. The communities will be required to submit photos upon completion of the installation. The community will agree to provide updated data (crash, volume, speed) 3 years post installation. **Use a separate application for each location to be included in the program. When complete please send to Bonnie Polin, MassDOT Highway Division, Traffic Engineering and Safety, 10 Park Plaza, Room 7210, Boston, MA 02116. Call or email with any questions. 857-368-9636 Bonnie.polin@state.ma.us**

City / Town: _____ **Request Date:** _____

Roadway: _____

Specific curve location (describe location, includes coordinates, if possible): _____

_____

Average Daily Traffic Volume (if known): _____ **Count Year:** _____

Number of travel lanes in each direction: _____

Number of crashes over 3 recent years (if known, source of information): _____
(Attach backup of crash data including actual crash reports - REQUIRED for evaluation)

Has a speed study been conducted around the curve (Y / N), if so, please attach _____

Regulatory/posted speed in vicinity of curve: _____

Please attach photos of the existing condition of the curve, taken from both approaches

Comments:

_____

Name, Title and Organization of Applicant — Date
Public Works Director, Selectman Chair or Town Administrator/City Manager

_____

Signature of Applicant

Route 31 Bridge Information

- Town of Holden
- Town of Spencer

Town of Holden

- Route 31 Bridge over P&W RR Inspection Report

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
03	223	H-18-002

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
HOLDEN	H18002-223-DOT-634	048.054	A:OPEN	DEC 6, 2013

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
ST 31 RESERVOIR ST	Korean & Vietnam War	1983	0000	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER
RR PWRR	Urban Minor Arterial	M. Azizi

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER
501 : Prestressed Concrete Slab	State Highway Agency	State Highway Agency	D. Simkhovich

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
2 : Concrete Precast Panels	Rain	3°C	Z. HURD

ITEM 58 — DECK: 5

		DEF
1.Wearing surface	4	S-P
2.Deck Condition	5	S-P
3.Stay in place forms	N	-
4.Curbs	7	-
5.Median	N	-
6.Sidewalks	6	-
7.Parapets	N	-
8.Railing	7	M-P
9.Anti Missile Fence	7	M-P
10.Drainage System	N	-
11.Lighting Standards	N	-
12.Utilities	7	M-P
13.Deck Joints	N	-
14.	N	-
15.	N	-
16.	N	-

CURB REVEAL (In millimeters)	E	W
	290	275

APPROACHES

		DEF
a. Appr. pavement condition	5	M-P
b. Appr. Roadway Settlement	6	S-P
c. Appr. Sidewalk Settlement	5	S-P
d.	N	-

OVERHEAD SIGNS (Attached to bridge) (Y/N): N

		DEF
a. Condition of Welds	N	-
b. Condition of Bolts	N	-
c. Condition of Signs	N	-

ITEM 59 — SUPERSTRUCTURE: 5

			DEF
1.Stringers		N	-
2.Floorbeams		N	-
3.Floor System Bracing		N	-
4.Girders or Beams		5	S-P
5.Trusses - General		N	-
a. Upper Chords	N		-
b. Lower Chords	N		-
c. Web Members	N		-
d. Lateral Bracing	N		-
e. Sway Bracings	N		-
f. Portals	N		-
g. End Posts	N		-
6.Pin & Hangers		N	-
7.Conn Plt's, Gussets & Angles		N	-
8.Cover Plates		N	-
9.Bearing Devices		H	-
10.Diaphragms/Cross Frames		N	-
11.Rivets & Bolts		N	-
12.Welds		N	-
13.Member Alignment		7	-
14.Paint/Coating		N	-
15.Post Tensioning		5	S-P

Year Painted: N

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None ( ) Minor (X) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None ( ) Minor (X) Moderate ( ) Severe ( )

Any Fracture Critical Member: (Y/N) N

Any Cracks: (Y/N) N

ITEM 60 — SUBSTRUCTURE: 7

1. Abutments	Dive	Cur	7	DEF
a. Pedestals	N	N		-
b. Bridge Seats	N	7		-
c. Backwalls	N	H		-
d. Breastwalls	N	7		M-P
e. Wingwalls	N	7		-
f. Slope Paving/Rip-Rap	N	N		-
g. Pointing	N	N		-
h. Footings	N	H		-
i. Piles	N	N		-
j. Scour	N	N		-
k. Settlement	N	7		-
l.	N	N		-
m.	N	N		-
2. Piers or Bents			N	
a. Pedestals	N	N		-
b. Caps	N	N		-
c. Columns	N	N		-
d. Stems/Webs/Pierwalls	N	N		-
e. Pointing	N	N		-
f. Footing	N	N		-
g. Piles	N	N		-
h. Scour	N	N		-
i. Settlement	N	N		-
j.	N	N		-
k.	N	N		-
3. Pile Bents			N	
a. Pile Caps	N	N		-
b. Piles	N	N		-
c. Diagonal Bracing	N	N		-
d. Horizontal Bracing	N	N		-
e. Fasteners	N	N		-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )

SCOUR: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

I-60 (Dive Report): N *I-60 (This Report):* 7

93B-U/W (DIVE) Insp 00/00/00

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

RTN(1)7-96

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

ITEM 61 CHANNEL & CHANNEL PROTECTION

N

	Dive	Cur	DEF
1.Channel Scour	N	N	-
2.Embankment Erosion	N	N	-
3.Debris	N	N	-
4.Vegetation	N	N	-
5.Utilities	N	N	-
6.Rip-Rap/Slope Protection	N	N	-
7.Aggradation	N	N	-
8.Fender System	N	N	-

STREAM FLOW VELOCITY:
Tidal ( )High ( ) Moderate ( )Low ( )None (X)

ITEM 61 (Dive Report): N ITEM 61 (This Report) N

93b-U/W INSP. DATE: 00/00/00

ITEM 36 TRAFFIC SAFETY

	36	COND	DEF
A. Bridge Railing	0	7	M-P
B. Transitions	0	6	M-P
C. Approach Guardrail	1	7	-
D. Approach Guardrail Ends	1	5	S-A

WEIGHT POSTING

Not Applicable X

	H	3	3S2	Single
Actual Posting	N	N	N	N
Recommended Posting	N	N	N	N

Waived Date: 00/00/00 EJDMT Date: 00/00/00

Signs In Place (Y=Yes,N=No, NR=NotRequired) Legibility/ Visibility	At bridge N	At bridge S	Other Advance N	Other Advance S

CLEARANCE POSTING

Not Applicable X

	E ft	E in	W ft	W in	meter
Actual Field Measurement		0		0	
Posted Clearance		0		0	

Signs In Place (Y=Yes,N=No, NR=NotRequired) Legibility/ Visibility	At bridge E	At bridge W	Advance E	Advance W

ACCESSIBILITY (Y/N/P)

	Needed	Used
Lift Bucket	N	N
Ladder	Y	N
Boat	N	N
Waders	N	N
Inspector 50	N	N
Rigging	N	N
Staging	N	N
Traffic Control	N	N
RR Flagger	Y	Y
Police	N	N
Other:		
	N	N

TOTAL HOURS 8

PLANS (Y/N): Y

(V.C.R.) (Y/N): N

TAPE#:

List of field tests performed:
NONE

RATING

Rating Report (Y/N) Y

Date: 01/01/2006

Inspection data at time of existing rating
I 58: 6 I 59: 6 I 60: 7 Date :12/08/2003

(To be filled out by DBIE)
Request for Rating or Rerating (Y/N): N

If YES please give priority:
HIGH ( ) MEDIUM ( ) LOW ( )

REASON:

CONDITION RATING GUIDE (For Items 58, 59, 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stablility. Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair Examples include but are not limited to Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge Examples include but are not limited to Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her]

A = ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report]

P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

REMARKS

BRIDGE ORIENTATION
According to the plans, the approaches are South and North and the elevations are West and East. This is a single span prestressed concrete deck beam bridge with 12 beams numbered from the West to the East.

ITEM 58 - DECK

Item 58.1 - Wearing surface
The bituminous concrete wearing surface shows moderate to heavy longitudinal and map cracking along both approaches and several longitudinal shear key joints. **See photos 1 and 2.** The heaviest map cracking is in the Southbound lane and there is evidence of active leakage through the shear key joints below this area. There is a large bituminous concrete patch at the Southwest corner 12 feet wide x 4 feet long.

Item 58.2 - Deck Condition
See Items 58.1 and 59.4.

Item 58.4 - Curbs
There is minor misalignment of the Southeast approach curb.

Item 58.6 - Sidewalks
The West sidewalk shows several small shallow spalls throughout the South half, some with rust staining, and several hairline transverse cracks throughout.

Item 58.8 - Railing
Both bridge rails are AL-1. There is one anchor nut missing to the Southwest corner base plate.

Item 58.9 - Anti Missile Fence
The South post on the East Anti Missile Fence is approximately 2 feet out of vertical alignment.

Item 58.12 - Utilities
The utiliity on the East side of the bridge has a small tear in the insulation jacket at the South end.

APPROACHES

Approaches a - Appr. pavement condition
Both approaches have minor to moderate longitudinal and transverse cracking throughout. The North approach to deck transition area has full width transverse cracking up to 2 inch wide, with breakup and bituminous concrete patches. **See photo 3.** The South approach to deck transition area has bituminous concrete patching full width of Southbound lane, that extends into the wearing surface over the bridge, and moderate transverse cracking with minor breakup in the Northbound lane. **See photo 4.**

Approaches b - Appr. Roadway Settlement
Both approaches show minor unevenness.

Approaches c - Appr. Sidewalk Settlement
Both approach sidewalks show a previous bituminous concrete ramps at the transitions onto the bridge, which is wearing away, and shows 2 inches of settlement. **See photo 5.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

REMARKS

ITEM 59 - SUPERSTRUCTURE

Item 59.4 - Girders or Beams

There is a 3 foot long x 1 foot wide area of delamination cracking and incipient spalling with exposed rusted stirrup at the center of beam #7. **See photo 6.**

Beams #4, #6, #7, #,8 and #12, have isolated areas of minor delamination cracking and rust staining.

There are several areas of sagging or missing joint filler and evidence of active leakage through most of the shear key joints. **See photo 7.**

There is hairline longitudinal cracking on the East face of the East fascia beam (#12), near the South end, and at mid span, with minor rust staining. **See photo 8.**

Item 59.15 - Post Tensioning

Due to cracking of the wearing surface over the shear key joints with evidence of active leakage, the integrity of the post tensioning system has been compromised. See Items 58.1 and 59.4.

SuperStructure Load Deflection Notes

Minor under heavy live load.

SuperStructure Load Vibration Notes

Minor under heavy live load.

ITEM 60 - SUBSTRUCTURE

Item 60.1 - Abutments

Both abutments show heavy graffiti.

Item 60.1.d - Breastwalls

Both breastwalls have several vertical hairline cracks, up to full height. There is active leakage throughout both breastwalls.

There is a 4 foot high x 6 inch wide spall near the top of the East end of the North breastwall adjacent to the wingwall construction joint exposing the plastic waterstop. **See photo 9.** There is an area of delamination cracking under beams #7 through #9. There is a 15 foot long horizontal hairline crack in the bridge seat area, under beams #10 through #12 with a 1 foot diameter spall at the end. **See photo 10.**

The South breastwall has an area of honeycombing with efflorescence staining under beam #12. There is a 10 foot long diagonal hairline crack with efflorescence under beams #8 through #10. Under beam #4 there is a 2 foot square area of delamination cracking, and under beam #3 there is a spall 18 inches long x 3 inches wide x 1 inch deep due to lack of concrete cover. There is minor area of scale at the West end and under beam #1.

TRAFFIC SAFETY

Item 36a - Bridge Railing

See Item 58.8.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

REMARKS

Item 36b - Transitions

All four corner transitional posts are not properly spaced. The terminal connector panel of the Northwest transition is not properly attached. **See photo 11.**

Item 36c - Approach Guardrail

There is minor collision damage to the Northwest approach guardrail, approximately 50 feet from the bridge.

Item 36d - Approach Guardrail Ends

The Southwest buried end has collision damage and is torn.

Photo Log

Photo 1 : Deterioration to the wearing surface in the Northbound lane. Note the longitudinal cracking over the shear key joints.
Photo 2 : Deterioration to the wearing surface in the Southbound lane.
Photo 3 : The North approach to deck transition area.
Photo 4 : Deterioration to the South approach to deck transition area.
Photo 5 : Settlement at the North approach sidewalk.
Photo 6 : Delamination cracking and incipient spalling to beam #7.
Photo 7 : View of the underside of the deck beams, looking North. The map cracking in the wearing surface is above the areas of efflorescence staining.
Photo 8 : Longitudinal cracking to beam #12.
Photo 9 : A spall to the East end of the North breastwall at the wingwall interface.
Photo 10 : Deterioration to the North breastwall at the East end.
Photo 11 : The Northwest terminal connector panel.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

PHOTOS

Photo 1: **Deterioration to the wearing surface in the Northbound lane. Note the longitudinal cracking over the shear key joints.**

Photo 2: **Deterioration to the wearing surface in the Southbound lane.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

PHOTOS

Photo 3: **The North approach to deck transition area.**

Photo 4: **Deterioration to the South approach to deck transition area.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

PHOTOS

Photo 5: Settlement at the North approach sidewalk.

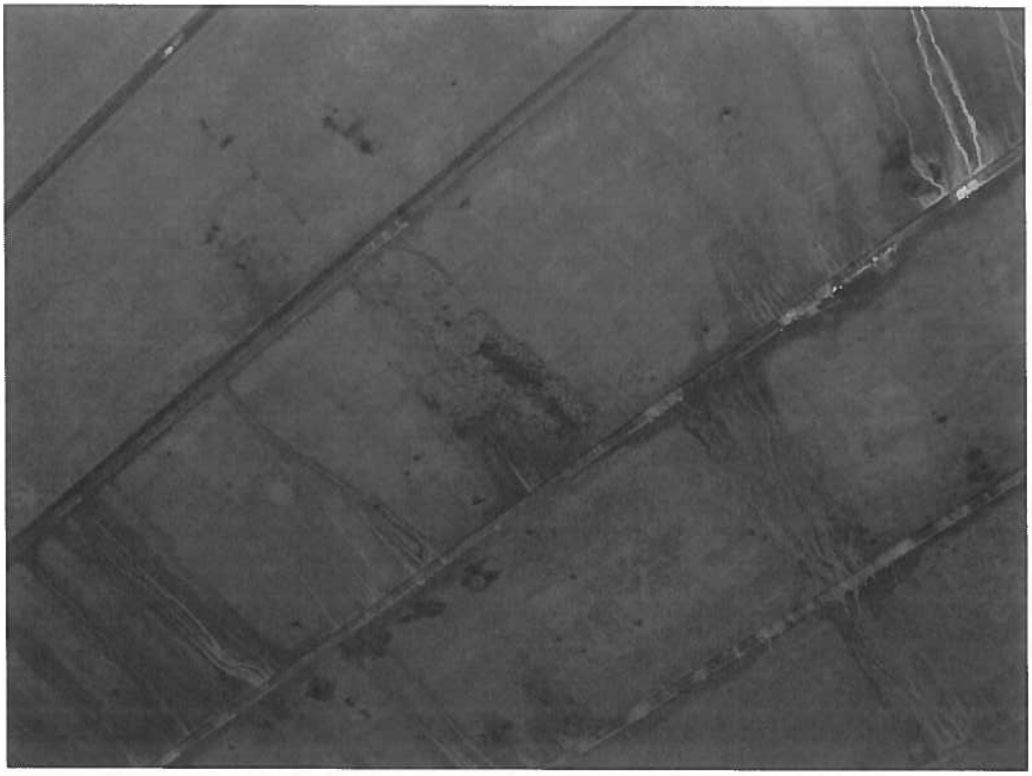

Photo 6: Delamination cracking and incipient spalling to beam #7.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

PHOTOS

Photo 7: **View of the underside of the deck beams, looking North. The map cracking in the wearing surface is above the areas of efflorescence staining.**

Photo 8: **Longitudinal cracking to beam #12.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

PHOTOS

Photo 9: **A spall to the East end of the North breastwall at the wingwall interface.**

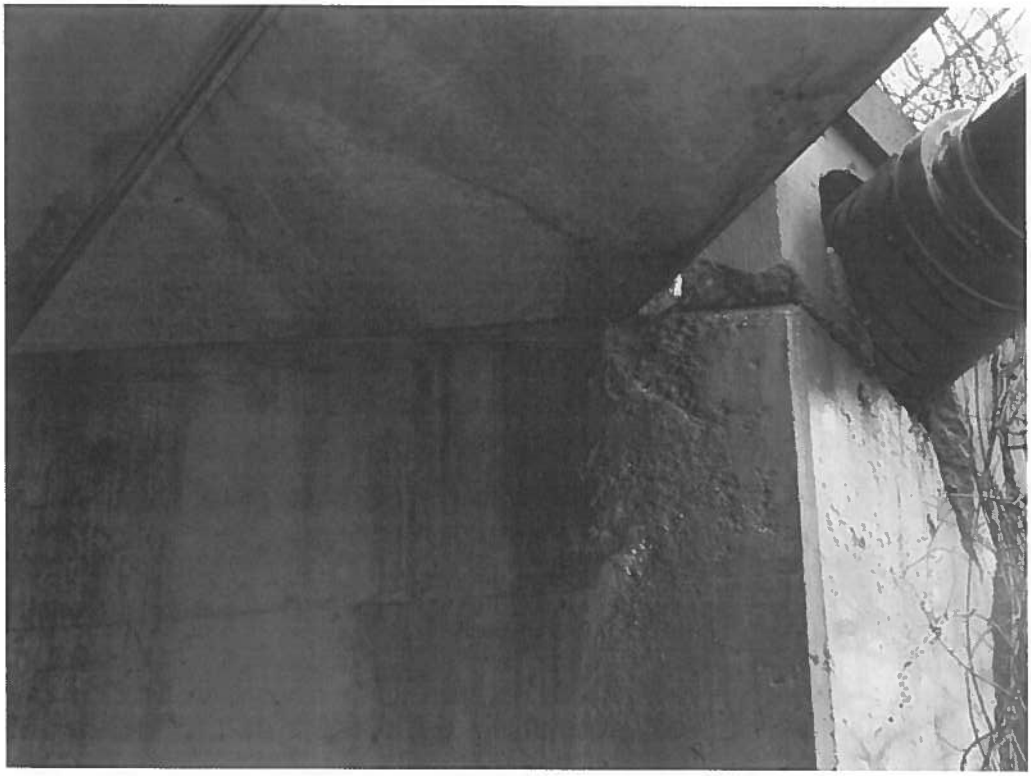

Photo 10: **Deterioration to the North breastwall at the East end.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
HOLDEN	223	H-18-002	H18002-223-DOT-634	DEC 6, 2013

PHOTOS

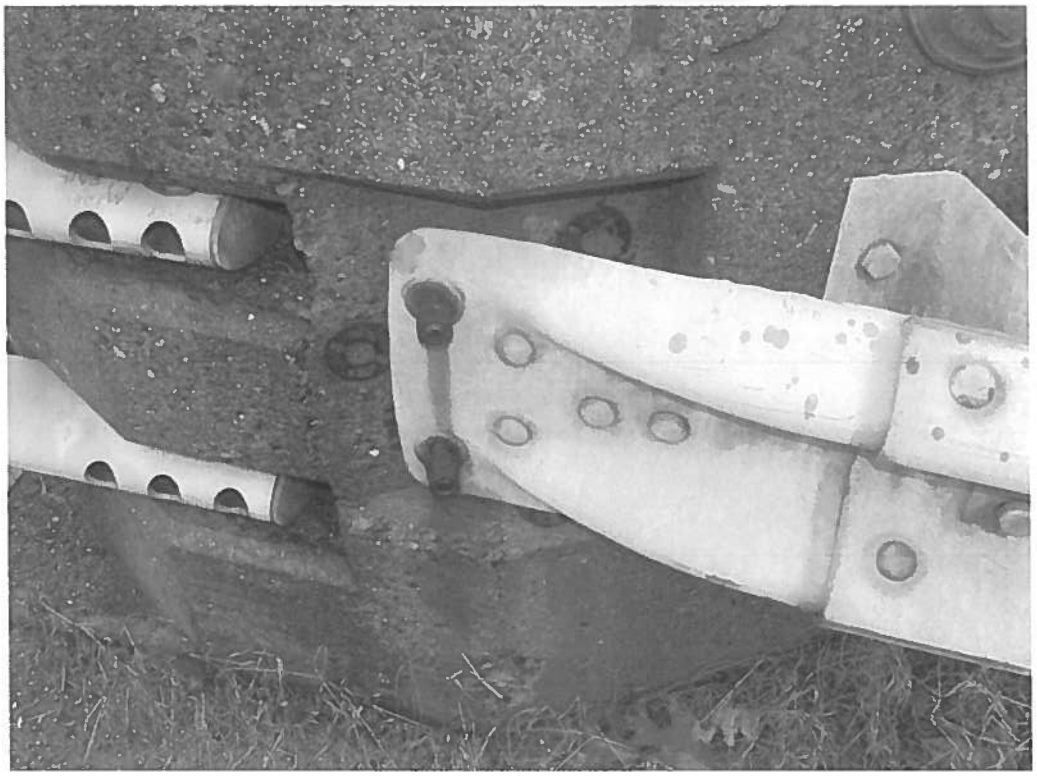

Photo 11: The Northwest terminal connector panel.

Subject: RE: Bridge Condition

More from “city-data” : Don’t know their source

Structure Number: **H18002223DOT634**, Location: **.5 MI W OF ST 122A** (Lat: **42.347697**, Lng: **-71.865356**), Route carried "on" structure: **State highway 31**, Year Built: **1983**, Status: **Open**, Structure Length: **1.55m (5.09ft)**, Average Daily Traffic: **16,100 (year 2011)**, Truck Traffic: **10%**, Average Future Daily Traffic: **25,427 (year 2032)**, Design Load: **HS 20**, Features Intersected: **RR PWRR**
Minimum Vertical Clearance: **30+ m (98+ ft)**, Kilometerpoint: **48.054**, Lanes on structure: **2**, Owner: **State Highway Agency**, Approaching Roadway Width: **12.2m (40.0ft)**, Skew: **3 degrees**, Material/Design: **Prestressed concrete**, Design/Construction: **Slab**, Number Of Spans In Main Unit: **1**, Length of Maximum Span: **12.8m (42.0ft)**, Curb or Sidewalk Widths: Left: **1.5m (4.9ft)**, Right: **0.2m (0.7ft)**, Curb-To-Curb Width: **12.2m (40.0ft)**, Out-to-Out Width: **14.8m (48.6ft)**

Condition: Deck: **Fair**, Superstructure: **Fair**, Substructure: **Good**, Operating Rating: **67.3 metric tons**, Method Used To Determine Operating Rating: **Load Factor (LF)**, Inventory Rating: **40.3 metric tons**, Method Used To Determine Inventory Rating: **Load Factor (LF)**, Structural Evaluation: **Somewhat better than minimum adequacy**, Deck Geometry: **Somewhat better than minimum adequacy**, Underclear: **High priority of corrective action**, Approach Roadway Alignment: **Equal to present minimum criteria**, Length Of Structure Improvement: **1.60m (5.25ft)**, Designated Inspection Frequency: **Every 24 months**, Inspection Date: **December 11**, Bridge Improvement Cost: **$547,000**, Roadway Improvement Cost: **$55,000**, Total Project Cost: **$821,000 (Estimate for 2012)**, Deck Structure Type: **Concrete Precast Panels**, Wearing Surface/Protective System: Wearing Surface: **Bituminous**, Membrane: **Built-up**

From Uglybridges.com:

Facts

Name:	ST 31 RESERVOIR ST over RR PWRR
Structure number:	H18002223DOT634
Location:	.5 MI W OF ST 122A
Purpose:	Carries highway and pedestrian walkway over railroad
Route classification:	Minor Arterial (Urban) *[16]*
Length of largest span:	42.0 ft. *[12.8 m]*
Total length:	50.9 ft. *[15.5 m]*
Roadway width between curbs:	40.0 ft. *[12.2 m]*

Deck width edge-to-edge:	48.6 ft. *[14.8 m]*
Vertical clearance below bridge:	19.4 ft. *[5.9 m]*
Skew angle:	37°
Owner:	State Highway Agency *[01]*
Year built:	1983
Historic significance:	Bridge is not eligible for the National Register of Historic Places *[5]*
Design load:	MS 18 / HS 20 *[5]*
Main span material:	Prestressed concrete *[5]*
Main span design:	Slab *[01]*
Deck type:	Concrete Precast Panels *[2]*
Wearing surface:	Bituminous *[6]*

2010 Inspection

Status:	Open, no restriction *[A]*
Average daily traffic:	16,100 *[as of 2009]*
Truck traffic:	10% of total traffic
Deck condition:	Fair *[5 out of 9]*
Superstructure condition:	Fair *[5 out of 9]*
Substructure condition:	Good *[7 out of 9]*
Scour condition:	Bridge not over waterway. *[N]*
Operating rating:	74.0 tons *[67.3 metric tons]*
Inventory rating:	44.3 tons *[40.3 metric tons]*
Evaluation:	Functionally obsolete *[2]*
Sufficiency rating:	77.3
Recommended work:	Bridge rehabilitation because of general structure deterioration or inadequate strength. *[35]*
Estimated cost of work:	$986,000

Town of Spencer

- Route 31 Bridge over Seven Mile River (adjacent to Hastings Road) Inspection Report

- Route 31 Bridge over Seven Mile River (adjacent to Meadow Road) Inspection Report

- Construction Notice: Single Lane Vehicle Restriction on Hastings Road at Wire Village Road Bridge over Turkey Hill Brook

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
03	1DE	S-23-012

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
SPENCER	S23012-1DE-MUN-NBI	033.259	A:OPEN	JUN 16, 2011

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
ST 31 N SPENCER RD		1938	0000	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER	L. A. Gauthier
WATER SEVEN MILE RIVER	Major Collector		

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER R. C. Angell
302 : Steel Stringer/Girder	Town Agency	Town Agency	

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
1 : Concrete Cast-in-Place	Sunny	26°C	R. VANMETER BV

ITEM 58 — DECK: 5

		DEF
1.Wearing surface	6	M-P
2.Deck Condition	5	S-P
3.Stay in place forms	N	-
4.Curbs	3	S-P
5.Median	N	-
6.Sidewalks	N	-
7.Parapets	4	S-P
8.Railing	4	S-P
9.Anti Missile Fence	N	-
10.Drainage System	N	-
11.Lighting Standards	N	-
12.Utilities	N	-
13.Deck Joints	N	-
14.	N	-
15.	N	-
16.	N	-

CURB REVEAL (In millimeters)	N	S
	120	170

APPROACHES

		DEF
a. Appr. pavement condition	7	-
b. Appr. Roadway Settlement	7	-
c. Appr. Sidewalk Settlement	N	-
d.	N	-

OVERHEAD SIGNS (Attached to bridge) (Y/N): N

		DEF
a. Condition of Welds	N	-
b. Condition of Bolts	N	-
c. Condition of Signs	N	-

ITEM 59 — SUPERSTRUCTURE: 6

			DEF
1.Stringers		N	-
2.Floorbeams		N	-
3.Floor System Bracing		N	-
4.Girders or Beams		6	M-P
5.Trusses - General		N	-
a. Upper Chords	N		-
b. Lower Chords	N		-
c. Web Members	N		-
d. Lateral Bracing	N		-
e. Sway Bracings	N		-
f. Portals	N		-
g. End Posts	N		-
6.Pin & Hangers		N	-
7.Conn Plt's, Gussets & Angles		N	-
8.Cover Plates		N	-
9.Bearing Devices		6	M-P
10.Diaphragms/Cross Frames		5	S-P
11.Rivets & Bolts		6	M-P
12.Welds		7	-
13.Member Alignment		7	-
14.Paint/Coating		5	S-P
15.		N	-

Year Painted	1938

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member: (Y/N) N

Any Cracks: (Y/N) N

ITEM 60 — SUBSTRUCTURE: 6

	Dive	Cur		DEF
1. Abutments			6	
a. Pedestals	N	N		-
b. Bridge Seats	N	6		M-P
c. Backwalls	N	7		-
d. Breastwalls	N	6		M-P
e. Wingwalls	N	5		S-P
f. Slope Paving/Rip-Rap	N	N		-
g. Pointing	N	N		-
h. Footings	N	H		-
i. Piles	N	N		-
j. Scour	N	6		M-P
k. Settlement	N	7		-
l. Erosion	N	7		-
m.	N	N		-
2. Piers or Bents			N	
a. Pedestals	N	N		-
b. Caps	N	N		-
c. Columns	N	N		-
d. Stems/Webs/Pierwalls	N	N		-
e. Pointing	N	N		-
f. Footing	N	N		-
g. Piles	N	N		-
h. Scour	N	N		-
i. Settlement	N	N		-
j.	N	N		-
k.	N	N		-
3. Pile Bents			N	
a. Pile Caps	N	N		-
b. Piles	N	N		-
c. Diagonal Bracing	N	N		-
d. Horizontal Bracing	N	N		-
e. Fasteners	N	N		-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )

SCOUR: *Please explain*
None ( ) Minor (X) Moderate ( ) Severe ( )

I-60 (Dive Report): N *I-60 (This Report):* 6

93B-U/W (DIVE) Insp 00/00/00

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

RTN(1)7-96

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

ITEM 61 6

CHANNEL & CHANNEL PROTECTION

	Dive	Cur	DEF
1.Channel Scour	N	6	M-P
2.Embankment Erosion	N	6	M-P
3.Debris	N	7	-
4.Vegetation	N	6	-
5.Utilities	N	N	-
6.Rip-Rap/Slope Protection	N	7	-
7.Aggradation	N	6	-
8.Fender System	N	N	-

STREAM FLOW VELOCITY: Tidal ( ) High ( ) Moderate (X) Low ( ) None ( )

ITEM 61 (Dive Report): N *ITEM 61 (This Report)* 6

93b-U/W INSP. DATE: 00/00/00

ITEM 36 *TRAFFIC SAFETY*

	36	COND	DEF
A. Bridge Railing	0	4	S-P
B. Transitions	0	7	-
C. Approach Guardrail	1	7	-
D. Approach Guardrail Ends	0	6	M-P

WEIGHT POSTING *Not Applicable* X

	H	3	3S2	Single
Actual Posting	N	N	N	N
Recommended Posting	N	N	N	N

Waived Date: 02/17/1988 EJDMT Date: 00/00/00

Signs In Place (Y=Yes,N=No, NR=NotRequired) Legibility/ Visibility	At bridge E	At bridge W	Other Advance E	Other Advance W

CLEARANCE POSTING *Not Applicable* X

	N ft	N in	S ft	S in	meter
Actual Field Measurement ft		0		0	
Posted Clearance ft		0		0	

Signs In Place (Y=Yes,N=No, NR=NotRequired) Legibility/ Visibility	At bridge N	At bridge S	Advance N	Advance S

ACCESSIBILITY (Y/N/P)

	Needed	Used
Lift Bucket	N	N
Ladder	Y	Y
Boat	N	N
Waders	Y	Y
Inspector 50	N	N
Rigging	N	N
Staging	N	N
Traffic Control	N	N
RR Flagger	N	N
Police	N	N
Other:		
	N	N

TOTAL HOURS 8

PLANS (Y/N): Y

(V.C.R.) (Y/N): N

TAPE#:

List of field tests performed: None:

RATING

Rating Report (Y/N): Y

Date: 11/01/1987

Inspection data at time of existing rating

I 58: 6 I 59: 7 I 60: 6 Date :07/13/1984

(To be filled out by DBIE)

Request for Rating or Rerating (Y/N): N

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

REASON:

CONDITION RATING GUIDE (For Items 58, 59, 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency- Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

S= Severe/Major Deficiency- Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroded rebars, Considerable settlement, Considerable scouring or undermining, Moderate to extensive corrosion to structural steel with measurable loss of section, etc.

C-S= Critical Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

URGENCY OF REPAIR:

I = Immediate- [Inspector(s) immediately contact District Bridge Inspection Engineer (DBIE) to report the Deficiency and to receive further instruction from him/her].

A = ASAP- [Action/Repair should be initiated by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) upon receipt of the Inspection Report].

P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

RTB(2)04-07

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

REMARKS

BRIDGE ORIENTATION

Orientation from the plans.

The approaches are South to North and the elevations are West to East. There are eight beams and seven bays numbered from the West to East. The river flows from the West to East.

ITEM 58 - DECK

Item 58.1 - Wearing surface

There is a 12 ft. long x 5 ft. wide bituminous concrete (bit. conc.) patch in the Northbound travel lane where the deck has been repaired. **See photo #1.** There is a 3 ft. diameter area of minor map cracking and settlement just South of this patched area, This area has been patched with crack sealer. There is a 6 ft. long sealed longitudinal crack in the Southbound travel lane. The bit. conc. wearing surface shows moderate wheel wear in both travel lanes.

Item 58.2 - Deck Condition

The underside of the West deck fascia shows minor spalling, exposed rebar, moderate scaling, honeycombing,and efflorescence throughout. **See photo #2.** The underside of the East deck fascia shows full length delamination cracking with moderate efflorescence. **See photo #3.** There is a spall in bay #2, at the North end, approximately 5 feet long x 3 feet wide x 1 inch deep with exposed rebar, due to lack of cover. **See photo #4.** There are several small spall/scale areas to the underside throughout, approximately 1 in. deep due to lack of concrete cover. There are galvanized steel repair forms to the North half of bay #6. **See photo #5.** The remainder of the deck underside shows many areas of hairline transverse and diagonal cracking, moderate efflorescence, efflorescence icicles, and honeycombing. **See photo #6.**

Item 58.4 - Curbs

Both concrete curbs show several areas of severe spalling, up to 8 ft. long x full height x full depth, with exposed rusting rebar. **See photos #7 & #8.**

Item 58.7 - Parapets

Re: Item #58.8.

Item 58.8 - Railing

The inside face of both concrete parapet/ bridge rail bases show severe spalling in many areas throughout, with exposed rusted rebars. This deterioration is undermining many of the steel bridge rail posts. **See photos #7 & #8.** Both concrete parapet/bridgerail bases (outside face) have moderate spalling, cracking, and efflorescence throughout. **See photo #9.**

APPROACHES

Approaches a - Appr. pavement condition

Both approach to deck transitions are saw cut and sealed. There is a 2 ft. long minor (sealed) crack adjacent to the North sealed joint.

ITEM 59 - SUPERSTRUCTURE

Item 59.4 - Girders or Beams

All of the steel beams have minor surface rusting, minor pitting, several areas of minor rust flaking and, paint fading, mostly to the top and bottom flanges, heaviest on beams #5, #6, & #7. **See photo #10.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

REMARKS

Item 59.9 - Bearing Devices
The fascia bearings show moderate rusting and minor rust flaking. See photo #11. The inside bearings show minor surface rusting.

Item 59.10 - Diaphragms/Cross Frames
The concrete diaphragms at mid-span show minor cracking, delamination, efflorescence, and minor pop outs, some with exposed rebar. **See photo #12.** The concrete end diaphragms in bays #6 and #7, over the North abutment, show delamination cracking with efflorescence to the bottom face.

Item 59.14 - Paint/Coating
The paint system shows minor surface rusting, minor pitting, several areas of minor rust flaking, and, paint fading, mostly to the top and bottom flanges, heaviest on beams #5, #6, & #7.

ITEM 60 - SUBSTRUCTURE

Item 60.1 - Abutments
Item 60.1.b - Bridge Seats
Re: Item #60.1d.

Item 60.1.d - Breastwalls
The entire length of both breastwalls show moderate (1 in. to 3 in. deep) abrasion from the high waterline down. There is an area of concrete deterioration (spall) to the top West end of the North breastwall/seat area, approximately 5 ft. high x 2 ft. wide x 3 in. deep. This deterioration is starting to encroach on the Northwest fascia bearing. There is a 5 ft. long x 3 ft. high area of minor delamination cracking adjacent to this deterioration. **See photo #13.**

Item 60.1.e - Wingwalls
The Northwest and Northeast wingwalls have map cracking with efflorescence throughout and moderate spalling and delamination along tops and faces. **See photos #14 and #15.** The Northeast wingwall has moderate waterline abrasion.

Item 60.1.j - Scour
There is minor scour at both abutments, heaviest to the upstream North abutment.

Item 60.1.l - Erosion
There is minor erosion behind the Southeast wingwall.

SubStructure Scour Notes
Re: Item #60.1.j.

ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.1 - Channel Scour
Re: Item #60.1.j.

Item 61.2 - Embankment Erosion
There is minor channel embankment erosion and undercutting to the Northeast downstream embankment.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

REMARKS

Item 61.4 - Vegetation
There is a minor to moderate amount of vegetation on the bar in the upstream channel and on the channel bottom downstream of the bridge.

Item 61.7 - Aggradation
There is an approx. 30 ft. long x 10 ft. wide x 1.5 ft. high vegetated bar, in the center of the upstream channel. **See photo #16.**

TRAFFIC SAFETY

Item 36a - Bridge Railing
The bridge rails consist of concrete rail bases with a top "SS" type guardrail extending over the structure and continuous as traffic safety features. Re: Item #58.8 for condition remarks.

Item 36b - Transitions
The transitions are not sufficiently stiffened at all four corners of the bridge..

Item 36d - Approach Guardrail Ends
The Northwest and Southeast terminal ends are buried in level ground, and are not sufficiently turned from the traffic. The Northwest terminal end has minor collision damage. The Southwest and Northeast terminal ends are boxing glove shaped ends, not buried, or sufficiently turned from the traffic.

Photo Log
Photo 1 : Bit. conc. patch to the wearing surface in the Northbound travel lane.
Photo 2 : Underside of the West deck fascia.
Photo 3 : Underside of the East deck fascia.
Photo 4 : Spall to the deck underside, at the North end of bay #2.
Photo 5 : Galvinized steel repair to the deck underside, to the North half of bay #6.
Photo 6 : Typical cracking to the deck underside.
Photo 7 : Spalling to the West concrete curbs and rail bases.
Photo 8 : Spalling to the East concrete curbs and rail bases.
Photo 9 : Outside face of the East Parapet/bridge rail base, typical of the West parapet/rail base.
Photo 10 : Typical rusting to beams #5, #6, and #7.
Photo 11 : Typical rusting and rust flaking to the fascia bearings.
Photo 12 : Typical cracking and delamination to the concrete diaphragms, at mid-span
Photo 13 : Cracking, spalling, and delamination to the West end of the North breastwall/bridge seat.
Photo 14 : Cracking and spalling to the Northwest wingwall.
Photo 15 : Cracking and spalling to the Northeast wingwall.
Photo 16 : Vegetated bar (aggradation) at the center of the upstream channel.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

PHOTOS

Photo 1: **Bit. conc. patch to the wearing surface in the Northbound travel lane.**

Photo 2: **Underside of the West deck fascia.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

PHOTOS

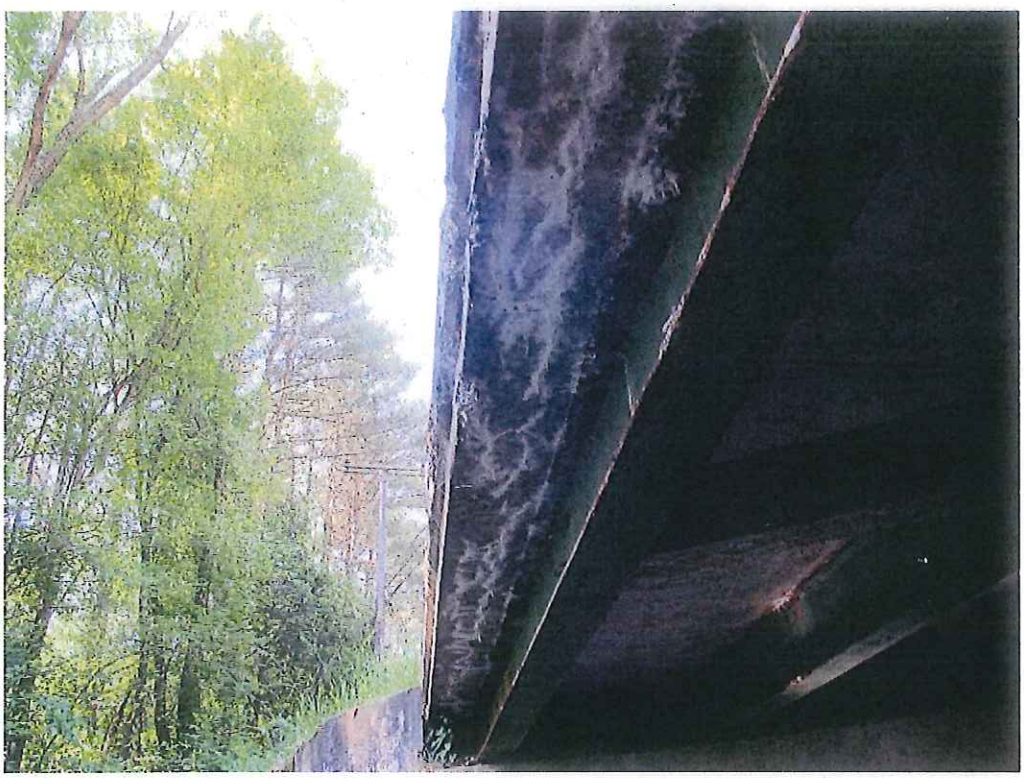

Photo 3: **Underside of the East deck fascia.**

Photo 4: **Spall to the deck underside, at the North end of bay #2.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

PHOTOS

Photo 5: **Galvinized steel repair to the deck underside, to the North half of bay #6.**

Photo 6: **Typical cracking to the deck underside.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

PHOTOS

Photo 7: Spalling to the West concrete curbs and rail bases.

Photo 8: Spalling to the East concrete curbs and rail bases.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

PHOTOS

Photo 9: **Outside face of the East Parapet/bridge rail base, typical of the West parapet/rail base.**

Photo 10: **Typical rusting to beams #5, #6, and #7.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

PHOTOS

Photo 11: Typical rusting and rust flaking to the fascia bearings.

Photo 12: Typical cracking and delamination to the concrete diaphragms, at mid-span

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

PHOTOS

Photo 13: **Cracking, spalling, and delamination to the West end of the North breastwall/bridge seat.**

Photo 14: **Cracking and spalling to the Northwest wingwall.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1DE	S-23-012	S23012-1DE-MUN-NBI	JUN 16, 2011

PHOTOS

Photo 15: Cracking and spalling to the Northeast wingwall.

Photo 16: Vegetated bar (aggradation) at the center of the upstream channel.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

2-DIST	B.I.N.	BR. DEPT. NO.
03	1XW	S-23-002

CITY/TOWN	8.-STRUCTURE NO.	11-Kilo. POINT	41-STATUS	90-ROUTINE INSP. DATE
SPENCER	S23002-1XW-DOT-NBI	028.823	P:POSTED	APR 5, 2012

07-FACILITY CARRIED	MEMORIAL NAME/LOCAL NAME	27-YR BUILT	106-YR REBUILT	YR REHAB'D (NON 106)
ST 31 N SPENCER RD		1952	0000	0000

06-FEATURES INTERSECTED	26-FUNCTIONAL CLASS	DIST. BRIDGE INSPECTION ENGINEER
WATER SEVEN MILE RIVER	Urban Minor Arterial	Sharon Begley

43-STRUCTURE TYPE	22-OWNER	21-MAINTAINER	TEAM LEADER R. Orlando
302 : Steel Stringer/Girder	State Highway Agency	State Highway Agency	R. Orlando

107-DECK TYPE	WEATHER	TEMP. (air)	TEAM MEMBERS
1 : Concrete Cast-in-Place	Cloudy	5°C	M. DYGON MD

ITEM 58 — DECK: 6

		DEF
1.Wearing Surface	7	-
2.Deck Condition	6	M-P
3.Stay in place forms	N	-
4.Curbs	7	-
5.Median	N	-
6.Sidewalks	7	M-P
7.Parapets	7	-
8.Railing	7	M-P
9.Anti Missile Fence	N	-
10.Drainage System	N	-
11.Lighting Standards	N	-
12.Utilities	N	-
13.Deck Joints	N	-
14.	N	-
15.	N	-
16.	N	-

CURB REVEAL (In millimeters): E 230 W 160

APPROACHES

		DEF
a. Appr. Pavement Condition	7	-
b. Appr. Roadway Settlement	7	-
c. Appr. Sidewalk Settlement	4	M-A
d.	N	-

OVERHEAD SIGNS (Attached to bridge) (Y/N): N

		DEF
a. Condition of Welds	N	-
b. Condition of Bolts	N	-
c. Condition of Signs	N	-

ITEM 59 — SUPERSTRUCTURE: 7

			DEF
1.Stringers		N	-
2.Floorbeams		N	-
3.Floor System Bracing		N	-
4.Girders or Beams		7	-
5.Trusses - General		N	-
a. Upper Chords	N		-
b. Lower Chords	N		-
c. Web Members	N		-
d. Lateral Bracing	N		-
e. Sway Bracings	N		-
f. Portals	N		-
g. End Posts	N		-
6.Pin & Hangers		N	-
7.Conn Plt's, Gussets & Angles		7	-
8.Cover Plates		N	-
9.Bearing Devices		7	M-P
10.Diaphragms/Cross Frames		7	-
11.Rivets & Bolts		7	-
12.Welds		7	-
13.Member Alignment		7	-
14.Paint/Coating		7	-
15.		N	-

Year Painted: 1995

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None ( ) Minor X) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None ( ) Minor X) Moderate ( ) Severe ( )

Any Fracture Critical Member: (Y/N) N

Any Cracks: (Y/N) N

ITEM 60 — SUBSTRUCTURE: 5

	Dive	Cur		DEF
1. Abutments			5	
a. Pedestals	N	N		-
b. Bridge Seats	N	6		M-P
c. Backwalls	N	7		-
d. Breastwalls	7	7		M-P
e. Wingwalls	7	7		M-P
f. Slope Paving/Rip-Rap	N	N		-
g. Pointing	N	N		-
h. Footings	7	H		-
i. Piles	N	H		-
j. Scour	5	5		S-P
k. Settlement	7	7		-
l. Erosion	N	6		S-P
m.	N	N		-
2. Piers or Bents			N	
a. Pedestals	N	N		-
b. Caps	N	N		-
c. Columns	N	N		-
d. Stems/Webs/Pierwalls	N	N		-
e. Pointing	N	N		-
f. Footing	N	N		-
g. Piles	N	N		-
h. Scour	N	N		-
i. Settlement	N	N		-
j.	N	N		-
k.	N	N		-
3. Pile Bents			N	
a. Pile Caps	N	N		-
b. Piles	N	N		-
c. Diagonal Bracing	N	N		-
d. Horizontal Bracing	N	N		-
e. Fasteners	N	N		-

UNDERMINING (Y/N) If YES please explain: N

COLLISION DAMAGE:
None (X) Minor) Moderate ( ) Severe ( )

SCOUR: *Please explain*
None ( ) Minor X) Moderate ( ) Severe ( )

I-60 (Dive Report): 5 *I-60 (This Report):* 5

93B-U/W (DIVE) Insp 02/12/2010

X=UNKNOWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

RTN(1)7-96

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1XW	S-23-002	S23002-1XW-DOT-NBI	APR 5, 2012

ITEM 61 5

CHANNEL & CHANNEL PROTECTION

	Dive	Cur	DEF
1.Channel Scour	5	5	S-P
2.Embankment Erosion	7	7	-
3.Debris	8	8	-
4.Vegetation	7	5	M-P
5.Utilities	N	N	-
6.Rip-Rap/Slope Protection	N	N	-
7.Aggradation	6	6	M-P
8.Fender System	N	N	-

STREAM FLOW VELOCITY:
Tidal ( ) High ( ) Moderate (X) Low ( ) None ( )

ITEM 61 (Dive Report): 5 *ITEM 61 (This Report)* 5

93b-U/W INSP. DATE: 02/12/2010

ITEM 36 *TRAFFIC SAFETY*

	36	COND	DEF
A. Bridge Railing	0	7	M-P
B. Transitions	0	6	M-P
C. Approach Guardrail	1	7	-
D. Approach Guardrail Ends	0	7	-

WEIGHT POSTING *Not Applicable* ☐

	H	3'	3S2	Single
Actual Posting	20	25	40	N
Recommended Posting	20	25	40	N

Waived Date: 00/00/00 EJDMT Date: 00/00/00

	At bridge N	At bridge S	Other Advance N	Other Advance S
Signs In Place (Y=Yes,N=No, NR=NotRequired)	Y	Y	Y	Y
Legibility/ Visibility	7/7	7/7	7/7	7/7

CLEARANCE POSTING

Not Applicable X

	E ft	E in	W ft	W in	meter
Actual Field Measurement		0		0	
Posted Clearance		0		0	

	At bridge E	At bridge W	Advance E	Advance W
Signs In Place (Y=Yes,N=No, NR=NotRequired)				
Legibility/ Visibility				

ACCESSIBILITY (Y/N/P)

	Needed	Used
Lift Bucket	N	N
Ladder	N	N
Boat	N	N
Waders	Y	Y
Inspector 50	N	N
Rigging	N	N
Staging	N	N
Traffic Control	N	N
RR Flagger	N	N
Police	N	N
Other:		
TUBE	P	N

TOTAL HOURS 8

PLANS (Y/N): N

(V.C.R.) (Y/N): N

TAPE#: _____

List of field tests performed:

RATING

Rating Report (Y/N): Y

Date: 06/01/1996

Inspection data at time of existing rating

I 58: 7 I 59: 7 I 60: 7 Date :07/11/1986

(To be filled out by DBIE)

Request for Rating or Rerating (Y/N): N

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

REASON: J.B.

CONDITION RATING GUIDE (For Items 58, 59, 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor pot holes, Minor corrosion of steel, Minor scouring, Clogged drainage, etc.

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C-H= Critical Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Loose concrete hanging down over traffic or pedestrians, A hole in a sidewalk that may cause injuries to pedestrians, Missing section of bridge railing, etc.

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P = Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1XW	S-23-002	S23002-1XW-DOT-NBI	APR 5, 2012

REMARKS

BRIDGE ORIENTATION

According to the rating report, the approaches are South and North and the elevations are West and East. There are seven beams and six bays numbered from West to East. The river flows from East to West.

ITEM 58 - DECK

Item 58.1 - Wearing Surface

Both gutterlines have a moderate accumulation of sand. There is minor wheel wear throughout.

Item 58.2 - Deck Condition

There are three full width transverse hairline cracks with efflorescence throughout bay #1. Bay #1 has a full width x 1 foot area of minor spalling with exposed rusted rebar at the North end. **See Photo 1**. The West deck fascia has full width x 4 inch high x 3 inch deep spalling with exposed rusted rebar from midspan to the North end. **See Photo 2.**

Item 58.6 - Sidewalks

There is a 7 foot long x 6 inch wide x 2 inch deep area of spalling behind the curb near the South end of the West sidewalk.

Item 58.8 - Railing

Both bridge rails consists of c.i.p. concrete rails and posts. Both have minor scaling. The Southeast end post has a 1 foot long x 5 inch high x 2 inch deep chip-out at the top.

APPROACHES

Approaches a - Appr. Pavement Condition

Both approaches have minor wheel wear.

Approaches c - Appr. Sidewalk Settlement

Both gravel approach sidewalks are approximately 6 inches lower than the bridge sidewalk. **See Photo 3.** There is minor erosion along the Southwest sidewalk.

ITEM 59 - SUPERSTRUCTURE

Item 59.4 - Girders or Beams

Both fascia beams have minor spot rusting.

Item 59.9 - Bearing Devices

There is minor surface rusting to bearing #1 on the South abutment.

Item 59.14 - Paint/Coating

The paint system is faded throughout. See Item 59.4.

SuperStructure Load Deflection Notes

Minor under heavy live loads.

SuperStructure Load Vibration Notes

Minor under heavy live loads.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1XW	S-23-002	S23002-1XW-DOT-NBI	APR 5, 2012

REMARKS

ITEM 60 - SUBSTRUCTURE

Item 60.1 - Abutments

Item 60.1.b - Bridge Seats

There is a 7 foot long x 8 inch high x up to 5 inch deep spall at the West end of the South bridge seat, slightly undermining the Southwest corner bearing device. **See Photo 4.** There is a 1 foot long area of minor delamination cracking to the South bridge seat under bay #3. **See Photo 5.** The North breastwall has a minor horizontal crack from the bridge seat to the wingwall / breastwall construction joint.

Item 60.1.d - Breastwalls

There is a 2 foot horizontal hairline crack with efflorescence just under the curtain wall at the East end of the South breastwall.

The North breastwall has a 5 foot vertical hairline crack from the waterline up, under bay #3. There is a minor horizontal crack from the bridge seat in bay #3, to the construction joint at the Northwest wingwall.

There is an 18 inch long x 10 inch high x 1/2 inch deep spall at the base of the North breastwall, near the East end, just above the water line.

Item 60.1.e - Wingwalls

The Northwest wingwall has full length minor horizontal cracking at the top. There is an almost full height delamination crack to the Northeast wingwall at the interface of the breastwall, from hairline at the bottom, with 1 inch of differential and displacement at the top. **See Photo 6.**

Item 60.1.j - Scour

The South footing is exposed up to 18 inches high, from bay #3 to the East end of the breastwall. The top of the North footing is exposed up to 6 feet from the West end of the breastwall.

Item 60.1.l - Erosion

There is minor erosion behind the Southwest wingwall and moderate behind the Northwest. The back of the Southeast wingwall is exposed up to 3-1/2 feet.

There is minor erosion behind the Southeast corner transitional railing, undermining the granite block supports.

SubStructure Scour Notes

See Item 60.j.

ITEM 61 - CHANNEL AND CHANNEL PROTECTION

Item 61.1 - Channel Scour

See Item 60.1.j.

Item 61.4 - Vegetation

There is a large vegetated bar upstream of the bridge, along the North embankment, directing the flow to the South abutment.

Item 61.7 - Aggradation

There is a moderate accumulation of silt at the Northeast corner of the channel under the bridge.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1XW	S-23-002	S23002-1XW-DOT-NBI	APR 5, 2012

REMARKS

TRAFFIC SAFETY

Item 36a - Bridge Railing
See Item 58.8.

Item 36b - Transitions
The vertical posts are not properly spaced at all four corner transitions.

The Southwest is missing two anchor bolts, and the rail is not attached to the 2nd post.

The Northeast bridge end transition has one bolt missing and the rail is not attached to the 1st post.

Item 36d - Approach Guardrail Ends
The Northwest buried end has insufficient cover.

Photo Log
Photo 1 : North end of bay #1.
Photo 2 : North half of the West deck fascia.
Photo 3 : North approach sidewalk.
Photo 4 : West end of the South bridge seat.
Photo 5 : South bridge seat below bay #3.
Photo 6 : Northeast wingwall.

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1XW	S-23-002	S23002-1XW-DOT-NBI	APR 5, 2012

PHOTOS

Photo 1: **North end of bay #1.**

Photo 2: **North half of the West deck fascia.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1XW	S-23-002	S23002-1XW-DOT-NBI	APR 5, 2012

PHOTOS

Photo 3: **North approach sidewalk.**

Photo 4: **West end of the South bridge seat.**

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8.-STRUCTURE NO.	INSPECTION DATE
SPENCER	1XW	S-23-002	S23002-1XW-DOT-NBI	APR 5, 2012

PHOTOS

Photo 5: **South bridge seat below bay #3.**

Photo 6: **Northeast wingwall.**

Subject: Spencer bridges

http://uglybridges.com/1238460

Structure Number: **S230021XWDOTNBI**, Location: **1MI. N. OF ST-9** (Lat: **42.255597**, Lng: **-72.005164**), Route carried "on" structure: **State highway 31**, Year Built: **1952**, Status: **Posted for load**, Structure Length: **1.65m (5.41ft)**, Average Daily Traffic: **3,200 (year 2010)**, Truck Traffic: **8%**, Average Future Daily Traffic: **5,054 (year 2031)**, Design Load: **H 20**, Features Intersected: **WATER SEVEN MILE RIVER**
Minimum Vertical Clearance: **30+ m (98+ ft)**, Kilometerpoint: **28.823**, Lanes on structure: **2**, Owner: **State Highway Agency**, Approaching Roadway Width: **8.5m (27.9ft)**, Skew: **9 degrees**, Material/Design: **Steel**, Design/Construction: **Stringer/Multi-beam**, Number Of Spans In Main Unit: **1**, Length of Maximum Span: **14.9m (48.9ft)**, Curb or Sidewalk Widths: Left: **1.5m (4.9ft)**, Right: **0.0m**, Curb-To-Curb Width: **8.5m (27.9ft)**, Out-to-Out Width: **11.3m (37.1ft)**

Condition: Deck: **Good**, Superstructure: **Good**, Substructure: **Fair**, Channel: **Fair**, Operating Rating: **36.4 metric tons**, Method Used To Determine Operating Rating: **Allowable Stress (AS)**, Inventory Rating: **19.9 metric tons**, Method Used To Determine Inventory Rating: **Allowable Stress (AS)**, Structural Evaluation: **Somewhat better than minimum adequacy**, Deck Geometry: **Meets minimum limits**, Waterway Adequacy: **Equal to present desirable criteria**, Approach Roadway Alignment: **Equal to present minimum criteria**, Length Of Structure Improvement: **1.70m (5.58ft)**, Designated Inspection Frequency: **Every 24 months**, Underwater Inspection Frequency: **Every 36 months**, Inspection Date: **April 10**, Underwater Inspection Date: **Febuary 10**, Bridge Improvement Cost: **$444,000**, Roadway Improvement Cost: **$45,000**, Total Project Cost: **$667,000 (Estimate for 2012)**, Deck Structure Type: **Concrete Cast-file-Place**, Wearing Surface/Protective System: Wearing Surface: **Monolithic Concrete**

http://uglybridges.com/1238465

Structure Number: **S230121DEMUNNBI**, Location: **AT CORNER OF HASTINGS RD.** (Lat: **42.291469**, Lng: **-72.001403**), Route carried "on" structure: **City street 31**, Year Built: **1938**, Status: **Open**, Structure Length: **0.79m (2.59ft)**, Average Daily Traffic: **6,700 (year 2011)**, Truck Traffic: **3%**, Average Future Daily Traffic: **10,581 (year 2032)**, Design Load: **H 15**, Features Intersected: **WATER SEVEN MILE RIVER**
Minimum Vertical Clearance: **30+ m (98+ ft)**, Kilometerpoint: **33.259**, Lanes on structure: **2**, Owner: **Town or Township Highway Agency**, Approaching Roadway Width: **8.8m (28.9ft)**, Skew: **3 degrees**, Material/Design: **Steel**, Design/Construction: **Stringer/Multi-beam**, Number Of Spans In Main Unit: **1**, Length of Maximum Span: **6.7m (22.0ft)**, Curb or Sidewalk Widths: Left: **0.3m (1.0ft)**, Right: **0.3m (1.0ft)**, Curb-To-Curb Width: **9.1m (29.9ft)**, Out-to-Out Width: **10.4m (34.1ft)**

Condition: Deck: **Fair**, Superstructure: **Satisfactory**, Substructure: **Satisfactory**, Channel: **Satisfactory**, Operating Rating: **38.6 metric tons**, Method Used To Determine Operating Rating:

Allowable Stress (AS), Inventory Rating: **25.0 metric tons**, Method Used To Determine Inventory Rating: **Allowable Stress (AS)**, Structural Evaluation: **Equal to present minimum criteria**, Deck Geometry: **High priority of corrective action**, Waterway Adequacy: **Somewhat better than minimum adequacy**, Approach Roadway Alignment: **Equal to present minimum criteria**, Length Of Structure Improvement: **0.80m (2.62ft)**, Designated Inspection Frequency: **Every 24 months**, Inspection Date: **June 11**, Bridge Improvement Cost: **$192,000**, Roadway Improvement Cost: **$20,000**, Total Project Cost: **$289,000 (Estimate for 2012)**, Deck Structure Type: **Concrete Cast-file-Place**, Wearing Surface/Protective System: Wearing Surface: **Bituminous**

TOWN OF SPENCER

Office of Utilities & Facilities

Steven J. Tyler, P.E.
Superintendent
styler@spencerma.gov

3 Old Meadow Road
Spencer, MA 01562
Phone: 508-885-7515
Fax: 508-885-9416

Construction Notice: Single Lane Vehicle Restriction on Hastings Road at Wire Village Road Bridge Over Turkey Hill Brook

Due to guardrail and bridge damage, the Hastings Road Bridge will be restricted to one single lane of travel from now to the foreseeable future when funds are available for permanent repairs. Soon you will see new jersey style crash barriers, advanced warning and yield signs per the attached plans. The traffic management changes will affect the Wire Village Road approaches as well.

Drivers must yield to allow only one vehicle at a time on the bridge. Drive with caution and alertness at all times. Reduce speeds and strictly adhere to traffic signs when approaching this bridge from Hastings Road or Wire Village Road.

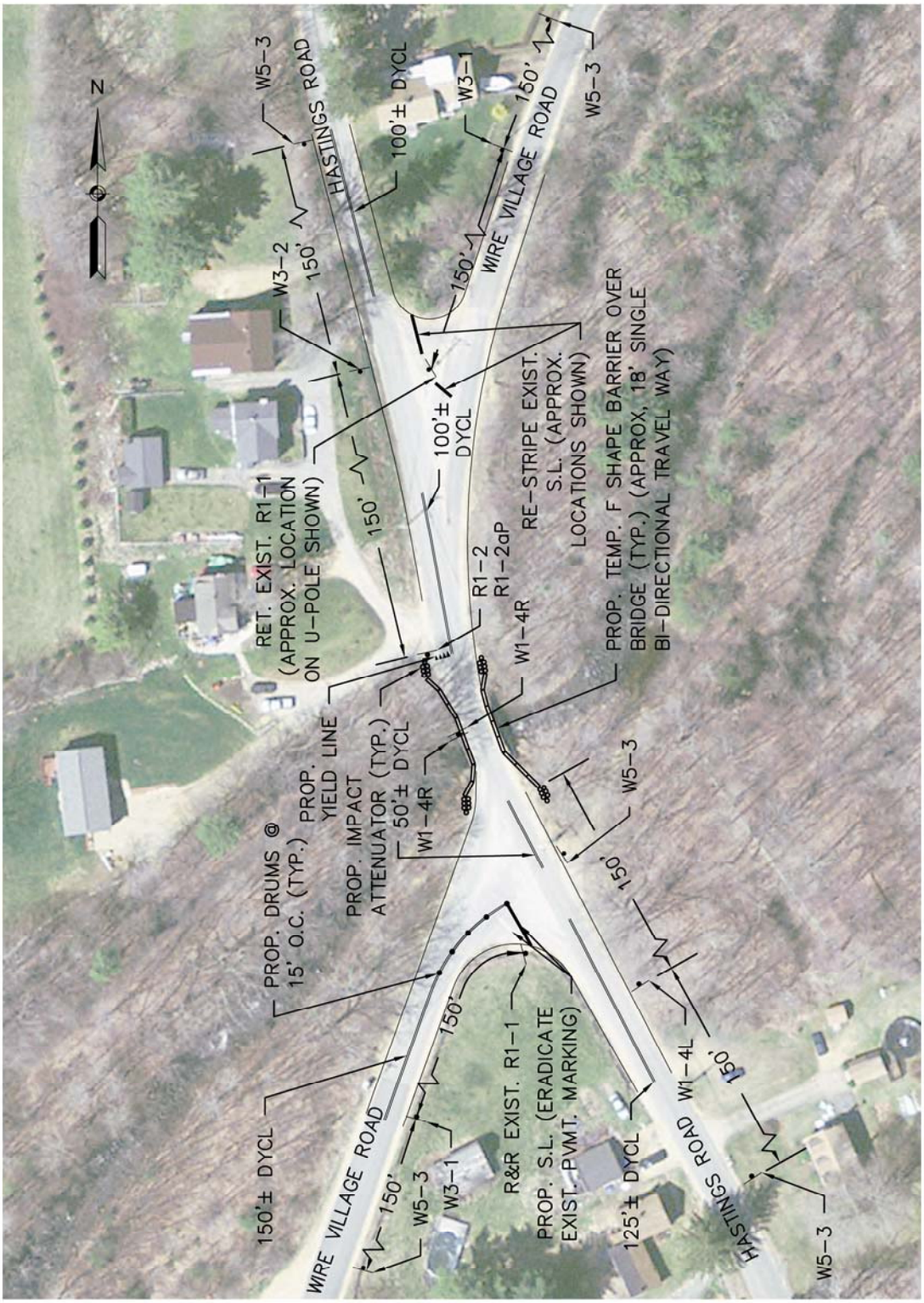
We apologize for the inconvenience, but the temporary narrowing of the bridge to a single lane is necessary to provide adequate protection in place of the damaged guardrails.

If you wish to be on our project status email update list please send an email requesting to be placed on the Spencer Construction updates list to styler@spencerma.gov. Please include “Spencer Construction Updates” in your email subject line.

If necessary, you may call the Utilities and Facilities Office at 508-885-7525. We will do our best to assist you. Thank you for your patience and understanding.

65 Glenn Street | Lawrence, MA 01843
tel 978.794.1792 | fax 978.794.1793
www.tecmass.com

JOB:	EMERGENCY TEMPORARY SAFETY BARRIER INSTALLATION & TRAFFIC MANAGEMENT PLAN	PROJECT #:	T0397.01
SK#	1	DATE:	6/13/2013
SK TITLE:	SIGNING AND STRIPING		



NOTES:

1. DRUMS ARE INTENDED TO BE A TEMPORARY MEASURE TO ACCLIMATE DRIVERS TO NEW ROADWAY ALIGNMENT.
2. CONTRACTOR SHALL FASTEN TEMPORARY SIGN POSTS TO EXISTING BRIDGE RAIL OR EXISTING STRUCTURE OUTSIDE TEMPORARY BARRIER.

T:\T0397.01\CAD\Structural\Final\T0397.01_Hastings Road Emergency Repair.dwg 6/12/2013 5:15:14 PM

65 Glenn Street | Lawrence, MA 01843
tel 978.794.1792 | fax 978.794.1793
www.tecmass.com

JOB:	EMERGENCY TEMPORARY SAFETY BARRIER INSTALLATION & TRAFFIC MANAGEMENT PLAN	PROJECT #:	T0397.01
SK#	2	DATE:	6/13/2013
SK TITLE:	SIGN SUMMARY		

ID NUMBER	SIZE OF SIGN		LEGEND	TEXT DIMENSIONS			SIGNS REQUIRED	UNIT AREA (SF)	TOTAL AREA (SF)
	WIDTH	HEIGHT		LETTER HEIGHT	VERTICAL SPACING	ARROW RTE. MKR.			
R1-2	30	30		SEE 2009 MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS			1	6.25	6.25
R1-2aP	24	18					1	3	3
W1-4R	30	30					2	6.25	12
W1-4L	30	30					1	6.25	6.25
W3-1	30	30					2	6.25	12.50
W3-2	30	30					1	6.25	6.25
W5-3	30	30					5	6.25	31.25

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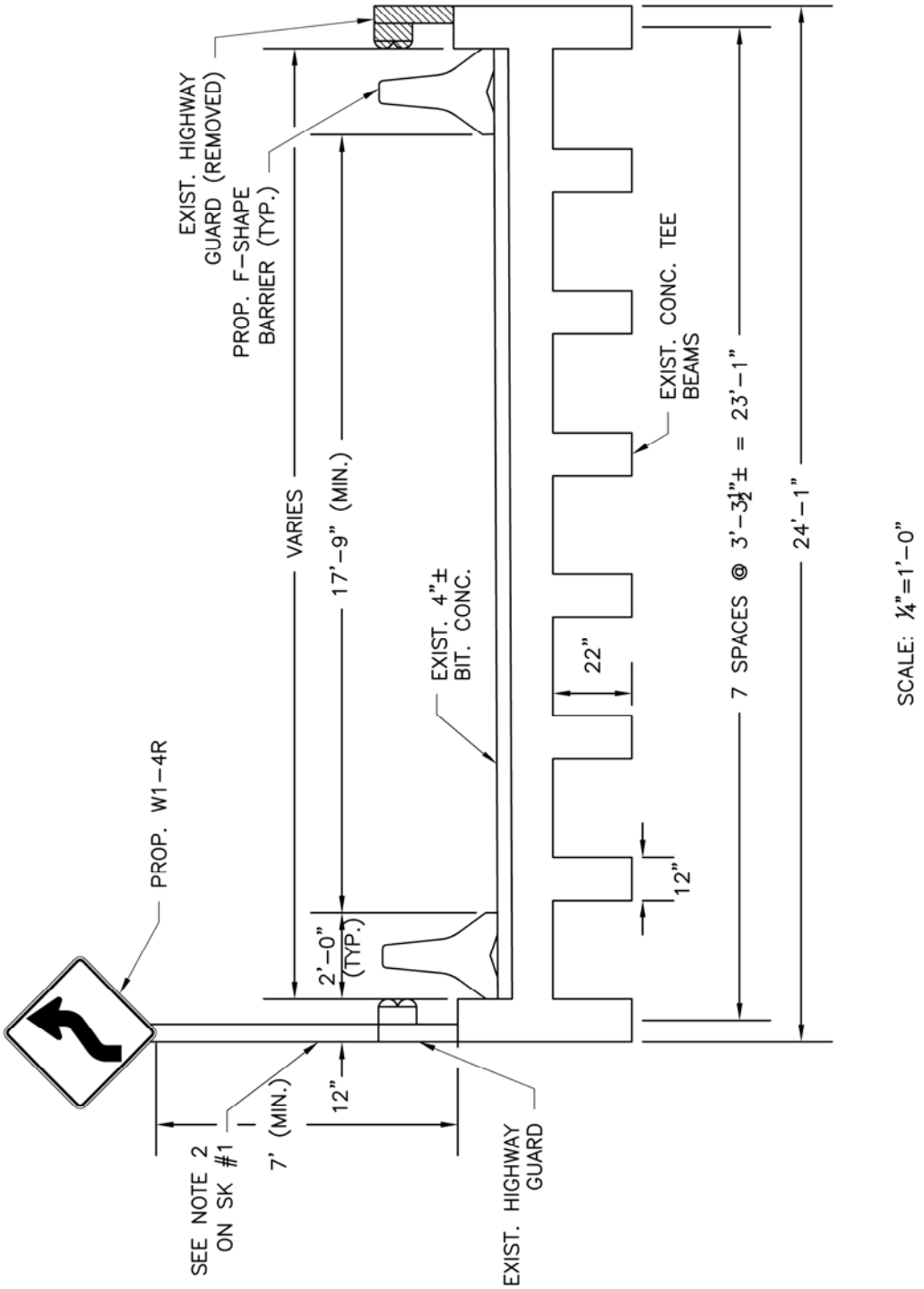
65 Glenn Street | Lawrence, MA 01843
tel 978.794.1792 | fax 978.794.1793
www.tecmass.com

JOB:	EMERGENCY TEMPORARY SAFETY BARRIER INSTALLATION & TRAFFIC MANAGEMENT PLAN	PROJECT #:	T0397.01
SK#	3	DATE:	6/13/2013
SK TITLE:	DECK CROSS SECTION (LOOKING NORTH)		



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Major Drainage Structures Information

- Route 31 Environmental Profile Information
- North Spencer Road Drainage Improvements
- Stream Crossings Contacts and Resources
- Additional Major Drainage Structure Photos

Corridor Profile Route 31 Environmental Profiles

MassGIS Datalayers webpage is the main source for the GIS Layers and definitions.
http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/layerlist.html

1) **Areas of Critical Environmental Concern** – The Areas of Critical Environmental Concern (ACEC) datalayers provide digital polygon and line boundaries for areas that have been designated ACECs by the Secretary of Energy and Environmental Affairs (EEA). ACECs are places in Massachusetts that receive special recognition because of the quality, uniqueness and significance of their natural and cultural resources.

2) **Open Space** - Layer updated in January 2014. The protected and recreational open space datalayer contains the boundaries of conservation lands and outdoor recreational facilities in Massachusetts.

3) **NHESP Certified Vernal Pools** - This datalayer contains points for all vernal pools that have been certified by the Natural Heritage and Endangered Species Program (NHESP) according to the Guidelines for the Certification of Vernal Pool Habitat pdf format of Vernal Pool Certification Guidelines (MA Division of Fisheries & Wildlife, 2009).

4) **NHESP Potential Vernal Pools** - Unverified vernal pool habitats. Not equivalent to Certified Vernal Pools.

5) **NHESP Priority Habitats of Rare Species** - The Priority Habitats of Rare Species datalayer contains polygons representing the geographic extent of Habitat of state-listed rare species in Massachusetts based on observations documented within the last 25 years in the database of the Natural Heritage & Endangered Species Program (NHESP). Priority Habitat polygons are the filing trigger for project proponents, municipalities, and all others for determining whether or not a proposed project or activity must be reviewed by the NHESP for compliance with the (MESA) and its implementing regulations. Areas delineated as Priority Habitats can include wetlands, uplands, and marine habitats—in fact, over half of the total acreage of Priority Habitat is mapped for marine habitats of state-listed rare species. The Priority Habitats presented here are those published in the 13th Edition of the Massachusetts Natural Heritage Atlas, and are effective beginning October 1, 2008. The PH number may be used to identify a Priority Habitat polygon when contacting the NHESP.

6) **NHESP Estimated Habitats of Rare Wildlife** - Estimated Habitats are for use with the Wetlands Protection Act regulations (310 CMR 10.00). The Estimated Habitats of Rare Wildlife datalayer contains polygons that are a subset of the Priority Habitats of Rare Species. They are based on occurrences of rare wetland wildlife observed within the last 25 years and documented in the NHESP database. The EH number may be used to identify an Estimated Habitat polygon when contacting the NHESP.

7) **NHESP Natural Communities** - The NHESP Natural Communities datalayer consists of polygons that represent the extent of various natural communities of biodiversity conservation interest in Massachusetts. There are several NHESP Natural Communities identified in the Town of Holden (Shrub Swamp ID 6966 and Black Gum Swap ID 11938), but they are outside the 1 mile buffer zone, located in the intersection of Salisbury Street and Route 122A. There's another NHESP Natural Community in Holden close to the boundary with West Boylston and princeton (Level Bog ID 11911), is not relateive to the study area.

8) **BioMap2 Core Habitat** - BioMap2 Core Habitat identifies specific areas necessary to promote the long-term persistence of Species of Conservation Concern (those listed under the Massachusetts Endangered Species Act as well as additional species identified in the State Wildlife Action Plan), exemplary natural communities, and intact ecosystems.
   a) ***Forest Core*** - Forest Core identifies the best examples of large, intact forests that are least impacted by roads and development, providing critical habitat for numerous woodland species.
   b) ***Species of Conservation Concern*** - This layer contains the combined BioMap2 footprint of all species listed under the Massachusetts Endangered Species Act in combination with all non-listed species present in the State Wildlife Action Plan that were mapped.
   c) ***Prioirty Natural Communities*** - The Priority Natural Communities data set is maintained by the Massachusetts Natural Heritage and Endangered Species Program (NHESP). The NHESP Natural Communities datalayer consists of polygons that represent the extent of various natural communities of biodiversity conservation interest in Massachusetts.
   d) ***BioMap2 Wetlands*** - BioMap2 Wetlands identifies important wetland habitat in Massachusetts. It is a combination of the Wetland Core analysis that identified the most intact wetlands in Massachusetts, the wetlands present within the Priority Natural Communities data layer, and several Oxbows identified as important wetland habitat
   e) ***Vernal Pool Core*** - The BioMap2 team used a GIS model developed by the University of Massachusetts Landscape Ecology Program to identify the top 5 percent most interconnected clusters of Potential Vernal Pools within each ecoregion. Each cluster of pools was then buffered to create vernal pool habitat areas to target for conservation that include the pools themselves and the surrounding habitat to allow for successful breeding, dispersal, overwintering, foraging, and migration.
   f) ***Aquatic Core*** - Aquatic core contains integrated and functional ecosystems for fish species and other aquatic Species of Conservation Concern.

9) **BioMap2 Critical Natural Landscape** - BioMap2 Critical Natural Landscape was created to identify and prioritize intact landscapes in Massachusetts that are better able to support ecological processes and disturbance regimes, and a wide array of species and habitats over long time frames.
   a) ***Landscape Blocks*** - Landscape Blocks, the primary component of Critical Natural Landscapes, are large areas of intact predominately natural vegetation, consisting of contiguous forests, wetlands, rivers, lakes, and ponds, as well as coastal habitats such as barrier beaches and salt marshes. Pastures and power-line rights-of-way, which are less intensively altered than most developed areas, were also included since they provide habitat and connectivity for many species.

b) ***Aquatic Buffer*** - The Aquatic Buffer identifies upland habitat adjacent to each Aquatic Core.
c) ***Wetland Buffer*** - The Wetland Buffer identifies upland habitat adjacent to each of the wetlands delineated in BM2_CH_BioMap2_wetlands.

10) **DEP Wetlands** - MAssDEP wetlands by type.

11) **FEMA Q3 Flood Zones** - These data represent a subset of the data available on the paper Flood Insurance Rate Maps (FIRM) as provided by the Federal Emergency Management Agency (FEMA). The Q3 flood data were developed to support floodplain management and planning activities but do not replace the official paper FIRMs. These data are not suitable for engineering applications or site work nor can the data be used to determine absolute delineation of flood boundaries. Instead the data should be used to portray zones of uncertainty and possible risks associated with flooding.
    a) ***Zone A*** - An area inundated by 100-year flooding, for which no BFEs have been determined.
    b) ***Zone AE*** - An area inundated by 100-year flooding, for which BFEs have been determined.
    c) ***Zone X500*** - An area that is determined to be outside the 100- and 500-year floodplains.

12) **MassDEP 2012 Integrated List of Waters (305(b)/303(d))** - The MassDEP Division of Watershed Management (DWM), Watershed Planning Program (WPP) 2012 Integrated List of Waters (305(b)/303(d)) data layer represents the combined reporting elements for the 2012 cycle of both sections 305(b) and 303(d) of the Federal Clean Water Act (CWA). The objective of this statute is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. As one step toward meeting this goal each state must administer a program to monitor and assess the quality of its surface waters and provide periodic status reports to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the public.

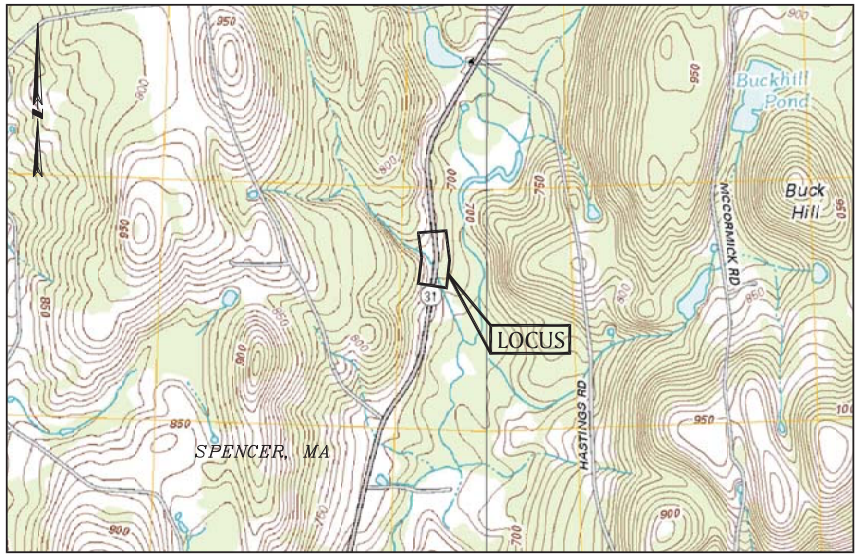
    Section 305(b) of the CWA codifies the process whereby waters are evaluated with respect to their capacity to support designated uses as defined in the Massachusetts Surface Water Quality Standards. These uses include aquatic life, fish consumption, drinking water, shellfish harvesting, primary (e.g., swimming) and secondary (e.g., boating) contact-recreation, and aesthetics. The 305(b) process entails assessing each of these uses, where applicable, for rivers, lakes and coastal waters. Where possible, causes and sources of use impairment are also identified. Once a water body is identified as impaired by a pollutant, MassDEP is required under Section 303(d) of the CWA, and the implementing regulations at 40 CFR 130.7, to develop a pollutant budget designed to restore the health of the impaired water body. The process of developing this pollutant budget, generally referred to as a Total Maximum Daily Load (TMDL), includes identifying the cause (type of pollutant) and source (where the pollutant comes from), determining how much of the pollutant is from direct discharges (point sources) or indirect discharges (non-point sources), determining the maximum amount of the pollutant that can be discharged to a specific water body to meet water quality standards, and developing a plan to meet that goal. In short a TMDL is a clean-up plan that is required under the CWA to restore water quality and enable waters to attain designated uses.
    a) ***Category 1)*** Unimpaired and not threatened for all designated uses;
    b) ***Category 2)*** Unimpaired for some uses and not assessed for others;
    c) ***Category 3)*** Insufficient information to make assessments for any uses;
    d) ***Category 4)*** Impaired for one or more uses, but not requiring the calculation of a Total Maximum Daily Load (TMDL); (impairment due to "pollution" such as low flow, habitat alterations or non-native species infestations).

e) Category 5) Impaired for one or more uses and requiring a TMDL (impairment due to pollutant(s) such as nutrients, metals, pesticides, solids and pathogens).

DRAINAGE IMPROVEMENTS

NORTH SPENCER ROAD
SPENCER, MASSACHUSETTS

FEBRUARY **, 2013



LOCUS MAP

400 0 800 1600 2400 feet

SCALE: 1" = 800±

INDEX OF DRAWINGS

G-100	TITLE SHEET
V-100 - V-101	EXISTING CONDITIONS PLANS
C-100	GENERAL NOTES & LEGEND
C-101	SITE PLAN
C-200	DETAILS

PREPARED FOR:

TOWN OF SPENCER
UTILITIES AND FACILITIES OFFICE
3 OLD MEADOW ROAD
SPENCER, MA 01562

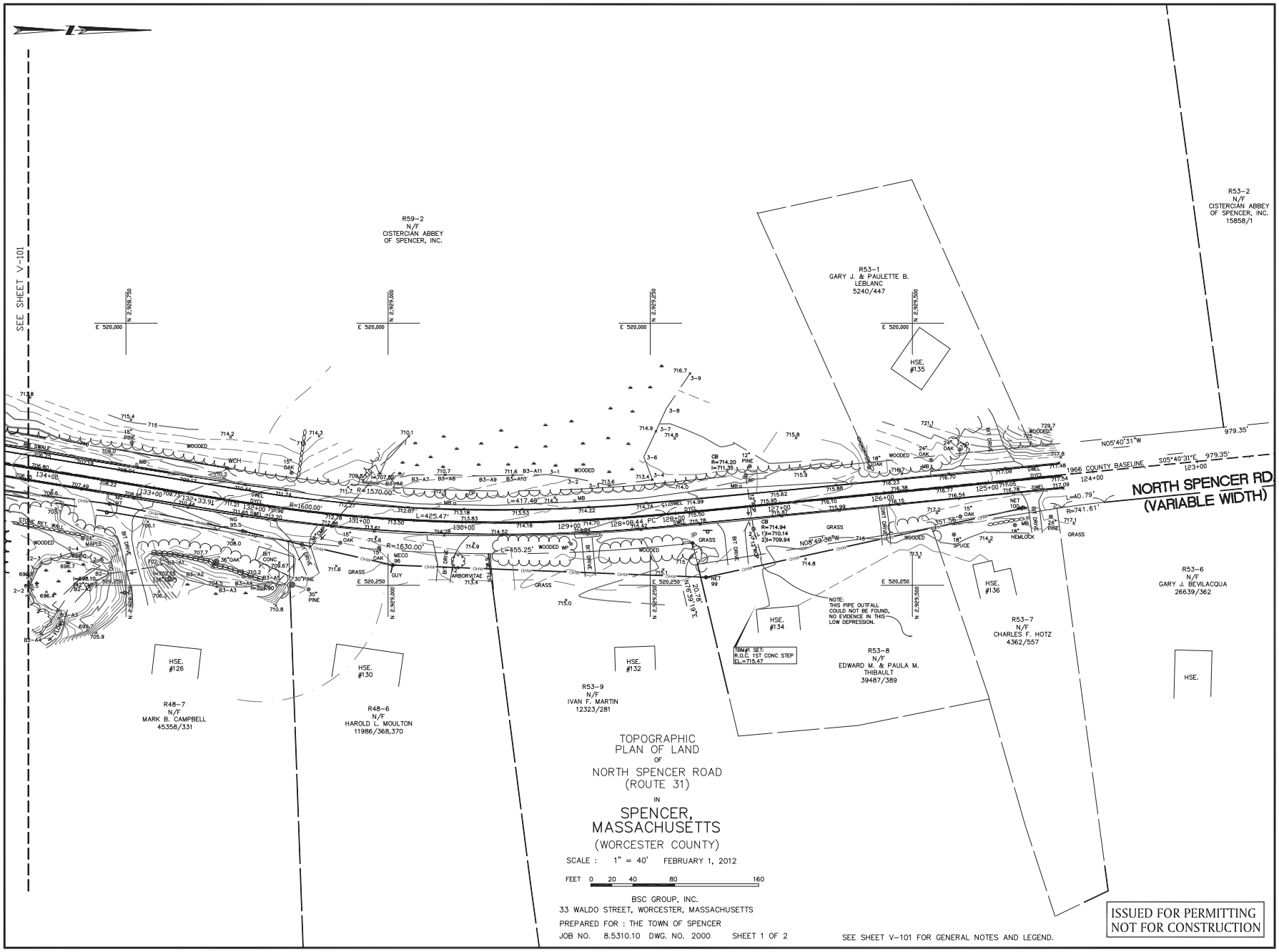
DRAFT

ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION

PREPARED BY:

BSC GROUP
15 Elkins Street
Boston, Massachusetts
02127
617 896 4300

JOB NO: 85310.13 SHEET G-100



TOPOGRAPHIC
PLAN OF LAND
OF
NORTH SPENCER ROAD
(ROUTE 31)
IN
SPENCER,
MASSACHUSETTS
(WORCESTER COUNTY)

SCALE : 1" = 40' FEBRUARY 1, 2012

FEET 0 20 40 80 160

BSC GROUP, INC.
33 WALDO STREET, WORCESTER, MASSACHUSETTS
PREPARED FOR : THE TOWN OF SPENCER
JOB NO. 8.5310.10 DWG. NO. 2000 SHEET 1 OF 2

SEE SHEET V-101 FOR GENERAL NOTES AND LEGEND.

ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION

DRAFT

PROFESSIONAL LAND SURVEYOR DATE

DRAINAGE
IMPROVEMENTS

NORTH SPENCER ROAD
IN
SPENCER
MASSACHUSETTS
(WORCESTER COUNTY)

EXISTING
CONDITIONS PLAN

FEBRUARY ??, 2013

REVISIONS:

NO.	DATE	DESC.

PREPARED FOR:
TOWN OF SPENCER
UTILITIES AND FACILITIES OFFICE
3 OLD MEADOW ROAD
SPENCER, MA 01562

BSC GROUP
15 Elkins Street
Boston, Massachusetts
02127
617 896 4300

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SCALE: AS NOTED

FILE: \Civil_Drawings\8531013-EC
DWG. NO:
JOB. NO: 8-5310.13 SHEET V-100

GENERAL NOTES:

1.) THIS PLAN WAS PREPARED FROM AN ACTUAL ON-THE-GROUND SURVEY PERFORMED BY BSC GROUP, INC. BETWEEN JANUARY 3, 2012 AND JANUARY 10, 2012. COORDINATES ARE BASED ON NAD 83 AND ARE A RESULT OF GPS OBERVATIONS USING TRIMBLE GPS EQUIPMENT.

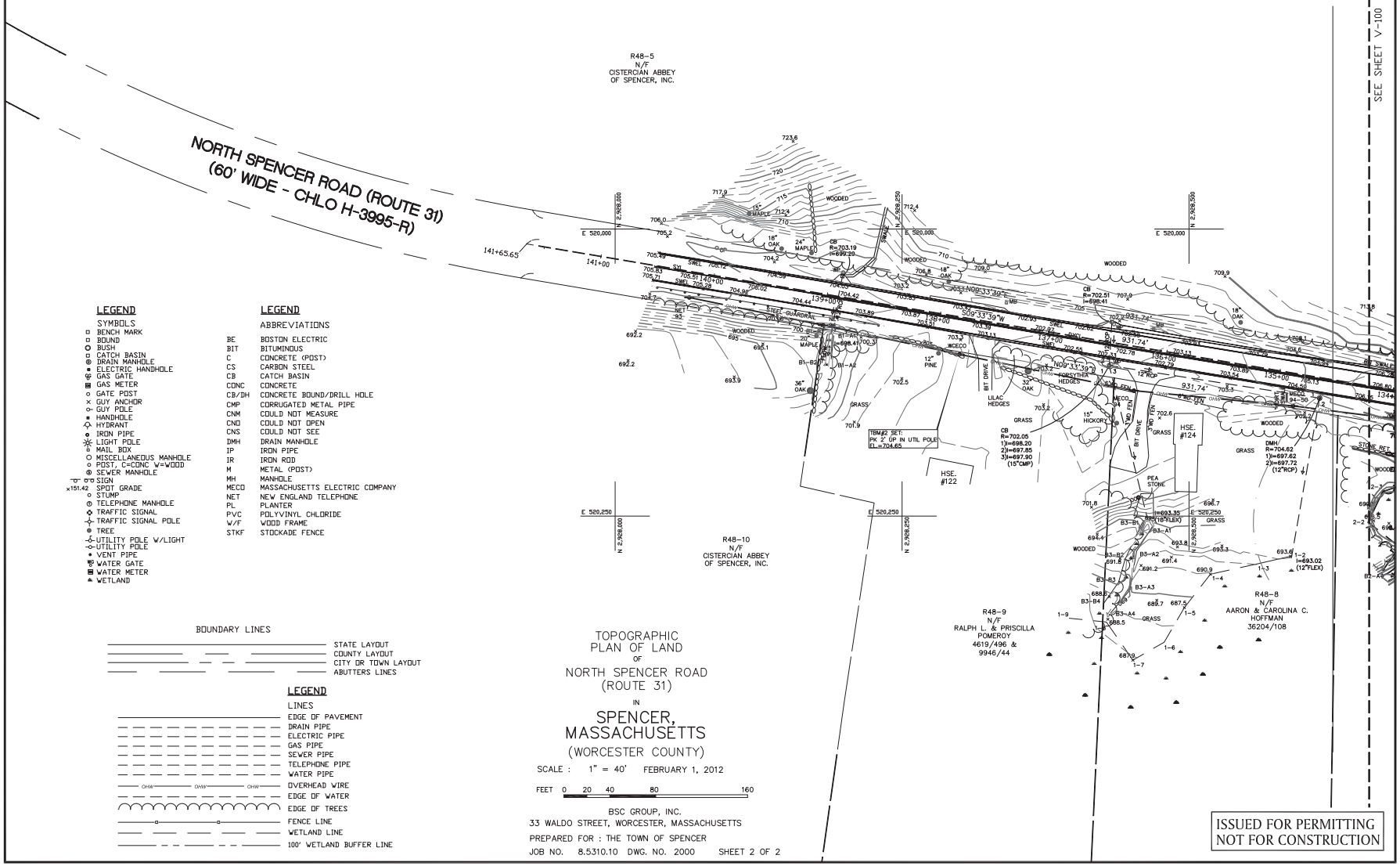
2.) THE PROPERTY LINES SHOWN HEREON ARE BASED ON PLANS AND DEEDS RECORDED AT THE WORCESTER DISTRICT REGISTRY OF DEEDS. PRIVATE PROPERTY OWNERSHIPS ARE BASED ON ASSESSOR'S MAPS ONLY. SEE PLAN FOR DEED REFERENCES.

3.) NORTH SPENCER ROAD LAYOUT IS BASED ON PLANS RECORDED AT WORCESTER DISTRICT REGISTRY OF DEEDS. THE LINES SHOWN HEREON ARE THE RESULT OF A COMPILATION OF THE RESULTS OF THE FIELD SURVEY AND THE MONUMENTS LOCATED, AND THE RECORDED DEEDS, LAYOUTS AND PROPERTY PLANS THROUGHOUT THE PROJECT.

4.) ELEVATIONS SHOWN HEREON ARE BASED NAVD 88 AS A RESULT OF GPS OBSERVATIONS REFERRED TO IN GENERAL NOTE 1.

TBM'S SET: SEE PLAN

5.) ALL UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE ONLY. SEE CHAPTER 370 ACTS OF 1963, MASSACHUSETTS GENERAL LAWS. BSC GROUP, INC. ASSUMES NO RESPONSIBILITY FOR DAMAGES INCURRED AS A RESULT OF UTILITIES OMITTED OR INACCURATELY SHOWN. BEFORE PLANNING FUTURE CONNECTIONS, THE APPROPRIATE PUBLIC UTILITY ENGINEERING DEPARTMENT MUST BE CONSULTED. NOT ALL UTILITIES ARE SHOWN.



LEGEND

SYMBOLS

- BENCH MARK
- BOUND
- BUSH
- CATCH BASIN
- DRAIN MANHOLE
- ELECTRIC HANDHOLE
- GAS GATE
- GAS METER
- GATE POST
- GUY ANCHOR
- GUY POLE
- HANDHOLE
- HYDRANT
- IRON PIPE
- LIGHT POLE
- MAIL BOX
- MISCELLANEOUS MANHOLE
- POST, C=CONC W=WOOD
- SEWER MANHOLE
- SIGN
- x151.42 SPOT GRADE
- STUMP
- TELEPHONE MANHOLE
- TRAFFIC SIGNAL
- TRAFFIC SIGNAL POLE
- TREE
- UTILITY POLE W/LIGHT
- UTILITY POLE
- VENT PIPE
- WATER GATE
- WATER METER
- WETLAND

LEGEND

ABBREVIATIONS

BE	BOSTON ELECTRIC
BIT	BITUMINOUS
C	CONCRETE (POST)
CS	CARBON STEEL
CB	CATCH BASIN
CONC	CONCRETE
CB/DH	CONCRETE BOUND/DRILL HOLE
CMP	CORRUGATED METAL PIPE
CNM	COULD NOT MEASURE
CNO	COULD NOT OPEN
CNS	COULD NOT SEE
DMH	DRAIN MANHOLE
IP	IRON PIPE
IR	IRON ROD
M	METAL (POST)
MH	MANHOLE
MECO	MASSACHUSETTS ELECTRIC COMPANY
NET	NEW ENGLAND TELEPHONE
PL	PLANTER
PVC	POLYVINYL CHLORIDE
W/F	WOOD FRAME
STKF	STOCKADE FENCE

BOUNDARY LINES

- STATE LAYOUT
- COUNTY LAYOUT
- CITY OR TOWN LAYOUT
- ABUTTERS LINES

LEGEND

LINES

- EDGE OF PAVEMENT
- DRAIN PIPE
- ELECTRIC PIPE
- GAS PIPE
- SEWER PIPE
- TELEPHONE PIPE
- WATER PIPE
- OHW — OVERHEAD WIRE
- EDGE OF WATER
- EDGE OF TREES
- FENCE LINE
- WETLAND LINE
- 100' WETLAND BUFFER LINE

TOPOGRAPHIC PLAN OF LAND OF NORTH SPENCER ROAD (ROUTE 31) IN SPENCER, MASSACHUSETTS (WORCESTER COUNTY)

SCALE : 1" = 40' FEBRUARY 1, 2012

FEET 0 20 40 80 160

BSC GROUP, INC.
33 WALDO STREET, WORCESTER, MASSACHUSETTS
PREPARED FOR : THE TOWN OF SPENCER
JOB NO. 8.5310.10 DWG. NO. 2000 SHEET 2 OF 2

ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION

DRAFT

PROFESSIONAL LAND SURVEYOR DATE

DRAINAGE IMPROVEMENTS

NORTH SPENCER ROAD
IN
SPENCER
MASSACHUSETTS
(WORCESTER COUNTY)

EXISTING CONDITIONS PLAN

FEBRUARY ??, 2013

REVISIONS:

NO.	DATE	DESC.

PREPARED FOR:
TOWN OF SPENCER
UTILITIES AND FACILITIES OFFICE
3 OLD MEADOW ROAD
SPENCER, MA 01562

BSC GROUP
15 Elkins Street
Boston, Massachusetts
02127
617 896 4300

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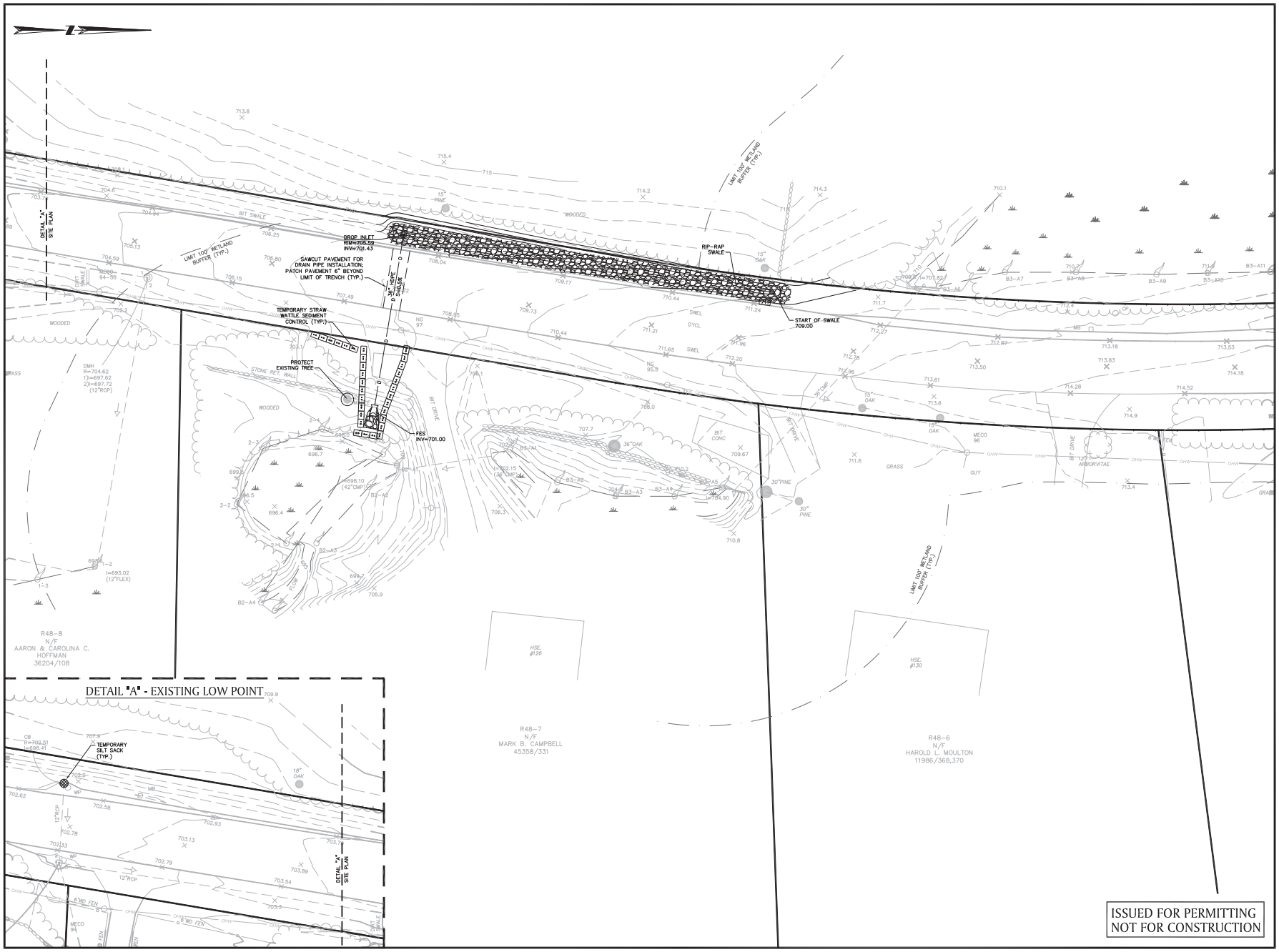
SCALE: AS NOTED

FILE: \Civil_Drawings\8531013-EC
DWG. NO:
JOB. NO: 8-5310.13 SHEET V-101



DRAFT

PROFESSIONAL ENGINEER DATE

DRAINAGE IMPROVEMENTS

NORTH SPENCER ROAD

IN

SPENCER
MASSACHUSETTS
(WORCESTER COUNTY)

SITE PLAN

FEBRUARY ??, 2013

REVISIONS:

NO.	DATE	DESC.

PREPARED FOR:
TOWN OF SPENCER
UTILITIES AND FACILITIES OFFICE
3 OLD MEADOW ROAD
SPENCER, MA 01562

BSC GROUP
15 Elkins Street
Boston, Massachusetts
02127
617 896 4300

© 2013 BSC Group, Inc.

SCALE: 1" = 20'
0 10 20 40 FEET

FILE: \Civil_Drawings\8531013-SP
DWG. NO:
JOB. NO: 8-5310.13
SHEET C-101

MASSACHUSETTS

stream crossings

CONTACTS & RESOURCES

GRANT OPPORTUNITIES AND TECHNICAL ASSISTANCE

Grant funding may be available to help defray the costs of new stream crossings that are friendlier to fish and wildlife. Check the websites below for availability, deadlines, and details about the application process.

River Restoration Priority Projects
Massachusetts Division of Ecological Restoration (DER) evaluates and undertakes stream restoration projects by partnering with local and regional organizations. Priority Projects receive technical, engineering and, when available, funding assistance.

http://www.mass.gov/eea/agencies/dfg/der/

Massachusetts Environmental Trust
The General Grants Program supports nonprofit organizations and municipalities in efforts to restore, protect, and improve water and water-related resources of the Commonwealth.

http://www.mass.gov/eea/met

Trout Unlimited Embrace-A-Stream Program
Grants up to $10,000 are available to support local Trout Unlimited chapters in conserving, protecting, and restoring cold water fisheries and their watersheds.

http://www.tu.org/conservation/watershed-restoration-home-rivers-initiative/embrace-a-stream

Orvis/TU 1,000 Mile Campaign
The Orvis/TU 1,000 Miles Campaign is dedicated to removing and improving culverts across the country. Orvis is matching customer donations to make grant funds available.

http://www.orvis.com/intro.aspx?subject=9848

U.S. Fish & Wildlife National Fish Passage Program – The U.S. Fish and Wildlife Service's National Fish Passage Program is a voluntary, non-regulatory program that provides funding and technical assistance toward removing or bypassing barriers to fish movement.

http://www.fws.gov/northeast/fisheries/help/nfpp.html

National Fish & Wildlife Foundation's (NFWF) Bring Back the Natives (BBN)
The NFWF, in cooperation with the U.S. Fish and Wildlife Service (FWS) and Trout Unlimited (TU), annually requests proposals from local, state, and federal agencies interested in restoring, protecting, and enhancing native populations of sensitive or listed aquatic species.

www.nfwf.org/bbn/

U.S. Department of Agriculture – Natural Resources Conservation Service – The Wildlife Habitat Incentives Program (WHIP) provides technical and financial assistance to landowners for developing, managing or improving wildlife habitat or for restoring natural ecosystems.

http://www.ma.nrcs.usda.gov/programs/whip/index.html

Eastern Brook Trout Joint Venture
The Eastern Brook Trout Joint Venture is an element of the National Fish Habitat Initiative, and is composed of a diverse group of partners, including state fish and wildlife agencies, federal resource agencies, academic institutions and private sector conservation organizations working to conserve Eastern brook trout and their habitats. The EBTJV funds a variety of habitat enhancement projects, such as culvert replacements, that benefit brook trout.

http://www.easternbrooktrout.net/

ONLINE RESOURCES

You can find additional information and resources at the websites listed below.

UMass Extension Stream Continuity Project – Information on stream crossing surveys and identifying problem crossings in Massachusetts.

www.streamcontinuity.org
www.streamcontinuity.org/cdb2 (New England Stream Crossing Inventory Database)

Massachusetts Department of Transportation (MassDOT) – *Design of Bridges and Culverts for Wildlife Passage at Freshwater Streams* (2010) – a manual to help design better stream crossings.

http://www.mhd.state.ma.us/downloads/projDev/Design_Bridges_Culverts_Wildlife_Passage_122710.pdf

Ebb & Flow
DER's Electronic Newsletter

Division of Ecological Restoration's (DER) *Ebb & Flow E-Newsletter* – A quarterly electronic newsletter published by DER containing an extensive number of Grant & Fundraising Opportunities, On-Line Resources and Publications. To receive electronic copies of *Ebb &* Flow, e-mail Russ.Cohen@state.ma.us.

Linking Landscapes – A collaboration between MassDOT, Massachusetts Natural Heritage Endangered Species Program, and University of Massachusetts to minimize the impact of the existing road network on rare and nongame wildlife, while improving highway safety, through cost-effective research, planning, and implementation of partnerships with citizens and communities of the Commonwealth of Massachusetts.

http://www.linkinglandscapes.info

Critical Linkages – *Assessing Connectivity Restoration Potential for Culvert Replacement, Dam Removal and Construction of Wildlife Passage Structures in Massachusetts* – The University of Massachusetts Amherst is working in partnership with The Nature Conservancy and state agencies to complete a comprehensive analysis of areas in Massachusetts where connections must be protected and restored to support the Commonwealth's wildlife and biodiversity resources. The Critical Linkages project is developing spatially explicit tools, including models, maps and scenario-testing software, for use in mitigating the impacts of roads and railroads on the environment.

http://www.umasscaps.org/applications/critical-linkages.html

Critical Linkages Phase 1 Summary Report:

http://www.umasscaps.org/pdf/Critical-Linkages-Phase-1-Report-Final.pdf

ADDITIONAL CONTACTS

Many agencies and organizations are involved in repairing and enhancing Massachusetts' stream crossings. Please contact the individuals below for more information.

Carrie Banks, River Continuity Coordinator
Massachusetts Division of Ecological Restoration
Department of Fish & Game
577 Western Ave, Wilson Hall
Room 209
Westfield, MA 01086
Phone: 413-579-3015
carrie.banks@state.ma.us

Department of Fish and Game
Division of Ecological Restoration

Alison Bowden, *Director of Freshwaters Programs*
The Nature Conservancy
99 Bedford St., 5th Floor
Boston, Massachusetts, 02111
Phone: (617) 532-8300;
abowden@TNC.ORG

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Timothy Dexter, Environmental Analyst
Massachusetts Department of Transportation
MassDOT, Highway Division
10 Park Plaza, Room 4260
Boston, MA 02116
Phone: 857-368-8794

Questions regarding Chapter 85 Bridge Reviews should be directed to the MassDOT District Offices:
http://www.mhd.state.ma.us/dist/dist.asp

The following workshop organizers maintain a network of local, regional and state resources which may be available for stream crossing replacements.

Massachusetts Rivers Alliance
American Rivers – Rivers Connect Us
MAPC Metropolitan Area Planning Council – 50 Years – Smart Growth and Regional Collaboration
UMassAmherst
SRPEDD
the Sudbury Assabet & Concord Wild & Scenic River Stewardship Council
Wild & Scenic Taunton River Stewardship Council
Ipswich River Watershed Association – The Voice of the River
OARS

Town of Paxton
Additional Route 31 Major Drainage Structures Photos

Culvert #P2 northbound side

Culvert #P3 northbound side

Culvert #P4 southbound side

Culvert #P5 northbound side

Culvert #P6 northbound side

Town of Spencer
Additional Route 31 Major Drainage Structures Photos

Culvert #S1 northbound side

Culvert #S1 southbound side

Culvert #S2 northbound side

Culvert #S2 southbound side

Bridge #S4 southbound side

Culvert #S5 northbound side

Town of Spencer
Additional Route 31 Major Drainage Structures Photos

Culvert #S5 southbound side

Culvert #S6 northbound side

Culvert #S7 southbound side

Bridge #S8 northbound side

Culvert #S9 northbound side

Culvert #S9 southbound side

Town of Spencer
Additional Route 31 Major Drainage Structures Photos

Culvert #S10 northbound side

Culvert #S10 southbound side

Culvert #S11 southbound side

Pavement Information

- Fay, Spofford, & Thorndike (FST) FY 2013 Pavement Management Summary Information for the Town of Spencer

ENGINEERS
FST
Since 1914

FAY, SPOFFORD & THORNDIKE
5 Burlington Woods
Burlington, MA 01803
Toll Free: 800.835.8666
T: 781.221.1000
F: 781.229.1115
www.fstinc.com

January 24, 2013

Steven J. Tyler, P.E.
Superintendent
3 Old Meadow Rd.
Spencer, MA 01562

Subject: **2013 State of Street Conditions Report**

Dear Mr. Tyler,

Enclosed please find our FY 2013 Pavement Management Summary. This memorandum is intended to summarize FST's most recent Pavement Management System (PMS) update. Below are some important notes worth noting for your use.

1. Since Spencer's Pavement Management System was implemented, FST has been monitoring its PMS and tracking several important performance metrics.

2. The average PCI in Spencer is 49.7, which decreased from the FY 2011 value of 52.5. The current Town-wide backlog is approximately $22.2 million dollars, which is $4.8 million more than FY 2011's backlog.

3. Funding analyses indicate that an aggressive approach the next five years needs to be implemented to resolve today's diminished PCI and costly backlog. We have provided three different budget scenarios projected over the next five years for your review.

    1. $14.5 Million over 5 years (Aggressive) –PCI increases to 72 and backlog declines to $14.3M in 2018
    2. $12.5 Million over 5 Years (Progressive) –PCI increases to 65 and backlog declines to $18.0M in 2018
    3. $10.5 Million over 5 Years (Maintain Backlog) –PCI increases to 60 and backlog declines to $20.9M in 2018

4. It is vital to do survey updates on a yearly basis to assess progress made by the town, and to maintain accurate backlog values and projections.

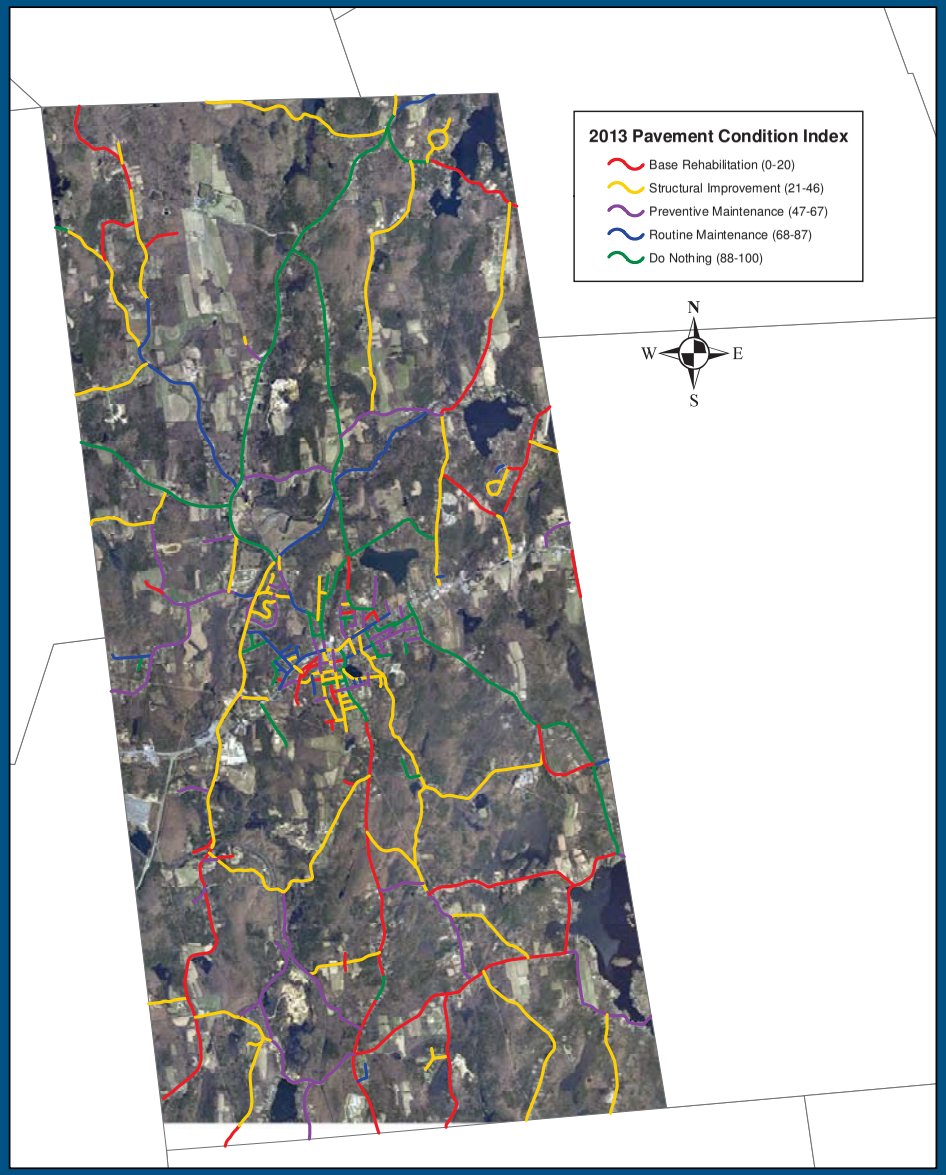
5. We recommend the Town, at a minimum, to adapt the 'Aggressive' approach starting FY 2013. As detailed in the report, it is vital for the Town to front-load the budget by spending $3.5 Million the first year in order to stabilize the rapidly decaying network.

6. There have been excessive trends which have been occurring in both 'Structural Improvement' and 'Base Rehabilitation' treatment bands in previous years. Not only do these trends decrease the network condition, they vastly increase the backlog since so much mileage is being transferred to more expensive treatments. The 'Aggressive' approach halts these trends which stabilizes the network and allows for future improvement.

If you have any questions or comments pertaining to this report, please don't hesitate to contact me, at (781) 221-1165 or by email at wscarpati@fstinc.com.

Very truly yours,
FAY, SPOFFORD & THORNDIKE, LLC

William P. Scarpati
Senior Asset Management Specialist



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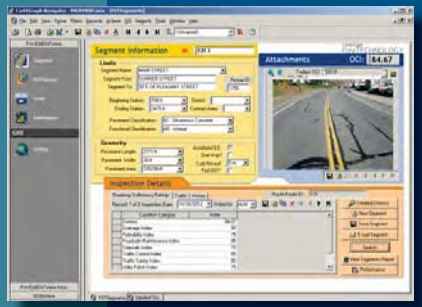
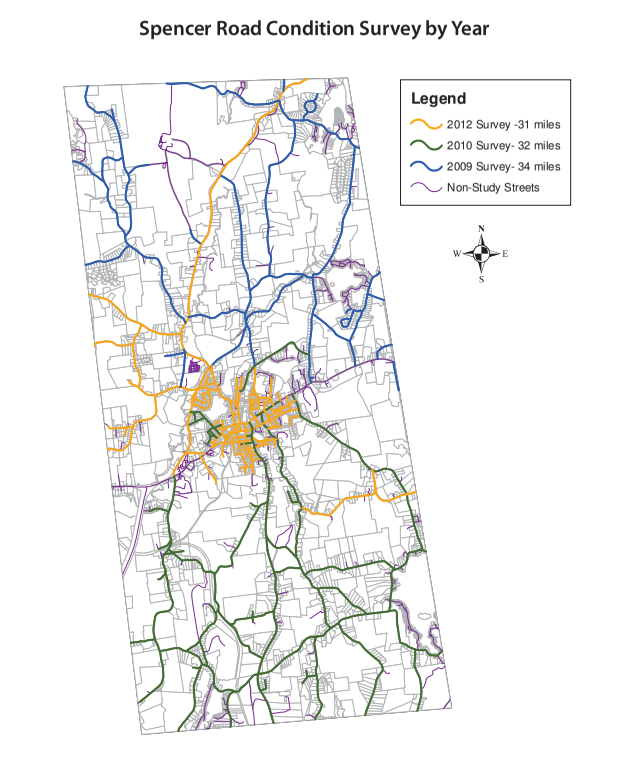
FY 2013

Pavement Management Summary





Prepared For:

Town of Spencer
Office of Utilities and Facilities

Steven J. Tyler, P.E.
Superintendent

Prepared By:

ENGINEERS
FST
Since 1914

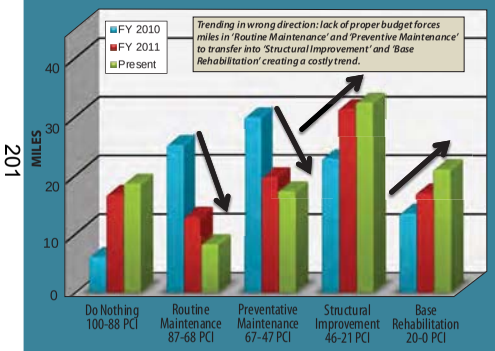
FAY, SPOFFORD & THORNDIKE
Engineers – Planners – Scientists
5 Burlington Woods
Burlington, MA 01803

January 2013

EXISTING CONDITIONS

Spencer's roadway network is comprised of 5.3 state highway miles, 8.5 private road miles, and 97.0 public miles. Since 2009 Fay, Spofford & Thorndike (FST) has worked with the Town implementing and updating its Pavement Management System. In December of 2012, FST completed a 33% re-survey of the Town's public roadway network, determined today's average road network Pavement Condition Index (PCI), roadway repair backlog, and investigated two new future funding scenarios. FST identified 218 pavement segments and determined the Town's average road network PCI in January 2013 was a 49.7, placing Spencer's typical road conditions in the bottom of the Preventive Maintenance treatment band (PCI range from 47 to 67), as seen to the right. This PCI average value represents a roadway in "fair" condition which is rapidly approaching "poor" condition.

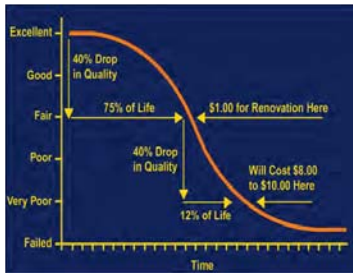
PCI Distribution in Miles By Treatment Band For Previous 3 Years Monitored



Current Backlog of Outstanding Repairs ($22,199,481)

The backlog is defined as the cost of repairing all the roads within one year and bringing the average PCI to a near perfect 100. Backlog is a "snapshot" or relative measure of outstanding repair work. The backlog not only represents how far behind the Spencer roadway network is in terms of its present physical condition, but also its cost value serves as a benchmark to measure the impact of various funding scenarios. The current backlog offers a basis for comparison to future and/or past year's backlog(s). Backlog dollars represent the pavement structure only; it does not include related repair cost for drainage, sidewalk, curbing, signals, or signs. Spencer's backlog as of January 2013 is $22,199,481. The figure to the right summarizes the backlog repair costs by PCI treatment bands for the last three surveyed years, showing an overwhelming trend increase in the capital construction category.

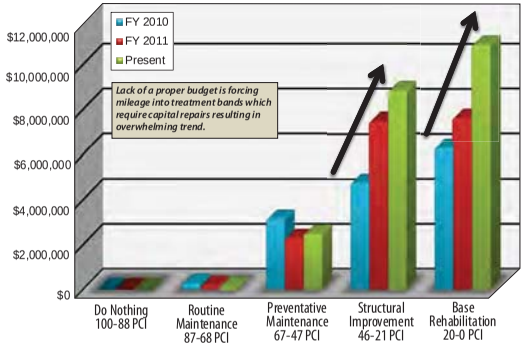
Pavement Deterioration Curve



(PCI) Treatment Band Ranges[1]

DO NOTHING PCI Band #1(100 – 88 PCI)	Excellent Condition - in need of no immediate maintenance.
ROUTINE MAINTENANCE PCI Band #2 (87 - 68 PCI)	Good Condition - may be in need of crack sealing or minor localized repair.
PREVENTIVE MAINTENANCE PCI Band #3 (67 - 47 PCI)	Fair Condition - pavement surface in need of surface sealing or thin overlay.
STRUCTURAL IMPROVEMENT PCI Band #4 (46 - 21 PCI)	Poor Condition - pavement structure in need of additional thickness to resist traffic loading.
BASE REHABILITATION PCI Band #5 (20 - 0 PCI)	Failed Condition - in need of full depth reconstruction/reclamation.

[1]The PCI ranges given in this table are general averages. The actual treatment band threshold numbers depend on pavement surface type and functional classification.



BUDGET ANALYSIS

The analysis software of the PMS is where financial determinations and projections are made. Consideration is given to the required budget, by repair type, based on the supplied information from meetings with the Town and FST, for overall desired roadway network conditions. Various scenarios were analyzed to measure the effects of alternative funding levels and to determine the funding needed to avoid deteriorating pavement conditions. Today's backlog cost and future funding scenarios are based on Spencer's current unit bid prices for roadway construction and projected liquid asphalt prices.

Using the Town's pavement management software, FST modeled three, five-year future funding scenarios:

Each scenario, as depicted in the line charts below, results in a projected average network PCI and backlog. All scenarios incorporate a 3.5% annual inflation rate. Therefore, where the annual road appropriation appears to remain level, it in fact represents a net budget decrease due to impact of inflation. Since Spencer's overall PCI is so low, it is **necessary** to spend at least $2,500,000 the first year to stabilize the network condition and make it possible to improve in future years.

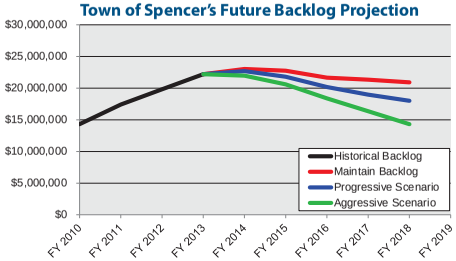
Required Budget	Maintain Backlog	Progressive Approach	Aggressive Approach
FY 2013	$2,500,000	$3,000,000	$3,500,000
FY 2014	$2,000,000	$2,500,000	$3,000,000
FY 2015	$2,000,000	$2,500,000	$3,000,000
FY 2016	$2,000,000	$2,250,000	$2,500,000
FY 2017	$2,000,000	$2,250,000	$2,500,000
5 Year Total	**$10,500,000**	**$12,500,000**	**$14,500,000**

The five-year Maintain Backlog scenario, as seen by the red line, shows the backlog slightly decreasing to $20,919,074 while the network average PCI increases to 59.8, in FY 2017. This scenario is controlled by allocating funds for the sole purpose of retaining the current backlog.

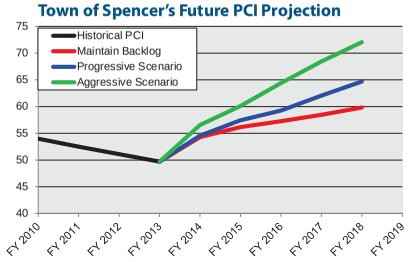
FST also investigated a five-year Progressive scenario, as depicted by the blue line. Here the backlog falls to $17,987,631 while the network average PCI increases to 64.7 in FY 2017. This funding scenario is labeled a progressive approach because it stabilizes the network faster which allows for more improvement to be made.

Lastly, a five-year Aggressive scenario was evaluated. As shown by the green line, the backlog decreases to $14,314,432 and the network average PCI increases to 72.0 in FY 2017. While this scenario does require spending $14,500,000 over five years, it brings the backlog down to a reasonable level and the network PCI from the current "fair" condition to "good" condition.

Town of Spencer's Future Backlog Projection



Town of Spencer's Future PCI Projection

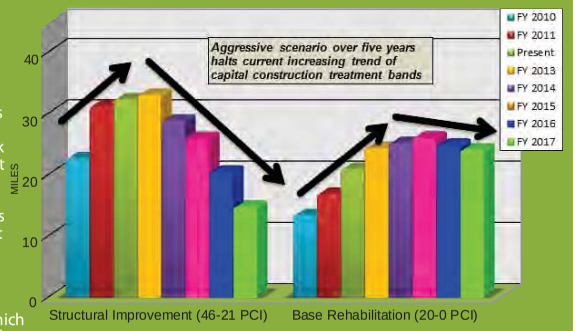


CONCLUDING REMARKS

Pavement management recognizes that roads deteriorate in an accelerated fashion after the first 75% of their service life, and consequently programs timely road expenditures to avert far more costly and widespread repairs through a balanced road maintenance plan.

Since FST began monitoring Spencer's pavement conditions in 2009, the network PCI has decreased while the backlog has increased, as depicted by the black lines above. The lack of funding is leaving too many streets untreated and has put the town in a tough situation.

The funding analyses herein illustrate existing funding levels need to be increased in order to sustain expected pavement deterioration. A big concern for the town is the increasing trend occuring in the Base Rehabilitation treatment band. When FST first began monitoring Spencer's network, a little less than 14% of the network was in this treatment band. Today, almost 22% of the network sits in this band which accounts for nearly half of the Town backlog. It is essential that the Town put in the proper funding now to stop this trend before it is too late. The figure on the right shows the mileage associated to the 'Base Rehabilitation' and 'Structural Improvement' treatment bands for the three years monitored, as well as the next five years under the "Aggressive" approach. It can be seen that this strategy aggressively reverses the trend in the 'Structural Improvement' treatment band and prevents additional mileage to be added to the 'Base Rehabilitation' treatment band.



It is recommended that at a minimum, the Town should strive to follow the "Aggressive" funding approach to stabilize the network rapidly and reverse costly trends in the Structural Improvement and Base Rehabilitation bands.

Segments FST Analysis Recommendations by Plan Year

Filter	*(..\..\Model ID = "5")*
Working Set Filter	*<Not Applicable>*
Sort	*Segment ID\Description, Segment ID*
Group By	*Plan Year*

Segments FST Analysis Recommendations by Plan Year

Scenario TEST **Description**

Protocol FST Roadway

Budget Unlimited

Time Frame 1

Attached latest Pavement Management conditions index for Route 31 corridor & Meadow Rd. in Spencer.

202

Segments FST Analysis Recommendations by Plan Year

Scenario TEST **Description**

Protocol FST Roadway

Budget Unlimited

Time Frame 1

Plan Year *1*

Street	From	To	Length	Plan Activity	Plan Cost	PCI	NPR
MEADOW ROAD	WEST MAIN STREET	PLEASANT STREET	8210 ft	BC - 3" Overlay Art/Col	$692,194	33.6	72.7
NORTH SPENCER ROAD	PLEASANT STREET	BARCLAY ROAD	22698 ft	BC - Crack Seal or Patch	$41,689	88.2	55.9
NORTH SPENCER ROAD	BARCLAY ROAD	PAXTON TOWN LINE	2090 ft	BC - Crack Seal and Patch	$8,231	69.6	61.7
PLEASANT STREET	MAIN STREET	400' N OF MAIN STREET	410 ft	BC - Shim, Crack Seal & Patch	$11,917	64.2	64.1
PLEASANT STREET	400' N OF MAIN STREET	100' N OF HIGH STREET	1587 ft	Do Nothing	$0	99.7	53.2
PLEASANT STREET	100' N OF HIGH STREET	200' N OF SMITHVILLE ROAD	1247 ft	BC - Crack Seal or Patch	$2,049	80.2	59.2
PLEASANT STREET	200' N OF SMITHVILLE ROAD	MEADOW ROAD	1494 ft	BC - 1-1/4" Overlay	$67,065	51.5	68.0

Plan cost for Plan Year 1 **$823,145**

Segment Count 7

$823,145

Segment Information

ID: 171

CartéGraph flexTECHNOLOGY

Limits

Segment Name: PLEASANT STREET
Segment From: MAIN STREET
Segment To: 400' N OF MAIN STREET
Beginning Station: 0 ft
Ending Station: 410 ft
Pavement Classification: BC - Bituminous Concrete
Functional Classification: CO - Collector
Zone: 2 - Commercial

Geometry

Pavement Length: 410 ft
Pavement Width: 30 ft
Pavement Area: 12300 ft²
One Way? ☐
Curb Reveal: 2.5 in
BC - Bit. Conc.

Attachments

Today's OCI: 64.28

<Project Home>\attachments\Segme ...

Inspection Details

Roadway Sufficiency Ratings | Traffic | History

Record: 1 of 2 Inspection Date: 10/23/2012

Condition Category	Index
Distress	69.36
Drainage Index	75
Rideability Index	65
Roadside Maintenance Index	85
Sidewalk Index	60
Traffic Control Index	90
Traffic Safety Index	85
Utility Patch Index	65

Detailed Distress
New Segment
Save Segment
E-mail Segment
Search
View Segments Report
Performance

FYI

This segment will be part of Main St project.

Route 31 Data Collection

- Data Collection Locations
- MassDOT Traffic Counts
- Town of Holden
- Town of Paxton
- Town of Spener

Route 31 Corridor Profile:
Planned Traffic Volume Data Collection Effort

Town of Holden

ATRs: Manning Street at West Boylston Town Line, Complete - 5/2/13
Route 31 north of Route 122A, Complete - 5/2/13
Route 31 south of Route 122A, Complete – 5/2/13
Route 31 north of Reservoir Street, Complete – 5/7/13
Route 31 at Paxton Town Line, Complete – 5/7/13

TMCs: Route 31/Manning Street, Complete – 5/9/13
Route 31/Route 122A, Complete – 5/16/13
Route 31/Holden Commons Shopping Center, Complete – 6/6/13
Route 31/Reservoir Street/Mixter Road, Complete – 5/23/13

Town of Paxton

ATRs: Grove Street between Holden Road & Maple Street, Complete – 5/7/13
Route 31 east of Route 56, Complete – 5/7/13
Route 31 west of Route 122, Complete – 5/7/13
Route 31 at Spencer Town Line, Complete – 5/21/13

TMCs: Route 31 (Holden Road)/Grove Street, Complete – 5/29/13
Route 31 (Maple Street)/Grove Street, Complete – 5/29/13
Route 31/Route 56, **2012**
Route 31/Route 122, **2012**
Route 31/Suomi Street, Complete – 6/13/13

Town of Spencer

ATRs: Route 31 south of Hastings Road, Complete 6/6/13
Route 31 north of Wire Village Road, Complete – 5/21/13
Route 31 north of Route 9, Complete – 5/23/13
Meadow Road south of Route 31, Complete – 5/23/13
West Main Street north of Route 9, Complete – 5/23/13

TMCs: Route 31/Barclay Road, Complete – 6/6/13
Route 31/Browning Pond Road/Thompson Pond Road, Complete – 6/13/13
Route 31/North Brookfield Road, **2011**
Route 31/Meadow Road/Wire Village Road, **2011**
Route 9/Meadow Road/South Spencer Road, Complete – 8/1/13

Mass Highway Department
WEEKLY SUMMARY FOR LANE
Starting: 4/8/2013

STA. 3141

Site Reference: 110000000559
Site ID: 000000314103
Location: RTE. 31, WEST OF RTE. 122
Direction: ROAD TOTAL

File: CLC3141.prn
City: PAXTON
County: CLASS

TIME	MON 8	TUE 9	WED 10	THU 11	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		15	12	26		17			17	53
02:00		14	11	13		12			12	38
03:00		4	12	15		10			10	31
04:00		15	16	13		14			14	44
05:00		25	26	32		27			27	83
06:00		126	122	126		124			124	374
07:00		317	331	315		321			321	963
08:00		537	549	538		541			541	1624
09:00		454	463	458		458			458	1375
10:00		295	292			293			293	587
11:00		260	254			257			257	514
12:00		278	298			288			288	576
13:00		260	284			272			272	544
14:00	281	276	282			279			279	839
15:00	347	354	385			362			362	1086
16:00	506	508	471			495			495	1485
17:00	541	549	557			549			549	1647
18:00	527	572	540			546			546	1639
19:00	372	384	373			376			376	1129
20:00	259	254	251			254			254	764
21:00	131	178	165			158			158	474
22:00	90	117	110			105			105	317
23:00	71	75	72			72			72	218
24:00	42	43	43			42			42	128
TOTALS	3167	5910	5919	1536	0	5872	0	0	5872	16532
% AVG WKDY	53.9	100.6	100.8	26.1						
% AVG WEEK	53.9	100.6	100.8	26.1						
AM Times		08:00	08:00	08:00		08:00			08:00	
AM Peaks		537	549	538		541			541	
PM Times	17:00	18:00	17:00			17:00			17:00	
PM Peaks	541	572	557			549			549	
D%	70	70	65	75						
K%	17	10	9	35						

US

Tph = 1%
Tad = 2%

COMB AWD 5872
FAC .92
COMB ADT 5,400

Mass Highway Department
WEEKLY SUMMARY FOR LANE 1
Starting: 4/8/2013

Site Reference: 110000000559
Site ID: 000000314103
Location: RTE 31, WEST OF RTE. 122
Direction: EB

File: CLC3141.prn
City: PAXTON
County: CLASS

TIME	MON 8	TUE 9	WED 10	THU 11	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		3	1	6		3			3	10
02:00		4	3	2		3			3	9
03:00		1	4	5		3			3	10
04:00		13	12	11		12			12	36
05:00		19	20	20		19			19	59
06:00		105	94	102		100			100	301
07:00		249	249	248		248			248	746
08:00		413	414	413		413			413	1240
09:00		304	320	299		307			307	923
10:00		161	165			163			163	326
11:00		129	131			130			130	260
12:00		127	143			135			135	270
13:00		130	148			139			139	278
14:00	134	125	139			132			132	398
15:00	155	148	166			156			156	469
16:00	191	191	181			187			187	563
17:00	154	184	190			176			176	528
18:00	175	163	189			175			175	527
19:00	132	151	139			140			140	422
20:00	84	96	76			85			85	256
21:00	38	60	56			51			51	154
22:00	29	39	33			33			33	101
23:00	32	19	23			24			24	74
24:00	12	20	13			15			15	45
TOTALS	1136	2854	2909	1106	0	2849	0	0	2849	8005
% AVG WKDY	39.8	100.1	102.1	38.8						
% AVG WEEK	39.8	100.1	102.1	38.8						
AM Times		08:00	08:00	08:00		08:00			08:00	
AM Peaks		413	414	413		413			413	
PM Times	16:00	16:00	17:00			16:00			16:00	
PM Peaks	191	191	190			187			187	

Mass Highway Department
WEEKLY SUMMARY FOR LANE 2
Starting: 4/8/2013

Site Reference: 110000000559
Site ID: 000000314103
Location: RTE. 31, WEST OF RTE. 122
Direction: WB

File: CLC3141.prn
City: PAXTON
County: CLASS

TIME	MON 8	TUE 9	WED 10	THU 11	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		12	11	20		14			14	43
02:00		10	8	11		9			9	29
03:00		3	8	10		7			7	21
04:00		2	4	2		2			2	8
05:00		6	6	12		8			8	24
06:00		21	28	24		24			24	73
07:00		68	82	67		72			72	217
08:00		124	135	125		128			128	384
09:00		150	143	159		150			150	452
10:00		134	127			130			130	261
11:00		131	123			127			127	254
12:00		151	155			153			153	306
13:00		130	136			133			133	266
14:00	147	151	143			147			147	441
15:00	192	206	219			205			205	617
16:00	315	317	290			307			307	922
17:00	387	365	367			373			373	1119
18:00	352	409	351			370			370	1112
19:00	240	233	234			235			235	707
20:00	175	158	175			169			169	508
21:00	93	118	109			106			106	320
22:00	61	78	77			72			72	216
23:00	39	56	49			48			48	144
24:00	30	23	30			27			27	83
TOTALS	2031	3056	3010	430	0	3016	0	0	3016	8527
% AVG WKDY	67.3	101.3	99.8	14.2						
% AVG WEEK	67.3	101.3	99.8	14.2						
AM Times		12:00	12:00	09:00		12:00			12:00	
AM Peaks		151	155	159		153			153	
PM Times	17:00	18:00	17:00			17:00			17:00	
PM Peaks	387	409	367			373			373	

Mass Highway Department
WEEKLY SUMMARY FOR LANE
Starting: 4/8/2013

STA. 3146

Site Reference: 110000000459
Site ID: 000000314601
Location: RTE. 31, NORTH OF MEADOW ST.
Direction: ROAD TOTAL

File: CLC3146.prn
City: SPENCER
County: CLASS

TIME	MON 8	TUE 9	WED 10	THU 11	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		16	24	25		21			21	65
02:00		16	21	11		16			16	48
03:00		12	14	15		13			13	41
04:00		17	13	17		15			15	47
05:00		25	29	35		29			29	89
06:00		119	145	125		129			129	389
07:00		342	331	344		339			339	1017
08:00		535	512	507		518			518	1554
09:00		451	411			431			431	862
10:00		335	373			354			354	708
11:00		359	325			342			342	684
12:00		347	385			366			366	732
13:00	348	346	348			347			347	1042
14:00	325	387	343			351			351	1055
15:00	428	436	455			439			439	1319
16:00	536	579	570			561			561	1685
17:00	581	623	641			615			615	1845
18:00	600	647	612			619			619	1859
19:00	435	464	486			461			461	1385
20:00	366	347	334			349			349	1047
21:00	228	253	208			229			229	689
22:00	117	155	169			147			147	441
23:00	66	75	96			79			79	237
24:00	48	48	43			46			46	139
TOTALS	4078	6934	6888	1079	0	6816	0	0	6816	18979
% AVG WKDY	59.8	101.7	101	15.8						
% AVG WEEK	59.8	101.7	101	15.8						
AM Times		08:00	08:00	08:00		08:00			08:00	
AM Peaks		535	512	507		518			518	
PM Times	18:00	18:00	17:00			18:00			18:00	
PM Peaks	600	647	641			619			619	
D%	55	55	50	60						
K%	15	9	9	47						

U5

COMB AWD 6816
FAC .92
COMB ADT 6,300

Tph = 1%

Tad = 3%

Mass Highway Department
WEEKLY SUMMARY FOR LANE 1
Starting: 4/8/2013

Site Reference: 110000000459
Site ID: 000000314601
Location: RTE. 31, NORTH OF MEADOW ST.
Direction: EAST

File: CLC3146.prn
City: SPENCER
County: CLASS

TIME	MON 8	TUE 9	WED 10	THU 11	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		8	11	17		12			12	36
02:00		8	14	6		9			9	28
03:00		2	7	7		5			5	16
04:00		8	6	8		7			7	22
05:00		10	12	15		12			12	37
06:00		50	52	48		50			50	150
07:00		150	149	145		148			148	444
08:00		214	206	196		205			205	616
09:00		201	175			188			188	376
10:00		144	181			162			162	325
11:00		162	147			154			154	309
12:00		174	167			170			170	341
13:00	174	186	174			178			178	534
14:00	172	212	179			187			187	563
15:00	237	228	230			231			231	695
16:00	270	312	288			290			290	870
17:00	320	316	335			323			323	971
18:00	327	343	340			336			336	1010
19:00	213	245	292			250			250	750
20:00	215	191	179			195			195	585
21:00	134	149	117			133			133	400
22:00	69	90	96			85			85	255
23:00	33	40	53			42			42	126
24:00	31	28	24			27			27	83
TOTALS	2195	3471	3434	442	0	3399	0	0	3399	9542
% AVG WKDY	64.5	102.1	101	13						
% AVG WEEK	64.5	102.1	101	13						
AM Times		08:00	08:00	08:00		08:00			08:00	
AM Peaks		214	206	196		205			205	
PM Times	18:00	18:00	18:00			18:00			18:00	
PM Peaks	327	343	340			336			336	

Mass Highway Department
WEEKLY SUMMARY FOR LANE 2
Starting: 4/8/2013

Site Reference: 110000000459
Site ID: 000000314601
Location: RTE. 31, NORTH OF MEADOW ST.
Direction:

File: CLC3146.prn
City: SPENCER
County: CLASS

TIME	MON 8	TUE 9	WED 10	THU 11	FRI	WKDAY AVG	SAT	SUN	WEEK AVG	TOTAL
01:00		8	13	8		9			9	29
02:00		8	7	5		6			6	20
03:00		10	7	8		8			8	25
04:00		9	7	9		8			8	25
05:00		15	17	20		17			17	52
06:00		69	93	77		79			79	239
07:00		192	182	199		191			191	573
08:00		321	306	311		312			312	938
09:00		250	236			243			243	486
10:00		191	192			191			191	383
11:00		197	178			187			187	375
12:00		173	218			195			195	391
13:00	174	160	174			169			169	508
14:00	153	175	164			164			164	492
15:00	191	208	225			208			208	624
16:00	266	267	282			271			271	815
17:00	261	307	306			291			291	874
18:00	273	304	272			283			283	849
19:00	222	219	194			211			211	635
20:00	151	156	155			154			154	462
21:00	94	104	91			96			96	289
22:00	48	65	73			62			62	186
23:00	33	35	43			37			37	111
24:00	17	20	19			18			18	56
TOTALS	1883	3463	3454	637	0	3410	0	0	3410	9437
% AVG WKDY	55.2	101.5	101.2	18.6						
% AVG WEEK	55.2	101.5	101.2	18.6						
AM Times		08:00	08:00	08:00		08:00			08:00	
AM Peaks		321	306	311		312			312	
PM Times	18:00	17:00	17:00			17:00			17:00	
PM Peaks	273	307	306			291			291	

Town of Holden

- Traffic Counts
- Turning Movement Counts: Existing and Projected 2023 Level of Service Results

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
09/19/85	Holden	Anderson Ave	At West Boylston TL	EB	350	357	707	1985249	CMRPC
08/29/85	Holden	Brattle St	At Worcester CL	NB	914	799	1713	1985262	CMRPC
07/10/86	Holden	Brattle St	At Worcester CL	NB	712	697	1409	1986008	CMRPC
08/31/89	Holden	Brattle St	At Worcester CL	NB	1046	935	1981	1989203	CMRPC
06/18/91	Holden	Brattle St	At Worcester CL	NB	1090	1013	2103	1991089	CMRPC
09/01/92	Holden	Brattle St	At Worcester CL	NB	1093	1002	2095	1992192	CMRPC
11/18/97	Holden	Brattle St	At Worcester CL	NB	841	1279	2120	1997108	CMRPC
05/15/00	Holden	Brattle St	At Worcester CL	NB	529	969	1498	2000043	CMRPC
09/15/03	Holden	Brattle St	At Worcester CL	NB	952	875	1827	2003034	CMRPC
08/07/06	Holden	Brattle St	At Worcester CL	NB	902	965	1867	2006029	CMRPC
07/01/09	Holden	Brattle St	At Worcester CL	NB	884	948	1832	2009042	CMRPC
06/12/12	Holden	Brattle St	At Worcester CL	NB	1031	1237	2268	2012014	CMRPC
04/30/13	Holden	Bullard St	Btwn Wachusett St & Malden St	EB	1424	1747	3171	2013051	CMRPC
09/19/85	Holden	Bullard St	N of Shrewsbury St	NB	1042	873	1915	1985264	CMRPC
06/18/91	Holden	Bullard St	N of Shrewsbury St	NB	1032	1038	2070	1991092	CMRPC
09/26/96	Holden	Bullard St	N of Shrewsbury St	NB	1089	999	2088	1996121	CMRPC
06/28/01	Holden	Bullard St	N of Shrewsbury St	NB	1119	973	2092	2001058	CMRPC
08/21/07	Holden	Bullard St	N of Shrewsbury St	NB	1098	1345	2443	2007065	CMRPC
07/07/10	Holden	Bullard St	N of Shrewsbury St	NB	1418	1196	2614	2010056	CMRPC
08/29/85	Holden	Chapel St	N of Shrewsbury St	NB	1074	1168	2242	1985266	CMRPC
04/20/88	Holden	Chapel St	N of Shrewsbury St	NB	1400	1436	2836	1988046	CMRPC
10/01/91	Holden	Chapel St	N of Shrewsbury St	NB	1555	1554	3109	1991187	CMRPC
06/26/97	Holden	Chapel St	N of Shrewsbury St	NB	1586	1582	3168	1997045	CMRPC
07/17/00	Holden	Chapel St	N of Shrewsbury St	NB	2371	2237	4608	MHD-3114	CMRPC
06/09/03	Holden	Chapel St	N of Shrewsbury St	NB	2187	2154	4341	MHD-3114	CMRPC
09/04/06	Holden	Chapel St	N of Shrewsbury St	NB	2062	2032	4094	MHD-3114	CMRPC
09/15/09	Holden	Chapel St	N of Shrewsbury St	NB	1911	1950	3861	MHD-3114	CMRPC
10/10/12	Holden	Chapel St	N of Shrewsbury St	NB	1773	1949	3722	MHD-3114	CMRPC
08/29/85	Holden	Doyle Rd	At Worcester CL	EB	5976	4966	10942	1985269	CMRPC
06/18/91	Holden	Doyle Rd	At Worcester CL	EB	5939	5419	11358	1991094	CMRPC
09/26/96	Holden	Doyle Rd	At Worcester CL	EB	6248	5991	12239	1996122	CMRPC
09/22/98	Holden	Doyle Rd	At Worcester CL	EB	5396	4768	10164	1998040	CMRPC
06/28/01	Holden	Doyle Rd	At Worcester CL	EB	6534	5568	12102	2001059	CMRPC
08/21/07	Holden	Doyle Rd	At Worcester CL	EB	5803	6110	11913	2007066	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
06/19/12	Holden	Doyle Rd	At Worcester CL	EB	6210	6048	12258	2012187	CMRPC
06/18/91	Holden	Doyle Rd	S of Shrewsbury St	NB	4941	5378	10319	1991093	CMRPC
04/30/13	Holden	Doyle Rd	S of Shrewsbury St	NB	4984	5713	10697	2013052	CMRPC
08/29/85	Holden	Glenwood St	E of Doyle Rd	EB	246	341	587	1985063	CMRPC
06/18/91	Holden	Glenwood St	E of Doyle Rd	EB	436	490	926	1991091	CMRPC
05/18/89	Holden	High St	N of Route 122A (Main St)	NB	486	429	915	1989056	CMRPC
07/15/86	Holden	Holden St	At Worcester CL	NB	2344	2226	4570	1986009	CMRPC
08/31/89	Holden	Holden St	At Worcester CL	NB	3059	3209	6268	1989202	CMRPC
09/01/92	Holden	Holden St	At Worcester CL	NB	3337	3408	6745	1992188	CMRPC
11/12/97	Holden	Holden St	At Worcester CL	NB	4105	3851	7956	1997143	CMRPC
05/15/00	Holden	Holden St	At Worcester CL	NB	4075	4137	8212	2000073	CMRPC
05/24/04	Holden	Holden St	At Worcester CL	NB	3908	3654	7562	2004063	CMRPC
08/07/06	Holden	Holden St	At Worcester CL	NB	4312	4436	8748	2006082	CMRPC
09/11/09	Holden	Holden St	At Worcester CL	NB	4310	4496	8806	2009089	CMRPC
07/07/10	Holden	Holden St	At Worcester CL	NB	4170	4315	8485	2010057	CMRPC
06/19/12	Holden	Holden St	At Worcester CL	NB	4032	4394	8426	2012083	CMRPC
08/29/85	Holden	Holden St	S of Shrewsbury St	NB	1904	1609	3513	1985227	CMRPC
10/01/91	Holden	Holden St	S of Shrewsbury St	NB	3198	3133	6331	1991188	CMRPC
12/09/93	Holden	Industrial Dr	S of Route 122A (Main St)	NB	1308	1117	2425	1993068	CMRPC
08/31/10	Holden	Malden St	At West Boylston TL	EB	875	965	1840	2010193	CMRPC
07/09/13	Holden	Malden St	At West Boylston TL	EB	929	1001	1930	2013170	CMRPC
09/18/85	Holden	Malden St	N of Route 122A (Main St)	NB	942	902	1844	1985228	CMRPC
05/23/89	Holden	Malden St	N of Route 122A (Main St)	NB	1228	960	2188	1989063	CMRPC
05/30/91	Holden	Malden St	N of Route 122A (Main St)	NB	837	787	1624	1991063	CMRPC
09/18/01	Holden	Malden St	N of Route 122A (Main St)	NB	941	928	1869	2001060	CMRPC
10/04/04	Holden	Malden St	N of Route 122A (Main St)	NB	705	839	1544	2004064	CMRPC
08/21/07	Holden	Malden St	N of Route 122A (Main St)	NB	820	882	1702	2007067	CMRPC
11/04/10	Holden	Malden St	N of Route 122A (Main St)	NB	869	785	1654	2010058	CMRPC
04/30/13	Holden	Malden St	N of Wachusett St	NB	774	764	1538	2013053	CMRPC
06/28/01	Holden	Manning St	At West Boylston TL	EB	2545	2803	5348	2001061	CMRPC
09/27/04	Holden	Manning St	At West Boylston TL	EB	1974	3131	5105	2004191	CMRPC
08/21/07	Holden	Manning St	At West Boylston TL	EB	2995	2947	5942	2007068	CMRPC
10/13/10	Holden	Manning St	At West Boylston TL	EB	2817	3245	6062	2010059	CMRPC
05/02/13	Holden	Manning St	At West Boylston TL	EB	3585	3459	7044	2013054	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
09/08/92	Holden	Mill St	W of Route 31 (Wachusett St)	EB	1100	907	2007	1992211	CMRPC
09/08/92	Holden	Mount Pleasant Ave	E of Route 122A (N Main St)	EB	745	794	1539	1992210	CMRPC
08/27/98	Holden	Quinapoxet St	E of Princeton St	EB	1216	42	1258	1998042	CMRPC
09/27/01	Holden	Quinapoxet St	E of Princeton St	EB	1343	1399	2742	2001062	CMRPC
11/04/10	Holden	Quinapoxet St	E of Princeton St	EB	1541	1693	3234	2010224	CMRPC
07/01/86	Holden	Reservoir St	At Worcester CL	NB	449	374	823	1986023	CMRPC
09/03/92	Holden	Reservoir St	At Worcester CL	NB	1057	959	2016	1992181	CMRPC
10/23/97	Holden	Reservoir St	At Worcester CL	NB	2394	2197	4591	1997181	CMRPC
06/12/00	Holden	Reservoir St	At Worcester CL	NB	1224	1186	2410	2000105	CMRPC
06/23/03	Holden	Reservoir St	At Worcester CL	NB	1439	1379	2818	2003118	CMRPC
05/15/06	Holden	Reservoir St	At Worcester CL	NB	1154	1277	2431	2006116	CMRPC
08/20/09	Holden	Reservoir St	At Worcester CL	NB	1097	992	2089	2009119	CMRPC
07/12/12	Holden	Reservoir St	At Worcester CL	NB	1148	1113	2261	2012134	CMRPC
09/08/92	Holden	Reservoir St	S of Route 31 (South Rd)	NB	931	867	1798	1992207	CMRPC
05/07/13	Holden	Reservoir St	S of Route 31 (South Rd)	NB	1208	1124	2332	2013055	CMRPC
08/22/85	Holden	Route 122A (Main St)	At Rutland TL	NB	3237	3300	6537	1985202	CMRPC
10/17/95	Holden	Route 122A (Main St)	At Rutland TL	NB	4479	4476	8955	1995181	CMRPC
09/18/01	Holden	Route 122A (Main St)	At Rutland TL	NB	5221	4897	10118	2001063	CMRPC
08/23/07	Holden	Route 122A (Main St)	At Rutland TL	NB	5263	5408	10671	2007069	CMRPC
10/13/10	Holden	Route 122A (Main St)	At Rutland TL	NB	5346	5305	10651	2010060	CMRPC
09/26/85	Holden	Route 122A (Main St)	At Worcester CL	NB	3329	3252	6581	1985255	CMRPC
05/23/89	Holden	Route 122A (Main St)	At Worcester CL	NB	3511	3509	7020	1989059	CMRPC
09/01/92	Holden	Route 122A (Main St)	At Worcester CL	NB	3371	3315	6686	1992195	CMRPC
09/24/98	Holden	Route 122A (Main St)	At Worcester CL	NB	4193	3761	7954	1998043	CMRPC
08/14/00	Holden	Route 122A (Main St)	At Worcester CL	NB	3559	3345	6904	2000127	CMRPC
06/09/03	Holden	Route 122A (Main St)	At Worcester CL	NB	3681	3687	7368	2003140	CMRPC
05/22/06	Holden	Route 122A (Main St)	At Worcester CL	NB	3666	3570	7236	2006142	CMRPC
08/16/07	Holden	Route 122A (Main St)	At Worcester CL	NB	5057	5457	10514	2007070	CMRPC
07/07/10	Holden	Route 122A (Main St)	At Worcester CL	NB	3192	3136	6328	2010061	CMRPC
06/12/12	Holden	Route 122A (Main St)	At Worcester CL	NB	3483	3433	6916	2012066	CMRPC
09/26/96	Holden	Route 122A (Main St)	N of Industrial Dr	NB	13515	12748	26263	1996120	CMRPC
10/01/85	Holden	Route 122A (Main St)	N of Route 31 (Reservoir/Highland St)	NB	7375	7123	14498	1985246	CMRPC
06/13/95	Holden	Route 122A (Main St)	N of Route 31 (Reservoir/Highland St)	NB	9119	8529	17648	1995068	CMRPC
09/18/01	Holden	Route 122A (Main St)	N of Route 31 (Reservoir/Highland St)	NB	8680	6867	15547	2001064	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
09/04/85	Holden	Route 122A (Main St)	N of Shrewsbury St	NB	10599	9340	19939	1985258	CMRPC
05/23/89	Holden	Route 122A (Main St)	N of Shrewsbury St	NB	12606	10889	23495	1989064	CMRPC
06/13/95	Holden	Route 122A (Main St)	N of Shrewsbury St	NB	12391	10124	22515	1995070	CMRPC
09/18/01	Holden	Route 122A (Main St)	N of Shrewsbury St	NB	8368	10001	18369	2001065	CMRPC
06/13/95	Holden	Route 122A (Main St)	S of Princeton St	NB	7715	8471	16186	1995067	CMRPC
06/13/95	Holden	Route 122A (Main St)	S of Route 31 (Reservoir/Highland St)	NB	11503	12729	24232	1995069	CMRPC
08/13/13	Holden	Route 122A (Main St)	S of Route 31 (Reservoir/Highland St)	NB	9537	10695	20232	2013056	CMRPC
05/23/89	Holden	Route 122A (Main St)	S of Route 68 (Broad St)	NB	6328	6270	12598	1989060	CMRPC
06/13/95	Holden	Route 122A (Main St)	S of Route 68 (Broad St)	NB	7007	7055	14062	1995066	CMRPC
06/26/97	Holden	Route 122A (Main St)	S of Route 68 (Broad St)	NB	7293	7356	14649	1997046	CMRPC
08/25/98	Holden	Route 122A (Main St)	S of Route 68 (Broad St)	NB	6307	7033	13340	1998046	CMRPC
10/17/95	Holden	Route 122A (Main St)	S of Salisbury St	NB			15787	1995180	CMRPC
09/26/85	Holden	Route 31 (Highland St)	N of Route 122A (Main St)	NB	2711	3978	6689	1985253	CMRPC
09/22/98	Holden	Route 31 (Highland St)	N of Route 122A (Main St)	NB	3241	3857	7098	1998045	CMRPC
09/18/01	Holden	Route 31 (Highland St)	N of Route 122A (Main St)	NB	3637	4277	7914	2001067	CMRPC
10/04/04	Holden	Route 31 (Highland St)	N of Route 122A (Main St)	NB	2897	4347	7244	2004072	CMRPC
08/21/07	Holden	Route 31 (Highland St)	N of Route 122A (Main St)	NB	4119	3204	7323	2007073	CMRPC
05/02/13	Holden	Route 31 (Highland St)	N of Route 122A (Main St)	NB	3608	4343	7951	2013060	CMRPC
09/10/98	Holden	Route 31 (Holden Rd)	At Paxton TL	NB	2432	2680	5112	1998102	CMRPC
05/16/85	Holden	Route 31 (Paxton Rd)	At Paxton TL	NB	1843	1848	3691	1985211	CMRPC
05/18/89	Holden	Route 31 (Paxton Rd)	At Paxton TL	NB	2331	2340	4671	1989055	CMRPC
05/23/91	Holden	Route 31 (Paxton Rd)	At Paxton TL	NB	2393	2358	4751	1991055	CMRPC
09/24/01	Holden	Route 31 (Paxton Rd)	At Paxton TL	NB	2813	2663	5476	2001066	CMRPC
05/24/04	Holden	Route 31 (Paxton Rd)	At Paxton TL	NB	2941	2848	5789	2004070	CMRPC
08/23/07	Holden	Route 31 (Paxton Rd)	At Paxton TL	NB	2920	2701	5621	2007071	CMRPC
11/04/10	Holden	Route 31 (Paxton Rd)	At Paxton TL	NB	2572	2565	5137	2010062	CMRPC
05/07/13	Holden	Route 31 (Paxton Rd)	At Paxton TL	NB	2746	2820	5566	2013057	CMRPC
05/07/13	Holden	Route 31 (Reservoir St)	N of Reservoir St	NB	3866	3872	7738	2013059	CMRPC
08/27/85	Holden	Route 31 (Reservoir St)	S of Route 122A (Main St)	NB	3054	2841	5895	1985252	CMRPC
01/07/87	Holden	Route 31 (Reservoir St)	S of Route 122A (Main St)	NB	3727	3085	6812	EOEA6479	HMM
10/04/04	Holden	Route 31 (Reservoir St)	S of Route 122A (Main St)	NB	6921	3176	10097	2004073	CMRPC
08/16/07	Holden	Route 31 (Reservoir St)	S of Route 122A (Main St)	NB	6201	6563	12764	2007074	CMRPC
11/04/10	Holden	Route 31 (Reservoir St)	S of Route 122A (Main St)	NB	5927	5810	11737	2010064	CMRPC
05/02/13	Holden	Route 31 (Reservoir St)	S of Route 122A (Main St)	NB	6434	6108	12542	2013062	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
10/03/85	Holden	Route 31 (Wachusett St)	At Princeton TL	NB	662	628	1290	1985179	CMRPC
06/26/01	Holden	Route 31 (Wachusett St)	At Princeton TL	NB	1388	1427	2815	2001137	CMRPC
08/21/07	Holden	Route 31 (Wachusett St)	At Princeton TL	NB	1331	1334	2665	2007072	CMRPC
10/13/10	Holden	Route 31 (Wachusett St)	At Princeton TL	NB	1302	1346	2648	2010065	CMRPC
09/08/92	Holden	Route 31 (Wachusett St)	N of Manning St	NB	2184	2190	4374	1992209	CMRPC
05/02/13	Holden	Route 31 (Wachusett St)	N of Manning St	NB	2380	2381	4761	2013058	CMRPC
05/02/13	Holden	Route 31 (Wachusett St)	S of Quinapoxet St	NB	4502	4314	8816	2013061	CMRPC
08/22/85	Holden	Route 68 (Broad St)	At Rutland TL	NB	1457	1536	2993	1985199	CMRPC
06/23/97	Holden	Route 68 (Broad St)	At Rutland TL	NB	1950	2005	3955	1997047	CMRPC
09/18/01	Holden	Route 68 (Broad St)	At Rutland TL	NB	899	1864	2763	2001068	CMRPC
08/21/07	Holden	Route 68 (Broad St)	At Rutland TL	NB	1714	1728	3442	2007075	CMRPC
10/13/10	Holden	Route 68 (Broad St)	At Rutland TL	NB	1910	1935	3845	2010066	CMRPC
10/07/86	Holden	Route 68 (Broad St)	S of Muschopauge Rd	NB	1734	1757	3491	Spec149	CMRPC
05/18/89	Holden	Route 68 (Broad St)	S of Muschopauge Rd	NB	1916	1839	3755	1989054	CMRPC
06/30/92	Holden	Route 68 (Broad St)	S of Muschopauge Rd	NB	1875	1855	3730	120018	MHD
09/26/85	Holden	Salisbury St	At Worcester CL	NB	1938	2070	4008	1985236	CMRPC
07/17/86	Holden	Salisbury St	At Worcester CL	NB	1988	2078	4066	1986018	CMRPC
09/05/89	Holden	Salisbury St	At Worcester CL	NB	1855	1883	3738	1989196	CMRPC
05/30/91	Holden	Salisbury St	At Worcester CL	NB	1783	1858	3641	1991065	CMRPC
09/03/92	Holden	Salisbury St	At Worcester CL	NB	1397	1865	3262	1992185	CMRPC
11/18/97	Holden	Salisbury St	At Worcester CL	NB	2108	2028	4136	1997229	CMRPC
07/17/00	Holden	Salisbury St	At Worcester CL	NB	2012	2002	4014	2000143	CMRPC
06/09/03	Holden	Salisbury St	At Worcester CL	NB	1674	1550	3224	2003145	CMRPC
05/22/06	Holden	Salisbury St	At Worcester CL	NB	2032	2051	4083	2006147	CMRPC
07/14/09	Holden	Salisbury St	At Worcester CL	NB	2054	2040	4094	2009145	CMRPC
07/17/12	Holden	Salisbury St	At Worcester CL	NB	2069	2120	4189	2012157	CMRPC
09/19/85	Holden	Shrewsbury St	At West Boylston TL	EB	3905	3004	6909	1985239	CMRPC
05/23/89	Holden	Shrewsbury St	At West Boylston TL	EB	3183	3308	6491	1989065	CMRPC
08/16/07	Holden	Shrewsbury St	At West Boylston TL	EB	2353	2464	4817	2007076	CMRPC
04/23/87	Holden	Shrewsbury St	E of Chapel St	EB	7611	7012	14623	1987032	CMRPC
07/24/90	Holden	Shrewsbury St	E of Chapel St	EB	6911	6638	13549	1990059	CMRPC
06/18/91	Holden	Shrewsbury St	E of Chapel St	EB	8717	8957	17674	1991090	CMRPC
09/30/93	Holden	Shrewsbury St	E of Chapel St	EB	12084	7521	19605	1993037	CMRPC
09/26/96	Holden	Shrewsbury St	E of Chapel St	EB	8255	7944	16199	1996119	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	SB/WB or OFF	Total	Reference ID	Source
09/18/01	Holden	Shrewsbury St	E of Chapel St	EB	7230	6089	13319	2001069	CMRPC
09/16/02	Holden	Shrewsbury St	E of Chapel St	EB	6958	6111	13069	MHD-3113	CMRPC
07/28/05	Holden	Shrewsbury St	E of Chapel St	EB	7493	6757	14250	MHD-3113	CMRPC
06/26/08	Holden	Shrewsbury St	E of Chapel St	EB	6912	6914	13826	MHD-3113	CMRPC
07/06/11	Holden	Shrewsbury St	E of Chapel St	EB	6417	5936	12353	MHD-3113	CMRPC
04/30/13	Holden	Shrewsbury St	E of Chapel St	EB	7697	6331	14028	2013064	CMRPC
04/30/13	Holden	Shrewsbury St	E of Doyle Rd	EB	2126	2143	4269	2013063	CMRPC
09/04/85	Holden	Shrewsbury St	E of Route 122A (Main St)	EB	8394	8022	16416	1985237	CMRPC
10/13/10	Holden	Sterling Rd	At Sterling TL	NB	182	182	364	2010067	CMRPC
09/08/92	Holden	Wachusett St	E of Route 31 (Highland St)	EB	1774	1754	3528	1992208	CMRPC
04/30/13	Holden	Wachusett St	N of Malden St	NB	1892	2082	3974	2013065	CMRPC
09/01/92	Holden	Winter Hill Rd	At Worcester CL	NB	96	100	196	1992190	CMRPC

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Holden
Street : Manning St
Location : At West Boylston TL

Site: 2013054

Weekly Volume

Interval Start	Mon 4/29/2013		Tue 4/30/2013		Wed 5/1/2013		Thu 5/2/2013		Fri 5/3/2013		Sat 5/4/2013		Sun 5/5/2013		Mon - Fri Average		Weekly Average	
	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	-	-	-	-	-	-	6	11	7	19	-	-	-	-	6.5	15.0	6.5	15.0
1:00 AM	-	-	-	-	-	-	2	4	2	10	-	-	-	-	2.0	7.0	2.0	7.0
2:00 AM	-	-	-	-	-	-	3	7	2	9	-	-	-	-	2.5	8.0	2.5	8.0
3:00 AM	-	-	-	-	-	-	7	6	6	2	-	-	-	-	6.5	4.0	6.5	4.0
4:00 AM	-	-	-	-	-	-	34	7	40	6	-	-	-	-	37.0	6.5	37.0	6.5
5:00 AM	-	-	-	-	-	-	120	29	100	30	-	-	-	-	110.0	29.5	110.0	29.5
6:00 AM	-	-	-	-	-	-	345	106	335	106	-	-	-	-	340.0	106.0	340.0	106.0
7:00 AM	-	-	-	-	-	-	581	139	521	127	-	-	-	-	551.0	133.0	551.0	133.0
8:00 AM	-	-	-	-	-	-	390	121	338	139	-	-	-	-	364.0	130.0	364.0	130.0
9:00 AM	-	-	-	-	-	-	200	102	197	118	-	-	-	-	198.5	110.0	198.5	110.0
10:00 AM	-	-	-	-	-	-	146	140	181	135	-	-	-	-	163.5	137.5	163.5	137.5
11:00 AM	-	-	-	-	-	-	160	129	183	149	-	-	-	-	171.5	139.0	171.5	139.0
12:00 PM	-	-	-	-	-	-	136	146	186	160	-	-	-	-	161.0	153.0	161.0	153.0
1:00 PM	-	-	-	-	168	127	133	174	-	-	-	-	-	-	150.5	150.5	150.5	150.5
2:00 PM	-	-	-	-	243	222	237	211	-	-	-	-	-	-	240.0	216.5	240.0	216.5
3:00 PM	-	-	-	-	231	358	223	372	-	-	-	-	-	-	227.0	365.0	227.0	365.0
4:00 PM	-	-	-	-	189	488	217	439	-	-	-	-	-	-	203.0	463.5	203.0	463.5
5:00 PM	-	-	-	-	199	504	211	513	-	-	-	-	-	-	205.0	508.5	205.0	508.5
6:00 PM	-	-	-	-	155	343	153	315	-	-	-	-	-	-	154.0	329.0	154.0	329.0
7:00 PM	-	-	-	-	96	198	129	234	-	-	-	-	-	-	112.5	216.0	112.5	216.0
8:00 PM	-	-	-	-	80	139	76	132	-	-	-	-	-	-	78.0	135.5	78.0	135.5
9:00 PM	-	-	-	-	50	106	60	94	-	-	-	-	-	-	55.0	100.0	55.0	100.0
10:00 PM	-	-	-	-	27	51	29	48	-	-	-	-	-	-	28.0	49.5	28.0	49.5
11:00 PM	-	-	-	-	18	38	14	37	-	-	-	-	-	-	16.0	37.5	16.0	37.5
Totals	0	0	0	0	1456	2574	3612	3516	2098	1010	0	0	0	0	3583.0	3550.0	3583.0	3550.0
Combined	0		0		4030		7128		3108		0		0		7133.0		7133.0	
Split (%)	-	-	-	-	36.1	63.9	50.7	49.3	67.5	32.5	-	-	-	-	50.2	49.8	50.2	49.8

Peak Hours

12:00 AM - 12:00 PM	-	-	-	-	-	-	7:00 AM	10:00 AM	7:00 AM	11:00 AM	-	-	-	-	7:00 AM	11:00 AM	7:00 AM	11:00 AM
Volume	-	-	-	-	-	-	581	140	521	149	-	-	-	-	551.0	139.0	551.0	139.0
12:00 PM - 12:00 AM	-	-	-	-	2:00 PM	5:00 PM	2:00 PM	5:00 PM	12:00 PM	12:00 PM	-	-	-	-	2:00 PM	5:00 PM	2:00 PM	5:00 PM
Volume	-	-	-	-	243	504	237	513	186	160	-	-	-	-	240.0	508.5	240.0	508.5

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Holden
Street : Route 31
Location : North of Route 122A

Site: 2013060

Weekly Volume

Interval Start	Mon 4/29/2013		Tue 4/30/2013		Wed 5/1/2013		Thu 5/2/2013		Fri 5/3/2013		Sat 5/4/2013		Sun 5/5/2013		Mon - Fri Average		Weekly Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	-	-	-	-	-	-	13	5	9	7	-	-	-	-	11.0	6.0	11.0	6.0
1:00 AM	-	-	-	-	-	-	4	3	7	5	-	-	-	-	5.5	4.0	5.5	4.0
2:00 AM	-	-	-	-	-	-	2	1	2	5	-	-	-	-	2.0	3.0	2.0	3.0
3:00 AM	-	-	-	-	-	-	9	4	4	3	-	-	-	-	6.5	3.5	6.5	3.5
4:00 AM	-	-	-	-	-	-	9	25	10	23	-	-	-	-	9.5	24.0	9.5	24.0
5:00 AM	-	-	-	-	-	-	38	67	39	64	-	-	-	-	38.5	65.5	38.5	65.5
6:00 AM	-	-	-	-	-	-	152	183	138	185	-	-	-	-	145.0	184.0	145.0	184.0
7:00 AM	-	-	-	-	-	-	303	309	290	265	-	-	-	-	296.5	287.0	296.5	287.0
8:00 AM	-	-	-	-	-	-	266	299	262	318	-	-	-	-	264.0	308.5	264.0	308.5
9:00 AM	-	-	-	-	-	-	173	238	181	283	-	-	-	-	177.0	260.5	177.0	260.5
10:00 AM	-	-	-	-	-	-	150	195	170	219	-	-	-	-	160.0	207.0	160.0	207.0
11:00 AM	-	-	-	-	-	-	179	217	190	266	-	-	-	-	184.5	241.5	184.5	241.5
12:00 PM	-	-	-	-	-	-	191	219	231	207	-	-	-	-	211.0	213.0	211.0	213.0
1:00 PM	-	-	-	-	-	-	192	220	-	-	-	-	-	-	192.0	220.0	192.0	220.0
2:00 PM	-	-	-	-	283	277	290	286	-	-	-	-	-	-	286.5	281.5	286.5	281.5
3:00 PM	-	-	-	-	280	381	292	376	-	-	-	-	-	-	286.0	378.5	286.0	378.5
4:00 PM	-	-	-	-	295	453	254	447	-	-	-	-	-	-	274.5	450.0	274.5	450.0
5:00 PM	-	-	-	-	286	463	312	455	-	-	-	-	-	-	299.0	459.0	299.0	459.0
6:00 PM	-	-	-	-	246	380	280	314	-	-	-	-	-	-	263.0	347.0	263.0	347.0
7:00 PM	-	-	-	-	238	233	245	259	-	-	-	-	-	-	241.5	246.0	241.5	246.0
8:00 PM	-	-	-	-	179	159	163	138	-	-	-	-	-	-	171.0	148.5	171.0	148.5
9:00 PM	-	-	-	-	93	73	96	77	-	-	-	-	-	-	94.5	75.0	94.5	75.0
10:00 PM	-	-	-	-	48	42	40	33	-	-	-	-	-	-	44.0	37.5	44.0	37.5
11:00 PM	-	-	-	-	31	31	21	27	-	-	-	-	-	-	26.0	29.0	26.0	29.0
Totals	0	0	0	0	1979	2492	3674	4397	1533	1850	0	0	0	0	3689.0	4479.5	3689.0	4479.5
Combined	0		0		4471		8071		3383		0		0		8168.5		8168.5	
Split (%)	-	-	-	-	44.3	55.7	45.5	54.5	45.3	54.7	-	-	-	-	45.2	54.8	45.2	54.8

Peak Hours

12:00 AM - 12:00 PM	-	-	-	-	-	-	7:00 AM	7:00 AM	7:00 AM	8:00 AM	-	-	-	-	7:00 AM	8:00 AM	7:00 AM	8:00 AM
Volume	-	-	-	-	-	-	303	309	290	318	-	-	-	-	296.5	308.5	296.5	308.5
12:00 PM - 12:00 AM	-	-	-	-	4:00 PM	5:00 PM	5:00 PM	5:00 PM	12:00 PM	12:00 PM	-	-	-	-	5:00 PM	5:00 PM	5:00 PM	5:00 PM
Volume	-	-	-	-	295	463	312	455	231	207	-	-	-	-	299.0	459.0	299.0	459.0

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Holden
Street : Route 31
Location : South of Route 122A

Site: 2013062

Weekly Volume

Interval Start	Mon 4/29/2013		Tue 4/30/2013		Wed 5/1/2013		Thu 5/2/2013		Fri 5/3/2013		Sat 5/4/2013		Sun 5/5/2013		Mon - Fri Average		Weekly Average	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	-	-	-	-	-	-	18	17	-	-	-	-	-	-	18.0	17.0	18.0	17.0
1:00 AM	-	-	-	-	-	-	7	5	-	-	-	-	-	-	7.0	5.0	7.0	5.0
2:00 AM	-	-	-	-	-	-	3	5	-	-	-	-	-	-	3.0	5.0	3.0	5.0
3:00 AM	-	-	-	-	-	-	6	10	-	-	-	-	-	-	6.0	10.0	6.0	10.0
4:00 AM	-	-	-	-	-	-	15	27	-	-	-	-	-	-	15.0	27.0	15.0	27.0
5:00 AM	-	-	-	-	-	-	52	90	-	-	-	-	-	-	52.0	90.0	52.0	90.0
6:00 AM	-	-	-	-	-	-	127	297	-	-	-	-	-	-	127.0	297.0	127.0	297.0
7:00 AM	-	-	-	-	-	-	305	554	-	-	-	-	-	-	305.0	554.0	305.0	554.0
8:00 AM	-	-	-	-	-	-	354	502	-	-	-	-	-	-	354.0	502.0	354.0	502.0
9:00 AM	-	-	-	-	-	-	324	349	-	-	-	-	-	-	324.0	349.0	324.0	349.0
10:00 AM	-	-	-	-	-	-	352	373	-	-	-	-	-	-	352.0	373.0	352.0	373.0
11:00 AM	-	-	-	-	-	-	370	360	-	-	-	-	-	-	370.0	360.0	370.0	360.0
12:00 PM	-	-	-	-	-	-	385	389	-	-	-	-	-	-	385.0	389.0	385.0	389.0
1:00 PM	-	-	-	-	-	-	374	390	-	-	-	-	-	-	374.0	390.0	374.0	390.0
2:00 PM	-	-	-	-	-	-	527	465	-	-	-	-	-	-	527.0	465.0	527.0	465.0
3:00 PM	-	-	-	-	518	476	-	-	-	-	-	-	-	-	518.0	476.0	518.0	476.0
4:00 PM	-	-	-	-	544	511	-	-	-	-	-	-	-	-	544.0	511.0	544.0	511.0
5:00 PM	-	-	-	-	639	455	-	-	-	-	-	-	-	-	639.0	455.0	639.0	455.0
6:00 PM	-	-	-	-	486	433	-	-	-	-	-	-	-	-	486.0	433.0	486.0	433.0
7:00 PM	-	-	-	-	367	327	-	-	-	-	-	-	-	-	367.0	327.0	367.0	327.0
8:00 PM	-	-	-	-	232	299	-	-	-	-	-	-	-	-	232.0	299.0	232.0	299.0
9:00 PM	-	-	-	-	109	122	-	-	-	-	-	-	-	-	109.0	122.0	109.0	122.0
10:00 PM	-	-	-	-	80	55	-	-	-	-	-	-	-	-	80.0	55.0	80.0	55.0
11:00 PM	-	-	-	-	46	32	-	-	-	-	-	-	-	-	46.0	32.0	46.0	32.0
Totals	0	0	0	0	3021	2710	3219	3833	0	0	0	0	0	0	6240.0	6543.0	6240.0	6543.0
Combined	0		0		5731		7052		0		0		0		12783.0		12783.0	
Split (%)	-	-	-	-	52.7	47.3	45.6	54.4	-	-	-	-	-	-	48.8	51.2	48.8	51.2

Peak Hours

12:00 AM - 12:00 PM	-	-	-	-	-	-	11:00 AM	7:00 AM	-	-	-	-	-	-	11:00 AM	7:00 AM	11:00 AM	7:00 AM
Volume	-	-	-	-	-	-	370	554	-	-	-	-	-	-	370.0	554.0	370.0	554.0
12:00 PM - 12:00 AM	-	-	-	-	5:00 PM	4:00 PM	2:00 PM	2:00 PM	-	-	-	-	-	-	5:00 PM	4:00 PM	5:00 PM	4:00 PM
Volume	-	-	-	-	639	511	527	465	-	-	-	-	-	-	639.0	511.0	639.0	511.0

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Holden
Street : Route 31
Location : North of Reservoir St

Site: 2013059

Weekly Volume

Interval Start	Mon 5/6/2013		Tue 5/7/2013		Wed 5/8/2013		Thu 5/9/2013		Fri 5/10/2013		Sat 5/11/2013		Sun 5/12/2013		Mon - Fri Average		Weekly Average	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	-	-	12	7	13	13	13	8	-	-	-	-	-	-	12.7	9.3	12.7	9.3
1:00 AM	-	-	8	3	7	3	7	5	-	-	-	-	-	-	7.3	3.7	7.3	3.7
2:00 AM	-	-	3	4	2	5	6	2	-	-	-	-	-	-	3.7	3.7	3.7	3.7
3:00 AM	-	-	1	8	3	10	3	10	-	-	-	-	-	-	2.3	9.3	2.3	9.3
4:00 AM	-	-	8	19	8	17	9	24	-	-	-	-	-	-	8.3	20.0	8.3	20.0
5:00 AM	-	-	40	75	43	83	39	73	-	-	-	-	-	-	40.7	77.0	40.7	77.0
6:00 AM	-	-	95	243	113	256	95	249	-	-	-	-	-	-	101.0	249.3	101.0	249.3
7:00 AM	-	-	238	420	238	422	225	407	-	-	-	-	-	-	233.7	416.3	233.7	416.3
8:00 AM	-	-	235	301	251	324	229	315	-	-	-	-	-	-	238.3	313.3	238.3	313.3
9:00 AM	-	-	203	232	189	205	-	-	-	-	-	-	-	-	196.0	218.5	196.0	218.5
10:00 AM	-	-	187	187	157	177	-	-	-	-	-	-	-	-	172.0	182.0	172.0	182.0
11:00 AM	-	-	198	186	201	199	-	-	-	-	-	-	-	-	199.5	192.5	199.5	192.5
12:00 PM	188	194	217	178	202	205	-	-	-	-	-	-	-	-	202.3	192.3	202.3	192.3
1:00 PM	169	226	228	227	193	233	-	-	-	-	-	-	-	-	196.7	228.7	196.7	228.7
2:00 PM	287	255	303	234	276	299	-	-	-	-	-	-	-	-	288.7	262.7	288.7	262.7
3:00 PM	330	332	322	310	334	298	-	-	-	-	-	-	-	-	328.7	313.3	328.7	313.3
4:00 PM	408	306	380	303	378	293	-	-	-	-	-	-	-	-	388.7	300.7	388.7	300.7
5:00 PM	393	253	383	328	406	298	-	-	-	-	-	-	-	-	394.0	293.0	394.0	293.0
6:00 PM	270	179	291	226	286	204	-	-	-	-	-	-	-	-	282.3	203.0	282.3	203.0
7:00 PM	187	155	199	168	170	128	-	-	-	-	-	-	-	-	185.3	150.3	185.3	150.3
8:00 PM	121	126	182	119	158	87	-	-	-	-	-	-	-	-	153.7	110.7	153.7	110.7
9:00 PM	96	72	106	84	66	71	-	-	-	-	-	-	-	-	89.3	75.7	89.3	75.7
10:00 PM	42	30	59	35	54	30	-	-	-	-	-	-	-	-	51.7	31.7	51.7	31.7
11:00 PM	29	20	38	23	43	19	-	-	-	-	-	-	-	-	36.7	20.7	36.7	20.7
Totals	2520	2148	3936	3920	3791	3879	626	1093	0	0	0	0	0	0	3813.5	3877.7	3813.5	3877.7
Combined	4668		7856		7670		1719		0		0		0		7691.2		7691.2	
Split (%)	54.0	46.0	50.1	49.9	49.4	50.6	36.4	63.6	-	-	-	-	-	-	49.6	50.4	49.6	50.4

Peak Hours

12:00 AM - 12:00 PM	-	-	7:00 AM	7:00 AM	8:00 AM	7:00 AM	8:00 AM	7:00 AM	-	-	-	-	-	-	8:00 AM	7:00 AM	8:00 AM	7:00 AM
Volume	-	-	238	420	251	422	229	407	-	-	-	-	-	-	238.3	416.3	238.3	416.3
12:00 PM - 12:00 AM	4:00 PM	3:00 PM	5:00 PM	5:00 PM	5:00 PM	2:00 PM	-	-	-	-	-	-	-	-	5:00 PM	3:00 PM	5:00 PM	3:00 PM
Volume	408	332	383	328	406	299	-	-	-	-	-	-	-	-	394.0	313.3	394.0	313.3

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Holden
Street : Route 31
Location : At Paxton Town Line

Site: 2013057

Weekly Volume

Interval Start	Mon 5/6/2013		Tue 5/7/2013		Wed 5/8/2013		Thu 5/9/2013		Fri 5/10/2013		Sat 5/11/2013		Sun 5/12/2013		Mon - Fri Average		Weekly Average	
	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	-	-	3	12	7	7	5	13	-	-	-	-	-	-	5.0	10.7	5.0	10.7
1:00 AM	-	-	2	8	3	7	4	9	-	-	-	-	-	-	3.0	8.0	3.0	8.0
2:00 AM	-	-	2	4	4	3	2	4	-	-	-	-	-	-	2.7	3.7	2.7	3.7
3:00 AM	-	-	7	1	7	3	8	2	-	-	-	-	-	-	7.3	2.0	7.3	2.0
4:00 AM	-	-	16	4	16	5	19	8	-	-	-	-	-	-	17.0	5.7	17.0	5.7
5:00 AM	-	-	69	24	71	21	63	24	-	-	-	-	-	-	67.7	23.0	67.7	23.0
6:00 AM	-	-	205	57	223	65	220	62	-	-	-	-	-	-	216.0	61.3	216.0	61.3
7:00 AM	-	-	381	133	361	131	368	143	-	-	-	-	-	-	370.0	135.7	370.0	135.7
8:00 AM	-	-	229	143	261	165	238	132	-	-	-	-	-	-	242.7	146.7	242.7	146.7
9:00 AM	-	-	173	130	136	127	158	128	-	-	-	-	-	-	155.7	128.3	155.7	128.3
10:00 AM	-	-	123	115	116	108	-	-	-	-	-	-	-	-	119.5	111.5	119.5	111.5
11:00 AM	-	-	134	137	146	135	-	-	-	-	-	-	-	-	140.0	136.0	140.0	136.0
12:00 PM	-	-	127	139	160	151	-	-	-	-	-	-	-	-	143.5	145.0	143.5	145.0
1:00 PM	172	127	169	169	171	148	-	-	-	-	-	-	-	-	170.7	148.0	170.7	148.0
2:00 PM	165	231	151	221	193	203	-	-	-	-	-	-	-	-	169.7	218.3	169.7	218.3
3:00 PM	226	269	191	244	207	267	-	-	-	-	-	-	-	-	208.0	260.0	208.0	260.0
4:00 PM	184	324	190	325	176	329	-	-	-	-	-	-	-	-	183.3	326.0	183.3	326.0
5:00 PM	153	326	208	325	179	329	-	-	-	-	-	-	-	-	180.0	326.7	180.0	326.7
6:00 PM	105	215	144	238	130	235	-	-	-	-	-	-	-	-	126.3	229.3	126.3	229.3
7:00 PM	97	133	106	145	84	125	-	-	-	-	-	-	-	-	95.7	134.3	95.7	134.3
8:00 PM	99	80	74	128	54	99	-	-	-	-	-	-	-	-	75.7	102.3	75.7	102.3
9:00 PM	43	69	61	91	48	46	-	-	-	-	-	-	-	-	50.7	68.7	50.7	68.7
10:00 PM	14	24	22	41	24	36	-	-	-	-	-	-	-	-	20.0	33.7	20.0	33.7
11:00 PM	14	22	11	31	16	34	-	-	-	-	-	-	-	-	13.7	29.0	13.7	29.0
Totals	1272	1820	2798	2865	2793	2779	1085	525	0	0	0	0	0	0	2783.7	2793.8	2783.7	2793.8
Combined	3092		5663		5572		1610		0		0		0		5577.5		5577.5	
Split (%)	41.1	58.9	49.4	50.6	50.1	49.9	67.4	32.6	-	-	-	-	-	-	49.9	50.1	49.9	50.1

Peak Hours

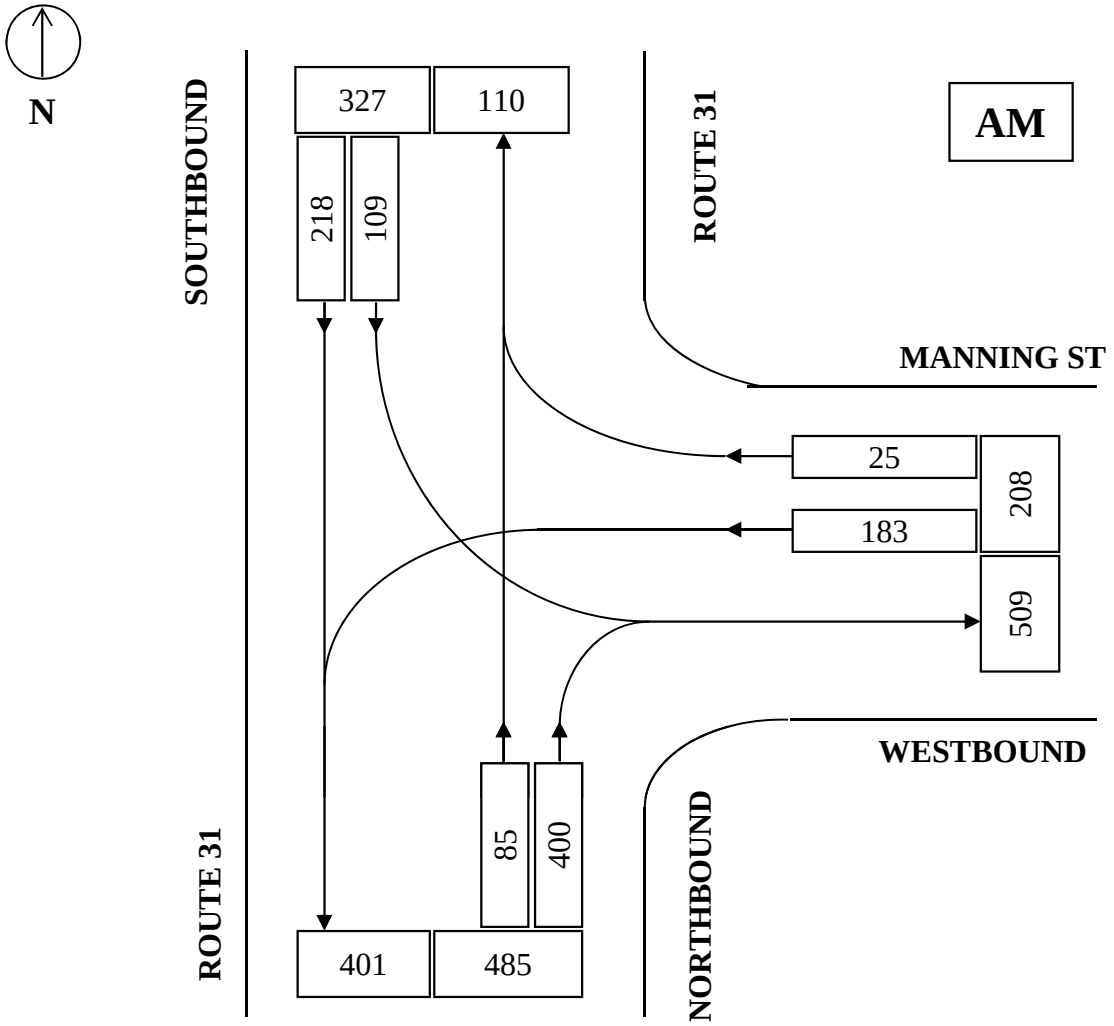
12:00 AM - 12:00 PM	-	-	7:00 AM	8:00 AM	7:00 AM	8:00 AM	7:00 AM	7:00 AM	-	-	-	-	-	-	7:00 AM	8:00 AM	7:00 AM	8:00 AM
Volume	-	-	381	143	361	165	368	143	-	-	-	-	-	-	370.0	146.7	370.0	146.7
12:00 PM - 12:00 AM	3:00 PM	5:00 PM	5:00 PM	4:00 PM	3:00 PM	4:00 PM	-	-	-	-	-	-	-	-	3:00 PM	5:00 PM	3:00 PM	5:00 PM
Volume	226	326	208	325	207	329	-	-	-	-	-	-	-	-	208.0	326.7	208.0	326.7

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Holden **DATE:** 5/9/2013 **DAY OF WEEK:** Thursday

INTERSECTION: Route 31 / Manning Street



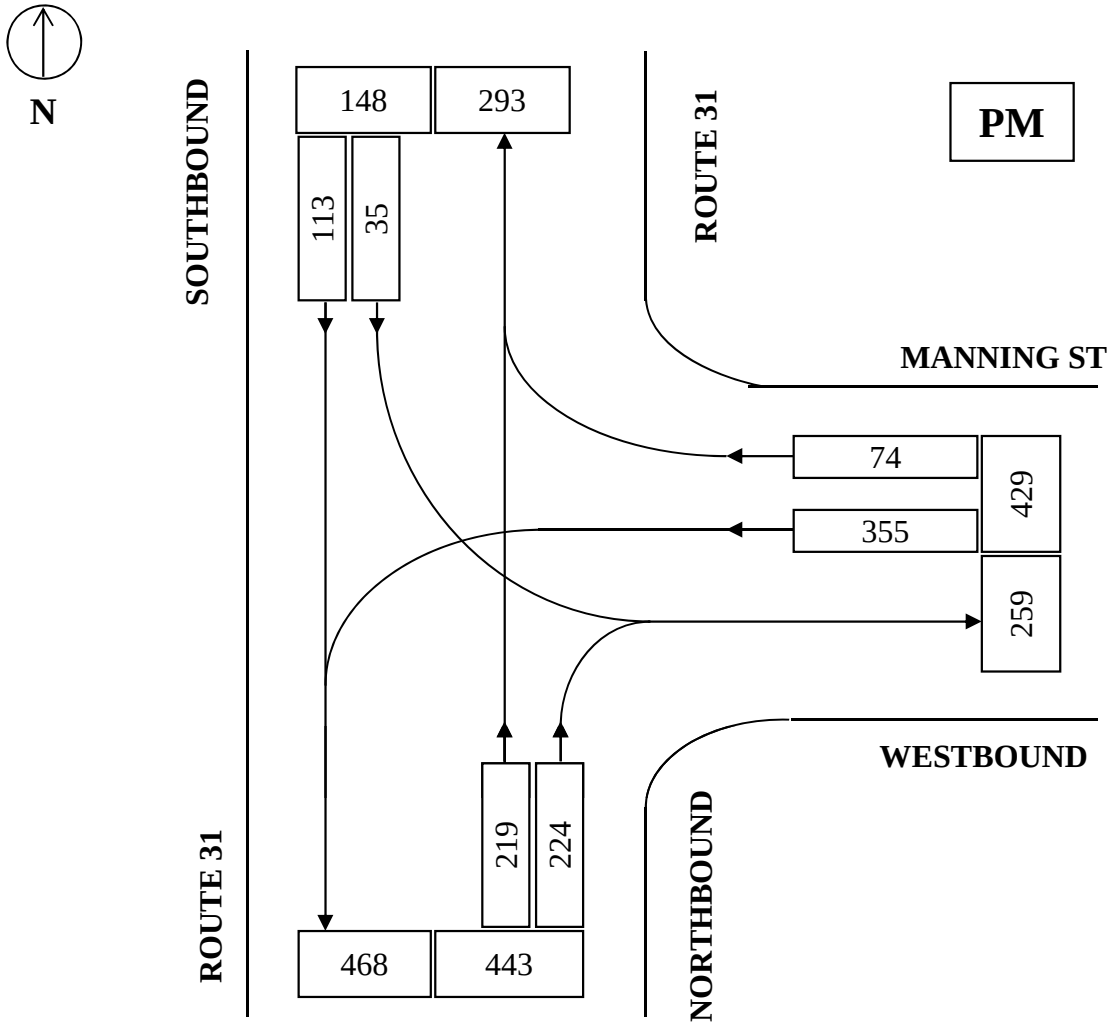
STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:00 - 8:00 AM
Manning St WB	208	20.4%	
			PHF = .93
Route 31 NB	485	47.5%	
			VEHICLES COUNTED
Route 31 SB	327	32.1%	
			ALL VEHICLES: 1020
TOTAL	1020	100.00%	**TRUCKS:** 49
			PERCENT TRUCKS: 4.80%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Holden **DATE:** 5/9/2013 **DAY OF WEEK:** Thursday

INTERSECTION: Route 31 / Manning Street



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:15 - 5:15 PM
Manning St WB	429	42.1%	
			PHF = .96
Route 31 NB	443	43.4%	
			VEHICLES COUNTED
Route 31 SB	148	14.5%	
			ALL VEHICLES: 1020
TOTAL	1020	100.00%	**TRUCKS:** 26
			PERCENT TRUCKS: 2.55%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Holden

DATE: 5/9/2013

LOCATION: Route 31 / Manning Street

DAY OF WEEK: Thursday

WEATHER: AM: Cloudy PM: Rainy

TECHNICIAN: RR

Time Period					Manning St WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15					65	0	7	2	0	17	98	6	30	56	0	6	273	
7:15 - 7:30					39	0	11	2	0	27	99	7	24	50	0	1	250	
7:30 - 7:45					38	0	6	9	0	22	119	2	29	49	0	3	263	
7:45 - 8:00					41	0	1	3	0	19	84	6	26	63	0	2	234	1020
8:00 - 8:15					30	0	5	5	0	19	90	4	22	48	0	5	214	961
8:15 - 8:30					45	0	9	6	0	7	54	5	14	46	0	3	175	886
8:30 - 8:45					41	0	12	6	0	10	73	7	11	50	0	5	197	820
8:45 - 9:00					38	0	8	7	0	26	50	6	8	45	0	2	175	761
TOTAL	0	0	0	0	337	0	59	40	0	147	667	43	164	407	0	27	1781	

EBPct 0.0 **WBPct** 20.4 **NBPct** 47.5 **SBPct** 32.1

Peak Sums:	**0**	**0**	**0**	**0**	**183**	**0**	**25**	**16**	**0**	**85**	**400**	**21**	**109**	**218**	**0**	**12**	**1020**

Total Trucks 49 **TrkPct** 4.80 **PHF** 0.93

Time Period					Manning St WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15					71	0	11	1	0	53	76	5	13	28	0	2	252	
4:15 - 4:30					77	0	18	2	0	54	58	4	15	26	0	1	248	
4:30 - 4:45					98	0	16	1	0	53	60	2	7	32	0	3	266	
4:45 - 5:00					96	0	16	2	0	55	54	7	5	22	0	1	248	1014
5:00 - 5:15					84	0	24	1	0	57	52	0	8	33	0	2	258	1020
5:15 - 5:30					93	0	16	1	0	40	52	1	12	30	0	0	243	1015
5:30 - 5:45					101	0	24	2	0	47	28	3	10	32	0	1	242	991
5:45 - 6:00					87	0	21	2	0	38	28	1	6	20	0	0	200	943
TOTAL	0	0	0	0	707	0	146	12	0	397	408	23	76	223	0	10	1957	

EBPct 0.0 **WBPct** 42.1 **NBPct** 43.4 **SBPct** 14.5

Peak Sums:	**0**	**0**	**0**	**0**	**355**	**0**	**74**	**6**	**0**	**219**	**224**	**13**	**35**	**113**	**0**	**7**	**1020**

Total Trucks 26 **TrkPct** 2.55 **PHF** 0.96

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/17/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/Manning St
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Manning St
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		85	400	109	218	
Peak-Hour Factor, PHF		0.93	0.93	0.93	0.93	
Hourly Flow Rate, HFR		91	430	117	234	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	183		25			
Peak Hour Factor, PHF	0.93		0.93			
Hourly Flow Rate, HFR	196		26			
Percent Heavy Vehicles	5		5			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes		0	0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		117		222				
C(m) (vph)		1040		344				
v/c		0.11		0.65				
95% queue length		0.38		4.27				
Control Delay		8.9		32.7				
LOS		A		D				
Approach Delay				32.7				
Approach LOS				D				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/17/2013
Analysis Time Period: 4:15 - 5:15 PM
Intersection: Route 31/Manning St
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Manning St
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		219	224	35	113	
Peak-Hour Factor, PHF		0.96	0.96	0.96	0.96	
Hourly Flow Rate, HFR		228	233	36	117	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	355		74			
Peak Hour Factor, PHF	0.96		0.96			
Hourly Flow Rate, HFR	369		77			
Percent Heavy Vehicles	3		3			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0	0				
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		36		446				
C(m) (vph)		1095		515				
v/c		0.03		0.87				
95% queue length		0.10		9.32				
Control Delay		8.4		42.1				
LOS		A		E				
Approach Delay				42.1				
Approach LOS				E				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/17/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/Manning St
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Manning St
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		94	442	120	241	
Peak-Hour Factor, PHF		0.93	0.93	0.93	0.93	
Hourly Flow Rate, HFR		101	475	129	259	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	202		28			
Peak Hour Factor, PHF	0.93		0.93			
Hourly Flow Rate, HFR	217		30			
Percent Heavy Vehicles	6		6			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes		0	0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		129		247				
C(m) (vph)		987		303				
v/c		0.13		0.82				
95% queue length		0.45		6.74				
Control Delay		9.2		53.3				
LOS		A		F				
Approach Delay				53.3				
Approach LOS				F				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/17/2013
Analysis Time Period: 4:15 - 5:15 PM
Intersection: Route 31/Manning St
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Manning St
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		242	247	39		
Peak-Hour Factor, PHF		0.96	0.96	0.96	0.96	
Hourly Flow Rate, HFR		252	257	40	117	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	392		82			
Peak Hour Factor, PHF	0.96		0.96			
Hourly Flow Rate, HFR	408		85			
Percent Heavy Vehicles	4		4			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0	0				
Configuration		LR				

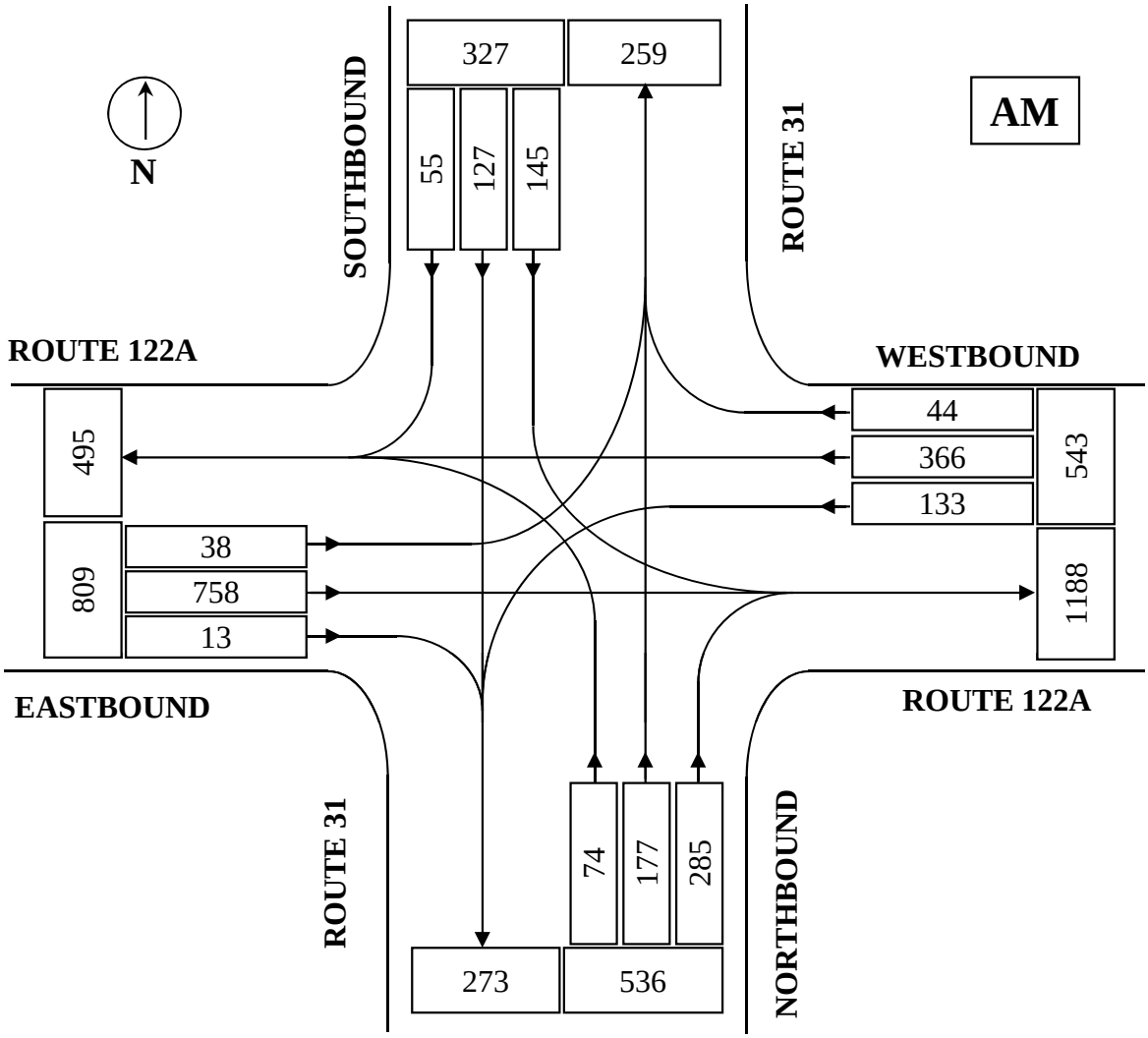
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		40		493				
C(m) (vph)		1046		483				
v/c		0.04		1.02				
95% queue length		0.12		14.24				
Control Delay		8.6		75.8				
LOS		A		F				
Approach Delay				75.8				
Approach LOS				F				

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Holden **DATE:** 5/16/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Route 122A

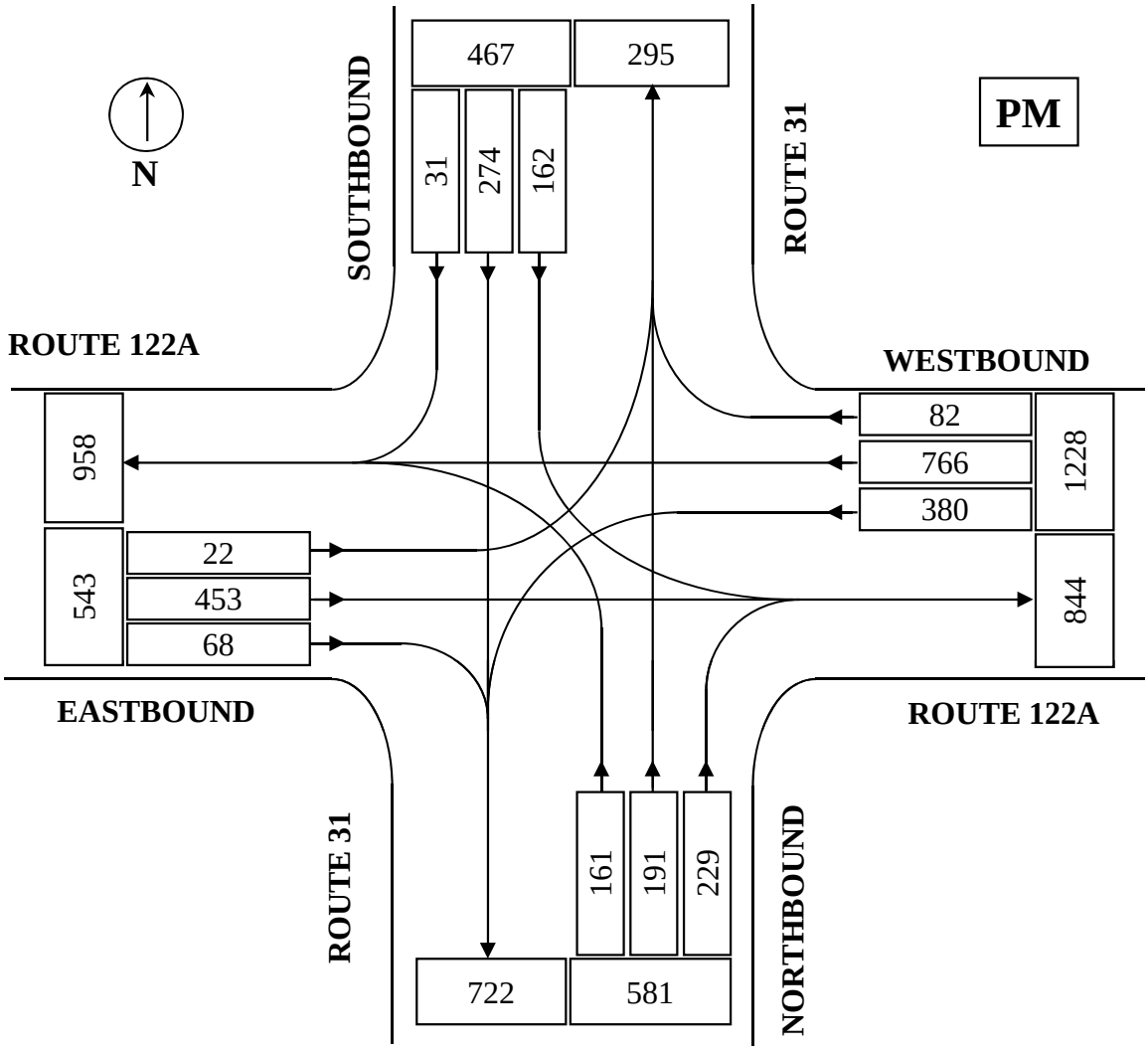


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 122A EB	809	36.5%	7:00 - 8:00 AM
Route 122A WB	543	24.5%	PHF = .94
Route 31 NB	536	24.2%	**VEHICLES COUNTED**
Route 31 SB	327	14.8%	**ALL VEHICLES:** 2215
TOTAL	2215	100.0%	**TRUCKS:** 126
			PERCENT TRUCKS: 5.69%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Holden **DATE:** 5/16/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Route 122A



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 122A EB	543	19.3%	4:45 - 5:45 PM
Route 122A WB	1228	43.5%	PHF = .99
Route 31 NB	581	20.6%	**VEHICLES COUNTED**
Route 31 SB	467	16.6%	**ALL VEHICLES:** 2819
TOTAL	2819	100.0%	**TRUCKS:** 31
			PERCENT TRUCKS: 1.10%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Holden

DATE: 5/16/2013

LOCATION: Route 31 / Route 122A

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

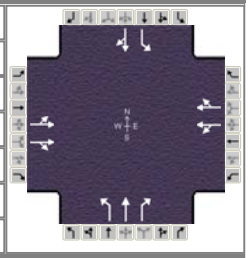
TECHNICIAN: RR

Time Period	Route 122A EB				Route 122A WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	15	176	1	14	22	124	8	13	31	33	80	7	39	26	33	9	588	
7:15 - 7:30	12	186	1	13	20	101	5	14	16	54	80	4	34	33	11	3	553	
7:30 - 7:45	3	200	4	10	39	63	19	4	8	45	69	3	36	26	7	4	519	
7:45 - 8:00	8	196	7	10	52	78	12	13	19	45	56	3	36	42	4	2	555	2215
8:00 - 8:15	3	179	6	6	57	86	18	20	16	50	81	3	35	27	11	0	569	2196
8:15 - 8:30	7	173	7	18	37	78	16	15	13	38	64	7	41	21	11	3	506	2149
8:30 - 8:45	4	169	6	12	42	75	9	9	14	47	86	6	30	26	8	6	516	2146
8:45 - 9:00	6	175	9	12	42	73	13	15	21	37	82	4	61	24	11	7	554	2145
TOTAL	58	1454	41	95	311	678	100	103	138	349	598	37	312	225	96	34	4360	
		EBPct	36.5			**WBPct**	24.5			**NBPct**	24.2			**SBPct**	14.8			
Peak Sums:	**38**	**758**	**13**	**47**	**133**	**366**	**44**	**44**	**74**	**177**	**285**	**17**	**145**	**127**	**55**	**18**	**2215**	
Total Trucks	126					**TrkPct**	5.69			**PHF**	0.94							

Time Period	Route 122A EB				Route 122A WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	6	90	11	5	100	174	18	9	42	42	67	3	30	68	7	4	655	
4:15 - 4:30	7	127	19	3	83	184	11	8	44	51	62	3	40	62	10	3	700	
4:30 - 4:45	4	110	21	0	79	194	22	3	37	56	48	6	43	59	9	2	682	
4:45 - 5:00	4	104	17	1	116	185	13	6	33	48	66	2	42	66	11	3	705	2742
5:00 - 5:15	6	115	18	2	92	212	20	3	40	48	55	0	36	66	7	2	715	2802
5:15 - 5:30	5	121	18	3	98	177	21	5	45	61	54	1	35	69	6	0	710	2812
5:30 - 5:45	7	113	15	0	74	192	28	0	43	34	54	2	49	73	7	1	689	2819
5:45 - 6:00	7	106	18	2	74	154	24	2	32	59	41	1	46	55	11	2	627	2741
TOTAL	46	886	137	16	716	1472	157	36	316	399	447	18	321	518	68	17	5483	
		EBPct	19.3			**WBPct**	43.6			**NBPct**	20.6			**SBPct**	16.6			
Peak Sums:	**22**	**453**	**68**	**6**	**380**	**766**	**82**	**14**	**161**	**191**	**229**	**5**	**162**	**274**	**31**	**6**	**2819**	
Total Trucks	31					**TrkPct**	1.10			**PHF**	0.99							

HCS 2010 Signalized Intersection Results Summary

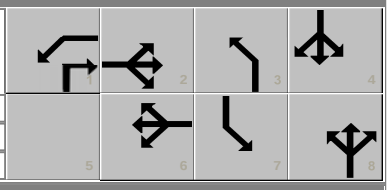
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	5/23/2013	Area Type	Other
Jurisdiction	Holden	Time Period	7:00 - 8:00 AM	PHF	0.94
Intersection	Route 122A/Route 31	Analysis Year	2013	Analysis Period	1> 7:00
File Name	13_Route 122A & Route 31_AM.xus				
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	38	758	13	133	366	44	74	177	285	145	127	55

Signal Information			
Cycle, s	117.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.0	56.0	14.0	19.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6	3	8	7	4
Case Number		8.3	0.0	14.0	1.1	3.0	1.1	4.0
Phase Duration, s		61.0	13.0	74.0	19.0	24.0	19.0	24.0
Change Period, ($Y+R_c$), s		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.3	0.0	3.3	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		23.3		17.9	6.1	21.0	10.3	14.2
Green Extension Time (g_e), s		3.7	0.0	3.7	0.1	0.0	0.1	0.8
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.00		0.00	0.00	1.00	0.55	0.46

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	440		420	172		402	79	188	286	154	188	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1692		1622	574		1618	1707	1792	1519	1707	1706	
Queue Service Time (g_s), s	3.0		21.3	5.3		15.9	4.1	11.5	19.0	8.3	12.2	
Cycle Queue Clearance Time (g_c), s	20.2		21.3	5.3		15.9	4.1	11.5	19.0	8.3	12.2	
Green Ratio (*g/C*)	0.48		0.48	0.59		0.59	0.28	0.16	0.23	0.28	0.16	
Capacity (*c*), veh/h	843		776	395		954	313	291	351	307	277	
Volume-to-Capacity Ratio (*X*)	0.521		0.541	0.436		0.422	0.251	0.647	0.816	0.502	0.680	
Available Capacity (c_a), veh/h	843		776	395		954	313	291	351	307	277	
Back of Queue (*Q*), veh/ln (50th percentile)	8.1		7.9	2.0		5.5	1.7	5.4	9.0	3.5	5.5	
Queue Storage Ratio (*RQ*) (50th percentile)	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	21.1		21.5	14.7		13.1	32.5	45.9	42.7	34.1	46.1	
Incremental Delay (d_2), s/veh	0.3		0.4	0.3		0.1	0.2	3.9	13.1	0.5	5.5	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	21.4		21.9	15.0		13.2	32.7	49.7	55.7	34.6	51.6	
Level of Service (LOS)	C		C	B		B	C	D	E	C	D	
Approach Delay, s/veh / LOS	21.6	C		13.7	B		50.4	D		43.9	D	
Intersection Delay, s/veh / LOS	29.8						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.3	B	2.7	B	2.7	B
Bicycle LOS Score / LOS	1.2	A	1.0	A	1.4	A	1.1	A

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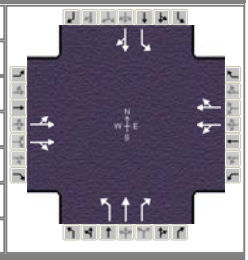
HCS 2010 Signalized Intersection Results Summary

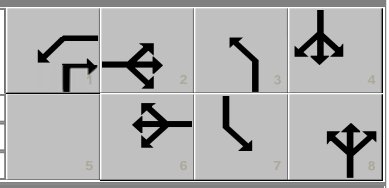
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	5/23/2013	Area Type	Other
Jurisdiction	Holden	Time Period	4:45 - 5:45 PM	PHF	0.99
Intersection	Route 122A/Route 31	Analysis Year	2013	Analysis Period	1> 7:00
File Name	13_Route 122A & Route 31_PM.xus				
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	22	453	68	380	766	82	161	191	229	162	274	31

Signal Information			
Cycle, s	117.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.0	53.0	15.0	20.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6	3	8	7	4
Case Number		8.3	0.0	14.0	1.1	3.0	1.1	4.0
Phase Duration, s		58.0	14.0	72.0	20.0	25.0	20.0	25.0
Change Period, ($Y+R_c$), s		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4	0.0	3.4	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		35.9		63.9	10.2	15.7	10.2	21.0
Green Extension Time (g_e), s		5.0	0.0	0.0	0.1	0.7	0.1	0.0
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.18		1.00	0.16	0.59	0.17	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	243		304	426		812	163	193	215	164	303	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1298		1646	782		1704	1792	1881	1594	1792	1852	
Queue Service Time (g_s), s	2.4		14.5	9.0		45.4	8.2	11.1	13.7	8.2	19.0	
Cycle Queue Clearance Time (g_c), s	33.9		14.5	61.9		45.4	8.2	11.1	13.7	8.2	19.0	
Green Ratio (*g/C*)	0.45		0.45	0.57		0.57	0.30	0.17	0.25	0.30	0.17	
Capacity (*c*), veh/h	622		746	506		976	291	322	395	349	317	
Volume-to-Capacity Ratio (*X*)	0.391		0.408	0.841		0.832	0.558	0.600	0.544	0.468	0.957	
Available Capacity (c_a), veh/h	622		746	506		976	291	322	395	349	317	
Back of Queue (*Q*), veh/ln (50th percentile)	4.1		5.5	7.9		18.3	3.6	5.3	5.4	3.6	12.0	
Queue Storage Ratio (*RQ*) (50th percentile)	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	21.0		21.5	24.0		20.4	33.3	44.8	38.3	32.5	48.1	
Incremental Delay (d_2), s/veh	0.1		0.1	11.5		5.8	1.5	2.2	0.9	0.4	38.8	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	21.1		21.6	35.5		26.2	34.8	47.0	39.1	32.9	86.9	
Level of Service (LOS)	C		C	D		C	C	D	D	C	F	
Approach Delay, s/veh / LOS	21.4	C		29.4	C		40.5	D		67.9	E	
Intersection Delay, s/veh / LOS	36.5						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.3	B	2.7	B	2.7	B
Bicycle LOS Score / LOS	0.9	A	1.5	A	1.4	A	1.3	A

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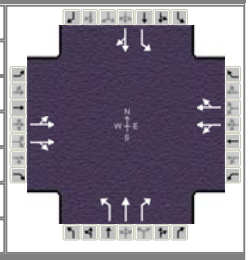
HCS 2010 Signalized Intersection Results Summary

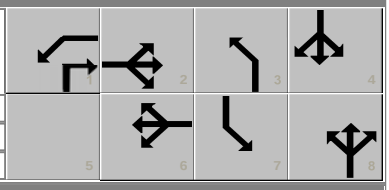
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	5/23/2013	Area Type	Other
Jurisdiction	Holden	Time Period	7:00 - 8:00 AM	PHF	0.94
Intersection	Route 122A/Route 31	Analysis Year	2013	Analysis Period	1> 7:00
File Name	13_Route 122A & Route 31_AM_Proj2023.xus				
Project Description	Projected 2023				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	44	837	14	149	404	57	84	210	324	164	145	63

Signal Information			
Cycle, s	117.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	8.0	56.0	14.0	19.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6	3	8	7	4
Case Number		8.3	0.0	14.0	1.1	3.0	1.1	4.0
Phase Duration, s		61.0	13.0	74.0	19.0	24.0	19.0	24.0
Change Period, ($Y+R_c$), s		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4	0.0	3.4	3.1	3.2	3.1	3.2
Queue Clearance Time (g_s), s		27.0		22.0	6.7	21.0	11.7	16.4
Green Extension Time (g_e), s		4.4	0.0	4.5	0.1	0.0	0.1	0.6
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		0.02		0.01	0.00	1.00	1.00	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	483		468	175		471	89	223	328	174	216	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1655		1607	483		1599	1691	1776	1505	1691	1689	
Queue Service Time (g_s), s	9.0		25.0	5.5		20.0	4.7	14.1	19.0	9.7	14.4	
Cycle Queue Clearance Time (g_c), s	24.0		25.0	5.5		20.0	4.7	14.1	19.0	9.7	14.4	
Green Ratio (*g/C*)	0.48		0.48	0.59		0.59	0.28	0.16	0.23	0.28	0.16	
Capacity (*c*), veh/h	826		769	343		943	289	288	347	284	274	
Volume-to-Capacity Ratio (*X*)	0.585		0.608	0.510		0.499	0.309	0.775	0.944	0.614	0.787	
Available Capacity (c_a), veh/h	826		769	343		943	289	288	347	284	274	
Back of Queue (*Q*), veh/ln (50th percentile)	9.4		9.3	2.0		6.9	1.9	7.1	12.4	4.2	7.0	
Queue Storage Ratio (*RQ*) (50th percentile)	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	22.0		22.4	16.3		14.0	33.1	46.9	44.3	35.0	47.1	
Incremental Delay (d_2), s/veh	0.7		1.0	0.5		0.2	0.2	11.3	33.5	2.9	13.0	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	22.7		23.4	16.8		14.1	33.3	58.3	77.7	37.9	60.1	
Level of Service (LOS)	C		C	B		B	C	E	E	D	E	
Approach Delay, s/veh / LOS	23.0	C		14.8	B		64.7	E		50.2	D	
Intersection Delay, s/veh / LOS	35.2						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.3	B	2.7	B	2.7	B
Bicycle LOS Score / LOS	1.3	A	1.0	A	1.5	A	1.1	A

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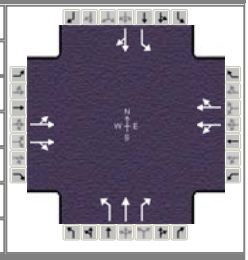
HCS 2010 Signalized Intersection Results Summary

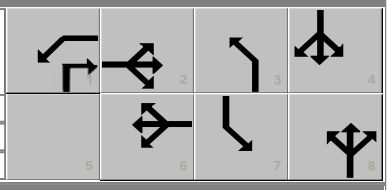
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	5/23/2013	Area Type	Other
Jurisdiction	Holden	Time Period	4:45 - 5:45 PM	PHF	0.99
Intersection	Route 122A/Route 31	Analysis Year	2013	Analysis Period	1> 7:00
File Name	13_Route 122A & Route 31_PM_Proj2023.xus				
Project Description	Projected 2023				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	25	500	77	427	846	95	180	224	256	188	323	36

Signal Information			
Cycle, s	117.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	9.0	53.0	15.0	20.0	0.0	0.0
Yellow	4.0	4.0	4.0	4.0	0.0	0.0
Red	1.0	1.0	1.0	1.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6	3	8	7	4
Case Number		8.3	0.0	14.0	1.1	3.0	1.1	4.0
Phase Duration, s		58.0	14.0	72.0	20.0	25.0	20.0	25.0
Change Period, ($Y+R_c$), s		5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Allow Headway (*MAH*), s		3.4	0.0	3.4	3.1	3.1	3.1	3.1
Queue Clearance Time (g_s), s		55.0		69.0	11.4	18.0	11.8	22.0
Green Extension Time (g_e), s		0.0	0.0	0.0	0.1	0.5	0.1	0.0
Phase Call Probability		1.00		1.00	1.00	1.00	1.00	1.00
Max Out Probability		1.00		1.00	0.58	1.00	0.95	1.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	78		529	431		947	182	226	242	190	358	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	210		1652	524		1688	1774	1863	1579	1774	1834	
Queue Service Time (g_s), s	3.0		30.2	9.0		64.0	9.4	13.4	16.0	9.8	20.0	
Cycle Queue Clearance Time (g_c), s	53.0		30.2	67.0		64.0	9.4	13.4	16.0	9.8	20.0	
Green Ratio (*g/C*)	0.45		0.45	0.57		0.57	0.30	0.17	0.25	0.30	0.17	
Capacity (*c*), veh/h	136		748	361		967	289	318	391	325	313	
Volume-to-Capacity Ratio (*X*)	0.571		0.708	1.194		0.980	0.629	0.711	0.620	0.584	1.141	
Available Capacity (c_a), veh/h	136		748	361		967	289	318	391	325	313	
Back of Queue (*Q*), veh/ln (50th percentile)	1.3		12.0	17.3		29.8	4.2	6.7	6.3	4.3	17.2	
Queue Storage Ratio (*RQ*) (50th percentile)	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay (d_1), s/veh	27.9		25.8	29.7		24.4	33.7	45.8	39.1	33.5	48.5	
Incremental Delay (d_2), s/veh	3.7		2.6	111.2		24.1	3.3	6.2	2.2	1.8	94.5	
Initial Queue Delay (d_3), s/veh	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh	31.6		28.4	140.9		48.4	37.0	52.0	41.3	35.3	143.0	
Level of Service (LOS)	C		C	F		D	D	D	D	D	F	
Approach Delay, s/veh / LOS	28.8	C		77.3	E		43.8	D		105.6	F	
Intersection Delay, s/veh / LOS	66.1						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.4	B	2.3	B	2.7	B	2.7	B
Bicycle LOS Score / LOS	1.0	A	1.6	A	1.6	A	1.4	A

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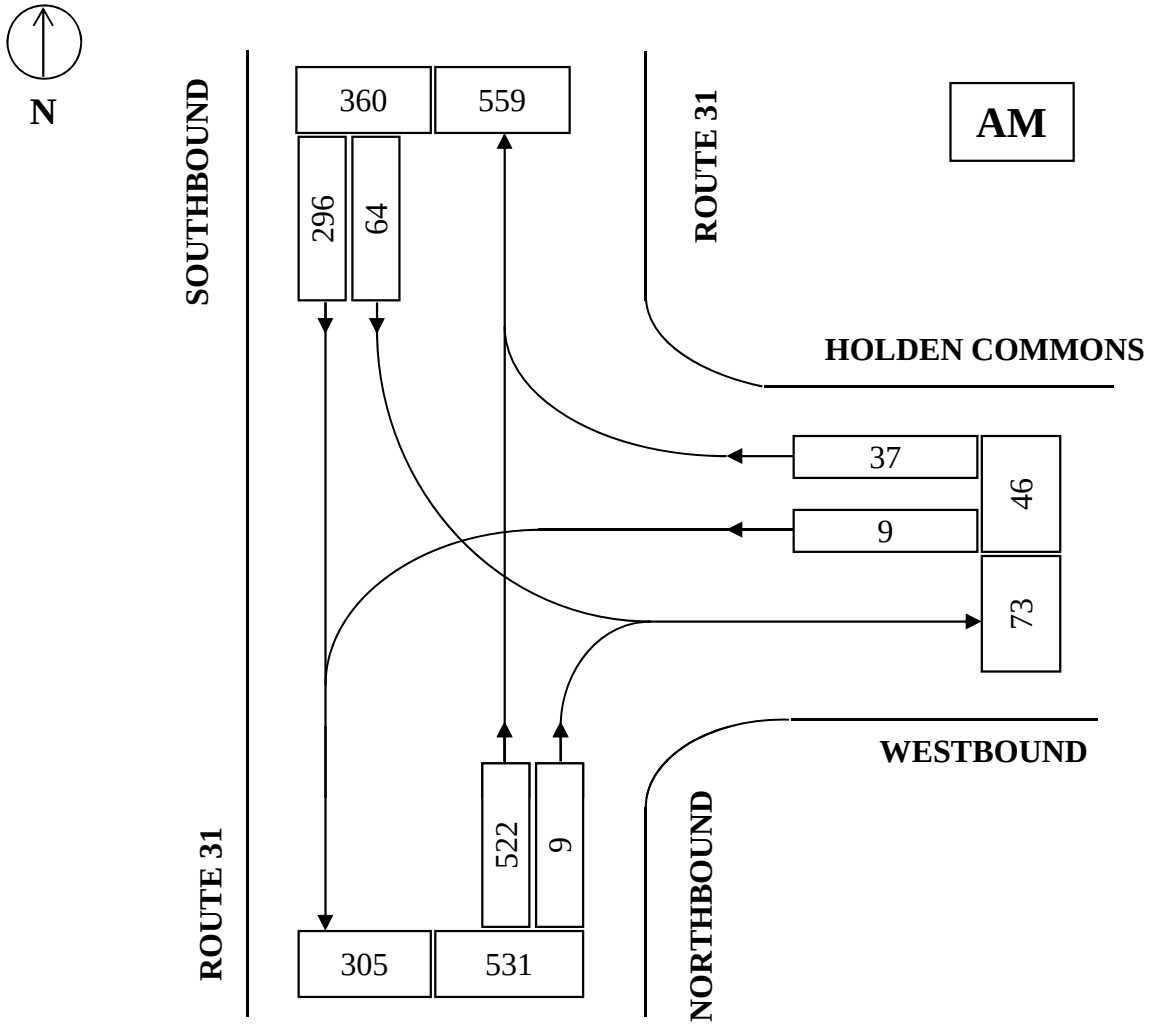
CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Holden **DATE:** 6/6/2013 **DAY OF WEEK:** Thursday

INTERSECTION: Route 31 / Holden Commons Shopping Center



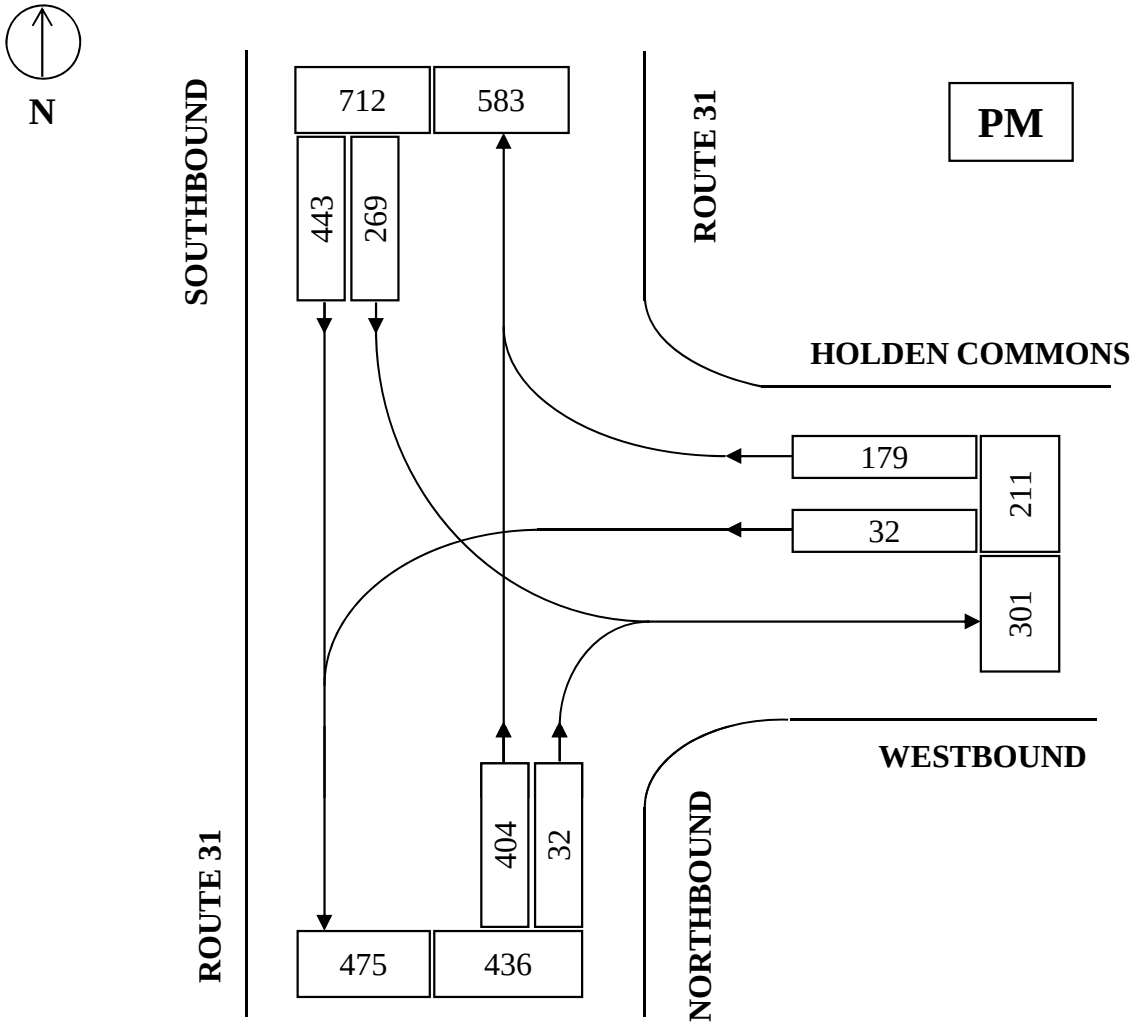
STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:15 - 8:15 AM
Holden Commons WB	46	4.9%	
			PHF = .86
Route 31 NB	531	56.7%	
			VEHICLES COUNTED
Route 31 SB	360	38.4%	
			ALL VEHICLES: 937
TOTAL	937	100.00%	**TRUCKS:** 23
			PERCENT TRUCKS: 2.45%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Holden **DATE:** 6/6/2013 **DAY OF WEEK:** Thursday

INTERSECTION: Route 31 / Holden Commons Shopping Center



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:15 - 5:15 PM
Holden Commons WB	211	15.5%	
			PHF = .96
Route 31 NB	436	32.1%	
			VEHICLES COUNTED
Route 31 SB	712	52.4%	
			ALL VEHICLES: 1359
TOTAL	1359	100.00%	**TRUCKS:** 14
			PERCENT TRUCKS: 1.03%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Holden

DATE: 6/6/2013

LOCATION: Route 31 / Holden Commons Shopping Center

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Cloudy

TECHNICIAN: RJ

Time Period					Holden Commons WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15					0	0	2	0	0	145	2	3	12	53	0	6	214	
7:15 - 7:30					3	0	7	2	0	132	1	1	11	57	0	2	211	
7:30 - 7:45					2	0	6	2	0	126	2	2	16	64	0	5	216	
7:45 - 8:00					3	0	13	0	0	138	1	1	27	89	0	1	271	912
8:00 - 8:15					1	0	11	0	0	126	5	2	10	86	0	5	239	937
8:15 - 8:30					2	0	15	1	0	99	6	3	20	69	0	4	211	937
8:30 - 8:45					2	0	8	1	0	106	7	6	19	54	0	3	196	917
8:45 - 9:00					4	0	16	0	0	106	4	5	26	58	0	6	214	860
TOTAL	0	0	0	0	17	0	78	6	0	978	28	23	141	530	0	32	1772	

EBPct 0.0 **WBPct** 4.9 **NBPct** 56.7 **SBPct** 38.4

Peak Sums:	**0**	**0**	**0**	**0**	**9**	**0**	**37**	**4**	**0**	**522**	**9**	**6**	**64**	**296**	**0**	**13**	**937**

Total Trucks 23 **TrkPct** 2.45 **PHF** 0.86

Time Period					Holden Commons WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15					5	0	48	0	0	108	7	4	68	108	0	6	344	
4:15 - 4:30					6	0	39	1	0	105	6	2	73	126	0	3	355	
4:30 - 4:45					8	0	53	2	0	96	5	2	72	102	0	2	336	
4:45 - 5:00					4	0	43	0	0	98	10	0	65	98	0	0	318	1353
5:00 - 5:15					14	0	44	0	0	105	11	0	59	117	0	2	350	1359
5:15 - 5:30					4	0	47	0	0	99	4	4	74	113	0	0	341	1345
5:30 - 5:45					5	0	46	0	0	99	5	0	73	106	0	0	334	1343
5:45 - 6:00					5	0	43	0	0	80	3	1	54	92	0	0	277	1302
TOTAL	0	0	0	0	51	0	363	3	0	790	51	13	538	862	0	13	2655	

EBPct 0.0 **WBPct** 15.5 **NBPct** 32.1 **SBPct** 52.4

Peak Sums:	**0**	**0**	**0**	**0**	**32**	**0**	**179**	**3**	**0**	**404**	**32**	**4**	**269**	**443**	**0**	**7**	**1359**

Total Trucks 14 **TrkPct** 1.03 **PHF** 0.96

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 7:15 - 8:15 AM
Intersection: Route 31/Holden Commons
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Holden Commons
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		522	9	64	296	
Peak-Hour Factor, PHF		0.86	0.86	0.86	0.86	
Hourly Flow Rate, HFR		606	10	74	344	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	9		37			
Peak Hour Factor, PHF	0.86		0.86			
Hourly Flow Rate, HFR	10		43			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes		1	1			
Configuration		L	R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L		R			
v (vph)		74	10		43			
C(m) (vph)		964	216		494			
v/c		0.08	0.05		0.09			
95% queue length		0.25	0.14		0.28			
Control Delay		9.0	22.5		13.0			
LOS		A	C		B			
Approach Delay				14.8				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 4:15 - 5:15 PM
Intersection: Route 31/Holden Commons
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Holden Commons
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		404	32	269	443	
Peak-Hour Factor, PHF		0.96	0.96	0.96	0.96	
Hourly Flow Rate, HFR		420	33	280	461	
Percent Heavy Vehicles		--	--	1	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	32		179			
Peak Hour Factor, PHF	0.96		0.96			
Hourly Flow Rate, HFR	33		186			
Percent Heavy Vehicles	1		1			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes		1	1			
Configuration		L	R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L		R			
v (vph)		280	33		186			
C(m) (vph)		1113	108		622			
v/c		0.25	0.31		0.30			
95% queue length		1.00	1.17		1.25			
Control Delay		9.3	52.4		13.2			
LOS		A	F		B			
Approach Delay				19.1				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 7:15 - 8:15 AM
Intersection: Route 31/Holden Commons
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Holden Commons
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		599	12	72	333	
Peak-Hour Factor, PHF		0.86	0.86	0.86	0.86	
Hourly Flow Rate, HFR		696	13	83	387	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	12		44			
Peak Hour Factor, PHF	0.86		0.86			
Hourly Flow Rate, HFR	13		51			
Percent Heavy Vehicles	3		3			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes		1	1			
Configuration		L	R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L		R			
v (vph)		83	13		51			
C(m) (vph)		885	171		436			
v/c		0.09	0.08		0.12			
95% queue length		0.31	0.24		0.39			
Control Delay		9.5	27.8		14.3			
LOS		A	D		B			
Approach Delay				17.1				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 4:15 - 5:15 PM
Intersection: Route 31/Holden Commons
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Holden Commons
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		461	38	303	512	
Peak-Hour Factor, PHF		0.96	0.96	0.96	0.96	
Hourly Flow Rate, HFR		480	39	315	533	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	40		201			
Peak Hour Factor, PHF	0.96		0.96			
Hourly Flow Rate, HFR	41		209			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			/
Lanes		1	1			
Configuration		L	R			

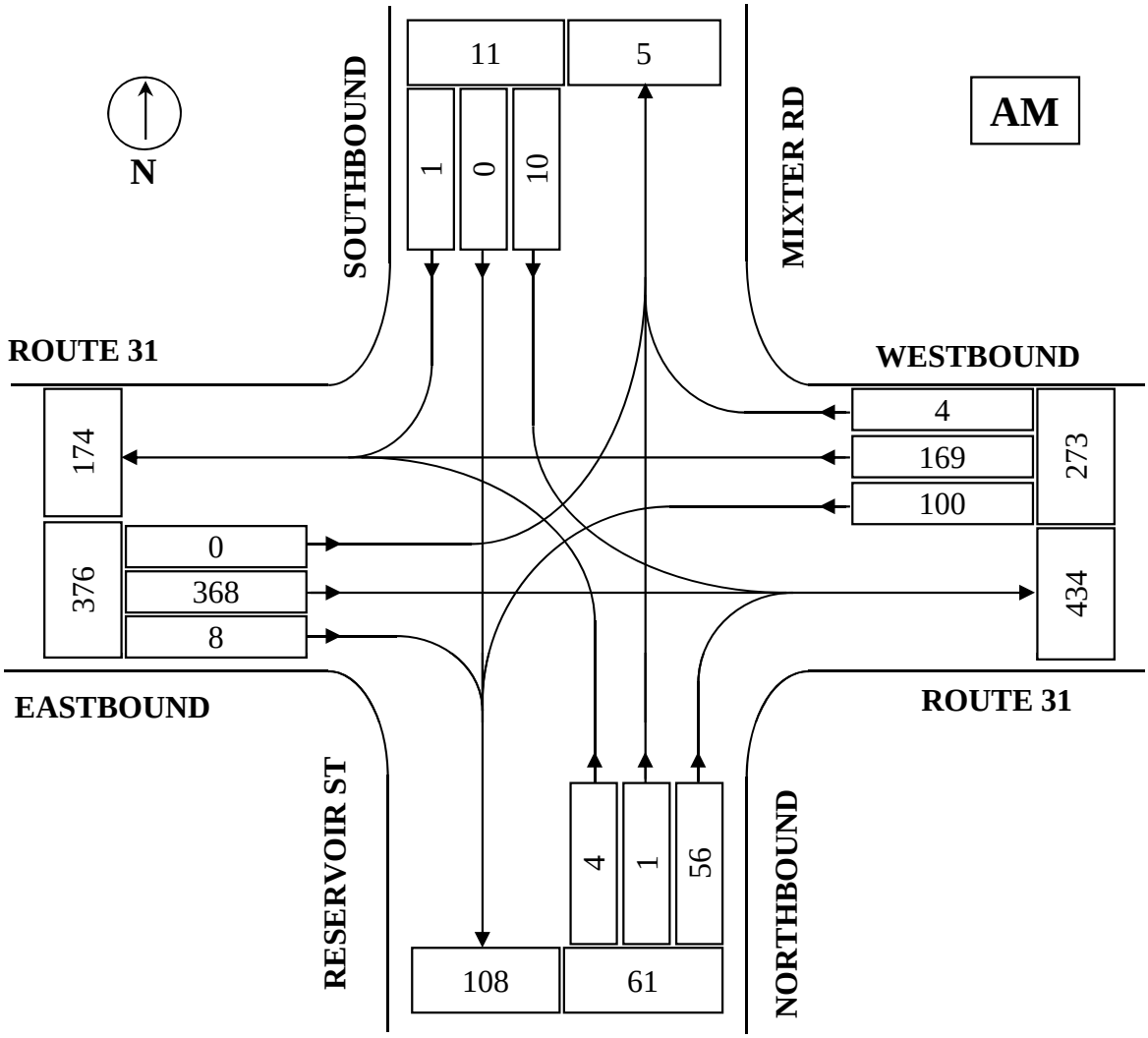
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT	L		R			
v (vph)		315	41		209			
C(m) (vph)		1047	75		571			
v/c		0.30	0.55		0.37			
95% queue length		1.27	2.33		1.67			
Control Delay		9.9	100.0		14.9			
LOS		A	F		B			
Approach Delay				28.9				
Approach LOS				D				

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Holden **DATE:** 5/23/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Reservoir Street / Mixter Road

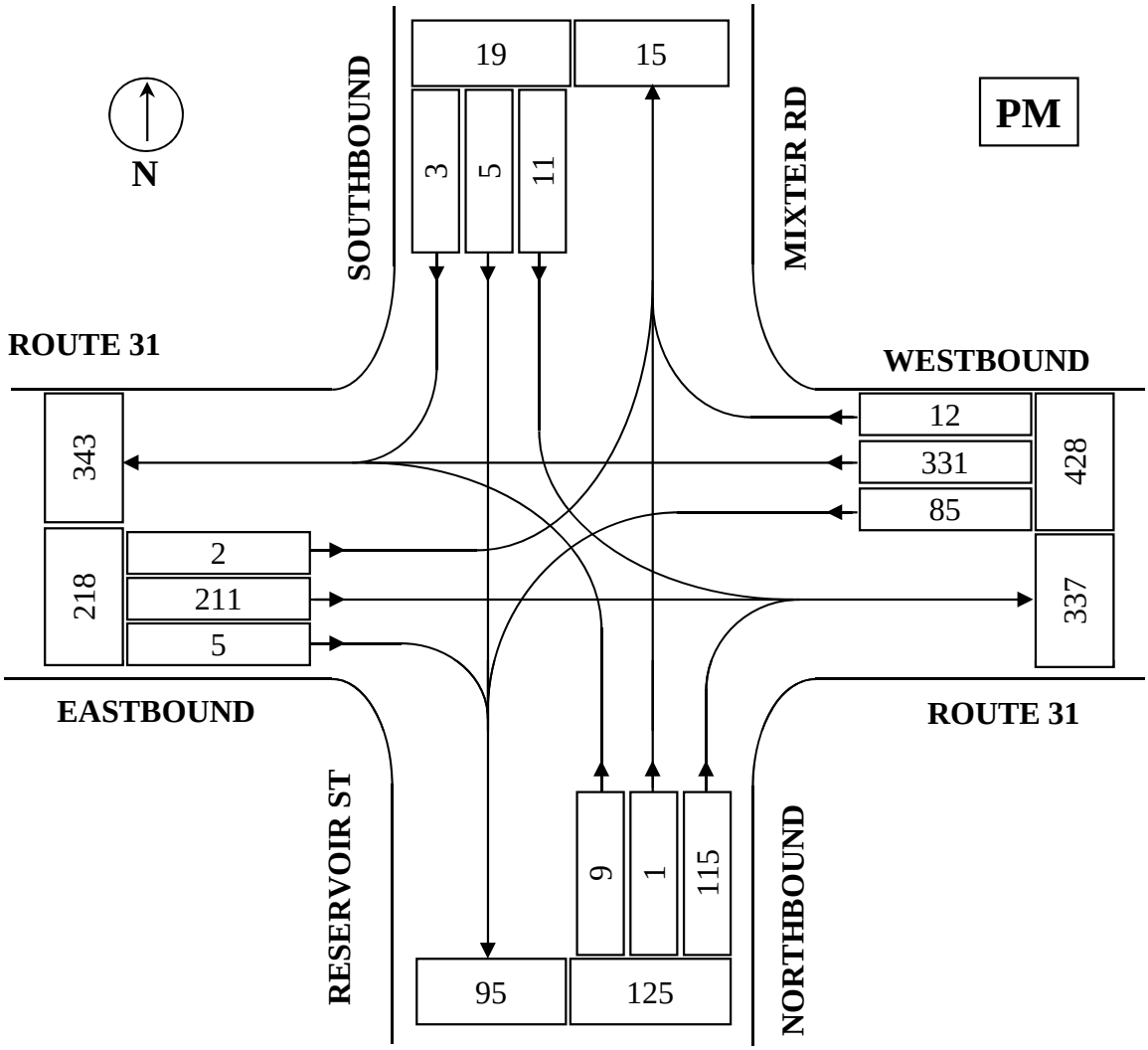


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 31 EB	376	52.1%	7:15 - 8:15 AM
Route 31 WB	273	37.9%	PHF = .95
Reservoir St NB	61	8.5%	VEHICLES COUNTED
Mixter Rd SB	11	1.5%	ALL VEHICLES: 721
TOTAL	721	100.0%	TRUCKS: 31
			PERCENT TRUCKS: 4.30%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Holden **DATE:** 5/23/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Reservoir Street / Mixter Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 31 EB	218	27.6%	4:45 - 5:45 PM
Route 31 WB	428	54.2%	PHF = .88
Reservoir St NB	125	15.8%	**VEHICLES COUNTED**
Mixter Rd SB	19	2.4%	**ALL VEHICLES:** 790
TOTAL	790	100.0%	**TRUCKS:** 12
			PERCENT TRUCKS: 1.52%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Holden

DATE: 5/23/2013

LOCATION: Route 31 / Reservoir Street / Mixter Road

DAY OF WEEK: Thursday

WEATHER: AM: Cloudy PM: Rainy

TECHNICIAN: RR

Time Period	Route 31 EB				Route 31 WB				Reservoir St NB				Mixter Rd SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	0	80	4	0	12	33	1	3	1	1	17	1	5	1	0	0	155	
7:15 - 7:30	0	105	1	3	14	33	0	3	1	0	13	1	3	0	0	0	170	
7:30 - 7:45	0	91	5	6	24	46	1	6	1	1	13	0	1	0	1	0	184	
7:45 - 8:00	0	98	1	4	29	43	2	2	2	0	11	0	4	0	0	0	190	699
8:00 - 8:15	0	74	1	1	33	47	1	4	0	0	19	1	2	0	0	0	177	721
8:15 - 8:30	1	67	2	4	21	42	2	3	2	0	11	1	3	0	3	0	154	705
8:30 - 8:45	0	47	1	3	24	39	0	4	0	1	12	1	4	0	0	0	128	649
8:45 - 9:00	0	62	2	1	18	25	0	3	2	0	30	1	2	1	0	0	142	601
TOTAL	1	624	17	22	175	308	7	28	9	3	126	6	24	2	4	0	1300	
		EBPct	52.1			**WBPct**	37.9			**NBPct**	8.5			**SBPct**	1.5			
Peak Sums:	**0**	**368**	**8**	**14**	**100**	**169**	**4**	**15**	**4**	**1**	**56**	**2**	**10**	**0**	**1**	**0**	**721**	
Total Trucks	31					**TrkPct**	4.30			**PHF**	0.95							

Time Period	Route 31 EB				Route 31 WB				Reservoir St NB				Mixter Rd SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	0	39	1	1	23	92	3	7	2	2	27	1	1	2	2	0	194	
4:15 - 4:30	2	42	1	0	21	68	2	2	0	1	30	0	1	0	0	0	168	
4:30 - 4:45	0	36	3	2	16	86	5	3	2	1	26	0	1	1	0	0	177	
4:45 - 5:00	1	58	1	2	22	83	7	1	3	0	43	1	4	1	1	0	224	763
5:00 - 5:15	0	44	1	0	25	94	1	4	3	0	24	0	4	1	1	0	198	767
5:15 - 5:30	1	53	3	1	16	78	3	0	0	1	25	0	2	3	0	0	185	784
5:30 - 5:45	0	56	0	3	22	76	1	0	3	0	23	0	1	0	1	0	183	790
5:45 - 6:00	0	43	3	1	13	78	1	0	1	0	21	0	3	0	0	0	163	729
TOTAL	4	371	13	10	158	655	23	17	14	5	219	2	17	8	5	0	1492	
		EBPct	27.6			**WBPct**	54.2			**NBPct**	15.8			**SBPct**	2.4			
Peak Sums:	**2**	**211**	**5**	**6**	**85**	**331**	**12**	**5**	**9**	**1**	**115**	**1**	**11**	**5**	**3**	**0**	**790**	
Total Trucks	12					**TrkPct**	1.52			**PHF**	0.88							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/24/2013
Analysis Time Period: 7:15 - 8:15 AM
Intersection: Rte 31/Reservoir St/Mixter Rd
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Route 31
North/South Street: Reservoir St/Mixter Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	368	8	100	169	4
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	387	8	105	177	4
Percent Heavy Vehicles	4	--	--	4	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4	1	56	10	0	1
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	4	1	58	10	0	1
Percent Heavy Vehicles	1	1	1	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	105		63			11	
C(m) (vph)	1382	1153		599			269	
v/c	0.00	0.09		0.11			0.04	
95% queue length	0.00	0.30		0.35			0.13	
Control Delay	7.6	8.4		11.7			19.0	
LOS	A	A		B			C	
Approach Delay				11.7			19.0	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/24/2013
Analysis Time Period: 4:45 - 5:45 PM
Intersection: Rte 31/Reservoir St/Mixter Rd
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Route 31
North/South Street: Reservoir St/Mixter Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	211	5	85	331	12
Peak-Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR	2	239	5	96	376	13
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	9	1	115	11	5	3
Peak Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR	10	1	130	12	5	3
Percent Heavy Vehicles	1	1	1	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	2	96		141			20	
C(m) (vph)	1170	1322		692			249	
v/c	0.00	0.07		0.20			0.08	
95% queue length	0.01	0.23		0.76			0.26	
Control Delay	8.1	7.9		11.5			20.7	
LOS	A	A		B			C	
Approach Delay				11.5			20.7	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/24/2013
Analysis Time Period: 7:15 - 8:15 AM
Intersection: Rte 31/Reservoir St/Mixter Rd
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Route 31
North/South Street: Reservoir St/Mixter Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	416	9	114	194	4
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	0	437	9	120	204	4
Percent Heavy Vehicles	5	--	--	5	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4	1	65	12	0	1
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	4	1	68	12	0	1
Percent Heavy Vehicles	2	2	2	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	0	120		73			13	
C(m) (vph)	1345	1098		556			216	
v/c	0.00	0.11		0.13			0.06	
95% queue length	0.00	0.37		0.45			0.19	
Control Delay	7.7	8.7		12.5			22.7	
LOS	A	A		B			C	
Approach Delay				12.5			22.7	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/24/2013
Analysis Time Period: 4:45 - 5:45 PM
Intersection: Rte 31/Reservoir St/Mixter Rd
Jurisdiction: Holden
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Route 31
North/South Street: Reservoir St/Mixter Rd
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	244	6	99	377	15
Peak-Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR	2	277	6	112	428	17
Percent Heavy Vehicles	3	--	--	3	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10	1	133	14	6	3
Peak Hour Factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Hourly Flow Rate, HFR	11	1	151	15	6	3
Percent Heavy Vehicles	2	2	2	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	2	112		163			24	
C(m) (vph)	1110	1274		639			190	
v/c	0.00	0.09		0.26			0.13	
95% queue length	0.01	0.29		1.01			0.43	
Control Delay	8.2	8.1		12.6			26.7	
LOS	A	A		B			D	
Approach Delay				12.6			26.7	
Approach LOS				B			D	

Town of Paxton

- Traffic Counts
- Turning Movement Counts: Existing, Balanced, and Projected 2023 Level of Service Results

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
10/27/88	Paxton	Asnebumskit Rd	E of Route 56/122 (Pleasant St)	EB	370	394	764	1988195	CMRPC
05/11/10	Paxton	Church St	Btwn Pleasant & Maple St	NB	1844	2110	3954	2010124	CMRPC
05/24/04	Paxton	Grove St	N of Route 122/56 (Pleasant St)	NB	1205	1506	2711	2004120	CMRPC
08/23/07	Paxton	Grove St	N of Route 122/56 (Pleasant St)	NB	1449	1500	2949	2007136	CMRPC
05/11/10	Paxton	Grove St	N of Route 122/56 (Pleasant St)	NB	1489	1493	2982	2010126	CMRPC
05/11/10	Paxton	Grove St	N of Route 31 (Holden St)	NB	1289	1338	2627	2010125	CMRPC
10/25/88	Paxton	Grove St	S of Route 31 (Maple St)	NB	1264	1170	2434	1988192	CMRPC
07/26/01	Paxton	Laurel St	S of Marshall St	NB	237	219	456	2001121	CMRPC
05/18/10	Paxton	Laurel St	S of Marshall St	NB	310	299	609	2010127	CMRPC
05/16/91	Paxton	Marshall St	At Leicester TL	EB	798	790	1588	1991042	CMRPC
09/20/07	Paxton	Marshall St	At Leicester TL	EB	1666	1579	3245	2007137	CMRPC
05/16/91	Paxton	Marshall St	At Spencer TL	EB	798	849	1647	1991045	CMRPC
06/28/07	Paxton	Marshall St	At Spencer TL	EB	1069	1032	2101	2007192	CMRPC
07/26/01	Paxton	Marshall St	E of Golf Course	EB	1195	1106	2301	2001122	CMRPC
10/30/07	Paxton	Marshall St	E of Laurel St	EB	1132	1135	2267	2007138	CMRPC
07/26/01	Paxton	Nannigan Rd	N of Route 31(West St)	NB	208	202	410	2001123	CMRPC
06/18/85	Paxton	Route 122 (Pleasant St)	At Rutland TL	NB	1822	1694	3516	1985201	CMRPC
09/11/86	Paxton	Route 122 (Pleasant St)	At Rutland TL	NB	1926	1972	3898	Spec119	CMRPC
05/16/89	Paxton	Route 122 (Pleasant St)	At Rutland TL	NB	1928	2021	3949	1989049	CMRPC
03/11/92	Paxton	Route 122 (Pleasant St)	At Rutland TL	NB	1720	2021	3741	139014	MHD
08/02/01	Paxton	Route 122 (Pleasant St)	At Rutland TL	NB	2493	2611	5104	2001124	CMRPC
05/24/04	Paxton	Route 122 (Pleasant St)	At Rutland TL	NB	2162	2887	5049	2004121	CMRPC
08/28/07	Paxton	Route 122 (Pleasant St)	At Rutland TL	NB	2531	2375	4906	2007139	CMRPC
05/18/10	Paxton	Route 122 (Pleasant St)	At Rutland TL	NB	2338	2488	4826	2010128	CMRPC
10/03/85	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	5744	5616	11360	1985215	CMRPC
07/24/86	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	6314	6202	12516	1986056	CMRPC
10/01/88	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	6016	5652	11668	1988197	CMRPC
08/29/89	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	5956	5891	11847	1989188	CMRPC
11/11/97	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	4786	6750	11536	1997206	CMRPC
09/10/98	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	6428	6417	12845	1998100	CMRPC
07/31/00	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	5988	6236	12224	2000125	CMRPC
05/15/06	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	6270	6241	12511	2006136	CMRPC
08/28/07	Paxton	Route 122 (Pleasant St)	At Worcester CL	NB	6614	5661	12275	2007140	CMRPC
10/24/88	Paxton	Route 122 (Pleasant St)	N of Route 31 (West St)	NB	2282	2390	4672	1988191	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
09/10/98	Paxton	Route 122 (Pleasant St)	N of Route 31 (West St)	NB	2591	2463	5054	1998101	CMRPC
07/31/01	Paxton	Route 122 (Pleasant St)	N of Route 31 (West St)	NB	2717	2928	5645	2001125	CMRPC
08/28/07	Paxton	Route 122 (Pleasant St)	N of Route 31 (West St)	NB	2856	2649	5505	2007141	CMRPC
05/18/10	Paxton	Route 122 (Pleasant St)	N of Route 31 (West St)	NB	2626	2775	5401	2010129	CMRPC
05/23/91	Paxton	Route 122 (Pleasant St)	S of Indian Hill Rd	NB	6226	6077	12303	1991053	CMRPC
07/11/95	Paxton	Route 122 (Pleasant St)	S of Route 56 (Reservoir Rd)	NB	5065	5227	10292	1995081	CMRPC
03/26/87	Paxton	Route 122/56 (Pleasant St)	N of Route 56 (Reservoir Rd)	NB	5731	5801	11532	1987002	CMRPC
11/01/88	Paxton	Route 122/56 (Pleasant St)	N of Route 56 (Reservoir Rd)	NB	5904	5913	11817	1988196	CMRPC
08/02/90	Paxton	Route 122/56 (Pleasant St)	N of Route 56 (Reservoir Rd)	NB	6307	6411	12718	1990065	CMRPC
08/23/07	Paxton	Route 122/56 (Pleasant St)	N of Route 56 (Reservoir Rd)	NB	6746	6452	13198	2007142	CMRPC
05/21/13	Paxton	Route 122/56 (Pleasant St)	N of Route 56 (Reservoir Rd)	NB	6237	6662	12899	2013115	CMRPC
05/23/91	Paxton	Route 122/56 (Pleasant St)	S of Route 31 (West St)	NB	5686	5859	11545	1991054	CMRPC
07/11/95	Paxton	Route 122/56 (Pleasant St)	S of Route 31 (West St)	NB	5056	5177	10233	1995083	CMRPC
09/10/98	Paxton	Route 122/56 (Pleasant St)	S of Route 31 (West St)	NB	5590	5584	11174	1998106	CMRPC
07/26/01	Paxton	Route 122/56 (Pleasant St)	S of Route 31 (West St)	NB	5609	5707	11316	2001126	CMRPC
08/23/07	Paxton	Route 122/56 (Pleasant St)	S of Route 31 (West St)	NB	5818	5540	11358	2007143	CMRPC
05/21/13	Paxton	Route 122/56 (Pleasant St)	S of Route 31 (West St)	NB	5470	5674	11144	2013116	CMRPC
07/11/95	Paxton	Route 122/56 (Pleasant St)	S of Rt 31/N of Rt 56	NB	3792	3757	7549	1995084	CMRPC
05/07/13	Paxton	Route 31 (Grove St)	Btwn Maple St & Holden Rd	NB	3074	3301	6375	2013118	CMRPC
05/16/85	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	1843	1848	3691	1985211	CMRPC
05/18/89	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	2331	2340	4671	1989055	CMRPC
05/23/91	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	2393	2358	4751	1991055	CMRPC
09/10/98	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	2432	2680	5112	1998102	CMRPC
09/24/01	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	2813	2663	5476	2001066	CMRPC
05/24/04	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	2941	2848	5789	2004070	CMRPC
08/23/07	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	2920	2701	5621	2007071	CMRPC
11/04/10	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	2572	2565	5137	2010062	CMRPC
05/07/13	Paxton	Route 31 (Holden Rd)	At Holden TL	NB	2746	2820	5566	2013057	CMRPC
10/25/88	Paxton	Route 31 (Maple St)	E of Route 56 (Richard's Ave)	EB	1725	1554	3279	1988193	CMRPC
05/24/04	Paxton	Route 31 (Maple St)	E of Route 56 (Richard's Ave)	EB	2041	1901	3942	2004123	CMRPC
05/11/10	Paxton	Route 31 (Maple St)	E of Route 56 (Richard's Ave)	EB	1907	1981	3888	2010130	CMRPC
05/07/13	Paxton	Route 31 (Maple St)	E of Route 56 (Richard's Ave)	EB	1920	2009	3929	2013119	CMRPC
05/14/91	Paxton	Route 31 (West St)	At Spencer TL	NB	2222	2181	4403	1991036	CMRPC
08/13/98	Paxton	Route 31 (West St)	At Spencer TL	NB	1745	1628	3373	1998161	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
06/14/01	Paxton	Route 31 (West St)	At Spencer TL	NB	1940	1951	3891	2001188	CMRPC
05/24/04	Paxton	Route 31 (West St)	At Spencer TL	NB	1932	2276	4208	2004122	CMRPC
09/20/07	Paxton	Route 31 (West St)	At Spencer TL	NB	2042	2070	4112	2007144	CMRPC
05/18/10	Paxton	Route 31 (West St)	At Spencer TL	NB	1713	1656	3369	2010131	CMRPC
05/21/13	Paxton	Route 31 (West St)	At Spencer TL	NB	1724	1803	3527	2013117	CMRPC
05/23/91	Paxton	Route 31 (West St)	W of Black Hill Rd	EB	2033	1928	3961	1991059	CMRPC
10/03/85	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	2098	2165	4263	1985210	CMRPC
09/11/86	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	3227	2589	5816	Spec120	CMRPC
10/19/88	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	2748	2863	5611	1988190	CMRPC
05/18/89	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	3108	3253	6361	1989058	CMRPC
03/11/92	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	2415	3611	6026	104314	MHD
11/05/98	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	2645	2847	5492	1998103	CMRPC
07/26/01	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	2919	2786	5705	2001127	CMRPC
05/24/04	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	3677	3758	7435	2004124	CMRPC
08/28/07	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	3228	3153	6381	2007146	CMRPC
05/18/10	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	2882	2860	5742	2010132	CMRPC
05/07/13	Paxton	Route 31 (West St)	W of Route 122 (Pleasant St)	EB	2920	2993	5913	2013120	CMRPC
08/01/85	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	734	1084	1818	1985214	CMRPC
10/26/88	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	1022	1059	2081	1988194	CMRPC
05/16/89	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	1420	996	2416	1989051	CMRPC
07/26/90	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	1151	1053	2204	1990062	CMRPC
03/11/92	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	896	864	1760	123714	MHD
09/10/98	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	1265	1174	2439	1998104	CMRPC
07/26/01	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	1241	1281	2522	2001128	CMRPC
05/31/04	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	1602	1448	3050	2004078	CMRPC
06/26/07	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	1697	1686	3383	2007081	CMRPC
06/03/10	Paxton	Route 56 (Reservoir Rd)	At Leicester TL	NB	1749	1648	3397	2010072	CMRPC
07/11/95	Paxton	Route 56 (Richards Ave)	N of Route 122 (Pleasant St)	NB	1604	1721	3325	1995086	CMRPC
05/11/10	Paxton	Route 56 (Richards Ave)	N of Route 122 (Pleasant St)	NB	1918	1746	3664	2010134	CMRPC
08/22/85	Paxton	Route 56 (Richard's Ave)	At Rutland TL	NB	1349	1297	2646	1985197	CMRPC
05/23/91	Paxton	Route 56 (Richard's Ave)	At Rutland TL	NB	1387	1628	3015	1991058	CMRPC
07/31/01	Paxton	Route 56 (Richard's Ave)	At Rutland TL	NB	1557	1561	3118	2001129	CMRPC
05/24/04	Paxton	Route 56 (Richard's Ave)	At Rutland TL	NB	1658	1920	3578	2004125	CMRPC
08/28/07	Paxton	Route 56 (Richard's Ave)	At Rutland TL	NB	1597	1546	3143	2007147	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
05/11/10	Paxton	Route 56 (Richard's Ave)	At Rutland TL	NB	1652	1631	3283	2010133	CMRPC
08/22/85	Paxton	Route 56 (Richard's Ave)	N of Route 31 (Maple St)	NB	1349	1297	2646	1985212	CMRPC
03/26/87	Paxton	Route 56 (Richard's Ave)	N of Route 31 (Maple St)	NB	1666	1690	3356	1987010	CMRPC
10/04/88	Paxton	Route 56 (Richard's Ave)	N of Route 31 (Maple St)	NB	1871	1980	3851	1988198	CMRPC
08/23/90	Paxton	Route 56 (Richard's Ave)	N of Route 31 (Maple St)	NB	1813	1820	3633	1990083	CMRPC
09/10/98	Paxton	Route 56 (Richard's Ave)	N of Route 31 (Maple St)	NB	1729	1846	3575	1998105	CMRPC
07/31/01	Paxton	Route 56 (Richard's Ave)	N of Route 31 (Maple St)	NB	1933	1695	3628	2001130	CMRPC
05/24/04	Paxton	Route 56 (Richard's Ave)	N of Route 31 (Maple St)	NB	2522	2668	5190	2004127	CMRPC
08/28/07	Paxton	Route 56 (Richard's Ave)	N of Route 31 (Maple St)	NB	1911	1835	3746	2007148	CMRPC
10/20/88	Paxton	South St	S of Route 31 (West St)	NB	273	310	583	1988189	CMRPC
08/25/98	Paxton	South St	S of Route 31 (West St)	NB	311	304	615	1998108	CMRPC
05/18/10	Paxton	South St	S of Route 31 (West St)	NB	337	358	695	2010136	CMRPC
11/03/88	Paxton	Streeter Rd	E of Route 56 (Richard's Ave)	EB	260	245	505	1988199	CMRPC
07/31/01	Paxton	Streeter Rd	E of Route 56 (Richard's Ave)	EB	312	363	675	2001131	CMRPC
05/11/10	Paxton	Streeter Rd	E of Route 56 (Richard's Ave)	EB	397	421	818	2010137	CMRPC
05/16/91	Paxton	Suomi St	N of Marshall St	NB	278	303	581	1991041	CMRPC
08/25/97	Paxton	Suomi St	N of Marshall St	NB	247	263	510	1998107	CMRPC
07/26/01	Paxton	Suomi St	N of Marshall St	NB	325	404	729	2001132	CMRPC
06/02/10	Paxton	Suomi St	N of Marshall St	NB	467	472	939	2010138	CMRPC
05/21/13	Paxton	Suomi St	N of Marshall St	NB	499	504	1003	2013121	CMRPC

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Paxton
Street : Route 31
Location : Btwn Maple St & Holden Rd

Site: 2013118

Weekly Volume

Interval Start	Mon 5/6/2013		Tue 5/7/2013		Wed 5/8/2013		Thu 5/9/2013		Fri 5/10/2013		Sat 5/11/2013		Sun 5/12/2013		Mon - Fri Average		Weekly Average	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	-	-	13	15	18	20	14	15	-	-	-	-	-	-	15.0	16.7	15.0	16.7
1:00 AM	-	-	7	13	8	11	9	8	-	-	-	-	-	-	8.0	10.7	8.0	10.7
2:00 AM	-	-	10	6	4	6	6	6	-	-	-	-	-	-	6.7	6.0	6.7	6.0
3:00 AM	-	-	3	9	4	7	2	7	-	-	-	-	-	-	3.0	7.7	3.0	7.7
4:00 AM	-	-	3	14	7	15	8	17	-	-	-	-	-	-	6.0	15.3	6.0	15.3
5:00 AM	-	-	34	79	25	74	33	68	-	-	-	-	-	-	30.7	73.7	30.7	73.7
6:00 AM	-	-	66	198	83	219	78	212	-	-	-	-	-	-	75.7	209.7	75.7	209.7
7:00 AM	-	-	161	358	163	340	166	376	-	-	-	-	-	-	163.3	358.0	163.3	358.0
8:00 AM	-	-	167	259	163	263	153	272	-	-	-	-	-	-	161.0	264.7	161.0	264.7
9:00 AM	-	-	145	204	137	176	140	180	-	-	-	-	-	-	140.7	186.7	140.7	186.7
10:00 AM	-	-	138	137	137	186	-	-	-	-	-	-	-	-	137.5	161.5	137.5	161.5
11:00 AM	-	-	160	160	185	159	-	-	-	-	-	-	-	-	172.5	159.5	172.5	159.5
12:00 PM	-	-	195	146	173	158	-	-	-	-	-	-	-	-	184.0	152.0	184.0	152.0
1:00 PM	156	194	195	171	200	177	-	-	-	-	-	-	-	-	183.7	180.7	183.7	180.7
2:00 PM	272	170	255	161	243	216	-	-	-	-	-	-	-	-	256.7	182.3	256.7	182.3
3:00 PM	321	223	274	221	298	216	-	-	-	-	-	-	-	-	297.7	220.0	297.7	220.0
4:00 PM	350	208	353	205	353	187	-	-	-	-	-	-	-	-	352.0	200.0	352.0	200.0
5:00 PM	362	175	340	234	336	219	-	-	-	-	-	-	-	-	346.0	209.3	346.0	209.3
6:00 PM	219	142	220	189	267	138	-	-	-	-	-	-	-	-	235.3	156.3	235.3	156.3
7:00 PM	188	108	173	127	169	110	-	-	-	-	-	-	-	-	176.7	115.0	176.7	115.0
8:00 PM	125	114	153	79	118	66	-	-	-	-	-	-	-	-	132.0	86.3	132.0	86.3
9:00 PM	94	59	167	50	60	69	-	-	-	-	-	-	-	-	107.0	59.3	107.0	59.3
10:00 PM	55	36	48	43	46	26	-	-	-	-	-	-	-	-	49.7	35.0	49.7	35.0
11:00 PM	41	31	40	18	38	28	-	-	-	-	-	-	-	-	39.7	25.7	39.7	25.7
Totals	2183	1460	3320	3096	3235	3086	609	1161	0	0	0	0	0	0	3280.3	3092.0	3280.3	3092.0
Combined	3643		6416		6321		1770		0		0		0		6372.3		6372.3	
Split (%)	59.9	40.1	51.7	48.3	51.2	48.8	34.4	65.6	-	-	-	-	-	-	51.5	48.5	51.5	48.5

Peak Hours

12:00 AM - 12:00 PM	-	-	8:00 AM	7:00 AM	11:00 AM	7:00 AM	7:00 AM	7:00 AM	-	-	-	-	-	-	11:00 AM	7:00 AM	11:00 AM	7:00 AM
Volume	-	-	167	358	185	340	166	376	-	-	-	-	-	-	172.5	358.0	172.5	358.0
12:00 PM - 12:00 AM	5:00 PM	3:00 PM	4:00 PM	5:00 PM	4:00 PM	5:00 PM	-	-	-	-	-	-	-	-	4:00 PM	3:00 PM	4:00 PM	3:00 PM
Volume	362	223	353	234	353	219	-	-	-	-	-	-	-	-	352.0	220.0	352.0	220.0

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Paxton
Street : Route 31
Location : East of Route 56

Site: 2013119

Weekly Volume

Interval Start	Mon 5/6/2013		Tue 5/7/2013		Wed 5/8/2013		Thu 5/9/2013		Fri 5/10/2013		Sat 5/11/2013		Sun 5/12/2013		Mon - Fri Average		Weekly Average	
	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	-	-	3	7	4	4	4	6	-	-	-	-	-	-	3.7	5.7	3.7	5.7
1:00 AM	-	-	0	4	2	5	3	4	-	-	-	-	-	-	1.7	4.3	1.7	4.3
2:00 AM	-	-	1	3	2	0	3	1	-	-	-	-	-	-	2.0	1.3	2.0	1.3
3:00 AM	-	-	5	1	5	3	7	0	-	-	-	-	-	-	5.7	1.3	5.7	1.3
4:00 AM	-	-	11	3	8	2	10	7	-	-	-	-	-	-	9.7	4.0	9.7	4.0
5:00 AM	-	-	55	25	57	14	53	16	-	-	-	-	-	-	55.0	18.3	55.0	18.3
6:00 AM	-	-	137	43	158	47	146	52	-	-	-	-	-	-	147.0	47.3	147.0	47.3
7:00 AM	-	-	254	101	251	110	272	109	-	-	-	-	-	-	259.0	106.7	259.0	106.7
8:00 AM	-	-	178	115	193	112	181	97	-	-	-	-	-	-	184.0	108.0	184.0	108.0
9:00 AM	-	-	131	97	95	88	114	82	-	-	-	-	-	-	113.3	89.0	113.3	89.0
10:00 AM	-	-	87	76	91	77	-	-	-	-	-	-	-	-	89.0	76.5	89.0	76.5
11:00 AM	-	-	86	89	100	89	-	-	-	-	-	-	-	-	93.0	89.0	93.0	89.0
12:00 PM	-	-	93	111	104	99	-	-	-	-	-	-	-	-	98.5	105.0	98.5	105.0
1:00 PM	111	86	98	98	108	115	-	-	-	-	-	-	-	-	105.7	99.7	105.7	99.7
2:00 PM	107	153	102	159	135	133	-	-	-	-	-	-	-	-	114.7	148.3	114.7	148.3
3:00 PM	150	200	142	169	141	177	-	-	-	-	-	-	-	-	144.3	182.0	144.3	182.0
4:00 PM	122	214	128	224	128	220	-	-	-	-	-	-	-	-	126.0	219.3	126.0	219.3
5:00 PM	118	239	155	236	113	257	-	-	-	-	-	-	-	-	128.7	244.0	128.7	244.0
6:00 PM	74	159	104	160	93	163	-	-	-	-	-	-	-	-	90.3	160.7	90.3	160.7
7:00 PM	61	104	58	103	57	87	-	-	-	-	-	-	-	-	58.7	98.0	58.7	98.0
8:00 PM	82	66	61	89	40	66	-	-	-	-	-	-	-	-	61.0	73.7	61.0	73.7
9:00 PM	31	44	23	61	31	30	-	-	-	-	-	-	-	-	28.3	45.0	28.3	45.0
10:00 PM	13	21	11	22	10	27	-	-	-	-	-	-	-	-	11.3	23.3	11.3	23.3
11:00 PM	7	19	7	26	12	25	-	-	-	-	-	-	-	-	8.7	23.3	8.7	23.3
Totals	876	1305	1930	2022	1938	1950	793	374	0	0	0	0	0	0	1939.2	1973.8	1939.2	1973.8
Combined	2181		3952		3888		1167		0		0		0		3913.0		3913.0	
Split (%)	40.2	59.8	48.8	51.2	49.8	50.2	68.0	32.0	-	-	-	-	-	-	49.6	50.4	49.6	50.4

Peak Hours

12:00 AM - 12:00 PM	-	-	7:00 AM	8:00 AM	7:00 AM	8:00 AM	7:00 AM	7:00 AM	-	-	-	-	-	-	7:00 AM	8:00 AM	7:00 AM	8:00 AM
Volume	-	-	254	115	251	112	272	109	-	-	-	-	-	-	259.0	108.0	259.0	108.0
12:00 PM - 12:00 AM	3:00 PM	5:00 PM	5:00 PM	5:00 PM	3:00 PM	5:00 PM	-	-	-	-	-	-	-	-	3:00 PM	5:00 PM	3:00 PM	5:00 PM
Volume	150	239	155	236	141	257	-	-	-	-	-	-	-	-	144.3	244.0	144.3	244.0

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Paxton
Street : Route 31
Location : West of Route 122

Site: 2013120

Weekly Volume

Interval Start	Mon 5/6/2013		Tue 5/7/2013		Wed 5/8/2013		Thu 5/9/2013		Fri 5/10/2013		Sat 5/11/2013		Sun 5/12/2013		Mon - Fri Average		Weekly Average	
	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	-	-	15	4	14	5	21	6	-	-	-	-	-	-	16.7	5.0	16.7	5.0
1:00 AM	-	-	6	1	12	3	6	3	-	-	-	-	-	-	8.0	2.3	8.0	2.3
2:00 AM	-	-	5	4	3	8	8	10	-	-	-	-	-	-	5.3	7.3	5.3	7.3
3:00 AM	-	-	1	13	2	13	1	11	-	-	-	-	-	-	1.3	12.3	1.3	12.3
4:00 AM	-	-	5	21	6	24	11	22	-	-	-	-	-	-	7.3	22.3	7.3	22.3
5:00 AM	-	-	32	117	30	114	34	109	-	-	-	-	-	-	32.0	113.3	32.0	113.3
6:00 AM	-	-	73	244	85	259	80	243	-	-	-	-	-	-	79.3	248.7	79.3	248.7
7:00 AM	-	-	121	408	139	417	136	418	-	-	-	-	-	-	132.0	414.3	132.0	414.3
8:00 AM	-	-	162	293	154	310	158	296	-	-	-	-	-	-	158.0	299.7	158.0	299.7
9:00 AM	-	-	127	183	128	164	101	176	-	-	-	-	-	-	118.7	174.3	118.7	174.3
10:00 AM	-	-	121	138	131	145	-	-	-	-	-	-	-	-	126.0	141.5	126.0	141.5
11:00 AM	-	-	144	136	129	152	-	-	-	-	-	-	-	-	136.5	144.0	136.5	144.0
12:00 PM	-	-	155	138	157	150	-	-	-	-	-	-	-	-	156.0	144.0	156.0	144.0
1:00 PM	159	161	126	131	145	153	-	-	-	-	-	-	-	-	143.3	148.3	143.3	148.3
2:00 PM	216	172	229	157	200	197	-	-	-	-	-	-	-	-	215.0	175.3	215.0	175.3
3:00 PM	300	187	263	192	300	187	-	-	-	-	-	-	-	-	287.7	188.7	287.7	188.7
4:00 PM	376	176	359	182	357	181	-	-	-	-	-	-	-	-	364.0	179.7	364.0	179.7
5:00 PM	355	164	370	211	371	163	-	-	-	-	-	-	-	-	365.3	179.3	365.3	179.3
6:00 PM	220	148	247	160	243	149	-	-	-	-	-	-	-	-	236.7	152.3	236.7	152.3
7:00 PM	148	98	172	98	151	69	-	-	-	-	-	-	-	-	157.0	88.3	157.0	88.3
8:00 PM	137	71	133	83	137	60	-	-	-	-	-	-	-	-	135.7	71.3	135.7	71.3
9:00 PM	77	34	97	36	53	42	-	-	-	-	-	-	-	-	75.7	37.3	75.7	37.3
10:00 PM	36	31	44	20	56	22	-	-	-	-	-	-	-	-	45.3	24.3	45.3	24.3
11:00 PM	27	13	33	10	31	18	-	-	-	-	-	-	-	-	30.3	13.7	30.3	13.7
Totals	2051	1255	3040	2980	3034	3005	556	1294	0	0	0	0	0	0	3033.2	2987.8	3033.2	2987.8
Combined	3306		6020		6039		1850		0		0		0		6021.0		6021.0	
Split (%)	62.0	38.0	50.5	49.5	50.2	49.8	30.1	69.9	-	-	-	-	-	-	50.4	49.6	50.4	49.6

Peak Hours

12:00 AM - 12:00 PM	-	-	8:00 AM	7:00 AM	8:00 AM	7:00 AM	8:00 AM	7:00 AM	-	-	-	-	-	-	8:00 AM	7:00 AM	8:00 AM	7:00 AM
Volume	-	-	162	408	154	417	158	418	-	-	-	-	-	-	158.0	414.3	158.0	414.3
12:00 PM - 12:00 AM	4:00 PM	3:00 PM	5:00 PM	5:00 PM	5:00 PM	2:00 PM	-	-	-	-	-	-	-	-	5:00 PM	3:00 PM	5:00 PM	3:00 PM
Volume	376	187	370	211	371	197	-	-	-	-	-	-	-	-	365.3	188.7	365.3	188.7

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Paxton
Street : Route 31
Location : At Spencer Town Line

Site: 2013117

Weekly Volume

Interval Start	Mon 5/20/2013		Tue 5/21/2013		Wed 5/22/2013		Thu 5/23/2013		Fri 5/24/2013		Sat 5/25/2013		Sun 5/26/2013		Mon - Fri Average		Weekly Average	
	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	-	-	11	2	8	2	-	-	-	-	-	-	-	-	9.5	2.0	9.5	2.0
1:00 AM	-	-	4	4	4	2	-	-	-	-	-	-	-	-	4.0	3.0	4.0	3.0
2:00 AM	-	-	1	2	4	1	-	-	-	-	-	-	-	-	2.5	1.5	2.5	1.5
3:00 AM	-	-	0	6	1	6	-	-	-	-	-	-	-	-	0.5	6.0	0.5	6.0
4:00 AM	-	-	3	19	4	15	-	-	-	-	-	-	-	-	3.5	17.0	3.5	17.0
5:00 AM	-	-	27	75	29	74	-	-	-	-	-	-	-	-	28.0	74.5	28.0	74.5
6:00 AM	-	-	75	164	75	151	-	-	-	-	-	-	-	-	75.0	157.5	75.0	157.5
7:00 AM	-	-	91	238	83	240	-	-	-	-	-	-	-	-	87.0	239.0	87.0	239.0
8:00 AM	-	-	90	151	90	144	-	-	-	-	-	-	-	-	90.0	147.5	90.0	147.5
9:00 AM	-	-	77	100	77	99	-	-	-	-	-	-	-	-	77.0	99.5	77.0	99.5
10:00 AM	-	-	79	83	83	88	-	-	-	-	-	-	-	-	81.0	85.5	81.0	85.5
11:00 AM	-	-	96	87	-	-	-	-	-	-	-	-	-	-	96.0	87.0	96.0	87.0
12:00 PM	81	60	84	97	-	-	-	-	-	-	-	-	-	-	82.5	78.5	82.5	78.5
1:00 PM	87	71	100	95	-	-	-	-	-	-	-	-	-	-	93.5	83.0	93.5	83.0
2:00 PM	97	104	111	97	-	-	-	-	-	-	-	-	-	-	104.0	100.5	104.0	100.5
3:00 PM	159	114	185	114	-	-	-	-	-	-	-	-	-	-	172.0	114.0	172.0	114.0
4:00 PM	212	72	239	105	-	-	-	-	-	-	-	-	-	-	225.5	88.5	225.5	88.5
5:00 PM	225	81	223	99	-	-	-	-	-	-	-	-	-	-	224.0	90.0	224.0	90.0
6:00 PM	132	32	129	81	-	-	-	-	-	-	-	-	-	-	130.5	56.5	130.5	56.5
7:00 PM	76	36	71	38	-	-	-	-	-	-	-	-	-	-	73.5	37.0	73.5	37.0
8:00 PM	62	41	59	32	-	-	-	-	-	-	-	-	-	-	60.5	36.5	60.5	36.5
9:00 PM	36	36	33	23	-	-	-	-	-	-	-	-	-	-	34.5	29.5	34.5	29.5
10:00 PM	19	7	22	21	-	-	-	-	-	-	-	-	-	-	20.5	14.0	20.5	14.0
11:00 PM	19	12	14	8	-	-	-	-	-	-	-	-	-	-	16.5	10.0	16.5	10.0
Totals	1205	666	1824	1741	458	822	0	0	0	0	0	0	0	0	1791.5	1658.0	1791.5	1658.0
Combined	1871		3565		1280		0		0		0		0		3449.5		3449.5	
Split (%)	64.4	35.6	51.2	48.8	35.8	64.2	-	-	-	-	-	-	-	-	51.9	48.1	51.9	48.1

Peak Hours

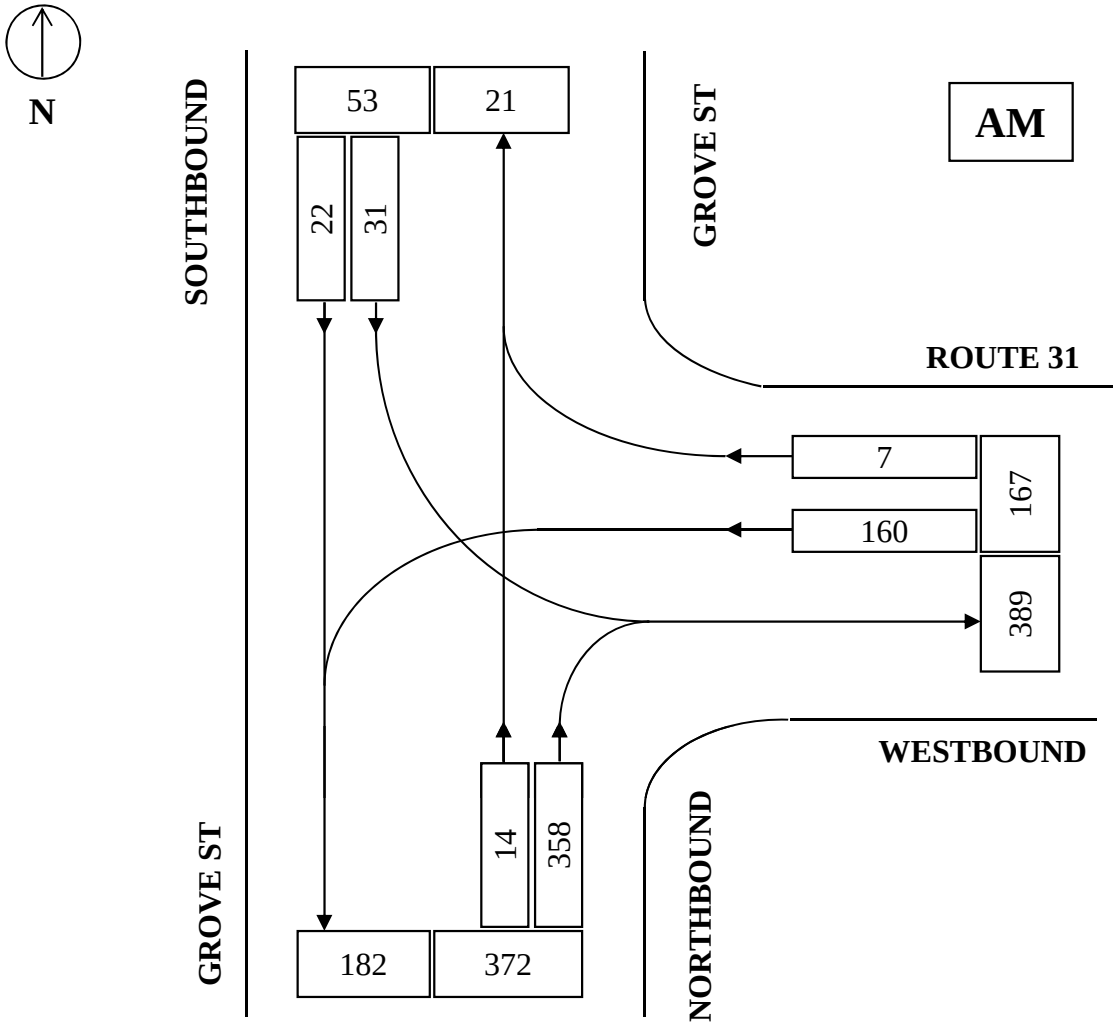
12:00 AM - 12:00 PM	-	-	11:00 AM	7:00 AM	8:00 AM	7:00 AM	-	-	-	-	-	-	-	-	11:00 AM	7:00 AM	11:00 AM	7:00 AM
Volume	-	-	96	238	90	240	-	-	-	-	-	-	-	-	96.0	239.0	96.0	239.0
12:00 PM - 12:00 AM	5:00 PM	3:00 PM	4:00 PM	3:00 PM	-	-	-	-	-	-	-	-	-	-	4:00 PM	3:00 PM	4:00 PM	3:00 PM
Volume	225	114	239	114	-	-	-	-	-	-	-	-	-	-	225.5	114.0	225.5	114.0

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 5/29/2013 **DAY OF WEEK:** Wednesday

INTERSECTION: Route 31 (Holden Road) / Grove Street



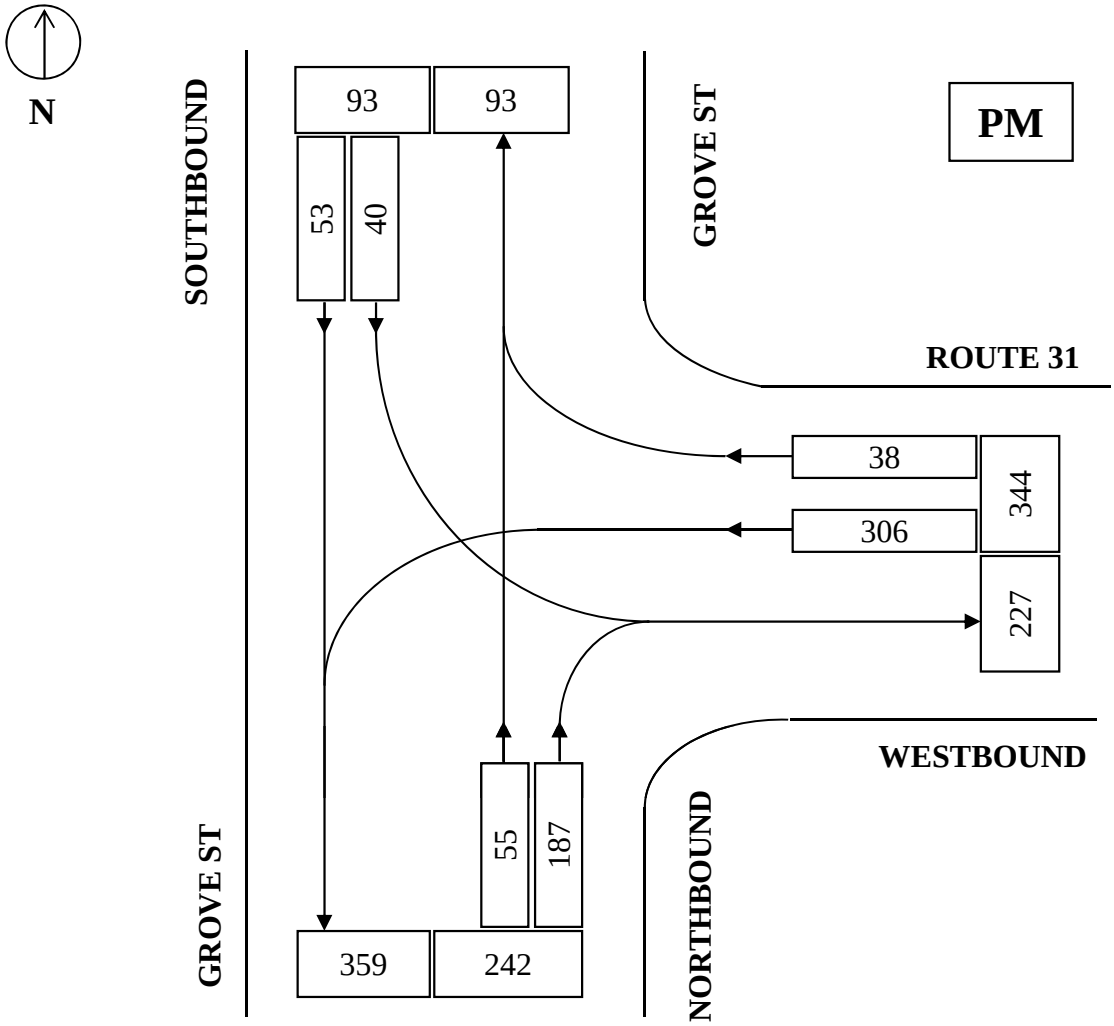
STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:00 - 8:00 AM
Route 31 WB	167	28.2%	
			PHF = .87
Grove St NB	372	62.8%	
			VEHICLES COUNTED
Grove St SB	53	9.0%	
			ALL VEHICLES: 592
TOTAL	592	100.00%	**TRUCKS:** 20
			PERCENT TRUCKS: 3.38%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 5/29/2013 **DAY OF WEEK:** Wednesday

INTERSECTION: Route 31 (Holden Road) / Grove Street



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:00 - 5:00 PM
Route 31 WB	344	50.7%	
			PHF = .93
Grove St NB	242	35.6%	
			VEHICLES COUNTED
Grove St SB	93	13.7%	
			ALL VEHICLES: 679
TOTAL	679	100.00%	**TRUCKS:** 18
			PERCENT TRUCKS: 2.65%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Paxton

DATE: 5/29/2013

LOCATION: Route 31 (Holden Road) / Grove Street

DAY OF WEEK: Wednesday

WEATHER: AM: Rainy PM: Cloudy

TECHNICIAN: RR

Time Period					Route 31 WB				Grove St NB				Grove St SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15					32	0	1	4	0	1	83	1	7	7	0	2	131	
7:15 - 7:30					35	0	2	3	0	3	96	2	5	5	0	1	146	
7:30 - 7:45					47	0	0	2	0	2	82	1	7	6	0	1	144	
7:45 - 8:00					46	0	4	1	0	8	97	1	12	4	0	1	171	592
8:00 - 8:15					33	0	4	2	0	7	55	0	10	8	0	2	117	578
8:15 - 8:30					39	0	9	2	0	13	75	5	4	7	0	0	147	579
8:30 - 8:45					25	0	9	2	0	10	48	1	4	3	0	2	99	534
8:45 - 9:00					27	0	2	4	0	5	56	5	6	6	0	0	102	465
TOTAL	0	0	0	0	284	0	31	20	0	49	592	16	55	46	0	9	1057	
		EBPct	0.0			**WBPct**	28.2			**NBPct**	62.8			**SBPct**	9.0			
Peak Sums:	**0**	**0**	**0**	**0**	**160**	**0**	**7**	**10**	**0**	**14**	**358**	**5**	**31**	**22**	**0**	**5**	**592**	
Total Trucks	20					**TrkPct**	3.38			**PHF**	0.87							

Time Period					Route 31 WB				Grove St NB				Grove St SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15					69	0	13	3	0	18	54	4	15	13	0	0	182	
4:15 - 4:30					87	0	8	3	0	9	46	3	1	9	0	0	160	
4:30 - 4:45					74	0	9	3	0	12	46	0	15	21	0	0	177	
4:45 - 5:00					76	0	8	2	0	16	41	0	9	10	0	0	160	679
5:00 - 5:15					71	0	4	1	0	13	42	2	7	5	0	1	142	639
5:15 - 5:30					76	0	6	0	0	5	45	1	7	9	0	1	148	627
5:30 - 5:45					62	0	8	0	0	13	37	0	10	8	0	1	138	588
5:45 - 6:00					63	0	7	1	0	8	29	0	5	5	0	0	117	545
TOTAL	0	0	0	0	578	0	63	13	0	94	340	10	69	80	0	3	1224	
		EBPct	0.0			**WBPct**	50.7			**NBPct**	35.6			**SBPct**	13.7			
Peak Sums:	**0**	**0**	**0**	**0**	**306**	**0**	**38**	**11**	**0**	**55**	**187**	**7**	**40**	**53**	**0**	**0**	**679**	
Total Trucks	18					**TrkPct**	2.65			**PHF**	0.93							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/30/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31(Holden Rd)/Grove St
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Route 31 (Holden Rd)
North/South Street: Grove St
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		14	358	31	22	
Peak-Hour Factor, PHF		0.87	0.87	0.87	0.87	
Hourly Flow Rate, HFR		16	411	35	25	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	160		7			
Peak Hour Factor, PHF	0.87		0.87			
Hourly Flow Rate, HFR	183		8			
Percent Heavy Vehicles	3		3			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes		0	0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		35		191				
C(m) (vph)		1127		658				
v/c		0.03		0.29				
95% queue length		0.10		1.20				
Control Delay		8.3		12.7				
LOS		A		B				
Approach Delay				12.7				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/30/2013
Analysis Time Period: 4:00 - 5:00 PM
Intersection: Route 31(Holden Rd)/Grove St
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Route 31 (Holden Rd)
North/South Street: Grove St
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		55	187	40	53	
Peak-Hour Factor, PHF		0.93	0.93	0.93	0.93	
Hourly Flow Rate, HFR		59	201	43	56	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	306		38			
Peak Hour Factor, PHF	0.93		0.93			
Hourly Flow Rate, HFR	329		40			
Percent Heavy Vehicles	3		3			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0	0				
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		43		369				
C(m) (vph)		1316		684				
v/c		0.03		0.54				
95% queue length		0.10		3.25				
Control Delay		7.8		16.3				
LOS		A		C				
Approach Delay				16.3				
Approach LOS				C				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/30/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31(Holden Rd)/Grove St
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Route 31 (Holden Rd)
North/South Street: Grove St
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		15	395	34	24	
Peak-Hour Factor, PHF		0.87	0.87	0.87	0.87	
Hourly Flow Rate, HFR		17	454	39	27	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	177		8			
Peak Hour Factor, PHF	0.87		0.87			
Hourly Flow Rate, HFR	203		9			
Percent Heavy Vehicles	4		4			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes		0	0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		39		212				
C(m) (vph)		1080		627				
v/c		0.04		0.34				
95% queue length		0.11		1.49				
Control Delay		8.5		13.6				
LOS		A		B				
Approach Delay				13.6				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/30/2013
Analysis Time Period: 4:00 - 5:00 PM
Intersection: Route 31(Holden Rd)/Grove St
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Route 31 (Holden Rd)
North/South Street: Grove St
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		61	207	44		
Peak-Hour Factor, PHF		0.93	0.93	0.93	0.93	
Hourly Flow Rate, HFR		65	222	47	56	
Percent Heavy Vehicles		--	--	0	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	338		42			
Peak Hour Factor, PHF	0.93		0.93			
Hourly Flow Rate, HFR	363		45			
Percent Heavy Vehicles	4		4			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes	0	0				
Configuration		LR				

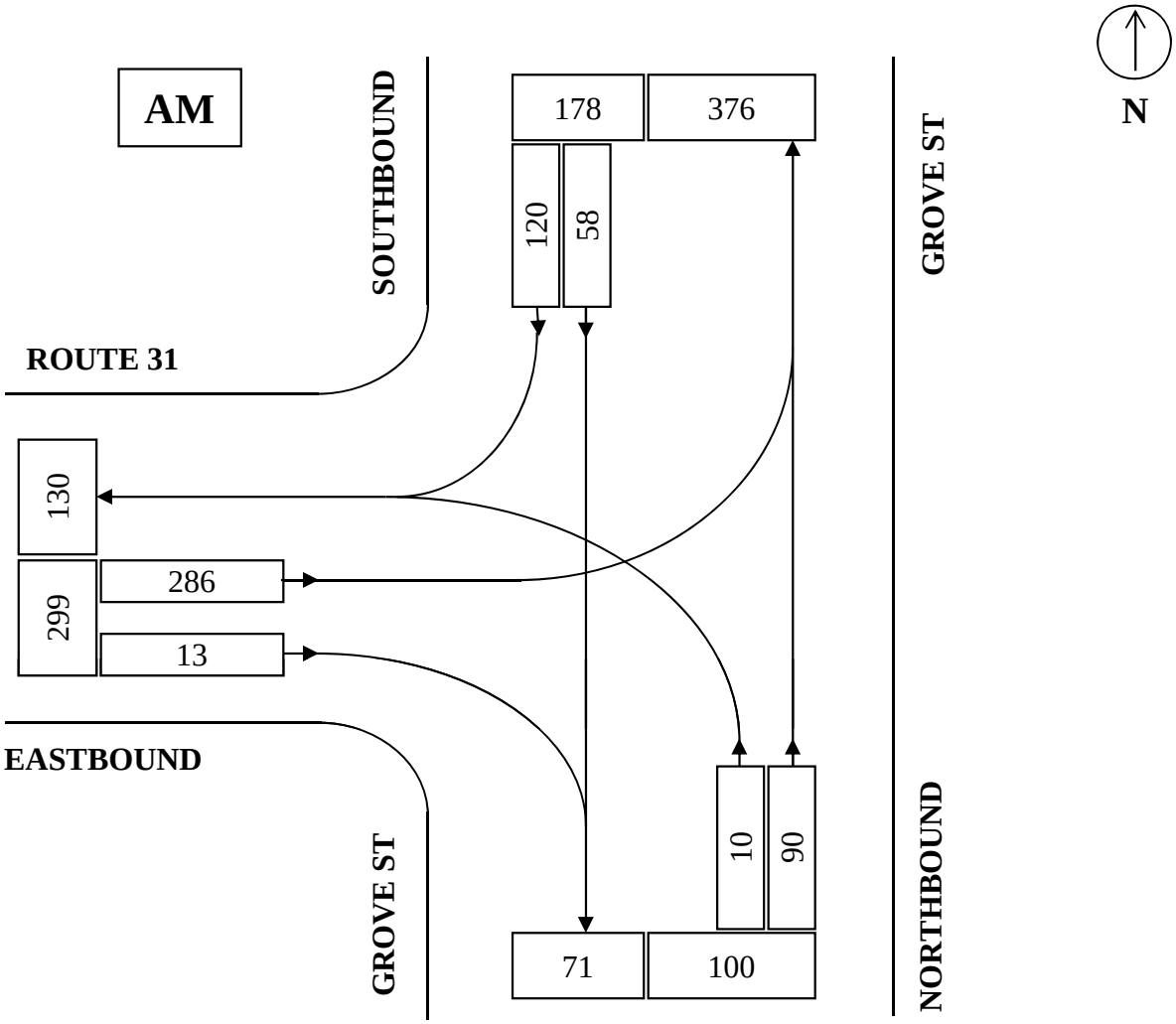
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		47		408				
C(m) (vph)		1287		659				
v/c		0.04		0.62				
95% queue length		0.11		4.29				
Control Delay		7.9		18.9				
LOS		A		C				
Approach Delay				18.9				
Approach LOS				C				

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 5/29/13 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 31 (Maple Street) / Grove Street

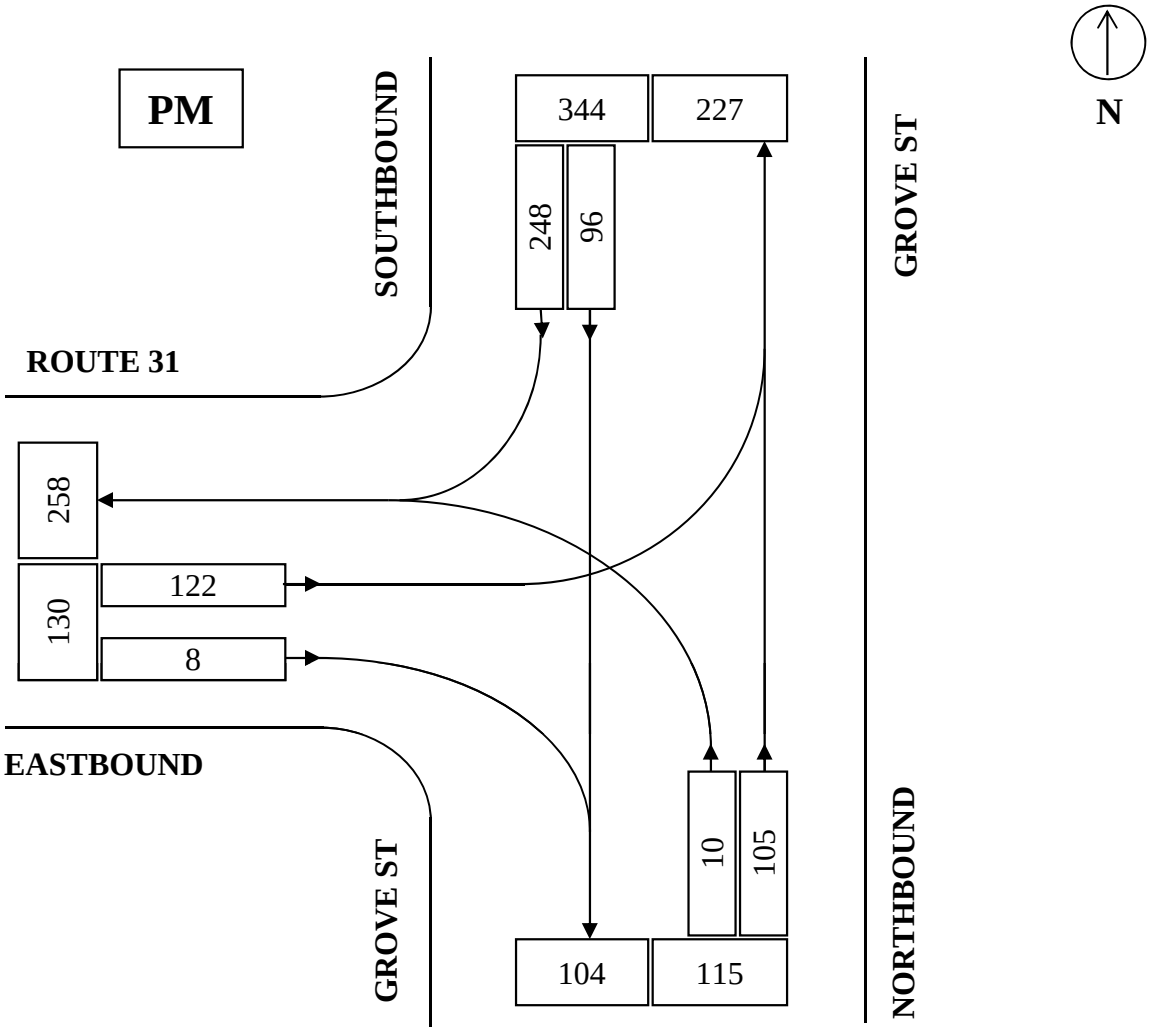


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:00 - 8:00 AM
Route 31 EB	299	51.8%	
			PHF = .91
Grove St NB	100	17.4%	
			VEHICLES COUNTED
Grove St SB	178	30.8%	
			ALL VEHICLES: 577
TOTAL	577	100.0%	**TRUCKS:** 16
			PERCENT TRUCKS 2.77%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 5/29/13 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 31 (Maple Street) / Grove Street



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:15 - 5:15 PM
Route 31 EB	130	22.1%	
			PHF = .92
Grove St NB	115	19.5%	
			VEHICLES COUNTED
Grove St SB	344	58.4%	
			ALL VEHICLES: 589
TOTAL	589	100.0%	**TRUCKS:** 10
			PERCENT TRUCKS 1.70%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Paxton

DATE: 5/29/2013

LOCATION: Route 31 (Maple Street) / Grove Street

DAY OF WEEK: Wednesday

WEATHER: AM: Rainy PM: Cloudy

TECHNICIAN: RJ

Time Period	Route 31 EB								Grove St NB				Grove St SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	70	0	2	0					2	15	0	2	0	14	24	3	127	
7:15 - 7:30	79	0	0	1					2	19	0	1	0	10	31	5	141	
7:30 - 7:45	67	0	3	0					2	28	0	0	0	18	33	2	151	
7:45 - 8:00	70	0	8	2					4	28	0	0	0	16	32	0	158	577
8:00 - 8:15	45	0	1	0					1	22	0	0	0	14	29	2	112	562
8:15 - 8:30	54	0	5	3					5	23	0	0	0	18	22	1	127	548
8:30 - 8:45	35	0	5	0					3	27	0	1	0	8	21	0	99	496
8:45 - 9:00	40	0	3	4					3	14	0	1	0	11	23	4	94	432
TOTAL	460	0	27	10	0	0	0	0	22	176	0	5	0	109	215	17	1009	
		EBPct	51.8			**WBPct**	0.0			**NBPct**	17.3			**SBPct**	30.8			
Peak Sums:	**286**	**0**	**13**	**3**	**0**	**0**	**0**	**0**	**10**	**90**	**0**	**3**	**0**	**58**	**120**	**10**	**577**	
Total Trucks	16					**TrkPct**	2.77			**PHF**	0.91							

Time Period	Route 31 EB								Grove St NB				Grove St SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	34	0	3	2					3	28	0	1	0	27	46	3	141	
4:15 - 4:30	36	0	2	3					3	22	0	0	0	26	71	3	160	
4:30 - 4:45	26	0	1	0					2	29	0	0	0	30	62	1	150	
4:45 - 5:00	27	0	0	0					2	27	0	0	0	20	60	1	136	587
5:00 - 5:15	33	0	5	0					3	27	0	1	0	20	55	1	143	589
5:15 - 5:30	25	0	1	0					2	25	0	1	0	28	56	1	137	566
5:30 - 5:45	26	0	3	0					0	24	0	0	0	26	47	0	126	542
5:45 - 6:00	20	0	3	0					5	15	0	0	0	23	43	1	109	515
TOTAL	227	0	18	5	0	0	0	0	20	197	0	3	0	200	440	11	1102	
		EBPct	22.1			**WBPct**	0.0			**NBPct**	19.5			**SBPct**	58.4			
Peak Sums:	**122**	**0**	**8**	**3**	**0**	**0**	**0**	**0**	**10**	**105**	**0**	**1**	**0**	**96**	**248**	**6**	**589**	
Total Trucks	10					**TrkPct**	1.70			**PHF**	0.92							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/30/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31(Maple St)/Grove St
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Route 31 (Maple St)
North/South Street: Grove St
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	90			58	120
Peak-Hour Factor, PHF	0.91	0.91			0.91	0.91
Hourly Flow Rate, HFR	10	98			63	131
Percent Heavy Vehicles	3	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				286		13
Peak Hour Factor, PHF				0.91		0.91
Hourly Flow Rate, HFR				314		14
Percent Heavy Vehicles				3		3
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	10						328	
C(m) (vph)	1373						741	
v/c	0.01						0.44	
95% queue length	0.02						2.28	
Control Delay	7.6						13.7	
LOS	A						B	
Approach Delay							13.7	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/30/2013
Analysis Time Period: 4:15 - 5:15 PM
Intersection: Route 31(Maple St)/Grove St
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Route 31 (Maple St)
North/South Street: Grove St
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	10	105			96	248
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	10	114			104	269
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				122		8
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				132		8
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	10						140	
C(m) (vph)	1185						632	
v/c	0.01						0.22	
95% queue length	0.03						0.84	
Control Delay	8.1						12.3	
LOS	A						B	
Approach Delay							12.3	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/30/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31(Maple St)/Grove St
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Route 31 (Maple St)
North/South Street: Grove St
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	11	99			64	133
Peak-Hour Factor, PHF	0.91	0.91			0.91	0.91
Hourly Flow Rate, HFR	12	108			70	146
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				316		14
Peak Hour Factor, PHF				0.91		0.91
Hourly Flow Rate, HFR				347		15
Percent Heavy Vehicles				4		4
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	12						362	
C(m) (vph)	1342						710	
v/c	0.01						0.51	
95% queue length	0.03						2.92	
Control Delay	7.7						15.2	
LOS	A						C	
Approach Delay							15.2	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 5/30/2013
Analysis Time Period: 4:15 - 5:15 PM
Intersection: Route 31(Maple St)/Grove St
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Route 31 (Maple St)
North/South Street: Grove St
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	11	116			106	274
Peak-Hour Factor, PHF	0.92	0.92			0.92	0.92
Hourly Flow Rate, HFR	11	126			115	297
Percent Heavy Vehicles	3	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				135		9
Peak Hour Factor, PHF				0.92		0.92
Hourly Flow Rate, HFR				146		9
Percent Heavy Vehicles				3		3
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

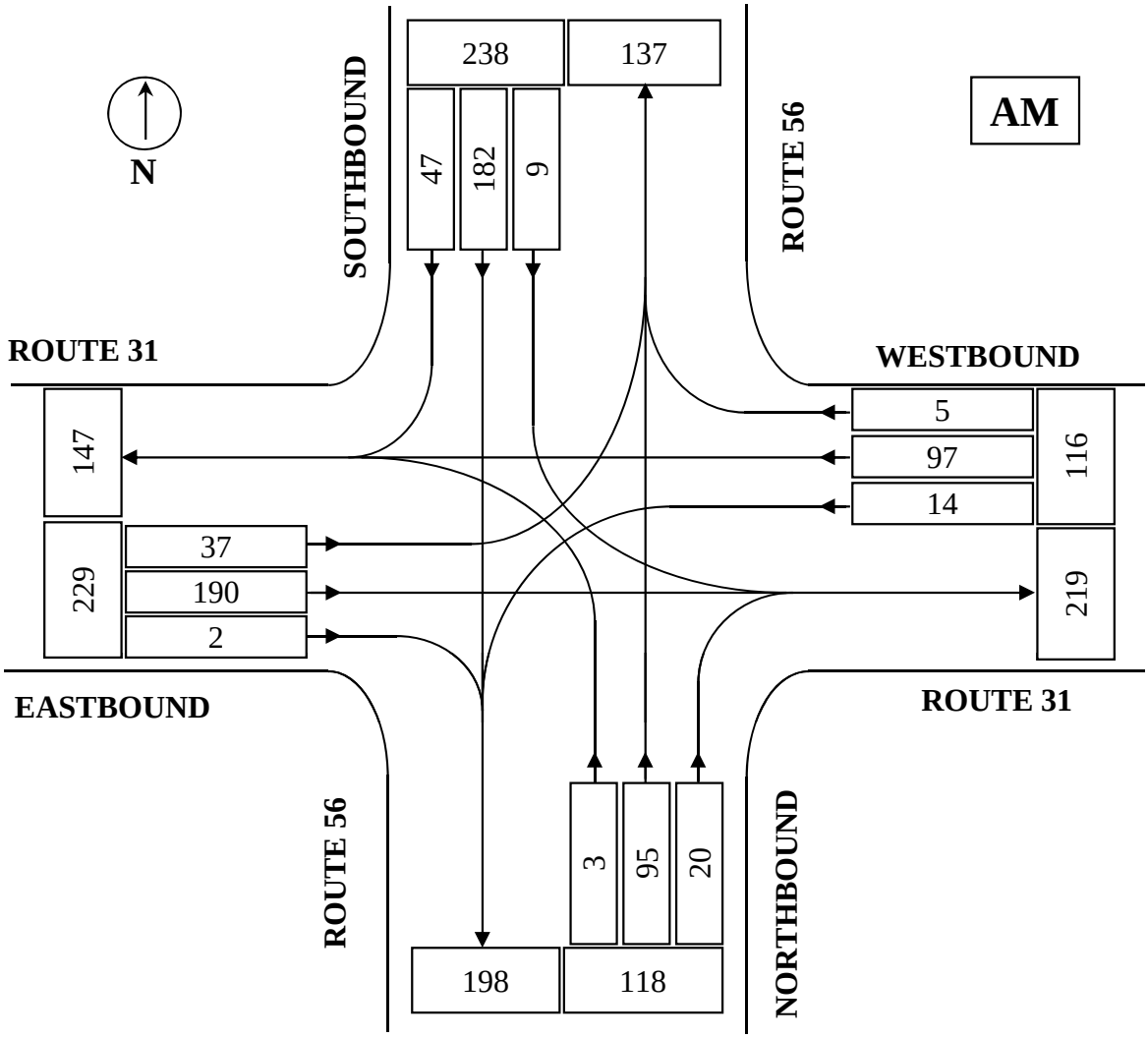
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	11						155	
C(m) (vph)	1142						596	
v/c	0.01						0.26	
95% queue length	0.03						1.03	
Control Delay	8.2						13.1	
LOS	A						B	
Approach Delay							13.1	
Approach LOS							B	

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 8/28/12 **DAY OF WEEK:** Tuesday
INTERSECTION: Route 56 / Route 31

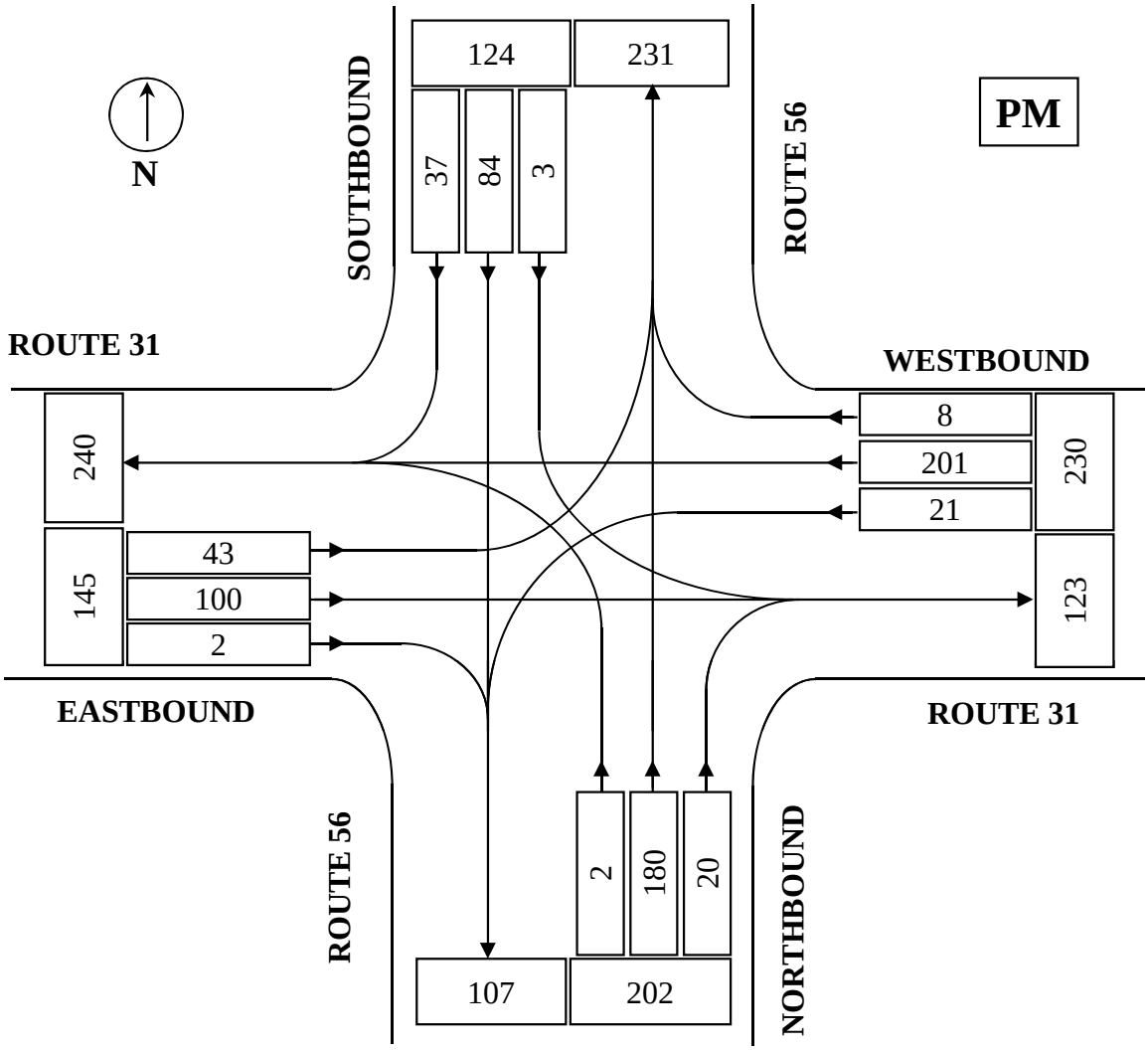


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 31 EB	229	32.7%	7:30 - 8:30 AM
Route 31 WB	116	16.5%	PHF = .96
Route 56 NB	118	16.8%	**VEHICLES COUNTED**
Route 56 SB	238	34.0%	**ALL VEHICLES:** 701
TOTAL	701	100.0%	**TRUCKS:** 27
			PERCENT TRUCKS: 3.85%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 8/28/12 **DAY OF WEEK:** Tuesday
INTERSECTION: Route 56 / Route 31



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 31 EB	145	20.7%	5:00 - 6:00 PM
Route 31 WB	230	32.8%	PHF = .85
Route 56 NB	202	28.8%	**VEHICLES COUNTED**
Route 56 SB	124	17.7%	**ALL VEHICLES:** 701
TOTAL	701	100.0%	**TRUCKS:** 13
			PERCENT TRUCKS: 1.85%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Paxton

DATE: 8/28/2012

LOCATION: Route 56 / Route 31

DAY OF WEEK: Tuesday

WEATHER: AM: Rainy PM: Clear

TECHNICIAN: RJ

Time Period	Route 31 EB				Route 31 WB				Route 56 NB				Route 56 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	5	51	0	2	2	15	1	0	0	11	5	1	0	46	5	3	141	
7:15 - 7:30	8	50	1	3	0	24	0	4	0	21	6	2	0	49	7	0	166	
7:30 - 7:45	5	46	0	3	5	27	2	1	0	21	5	2	2	50	12	0	175	
7:45 - 8:00	5	41	1	2	3	19	0	0	2	24	6	3	4	52	15	0	172	654
8:00 - 8:15	10	47	1	3	2	31	0	2	0	24	1	0	3	46	18	1	183	696
8:15 - 8:30	17	56	0	6	4	20	3	2	1	26	8	1	0	34	2	1	171	701
8:30 - 8:45	7	30	0	0	1	21	0	4	0	10	2	0	0	37	8	1	116	642
8:45 - 9:00	4	26	0	1	2	11	2	2	0	14	4	2	1	37	10	4	111	581
TOTAL	61	347	3	20	19	168	8	15	3	151	37	11	10	351	77	10	1235	
		EBPct	32.7			**WBPct**	16.5			**NBPct**	16.8			**SBPct**	34.0			
Peak Sums:	**37**	**190**	**2**	**14**	**14**	**97**	**5**	**5**	**3**	**95**	**20**	**6**	**9**	**182**	**47**	**2**	**701**	
Total Trucks	27					**TrkPct**	3.85			**PHF**	0.96							

Time Period	Route 31 EB				Route 31 WB				Route 56 NB				Route 56 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	10	25	0	1	1	36	0	1	1	30	4	1	2	27	6	2	142	
4:15 - 4:30	17	24	0	1	0	31	1	0	2	31	1	1	2	22	9	3	140	
4:30 - 4:45	6	27	0	1	3	46	1	2	0	36	4	0	1	16	9	0	149	
4:45 - 5:00	12	14	0	1	2	43	1	0	0	34	2	0	2	17	13	0	140	571
5:00 - 5:15	10	26	0	3	2	37	3	2	0	37	1	1	0	26	12	1	154	583
5:15 - 5:30	12	36	0	0	9	54	1	1	2	57	6	0	2	18	8	0	205	648
5:30 - 5:45	12	27	2	1	4	60	0	4	0	45	8	0	1	25	5	0	189	688
5:45 - 6:00	9	11	0	0	6	50	4	0	0	41	5	0	0	15	12	0	153	701
TOTAL	88	190	2	8	27	357	11	10	5	311	31	3	10	166	74	6	1272	
		EBPct	20.7			**WBPct**	32.8			**NBPct**	28.8			**SBPct**	17.7			
Peak Sums:	**43**	**100**	**2**	**4**	**21**	**201**	**8**	**7**	**2**	**180**	**20**	**1**	**3**	**84**	**37**	**1**	**701**	
Total Trucks	13					**TrkPct**	1.85			**PHF**	0.85							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/29/2012
Analysis Time Period: 7:30 - 8:30 AM
Intersection: Route 31/Route 56
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2012
Project ID:
East/West Street: Route 31
North/South Street: Route 56
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	95	20	9	182	47
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR	3	98	20	9	189	48
Percent Heavy Vehicles	1	--	--	1	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	14	97	5	37	190	2
Peak Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR	14	101	5	38	197	2
Percent Heavy Vehicles	2	2	2	4	4	4
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	9		120			237	
C(m) (vph)	1336	1476		535			547	
v/c	0.00	0.01		0.22			0.43	
95% queue length	0.01	0.02		0.85			2.17	
Control Delay	7.7	7.5		13.7			16.5	
LOS	A	A		B			C	
Approach Delay				13.7			16.5	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/29/2012
Analysis Time Period: 5:00 - 6:00 PM
Intersection: Route 31/Route 56
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2012
Project ID:
East/West Street: Route 31
North/South Street: Route 56
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	180	20	3	84	37
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	211	23	3	98	43
Percent Heavy Vehicles	1	--	--	1	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	21	201	8	43	100	2
Peak Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	24	236	9	50	117	2
Percent Heavy Vehicles	2	2	2	1	1	1
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	2	3		269			169	
C(m) (vph)	1448	1339		551			469	
v/c	0.00	0.00		0.49			0.36	
95% queue length	0.00	0.01		2.66			1.62	
Control Delay	7.5	7.7		17.6			16.9	
LOS	A	A		C			C	
Approach Delay				17.6			16.9	
Approach LOS				C			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/29/2012
Analysis Time Period: 7:30 - 8:30 AM
Intersection: Route 31/Route 56
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2012
Project ID: Balanced
East/West Street: Route 31
North/South Street: Route 56
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	95	20	9	182	
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR	3	98	20	9	189	48
Percent Heavy Vehicles	1	--	--	1	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	14	84	5	32	184	2
Peak Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR	14	87	5	33	191	2
Percent Heavy Vehicles	2	2	2	4	4	4
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	9		106			226	
C(m) (vph)	1336	1476		534			552	
v/c	0.00	0.01		0.20			0.41	
95% queue length	0.01	0.02		0.73			1.98	
Control Delay	7.7	7.5		13.4			16.0	
LOS	A	A		B			C	
Approach Delay				13.4			16.0	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/29/2012
Analysis Time Period: 5:00 - 6:00 PM
Intersection: Route 31/Route 56
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2012
Project ID: Balanced
East/West Street: Route 31
North/South Street: Route 56
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	180	20	3	84	
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	211	23	3	98	43
Percent Heavy Vehicles	1	--	--	1	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	21	198	8	35	92	2
Peak Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	24	232	9	41	108	2
Percent Heavy Vehicles	2	2	2	1	1	1
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	2	3		265			151	
C(m) (vph)	1448	1339		552			477	
v/c	0.00	0.00		0.48			0.32	
95% queue length	0.00	0.01		2.58			1.35	
Control Delay	7.5	7.7		17.4			16.0	
LOS	A	A		C			C	
Approach Delay				17.4			16.0	
Approach LOS				C			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/29/2012
Analysis Time Period: 7:30 - 8:30 AM
Intersection: Route 31/Route 56
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2012
Project ID: Projected 2023
East/West Street: Route 31
North/South Street: Route 56
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	107	22	10	205	39
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR	3	111	22	10	213	40
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	16	94	6	36	205	2
Peak Hour Factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Hourly Flow Rate, HFR	16	97	6	37	213	2
Percent Heavy Vehicles	3	3	3	5	5	5
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	10		119			252	
C(m) (vph)	1312	1452		501			520	
v/c	0.00	0.01		0.24			0.48	
95% queue length	0.01	0.02		0.92			2.62	
Control Delay	7.8	7.5		14.4			18.3	
LOS	A	A		B			C	
Approach Delay				14.4			18.3	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/29/2012
Analysis Time Period: 5:00 - 6:00 PM
Intersection: Route 31/Route 56
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2012
Project ID: Projected 2023
East/West Street: Route 31
North/South Street: Route 56
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	203	22	3	95	38
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	238	25	3	111	44
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	24	221	9	39	103	2
Peak Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	28	259	10	45	121	2
Percent Heavy Vehicles	3	3	3	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

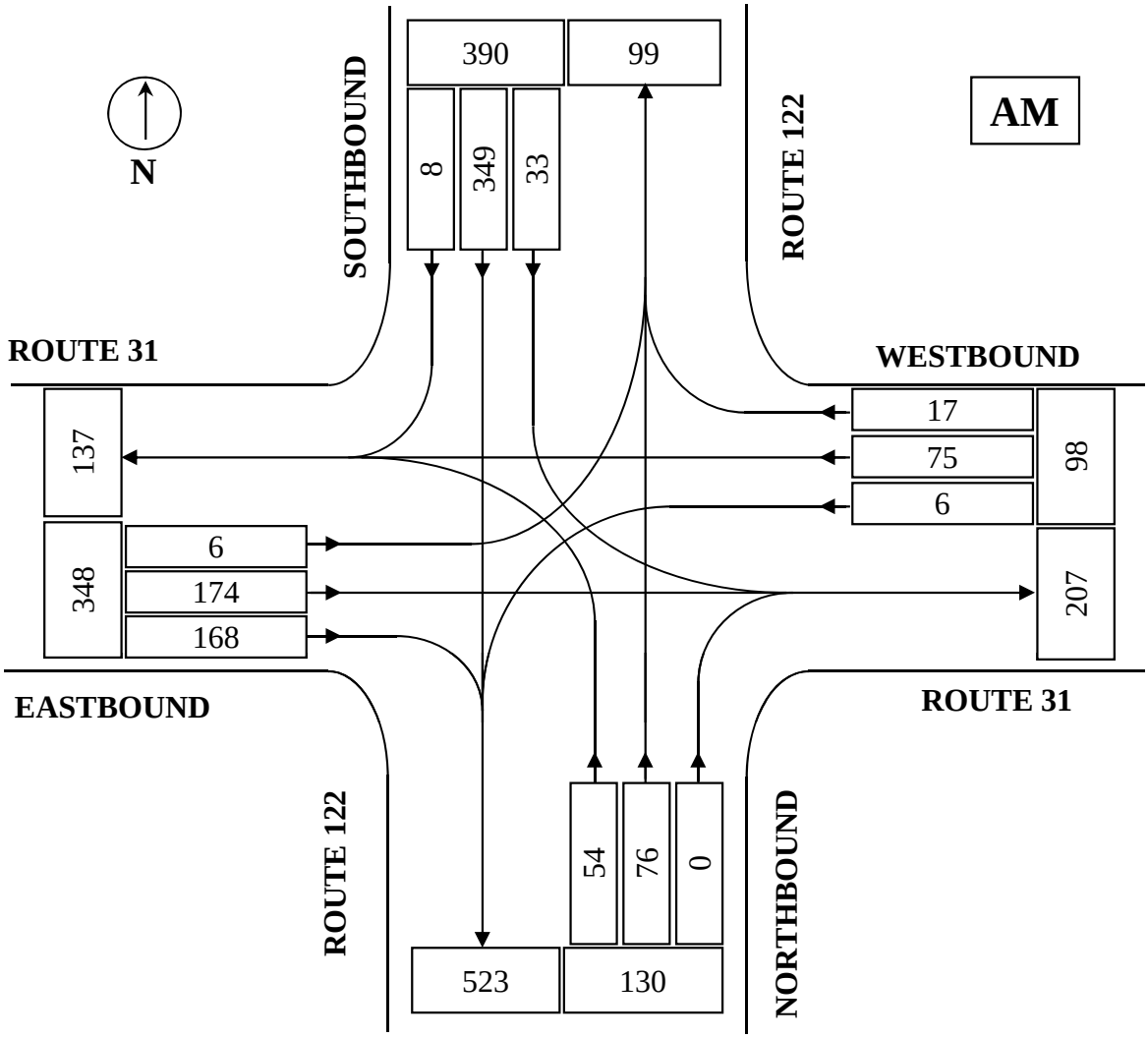
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	2	3		297			168	
C(m) (vph)	1425	1301		518			428	
v/c	0.00	0.00		0.57			0.39	
95% queue length	0.00	0.01		3.57			1.83	
Control Delay	7.5	7.8		20.9			18.7	
LOS	A	A		C			C	
Approach Delay				20.9			18.7	
Approach LOS				C			C	

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 8/23/12 **DAY OF WEEK:** Thursday
INTERSECTION: Route 122 / Route 31

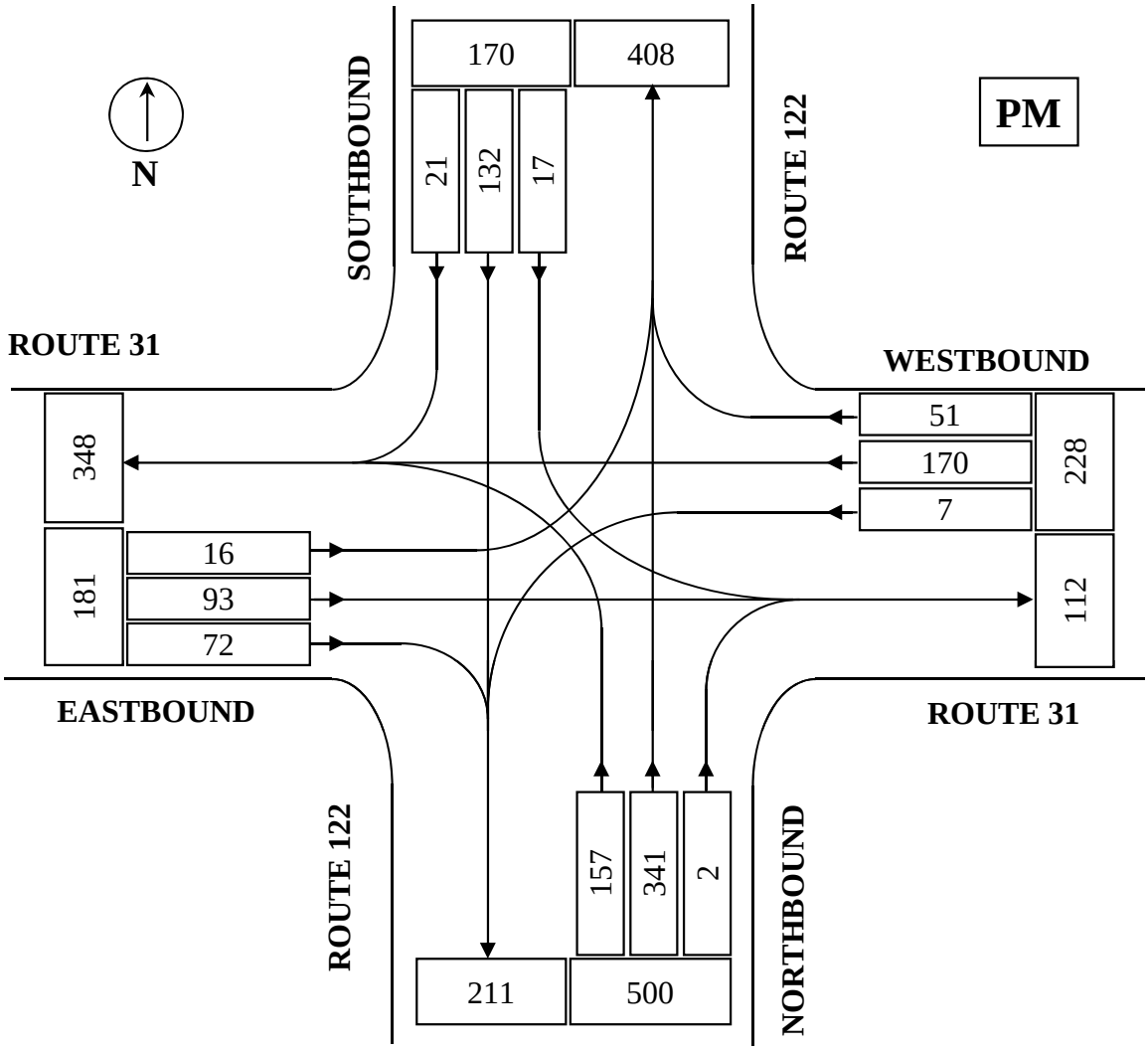


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 31 EB	348	36.0%	7:15 - 8:15 AM
Route 31 WB	98	10.1%	PHF = .94
Route 122 NB	130	13.5%	VEHICLES COUNTED
Route 122 SB	390	40.4%	ALL VEHICLES: 966
TOTAL	966	100.0%	TRUCKS: 16
			PERCENT TRUCKS: 1.66%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 8/23/12 **DAY OF WEEK:** Thursday
INTERSECTION: Route 122 / Route 31



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 31 EB	181	16.8%	4:45 - 5:45 PM
Route 31 WB	228	21.1%	PHF = .96
Route 122 NB	500	46.3%	**VEHICLES COUNTED**
Route 122 SB	170	15.8%	**ALL VEHICLES:** 1079
TOTAL	1079	100.0%	**TRUCKS:** 17
			PERCENT TRUCKS: 1.58%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Paxton

DATE: 8/23/2012

LOCATION: Route 122 / Route 31

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

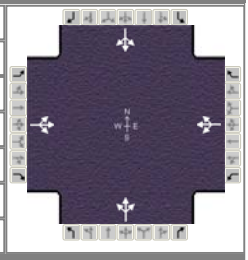
TECHNICIAN: RJ

Time Period	Route 31 EB				Route 31 WB				Route 122 NB				Route 122 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	6	50	48	1	1	9	5	1	10	13	0	0	6	66	2	1	216	
7:15 - 7:30	2	46	47	1	1	16	1	0	9	15	0	0	8	96	2	2	243	
7:30 - 7:45	0	51	44	2	2	19	3	0	17	18	0	1	11	90	2	3	257	
7:45 - 8:00	1	42	39	2	0	17	8	0	20	26	0	1	8	80	4	2	245	961
8:00 - 8:15	3	35	38	1	3	23	5	1	8	17	0	0	6	83	0	0	221	966
8:15 - 8:30	4	29	37	2	1	31	1	4	14	24	0	3	9	64	5	1	219	942
8:30 - 8:45	2	36	32	0	2	17	2	1	16	33	0	3	7	60	1	2	208	893
8:45 - 9:00	4	27	37	3	0	18	5	1	10	28	0	1	3	66	5	3	203	851
TOTAL	22	316	322	12	10	150	30	8	104	174	0	9	58	605	21	14	1812	
		EBPct	36.0			**WBPct**	10.1			**NBPct**	13.5			**SBPct**	40.4			
Peak Sums:	**6**	**174**	**168**	**6**	**6**	**75**	**17**	**1**	**54**	**76**	**0**	**2**	**33**	**349**	**8**	**7**	**966**	
Total Trucks	16					**TrkPct**	1.66			**PHF**	0.94							

Time Period	Route 31 EB				Route 31 WB				Route 122 NB				Route 122 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	2	31	20	1	2	44	7	0	41	65	0	2	3	35	7	1	257	
4:15 - 4:30	6	33	26	5	3	45	8	1	30	67	0	2	4	40	7	4	269	
4:30 - 4:45	7	24	26	2	1	34	7	0	32	77	1	3	11	27	3	1	250	
4:45 - 5:00	5	22	16	1	2	47	8	0	41	85	0	0	4	41	1	1	272	1048
5:00 - 5:15	3	23	15	1	2	39	20	1	34	92	1	2	3	36	6	4	274	1065
5:15 - 5:30	6	27	14	2	2	32	12	1	34	83	0	0	7	24	10	0	251	1047
5:30 - 5:45	2	21	27	1	1	52	11	2	48	81	1	1	3	31	4	0	282	1079
5:45 - 6:00	2	18	21	0	1	46	3	2	31	73	0	1	2	28	3	0	228	1035
TOTAL	33	199	165	13	14	339	76	7	291	623	3	11	37	262	41	11	2083	
		EBPct	16.8			**WBPct**	21.1			**NBPct**	46.3			**SBPct**	15.8			
Peak Sums:	**16**	**93**	**72**	**5**	**7**	**170**	**51**	**4**	**157**	**341**	**2**	**3**	**17**	**132**	**21**	**5**	**1079**	
Total Trucks	17					**TrkPct**	1.58			**PHF**	0.96							

HCS 2010 Signalized Intersection Results Summary

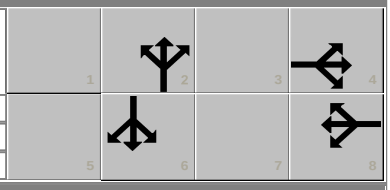
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 29, 2012	Area Type	Other
Jurisdiction	Paxton	Time Period	7:15 - 8:15 AM	PHF	0.94
Intersection	Route 122/Route 31	Analysis Year	2012	Analysis Period	1> 7:00
File Name	12_Rt 122 & Rt 31_AM.xus				
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	6	174	168	6	75	17	54	76	0	33	349	8

Signal Information			
Cycle, s	61.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	19.0	0.0	0.0	0.0	0.0
Yellow	4.0	4.0	0.0	0.0	0.0	0.0
Red	2.0	2.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		25.0		25.0		36.0		36.0
Change Period, *(Y+R$_c$)*, s		6.0		6.0		6.0		6.0
Max Allow Headway *(MAH)*, s		3.2		3.2		3.2		3.2
Queue Clearance Time *(g$_s$)*, s		11.8		4.2		4.4		10.9
Green Extension Time *(g$_e$)*, s		0.6		0.8		1.1		1.1
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.08		0.00		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h		340			94			138			414	
Adjusted Saturation Flow Rate *(s)*, veh/h/ln		1782			1844			1133			1740	
Queue Service Time *(g$_s$)*, s		0.0			0.0			0.0			0.0	
Cycle Queue Clearance Time *(g$_c$)*, s		9.8			2.2			2.4			8.9	
Capacity *(c)*, veh/h		615			637			641			920	
Volume-to-Capacity Ratio *(X)*		0.553			0.147			0.216			0.450	
Available Capacity *(c$_a$)*, veh/h		615			637			641			920	
Back of Queue *(Q)*, veh/ln (50th percentile)		3.7			0.8			0.8			3.0	
Overflow Queue *(Q$_3$)*, veh/ln		0.0			0.0			0.0			0.0	
Queue Storage Ratio *(RQ)* (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay *(d$_1$)*, s/veh		17.8			15.2			8.5			10.1	
Incremental Delay *(d$_2$)*, s/veh		0.6			0.0			0.1			0.1	
Initial Queue Delay *(d$_3$)*, s/veh		0.0			0.0			0.0			0.0	
Control Delay *(d)*, s/veh		18.5			15.2			8.5			10.3	
Level of Service (LOS)		B			B			A			B	
Approach Delay, s/veh / LOS	18.5	B		15.2	B		8.5	A		10.3	B	
Intersection Delay, s/veh / LOS	13.3						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	1.0	A	0.6	A	0.7	A	1.2	A

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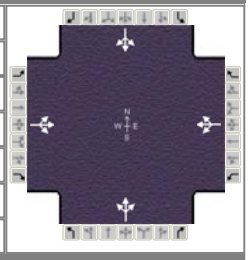
HCS 2010 Signalized Intersection Results Summary

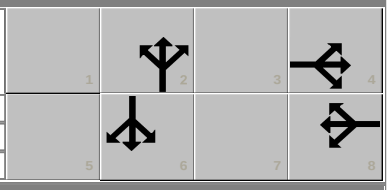
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 29, 2012	Area Type	Other
Jurisdiction	Paxton	Time Period	4:45 - 5:45 PM	PHF	0.96
Intersection	Route 122/Route 31	Analysis Year	2012	Analysis Period	1> 7:00
File Name	12_Rt 122 & Rt 31_PM.xus				
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	16	93	72	7	170	51	157	341	2	17	132	21

Signal Information			
Cycle, s	58.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	16.0	0.0	0.0	0.0	0.0
Yellow	4.0	4.0	0.0	0.0	0.0	0.0
Red	2.0	2.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		22.0		22.0		36.0		36.0
Change Period, *(Y+Rc)*, s		6.0		6.0		6.0		6.0
Max Allow Headway *(MAH)*, s		3.1		3.1		3.2		3.2
Queue Clearance Time *(g_s)*, s		6.1		7.7		17.7		4.8
Green Extension Time *(g_e)*, s		0.6		0.5		1.3		1.5
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.01		0.03		0.02		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate *(v)*, veh/h		163			223			521			169	
Adjusted Saturation Flow Rate *(s)*, veh/h/ln		1721			1849			1369			1666	
Queue Service Time *(g_s)*, s		0.0			0.0			11.5			0.0	
Cycle Queue Clearance Time *(g_c)*, s		4.1			5.7			15.7			2.8	
Capacity *(c)*, veh/h		543			574			789			930	
Volume-to-Capacity Ratio *(X)*		0.299			0.388			0.660			0.181	
Available Capacity *(c_a)*, veh/h		543			574			789			930	
Back of Queue *(Q)*, veh/ln (50th percentile)		1.5			2.2			3.9			0.9	
Overflow Queue *(Q_3)*, veh/ln		0.0			0.0			0.0			0.0	
Queue Storage Ratio *(RQ)* (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay *(d_1)*, s/veh		16.7			17.3			10.0			7.4	
Incremental Delay *(d_2)*, s/veh		0.1			0.2			1.6			0.0	
Initial Queue Delay *(d_3)*, s/veh		0.0			0.0			0.0			0.0	
Control Delay *(d)*, s/veh		16.8			17.4			11.7			7.5	
Level of Service (LOS)		B			B			B			A	
Approach Delay, s/veh / LOS	16.8	B		17.4	B		11.7	B		7.5	A	
Intersection Delay, s/veh / LOS	13.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	0.8	A	0.9	A	1.3	A	0.8	A

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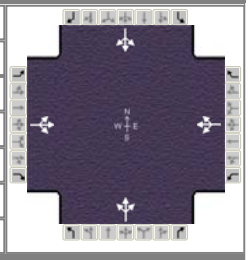
HCS 2010 Signalized Intersection Results Summary

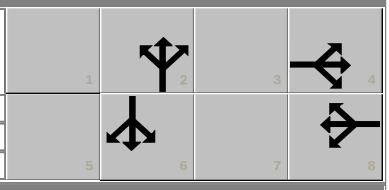
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 29, 2012	Area Type	Other
Jurisdiction	Paxton	Time Period	7:15 - 8:15 AM	PHF	0.94
Intersection	Route 122/Route 31	Analysis Year	2012	Analysis Period	1> 7:00
File Name	12_Rt 122 & Rt 31_AM_Bal.xus				
Project Description	Balanced				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	6	180	168	6	87	29	54	76	0	38	349	8

Signal Information			
Cycle, s	61.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	19.0	0.0	0.0	0.0	0.0
Yellow	4.0	4.0	0.0	0.0	0.0	0.0
Red	2.0	2.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		25.0		25.0		36.0		36.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.1		3.1
Queue Clearance Time (g_s), s		12.0		4.8		4.4		11.0
Green Extension Time (g_e), s		0.6		0.8		1.1		1.1
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.10		0.00		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		347			119			138			419	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1794			1858			1408			1817	
Queue Service Time (g_s), s		0.0			0.0			0.0			0.0	
Cycle Queue Clearance Time (g_c), s		10.0			2.8			2.4			9.0	
Green Ratio (*g/C*)		0.31			0.31			0.49			0.49	
Capacity (*c*), veh/h		619			641			776			958	
Volume-to-Capacity Ratio (*X*)		0.560			0.186			0.178			0.437	
Available Capacity (c_a), veh/h		619			641			776			958	
Back of Queue (*Q*), veh/ln (50th percentile)		3.8			1.1			0.8			3.0	
Queue Storage Ratio (*RQ*) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (d_1), s/veh		17.9			15.4			8.5			10.2	
Incremental Delay (d_2), s/veh		0.7			0.1			0.0			0.1	
Initial Queue Delay (d_3), s/veh		0.0			0.0			0.0			0.0	
Control Delay (*d*), s/veh		18.6			15.5			8.5			10.3	
Level of Service (LOS)		B			B			A			B	
Approach Delay, s/veh / LOS	18.6	B		15.5	B		8.5	A		10.3	B	
Intersection Delay, s/veh / LOS	13.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	1.1	A	0.7	A	0.7	A	1.2	A

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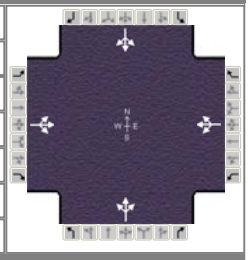
HCS 2010 Signalized Intersection Results Summary

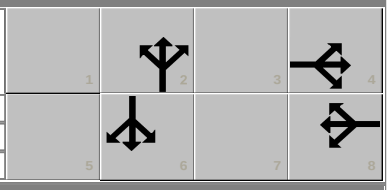
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 29, 2012	Area Type	Other
Jurisdiction	Paxton	Time Period	4:45 - 5:45 PM	PHF	0.96
Intersection	Route 122/Route 31	Analysis Year	2012	Analysis Period	1> 7:00
File Name	12_Rt 122 & Rt 31_PM_Bal.xus				
Project Description	Balanced				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	16	103	72	7	173	54	157	341	2	24	132	21

Signal Information			
Cycle, s	58.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	16.0	0.0	0.0	0.0	0.0
Yellow	4.0	4.0	0.0	0.0	0.0	0.0
Red	2.0	2.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		22.0		22.0		36.0		36.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s		3.1		3.1		3.2		3.2
Queue Clearance Time (g_s), s		6.3		7.8		13.7		5.0
Green Extension Time (g_e), s		0.6		0.5		1.4		1.4
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.01		0.03		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		173			229			521			176	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1800			1866			1705			1722	
Queue Service Time (g_s), s		0.0			0.0			7.6			0.0	
Cycle Queue Clearance Time (g_c), s		4.3			5.8			11.7			3.0	
Green Ratio (*g/C*)		0.28			0.28			0.52			0.52	
Capacity (*c*), veh/h		565			579			963			962	
Volume-to-Capacity Ratio (*X*)		0.306			0.396			0.541			0.183	
Available Capacity (c_a), veh/h		565			579			963			962	
Back of Queue (*Q*), veh/ln (50th percentile)		1.6			2.3			3.5			0.9	
Queue Storage Ratio (*RQ*) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (d_1), s/veh		16.8			17.3			9.5			7.5	
Incremental Delay (d_2), s/veh		0.1			0.2			0.3			0.0	
Initial Queue Delay (d_3), s/veh		0.0			0.0			0.0			0.0	
Control Delay (*d*), s/veh		16.9			17.5			9.8			7.5	
Level of Service (LOS)		B			B			A			A	
Approach Delay, s/veh / LOS	16.9	B		17.5	B		9.8	A		7.5	A	
Intersection Delay, s/veh / LOS	12.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	0.8	A	0.9	A	1.3	A	0.8	A

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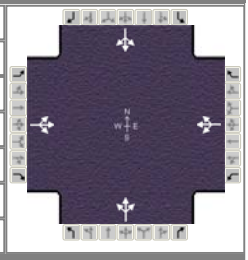
HCS 2010 Signalized Intersection Results Summary

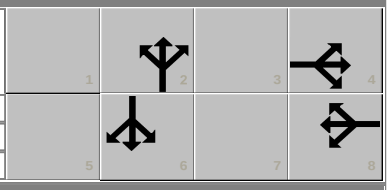
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 29, 2012	Area Type	Other
Jurisdiction	Paxton	Time Period	7:15 - 8:15 AM	PHF	0.94
Intersection	Route 122/Route 31	Analysis Year	2012	Analysis Period	1> 7:00
File Name	12_Rt 122 & Rt 31_AM_Proj2023.xus				
Project Description	Projected 2023				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	7	194	187	7	84	19	60	85	0	37	389	9

Signal Information			
Cycle, s	61.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	19.0	0.0	0.0	0.0	0.0
Yellow	4.0	4.0	0.0	0.0	0.0	0.0
Red	2.0	2.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		25.0		25.0		36.0		36.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.2		3.2
Queue Clearance Time (g_s), s		13.5		4.5		4.7		12.4
Green Extension Time (g_e), s		0.6		0.9		1.3		1.2
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.26		0.00		0.00		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		383			106			154			462	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1773			1855			1329			1803	
Queue Service Time (g_s), s		0.0			0.0			0.0			0.0	
Cycle Queue Clearance Time (g_c), s		11.5			2.5			2.7			10.4	
Green Ratio (*g/C*)		0.31			0.31			0.49			0.49	
Capacity (*c*), veh/h		612			641			737			951	
Volume-to-Capacity Ratio (*X*)		0.625			0.166			0.209			0.486	
Available Capacity (c_a), veh/h		612			641			737			951	
Back of Queue (*Q*), veh/ln (50th percentile)		4.4			1.0			0.9			3.4	
Queue Storage Ratio (*RQ*) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (d_1), s/veh		18.4			15.3			8.6			10.5	
Incremental Delay (d_2), s/veh		1.5			0.0			0.1			0.1	
Initial Queue Delay (d_3), s/veh		0.0			0.0			0.0			0.0	
Control Delay (*d*), s/veh		19.9			15.4			8.6			10.7	
Level of Service (LOS)		B			B			A			B	
Approach Delay, s/veh / LOS	19.9	B		15.4	B		8.6	A		10.7	B	
Intersection Delay, s/veh / LOS	14.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	1.1	A	0.7	A	0.7	A	1.2	A

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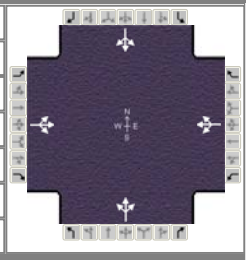
HCS 2010 Signalized Intersection Results Summary

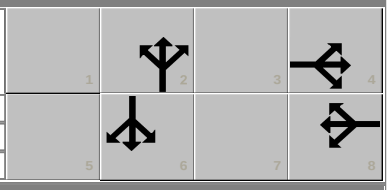
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 29, 2012	Area Type	Other
Jurisdiction	Paxton	Time Period	4:45 - 5:45 PM	PHF	0.96
Intersection	Route 122/Route 31	Analysis Year	2012	Analysis Period	1> 7:00
File Name	12_Rt 122 & Rt 31_PM_Proj2023.xus				
Project Description	Projected 2023				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	18	115	81	8	195	60	177	384	2	27	149	24

Signal Information			
Cycle, s	58.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	30.0	16.0	0.0	0.0	0.0	0.0
Yellow	4.0	4.0	0.0	0.0	0.0	0.0
Red	2.0	2.0	0.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8		2		6
Case Number		8.0		8.0		8.0		8.0
Phase Duration, s		22.0		22.0		36.0		36.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s		3.1		3.1		3.2		3.2
Queue Clearance Time (g_s), s		7.1		8.8		16.7		5.5
Green Extension Time (g_e), s		0.7		0.6		1.6		1.7
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.03		0.08		0.02		0.00

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h		197			259			586			200	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1775			1846			1671			1700	
Queue Service Time (g_s), s		0.0			0.0			11.2			0.0	
Cycle Queue Clearance Time (g_c), s		5.1			6.8			14.7			3.5	
Green Ratio (*g/C*)		0.28			0.28			0.52			0.52	
Capacity (*c*), veh/h		558			573			946			950	
Volume-to-Capacity Ratio (*X*)		0.353			0.452			0.620			0.211	
Available Capacity (c_a), veh/h		558			573			946			950	
Back of Queue (*Q*), veh/ln (50th percentile)		1.9			2.6			4.3			1.1	
Queue Storage Ratio (*RQ*) (50th percentile)		0.00			0.00			0.00			0.00	
Uniform Delay (d_1), s/veh		17.0			17.7			10.1			7.6	
Incremental Delay (d_2), s/veh		0.1			0.2			0.9			0.0	
Initial Queue Delay (d_3), s/veh		0.0			0.0			0.0			0.0	
Control Delay (*d*), s/veh		17.2			17.9			11.1			7.6	
Level of Service (LOS)		B			B			B			A	
Approach Delay, s/veh / LOS	17.2	B		17.9	B		11.1	B		7.6	A	
Intersection Delay, s/veh / LOS	12.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.1	B	2.1	B	2.1	B	2.1	B
Bicycle LOS Score / LOS	0.8	A	0.9	A	1.5	A	0.8	A

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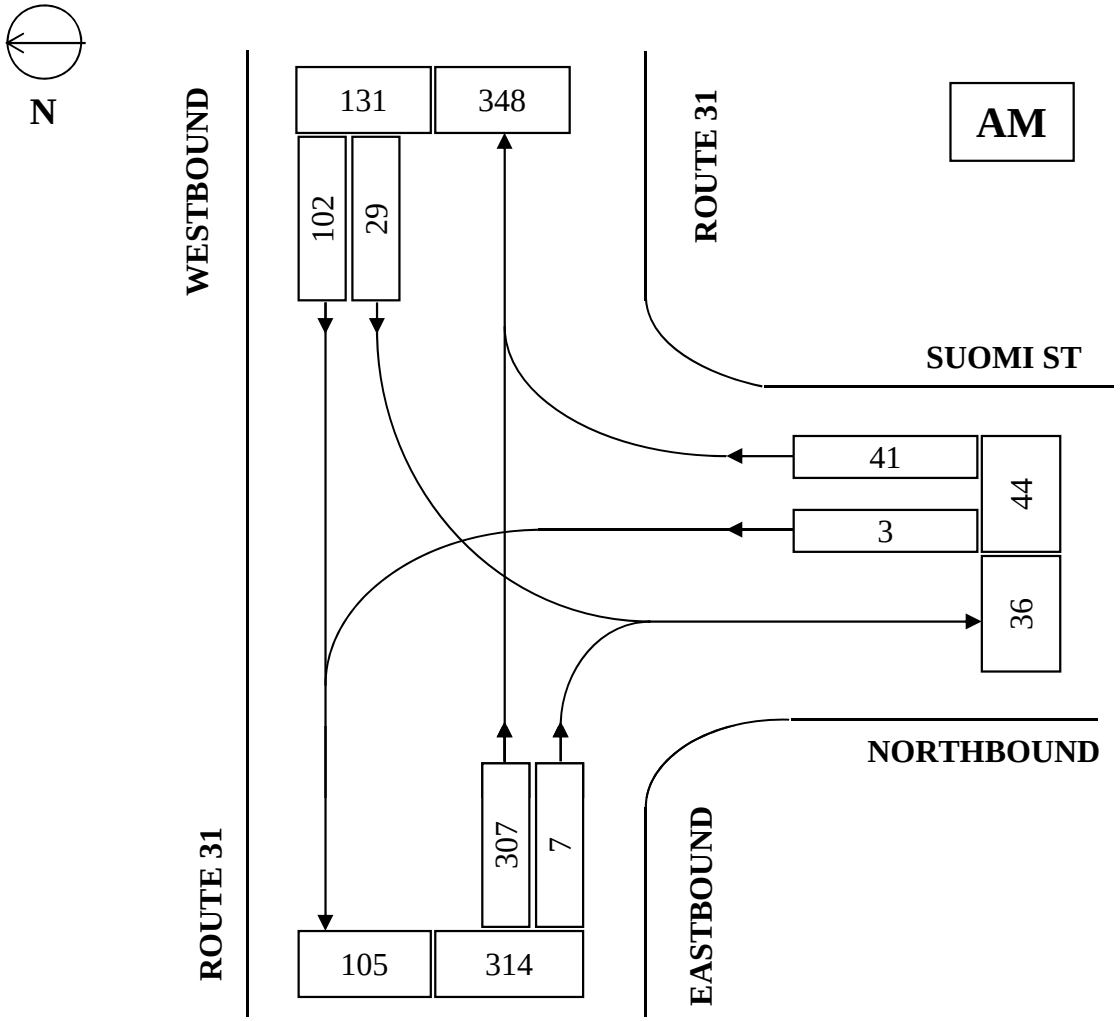
CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 6/13/2013 **DAY OF WEEK:** Thursday

INTERSECTION: Route 31 / Suomi Street



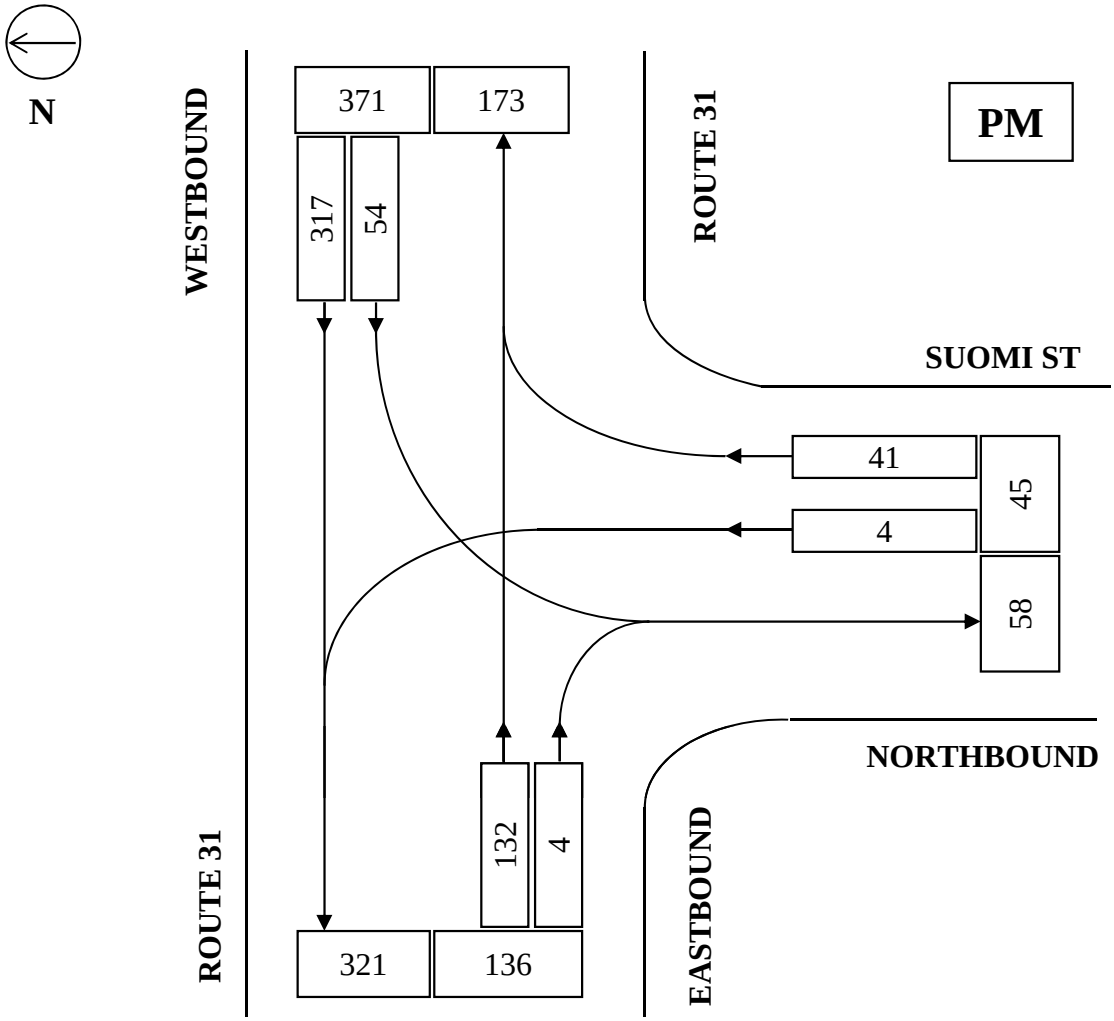
STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:00 - 8:00 AM
Route 31 EB	314	64.2%	
			PHF = .96
Route 31 WB	131	26.8%	
			VEHICLES COUNTED
Suomi St NB	44	9.0%	
			ALL VEHICLES: 489
TOTAL	489	100.00%	**TRUCKS:** 13
			PERCENT TRUCKS: 2.66%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Paxton **DATE:** 6/13/2013 **DAY OF WEEK:** Thursday

INTERSECTION: Route 31 / Suomi Street



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:00 - 5:00 PM
Route 31 EB	136	24.6%	
			PHF = .89
Route 31 WB	371	67.2%	
			VEHICLES COUNTED
Suomi St NB	45	8.2%	
			ALL VEHICLES: 552
TOTAL	552	100.00%	**TRUCKS:** 10
			PERCENT TRUCKS: 1.81%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Paxton

DATE: 6/13/2013

LOCATION: Route 31 / Suomi Street

DAY OF WEEK: Thursday

WEATHER: AM: Cloudy PM: Rainy

TECHNICIAN: RJ

Time Period	Route 31 EB				Route 31 WB				Suomi St NB								Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	0	85	1	1	3	23	0	3	0	0	11	0					123	
7:15 - 7:30	0	71	2	1	10	22	0	2	2	0	9	0					116	
7:30 - 7:45	0	81	2	1	7	30	0	3	0	0	7	0					127	
7:45 - 8:00	0	70	2	2	9	27	0	0	1	0	14	0					123	489
8:00 - 8:15	0	64	3	3	8	23	0	1	0	0	17	1					115	481
8:15 - 8:30	0	39	0	5	14	38	0	4	1	0	11	1					103	468
8:30 - 8:45	0	58	3	2	6	22	0	1	0	0	12	1					101	442
8:45 - 9:00	0	41	1	1	4	24	0	0	1	0	7	0					78	397
TOTAL	0	509	14	16	61	209	0	14	5	0	88	3	0	0	0	0	886	
		EBPct	64.2			**WBPct**	26.8			**NBPct**	9.0			**SBPct**	0.0			
Peak Sums:	**0**	**307**	**7**	**5**	**29**	**102**	**0**	**8**	**3**	**0**	**41**	**0**	**0**	**0**	**0**	**0**	**489**	
Total Trucks	13					**TrkPct**	2.66			**PHF**	0.96							

Time Period	Route 31 EB				Route 31 WB				Suomi St NB								Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	0	28	1	1	21	73	0	1	3	0	9	2					135	
4:15 - 4:30	0	36	0	0	9	80	0	0	0	0	7	0					132	
4:30 - 4:45	0	39	2	2	10	71	0	1	0	0	8	0					130	
4:45 - 5:00	0	29	1	2	14	93	0	1	1	0	17	0					155	552
5:00 - 5:15	0	34	1	1	5	71	0	0	1	0	7	0					119	536
5:15 - 5:30	0	25	2	0	10	79	0	1	5	0	5	1					126	530
5:30 - 5:45	0	42	1	0	6	64	0	1	1	0	12	0					126	526
5:45 - 6:00	0	31	2	0	6	55	0	0	4	0	8	0					106	477
TOTAL	0	264	10	6	81	586	0	5	15	0	73	3	0	0	0	0	1029	
		EBPct	24.6			**WBPct**	67.2			**NBPct**	8.2			**SBPct**	0.0			
Peak Sums:	**0**	**132**	**4**	**5**	**54**	**317**	**0**	**3**	**4**	**0**	**41**	**2**	**0**	**0**	**0**	**0**	**552**	
Total Trucks	10					**TrkPct**	1.81			**PHF**	0.89							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/Suomi Street
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Route 31
North/South Street: Suomi Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		307	7	29	102	
Peak-Hour Factor, PHF		0.96	0.96	0.96	0.96	
Hourly Flow Rate, HFR		319	7	30	106	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	3		41			
Peak Hour Factor, PHF	0.96		0.96			
Hourly Flow Rate, HFR	3		42			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes		0	0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		30		45				
C(m) (vph)		1228		707				
v/c		0.02		0.06				
95% queue length		0.08		0.20				
Control Delay		8.0		10.4				
LOS		A		B				
Approach Delay				10.4				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 4:00 - 5:00 PM
Intersection: Route 31/Suomi Street
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Route 31
North/South Street: Suomi Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		132	4	54	317	
Peak-Hour Factor, PHF		0.89	0.89	0.89	0.89	
Hourly Flow Rate, HFR		148	4	60	356	
Percent Heavy Vehicles		--	--	2	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4		41			
Peak Hour Factor, PHF	0.89		0.89			
Hourly Flow Rate, HFR	4		46			
Percent Heavy Vehicles	2		2			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes		0	0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		60		50				
C(m) (vph)		1429		824				
v/c		0.04		0.06				
95% queue length		0.13		0.19				
Control Delay		7.6		9.7				
LOS		A		A				
Approach Delay				9.7				
Approach LOS				A				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/Suomi Street
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Route 31
North/South Street: Suomi Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		339	8	32	113	
Peak-Hour Factor, PHF		0.96	0.96	0.96	0.96	
Hourly Flow Rate, HFR		353	8	33	117	
Percent Heavy Vehicles		--	--	4	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	3		45			
Peak Hour Factor, PHF	0.96		0.96			
Hourly Flow Rate, HFR	3		46			
Percent Heavy Vehicles	0		0			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			/
Lanes		0	0			
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		33		49				
C(m) (vph)		1187		675				
v/c		0.03		0.07				
95% queue length		0.09		0.23				
Control Delay		8.1		10.8				
LOS		A		B				
Approach Delay				10.8				
Approach LOS				B				

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 4:00 - 5:00 PM
Intersection: Route 31/Suomi Street
Jurisdiction: Paxton
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Route 31
North/South Street: Suomi Street
Intersection Orientation: EW Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume		146	4	60	350	
Peak-Hour Factor, PHF		0.89	0.89	0.89	0.89	
Hourly Flow Rate, HFR		164	4	67	393	
Percent Heavy Vehicles		--	--	3	--	--
Median Type/Storage	Undivided			/		
RT Channelized?						
Lanes		1	0	0	1	
Configuration			TR		LT	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	4		45			
Peak Hour Factor, PHF	0.89		0.89			
Hourly Flow Rate, HFR	4		50			
Percent Heavy Vehicles	3		3			
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No	/		/
Lanes	0	0				
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config		LT		LR				
v (vph)		67		54				
C(m) (vph)		1404		802				
v/c		0.05		0.07				
95% queue length		0.15		0.22				
Control Delay		7.7		9.8				
LOS		A		A				
Approach Delay				9.8				
Approach LOS				A				

Town of Spencer

- Traffic Counts
- Turning Movement Counts: Existing, Balanced, and Projected 2023 Level of Service Results

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
04/25/91	Spencer	Ash St	S of Clark St	NB	391	399	790	1991015	CMRPC
07/11/85	Spencer	Bacon Hill Rd	E of Route 31 (Charlton Rd)	EB	209	185	394	1985151	CMRPC
09/05/91	Spencer	Briarcliff Ln	At Charlton TL	NB	95	105	200	1991136	CMRPC
09/04/91	Spencer	Brooks Pond Rd	At North Brookfield TL	NB	76	84	160	1991131	CMRPC
09/04/91	Spencer	Browning Pond Rd	At Oakham TL	EB	422	423	845	1991129	CMRPC
09/29/88	Spencer	Chestnut St	W of Elm St	EB	975	1859	2834	1988176	CMRPC
07/11/85	Spencer	Chickering Rd	At Leicester TL	EB	664	673	1337	1985148	CMRPC
05/21/91	Spencer	Chickering Rd	At Leicester TL	EB	767	831	1598	1991047	CMRPC
06/28/07	Spencer	Chickering Rd	At Leicester TL	EB	1665	1489	3154	2007184	CMRPC
07/09/85	Spencer	Clark Rd	At Leicester TL	EB	582	243	825	1985153	CMRPC
07/09/85	Spencer	Clark Rd	W of Chickering Rd	EB	246	208	454	1985152	CMRPC
07/16/85	Spencer	Cranberry Meadow Rd	S of RR	NB	142	82	224	1985133	CMRPC
07/11/85	Spencer	Cranberry Meadow Rd	W of Bacon Hill Rd	EB	242	382	624	1985158	CMRPC
04/11/91	Spencer	Cranberry Meadow Rd	W of Briarcliff Ln	EB	238	227	465	1991008	CMRPC
06/09/87	Spencer	Donnelly Rd	N of Route 9 (Main St)	NB	482	813	1295	1987099	CMRPC
06/14/07	Spencer	Donnelly Rd	N of Route 9 (Main St)	NB	736	741	1477	2007185	CMRPC
07/09/85	Spencer	East Charlton Rd	S of Bacon Hill Rd	EB	183	199	382	1985147	CMRPC
04/25/91	Spencer	East Charlton Rd	S of Capen Rd	NB	544	566	1110	1991012	CMRPC
04/30/91	Spencer	Greenville St	S of Cherry St	NB	567	499	1066	1991016	CMRPC
06/14/01	Spencer	Greenville St	S of Cherry St	NB	1262	1140	2402	2001185	CMRPC
07/11/85	Spencer	Greenville St	S of Route 9 (Main St)	NB	711	529	1240	1985143	CMRPC
05/20/86	Spencer	Greenville St	S of Route 9 (Main St)	NB	1073	436	1509		HMM
08/11/98	Spencer	Greenville St	S of Route 9 (Main St)	NB	733	927	1660	1998156	CMRPC
06/14/07	Spencer	Greenville St	S of Route 9 (Main St)	NB	952	949	1901	2007186	CMRPC
11/02/10	Spencer	Greenville St	S of Route 9 (Main St)	NB	986	1020	2006	2010168	CMRPC
04/24/91	Spencer	Greenville St	S of S Kingsbury Rd	NB	732	638	1370	1991110	CMRPC
07/11/85	Spencer	Grove St	N of Route 9 (Main St)	NB	837	708	1545	1985139	CMRPC
05/14/91	Spencer	Hastings Rd	N of Nugget Farm Rd	NB	253	248	501	1991035	CMRPC
07/11/85	Spencer	Henry-Wilson Rd	At Leicester TL	EB	664	673	1337	1985148	CMRPC
05/21/91	Spencer	Henry-Wilson Rd	At Leicester TL	EB	767	831	1598	1991047	CMRPC
07/12/85	Spencer	Herbert Rd	E of South Spencer Rd	EB	151	122	273	1985149	CMRPC
05/14/91	Spencer	Highland St	S of Wilson St	NB	504	496	1000	1991034	CMRPC
06/06/13	Spencer	Kingsbury Rd	At Leicester TL	EB	383	366	749	2013072	CMRPC
07/02/85	Spencer	Kingsbury Rd	S of Greenville Rd	NB	72	124	196	1985144	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
05/14/91	Spencer	Meadow Rd	S of Route 31 (Pleasant St)	NB	1766	1872	3638	1991032	CMRPC
08/11/98	Spencer	Meadow Rd	S of Route 31 (Pleasant St)	NB	948	1906	2854	1998157	CMRPC
05/23/13	Spencer	Meadow Rd	S of Route 31 (Pleasant St)	NB	2256	2345	4601	2013155	CMRPC
06/27/85	Spencer	Meadow Rd(former W Main St)	N of Route 9 (West Main St)	NB	2333	2028	4361	1985135	CMRPC
09/22/88	Spencer	Meadow Rd(former W Main St)	N of Route 9 (West Main St)	NB	2390	2439	4829	1988172	CMRPC
06/14/07	Spencer	Meadow Rd(former W Main St)	N of Route 9 (West Main St)	NB	3412	3280	6692	2007193	CMRPC
10/26/10	Spencer	Meadow Rd(former W Main St)	N of Route 9 (West Main St)	NB	2870	2908	5778	2010175	CMRPC
05/23/13	Spencer	Meadow Rd(former W Main St)	N of Route 9 (West Main St)	NB	2853	2966	5819	2013160	CMRPC
06/27/85	Spencer	Meadow Rd(former W Main St)	W of Route 9 (Dewey St)	EB	460	506	966	1985138	CMRPC
06/18/85	Spencer	North Brookfield Rd	At North Brookfield TL	EB	358	345	703	1985117	CMRPC
08/11/98	Spencer	North Brookfield Rd	W of Route 31(North Spencer Rd)	EB	787	785	1572	1998158	CMRPC
06/14/01	Spencer	North Brookfield Rd	W of Route 31(North Spencer Rd)	EB	1036	986	2022	2001186	CMRPC
06/28/04	Spencer	North Brookfield Rd	W of Route 31(North Spencer Rd)	EB	1016	989	2005	2004175	CMRPC
06/14/07	Spencer	North Brookfield Rd	W of Route 31(North Spencer Rd)	EB	1078	1146	2224	2007187	CMRPC
10/26/10	Spencer	North Brookfield Rd	W of Route 31(North Spencer Rd)	EB	972	951	1923	2010169	CMRPC
05/21/91	Spencer	Northwest Rd	At Oakham TL	NB	121	95	216	1991051	CMRPC
05/21/91	Spencer	Northwest Rd	S of Kittredge Rd	NB	383	380	763	1991050	CMRPC
06/25/85	Spencer	Nugget Farm Rd	W of Paxton Rd	EB	203	254	457	1985150	CMRPC
04/23/91	Spencer	Paxton Rd	N of Donnelly Rd	NB	704	711	1415	1991011	CMRPC
07/11/85	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	923	710	1633	1985134	CMRPC
03/22/88	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	751	725	1476	1988004	CMRPC
05/21/91	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	879	939	1818	1991049	CMRPC
11/15/94	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	845	805	1650	1994074	CMRPC
07/10/97	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	929	899	1828	1997090	CMRPC
07/24/00	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	564	587	1151	MHD-3143	CMRPC
06/30/03	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	973	996	1969	MHD-3143	CMRPC
06/05/06	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	1073	1133	2206	MHD-3143	CMRPC
09/22/09	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	1103	1081	2184	MHD-3143	CMRPC
09/05/12	Spencer	Paxton Rd	N of Route 9 (Main St)	NB	967	960	1927	MHD-3143	CMRPC
06/25/85	Spencer	Paxton Rd	S of Thompson Pond Rd	NB	395	294	689	1985155	CMRPC
05/16/91	Spencer	Paxton Rd	S of Thompson Pond Rd	NB	498	539	1037	1991039	CMRPC
08/13/98	Spencer	Paxton Rd	S of Thompson Pond Rd	NB	473	508	981	1998159	CMRPC
06/14/01	Spencer	Paxton Rd	S of Thompson Pond Rd	NB	629	620	1249	2001187	CMRPC
06/28/07	Spencer	Paxton Rd	S of Thompson Pond Rd	NB	643	643	1286	2007188	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
11/02/10	Spencer	Paxton Rd	S of Thompson Pond Rd	NB	542	545	1087	2010170	CMRPC
07/11/85	Spencer	Route 31 (Charlton Rd)	At Charlton TL	NB	1099	1149	2248	1985130	CMRPC
10/06/98	Spencer	Route 31 (Charlton Rd)	At Charlton TL	NB	1323	1305	2628	1998160	CMRPC
04/29/02	Spencer	Route 31 (Charlton Rd)	At Charlton TL	NB	1258	1379	2637	2002035	CMRPC
06/28/07	Spencer	Route 31 (Charlton Rd)	At Charlton TL	NB	1802	1719	3521	2007189	CMRPC
05/24/11	Spencer	Route 31 (Charlton Rd)	At Charlton TL	NB	1499	1513	3012	2011031	CMRPC
06/14/01	Spencer	Route 31 (Charlton Rd)	N of Howe Rd	NB	2389	2260	4649	2001189	CMRPC
04/24/91	Spencer	Route 31 (Charlton Rd)	N of Sunberg Rd	NB	1565	1191	2756	1991013	CMRPC
05/21/13	Spencer	Route 31 (Hillsville Rd)	N of Wire Village Rd	NB	3471	3526	6997	2013158	CMRPC
07/02/85	Spencer	Route 31 (Maple St)	S of Adams St	NB	2470	2466	4936	1985131	CMRPC
03/22/88	Spencer	Route 31 (Maple St)	S of Adams St	NB	2404	2401	4805	1988002	CMRPC
08/23/90	Spencer	Route 31 (Maple St)	S of Adams St	NB	2778	2667	5445	1990084	CMRPC
09/05/91	Spencer	Route 31 (Maple St)	S of Adams St	NB	2759	2526	5285	1991135	CMRPC
10/19/93	Spencer	Route 31 (Maple St)	S of Adams St	NB	2633	2588	5221	1993051	CMRPC
11/15/94	Spencer	Route 31 (Maple St)	S of Adams St	NB	2530	2474	5004	1994073	CMPRC
07/18/95	Spencer	Route 31 (Maple St)	S of Adams St	NB	2575	2574	5149	1995094	CMRPC
07/16/96	Spencer	Route 31 (Maple St)	S of Adams St	NB	2871	2807	5678	1996080	CMRPC
10/21/97	Spencer	Route 31 (Maple St)	S of Adams St	NB	3071	2966	6037	1997089	CMRPC
07/27/99	Spencer	Route 31 (Maple St)	S of Adams St	NB	2275	2398	4673	1999143	CMRPC
07/24/00	Spencer	Route 31 (Maple St)	S of Adams St	NB	2398	2440	4838	MHD-3145	CMRPC
04/29/02	Spencer	Route 31 (Maple St)	S of Adams St	NB	2321	2196	4517	MHD-3145	CMRPC
06/16/03	Spencer	Route 31 (Maple St)	S of Adams St	NB	2816	2834	5650	MHD-3145	CMRPC
06/02/05	Spencer	Route 31 (Maple St)	S of Adams St	NB	2838	2663	5501	MHD-3145	CMRPC
06/05/06	Spencer	Route 31 (Maple St)	S of Adams St	NB	2600	2495	5095	MHD-3145	CMRPC
06/26/08	Spencer	Route 31 (Maple St)	S of Adams St	NB	2489	2666	5155	MHD-3145	CMRPC
08/18/11	Spencer	Route 31 (Maple St)	S of Adams St	NB	2517	3279	5796	MHD-3145	CMRPC
09/05/12	Spencer	Route 31 (Maple St)	S of Adams St	NB	2186	2103	4289	MHD-3145	CMRPC
11/02/10	Spencer	Route 31 (Maple St)	S of Adams St (actually S of Rt 9)	NB	2826	2378	5204	2010172	CMRPC
05/14/91	Spencer	Route 31 (North Spencer Rd)	At Paxton TL	NB	2222	2181	4403	1991036	CMRPC
08/13/98	Spencer	Route 31 (North Spencer Rd)	At Paxton TL	NB	1745	1628	3373	1998161	CMRPC
06/14/01	Spencer	Route 31 (North Spencer Rd)	At Paxton TL	NB	1940	1951	3891	2001188	CMRPC
05/24/04	Spencer	Route 31 (North Spencer Rd)	At Paxton TL	NB	1932	2276	4208	2004122	CMRPC
09/20/07	Spencer	Route 31 (North Spencer Rd)	At Paxton TL	NB	2042	2070	4112	2007144	CMRPC
05/18/10	Spencer	Route 31 (North Spencer Rd)	At Paxton TL	NB	1713	1656	3369	2010131	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
05/21/13	Spencer	Route 31 (North Spencer Rd)	At Paxton TL	NB	1724	1803	3527	2013117	CMRPC
05/14/91	Spencer	Route 31 (North Spencer Rd)	N of North Brookfield Rd	NB	2873	2370	5243	1991033	CMRPC
06/27/85	Spencer	Route 31 (North Spencer Rd)	S of Hastings Rd	NB	2052	1951	4003	1985156	CMRPC
09/29/88	Spencer	Route 31 (North Spencer Rd)	S of Hastings Rd	NB	2291	2266	4557	1988177	CMRPC
06/06/13	Spencer	Route 31 (North Spencer Rd)	S of Hastings Rd	NB	2680	2773	5453	2013156	CMRPC
09/26/85	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	2504	2922	5426	1985132	CMRPC
09/11/86	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	3263	2774	6037	Spec121	CMRPC
03/26/87	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	2538	2566	5104	1987005	CMRPC
04/14/88	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	2333	3512	5845	1988042	CMRPC
04/27/89	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	3420	3286	6706	1989022	CMRPC
04/28/92	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	2354	2648	5002	112228	MHD
08/13/98	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	2613	3165	5778	1998162	CMRPC
06/14/01	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	3329	3564	6893	2001190	CMRPC
06/28/04	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	2994	3372	6366	2004177	CMRPC
06/14/07	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	2991	2826	5817	2007190	CMRPC
05/23/13	Spencer	Route 31 (Pleasant St)	N of Route 9 (Main St)	NB	2853	3040	5893	2013157	CMRPC
09/27/88	Spencer	Route 49 (Podunk Pike)	S of Route 9 (West Main St)	NB	2396	2430	4826	1988175	CMRPC
05/02/91	Spencer	Route 49 (Podunk Pike)	S of Route 9 (West Main St)	NB	3014	3382	6396	1991009	CMRPC
11/05/98	Spencer	Route 49 (Podunk Pike)	S of Route 9 (West Main St)	NB	2629	2453	5082	1998163	CMRPC
07/19/01	Spencer	Route 49 (Podunk Pike)	S of Route 9 (West Main St)	NB	3265	3383	6648	2001191	CMRPC
10/16/06	Spencer	Route 49 (Podunk Pike)	S of Route 9 (West Main St)	NB	3541	3624	7165	2006173	CMRPC
10/26/10	Spencer	Route 49 (Podunk Pike)	S of Route 9 (West Main St)	NB	2799	3235	6034	2010173	CMRPC
04/11/91	Spencer	Route 9 (Dewey St)	W of Bixby Rd	EB	7684	8120	15804	1991001	CMRPC
08/01/85	Spencer	Route 9 (Main St)	At Leicester TL	EB	6764	6862	13626	1985163	CMRPC
10/06/88	Spencer	Route 9 (Main St)	At Leicester TL	EB	7595	7490	15085	1988182	CMRPC
04/23/91	Spencer	Route 9 (Main St)	At Leicester TL	EB	7437	7936	15373	1991010	CMRPC
05/09/91	Spencer	Route 9 (Main St)	At Leicester TL	EB	7618	7536	15154	91017501	CE
06/05/91	Spencer	Route 9 (Main St)	At Leicester TL	EB	7366	7275	14641	1991072	CMRPC
11/15/94	Spencer	Route 9 (Main St)	At Leicester TL	EB	6462	7877	14339	1994075	CMRPC
07/16/96	Spencer	Route 9 (Main St)	At Leicester TL	EB	7493	8249	15742	1996083	CMRPC
07/10/97	Spencer	Route 9 (Main St)	At Leicester TL	EB	6974	6676	13650	1997091	CMRPC
08/11/98	Spencer	Route 9 (Main St)	At Leicester TL	EB	6377	6979	13356	1998164	CMRPC
05/30/01	Spencer	Route 9 (Main St)	At Leicester TL	EB	7705	7039	14744	2001076	CMRPC
06/19/07	Spencer	Route 9 (Main St)	At Leicester TL	EB	6814	7198	14012	2007087	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
11/02/10	Spencer	Route 9 (Main St)	At Leicester TL	EB	6545	6926	13471	2010075	CMRPC
05/20/86	Spencer	Route 9 (Main St)	W of Donnelly Rd	EB	7074	8404	15478		HMM
06/09/87	Spencer	Route 9 (Main St)	W of Donnelly Rd	EB	7553	7254	14807	1987100	CMRPC
04/25/91	Spencer	Route 9 (Main St)	W of Greenville Rd	EB	8380	9269	17649	1991014	CMRPC
11/14/90	Spencer	Route 9 (Main St)	W of Grove St	EB	7598	7770	15368	1990139	CMRPC
11/03/94	Spencer	Route 9 (Main St)	W of Grove St	EB	9399	9449	18848	1994065	CMRPC
07/20/95	Spencer	Route 9 (Main St)	W of Paxton Rd	EB	8203	9320	17523	1995101	CMRPC
07/18/95	Spencer	Route 9 (Main St)	W of Route 31 (Maple St)	EB	8595	8238	16833	1995096	CMRPC
06/11/85	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	6752	7026	13778	1985118	CMRPC
11/14/90	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	8009	7807	15816	1990137	CMRPC
04/11/91	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	7687	7689	15376	1991003	CMRPC
11/17/94	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	7949	7839	15788	1994077	CMRPC
09/15/98	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	7775	6819	14594	1998028	CMRPC
07/19/01	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	7938	8623	16561	2001049	CMRPC
09/11/07	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	7295	6969	14264	2007056	CMRPC
10/27/10	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	7270	6949	14219	2010044	CMRPC
06/13/13	Spencer	Route 9 (West Main St)	At East Brookfield TL	EB	7188	7261	14449	2013042	CMRPC
07/18/95	Spencer	Route 9 (West Main St)	E of South Spencer Rd	EB	8233	7861	16094	1995095	CMRPC
06/27/85	Spencer	Route 9 (West Main St)	W of South Spencer Rd	EB	7905	8221	16126	1985129	CMRPC
09/25/86	Spencer	Route 9 (West Main St)	W of South Spencer Rd	EB	8841	8921	17762	Spec137	CMRPC
03/31/87	Spencer	Route 9 (West Main St)	W of South Spencer Rd	EB	7372	7365	14737	1987012	CMRPC
09/27/88	Spencer	Route 9 (West Main St)	W of South Spencer Rd	EB	7916	7606	15522	1988174	CMRPC
04/27/89	Spencer	Route 9 (West Main St)	W of South Spencer Rd	EB	9342	9778	19120	1989025	CMRPC
09/18/90	Spencer	Route 9 (West Main St)	W of South Spencer Rd	EB	8836	9157	17993	1990103	CMRPC
07/16/96	Spencer	Route 9 (West Main St)	W of South Spencer Rd	EB	12691	15618	28309	1996082	CMRPC
08/13/98	Spencer	Route 9 (West Main St)	W of South Spencer Rd	EB	7628	9303	16931	1998165	CMRPC
07/18/95	Spencer	Route 9/31 (Main St)	W of Mechanic St	EB	14901	10815	25716	1995097	CMRPC
09/04/91	Spencer	Smithville Rd	At East Brookfield TL	EB	140	120	260	1991133	CMRPC
04/11/91	Spencer	South Spencer Rd	N of Tom Casey Rd	NB	150	170	320	1991007	CMRPC
06/27/85	Spencer	South Spencer Rd	S of Route 9 (West Main St)	NB	1673	1891	3564	1985136	CMRPC
10/19/88	Spencer	South Spencer Rd	S of Route 9 (West Main St)	NB	2530	1944	4474	1988188	CMRPC
08/13/98	Spencer	South Spencer Rd	S of Route 9 (West Main St)	NB	1656	1503	3159	1998166	CMRPC
11/05/98	Spencer	South Spencer Rd	S of Route 9 (West Main St)	NB	1515	1301	2816	1998166	CMRPC
06/14/01	Spencer	South Spencer Rd	S of Route 9 (West Main St)	NB	2138	1951	4089	2001193	CMRPC

Date	Municipality	Street/Highway	Location	Traffic Flow	Volume NB/EB or ON	Volume SB/WB or OFF	Volume Total	Reference ID	Source
06/14/07	Spencer	South Spencer Rd	S of Route 9 (West Main St)	NB	1530	1756	3286	2007191	CMRPC
05/16/91	Spencer	Thompson Pond Rd	At Paxton TL	EB	798	849	1647	1991045	CMRPC
06/28/07	Spencer	Thompson Pond Rd	At Paxton TL	EB	1069	1032	2101	2007192	CMRPC
06/25/85	Spencer	Thompson Pond Rd	E of McCormick Rd	EB	315	289	604	1985154	CMRPC
09/27/88	Spencer	Wall St	S of Route 9 (Main St)	NB	828	371	1199	1988173	CMRPC
06/27/85	Spencer	Water St	S of Route 9 (Main St)	EB	1812	1066	2878	1985142	CMRPC
11/02/10	Spencer	Wilson St	Btwn Hasting & Lincoln St	EB	433	527	960	2010177	CMRPC
11/02/10	Spencer	Wilson St	Btwn Hasting & Paxton Rd	EB	837	390	1227	2010176	CMRPC
05/23/13	Spencer	Wire Village Rd	E of Route 31 (Pleasant St)	EB	451	526	977	2013161	CMRPC

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Spencer
Street : Route 31
Location : South of Hastings Rd

Site: 2013156

Weekly Volume

Interval Start	Mon 6/3/2013		Tue 6/4/2013		Wed 6/5/2013		Thu 6/6/2013		Fri 6/7/2013		Sat 6/8/2013		Sun 6/9/2013		Mon - Fri Average		Weekly Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	-	-	-	-	-	-	10	12	10	10	-	-	-	-	10.0	11.0	10.0	11.0
1:00 AM	-	-	-	-	-	-	4	3	9	5	-	-	-	-	6.5	4.0	6.5	4.0
2:00 AM	-	-	-	-	-	-	4	4	4	0	-	-	-	-	4.0	2.0	4.0	2.0
3:00 AM	-	-	-	-	-	-	6	6	8	6	-	-	-	-	7.0	6.0	7.0	6.0
4:00 AM	-	-	-	-	-	-	14	11	14	17	-	-	-	-	14.0	14.0	14.0	14.0
5:00 AM	-	-	-	-	-	-	71	48	60	37	-	-	-	-	65.5	42.5	65.5	42.5
6:00 AM	-	-	-	-	-	-	201	103	175	86	-	-	-	-	188.0	94.5	188.0	94.5
7:00 AM	-	-	-	-	-	-	250	165	230	157	-	-	-	-	240.0	161.0	240.0	161.0
8:00 AM	-	-	-	-	-	-	170	177	153	131	-	-	-	-	161.5	154.0	161.5	154.0
9:00 AM	-	-	-	-	-	-	118	158	-	-	-	-	-	-	118.0	158.0	118.0	158.0
10:00 AM	-	-	-	-	110	124	143	154	-	-	-	-	-	-	126.5	139.0	126.5	139.0
11:00 AM	-	-	-	-	146	133	151	138	-	-	-	-	-	-	148.5	135.5	148.5	135.5
12:00 PM	-	-	-	-	158	149	143	115	-	-	-	-	-	-	150.5	132.0	150.5	132.0
1:00 PM	-	-	-	-	156	135	148	141	-	-	-	-	-	-	152.0	138.0	152.0	138.0
2:00 PM	-	-	-	-	166	165	158	178	-	-	-	-	-	-	162.0	171.5	162.0	171.5
3:00 PM	-	-	-	-	152	221	165	254	-	-	-	-	-	-	158.5	237.5	158.5	237.5
4:00 PM	-	-	-	-	193	317	190	294	-	-	-	-	-	-	191.5	305.5	191.5	305.5
5:00 PM	-	-	-	-	199	274	211	235	-	-	-	-	-	-	205.0	254.5	205.0	254.5
6:00 PM	-	-	-	-	143	185	173	181	-	-	-	-	-	-	158.0	183.0	158.0	183.0
7:00 PM	-	-	-	-	135	107	147	136	-	-	-	-	-	-	141.0	121.5	141.0	121.5
8:00 PM	-	-	-	-	86	93	86	101	-	-	-	-	-	-	86.0	97.0	86.0	97.0
9:00 PM	-	-	-	-	67	69	58	86	-	-	-	-	-	-	62.5	77.5	62.5	77.5
10:00 PM	-	-	-	-	46	36	41	42	-	-	-	-	-	-	43.5	39.0	43.5	39.0
11:00 PM	-	-	-	-	16	24	18	31	-	-	-	-	-	-	17.0	27.5	17.0	27.5
Totals	0	0	0	0	1773	2032	2680	2773	663	449	0	0	0	0	2617.0	2706.0	2617.0	2706.0
Combined	0		0		3805		5453		1112		0		0		5323.0		5323.0	
Split (%)	-	-	-	-	46.6	53.4	49.1	50.9	59.6	40.4	-	-	-	-	49.2	50.8	49.2	50.8

Peak Hours

12:00 AM - 12:00 PM	-	-	-	-	11:00 AM	11:00 AM	7:00 AM	8:00 AM	7:00 AM	7:00 AM	-	-	-	-	7:00 AM	7:00 AM	7:00 AM	7:00 AM
Volume	-	-	-	-	146	133	250	177	230	157	-	-	-	-	240.0	161.0	240.0	161.0
12:00 PM - 12:00 AM	-	-	-	-	5:00 PM	4:00 PM	5:00 PM	4:00 PM	-	-	-	-	-	-	5:00 PM	4:00 PM	5:00 PM	4:00 PM
Volume	-	-	-	-	199	317	211	294	-	-	-	-	-	-	205.0	305.5	205.0	305.5

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Spencer
Street : Route 31
Location : North of Wire Village Rd

Site: 2013158

Weekly Volume

Interval Start	Mon 5/20/2013		Tue 5/21/2013		Wed 5/22/2013		Thu 5/23/2013		Fri 5/24/2013		Sat 5/25/2013		Sun 5/26/2013		Mon - Fri Average		Weekly Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	-	-	10	10	9	9	-	-	-	-	-	-	-	-	9.5	9.5	9.5	9.5
1:00 AM	-	-	7	7	11	11	-	-	-	-	-	-	-	-	9.0	9.0	9.0	9.0
2:00 AM	-	-	7	3	2	7	-	-	-	-	-	-	-	-	4.5	5.0	4.5	5.0
3:00 AM	-	-	10	8	13	7	-	-	-	-	-	-	-	-	11.5	7.5	11.5	7.5
4:00 AM	-	-	25	23	20	20	-	-	-	-	-	-	-	-	22.5	21.5	22.5	21.5
5:00 AM	-	-	64	85	48	79	-	-	-	-	-	-	-	-	56.0	82.0	56.0	82.0
6:00 AM	-	-	163	200	149	170	-	-	-	-	-	-	-	-	156.0	185.0	156.0	185.0
7:00 AM	-	-	225	324	223	320	-	-	-	-	-	-	-	-	224.0	322.0	224.0	322.0
8:00 AM	-	-	197	259	197	251	-	-	-	-	-	-	-	-	197.0	255.0	197.0	255.0
9:00 AM	-	-	196	191	173	173	-	-	-	-	-	-	-	-	184.5	182.0	184.5	182.0
10:00 AM	-	-	157	192	136	169	-	-	-	-	-	-	-	-	146.5	180.5	146.5	180.5
11:00 AM	-	-	200	214	-	-	-	-	-	-	-	-	-	-	200.0	214.0	200.0	214.0
12:00 PM	-	-	204	194	-	-	-	-	-	-	-	-	-	-	204.0	194.0	204.0	194.0
1:00 PM	177	198	202	216	-	-	-	-	-	-	-	-	-	-	189.5	207.0	189.5	207.0
2:00 PM	231	215	239	224	-	-	-	-	-	-	-	-	-	-	235.0	219.5	235.0	219.5
3:00 PM	308	269	267	311	-	-	-	-	-	-	-	-	-	-	287.5	290.0	287.5	290.0
4:00 PM	317	283	346	297	-	-	-	-	-	-	-	-	-	-	331.5	290.0	331.5	290.0
5:00 PM	338	277	314	275	-	-	-	-	-	-	-	-	-	-	326.0	276.0	326.0	276.0
6:00 PM	250	205	248	190	-	-	-	-	-	-	-	-	-	-	249.0	197.5	249.0	197.5
7:00 PM	184	173	155	140	-	-	-	-	-	-	-	-	-	-	169.5	156.5	169.5	156.5
8:00 PM	141	110	121	98	-	-	-	-	-	-	-	-	-	-	131.0	104.0	131.0	104.0
9:00 PM	95	68	78	60	-	-	-	-	-	-	-	-	-	-	86.5	64.0	86.5	64.0
10:00 PM	42	34	54	29	-	-	-	-	-	-	-	-	-	-	48.0	31.5	48.0	31.5
11:00 PM	38	27	35	20	-	-	-	-	-	-	-	-	-	-	36.5	23.5	36.5	23.5
Totals	2121	1859	3524	3570	981	1216	0	0	0	0	0	0	0	0	3515.0	3526.5	3515.0	3526.5
Combined	3980		7094		2197		0		0		0		0		7041.5		7041.5	
Split (%)	53.3	46.7	49.7	50.3	44.7	55.3	-	-	-	-	-	-	-	-	49.9	50.1	49.9	50.1

Peak Hours

12:00 AM - 12:00 PM	-	-	7:00 AM	7:00 AM	7:00 AM	7:00 AM	-	-	-	-	-	-	-	-	7:00 AM	7:00 AM	7:00 AM	7:00 AM
Volume	-	-	225	324	223	320	-	-	-	-	-	-	-	-	224.0	322.0	224.0	322.0
12:00 PM - 12:00 AM	5:00 PM	4:00 PM	4:00 PM	3:00 PM	-	-	-	-	-	-	-	-	-	-	4:00 PM	3:00 PM	4:00 PM	3:00 PM
Volume	338	283	346	311	-	-	-	-	-	-	-	-	-	-	331.5	290.0	331.5	290.0

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Spencer
Street : Route 31
Location : North of Route 9

Site: 2013157

Weekly Volume

Interval Start	Mon 5/20/2013		Tue 5/21/2013		Wed 5/22/2013		Thu 5/23/2013		Fri 5/24/2013		Sat 5/25/2013		Sun 5/26/2013		Mon - Fri Average		Weekly Average	
	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB
12:00 AM	-	-	-	-	-	-	11	17	6	22	-	-	-	-	8.5	19.5	8.5	19.5
1:00 AM	-	-	-	-	-	-	10	14	5	13	-	-	-	-	7.5	13.5	7.5	13.5
2:00 AM	-	-	-	-	-	-	7	7	10	7	-	-	-	-	8.5	7.0	8.5	7.0
3:00 AM	-	-	-	-	-	-	8	10	7	7	-	-	-	-	7.5	8.5	7.5	8.5
4:00 AM	-	-	-	-	-	-	22	12	21	5	-	-	-	-	21.5	8.5	21.5	8.5
5:00 AM	-	-	-	-	-	-	96	22	69	15	-	-	-	-	82.5	18.5	82.5	18.5
6:00 AM	-	-	-	-	-	-	192	69	179	69	-	-	-	-	185.5	69.0	185.5	69.0
7:00 AM	-	-	-	-	-	-	270	123	245	115	-	-	-	-	257.5	119.0	257.5	119.0
8:00 AM	-	-	-	-	-	-	198	115	213	126	-	-	-	-	205.5	120.5	205.5	120.5
9:00 AM	-	-	-	-	-	-	163	111	164	112	-	-	-	-	163.5	111.5	163.5	111.5
10:00 AM	-	-	-	-	-	-	178	138	172	152	-	-	-	-	175.0	145.0	175.0	145.0
11:00 AM	-	-	-	-	-	-	165	179	-	-	-	-	-	-	165.0	179.0	165.0	179.0
12:00 PM	-	-	-	-	-	-	182	156	-	-	-	-	-	-	182.0	156.0	182.0	156.0
1:00 PM	-	-	-	-	193	158	146	169	-	-	-	-	-	-	169.5	163.5	169.5	163.5
2:00 PM	-	-	-	-	172	203	214	201	-	-	-	-	-	-	193.0	202.0	193.0	202.0
3:00 PM	-	-	-	-	220	215	221	247	-	-	-	-	-	-	220.5	231.0	220.5	231.0
4:00 PM	-	-	-	-	226	248	238	301	-	-	-	-	-	-	232.0	274.5	232.0	274.5
5:00 PM	-	-	-	-	227	300	203	290	-	-	-	-	-	-	215.0	295.0	215.0	295.0
6:00 PM	-	-	-	-	215	225	177	234	-	-	-	-	-	-	196.0	229.5	196.0	229.5
7:00 PM	-	-	-	-	145	207	137	176	-	-	-	-	-	-	141.0	191.5	141.0	191.5
8:00 PM	-	-	-	-	108	147	95	125	-	-	-	-	-	-	101.5	136.0	101.5	136.0
9:00 PM	-	-	-	-	70	111	58	82	-	-	-	-	-	-	64.0	96.5	64.0	96.5
10:00 PM	-	-	-	-	39	45	51	60	-	-	-	-	-	-	45.0	52.5	45.0	52.5
11:00 PM	-	-	-	-	21	25	26	29	-	-	-	-	-	-	23.5	27.0	23.5	27.0
Totals	0	0	0	0	1636	1884	3068	2887	1091	643	0	0	0	0	3071.0	2874.5	3071.0	2874.5
Combined	0		0		3520		5955		1734		0		0		5945.5		5945.5	
Split (%)	-	-	-	-	46.5	53.5	51.5	48.5	62.9	37.1	-	-	-	-	51.7	48.3	51.7	48.3

Peak Hours

12:00 AM - 12:00 PM	-	-	-	-	-	-	7:00 AM	11:00 AM	7:00 AM	10:00 AM	-	-	-	-	7:00 AM	11:00 AM	7:00 AM	11:00 AM
Volume	-	-	-	-	-	-	270	179	245	152	-	-	-	-	257.5	179.0	257.5	179.0
12:00 PM - 12:00 AM	-	-	-	-	5:00 PM	5:00 PM	4:00 PM	4:00 PM	-	-	-	-	-	-	4:00 PM	5:00 PM	4:00 PM	5:00 PM
Volume	-	-	-	-	227	300	238	301	-	-	-	-	-	-	232.0	295.0	232.0	295.0

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Spencer
Street : Wire Village Rd
Location : East of Route 31

Site: 2013161

Weekly Volume

Interval Start	Mon 5/20/2013		Tue 5/21/2013		Wed 5/22/2013		Thu 5/23/2013		Fri 5/24/2013		Sat 5/25/2013		Sun 5/26/2013		Mon - Fri Average		Weekly Average	
	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB
12:00 AM	-	-	-	-	-	-	1	3	1	1	-	-	-	-	1.0	2.0	1.0	2.0
1:00 AM	-	-	-	-	-	-	1	1	1	2	-	-	-	-	1.0	1.5	1.0	1.5
2:00 AM	-	-	-	-	-	-	0	1	1	0	-	-	-	-	0.5	0.5	0.5	0.5
3:00 AM	-	-	-	-	-	-	0	0	1	0	-	-	-	-	0.5	0.0	0.5	0.0
4:00 AM	-	-	-	-	-	-	2	1	1	1	-	-	-	-	1.5	1.0	1.5	1.0
5:00 AM	-	-	-	-	-	-	7	5	5	4	-	-	-	-	6.0	4.5	6.0	4.5
6:00 AM	-	-	-	-	-	-	24	16	23	16	-	-	-	-	23.5	16.0	23.5	16.0
7:00 AM	-	-	-	-	-	-	36	20	28	18	-	-	-	-	32.0	19.0	32.0	19.0
8:00 AM	-	-	-	-	-	-	27	30	31	24	-	-	-	-	29.0	27.0	29.0	27.0
9:00 AM	-	-	-	-	-	-	24	17	25	19	-	-	-	-	24.5	18.0	24.5	18.0
10:00 AM	-	-	-	-	-	-	30	23	31	27	-	-	-	-	30.5	25.0	30.5	25.0
11:00 AM	-	-	-	-	-	-	34	25	-	-	-	-	-	-	34.0	25.0	34.0	25.0
12:00 PM	-	-	-	-	-	-	30	27	-	-	-	-	-	-	30.0	27.0	30.0	27.0
1:00 PM	-	-	-	-	35	24	16	31	-	-	-	-	-	-	25.5	27.5	25.5	27.5
2:00 PM	-	-	-	-	34	43	48	37	-	-	-	-	-	-	41.0	40.0	41.0	40.0
3:00 PM	-	-	-	-	46	43	44	38	-	-	-	-	-	-	45.0	40.5	45.0	40.5
4:00 PM	-	-	-	-	62	54	58	33	-	-	-	-	-	-	60.0	43.5	60.0	43.5
5:00 PM	-	-	-	-	96	74	49	48	-	-	-	-	-	-	72.5	61.0	72.5	61.0
6:00 PM	-	-	-	-	53	44	52	27	-	-	-	-	-	-	52.5	35.5	52.5	35.5
7:00 PM	-	-	-	-	91	30	18	28	-	-	-	-	-	-	54.5	29.0	54.5	29.0
8:00 PM	-	-	-	-	22	21	12	14	-	-	-	-	-	-	17.0	17.5	17.0	17.5
9:00 PM	-	-	-	-	17	21	9	10	-	-	-	-	-	-	13.0	15.5	13.0	15.5
10:00 PM	-	-	-	-	5	6	4	10	-	-	-	-	-	-	4.5	8.0	4.5	8.0
11:00 PM	-	-	-	-	0	2	0	7	-	-	-	-	-	-	0.0	4.5	0.0	4.5
Totals	0	0	0	0	461	362	526	452	148	112	0	0	0	0	599.5	489.0	599.5	489.0
Combined	0		0		823		978		260		0		0		1088.5		1088.5	
Split (%)	-	-	-	-	56.0	44.0	53.8	46.2	56.9	43.1	-	-	-	-	55.1	44.9	55.1	44.9

Peak Hours

12:00 AM - 12:00 PM	-	-	-	-	-	-	7:00 AM	8:00 AM	8:00 AM	10:00 AM	-	-	-	-	11:00 AM	8:00 AM	11:00 AM	8:00 AM
Volume	-	-	-	-	-	-	36	30	31	27	-	-	-	-	34.0	27.0	34.0	27.0
12:00 PM - 12:00 AM	-	-	-	-	5:00 PM	5:00 PM	4:00 PM	5:00 PM	-	-	-	-	-	-	5:00 PM	5:00 PM	5:00 PM	5:00 PM
Volume	-	-	-	-	96	74	58	48	-	-	-	-	-	-	72.5	61.0	72.5	61.0

CMRPC
2 Washington Square, Union Station
Worcester, MA 01604

Town : Spencer
Street : Meadow Rd
Location : South of Route 31

Site: 2013155

Weekly Volume

Interval Start	Mon 5/20/2013		Tue 5/21/2013		Wed 5/22/2013		Thu 5/23/2013		Fri 5/24/2013		Sat 5/25/2013		Sun 5/26/2013		Mon - Fri Average		Weekly Average	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
12:00 AM	-	-	-	-	-	-	10	8	6	4	-	-	-	-	8.0	6.0	8.0	6.0
1:00 AM	-	-	-	-	-	-	8	4	2	3	-	-	-	-	5.0	3.5	5.0	3.5
2:00 AM	-	-	-	-	-	-	2	1	5	5	-	-	-	-	3.5	3.0	3.5	3.0
3:00 AM	-	-	-	-	-	-	4	7	8	3	-	-	-	-	6.0	5.0	6.0	5.0
4:00 AM	-	-	-	-	-	-	9	12	9	7	-	-	-	-	9.0	9.5	9.0	9.5
5:00 AM	-	-	-	-	-	-	41	48	28	46	-	-	-	-	34.5	47.0	34.5	47.0
6:00 AM	-	-	-	-	-	-	105	112	85	96	-	-	-	-	95.0	104.0	95.0	104.0
7:00 AM	-	-	-	-	-	-	148	193	112	161	-	-	-	-	130.0	177.0	130.0	177.0
8:00 AM	-	-	-	-	-	-	143	170	130	149	-	-	-	-	136.5	159.5	136.5	159.5
9:00 AM	-	-	-	-	-	-	108	116	124	141	-	-	-	-	116.0	128.5	116.0	128.5
10:00 AM	-	-	-	-	-	-	123	137	125	150	-	-	-	-	124.0	143.5	124.0	143.5
11:00 AM	-	-	-	-	-	-	150	156	173	153	-	-	-	-	161.5	154.5	161.5	154.5
12:00 PM	-	-	-	-	-	-	128	148	-	-	-	-	-	-	128.0	148.0	128.0	148.0
1:00 PM	-	-	-	-	-	-	151	125	-	-	-	-	-	-	151.0	125.0	151.0	125.0
2:00 PM	-	-	-	-	-	-	143	152	-	-	-	-	-	-	143.0	152.0	143.0	152.0
3:00 PM	-	-	-	-	168	205	170	183	-	-	-	-	-	-	169.0	194.0	169.0	194.0
4:00 PM	-	-	-	-	228	235	178	210	-	-	-	-	-	-	203.0	222.5	203.0	222.5
5:00 PM	-	-	-	-	247	252	218	210	-	-	-	-	-	-	232.5	231.0	232.5	231.0
6:00 PM	-	-	-	-	147	177	153	135	-	-	-	-	-	-	150.0	156.0	150.0	156.0
7:00 PM	-	-	-	-	118	132	104	93	-	-	-	-	-	-	111.0	112.5	111.0	112.5
8:00 PM	-	-	-	-	78	91	73	63	-	-	-	-	-	-	75.5	77.0	75.5	77.0
9:00 PM	-	-	-	-	62	44	47	36	-	-	-	-	-	-	54.5	40.0	54.5	40.0
10:00 PM	-	-	-	-	40	29	49	25	-	-	-	-	-	-	44.5	27.0	44.5	27.0
11:00 PM	-	-	-	-	18	16	23	16	-	-	-	-	-	-	20.5	16.0	20.5	16.0
Totals	0	0	0	0	1106	1181	2288	2360	807	918	0	0	0	0	2311.5	2442.0	2311.5	2442.0
Combined	0		0		2287		4648		1725		0		0		4753.5		4753.5	
Split (%)	-	-	-	-	48.4	51.6	49.2	50.8	46.8	53.2	-	-	-	-	48.6	51.4	48.6	51.4

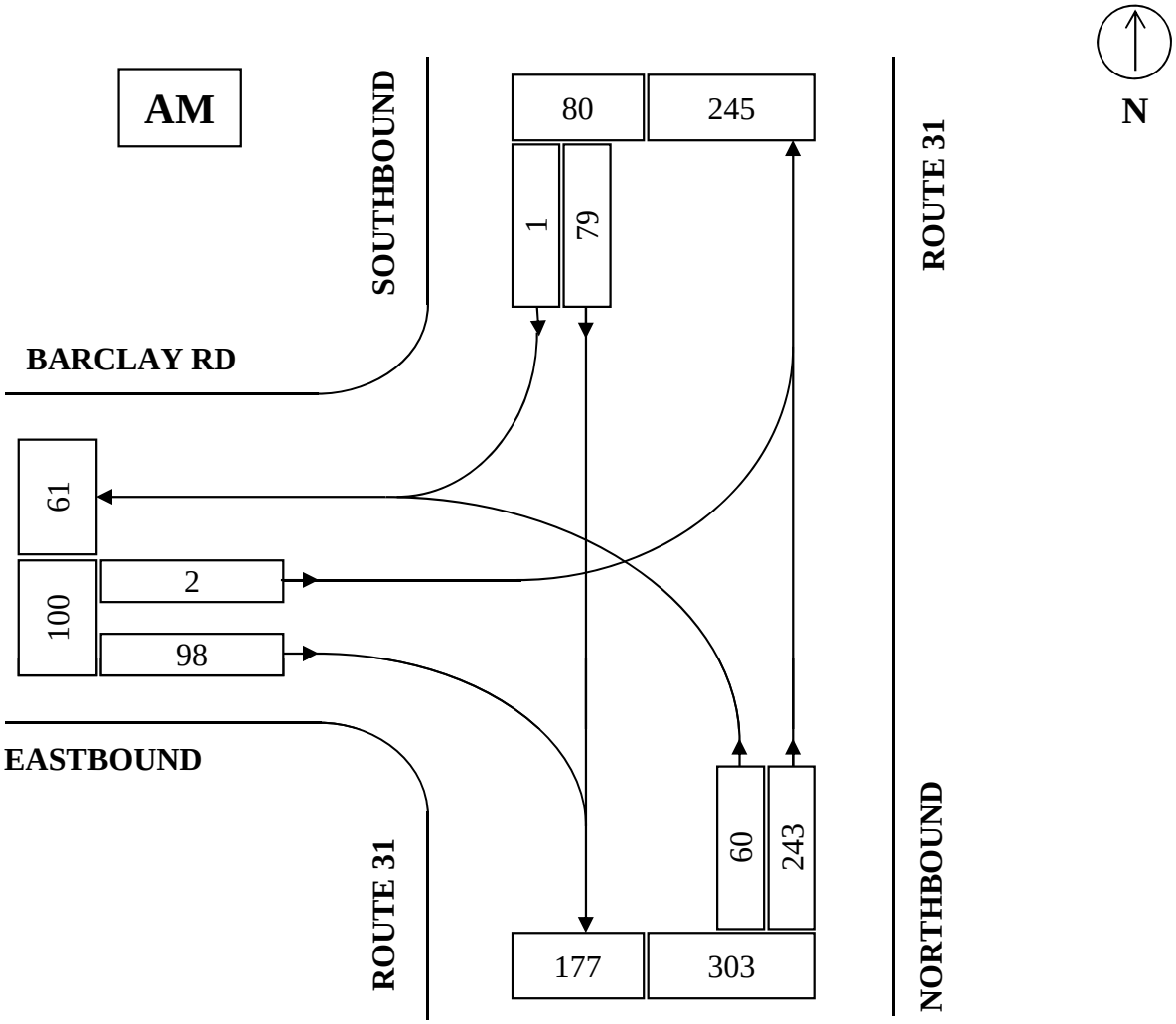
Peak Hours

12:00 AM - 12:00 PM	-	-	-	-	-	-	11:00 AM	7:00 AM	11:00 AM	7:00 AM	-	-	-	-	11:00 AM	7:00 AM	11:00 AM	7:00 AM
Volume	-	-	-	-	-	-	150	193	173	161	-	-	-	-	161.5	177.0	161.5	177.0
12:00 PM - 12:00 AM	-	-	-	-	5:00 PM	5:00 PM	5:00 PM	4:00 PM	-	-	-	-	-	-	5:00 PM	5:00 PM	5:00 PM	5:00 PM
Volume	-	-	-	-	247	252	218	210	-	-	-	-	-	-	232.5	231.0	232.5	231.0

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 6/6/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Barclay Road

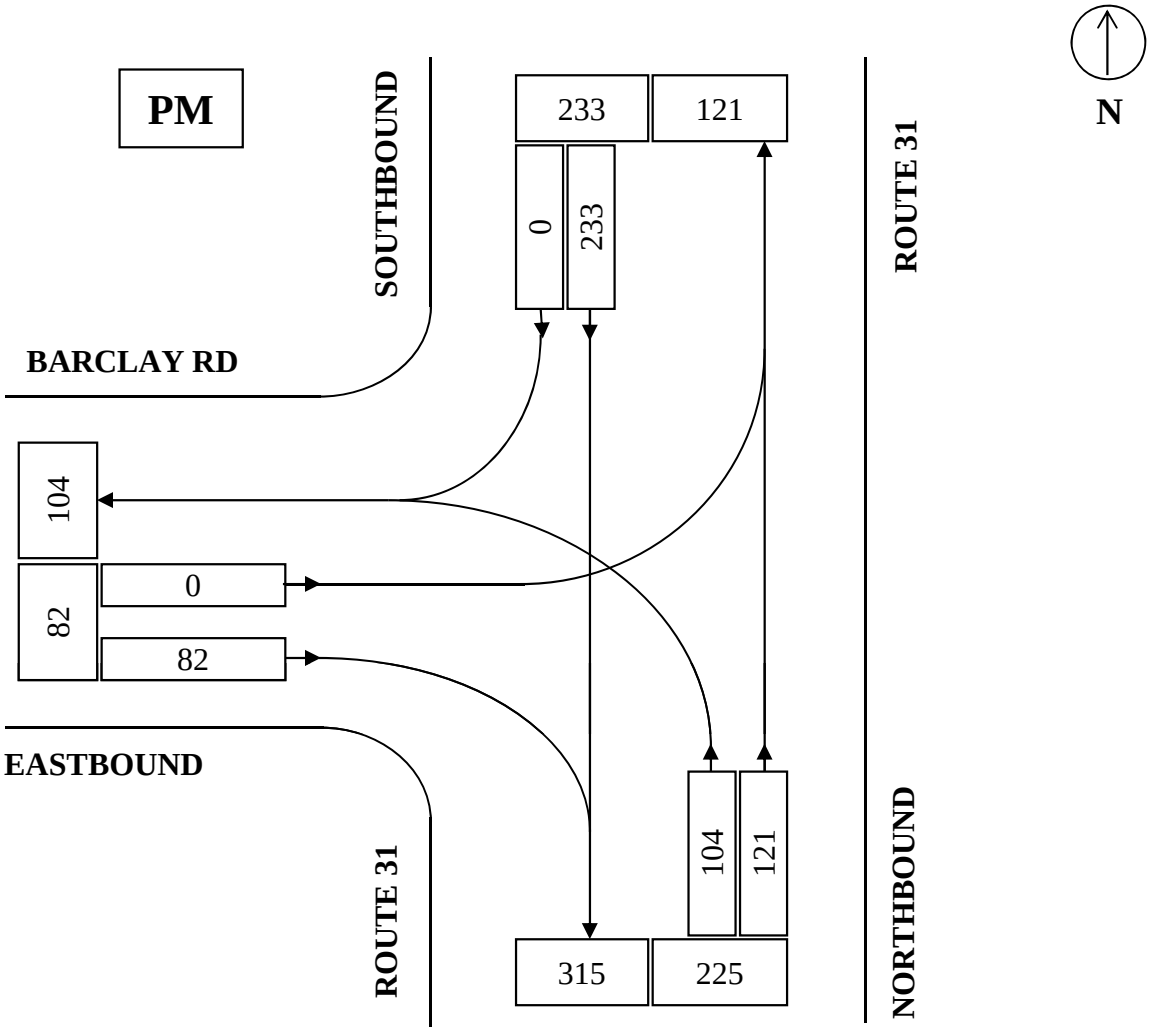


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:00 - 8:00 AM
Barclay Rd EB	100	20.7%	
			PHF = .90
Route 31 NB	303	62.7%	
			VEHICLES COUNTED
Route 31 SB	80	16.6%	
			ALL VEHICLES: 483
TOTAL	483	100.0%	**TRUCKS:** 17
			PERCENT TRUCKS 3.52%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 6/6/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Barclay Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:30 - 5:30 PM
Barclay Rd EB	82	15.2%	
			PHF = .89
Route 31 NB	225	41.7%	
			VEHICLES COUNTED
Route 31 SB	233	43.1%	
			ALL VEHICLES: 540
TOTAL	540	100.0%	**TRUCKS:** 11
			PERCENT TRUCKS 2.04%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Spencer

DATE: 6/6/2013

LOCATION: Route 31 / Barclay Road

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Cloudy

TECHNICIAN: RR

Time Period	Barclay Rd EB								Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	0	0	22	1					9	69	0	0	0	18	0	0	118	
7:15 - 7:30	0	0	32	2					16	65	0	2	0	21	0	0	134	
7:30 - 7:45	2	0	20	0					20	58	0	6	0	20	1	2	121	
7:45 - 8:00	0	0	24	3					15	51	0	0	0	20	0	1	110	483
8:00 - 8:15	0	0	14	1					19	44	0	4	0	19	1	1	97	462
8:15 - 8:30	0	0	28	1					11	46	0	5	0	30	1	4	116	444
8:30 - 8:45	1	0	16	2					9	28	0	1	0	32	0	1	86	409
8:45 - 9:00	1	0	11	2					12	37	0	3	0	24	0	0	85	384
TOTAL	4	0	167	12	0	0	0	0	111	398	0	21	0	184	3	9	867	
		EBPct	20.7			**WBPct**	0.0			**NBPct**	62.7			**SBPct**	16.6			
Peak Sums:	**2**	**0**	**98**	**6**	**0**	**0**	**0**	**0**	**60**	**243**	**0**	**8**	**0**	**79**	**1**	**3**	**483**	
Total Trucks	17					**TrkPct**	3.52			**PHF**	0.90							

Time Period	Barclay Rd EB								Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	0	0	14	1					27	26	0	3	0	38	0	0	105	
4:15 - 4:30	0	0	21	1					13	19	0	1	0	61	0	1	114	
4:30 - 4:45	0	0	29	1					26	30	0	1	0	66	0	1	151	
4:45 - 5:00	0	0	16	0					28	24	0	0	0	44	0	0	112	482
5:00 - 5:15	0	0	20	0					29	33	0	3	0	61	0	0	143	520
5:15 - 5:30	0	0	17	1					21	34	0	0	0	62	0	4	134	540
5:30 - 5:45	1	0	20	1					22	24	0	1	0	49	0	0	116	505
5:45 - 6:00	0	0	17	0					18	24	0	2	0	47	3	0	109	502
TOTAL	1	0	154	5	0	0	0	0	184	214	0	11	0	428	3	6	984	
		EBPct	15.2			**WBPct**	0.0			**NBPct**	41.7			**SBPct**	43.1			
Peak Sums:	**0**	**0**	**82**	**2**	**0**	**0**	**0**	**0**	**104**	**121**	**0**	**4**	**0**	**233**	**0**	**5**	**540**	
Total Trucks	11					**TrkPct**	2.04			**PHF**	0.89							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/Barclay Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Barclay Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	60	243			79	1
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	66	270			87	1
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2		98
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				2		108
Percent Heavy Vehicles				4		4
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	66						110	
C(m) (vph)	1495						950	
v/c	0.04						0.12	
95% queue length	0.14						0.39	
Control Delay	7.5						9.3	
LOS	A						A	
Approach Delay							9.3	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 4:30 - 5:30 PM
Intersection: Route 31/Barclay Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Barclay Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	104	121			233	0
Peak-Hour Factor, PHF	0.89	0.89			0.89	0.89
Hourly Flow Rate, HFR	116	135			261	0
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		82
Peak Hour Factor, PHF				0.89		0.89
Hourly Flow Rate, HFR				0		92
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	0	
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	116						92	
C(m) (vph)	1303						778	
v/c	0.09						0.12	
95% queue length	0.29						0.40	
Control Delay	8.0						10.2	
LOS	A						B	
Approach Delay							10.2	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/Barclay Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID: Balanced
East/West Street: Barclay Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	58	240			79	1
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	64	266			87	1
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2		98
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				2		108
Percent Heavy Vehicles				4		4
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	64						110	
C(m) (vph)	1495						950	
v/c	0.04						0.12	
95% queue length	0.13						0.39	
Control Delay	7.5						9.3	
LOS	A						A	
Approach Delay							9.3	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 4:30 - 5:30 PM
Intersection: Route 31/Barclay Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID: Balanced
East/West Street: Barclay Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	99	116			237	0
Peak-Hour Factor, PHF	0.89	0.89			0.89	0.89
Hourly Flow Rate, HFR	111	130			266	0
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		86
Peak Hour Factor, PHF				0.89		0.89
Hourly Flow Rate, HFR				0		96
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	0	
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	111						96	
C(m) (vph)	1298						773	
v/c	0.09						0.12	
95% queue length	0.28						0.42	
Control Delay	8.0						10.3	
LOS	A						B	
Approach Delay							10.3	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/Barclay Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Barclay Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	64	265			87	1
Peak-Hour Factor, PHF	0.90	0.90			0.90	0.90
Hourly Flow Rate, HFR	71	294			96	1
Percent Heavy Vehicles	5	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				2		108
Peak Hour Factor, PHF				0.90		0.90
Hourly Flow Rate, HFR				2		120
Percent Heavy Vehicles				5		5
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	71						122	
C(m) (vph)	1478						937	
v/c	0.05						0.13	
95% queue length	0.15						0.45	
Control Delay	7.6						9.4	
LOS	A						A	
Approach Delay							9.4	
Approach LOS							A	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/7/2013
Analysis Time Period: 4:30 - 5:30 PM
Intersection: Route 31/Barclay Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Barclay Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	109	128			262	0
Peak-Hour Factor, PHF	0.89	0.89			0.89	0.89
Hourly Flow Rate, HFR	122	143			294	0
Percent Heavy Vehicles	3	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				0		95
Peak Hour Factor, PHF				0.89		0.89
Hourly Flow Rate, HFR				0		106
Percent Heavy Vehicles				3		3
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

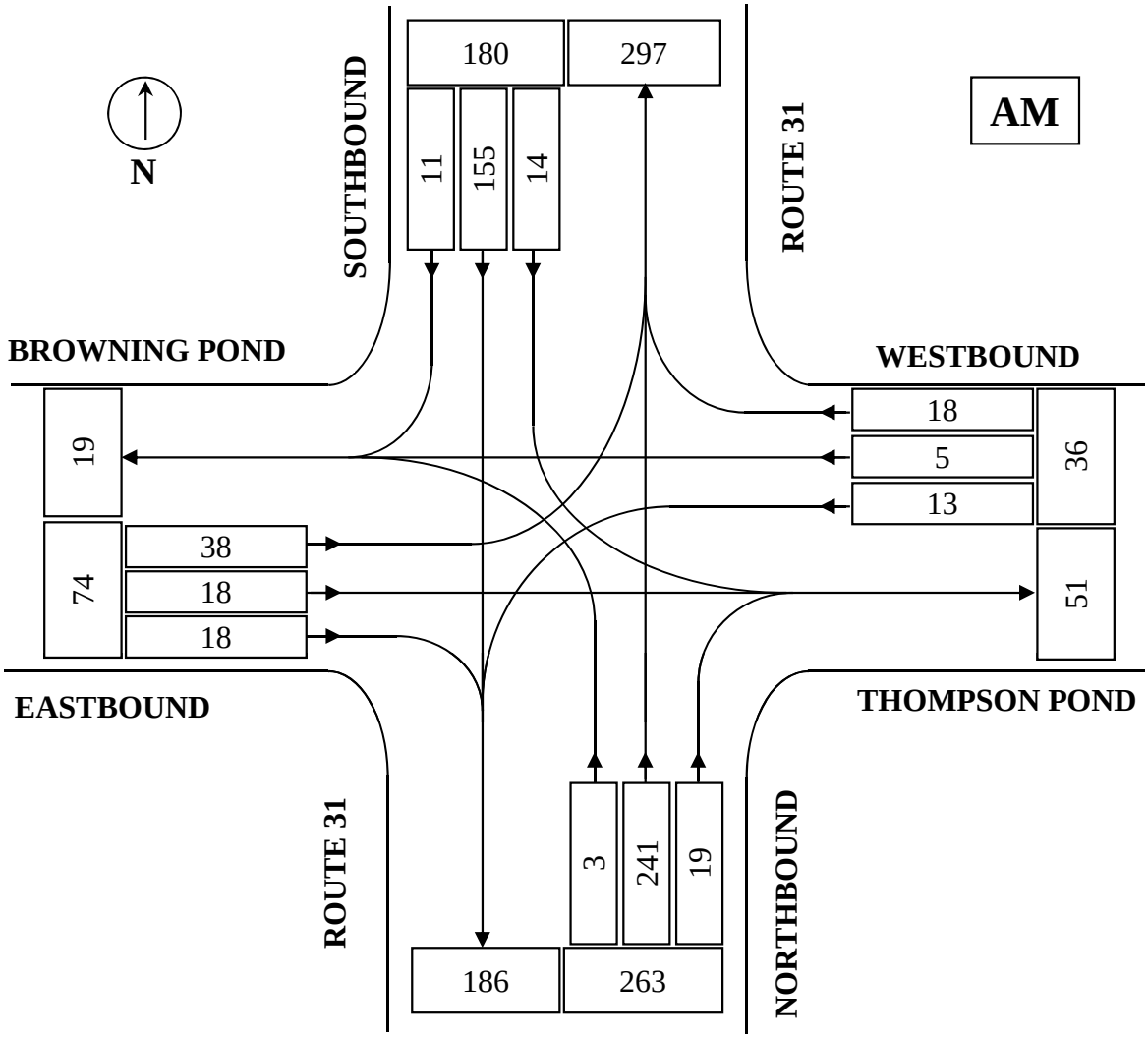
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	122						106	
C(m) (vph)	1262						743	
v/c	0.10						0.14	
95% queue length	0.32						0.50	
Control Delay	8.2						10.6	
LOS	A						B	
Approach Delay							10.6	
Approach LOS							B	

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 6/13/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Browning Pond Road / Thompson Pond Road

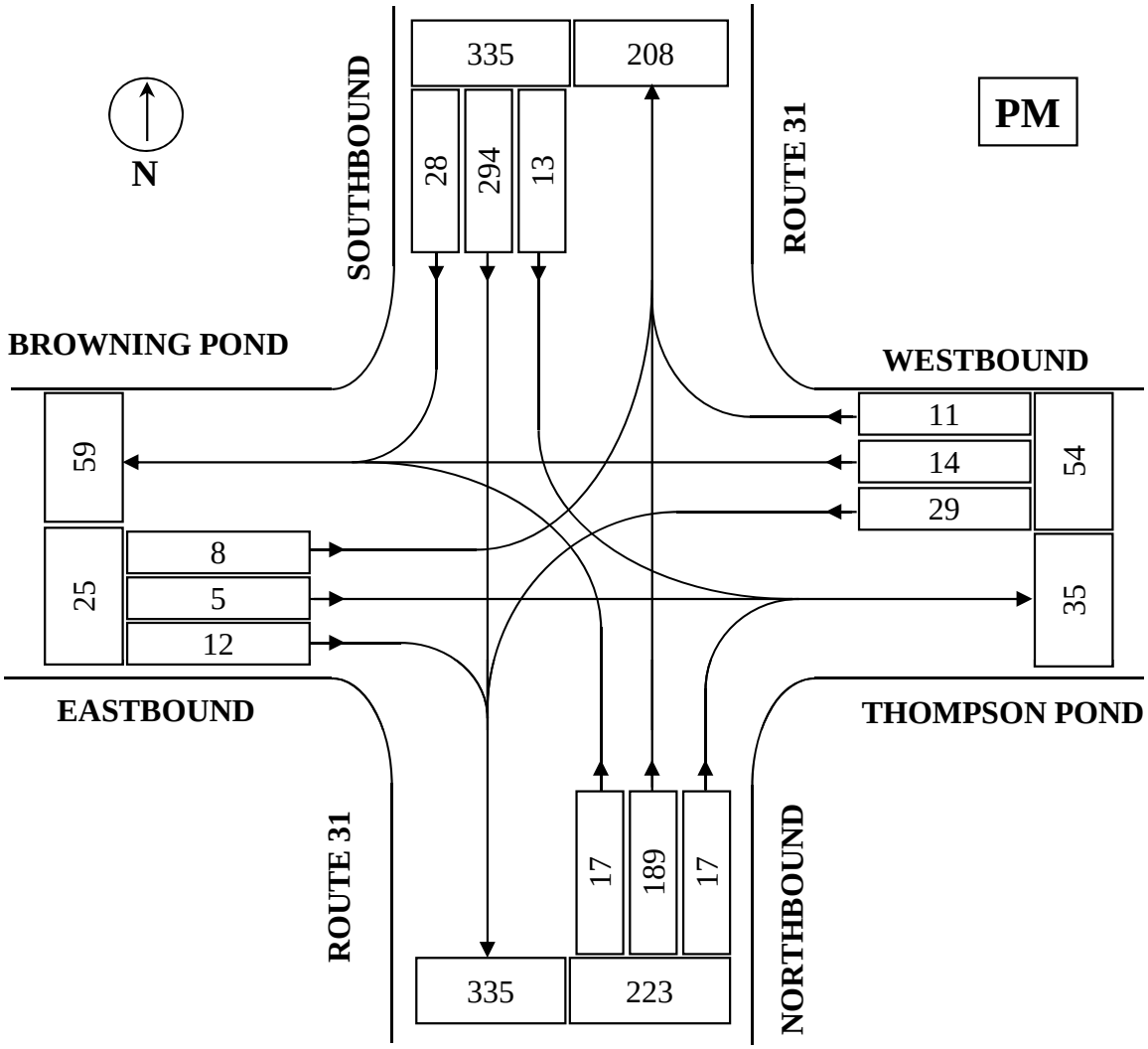


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Browning Pond Rd EB	74	13.4%	7:00 - 8:00 AM
Thompson Pond Rd WB	36	6.5%	PHF = .92
Route 31 NB	263	47.6%	**VEHICLES COUNTED**
Route 31 SB	180	32.5%	**ALL VEHICLES:** 553
TOTAL	553	100.0%	**TRUCKS:** 25
			PERCENT TRUCKS: 4.52%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 6/13/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Browning Pond Road / Thompson Pond Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Browning Pond Rd EB	25	3.9%	4:30 - 5:30 PM
Thompson Pond Rd WB	54	8.5%	PHF = .90
Route 31 NB	223	35.0%	**VEHICLES COUNTED**
Route 31 SB	335	52.6%	**ALL VEHICLES:** 637
TOTAL	637	100.0%	**TRUCKS:** 16
			PERCENT TRUCKS: 2.51%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Spencer

DATE: 6/13/2013

LOCATION: Rte 31/Browning Pond Rd/Thompson Pond Rd

DAY OF WEEK: Thursday

WEATHER: AM: Cloudy PM: Rainy

TECHNICIAN: RR

Time Period	Browning Pond Rd EB				Thompson Pond Rd WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	5	2	6	0	3	0	2	1	2	68	6	0	3	33	2	3	132	
7:15 - 7:30	13	6	3	1	2	1	7	0	0	62	2	2	5	48	1	6	150	
7:30 - 7:45	12	2	4	0	3	2	3	2	1	58	4	2	3	31	4	3	127	
7:45 - 8:00	8	8	5	1	5	2	6	0	0	53	7	3	3	43	4	1	144	553
8:00 - 8:15	10	4	1	0	9	1	3	0	2	46	3	2	3	37	2	3	121	542
8:15 - 8:30	5	4	2	0	2	2	3	0	1	35	4	4	3	51	1	5	113	505
8:30 - 8:45	8	4	1	1	3	0	7	1	2	42	2	0	7	30	2	2	108	486
8:45 - 9:00	5	2	2	0	4	3	3	0	1	33	4	4	0	47	2	2	106	448
TOTAL	66	32	24	3	31	11	34	4	9	397	32	17	27	320	18	25	1001	
		EBPct	13.4			**WBPct**	6.5			**NBPct**	47.6			**SBPct**	32.5			
Peak Sums:	**38**	**18**	**18**	**2**	**13**	**5**	**18**	**3**	**3**	**241**	**19**	**7**	**14**	**155**	**11**	**13**	**553**	
Total Trucks	25					**TrkPct**	4.52			**PHF**	0.92							

Time Period	Browning Pond Rd EB				Thompson Pond Rd WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	2	0	4	0	7	1	3	0	6	38	3	3	4	66	5	3	139	
4:15 - 4:30	1	1	1	1	3	3	6	0	4	37	2	0	4	67	8	1	137	
4:30 - 4:45	3	0	2	0	10	4	4	0	2	49	4	2	3	86	9	4	176	
4:45 - 5:00	1	1	1	0	2	3	1	0	6	41	4	3	3	82	5	2	150	602
5:00 - 5:15	4	2	2	0	9	4	4	0	5	46	3	1	5	58	7	2	149	612
5:15 - 5:30	0	2	7	0	8	3	2	0	4	53	6	0	2	68	7	2	162	637
5:30 - 5:45	3	1	3	0	5	2	2	0	5	47	3	0	4	67	8	1	150	611
5:45 - 6:00	2	0	5	0	8	3	0	0	5	39	4	0	1	50	10	0	127	588
TOTAL	16	7	25	1	52	23	22	0	37	350	29	9	26	544	59	15	1190	
		EBPct	3.9			**WBPct**	8.5			**NBPct**	35.0			**SBPct**	52.6			
Peak Sums:	**8**	**5**	**12**	**0**	**29**	**14**	**11**	**0**	**17**	**189**	**17**	**6**	**13**	**294**	**28**	**10**	**637**	
Total Trucks	16					**TrkPct**	2.51			**PHF**	0.90							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Rt31/Browning Pond/Thompson Po
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Browning Pond/Thompson Pond
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	241	19	14	155	11
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	3	261	20	15	168	11
Percent Heavy Vehicles	5	--	--	5	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	13	5	18	38	18	18
Peak Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	14	5	19	41	19	19
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	15		38			79	
C(m) (vph)	1379	1264		573			524	
v/c	0.00	0.01		0.07			0.15	
95% queue length	0.01	0.04		0.21			0.53	
Control Delay	7.6	7.9		11.7			13.1	
LOS	A	A		B			B	
Approach Delay				11.7			13.1	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 4:30 - 5:30 PM
Intersection: Rt31/Browning Pond/Thompson Po
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID:
East/West Street: Browning Pond/Thompson Pond
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	17	189	17	13	294	28
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	18	210	18	14	326	31
Percent Heavy Vehicles	3	--	--	3	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	29	14	11	8	5	12
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	32	15	12	8	5	13
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	18	14		59			26	
C(m) (vph)	1196	1334		425			489	
v/c	0.02	0.01		0.14			0.05	
95% queue length	0.05	0.03		0.48			0.17	
Control Delay	8.1	7.7		14.8			12.8	
LOS	A	A		B			B	
Approach Delay				14.8			12.8	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Rt31/Browning Pond/Thompson Po
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID: Balanced
East/West Street: Browning Pond/Thompson Pond
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	243	19	14	155	11
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	3	264	20	15	168	11
Percent Heavy Vehicles	5	--	--	5	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	13	5	19	39	18	18
Peak Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	14	5	20	42	19	19
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	15		39			80	
C(m) (vph)	1379	1261		574			522	
v/c	0.00	0.01		0.07			0.15	
95% queue length	0.01	0.04		0.22			0.54	
Control Delay	7.6	7.9		11.7			13.1	
LOS	A	A		B			B	
Approach Delay				11.7			13.1	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 4:30 - 5:30 PM
Intersection: Rt31/Browning Pond/Thompson Po
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID: Balanced
East/West Street: Browning Pond/Thompson Pond
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	17	193	17	10	291	25
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	18	214	18	11	323	27
Percent Heavy Vehicles	3	--	--	3	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	29	14	14	11	5	12
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	32	15	15	12	5	13
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	18	11		62			30	
C(m) (vph)	1203	1330		440			472	
v/c	0.01	0.01		0.14			0.06	
95% queue length	0.05	0.03		0.49			0.20	
Control Delay	8.0	7.7		14.5			13.1	
LOS	A	A		B			B	
Approach Delay				14.5			13.1	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Rt31/Browning Pond/Thompson Po
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Browning Pond/Thompson Pond
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	268	21	15	171	
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	3	291	22	16	185	11
Percent Heavy Vehicles	6	--	--	6	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	14	6	21	43	20	20
Peak Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	15	6	22	46	21	21
Percent Heavy Vehicles	3	3	3	3	3	3
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	16		43			88	
C(m) (vph)	1353	1225		537			486	
v/c	0.00	0.01		0.08			0.18	
95% queue length	0.01	0.04		0.26			0.65	
Control Delay	7.7	8.0		12.3			14.0	
LOS	A	A		B			B	
Approach Delay				12.3			14.0	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 6/14/2013
Analysis Time Period: 4:30 - 5:30 PM
Intersection: Rt31/Browning Pond/Thompson Po
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2013
Project ID: Projected 2023
East/West Street: Browning Pond/Thompson Pond
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	19	213	19	11	321	
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	21	236	21	12	356	27
Percent Heavy Vehicles	4	--	--	4	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	32	15	15	12	6	13
Peak Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	35	16	16	13	6	14
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

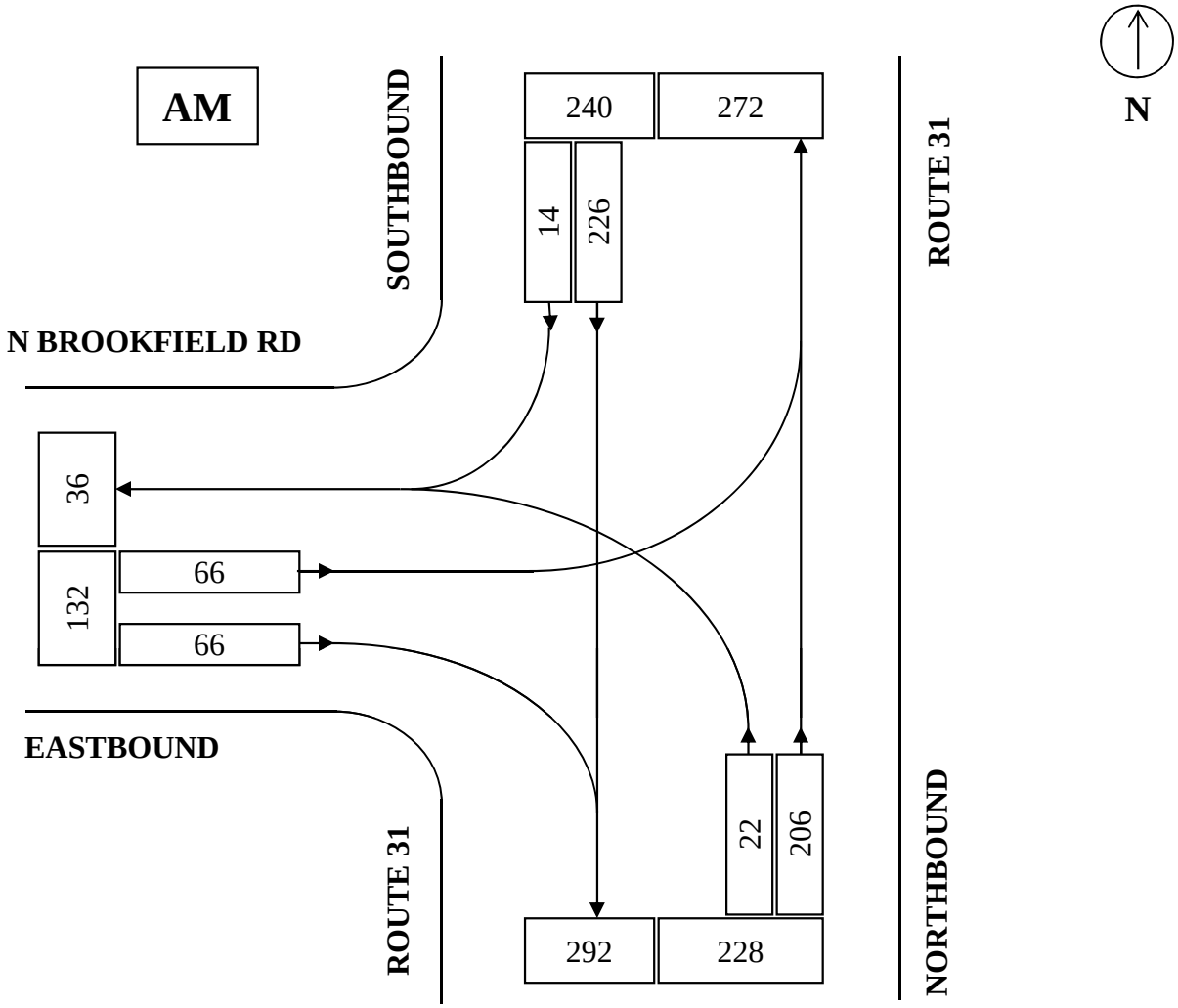
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	21	12		67			33	
C(m) (vph)	1165	1296		399			430	
v/c	0.02	0.01		0.17			0.08	
95% queue length	0.06	0.03		0.60			0.25	
Control Delay	8.1	7.8		15.8			14.1	
LOS	A	A		C			B	
Approach Delay				15.8			14.1	
Approach LOS				C			B	

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 7/19/11 **DAY OF WEEK:** Tuesday
INTERSECTION: Route 31 / North Brookfield Road

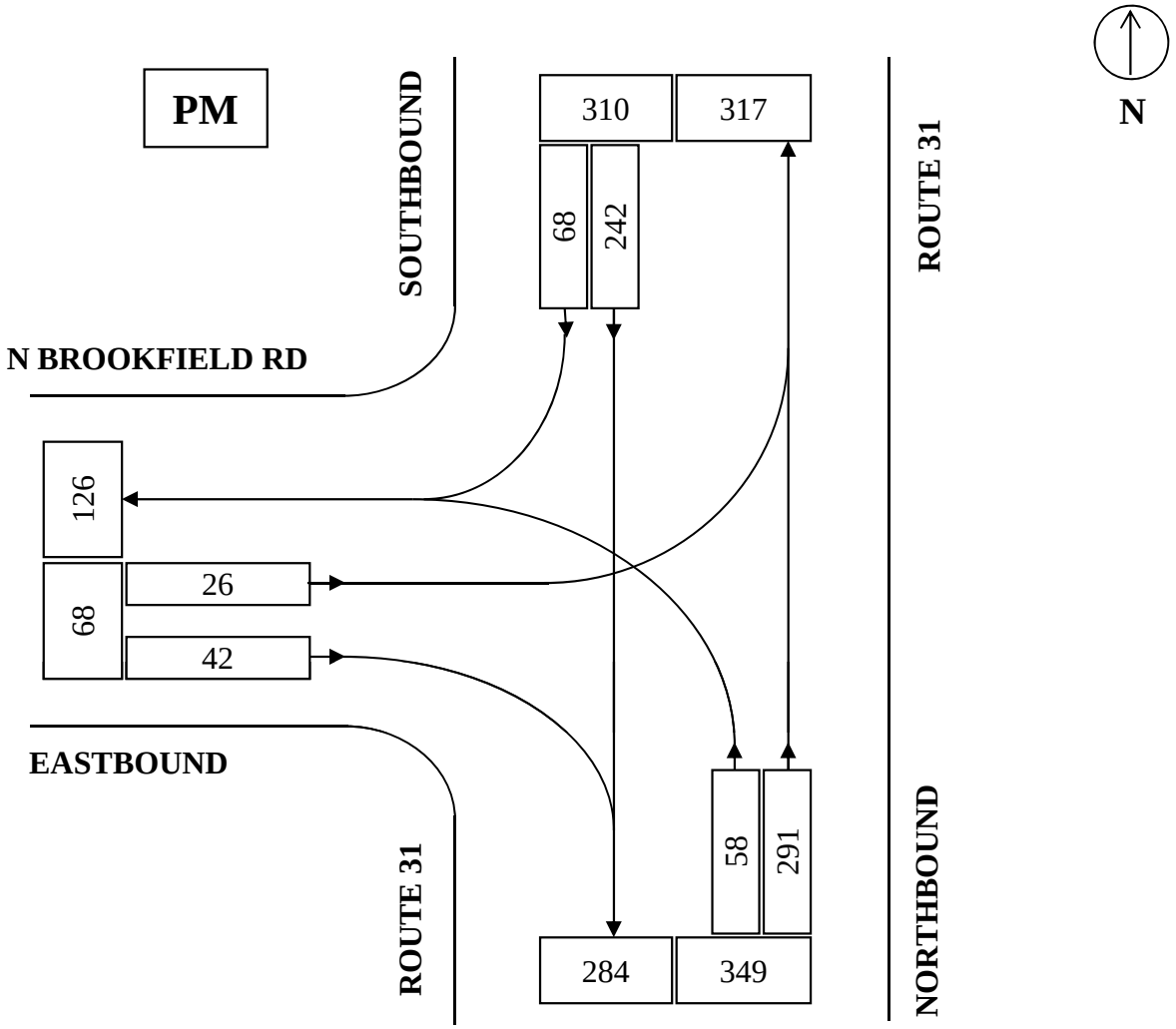


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:00 - 8:00 AM
North Brookfield Rd EB	132	22.0%	
			PHF = .84
Route 31 NB	228	38.0%	
			VEHICLES COUNTED
Route 31 SB	240	40.0%	
			ALL VEHICLES: 600
TOTAL	600	100.0%	TRUCKS: 21
			PERCENT TRUCKS 3.50%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 7/19/11 **DAY OF WEEK:** Tuesday
INTERSECTION: Route 31 / North Brookfield Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:45 - 5:45 PM
North Brookfield Rd EB	68	9.4%	
			PHF = .91
Route 31 NB	349	48.0%	
			VEHICLES COUNTED
Route 31 SB	310	42.6%	
			ALL VEHICLES: 727
TOTAL	727	100.0%	**TRUCKS:** 3
			PERCENT TRUCKS 0.41%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Spencer

DATE: 7/19/2011

LOCATION: Route 31 / North Brookfield Road

DAY OF WEEK: Tuesday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: JB

Time Period	North Brookfield Rd EB								Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	17	0	10	0					5	45	0	2	0	47	2	1	126	
7:15 - 7:30	22	0	21	0					3	64	0	3	0	62	7	5	179	
7:30 - 7:45	20	0	20	0					4	51	0	1	0	52	5	7	152	
7:45 - 8:00	7	0	15	1					10	46	0	0	0	65	0	1	143	600
8:00 - 8:15	12	0	13	0					5	34	0	2	0	49	0	1	113	587
8:15 - 8:30	8	0	10	0					5	55	0	2	0	53	4	3	135	543
8:30 - 8:45	14	0	14	0					6	42	0	2	0	46	4	2	126	517
8:45 - 9:00	7	0	16	0					5	30	0	0	0	46	5	4	109	483
TOTAL	107	0	119	1	0	0	0	0	43	367	0	12	0	420	27	24	1083	
		EBPct	22.0			**WBPct**	0.0			**NBPct**	38.0			**SBPct**	40.0			
Peak Sums:	**66**	**0**	**66**	**1**	**0**	**0**	**0**	**0**	**22**	**206**	**0**	**6**	**0**	**226**	**14**	**14**	**600**	
Total Trucks	21					**TrkPct**	3.50			**PHF**	0.84							

Time Period	North Brookfield Rd EB								Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	6	0	5	0					21	56	0	0	0	71	22	1	181	
4:15 - 4:30	7	0	9	0					13	55	0	1	0	72	11	1	167	
4:30 - 4:45	6	0	9	0					12	60	0	0	0	62	11	1	160	
4:45 - 5:00	5	0	11	0					12	67	0	0	0	59	23	0	177	685
5:00 - 5:15	7	0	15	0					16	81	0	0	0	62	19	1	200	704
5:15 - 5:30	8	0	9	0					20	74	0	1	0	58	13	0	182	719
5:30 - 5:45	6	0	7	0					10	69	0	0	0	63	13	1	168	727
5:45 - 6:00	7	0	10	0					12	48	0	0	0	59	14	0	150	700
TOTAL	52	0	75	0	0	0	0	0	116	510	0	2	0	506	126	5	1385	
		EBPct	9.4			**WBPct**	0.0			**NBPct**	48.0			**SBPct**	42.6			
Peak Sums:	**26**	**0**	**42**	**0**	**0**	**0**	**0**	**0**	**58**	**291**	**0**	**1**	**0**	**242**	**68**	**2**	**727**	
Total Trucks	3					**TrkPct**	0.41			**PHF**	0.91							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 7/21/2011
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/North Brookfield Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2011
Project ID:
East/West Street: North Brookfield Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	22	206			226	14
Peak-Hour Factor, PHF	0.84	0.84			0.84	0.84
Hourly Flow Rate, HFR	26	245			269	16
Percent Heavy Vehicles	4	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				66		66
Peak Hour Factor, PHF				0.84		0.84
Hourly Flow Rate, HFR				78		78
Percent Heavy Vehicles				4		4
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	26						156	
C(m) (vph)	1266						578	
v/c	0.02						0.27	
95% queue length	0.06						1.09	
Control Delay	7.9						13.5	
LOS	A						B	
Approach Delay							13.5	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 7/21/2011
Analysis Time Period: 4:45 - 5:45 PM
Intersection: Route 31/North Brookfield Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2011
Project ID:
East/West Street: North Brookfield Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	58	291			242	68
Peak-Hour Factor, PHF	0.91	0.91			0.91	0.91
Hourly Flow Rate, HFR	63	319			265	74
Percent Heavy Vehicles	1	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				26		42
Peak Hour Factor, PHF				0.91		0.91
Hourly Flow Rate, HFR				28		46
Percent Heavy Vehicles				1		1
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	63						74	
C(m) (vph)	1226						530	
v/c	0.05						0.14	
95% queue length	0.16						0.48	
Control Delay	8.1						12.9	
LOS	A						B	
Approach Delay							12.9	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 7/21/2011
Analysis Time Period: 7:00 - 8:00 AM
Intersection: Route 31/North Brookfield Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2011
Project ID: Projected 2023
East/West Street: North Brookfield Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	25	232			255	16
Peak-Hour Factor, PHF	0.84	0.84			0.84	0.84
Hourly Flow Rate, HFR	29	276			303	19
Percent Heavy Vehicles	5	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				74		74
Peak Hour Factor, PHF				0.84		0.84
Hourly Flow Rate, HFR				88		88
Percent Heavy Vehicles				5		5
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	29						176	
C(m) (vph)	1221						532	
v/c	0.02						0.33	
95% queue length	0.07						1.44	
Control Delay	8.0						15.1	
LOS	A						C	
Approach Delay							15.1	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 7/21/2011
Analysis Time Period: 4:45 - 5:45 PM
Intersection: Route 31/North Brookfield Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2011
Project ID: Projected 2023
East/West Street: North Brookfield Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	65	328			273	
Peak-Hour Factor, PHF	0.91	0.91			0.91	0.91
Hourly Flow Rate, HFR	71	360			299	74
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				29		47
Peak Hour Factor, PHF				0.91		0.91
Hourly Flow Rate, HFR				31		51
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			No /
Lanes				0		0
Configuration					LR	

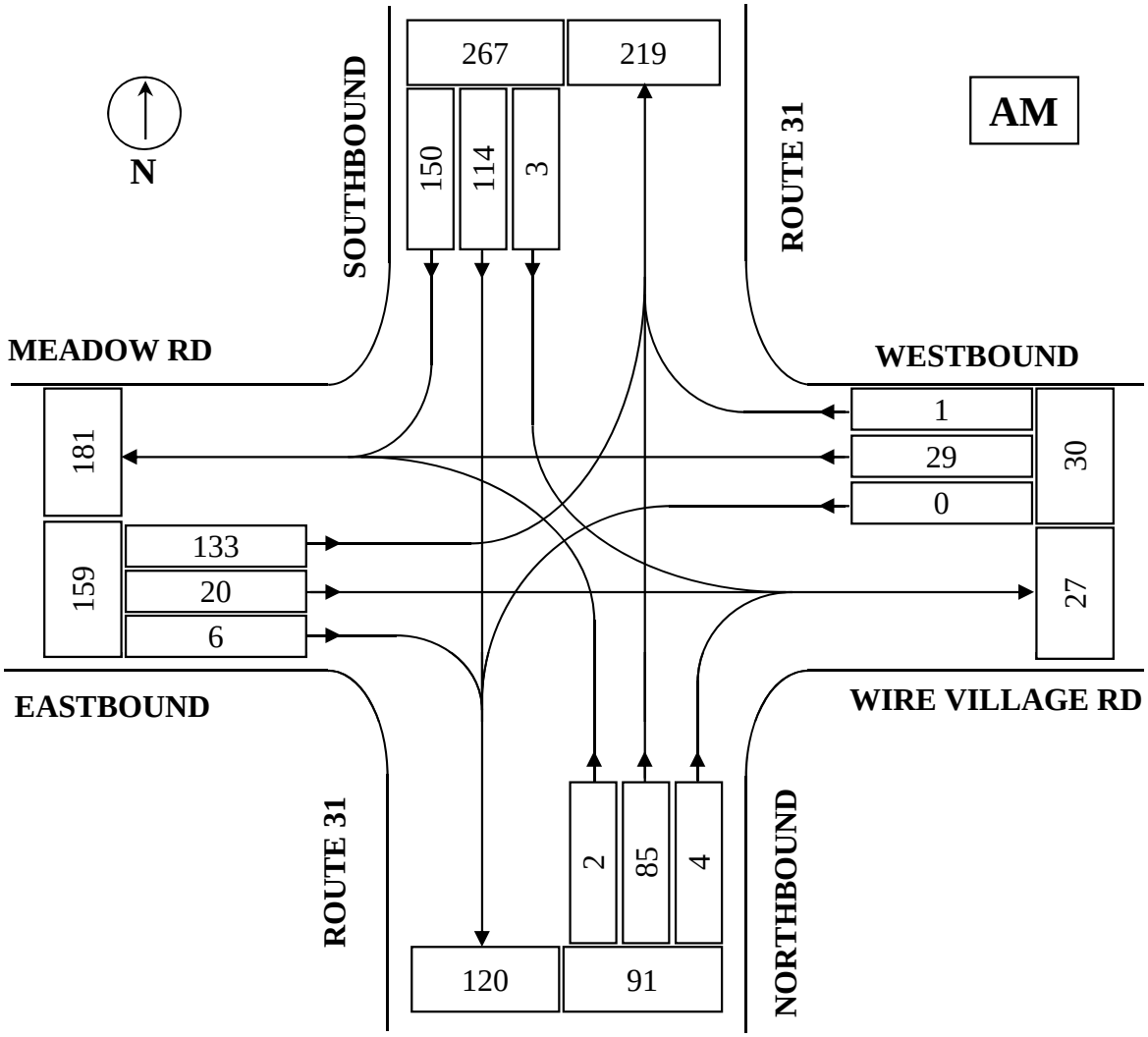
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	71						82	
C(m) (vph)	1185						481	
v/c	0.06						0.17	
95% queue length	0.19						0.61	
Control Delay	8.2						14.0	
LOS	A						B	
Approach Delay							14.0	
Approach LOS							B	

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 7/28/11 **DAY OF WEEK:** Thursday
INTERSECTION: Route 31 / Meadow Road / Wire Village Road

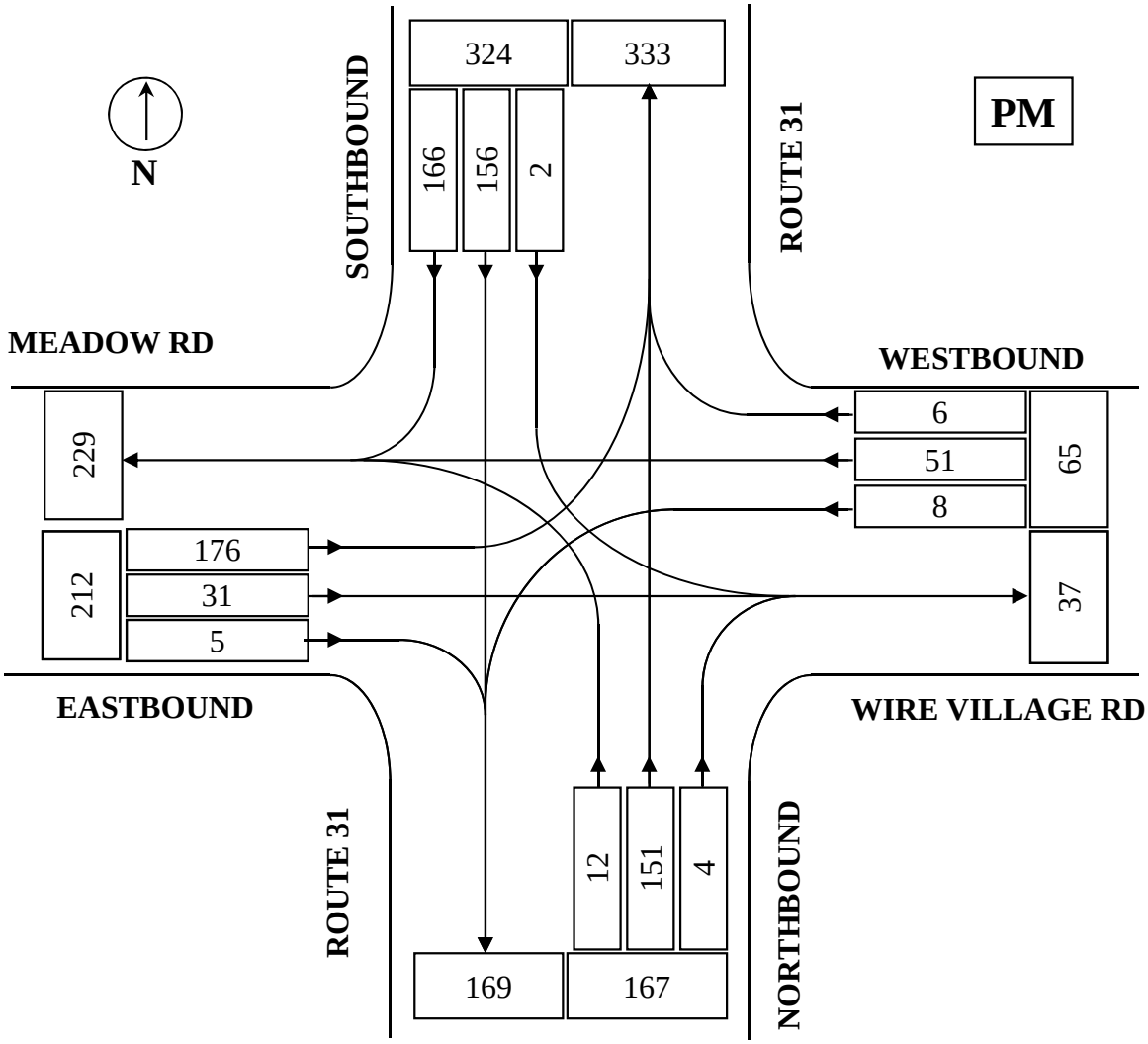


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Meadow Rd EB	159	29.1%	7:15 - 8:15 AM
Wire Village Rd WB	30	5.5%	PHF = .94
Route 31 NB	91	16.6%	VEHICLES COUNTED
Route 31 SB	267	48.8%	ALL VEHICLES: 547
TOTAL	547	100.0%	TRUCKS: 19
			PERCENT TRUCKS: 3.47%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 7/28/11 **DAY OF WEEK:** Thursday
INTERSECTION: Route 140 / Meadow Road / Wire Village Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Meadow Rd EB	212	27.6%	4:30 - 5:30 PM
Wire Village Rd WB	65	8.5%	PHF = .95
Route 31 NB	167	21.7%	**VEHICLES COUNTED**
Route 31 SB	324	42.2%	**ALL VEHICLES:** 768
TOTAL	768	100.0%	**TRUCKS:** 3
			PERCENT TRUCKS: 0.39%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Spencer

DATE: 7/28/2011

LOCATION: Route 31 / Meadow Road / Wire Village Road

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: JB

Time Period	Meadow Rd EB				Wire Village Rd WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	36	7	0	0	1	5	1	0	0	15	0	1	0	24	30	0	119	
7:15 - 7:30	30	4	1	3	0	5	0	0	0	24	1	1	1	36	40	5	142	
7:30 - 7:45	39	6	1	2	0	12	0	0	1	21	1	0	1	29	35	3	146	
7:45 - 8:00	25	5	2	0	0	5	0	0	0	28	1	0	0	27	42	2	135	542
8:00 - 8:15	39	5	2	1	0	7	1	0	1	12	1	0	1	22	33	2	124	547
8:15 - 8:30	29	5	1	1	0	6	0	0	1	17	1	0	1	30	41	2	132	537
8:30 - 8:45	35	4	2	2	1	6	1	0	1	20	0	1	2	22	30	0	124	515
8:45 - 9:00	22	6	0	1	1	5	0	0	1	15	0	0	1	23	35	2	109	489
TOTAL	255	42	9	10	3	51	3	0	5	152	5	3	7	213	286	16	1031	
		EBPct	29.1			**WBPct**	5.5			**NBPct**	16.6			**SBPct**	48.8			
Peak Sums:	**133**	**20**	**6**	**6**	**0**	**29**	**1**	**0**	**2**	**85**	**4**	**1**	**3**	**114**	**150**	**12**	**547**	
Total Trucks	19					**TrkPct**	3.47			**PHF**	0.94							

Time Period	Meadow Rd EB				Wire Village Rd WB				Route 31 NB				Route 31 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	26	2	1	5	2	3	1	0	3	32	0	1	1	41	41	1	153	
4:15 - 4:30	36	6	2	1	0	16	1	0	3	43	1	0	1	50	45	1	204	
4:30 - 4:45	38	7	2	0	3	16	1	0	4	44	1	0	1	35	38	0	190	
4:45 - 5:00	40	11	1	1	1	10	2	0	0	39	0	0	1	37	41	1	183	730
5:00 - 5:15	43	9	0	0	1	12	1	0	4	33	1	0	0	49	39	0	192	769
5:15 - 5:30	55	4	2	0	3	13	2	0	4	35	2	0	0	35	48	1	203	768
5:30 - 5:45	38	9	2	1	0	17	0	0	2	43	0	0	0	36	29	0	176	754
5:45 - 6:00	53	10	0	0	1	8	1	0	1	37	0	0	1	33	30	0	175	746
TOTAL	329	58	10	8	11	95	9	0	21	306	5	1	5	316	311	4	1476	
		EBPct	27.6			**WBPct**	8.5			**NBPct**	21.7			**SBPct**	42.2			
Peak Sums:	**176**	**31**	**5**	**1**	**8**	**51**	**6**	**0**	**12**	**151**	**4**	**0**	**2**	**156**	**166**	**2**	**768**	
Total Trucks	3					**TrkPct**	0.39			**PHF**	0.95							

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/3/2011
Analysis Time Period: 7:15 - 8:15 AM
Intersection: Rt 31/Meadow Rd/Wire Vilage Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2011
Project ID:
East/West Street: Meadow Rd/Wire Village Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	85	4	3	114	150
Peak-Hour Factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Hourly Flow Rate, HFR	2	90	4	3	121	159
Percent Heavy Vehicles	3	--	--	3	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	29	1	133	20	6
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Hourly Flow Rate, HFR	0	30	1	141	21	6
Percent Heavy Vehicles	3	3	3	3	3	3
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	2	3		31			168	
C(m) (vph)	1277	1494		555			610	
v/c	0.00	0.00		0.06			0.28	
95% queue length	0.00	0.01		0.18			1.12	
Control Delay	7.8	7.4		11.9			13.1	
LOS	A	A		B			B	
Approach Delay				11.9			13.1	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/3/2011
Analysis Time Period: 4:30 - 5:30 PM
Intersection: Rt 31/Meadow Rd/Wire Vilage Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2011
Project ID:
East/West Street: Meadow Rd/Wire Village Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	12	151	4	2	156	166
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	12	158	4	2	164	174
Percent Heavy Vehicles	1	--	--	1	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	8	51	6	176	31	5
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	8	53	6	185	32	5
Percent Heavy Vehicles	1	1	1	1	1	1
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	12	2		67			222	
C(m) (vph)	1227	1423		476			464	
v/c	0.01	0.00		0.14			0.48	
95% queue length	0.03	0.00		0.49			2.54	
Control Delay	8.0	7.5		13.8			19.7	
LOS	A	A		B			C	
Approach Delay				13.8			19.7	
Approach LOS				B			C	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/3/2011
Analysis Time Period: 7:15 - 8:15 AM
Intersection: Rt 31/Meadow Rd/Wire Vilage Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2011
Project ID: Projected 2023
East/West Street: Meadow Rd/Wire Village Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	96	5	3	128	
Peak-Hour Factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Hourly Flow Rate, HFR	2	102	5	3	136	159
Percent Heavy Vehicles	4	--	--	4	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	33	1	150	23	7
Peak Hour Factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Hourly Flow Rate, HFR	0	35	1	159	24	7
Percent Heavy Vehicles	4	4	4	4	4	4
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	2	3		36			190	
C(m) (vph)	1255	1471		534			578	
v/c	0.00	0.00		0.07			0.33	
95% queue length	0.00	0.01		0.22			1.43	
Control Delay	7.9	7.5		12.2			14.2	
LOS	A	A		B			B	
Approach Delay				12.2			14.2	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.6

TWO-WAY STOP CONTROL SUMMARY

Analyst: KK
Agency/Co.: CMRPC
Date Performed: 8/3/2011
Analysis Time Period: 4:30 - 5:30 PM
Intersection: Rt 31/Meadow Rd/Wire Vilage Rd
Jurisdiction: Spencer
Units: U. S. Customary
Analysis Year: 2011
Project ID: Projected 2023
East/West Street: Meadow Rd/Wire Village Rd
North/South Street: Route 31
Intersection Orientation: NS Study period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street: Approach	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	14	171	5	2	176	187
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	14	180	5	2	185	196
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration	LTR			LTR		
Upstream Signal?		No			No	

Minor Street: Approach	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	9	57	7	198	35	6
Peak Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Hourly Flow Rate, HFR	9	60	7	208	36	6
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			No /			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

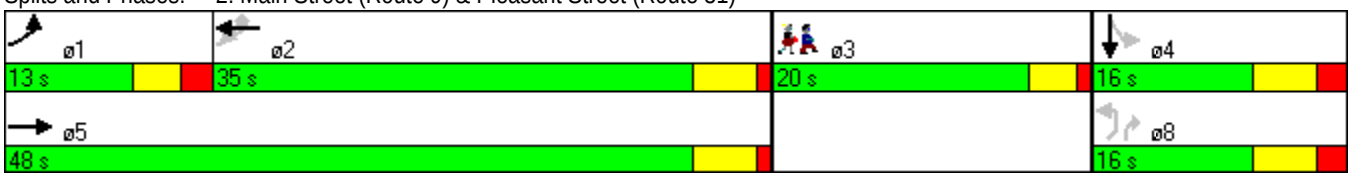
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	14	2		76			250	
C(m) (vph)	1177	1390		434			413	
v/c	0.01	0.00		0.18			0.61	
95% queue length	0.04	0.00		0.63			3.87	
Control Delay	8.1	7.6		15.0+			26.2	
LOS	A	A		C			D	
Approach Delay				15.0+			26.2	
Approach LOS				C			D	

Lane Group	EBL	EBT	WBL	WBT	WBR	NBR	SBT	NEL2	ø3
Lane Configurations									
Volume (vph)	25	565	5	300	100	5	0	20	
Lane Group Flow (vph)	27	613	0	317	104	9	336	34	
Turn Type	D.P+P		Perm		Perm	custom		custom	
Protected Phases	1	5		2			4		3
Permitted Phases	2		2		2	8		8	
Detector Phase	1	5	2	2	2	8	4	8	
Switch Phase									
Minimum Initial (s)	8.0	43.0	30.0	30.0	30.0	10.0	10.0	10.0	16.0
Minimum Split (s)	13.0	48.0	35.0	35.0	35.0	16.0	16.0	16.0	20.0
Total Split (s)	13.0	48.0	35.0	35.0	35.0	16.0	16.0	16.0	20.0
Total Split (%)	15.5%	57.1%	41.7%	41.7%	41.7%	19.0%	19.0%	19.0%	24%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag	Lag	Lag				
Lead-Lag Optimize?	Yes		Yes	Yes	Yes				
Recall Mode	Max	Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.06	0.70		0.51	0.17	0.01	0.57	0.06	
Control Delay	10.0	20.3		24.9	4.9	0.0	26.7	19.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	10.0	20.3		24.9	4.9	0.0	26.7	19.2	
Queue Length 50th (ft)	6	227		130	0	0	140	12	
Queue Length 95th (ft)	19	356		208	32	0	197	20	
Internal Link Dist (ft)		448		166			557		
Turn Bay Length (ft)	25								
Base Capacity (vph)	435	874		617	596	833	591	565	
Starvation Cap Reductn	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.06	0.70		0.51	0.17	0.01	0.57	0.06	

Intersection Summary
Cycle Length: 84
Actuated Cycle Length: 84
Offset: 12 (14%), Referenced to phase 2:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 2: Main Street (Route 9) & Pleasant Street (Route 31)



Movement	EBL	EBT	EBR2	WBL	WBT	WBR	NBR	SBL	SBT	SBR	SBR2	NEL2
Lane Configurations												
Volume (vph)	25	565	5	5	300	100	5	235	0	5	35	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0		6.0			6.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00		1.00			1.00
Frt	1.00	1.00			1.00	0.85	0.86		0.98			1.00
Flt Protected	0.95	1.00			1.00	1.00	1.00		0.96			0.95
Satd. Flow (prot)	1583	1665			1742	1482	1494		1701			1641
Flt Permitted	0.44	1.00			0.99	1.00	1.00		0.96			0.95
Satd. Flow (perm)	740	1665			1728	1482	1494		1701			1641
Peak-hour factor, PHF	0.93	0.93	0.93	0.96	0.96	0.96	0.58	0.82	0.82	0.82	0.82	0.58
Adj. Flow (vph)	27	608	5	5	312	104	9	287	0	6	43	34
RTOR Reduction (vph)	0	0	0	0	0	67	6	0	5	0	0	0
Lane Group Flow (vph)	27	613	0	0	317	37	3	0	331	0	0	34
Heavy Vehicles (%)	14%	14%	14%	9%	9%	9%	10%	5%	5%	5%	5%	10%
Turn Type	D.P+P			Perm		Perm	custom	Perm				custom
Protected Phases	1	5			2				4			
Permitted Phases	2			2		2	8	4				8
Actuated Green, G (s)	39.1	44.1			30.0	30.0	28.9		28.9			28.9
Effective Green, g (s)	39.1	44.1			30.0	30.0	28.9		28.9			28.9
Actuated g/C Ratio	0.47	0.53			0.36	0.36	0.34		0.34			0.34
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0		6.0			6.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0		3.0			3.0
Lane Grp Cap (vph)	436	874			617	529	514		585			565
v/s Ratio Prot	0.01	c0.37										
v/s Ratio Perm	0.02				0.18	0.03	0.00		0.19			0.02
v/c Ratio	0.06	0.70			0.51	0.07	0.01		0.57			0.06
Uniform Delay, d1	12.5	15.0			21.3	17.8	18.1		22.4			18.5
Progression Factor	1.00	1.00			1.00	1.00	1.00		1.00			1.00
Incremental Delay, d2	0.3	4.7			3.0	0.3	0.0		1.3			0.0
Delay (s)	12.7	19.7			24.3	18.1	18.1		23.7			18.5
Level of Service	B	B			C	B	B		C			B
Approach Delay (s)		19.4			22.8				23.7			
Approach LOS		B			C				C			

Intersection Summary			
HCM Average Control Delay	21.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

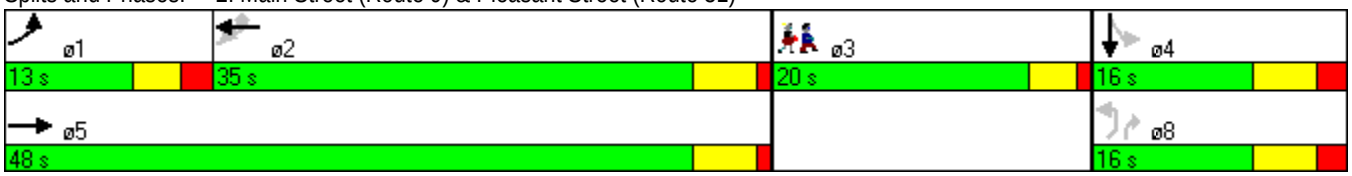
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBR	SBT	NEL2	ø3
Lane Configurations									
Volume (vph)	35	450	1	560	190	5	0	35	
Lane Group Flow (vph)	43	555	0	590	200	5	377	38	
Turn Type	D.P+P		Perm		Perm	custom		custom	
Protected Phases	1	5		2			4		3
Permitted Phases	2		2		2	8		8	
Detector Phase	1	5	2	2	2	8	4	8	
Switch Phase									
Minimum Initial (s)	8.0	43.0	30.0	30.0	30.0	10.0	10.0	10.0	16.0
Minimum Split (s)	13.0	48.0	35.0	35.0	35.0	16.0	16.0	16.0	20.0
Total Split (s)	13.0	48.0	35.0	35.0	35.0	16.0	16.0	16.0	20.0
Total Split (%)	15.5%	57.1%	41.7%	41.7%	41.7%	19.0%	19.0%	19.0%	24%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag	Lag	Lag				
Lead-Lag Optimize?	Yes		Yes	Yes	Yes				
Recall Mode	Max	Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.16	0.58		0.89	0.29	0.01	0.60	0.06	
Control Delay	11.9	17.2		43.2	4.2	0.0	25.9	18.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	11.9	17.2		43.2	4.2	0.0	25.9	18.3	
Queue Length 50th (ft)	11	192		288	0	0	152	13	
Queue Length 95th (ft)	24	250		#483	42	0	239	33	
Internal Link Dist (ft)		205		166			557		
Turn Bay Length (ft)	25								
Base Capacity (vph)	261	956		665	694	915	631	641	
Starvation Cap Reductn	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.16	0.58		0.89	0.29	0.01	0.60	0.06	

Intersection Summary

Cycle Length: 84
Actuated Cycle Length: 84
Offset: 12 (14%), Referenced to phase 2:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Main Street (Route 9) & Pleasant Street (Route 31)



Movement	EBL	EBT	EBR2	WBL	WBT	WBR	NBR	SBL	SBT	SBR	SBR2	NEL2
Lane Configurations												
Volume (vph)	35	450	5	1	560	190	5	245	0	5	85	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0		6.0			6.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00		1.00			1.00
Frt	1.00	1.00			1.00	0.85	0.86		0.96			1.00
Flt Protected	0.95	1.00			1.00	1.00	1.00		0.96			0.95
Satd. Flow (prot)	1770	1860			1863	1583	1644		1749			1805
Flt Permitted	0.13	1.00			1.00	1.00	1.00		0.96			0.95
Satd. Flow (perm)	248	1860			1862	1583	1644		1749			1805
Peak-hour factor, PHF	0.82	0.82	0.82	0.95	0.95	0.95	0.93	0.89	0.89	0.89	0.89	0.93
Adj. Flow (vph)	43	549	6	1	589	200	5	275	0	6	96	38
RTOR Reduction (vph)	0	0	0	0	0	129	3	0	11	0	0	0
Lane Group Flow (vph)	43	555	0	0	590	71	2	0	366	0	0	38
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	1%	1%	1%	1%	0%
Turn Type	D.P+P			Perm		Perm	custom	Perm				custom
Protected Phases	1	5			2				4			
Permitted Phases	2			2		2	8	4				8
Actuated Green, G (s)	38.2	43.2			30.0	30.0	29.8		29.8			29.8
Effective Green, g (s)	38.2	43.2			30.0	30.0	29.8		29.8			29.8
Actuated g/C Ratio	0.45	0.51			0.36	0.36	0.35		0.35			0.35
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0		6.0			6.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0		3.0			3.0
Lane Grp Cap (vph)	261	957			665	565	583		620			640
v/s Ratio Prot	0.02	c0.30										
v/s Ratio Perm	0.06				c0.32	0.05	0.00		0.21			0.02
v/c Ratio	0.16	0.58			0.89	0.13	0.00		0.59			0.06
Uniform Delay, d1	15.6	14.1			25.4	18.2	17.5		22.1			17.9
Progression Factor	1.00	1.00			1.00	1.00	1.00		1.00			1.00
Incremental Delay, d2	1.4	2.6			16.2	0.5	0.0		1.5			0.0
Delay (s)	17.0	16.7			41.6	18.6	17.5		23.6			17.9
Level of Service	B	B			D	B	B		C			B
Approach Delay (s)		16.7			35.8				23.6			
Approach LOS		B			D				C			

Intersection Summary			
HCM Average Control Delay	26.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

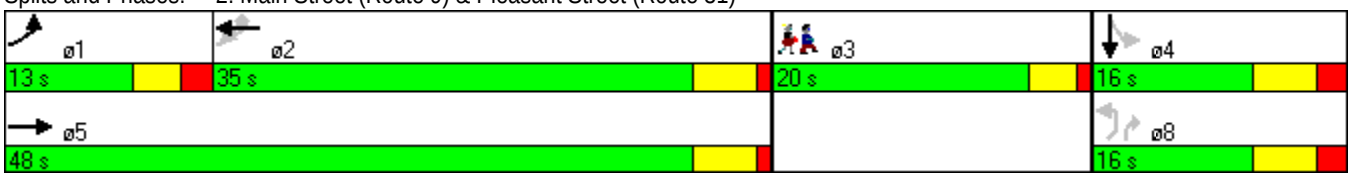
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBR	SBT	NEL2	ø3
Lane Configurations									
Volume (vph)	25	610	5	325	110	5	0	20	
Lane Group Flow (vph)	27	668	0	358	120	5	325	22	
Turn Type	D.P+P		Perm		Perm	custom		custom	
Protected Phases	1	5		2			4		3
Permitted Phases	2		2		2	8		8	
Detector Phase	1	5	2	2	2	8	4	8	
Switch Phase									
Minimum Initial (s)	8.0	43.0	30.0	30.0	30.0	10.0	10.0	10.0	16.0
Minimum Split (s)	13.0	48.0	35.0	35.0	35.0	16.0	16.0	16.0	20.0
Total Split (s)	13.0	48.0	35.0	35.0	35.0	16.0	16.0	16.0	20.0
Total Split (%)	15.5%	57.1%	41.7%	41.7%	41.7%	19.0%	19.0%	19.0%	24%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag	Lag	Lag				
Lead-Lag Optimize?	Yes		Yes	Yes	Yes				
Recall Mode	Max	Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.06	0.75		0.58	0.20	0.01	0.56	0.04	
Control Delay	9.6	21.9		26.5	4.7	0.0	27.1	19.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	9.6	21.9		26.5	4.7	0.0	27.1	19.6	
Queue Length 50th (ft)	6	252		151	0	0	137	8	
Queue Length 95th (ft)	18	400		238	34	0	219	24	
Internal Link Dist (ft)		417		166			557		
Turn Bay Length (ft)	25								
Base Capacity (vph)	416	885		617	606	812	579	554	
Starvation Cap Reductn	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.06	0.75		0.58	0.20	0.01	0.56	0.04	

Intersection Summary

Cycle Length: 84
Actuated Cycle Length: 84
Offset: 12 (14%), Referenced to phase 2:EBWB, Start of Green
Natural Cycle: 85
Control Type: Actuated-Coordinated

Splits and Phases: 2: Main Street (Route 9) & Pleasant Street (Route 31)



Movement	EBL	EBT	EBR2	WBL	WBT	WBR	NBR	SBL	SBT	SBR	SBR2	NEL2
Lane Configurations												
Volume (vph)	25	610	5	5	325	110	5	255	0	5	40	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0		6.0			6.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00		1.00			1.00
Frt	1.00	1.00			1.00	0.85	0.86		0.98			1.00
Flt Protected	0.95	1.00			1.00	1.00	1.00		0.96			0.95
Satd. Flow (prot)	1583	1665			1742	1482	1494		1701			1641
Flt Permitted	0.39	1.00			0.99	1.00	1.00		0.96			0.95
Satd. Flow (perm)	656	1665			1728	1482	1494		1701			1641
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	663	5	5	353	120	5	277	0	5	43	22
RTOR Reduction (vph)	0	0	0	0	0	77	3	0	5	0	0	0
Lane Group Flow (vph)	27	668	0	0	358	43	2	0	320	0	0	22
Heavy Vehicles (%)	14%	14%	14%	9%	9%	9%	10%	5%	5%	5%	5%	10%
Turn Type	D.P+P			Perm		Perm	custom	Perm				custom
Protected Phases	1	5			2				4			
Permitted Phases	2			2		2	8	4				8
Actuated Green, G (s)	39.6	44.6			30.0	30.0	28.4		28.4			28.4
Effective Green, g (s)	39.6	44.6			30.0	30.0	28.4		28.4			28.4
Actuated g/C Ratio	0.47	0.53			0.36	0.36	0.34		0.34			0.34
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0		6.0			6.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0		3.0			3.0
Lane Grp Cap (vph)	415	884			617	529	505		575			555
v/s Ratio Prot	0.01	c0.40										
v/s Ratio Perm	0.02				0.21	0.03	0.00		0.19			0.01
v/c Ratio	0.07	0.76			0.58	0.08	0.00		0.56			0.04
Uniform Delay, d1	12.4	15.4			21.9	17.9	18.4		22.7			18.7
Progression Factor	1.00	1.00			1.00	1.00	1.00		1.00			1.00
Incremental Delay, d2	0.3	6.0			3.9	0.3	0.0		1.2			0.0
Delay (s)	12.7	21.4			25.8	18.2	18.4		23.8			18.7
Level of Service	B	C			C	B	B		C			B
Approach Delay (s)		21.0			23.9				23.8			
Approach LOS		C			C				C			

Intersection Summary			
HCM Average Control Delay	22.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	75.2%	ICU Level of Service	D
Analysis Period (min)	15		

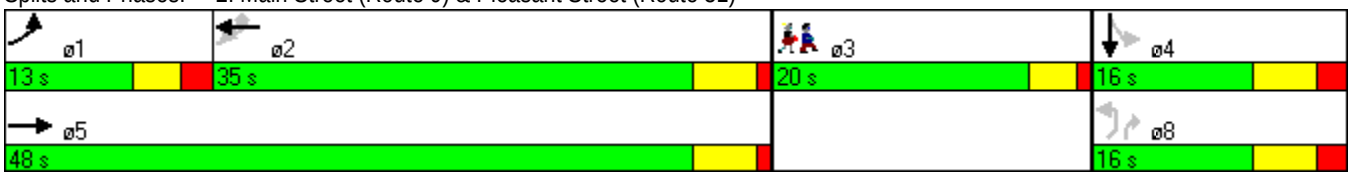
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBR	SBT	NEL2	ø3
Lane Configurations									
Volume (vph)	40	485	1	605	205	5	0	40	
Lane Group Flow (vph)	43	538	0	659	223	5	391	43	
Turn Type	D.P+P		Perm		Perm	custom		custom	
Protected Phases	1	5		2			4		3
Permitted Phases	2		2		2	8		8	
Detector Phase	1	5	2	2	2	8	4	8	
Switch Phase									
Minimum Initial (s)	8.0	43.0	30.0	30.0	30.0	10.0	10.0	10.0	16.0
Minimum Split (s)	13.0	48.0	35.0	35.0	35.0	16.0	16.0	16.0	20.0
Total Split (s)	13.0	48.0	35.0	35.0	35.0	16.0	16.0	16.0	20.0
Total Split (%)	15.5%	57.1%	41.7%	41.7%	41.7%	19.0%	19.0%	19.0%	24%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag	Lag	Lag				
Lead-Lag Optimize?	Yes		Yes	Yes	Yes				
Recall Mode	Max	Max	C-Max	C-Max	C-Max	None	None	None	None
v/c Ratio	0.17	0.57		0.99	0.31	0.01	0.62	0.07	
Control Delay	12.0	16.9		61.8	4.1	0.0	26.4	18.3	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	12.0	16.9		61.8	4.1	0.0	26.4	18.3	
Queue Length 50th (ft)	11	183		340	0	0	160	15	
Queue Length 95th (ft)	27	278		#567	44	0	255	36	
Internal Link Dist (ft)		205		166			557		
Turn Bay Length (ft)	25								
Base Capacity (vph)	257	952		665	709	925	635	645	
Starvation Cap Reductn	0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	
Reduced v/c Ratio	0.17	0.57		0.99	0.31	0.01	0.62	0.07	

Intersection Summary

Cycle Length: 84
Actuated Cycle Length: 84
Offset: 12 (14%), Referenced to phase 2:EBWB, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Main Street (Route 9) & Pleasant Street (Route 31)



Movement	EBL	EBT	EBR2	WBL	WBT	WBR	NBR	SBL	SBT	SBR	SBR2	NEL2
Lane Configurations												
Volume (vph)	40	485	10	1	605	205	5	265	0	5	90	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0	5.0	6.0		6.0			6.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00		1.00			1.00
Frt	1.00	1.00			1.00	0.85	0.86		0.96			1.00
Flt Protected	0.95	1.00			1.00	1.00	1.00		0.96			0.95
Satd. Flow (prot)	1770	1857			1863	1583	1644		1750			1805
Flt Permitted	0.13	1.00			1.00	1.00	1.00		0.96			0.95
Satd. Flow (perm)	248	1857			1862	1583	1644		1750			1805
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	527	11	1	658	223	5	288	0	5	98	43
RTOR Reduction (vph)	0	1	0	0	0	143	3	0	10	0	0	0
Lane Group Flow (vph)	43	537	0	0	659	80	2	0	381	0	0	43
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	1%	1%	1%	1%	0%
Turn Type	D.P+P			Perm		Perm	custom	Perm				custom
Protected Phases	1	5			2				4			
Permitted Phases	2			2		2	8	4				8
Actuated Green, G (s)	38.0	43.0			30.0	30.0	30.0		30.0			30.0
Effective Green, g (s)	38.0	43.0			30.0	30.0	30.0		30.0			30.0
Actuated g/C Ratio	0.45	0.51			0.36	0.36	0.36		0.36			0.36
Clearance Time (s)	5.0	5.0			5.0	5.0	6.0		6.0			6.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0		3.0			3.0
Lane Grp Cap (vph)	257	951			665	565	587		625			645
v/s Ratio Prot	0.02	c0.29										
v/s Ratio Perm	0.06				c0.35	0.05	0.00		0.22			0.02
v/c Ratio	0.17	0.56			0.99	0.14	0.00		0.61			0.07
Uniform Delay, d1	17.0	14.1			26.9	18.3	17.4		22.2			17.8
Progression Factor	1.00	1.00			1.00	1.00	1.00		1.00			1.00
Incremental Delay, d2	1.4	2.4			32.8	0.5	0.0		1.7			0.0
Delay (s)	18.4	16.5			59.6	18.8	17.4		23.9			17.8
Level of Service	B	B			E	B	B		C			B
Approach Delay (s)		16.6			49.3				23.9			
Approach LOS		B			D				C			

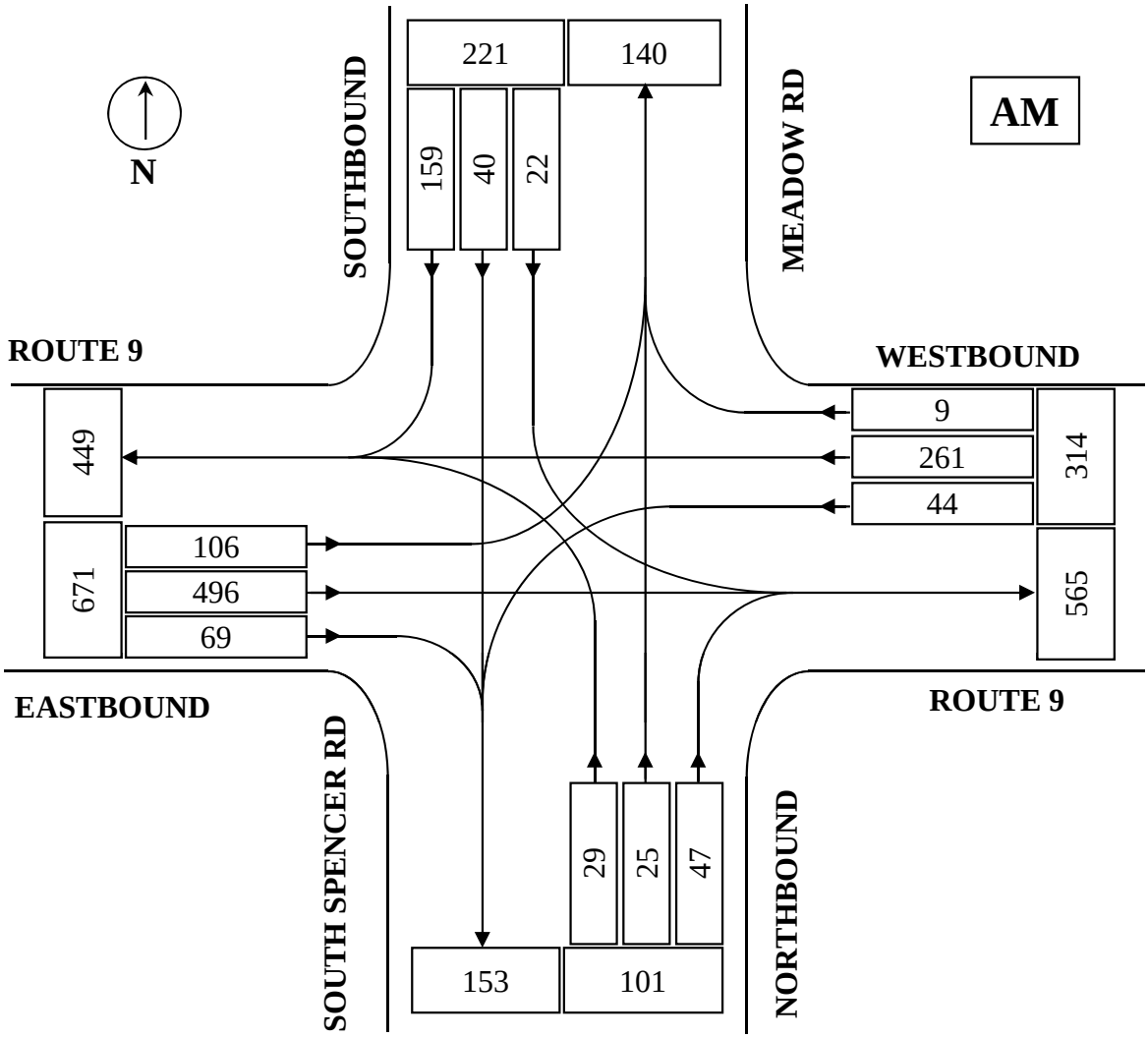
Intersection Summary			
HCM Average Control Delay	33.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	84.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 8/1/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 9 / Meadow Road / South Spencer Road

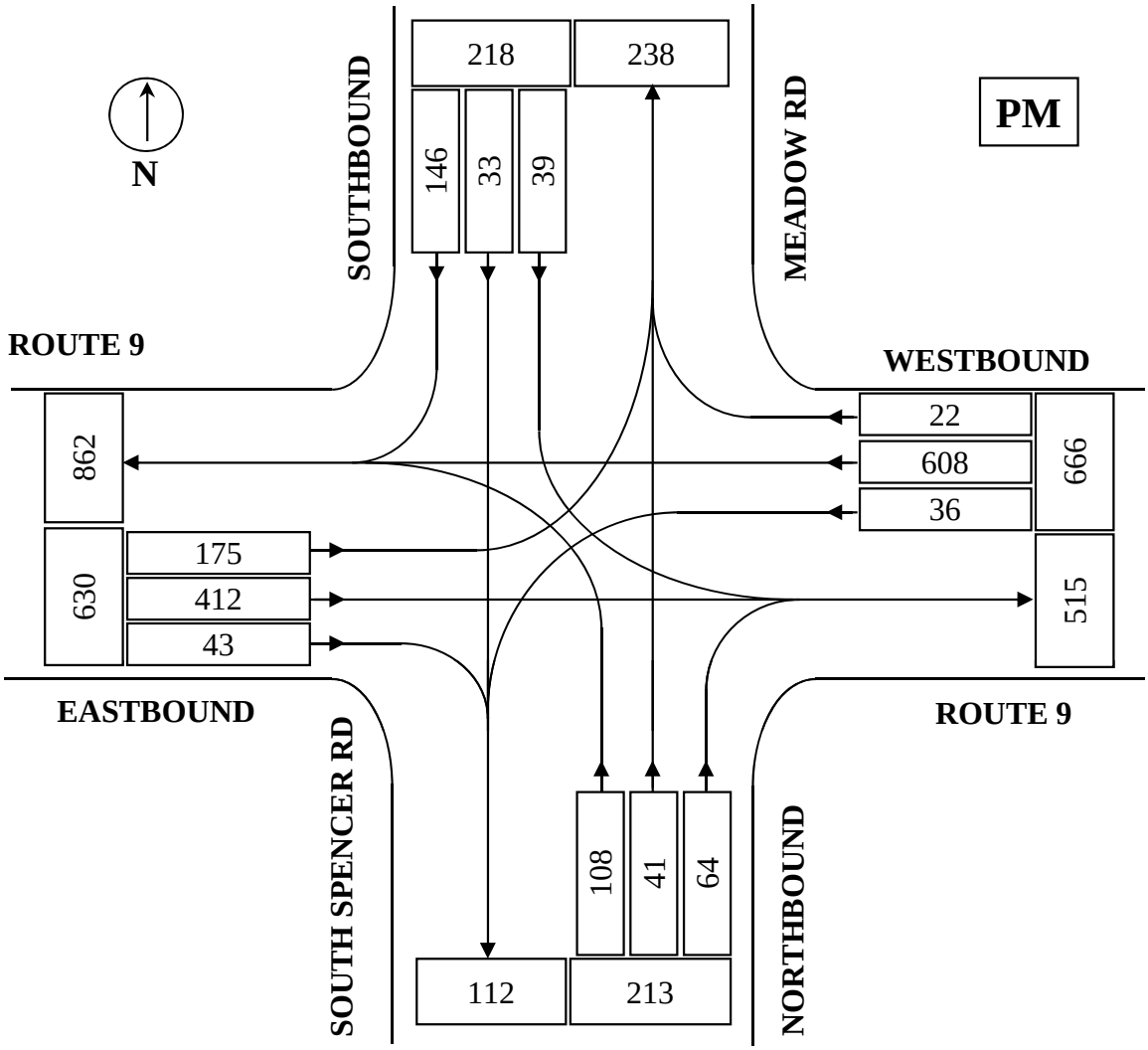


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 9 EB	671	51.3%	7:00 - 8:00 AM
Route 9 WB	314	24.1%	PHF = .91
South Spencer Rd NB	101	7.7%	**VEHICLES COUNTED**
Meadow Rd SB	221	16.9%	**ALL VEHICLES:** 1307
TOTAL	1307	100.0%	**TRUCKS:** 71
			PERCENT TRUCKS: 5.43%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Spencer **DATE:** 8/1/13 **DAY OF WEEK:** Thursday
INTERSECTION: Route 9 / Meadow Road / South Spencer Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 9 EB	630	36.5%	5:00 - 6:00 PM
Route 9 WB	666	38.6%	PHF = .90
South Spencer Rd NB	213	12.3%	**VEHICLES COUNTED**
Meadow Rd SB	218	12.6%	**ALL VEHICLES:** 1727
TOTAL	1727	100.0%	**TRUCKS:** 26
			PERCENT TRUCKS: 1.51%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Spencer

DATE: 8/1/2013

LOCATION: Route 9/Meadow Road/South Spencer Road

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Showers

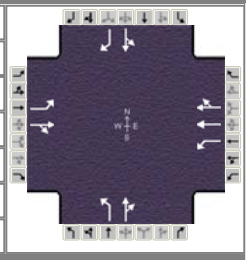
TECHNICIAN: RJ

Time Period	Route 9 EB				Route 9 WB				South Spencer Rd NB				Meadow Rd SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	27	112	15	8	9	64	0	9	9	7	7	1	5	8	35	7	298	
7:15 - 7:30	24	127	31	6	25	63	3	5	7	3	18	3	9	15	36	3	361	
7:30 - 7:45	22	124	19	2	8	62	1	1	5	11	11	1	3	10	44	3	320	
7:45 - 8:00	33	133	4	12	2	72	5	4	8	4	11	2	5	7	44	4	328	1307
8:00 - 8:15	23	121	6	9	4	80	3	10	4	0	8	4	11	4	30	4	294	1303
8:15 - 8:30	41	101	10	19	6	57	3	7	8	4	11	2	9	9	37	2	296	1238
8:30 - 8:45	33	121	3	10	11	79	3	5	10	3	16	2	4	7	30	2	320	1238
8:45 - 9:00	24	125	4	6	6	80	4	9	5	4	11	1	7	5	40	7	315	1225
TOTAL	227	964	92	72	71	557	22	50	56	36	93	16	53	65	296	32	2532	
		EBPct	51.3			**WBPct**	24.0			**NBPct**	7.7			**SBPct**	16.9			
Peak Sums:	**106**	**496**	**69**	**28**	**44**	**261**	**9**	**19**	**29**	**25**	**47**	**7**	**22**	**40**	**159**	**17**	**1307**	
Total Trucks	71					**TrkPct**	5.43			**PHF**	0.91							

Time Period	Route 9 EB				Route 9 WB				South Spencer Rd NB				Meadow Rd SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	33	94	9	5	7	111	4	4	21	6	13	2	7	10	51	3	366	
4:15 - 4:30	26	119	11	5	14	139	6	4	16	10	8	1	10	10	62	6	431	
4:30 - 4:45	32	109	2	3	10	148	9	2	7	10	14	1	5	15	42	1	403	
4:45 - 5:00	34	106	9	4	10	136	7	4	26	7	13	6	11	1	46	2	406	1606
5:00 - 5:15	43	110	11	2	9	144	7	2	60	15	26	1	10	5	39	1	479	1719
5:15 - 5:30	48	92	3	1	9	154	5	0	12	12	14	1	6	10	33	2	398	1686
5:30 - 5:45	50	117	12	4	9	154	6	3	17	5	11	1	16	9	27	2	433	1716
5:45 - 6:00	34	93	17	2	9	156	4	2	19	9	13	2	7	9	47	0	417	1727
TOTAL	300	840	74	26	77	1142	48	21	178	74	112	15	72	69	347	17	3333	
		EBPct	36.5			**WBPct**	38.6			**NBPct**	12.3			**SBPct**	12.6			
Peak Sums:	**175**	**412**	**43**	**9**	**36**	**608**	**22**	**7**	**108**	**41**	**64**	**5**	**39**	**33**	**146**	**5**	**1727**	
Total Trucks	26					**TrkPct**	1.51			**PHF**	0.90							

HCS 2010 Signalized Intersection Results Summary

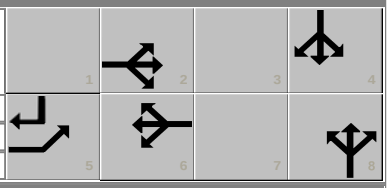
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 7, 2013	Area Type	Other
Jurisdiction	Spencer	Time Period	7:00 - 8:00 AM	PHF	0.91
Intersection	Rte 9/Meadow Rd/S.Spenc	Analysis Year	2013	Analysis Period	1> 7:00
File Name	13_Rt 9 & Meadow Rd & S Spencer Rd_AM.xus				
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	106	496	69	44	261	9	29	25	47	22	40	159

Signal Information			
Cycle, s	76.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.0	40.0	14.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		6.0		7.0
Phase Duration, s	10.0	56.0		46.0		20.0		20.0
Change Period, ($Y+R_c$), s	6.0	6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	3.2		3.2		3.2		3.2
Queue Clearance Time (g_s), s	4.2	15.8		8.5		6.0		7.7
Green Extension Time (g_e), s	0.0	2.1		2.1		0.4		0.3
Phase Call Probability	1.00	1.00		1.00		1.00		1.00
Max Out Probability	1.00	0.00		0.00		0.02		0.09

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	116	615		48	148	147	32	55			68	137
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1723	1773		781	1810	1790	1357	1777			1645	1533
Queue Service Time (g_s), s	2.2	13.8		2.6	3.2	3.2	1.5	2.0			0.0	5.7
Cycle Queue Clearance Time (g_c), s	2.2	13.8		6.5	3.2	3.2	4.0	2.0			2.4	5.7
Green Ratio (*g/C*)	0.61	0.66		0.53	0.53	0.53	0.18	0.18			0.18	0.24
Capacity (*c*), veh/h	693	1166		466	952	942	301	327			367	363
Volume-to-Capacity Ratio (*X*)	0.168	0.528		0.104	0.156	0.156	0.106	0.168			0.186	0.378
Available Capacity (c_a), veh/h	693	1166		466	952	942	301	327			367	363
Back of Queue (*Q*), veh/ln (50th percentile)	0.7	4.0		0.4	1.1	1.1	0.5	0.8			1.0	2.0
Queue Storage Ratio (*RQ*) (50th percentile)	0.00	0.00		0.18	0.00	0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	6.6	6.8		11.1	9.3	9.3	28.0	26.1			26.3	24.3
Incremental Delay (d_2), s/veh	0.0	0.2		0.0	0.0	0.0	0.1	0.1			0.1	0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	6.6	7.0		11.2	9.3	9.3	28.0	26.2			26.4	24.6
Level of Service (LOS)	A	A		B	A	A	C	C			C	C
Approach Delay, s/veh / LOS	7.0	A		9.6	A		26.9	C		25.2	C	
Intersection Delay, s/veh / LOS	11.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.2	B	2.3	B	2.4	B	2.7	B
Bicycle LOS Score / LOS	1.7	A	0.8	A	0.6	A	0.8	A

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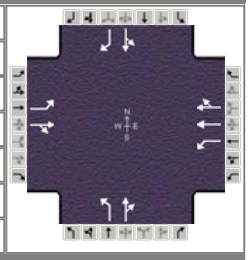
HCS 2010 Signalized Intersection Results Summary

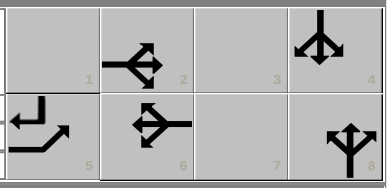
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 7, 2013	Area Type	Other
Jurisdiction	Spencer	Time Period	5:00 - 6:00 PM	PHF	0.90
Intersection	Rte 9/Meadow Rd/S.Spenc	Analysis Year	2013	Analysis Period	1> 5:00
File Name	13_Rt 9 & Meadow Rd & S Spencer Rd_PM.xus				
Project Description					



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	175	412	43	36	608	22	108	41	64	39	33	146

Signal Information			
Cycle, s	67.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.0	34.0	11.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		6.0		7.0
Phase Duration, s	10.0	50.0		40.0		17.0		17.0
Change Period, ($Y+R_c$), s	6.0	6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	3.1		3.1		3.2		3.2
Queue Clearance Time (g_s), s	5.3	10.6		9.7		12.3		6.5
Green Extension Time (g_e), s	0.0	2.5		2.5		0.0		0.4
Phase Call Probability	1.00	1.00		1.00		1.00		1.00
Max Out Probability	1.00	0.00		0.00		1.00		0.43

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	194	501		40	351	347	120	99			80	122
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1774	1834		894	1863	1842	1366	1766			1331	1579
Queue Service Time (g_s), s	3.3	8.6		1.5	7.7	7.7	5.8	3.3			1.2	4.4
Cycle Queue Clearance Time (g_c), s	3.3	8.6		1.5	7.7	7.7	10.3	3.3			4.5	4.4
Green Ratio (*g/C*)	0.60	0.66		0.51	0.51	0.51	0.16	0.16			0.16	0.22
Capacity (*c*), veh/h	506	1205		561	945	935	241	290			301	353
Volume-to-Capacity Ratio (*X*)	0.384	0.416		0.071	0.371	0.371	0.499	0.341			0.265	0.346
Available Capacity (c_a), veh/h	506	1205		561	945	935	241	290			301	353
Back of Queue (*Q*), veh/ln (50th percentile)	1.0	2.3		0.3	2.6	2.6	1.8	1.3			1.1	1.5
Queue Storage Ratio (*RQ*) (50th percentile)	0.00	0.00		0.11	0.00	0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	7.1	5.4		8.5	10.0	10.0	29.9	24.8			25.0	21.9
Incremental Delay (d_2), s/veh	0.2	0.1		0.0	0.1	0.1	0.6	0.3			0.2	0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	7.2	5.5		8.5	10.1	10.1	30.5	25.0			25.2	22.1
Level of Service (LOS)	A	A		A	B	B	C	C			C	C
Approach Delay, s/veh / LOS	6.0	A		10.0	B		28.0	C		23.3	C	
Intersection Delay, s/veh / LOS	12.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.2	B	2.3	B	2.4	B	2.7	B
Bicycle LOS Score / LOS	1.6	A	1.1	A	0.8	A	0.8	A

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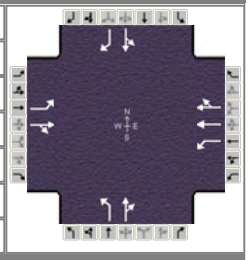
HCS 2010 Signalized Intersection Results Summary

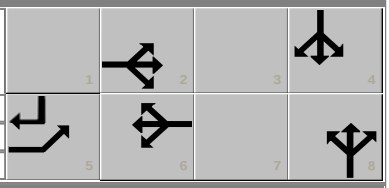
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 7, 2013	Area Type	Other
Jurisdiction	Spencer	Time Period	7:00 - 8:00 AM	PHF	0.91
Intersection	Rte 9/Meadow Rd/S.Spenc	Analysis Year	2013	Analysis Period	1> 7:00
File Name	13_Rt 9 & Meadow Rd & S Spencer Rd_AM_Proj2023.xus				
Project Description	Projected 2023				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	117	548	76	49	288	10	32	28	52	24	40	176

Signal Information			
Cycle, s	76.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.0	40.0	14.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		6.0		7.0
Phase Duration, s	10.0	56.0		46.0		20.0		20.0
Change Period, ($Y+R_c$), s	6.0	6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	3.2		3.2		3.3		3.3
Queue Clearance Time (g_s), s	4.4	18.4		11.8		6.3		8.6
Green Extension Time (g_e), s	0.0	2.4		2.4		0.4		0.3
Phase Call Probability	1.00	1.00		1.00		1.00		1.00
Max Out Probability	1.00	0.00		0.00		0.03		0.21

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	129	680		54	164	163	35	64			70	156
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1707	1756		728	1792	1773	1344	1755			1613	1519
Queue Service Time (g_s), s	2.4	16.4		3.4	3.6	3.6	1.7	2.3			0.0	6.6
Cycle Queue Clearance Time (g_c), s	2.4	16.4		9.8	3.6	3.6	4.3	2.3			2.5	6.6
Green Ratio (*g/C*)	0.61	0.66		0.53	0.53	0.53	0.18	0.18			0.18	0.24
Capacity (*c*), veh/h	668	1155		416	943	933	297	323			362	360
Volume-to-Capacity Ratio (*X*)	0.193	0.589		0.129	0.174	0.174	0.118	0.197			0.194	0.434
Available Capacity (c_a), veh/h	668	1155		416	943	933	297	323			362	360
Back of Queue (*Q*), veh/ln (50th percentile)	0.7	4.8		0.5	1.2	1.2	0.5	0.9			1.0	2.3
Queue Storage Ratio (*RQ*) (50th percentile)	0.00	0.00		0.22	0.00	0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	6.6	7.3		12.8	9.4	9.4	28.1	26.2			26.3	24.7
Incremental Delay (d_2), s/veh	0.1	0.5		0.1	0.0	0.0	0.1	0.1			0.1	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	6.7	7.8		12.8	9.4	9.4	28.2	26.4			26.4	25.0
Level of Service (LOS)	A	A		B	A	A	C	C			C	C
Approach Delay, s/veh / LOS	7.6	A		9.9	A		27.0	C		25.4	C	
Intersection Delay, s/veh / LOS	12.1						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.2	B	2.3	B	2.4	B	2.7	B
Bicycle LOS Score / LOS	1.8	A	0.8	A	0.7	A	0.9	A

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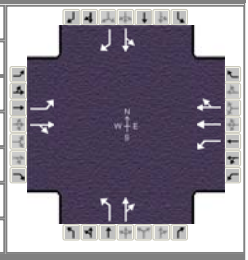
HCS 2010 Signalized Intersection Results Summary

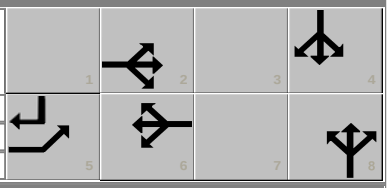
General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Aug 7, 2013	Area Type	Other
Jurisdiction	Spencer	Time Period	5:00 - 6:00 PM	PHF	0.90
Intersection	Rte 9/Meadow Rd/S.Spenc	Analysis Year	2013	Analysis Period	1> 5:00
File Name	13_Rt 9 & Meadow Rd & S Spencer Rd_PM_Proj2023.xus				
Project Description	Projected 2023				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	193	455	47	40	672	24	119	45	71	43	36	161

Signal Information			
Cycle, s	67.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

Green	4.0	34.0	11.0	0.0	0.0	0.0
Yellow	4.0	4.0	4.0	0.0	0.0	0.0
Red	2.0	2.0	2.0	0.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6		8		4
Case Number	1.0	4.0		6.3		6.0		7.0
Phase Duration, s	10.0	50.0		40.0		17.0		17.0
Change Period, ($Y+R_c$), s	6.0	6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s	3.1	3.1		3.1		3.2		3.2
Queue Clearance Time (g_s), s	5.8	12.1		10.8		13.0		7.4
Green Extension Time (g_e), s	0.0	2.9		2.9		0.0		0.4
Phase Call Probability	1.00	1.00		1.00		1.00		1.00
Max Out Probability	1.00	0.00		0.01		1.00		0.81

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (*v*), veh/h	214	553		44	388	383	132	111			88	139
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1757	1816		843	1845	1824	1348	1746			1242	1563
Queue Service Time (g_s), s	3.8	10.1		1.8	8.8	8.8	5.6	3.8			1.6	5.1
Cycle Queue Clearance Time (g_c), s	3.8	10.1		1.9	8.8	8.8	11.0	3.8			5.4	5.1
Green Ratio (*g/C*)	0.60	0.66		0.51	0.51	0.51	0.16	0.16			0.16	0.22
Capacity (*c*), veh/h	471	1193		534	936	925	220	287			287	350
Volume-to-Capacity Ratio (*X*)	0.455	0.464		0.083	0.414	0.414	0.600	0.388			0.306	0.397
Available Capacity (c_a), veh/h	471	1193		534	936	925	220	287			287	350
Back of Queue (*Q*), veh/ln (50th percentile)	1.1	2.7		0.3	3.0	3.0	2.2	1.5			1.2	1.8
Queue Storage Ratio (*RQ*) (50th percentile)	0.00	0.00		0.12	0.00	0.00	0.00	0.00			0.00	0.00
Uniform Delay (d_1), s/veh	7.5	5.7		8.6	10.3	10.3	31.1	25.0			25.4	22.1
Incremental Delay (d_2), s/veh	0.3	0.1		0.0	0.1	0.1	3.2	0.3			0.2	0.3
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0	0.0	0.0	0.0			0.0	0.0
Control Delay (*d*), s/veh	7.7	5.8		8.6	10.4	10.4	34.3	25.3			25.7	22.4
Level of Service (LOS)	A	A		A	B	B	C	C			C	C
Approach Delay, s/veh / LOS	6.3	A		10.3	B		30.2	C		23.7	C	
Intersection Delay, s/veh / LOS	12.6						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	2.2	B	2.3	B	2.4	B	2.7	B
Bicycle LOS Score / LOS	1.8	A	1.2	A	0.9	A	0.9	A

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MassDOT
Holden Sidewalk Estimates

ROUTE 31 (RESERVOIR STREET) SIDEWALKS

Phase 1 - Main Street (Route 122A) to Holden Commons Plaza

Item	Quantity	Units	Description	Unit Price	Total
102.51	6	EA	Individual Tree Protection	$270.00	$1,620.00
103.	0	EA	Tree Removed Dia. < 24"	$700.00	$0.00
104.	0	EA	Tree Removed Dia. > 24"	$1,250.00	$0.00
120.1	500	CY	Unclassified Excavation	$25.00	$12,500.00
151.	340	CY	Gravel Borrow	$35.00	$11,900.00
170.	1500	SY	Fine Grading and Compacting	$3.00	$4,500.00
220.	5	EA	Drainage Structure Adjusted	$325.00	$1,625.00
451.	30	TON	HMA for Patching	$175.00	$5,250.00
452.	55	GAL	Asphalt Emulsion for Tack Coat	$8.00	$440.00
482.3*	2000	FT	Sawing Asphalt Pavement	$2.00	$4,000.00
509.	52	FT	Granite Transition Curb for Wheelchair Ramps -Straight	$37.00	$1,924.00
509.1	117	FT	Granite Transition Curb for Wheelchair Ramps -Curved	$40.00	$4,680.00
570.2	1240	FT	Hot Mix Asphalt Curb Type 2	$6.00	$7,440.00
580.	375	FT	Curb Removed and Reset	$20.00	$7,500.00
701.2*	130	SY	Cement Concrete Wheelchair Ramp	$70.00	$9,100.00
702.	125	TON	Hot Mix Asphalt Walk Surface	$175.00	$21,875.00
703.	45	TON	Hot Mix Asphalt Driveway	$175.00	$7,875.00
734.*	3	EA	Sign Removed and Reset	$100.00	$300.00
751.	80	CY	Loam Borrow	$45.00	$3,600.00
765.	715	SY	Seeding	$1.50	$1,072.50
865.1	300	SF	Crosswalks and Stop Lines Refl. White (Thermoplastic)	$2.00	$600.00
866.06	1800	FT	6 Inch Reflectorized White Line White (Thermoplastic)	$1.00	$1,800.00
			Sub-Total		$109,601.50
			Misc. E&C and Police Detail (35%)		$38,360.00
			Total		$147,961.50

ROUTE 31 (RESERVOIR STREET) SIDEWALKS
Phase 2 - Holden Commons Plaza to Joel Scott Drive

Item	Quantity	Units	Description	Unit Price	Total
102.51	6	EA	Individual Tree Protection	$270.00	$1,620.00
103.	18	EA	Tree Removed Dia. < 24"	$700.00	$12,600.00
104.	11	EA	Tree Removed Dia. > 24"	$1,250.00	$13,750.00
120.1	570	CY	Unclassified Excavation	$25.00	$14,250.00
151.	380	CY	Gravel Borrow	$35.00	$13,300.00
170.	1710	SY	Fine Grading and Compacting	$3.00	$5,130.00
201.	6	EA	Catch Basin	$2,500.00	$15,000.00
202.	6	EA	Manhole	$2,800.00	$16,800.00
220.	4	EA	Drainage Structure Adjusted	$325.00	$1,300.00
220.2	1	FT	Drainage Structure Rebuilt	$250.00	$250.00
221.	6	EA	Frame and Cover	$650.00	$3,900.00
222.	6	EA	Frame and Grate	$750.00	$4,500.00
241.12	1000	FT	12 Inch Reinforced Concrete Pipe	$60.00	$60,000.00
451.	30	TON	HMA fot Patching	$175.00	$5,250.00
452.	75	GAL	Asphalt Emulsion for Tack Coat	$8.00	$600.00
482.3*	2600	FT	Sawing Asphalt Pavement	$2.00	$5,200.00
509.	26	FT	Granite Transition Curb for Wheelchair Ramps -Straight	$37.00	$962.00
509.1	26	FT	Granite Transition Curb for Wheelchair Ramps -Curved	$40.00	$1,040.00
570.2	1425	FT	Hot Mix Asphalt Curb Type 2	$6.00	$8,550.00
701.2*	40	SY	Cement Concrete Wheelchair Ramp	$70.00	$2,800.00
702.	110	TON	Hot Mix Asphalt Walk Surface	$175.00	$19,250.00
703.	125	TON	Hot Mix Asphalt Driveway	$175.00	$21,875.00
734.*	1	EA	Sign Removed and Reset	$100.00	$100.00
751.	70	CY	Loam Borrow	$45.00	$3,150.00
765.	650	SY	Seeding	$1.50	$975.00
865.1	60	SF	Crosswalks and Stop Lines Refl. White (Thermoplastic)	$2.00	$120.00
866.06	2000	FT	6 Inch Reflectorized White Line White (Thermoplastic)	$1.00	$2,000.00
			Sub-Total		$234,272.00
			Misc. E&C and Police Detail (35%)		$82,000.00
			Total		$316,272.00

ROUTE 31 (RESERVOIR STREET) SIDEWALKS
Phase 3 - Joel Scott Drive to Mixter Road

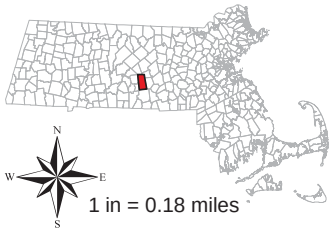
Item	Quantity	Units	Description	Unit Price	Total
102.51	15	EA	Individual Tree Protection	$270.00	$4,050.00
103.	12	EA	Tree Removed Dia. < 24"	$700.00	$8,400.00
104.	6	EA	Tree Removed Dia. > 24"	$1,250.00	$7,500.00
120.1	540	CY	Unclassified Excavation	$25.00	$13,500.00
151.	360	CY	Gravel Borrow	$35.00	$12,600.00
170.	1600	SY	Fine Grading and Compacting	$3.00	$4,800.00
201.	6	EA	Catch Basin	$2,500.00	$15,000.00
202.	6	EA	Manhole	$2,800.00	$16,800.00
220.	4	EA	Drainage Structure Adjusted	$325.00	$1,300.00
221.	6	EA	Frame and Cover	$650.00	$3,900.00
222.	6	EA	Frame and Grate	$750.00	$4,500.00
241.12	1000	FT	12 Inch Reinforced Concrete Pipe	$60.00	$60,000.00
451.	30	TON	HMA for patching	$175.00	$5,250.00
452.	65	GAL	Asphalt Emulsion for Tack Coat	$8.00	$520.00
482.3*	2280	FT	Sawing Asphalt Pavement	$2.00	$4,560.00
509.1	52	FT	Granite Transition Curb for Wheelchair Ramps -Curved	$40.00	$2,080.00
570.2	1780	FT	Hot Mix Asphalt Curb Type 2	$6.00	$10,680.00
630.	70	FT	Highway Guard Removed and Reset	$10.00	$700.00
701.2*	40	SY	Cement Concrete Wheelchair Ramp	$70.00	$2,800.00
702.	140	TON	Hot Mix Asphalt Walk Surface	$175.00	$24,500.00
703.	55	TON	Hot Mix Asphalt Driveway	$175.00	$9,625.00
734.*	3	EA	Sign Removed and Reset	$100.00	$300.00
751.	90	CY	Loam Borrow	$45.00	$4,050.00
765.	350	SY	Seeding	$1.50	$525.00
865.1	340	SF	Crosswalks and Stop Lines Refl. White (Thermoplastic)	$2.00	$680.00
866.06	2100	FT	6 Inch Reflectorized White Line White (Thermoplastic)	$1.00	$2,100.00
			Sub-Total		$220,720.00
			Misc. E&C and Police Detail (35%)		$77,250.00
			Total		$297,970.00

SPENCER SIDEWALK BETTERMENT PROGRAM

Legend

- Town Boundary
- Water Bodies
- Streams
- School
- Fire Station
- Police Station
- Major Road
- Local Road
- Active Railroad
- WRTA Bus Stops
- WRTA Route
- FUTURE/DESIRED PROPOSED NEW SIDEWALKS
- CURRENTLY PROPOSED SIDEWALK IMPROVEMENTS
- RECOMMENDED PRIORITY SIDEWALK IMPROVEMENTS
- COMPLETED SIDEWALK IMPROVEMENT (INCLUDES MAAB/ADA)

* Sidewalk betterment plan as presented and approved and Public TIP Hearing at the Wednesday, January 23, 2013 Meeting of the Board of Selectmen.
Plan Status Update: 10/23/2014



Last Updated: 10/23/2014

Source: Data provided by the Central Massachusetts Regional Planning Commission (CMRPC), massDOT and the Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, Information Technology Division.

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CMRPC
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2 Washington Square, Union Station Worcester, MA 01604

Date: 10/23/2014 Document Path: H:\Projects\O_Spencer_GIS\M280_Sidewalks_11x17.mxd

Other Recommended
Secondary Sidewalk Improvements

Rehab - Cherry St.
Rehab - Connection to Senior Center off Adams
New - Luther Hill Park & Connections

TOWN OF SPENCER, MASS.

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