CENTRAL MASSACHUSETTS

METROPOLITAN PLANNING ORGANIZATION

Sturbridge
Route 20 Corridor Profile
Technical Appendix

December 2019

Document Prepared by:
Staff of the Central Massachusetts Metropolitan Planning Organization
1 Mercantile Street, Suite 520, Worcester MA 01608

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 Metropolitan Planning Organization expressed herein do not necessarily reflect those of the Massachusetts Department of Transportation or the U.S. Department of Transportation.

Notice of Nondiscrimination Rights and Protections to Beneficiaries

Federal Title VI/Nondiscrimination Protections
The Central Massachusetts Metropolitan Planning Organization (CMMPO) hereby states its policy to operate its programs, services and activities in full compliance with federal nondiscrimination laws including Title VI of the Civil Rights Act of 1964 (Title VI), the Civil Rights Restoration Act of 1987, and related federal and state statutes and regulations. Title VI prohibits discrimination in federally assisted programs and requires that no person in the United States of America shall, on the grounds of race, color, or national origin, including limited English proficiency, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity receiving Federal assistance.

Related federal nondiscrimination laws administered by the Federal Highway Administration, the Federal Transit Administration, or both prohibit discrimination on the basis of age, sex, and disability. These protected categories are contemplated within the CMMPO's Title VI Programs consistent with federal and state interpretation and administration. Additionally, the CMMPO provides meaningful access to its programs, services, and activities to individuals with limited English proficiency, in compliance with US Department of Transportation policy and guidance on federal Executive Order 13166.

State Nondiscrimination Protections
The CMMPO also complies with the Massachusetts Public Accommodation Law, M.G.L. c272 §§ 92a, 98, 98a, prohibiting making any distinction, discrimination, or restriction in admission to or treatment in a place of public accommodation based on race, color, religious creed, national origin, sex, sexual orientation, disability or ancestry. Likewise, CMMPO complies with the Governor's Executive Order 526, section 4, requiring all programs, activities and services provided, performed, licensed, chartered, funded, regulated, or contracted for by the state shall be conducted without unlawful discrimination based on race, color, age, gender, ethnicity, sexual orientation, gender identity or expression, religion, creed, ancestry, national origin, disability, veteran's status (including Vietnam-era veterans), or background.

Filing a Complaint
Individuals who feel they have been discriminated against in violation of Title VI or related Federal nondiscrimination laws, must file a complaint within 180 days of the alleged discriminatory conduct to:

Ms. Janet Pierce, Executive Director
Central Massachusetts Regional Planning Commission
1 Mercantile Street
Suite 520
Worcester, MA 01608
(508) 756-7717

To file a complaint alleging violation of the State's Public Accommodation Law, contact the Massachusetts Commission Against Discrimination within 300 days of the alleged discriminatory conduct at:

Massachusetts Commission Against Discrimination (MCAD)
One Ashburton Place, 6th floor
Boston, MA 02109
(617) 994-6000
TTY: (617) 994-6196

Translation

English: If this information is needed in another language, please contact the CMRPC/CMMPO Title VI Specialist at (508) 756-7717.

Spanish: Si necesita esta información en otro lenguaje, favor contactar al especialista de Título VI de CMRPC/CMMPO al (508) 756-7717.

French: Si vous avez besoin d'obtenir une copie de la présente dans une autre langue, veuillez contacter le spécialiste du Titre VI de CMRPC/CMMPO en composant le (508) 756-7717.

Portuguese: Caso esta informação seja necessária em outro idioma, favor contatar o Especialista em Título VI do CMRPC/CMMPO pelo fone (508) 756-7717.

Vietnamese: Nếu bạn cần thông tin bằng ngôn ngữ khác, xin vui lòng liên lạc với Tiêu đề VI Chuyên CMRPC/CMMPO tại (508) 756-7717.

Chinese: 如果用另一种语言需要的信息，请联系第六章专门CMRPC/CMMPO（508）756-7717。

Afrikaans: As jy inligting nodig het in 'n ander taal, kontak asseblief die Titel VI Spesialis CMRPC/CMMPO by (508) 756-7717.

ADA/ 504 Notice of Nondiscrimination

The CMMPO does not discriminate on the basis of disability in admission to its programs, services, or activities; in access to them; in treatment of individuals with disabilities; or in any aspect of their operations. The CMMPO also does not discriminate on the basis of disability in its hiring or employment practices.

This notice is provided as required by Title II of the American with Disabilities Act of 1990 (ADA) and Section 504 of the Rehabilitation Act of 1973. Questions, complaints, or requests for additional information regarding ADA and Section 504 may be forwarded to:

Ms. Janet Pierce, Executive Director
Central Massachusetts Regional Planning Commission
1 Mercantile Street, Suite 520
Worcester, MA 01608
(508) 756-7717

This notice and document are available from the CMMPO in large print, on audio tape, and in Braille upon request.

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Route 20 Culvert Replacement Design Public Hearing
February 15, 2018

DESIGN PUBLIC HEARING

FEBRUARY 15, 2018

AT

VETERAN'S MEMORIAL HALL

STURBRIDGE, MASSACHUSETTS

7:00 PM

FOR THE PROPOSED

CULVERT REPLACEMENT PROJECT
ROUTE 20 (MAIN ST)
Project No. 606701
Bridge No. S-30-022 (6WJ)

Bridge Project Management Section

IN THE TOWN OF STURBRIDGE, MASSACHUSETTS

COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

JONATHAN GULLIVER
HIGHWAY ADMINISTRATOR

PATRICIA A. LEAVENWORTH, P.E.
CHIEF ENGINEER

THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION – HIGHWAY DIVISION
NOTICE OF A PUBLIC HEARING
Project File No. 606701

A Design Public Hearing will be held by MassDOT to discuss the proposed culvert replacement project in Sturbridge, MA.

WHERE: **Veteran's Memorial Hall**
380 Main Street
Sturbridge, MA 01566
WHEN: **Thursday, February 15, 2018 at 7:00 PM**

PURPOSE: The purpose of this hearing is to provide the public with the opportunity to become fully acquainted with the proposed culvert replacement at Route 20 and Snell Street. All views and comments made at the hearing will be reviewed and considered to the maximum extent possible.

PROPOSAL: The proposed project consists of the installation of a precast concrete box culvert conveying Cedar Meadow Brook under U.S. 20 (Main Street), full depth reconstruction, milling and overlay of the existing pavement structure of the Route 20 travel lanes and shoulders. The existing culvert will be abandoned and filled. Bicycle accommodations consisting of a usable shoulder have been provided in accordance with applicable design guides.

A secure right-of-way is necessary for this project. Acquisitions in fee and permanent or temporary easements may be required. The Commonwealth of Massachusetts is responsible for acquiring all needed rights in private or public lands. MassDOT's policy concerning land acquisitions will be discussed at this hearing.

Written views received by MassDOT subsequent to the date of this notice and up to five (5) days prior to the date of the hearing shall be displayed for public inspection and copying at the time and date listed above. Plans will be on display one-half hour before the hearing begins, with an engineer in attendance to answer questions regarding this project. A project handout will be made available on the MassDOT website listed below.

Written statements and other exhibits in place of, or in addition to, oral statements made at the Public Hearing regarding the proposed undertaking are to be submitted to Patricia A. Leavenworth, P.E., Chief Engineer, MassDOT, 10 Park Plaza, Boston, MA 02116, Attention: Bridge Project Management, Project File No. 606701. Such submissions will also be accepted at the hearing. Mailed statements and exhibits intended for inclusion in the public hearing transcript must be postmarked within ten (10) business days of this Public Hearing. Project inquiries may be emailed to dot.feedback.highway@state.ma.us

This location is accessible to people with disabilities. MassDOT provides reasonable accommodations and/or language assistance free of charge upon request (including but not limited to interpreters in American Sign Language and languages other than English, open or closed captioning for videos, assistive listening devices and alternate material formats, such as audio tapes, Braille and large print), as available. For accommodation or language assistance, please contact MassDOT's Chief Diversity and Civil Rights Officer by phone (857-368-8580), fax (857-368-0602), TTD/TTY (857-368-0603) or by email (MassDOT.CivilRights@dot.state.ma.us). Requests should be made as soon as possible prior to the meeting, and for more difficult to arrange services including sign-language, CART or language translation or interpretation, requests should be made at least ten (10) business days before the meeting.

In case of inclement weather, hearing cancellation announcements will be posted on the internet at **http://www.massdot.state.ma.us/Highway/**

JONATHAN GULLIVER
HIGHWAY ADMINISTRATOR

PATRICIA A. LEAVENWORTH, P.E.
CHIEF ENGINEER

Dear Concerned Citizen:

The Massachusetts Department of Transportation (MassDOT) is committed to building and maintaining a transportation infrastructure that is both safe and efficient for all who use our roadways, bridges, bicycle facilities and pedestrian paths, while maintaining the integrity of the environment.

As part of the design process for this project, we are conducting this public hearing to explain the proposed improvements, listen to your comments and answer any questions you may have. At the conclusion of the hearing, MassDOT will review all of your comments and, where feasible, incorporate them into the design of the project.

We recognize that road and bridge construction can create inconveniences for the public. MassDOT places a great deal of emphasis on minimizing the temporary disruptive effects of construction.

MassDOT encourages input from local communities and values your opinions. Please be assured that we will undertake no project without addressing the concerns of the community.

Sincerely,

Patricia A Leavenworth, P.E.
Chief Engineer

WHAT IS A PUBLIC HEARING?

WHY A PUBLIC HEARING?

To provide an assured method whereby the Commonwealth of Massachusetts can furnish to the public information concerning the State's highway construction proposals, and to afford every interested resident of the area an opportunity to be heard on any proposed project. At the same time, the hearings afford the Commonwealth an additional opportunity to receive information from local sources which would be of value to the State in making its final decisions to what design should be advanced for development.

WHY NOT A VOTE ON HIGHWAY PLANS?

The hearings are not intended to be a popular referendum for the purpose of determining the nature of a proposed improvement by a majority of those present. They do not relieve the duly constituted officials of a State highway department of the necessity for making decisions in State highway matters for which they are charged with full responsibility.

WHAT DOES A PUBLIC HEARING ACCOMPLISH?

It is designed to ensure the opportunity for, or the availability of, a forum to provide factual information which is pertinent to the determination of the final alternative considered by the state to best serve the public interest, and on which improvement projects are proposed to be undertaken.

It is important that the people of the area express their views in regard to the proposal being presented, so that views can be properly recorded in the minutes of the meeting. These minutes will be carefully studied and taken into consideration in the determination of the final design.

TO SAFEGUARD THE PROPERTY OWNER

If your property, or a portion of it, must be acquired by the State for highway purposes in the interest of all people of the Commonwealth, your rights are fully protected under the law. Briefly, here are some of the answers to questions you might ask.

1. WHO CONTACTS ME?

   Representatives of the Right of Way Bureau of the Massachusetts Department of Transportation's Highway Division. They will explain the impacts and your rights as protected under Massachusetts General Laws Chapter 79.

2. WHAT IS A FAIR PRICE FOR MY PROPERTY?

   Every offer is made to ensure that an equitable value is awarded to you for the property, or to appraise the "damage" to the property as a result of the acquisition. MassDOT appraisers, independent appraisers, MassDOT "Review Appraisers" and a Real Estate Appraisal Review Board may all contribute in arriving at an award of damages. The State also pays a proportionate part of the real estate tax for the current year for fee takings, and interest from the date the property is acquired to the payment date, on all impacts.

3. MUST I ACCEPT THE DEPARTMENT'S OFFER?

   No. If, after the figure established as market value has been offered to the owner, the owner feels he or she is not being offered a fair price, he or she has the right, within three years, to appeal to the courts. Pending a court decision, he or she can be paid on a "pro-tanto" basis (or "for the time being") that in no way prejudices the court appeal.

4. WHAT WILL HAPPEN TO MY HOUSE?

   The owner will have the opportunity to buy back his or her house, provided he or she has a location to which it can be moved, and the proper permits for its removal. If the owner does not wish to repurchase, the house will be advertised for bids. The highest bidder, who must also have a location and permits for removal, will be awarded the house. Otherwise, the structure will be slated for demolition.

5. WHAT HAPPENS IF I MUST RELOCATE?

   In addition to the market value of the property, the Department pays certain relocation benefits for both owners and tenants of acquired residences and businesses who meet eligibility requirements. Assistance in relocation is also provided. Department brochures are available for details on these benefits.

RIGHT OF WAY ISSUES

A secure right of way is necessary for this project. Temporary construction easements may be required. Your municipalities are responsible for acquiring all necessary rights in private or public lands. If your property is affected, your rights are fully protected under law.

1. REASON FOR PROJECT

   The completion of this project will serve local needs. The proposed enhancement will also be in the interest of others in the greater community, and provide for the public good.

2. WHO CONTACTS ME?

   Representatives of the municipality have already contacted or will contact you. They will explain the procedures used in acquiring any necessary rights in land.

3. WHAT ABOUT DONATIONS? WHAT IS A RIGHT OF ENTRY?

   Town officials will often seek donations, of parcels, where permanent rights are required. This procedure will minimize the acquisition cost for your community.

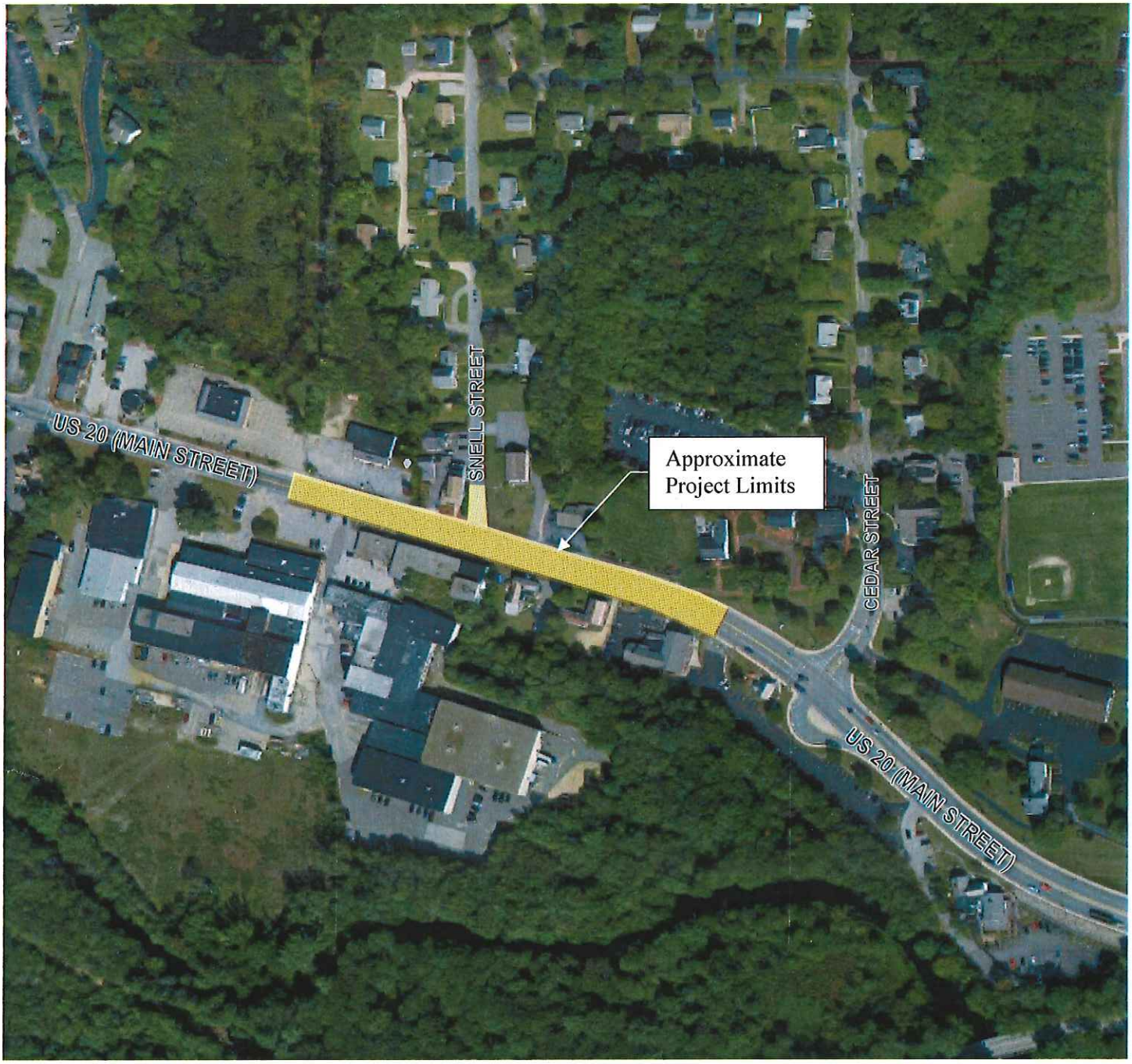
   A Right of Entry is a document that is signed by the owner. It allows the Contractor to perform certain types of work on the owner's land. The work is usually minor in nature and frequently consists of loaming/seeding behind sidewalks, new driveway apron work, grading/sloping, and wetland protection, etc. The rights granted are temporary in nature.

4. WHAT IS A FAIR PRICE FOR THE ACQUIRED PARCELS?

   In the event that donations are not considered, or completed, every effort will be made to ensure that an equitable value is awarded. Municipal and/or outside appraisers will complete an appraisal. Consideration is given to the type of rights needed, whether in fee, permanent or temporary easements. The appraisal will be the basis for arriving at a fair price (for damages that result).

5. MUST I ACCEPT THE MUNICIPALITY OFFER?

   No, if the owner feels that the offer is not fair the owner may petition the courts. This action does not stop or delay the acquisition. The action must occur within three years. The owner(s) may be paid pro tanto (for the time being). The pro tanto payment will not prejudice the court's final decision.



massDOT
Massachusetts Department of Transportation
Highway Division

10 Park Plaza
Boston, MA 02116

AI Engineers, Inc.

60 K Street, 3rd Floor
Boston, MA 02127

LOCATION MAP
Culvert Replacement Route 20 (Main Street)
Sturbridge, MA

PROPOSED IMPROVEMENTS

Project Description

The Massachusetts Department of Transportation (MassDOT) Highway Division is proposing to replace the existing culvert of (Bridge No. S-30-022) (6WJ) Cedar Meadow Brook carrying Route 20 (Main Street) over Cedar Meadow Brook in the Town of Sturbridge. The purpose of this project is to replace a structurally deficient culvert further damaged by Hurricane Irene with a new culvert. The proposed culvert will have new horizontal and vertical alignments in order to relocate the culvert out from under the existing Yankee Pedlar building at #433 Main Street. As part of this project, the existing water and sewer lines running under Route 20 are being relocated to avoid conflicts with the new culvert location.

Existing Conditions

The subject culvert is located in the Town of Sturbridge, Massachusetts. It is designated as Bridge Number S-30-022 (6WJ) within the MassDOT NBIS inventory. The existing culvert was originally constructed in 1850 and reconstructed in 1900. It conveys Cedar Meadow Brook across Route 20 in a roughly north (upstream) to south (downstream) orientation, along a convoluted 220-foot long alignment. The culvert begins on the North side of Route 20, adjacent and west of Yankee Candle shop, flowing underneath Route 20 in a southeasterly direction. There is an apparent right sharp turn underneath Route 20 just before it crosses the middle of the road followed by a left sharp turn underneath the Yankee Pedlar building where the stream ultimately exits on the east side of the building. The culvert's structural type and interior dimensions vary considerably over its total length- ranging from an 11-foot span, 4.7-foot rise three-sided rectangular masonry box culvert configuration at its northerly inlet - to a 7-foot span, 3.8-foot rise masonry arch configuration at the mid-point of its total length- to a 7-foot span, 5.75 foot rise rectangular masonry "open channel" configuration at its outlet on the south side of Route 20.

Route 20 is classified as an Urban Arterial within the Non-National Highway System. The average daily traffic (ADT) conveyed on Route 20 the crossing site is about 20,000 vehicles per day, 8 % of which may be trucks. The primary land uses near the bridge location are residential and commercial. The overall structural condition of the existing culvert is very poor. Cedar Meadow Brook is a minor tributary to the Quinebaug River.

Proposed Improvements

The principal project objective is to replace a structurally deficient culvert to current MassDOT standards. The existing culvert will be replaced by a new 268-foot long, 10-foot span, 6-foot rise reinforced concrete box culvert that provides interior span and rise dimensions of about of 8.7 and 4.7 feet, respectively. The proposed box culvert is proposed to be constructed along a new alignment starting at the existing inlet, then runs diagonally under Route 20 to the south curbline, then easterly along the south curbline, and then southerly between the existing building structures at nos. 425 and 433 Main Street and subsequently discharging into the existing open channel.

At the culvert inlet, the existing wingwall at the west side of the channel will be removed and reconstructed slightly in the west direction. The existing wingwall at east side of culvert entrance will be left in place and a new wingwall will be constructed adjacent to the existing wingwall to retain fill material. At the culvert outlet, a

section of the existing stone race wall is proposed to be removed and reused to construct the new 48 feet long cement stone masonry wall along the east side of the reconstructed channel.

A one-foot thick layer of coarse natural streambed material will be applied over the entire length of the proposed culvert's floor wall to facilitate aquatic organism passage. Flexible revetments is proposed to be installed along the brook's upstream and downstream culvert approaches to assure long-term channel bed stability at the replacement culvert's inlet and outlet.

A portion of the existing culvert located within the state highway layout in conflict with the proposed box culvert will be removed to facilitate construction of the new culvert. In additions, portions of the existing culvert within the state highway line not impacted by the proposed construction will be left in place and filled with controlled density flowable fill. The portion of the existing culvert located outside of the state highway layout along the south side of Route 20 will remain in place, and sealed by a bulkhead.

The post construction vertical and horizontal profile of Route 20 will be functionally similar to the roadway's current configuration. Route 20 will be rebuilt with full depth construction approximately within the limits of the box culvert construction. Route 20 east of the culvert installation will be milled and overlayed with bituminous concrete pavement. The existing granite stone curbing is proposed to be removed and reset in areas of full depth roadway construction. New 5' wide concrete sidewalks will be constructed starting at the beginning of the project up to the existing 5' wide concrete sidewalk at the east side of the project. In addition, concrete driveway ramps will be constructed at all driveway openings within the project limits. Drainage, utility and temporary construction easements are proposed for this project.

Drainage Improvements

Main Street in the vicinity of the proposed culvert is a low point in the vertical profile. The existing drainage system was analyzed and a new closed drainage system is being proposed which will attenuate a 50 year storm, a MassDOT requirement for a low point on Main Street. Additional catch basins are proposed along Main Street to collect the stormwater.

Utilities

As part of this project, the existing water and sewer lines running under Route 20 are being relocated within the project limits to avoid conflicts with the new culvert location. The existing water main along Main Street will be relocated of approximately 500 feet in length. Water services to the properties will be replaced and reconnected to the new water main. Water service to all properties will be continuously maintained for the entire duration of the project. In addition, approximately 320 feet of existing sanitary line within the project limits will be replaced. Existing utility poles and associated overhead wires will remain in place.

Traffic Management

The culvert will be constructed in three stages in order maintain bi-directional vehicular and pedestrian traffic. During Stage 1 construction, bi-directional traffic flow will be maintained along the north side of Route 20 while the culvert is installed at the south side of Route 20. During Stage 2, a portion of the culvert will be constructed in the center of the road while one lane of traffic in each direction will be maintained along each side of the work area. Fir the final stage, bi-directional traffic flow will be placed along the south of Route 20, while the northern section of the culvert and wingwalls are installed. Pedestrian routes will be maintained during the three phase of work with appropriate detours meeting the Massachusetts AAB and ADA guidelines.

Traffic Counts

Route 20 west of Route 148, **10/2/18**

Route 20 between Route 148 & Arnold Road, **10/2/18**

Route 20 between Arnold Road & Cedar Street, **10/30/18**

Route 20 between Cedar Street & Stallion Hill Road, **10/18/18**

Route 20 west of Route 131, **12/4/18**

Town : Sturbridge
Street : Rte 20
Location : West of Rte 148

Site: 2018244

Weekly Volume

Interval Start	Mon 10/1/2018		Tue 10/2/2018		Wed 10/3/2018		Thu 10/4/2018		Fri 10/5/2018		Sat 10/6/2018		Sun 10/7/2018		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	15	15	22	-	-	-	-	-	-	-	-	13.0	18.5	13.0	18.5
1:00 AM	-	-	11	15	9	15	-	-	-	-	-	-	-	-	10.0	15.0	10.0	15.0
2:00 AM	-	-	19	10	22	12	-	-	-	-	-	-	-	-	20.5	11.0	20.5	11.0
3:00 AM	-	-	23	10	24	11	-	-	-	-	-	-	-	-	23.5	10.5	23.5	10.5
4:00 AM	-	-	72	27	65	32	-	-	-	-	-	-	-	-	68.5	29.5	68.5	29.5
5:00 AM	-	-	192	81	198	74	-	-	-	-	-	-	-	-	195.0	77.5	195.0	77.5
6:00 AM	-	-	354	163	354	156	-	-	-	-	-	-	-	-	354.0	159.5	354.0	159.5
7:00 AM	-	-	463	240	431	234	-	-	-	-	-	-	-	-	447.0	237.0	447.0	237.0
8:00 AM	-	-	362	202	356	243	-	-	-	-	-	-	-	-	359.0	222.5	359.0	222.5
9:00 AM	-	-	274	200	288	195	-	-	-	-	-	-	-	-	281.0	197.5	281.0	197.5
10:00 AM	-	-	275	201	-	-	-	-	-	-	-	-	-	-	275.0	201.0	275.0	201.0
11:00 AM	274	240	252	225	-	-	-	-	-	-	-	-	-	-	263.0	232.5	263.0	232.5
12:00 PM	291	314	274	293	-	-	-	-	-	-	-	-	-	-	282.5	303.5	282.5	303.5
1:00 PM	250	283	272	268	-	-	-	-	-	-	-	-	-	-	261.0	275.5	261.0	275.5
2:00 PM	270	333	241	347	-	-	-	-	-	-	-	-	-	-	255.5	340.0	255.5	340.0
3:00 PM	332	400	333	391	-	-	-	-	-	-	-	-	-	-	332.5	395.5	332.5	395.5
4:00 PM	316	442	314	477	-	-	-	-	-	-	-	-	-	-	315.0	459.5	315.0	459.5
5:00 PM	262	465	269	434	-	-	-	-	-	-	-	-	-	-	265.5	449.5	265.5	449.5
6:00 PM	184	280	136	302	-	-	-	-	-	-	-	-	-	-	160.0	291.0	160.0	291.0
7:00 PM	94	200	85	187	-	-	-	-	-	-	-	-	-	-	89.5	193.5	89.5	193.5
8:00 PM	69	141	55	141	-	-	-	-	-	-	-	-	-	-	62.0	141.0	62.0	141.0
9:00 PM	55	102	51	106	-	-	-	-	-	-	-	-	-	-	53.0	104.0	53.0	104.0
10:00 PM	42	76	31	81	-	-	-	-	-	-	-	-	-	-	36.5	78.5	36.5	78.5
11:00 PM	31	44	34	39	-	-	-	-	-	-	-	-	-	-	32.5	41.5	32.5	41.5
Totals	2470	3320	4403	4455	1762	994	0	0	0	0	0	0	0	0	4455.0	4485.0	4455.0	4485.0
Combined	5790		8858		2756		0		0		0		0		8940.0		8940.0	
Split (%)	42.7	57.3	49.7	50.3	63.9	36.1	-	-	-	-	-	-	-	-	49.8	50.2	49.8	50.2

Peak Hours

12:00 AM - 12:00 PM	11:00 AM	11:00 AM	7:00 AM	7:00 AM	7:00 AM	8:00 AM	-	-	-	-	-	-	-	-	7:00 AM	7:00 AM	7:00 AM	7:00 AM
Volume	274	240	463	240	431	243	-	-	-	-	-	-	-	-	447.0	237.0	447.0	237.0
12:00 PM - 12:00 AM	3:00 PM	5:00 PM	3:00 PM	4:00 PM	-	-	-	-	-	-	-	-	-	-	3:00 PM	4:00 PM	3:00 PM	4:00 PM
Volume	332	465	333	477	-	-	-	-	-	-	-	-	-	-	332.5	459.5	332.5	459.5

Town : Sturbridge
Street : Rte 20
Location : Btwn 148 and Arnold Rd

Site: 2018245

Weekly Volume

Interval Start	Mon 10/1/2018		Tue 10/2/2018		Wed 10/3/2018		Thu 10/4/2018		Fri 10/5/2018		Sat 10/6/2018		Sun 10/7/2018		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	-	-	38	20	45	26	-	-	-	-	-	-	-	-	41.5	23.0	41.5	23.0
1:00 AM	-	-	34	13	35	16	-	-	-	-	-	-	-	-	34.5	14.5	34.5	14.5
2:00 AM	-	-	23	24	20	28	-	-	-	-	-	-	-	-	21.5	26.0	21.5	26.0
3:00 AM	-	-	21	42	19	38	-	-	-	-	-	-	-	-	20.0	40.0	20.0	40.0
4:00 AM	-	-	38	145	35	132	-	-	-	-	-	-	-	-	36.5	138.5	36.5	138.5
5:00 AM	-	-	103	378	96	406	-	-	-	-	-	-	-	-	99.5	392.0	99.5	392.0
6:00 AM	-	-	280	721	286	657	-	-	-	-	-	-	-	-	283.0	689.0	283.0	689.0
7:00 AM	-	-	415	839	391	868	-	-	-	-	-	-	-	-	403.0	853.5	403.0	853.5
8:00 AM	-	-	303	781	377	710	-	-	-	-	-	-	-	-	340.0	745.5	340.0	745.5
9:00 AM	-	-	366	529	346	559	-	-	-	-	-	-	-	-	356.0	544.0	356.0	544.0
10:00 AM	-	-	381	478	-	-	-	-	-	-	-	-	-	-	381.0	478.0	381.0	478.0
11:00 AM	465	400	431	492	-	-	-	-	-	-	-	-	-	-	448.0	446.0	448.0	446.0
12:00 PM	500	448	503	489	-	-	-	-	-	-	-	-	-	-	501.5	468.5	501.5	468.5
1:00 PM	504	383	551	464	-	-	-	-	-	-	-	-	-	-	527.5	423.5	527.5	423.5
2:00 PM	595	551	561	538	-	-	-	-	-	-	-	-	-	-	578.0	544.5	578.0	544.5
3:00 PM	752	490	749	543	-	-	-	-	-	-	-	-	-	-	750.5	516.5	750.5	516.5
4:00 PM	804	496	858	420	-	-	-	-	-	-	-	-	-	-	831.0	458.0	831.0	458.0
5:00 PM	855	442	803	389	-	-	-	-	-	-	-	-	-	-	829.0	415.5	829.0	415.5
6:00 PM	620	371	680	265	-	-	-	-	-	-	-	-	-	-	650.0	318.0	650.0	318.0
7:00 PM	408	183	440	224	-	-	-	-	-	-	-	-	-	-	424.0	203.5	424.0	203.5
8:00 PM	322	117	309	136	-	-	-	-	-	-	-	-	-	-	315.5	126.5	315.5	126.5
9:00 PM	198	134	238	104	-	-	-	-	-	-	-	-	-	-	218.0	119.0	218.0	119.0
10:00 PM	146	72	163	71	-	-	-	-	-	-	-	-	-	-	154.5	71.5	154.5	71.5
11:00 PM	65	32	79	48	-	-	-	-	-	-	-	-	-	-	72.0	40.0	72.0	40.0
Totals	6234	4119	8367	8153	1650	3440	0	0	0	0	0	0	0	0	8316.0	8095.0	8316.0	8095.0
Combined	10353		16520		5090		0		0		0		0		16411.0		16411.0	
Split (%)	60.2	39.8	50.6	49.4	32.4	67.6	-	-	-	-	-	-	-	-	50.7	49.3	50.7	49.3

Peak Hours

12:00 AM - 12:00 PM	11:00 AM	11:00 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	465	400	431	839	391	868	-	-	-	-	-	-	-	-	448.0	853.5	448.0	853.5
12:00 PM - 12:00 AM	5:00 PM	2:00 PM	4:00 PM	3:00 PM	-	-	-	-	-	-	-	-	-	-	4:00 PM	2:00 PM	4:00 PM	2:00 PM
Volume	855	551	858	543	-	-	-	-	-	-	-	-	-	-	831.0	544.5	831.0	544.5

Central Massachusetts Regional Planning Commission

One Mercantile Street
Suite 520, Worcester MA 01608

Site Code: 2018246
Sturbridge- Route 20
Between Arnold Rd and Cedar St

Start	29-Oct-18		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
Time	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	*	*	22	50	13	44	*	*	*	*	*	*	*	*	18	47
01:00	*	*	20	32	14	39	*	*	*	*	*	*	*	*	17	36
02:00	*	*	28	25	34	27	*	*	*	*	*	*	*	*	31	26
03:00	*	*	40	28	36	19	*	*	*	*	*	*	*	*	38	24
04:00	*	*	128	47	142	44	*	*	*	*	*	*	*	*	135	46
05:00	*	*	465	111	437	100	*	*	*	*	*	*	*	*	451	106
06:00	*	*	813	348	786	328	*	*	*	*	*	*	*	*	800	338
07:00	*	*	**1020**	524	**1033**	**542**	*	*	*	*	*	*	*	*	**1026**	533
08:00	*	*	896	509	896	505	*	*	*	*	*	*	*	*	896	507
09:00	*	*	675	477	630	512	*	*	*	*	*	*	*	*	652	494
10:00	*	*	596	515	660	529	*	*	*	*	*	*	*	*	628	522
11:00	**532**	**566**	622	**601**	*	*	*	*	*	*	*	*	*	*	577	**584**
12:00 PM	619	626	645	700	*	*	*	*	*	*	*	*	*	*	632	663
01:00	567	694	621	747	*	*	*	*	*	*	*	*	*	*	594	720
02:00	710	814	**744**	788	*	*	*	*	*	*	*	*	*	*	**727**	801
03:00	703	1028	730	1027	*	*	*	*	*	*	*	*	*	*	716	1028
04:00	**727**	**1099**	691	1106	*	*	*	*	*	*	*	*	*	*	709	**1102**
05:00	630	990	699	**1117**	*	*	*	*	*	*	*	*	*	*	664	1054
06:00	450	715	548	906	*	*	*	*	*	*	*	*	*	*	499	810
07:00	305	493	340	607	*	*	*	*	*	*	*	*	*	*	322	550
08:00	232	321	299	354	*	*	*	*	*	*	*	*	*	*	266	338
09:00	158	206	168	295	*	*	*	*	*	*	*	*	*	*	163	250
10:00	71	131	99	168	*	*	*	*	*	*	*	*	*	*	85	150
11:00	64	93	51	105	*	*	*	*	*	*	*	*	*	*	58	99
Lane	5768	7776	10960	11187	4681	2689	0	0	0	0	0	0	0	0	10704	10828
Day	13544		22147		7370		0		0		0		0		21532	
AM Peak	11:00	11:00	07:00	11:00	07:00	07:00	-	-	-	-	-	-	-	-	07:00	11:00
Vol.	532	566	1020	601	1033	542	-	-	-	-	-	-	-	-	1026	584
PM Peak	16:00	16:00	14:00	17:00	-	-	-	-	-	-	-	-	-	-	14:00	16:00
Vol.	727	1099	744	1117	-	-	-	-	-	-	-	-	-	-	727	1102

Comb. Total	13544	22147	7370	0	0	0	0	21532

ADT ADT 21,530 AADT 21,530

Central Massachusetts Regional Planning Commission

One Mercantile Street
Suite 520, Worcester MA 01608

Site Code: 2018247WB
Sturbridge- Route 20 WB
Btwn Cedar St and Stallion Hill Rd

Start Time	Mon 22-Oct-18	Tue 23-Oct-18	Wed 24-Oct-18	Thu 25-Oct-18	Fri 26-Oct-18	Average Day	Sat 27-Oct-18	Sun 28-Oct-18	Week Average
12:00 AM	*	*	*	61	78	70	*	*	70
01:00	*	*	*	48	39	44	*	*	44
02:00	*	*	*	25	26	26	*	*	26
03:00	*	*	*	26	20	23	*	*	23
04:00	*	*	*	40	54	47	*	*	47
05:00	*	*	*	121	116	118	*	*	118
06:00	*	*	*	359	361	360	*	*	360
07:00	*	*	*	588	582	585	*	*	585
08:00	*	*	*	668	**617**	642	*	*	642
09:00	*	*	*	579	*	579	*	*	579
10:00	*	*	591	607	*	599	*	*	599
11:00	*	*	**716**	**784**	*	**750**	*	*	**750**
12:00 PM	*	*	761	781	*	771	*	*	771
01:00	*	*	799	799	*	799	*	*	799
02:00	*	*	944	950	*	947	*	*	947
03:00	*	*	1132	**1157**	*	1144	*	*	1144
04:00	*	*	**1206**	1091	*	**1148**	*	*	**1148**
05:00	*	*	1105	1016	*	1060	*	*	1060
06:00	*	*	992	1047	*	1020	*	*	1020
07:00	*	*	706	705	*	706	*	*	706
08:00	*	*	444	524	*	484	*	*	484
09:00	*	*	325	366	*	346	*	*	346
10:00	*	*	187	209	*	198	*	*	198
11:00	*	*	95	109	*	102	*	*	102
Day Total	0	0	10003	12660	1893	12568	0	0	12568
% Avg. WkDay	0.0%	0.0%	79.6%	100.7%	15.1%				
% Avg. Week	0.0%	0.0%	79.6%	100.7%	15.1%	100.0%	0.0%	0.0%	
AM Peak	-	-	11:00	11:00	08:00	11:00	-	-	11:00
Vol.	-	-	716	784	617	750	-	-	750
PM Peak	-	-	16:00	15:00	-	16:00	-	-	16:00
Vol.	-	-	1206	1157	-	1148	-	-	1148
Grand Total	0	0	10003	12660	1893	12568	0	0	12568

ADT ADT 12,568 AADT 12,568

Central Massachusetts Regional Planning Commission

One Mercantile Street
Suite 520, Worcester MA 01608

Site Code: 2018247EB
Sturbridge- Route 20 EB
Btwn Cedar St and Stallion Hill Rd

Start Time	Mon 22-Oct-18	Tue 23-Oct-18	Wed 24-Oct-18	Thu 25-Oct-18	Fri 26-Oct-18	Average Day	Sat 27-Oct-18	Sun 28-Oct-18	Week Average
12:00 AM	*	22	24	*	*	23	*	*	23
01:00	*	18	23	*	*	20	*	*	20
02:00	*	25	28	*	*	26	*	*	26
03:00	*	43	42	*	*	42	*	*	42
04:00	*	146	146	*	*	146	*	*	146
05:00	*	485	474	*	*	480	*	*	480
06:00	*	881	918	*	*	900	*	*	900
07:00	*	**1160**	**1173**	*	*	**1166**	*	*	**1166**
08:00	*	1079	*	*	*	1079	*	*	1079
09:00	*	783	*	*	*	783	*	*	783
10:00	655	701	*	*	*	678	*	*	678
11:00	**707**	697	*	*	*	702	*	*	702
12:00 PM	793	775	*	*	*	784	*	*	784
01:00	711	713	*	*	*	712	*	*	712
02:00	825	871	*	*	*	848	*	*	848
03:00	877	**889**	*	*	*	883	*	*	883
04:00	**881**	888	*	*	*	**884**	*	*	**884**
05:00	776	784	*	*	*	780	*	*	780
06:00	557	583	*	*	*	570	*	*	570
07:00	377	417	*	*	*	397	*	*	397
08:00	298	282	*	*	*	290	*	*	290
09:00	170	149	*	*	*	160	*	*	160
10:00	98	88	*	*	*	93	*	*	93
11:00	62	48	*	*	*	55	*	*	55
Day Total	7787	12527	2828	0	0	12501	0	0	12501
% Avg. WkDay	62.3%	100.2%	22.6%	0.0%	0.0%				
% Avg. Week	62.3%	100.2%	22.6%	0.0%	0.0%	100.0%	0.0%	0.0%	
AM Peak	11:00	07:00	07:00	-	-	07:00	-	-	07:00
Vol.	707	1160	1173	-	-	1166	-	-	1166
PM Peak	16:00	15:00	-	-	-	16:00	-	-	16:00
Vol.	881	889	-	-	-	884	-	-	884
Grand Total	7787	12527	2828	0	0	12501	0	0	12501

ADT ADT 12,502 AADT 12,502

Central Massachusetts Regional Planning Commission

One Mercantile Street
Suite 520, Worcester MA 01608

Sturbridge Route 20 WB
West of Main Street Rt 131

Start Time	Mon 03-Dec-18	Tue 04-Dec-18	Wed 05-Dec-18	Thu 06-Dec-18	Fri 07-Dec-18	Average Day	Sat 08-Dec-18	Sun 09-Dec-18	Week Average
12:00 AM	*	56	69	*	*	62	*	*	62
01:00	*	44	36	*	*	40	*	*	40
02:00	*	25	27	*	*	26	*	*	26
03:00	*	17	21	*	*	19	*	*	19
04:00	*	57	53	*	*	55	*	*	55
05:00	*	133	155	*	*	144	*	*	144
06:00	*	429	411	*	*	420	*	*	420
07:00	*	683	664	*	*	674	*	*	674
08:00	*	655	679	*	*	667	*	*	667
09:00	*	566	556	*	*	561	*	*	561
10:00	*	644	670	*	*	657	*	*	657
11:00	*	**768**	**817**	*	*	**792**	*	*	**792**
12:00 PM	872	848	*	*	*	860	*	*	860
01:00	845	860	*	*	*	852	*	*	852
02:00	1002	1015	*	*	*	1008	*	*	1008
03:00	1173	1220	*	*	*	1196	*	*	1196
04:00	1240	**1413**	*	*	*	**1326**	*	*	**1326**
05:00	**1259**	1317	*	*	*	1288	*	*	1288
06:00	878	916	*	*	*	897	*	*	897
07:00	570	620	*	*	*	595	*	*	595
08:00	368	389	*	*	*	378	*	*	378
09:00	259	270	*	*	*	264	*	*	264
10:00	157	218	*	*	*	188	*	*	188
11:00	113	103	*	*	*	108	*	*	108
Day Total	8736	13266	4158	0	0	13077	0	0	13077
% Avg. WkDay	66.8%	101.4%	31.8%	0.0%	0.0%				
% Avg. Week	66.8%	101.4%	31.8%	0.0%	0.0%	100.0%	0.0%	0.0%	
AM Peak	-	11:00	11:00	-	-	11:00	-	-	11:00
Vol.	-	768	817	-	-	792	-	-	792
PM Peak	17:00	16:00	-	-	-	16:00	-	-	16:00
Vol.	1259	1413	-	-	-	1326	-	-	1326
Grand Total	8736	13266	4158	0	0	13077	0	0	13077

ADT ADT 13,079 AADT 13,079

Central Massachusetts Regional Planning Commission

One Mercantile Street
Suite 520, Worcester MA 01608

Sturbridge Route 20 EB
West of Main Rt 131

Start Time	Mon 03-Dec-18	Tue 04-Dec-18	Wed 05-Dec-18	Thu 06-Dec-18	Fri 07-Dec-18	Average Day	Sat 08-Dec-18	Sun 09-Dec-18	Week Average
12:00 AM	*	*	*	34	40	37	*	*	37
01:00	*	*	*	21	32	26	*	*	26
02:00	*	*	*	32	41	36	*	*	36
03:00	*	*	*	44	45	44	*	*	44
04:00	*	*	*	174	161	168	*	*	168
05:00	*	*	*	497	438	468	*	*	468
06:00	*	*	*	969	884	926	*	*	926
07:00	*	*	*	**1197**	**1185**	**1191**	*	*	**1191**
08:00	*	*	*	1131	1105	1118	*	*	1118
09:00	*	*	*	829	806	818	*	*	818
10:00	*	*	*	759	1121	940	*	*	940
11:00	*	*	*	868	908	888	*	*	888
12:00 PM	*	*	*	868	1003	936	*	*	936
01:00	*	*	*	902	988	945	*	*	945
02:00	*	*	917	1010	1119	1015	*	*	1015
03:00	*	*	**979**	**1156**	**1207**	**1114**	*	*	**1114**
04:00	*	*	885	956	*	920	*	*	920
05:00	*	*	837	879	*	858	*	*	858
06:00	*	*	638	676	*	657	*	*	657
07:00	*	*	443	524	*	484	*	*	484
08:00	*	*	296	441	*	368	*	*	368
09:00	*	*	237	268	*	252	*	*	252
10:00	*	*	131	170	*	150	*	*	150
11:00	*	*	67	89	*	78	*	*	78
Day Total	0	0	5430	14494	11083	14437	0	0	14437
% Avg. WkDay	0.0%	0.0%	37.6%	100.4%	76.8%				
% Avg. Week	0.0%	0.0%	37.6%	100.4%	76.8%	100.0%	0.0%	0.0%	
AM Peak	-	-	-	07:00	07:00	- 07:00	-	-	- 07:00 - -
Vol.	-	-	-	1197	1185	- 1191	-	-	- 1191 - -
PM Peak	-	-	15:00	15:00	15:00	- 15:00	-	-	- 15:00 - -
Vol.	-	-	979	1156	1207	- 1114	-	-	- 1114 - -
Grand Total	0	0	5430	14494	11083	14437	0	0	14437

ADT ADT 14,438 AADT 14,438

Turning Movement Counts (TMCs)

Route 20 @ Route 148 & Holland Road, **10/10/18**

Route 20 @ Arnold Road, **10/10/18**

Route 20 @ Cedar Street, **10/16/18**

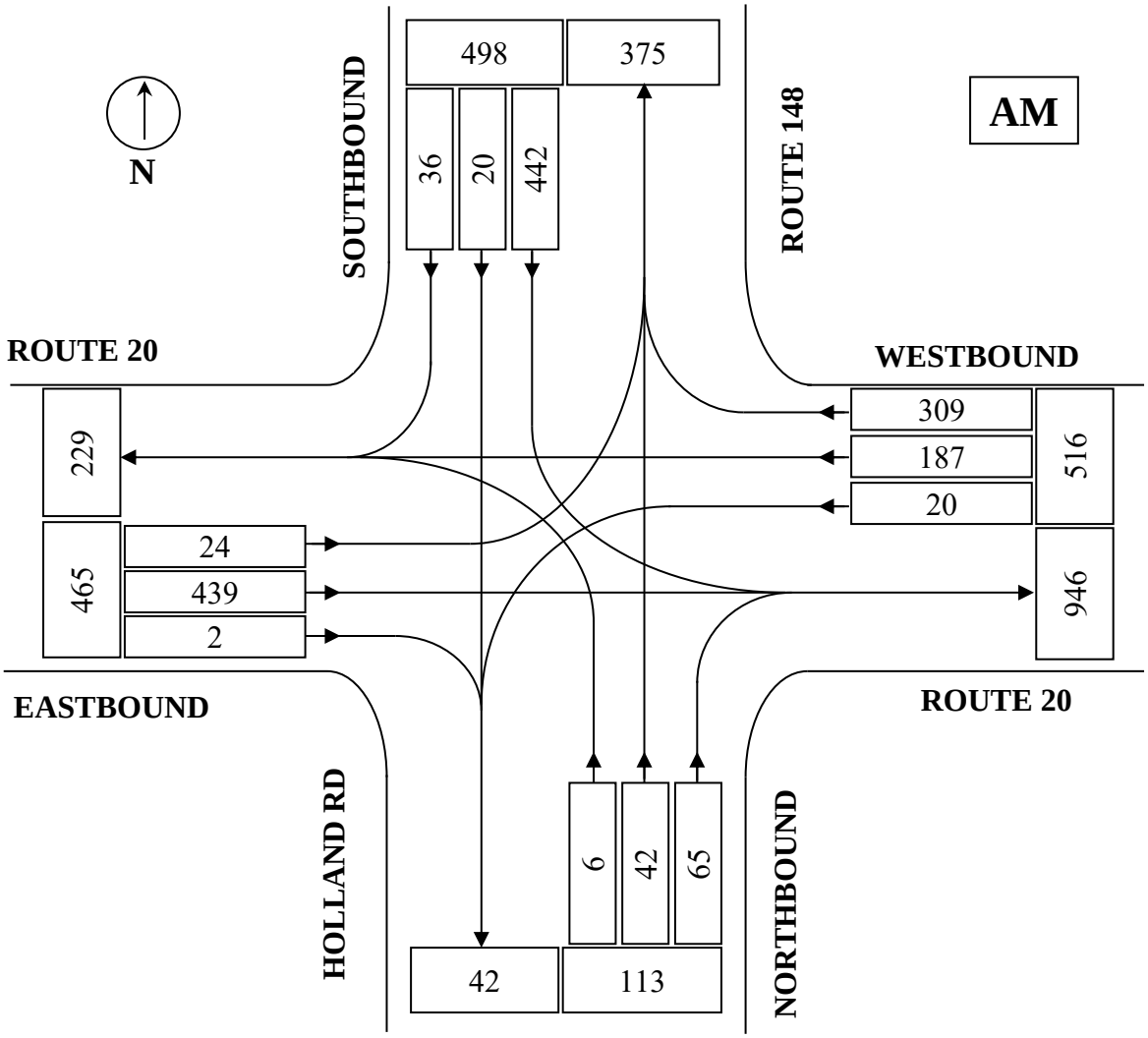
Route 20 @ Stallion Hill Road, **10/18/18**

Route 20 @ Fairground Road & Route 131, **11/8/18**

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 10/10/18 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 20 / Route 148 / Holland Road

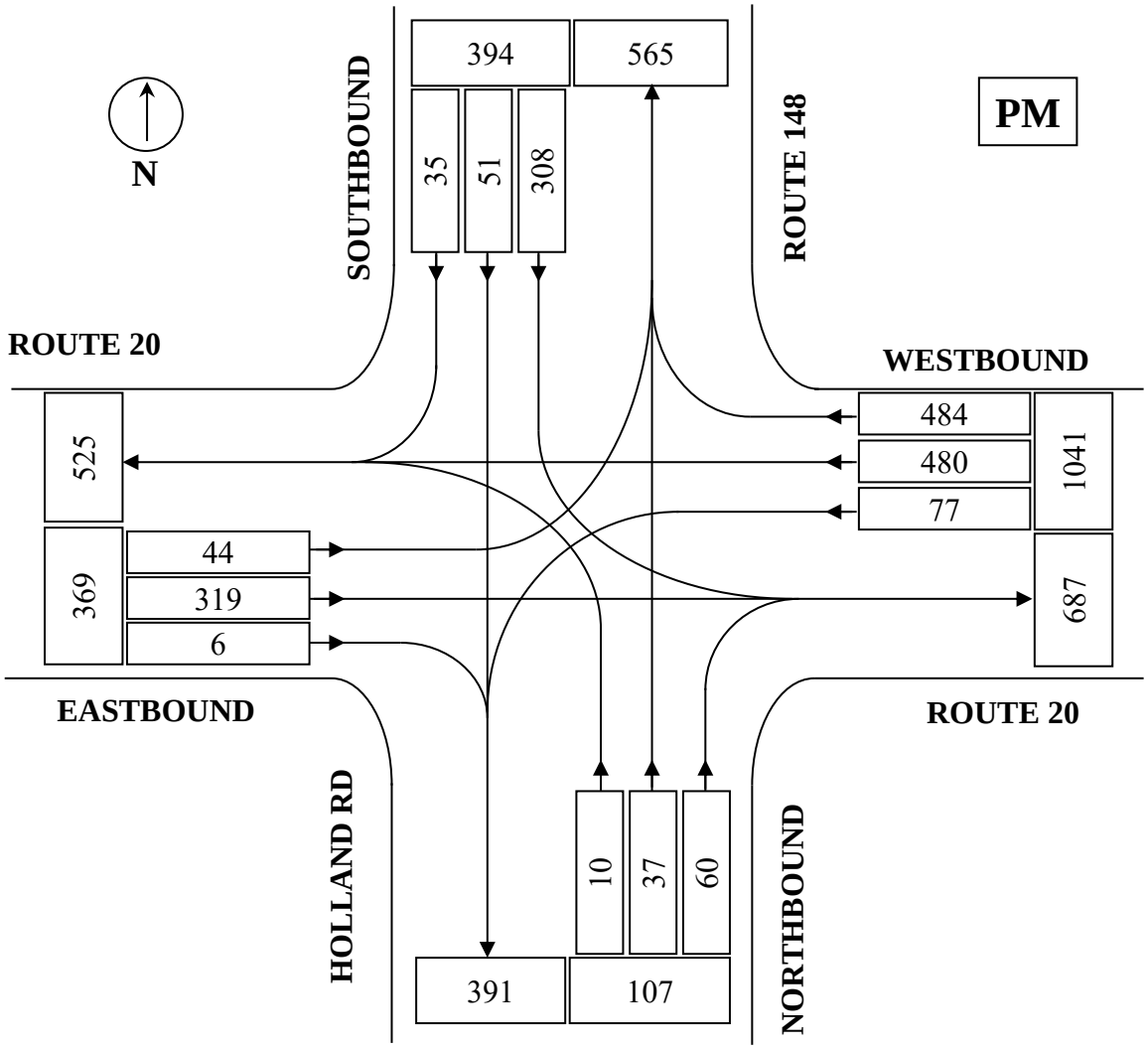


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 20 EB	465	29.2%	7:00 - 8:00 AM
Route 20 WB	516	32.4%	PHF = .97
Holland Rd NB	113	7.1%	**VEHICLES COUNTED**
Route 148 SB	498	31.3%	**ALL VEHICLES:** 1592
TOTAL	1592	100.0%	**TRUCKS:** 94
			PERCENT TRUCKS: 5.90%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 10/10/18 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 20 / Route 148 / Holland Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 20 EB	369	19.3%	4:45 - 5:45 PM
Route 20 WB	1041	54.5%	PHF = .97
Holland Rd NB	107	5.6%	**VEHICLES COUNTED**
Route 148 SB	394	20.6%	**ALL VEHICLES:** 1911
TOTAL	1911	100.0%	**TRUCKS:** 42
			PERCENT TRUCKS: 2.20%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Sturbridge

DATE: 10/10/2018

LOCATION: Route 20 / Route 148 / Holland Road

DAY OF WEEK: Wednesday

WEATHER: AM: Clear PM: Clear

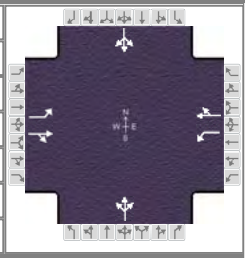
TECHNICIAN: PP

Time Period	Route 20 EB				Route 20 WB				Holland Rd NB				Route 148 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	10	109	1	6	2	30	121	17	1	24	16	6	84	1	10	3	409	
7:15 - 7:30	6	102	1	4	7	41	103	7	1	8	16	0	102	4	3	1	394	
7:30 - 7:45	3	119	0	5	6	43	42	4	1	8	14	0	145	11	12	24	404	
7:45 - 8:00	5	109	0	4	5	73	43	9	3	2	19	1	111	4	11	3	385	1592
8:00 - 8:15	10	92	0	3	3	44	30	10	3	4	11	2	100	1	13	8	311	1494
8:15 - 8:30	5	86	0	4	5	54	33	4	0	4	17	0	107	2	5	4	318	1418
8:30 - 8:45	5	94	0	1	9	44	41	7	0	4	19	1	88	5	12	2	321	1335
8:45 - 9:00	5	89	2	2	6	47	43	4	2	2	12	0	69	0	3	3	280	1230
TOTAL	49	800	4	29	43	376	456	62	11	56	124	10	806	28	69	48	2822	
		EBPct	29.2			**WBPct**	32.4			**NBPct**	7.1			**SBPct**	31.3			
Peak Sums:	**24**	**439**	**2**	**19**	**20**	**187**	**309**	**37**	**6**	**42**	**65**	**7**	**442**	**20**	**36**	**31**	**1592**	
Total Trucks	94					**TrkPct**	5.90			**PHF**	0.97							

Time Period	Route 20 EB				Route 20 WB				Holland Rd NB				Route 148 SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	13	80	6	2	18	132	111	7	2	9	15	0	52	7	7	4	452	
4:15 - 4:30	11	80	0	5	18	106	120	4	1	10	16	0	53	9	6	1	430	
4:30 - 4:45	14	83	0	3	13	108	91	7	0	12	15	1	59	11	6	6	412	
4:45 - 5:00	9	86	0	7	8	125	127	1	2	10	9	0	75	8	11	3	470	1764
5:00 - 5:15	13	73	1	1	21	129	111	8	3	8	15	0	68	15	11	1	468	1780
5:15 - 5:30	14	89	2	2	19	101	124	8	5	11	20	1	89	14	6	3	494	1844
5:30 - 5:45	8	71	3	2	29	125	122	4	0	8	16	0	76	14	7	1	479	1911
5:45 - 6:00	9	69	0	0	14	111	129	2	0	4	13	0	99	8	7	0	463	1904
TOTAL	91	631	12	22	140	937	935	41	13	72	119	2	571	86	61	19	3668	
		EBPct	19.3			**WBPct**	54.5			**NBPct**	5.6			**SBPct**	20.6			
Peak Sums:	**44**	**319**	**6**	**12**	**77**	**480**	**484**	**21**	**10**	**37**	**60**	**1**	**308**	**51**	**35**	**8**	**1911**	
Total Trucks	42					**TrkPct**	2.20			**PHF**	0.97							

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 17, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:00 - 8:00 AM	PHF	0.97
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Rt20/Rt148/Holland Rd	File Name	18_Route 20 & Route 148 & Holland Rd_AM-Bal.…		
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	24	439	2	20	187	309	6	42	65	442	20	36

Signal Information			
Cycle, s	91.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	52.0	30.0	0.0	0.0	0.0	0.0	5	6	7	8
Yellow	4.0	3.0	0.0	0.0	0.0	0.0				
Red	1.0	1.0	0.0	0.0	0.0	0.0				

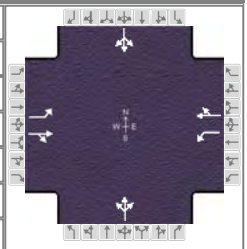
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		57.0		57.0		34.0		34.0
Change Period, ($Y+R_c$), s		5.0		5.0		4.0		4.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.2		3.2
Queue Clearance Time (g_s), s		19.2		17.7		5.3		32.0
Green Extension Time (g_e), s		2.2		2.2		1.3		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		0.00		0.00		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	25	455		21	487			93			510	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	880	1810		907	1699			1849			1353	
Queue Service Time (g_s), s	1.6	13.1		1.2	15.7			0.0			26.7	
Cycle Queue Clearance Time (g_c), s	17.2	13.1		14.3	15.7			3.3			30.0	
Green Ratio (*g/C*)	0.57	0.57		0.57	0.57			0.33			0.33	
Capacity (*c*), veh/h	431	1034		467	971			652			521	
Volume-to-Capacity Ratio (*X*)	0.057	0.440		0.044	0.501			0.142			0.980	
Back of Queue (*Q*), ft/ln (50 th percentile)	8.1	123.6		6.3	138.8			34.2			424.4	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.3	4.7		0.2	5.3			1.4			16.2	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.07	0.00		0.05	0.00			0.00			0.00	
Uniform Delay (d_1), s/veh	16.9	11.2		15.3	11.7			21.6			32.4	
Incremental Delay (d_2), s/veh	0.0	0.1		0.0	0.2			0.0			34.0	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	
Control Delay (*d*), s/veh	16.9	11.3		15.3	11.9			21.6			66.3	
Level of Service (LOS)	B	B		B	B			C			E	
Approach Delay, s/veh / LOS	11.6	B		12.0	B		21.6	C		66.3	E	
Intersection Delay, s/veh / LOS	29.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.69	B	1.66	B	1.95	B	1.92	B
Bicycle LOS Score / LOS	1.28	A	1.32	A	0.64	A	1.33	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 17, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:45 - 5:45 PM	PHF	0.97
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:45
Intersection	Rt20/Rt148/Holland Rd	File Name	18_Route 20 & Route 148 & Holland Rd_PM-Bal.…		
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	44	319	6	77	480	484	10	37	60	308	51	35

Signal Information			
Cycle, s	100.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	61.0	30.0	0.0	0.0	0.0	0.0	5	6	7	8
Yellow	4.0	3.0	0.0	0.0	0.0	0.0				
Red	1.0	1.0	0.0	0.0	0.0	0.0				

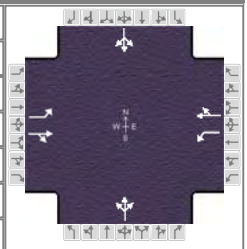
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		66.0		66.0		34.0		34.0
Change Period, ($Y+R_c$), s		5.0		5.0		4.0		4.0
Max Allow Headway (*MAH*), s		3.3		3.3		3.2		3.2
Queue Clearance Time (g_s), s		57.7		50.2		5.7		29.0
Green Extension Time (g_e), s		1.6		3.4		1.0		0.2
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.99		0.27		0.00		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	45	335		79	976			90			403	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	576	1864		1045	1766			1819			1449	
Queue Service Time (g_s), s	7.5	8.5		3.9	48.2			0.0			23.3	
Cycle Queue Clearance Time (g_c), s	55.7	8.5		12.5	48.2			3.7			27.0	
Green Ratio (*g/C*)	0.61	0.61		0.61	0.61			0.30			0.30	
Capacity (*c*), veh/h	146	1137		620	1077			586			499	
Volume-to-Capacity Ratio (*X*)	0.311	0.295		0.128	0.906			0.153			0.808	
Back of Queue (*Q*), ft/ln (50 th percentile)	26.9	80.3		22.2	508.8			39			264.2	
Back of Queue (*Q*), veh/ln (50 th percentile)	1.1	3.2		0.9	20.0			1.5			10.4	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.22	0.00		0.16	0.00			0.00			0.00	
Uniform Delay (d_1), s/veh	41.3	9.3		12.2	17.0			25.8			33.9	
Incremental Delay (d_2), s/veh	0.4	0.1		0.0	10.7			0.0			8.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	
Control Delay (*d*), s/veh	41.7	9.3		12.3	27.7			25.8			42.8	
Level of Service (LOS)	D	A		B	C			C			D	
Approach Delay, s/veh / LOS	13.2	B		26.5	C		25.8	C		42.8	D	
Intersection Delay, s/veh / LOS	27.3						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.68	B	1.66	B	1.95	B	1.93	B
Bicycle LOS Score / LOS	1.12	A	2.23	B	0.64	A	1.15	A

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 17, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:00 - 8:00 AM	PHF	0.97
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Rt20/Rt148/Holland Rd	File Name	18_Route 20 & Route 148 & Holland Rd_AM-Proj…		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	24	461	2	21	197	325	6	44	68	465	21	38

Signal Information			
Cycle, s	91.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4	
Green	52.0	30.0	0.0	0.0	0.0	0.0	5	6	7	8	
Yellow	4.0	3.0	0.0	0.0	0.0	0.0					
Red	1.0	1.0	0.0	0.0	0.0	0.0					

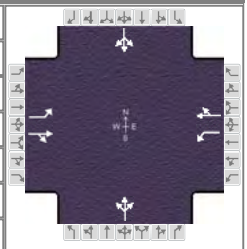
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		57.0		57.0		34.0		34.0
Change Period, ($Y+R_c$), s		5.0		5.0		4.0		4.0
Max Allow Headway (*MAH*), s		3.2		3.2		3.2		3.2
Queue Clearance Time (g_s), s		20.5		18.9		5.5		32.0
Green Extension Time (g_e), s		2.3		2.3		1.4		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.00		0.00		0.00		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	25	477		22	513			98			537	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	859	1810		888	1699			1847			1347	
Queue Service Time (g_s), s	1.7	14.0		1.3	16.9			0.0			26.5	
Cycle Queue Clearance Time (g_c), s	18.5	14.0		15.3	16.9			3.5			30.0	
Green Ratio (*g/C*)	0.57	0.57		0.57	0.57			0.33			0.33	
Capacity (*c*), veh/h	410	1034		450	971			651			519	
Volume-to-Capacity Ratio (*X*)	0.060	0.462		0.048	0.529			0.150			1.035	
Back of Queue (*Q*), ft/ln (50 th percentile)	8.4	131.9		6.8	150.7			36.2			485.2	
Back of Queue (*Q*), veh/ln (50 th percentile)	0.3	5.0		0.3	5.8			1.4			18.5	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.07	0.00		0.05	0.00			0.00			0.00	
Uniform Delay (d_1), s/veh	17.7	11.4		15.8	12.0			21.6			32.7	
Incremental Delay (d_2), s/veh	0.0	0.1		0.0	0.3			0.0			48.7	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	
Control Delay (*d*), s/veh	17.7	11.5		15.8	12.3			21.7			81.4	
Level of Service (LOS)	B	B		B	B			C			F	
Approach Delay, s/veh / LOS	11.8	B		12.4	B		21.7	C		81.4	F	
Intersection Delay, s/veh / LOS	34.9						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.69	B	1.66	B	1.95	B	1.92	B
Bicycle LOS Score / LOS	1.32	A	1.37	A	0.65	A	1.37	A

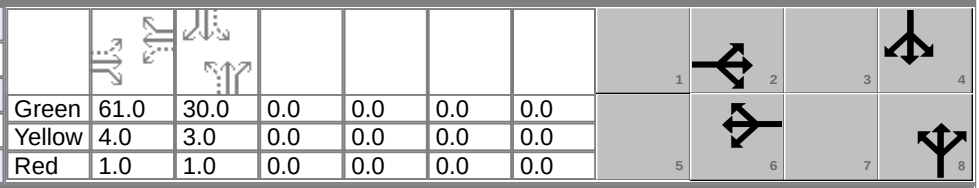
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 17, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:45 - 5:45 PM	PHF	0.97
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:45
Intersection	Rt20/Rt148/Holland Rd	File Name	18_Route 20 & Route 148 & Holland Rd_PM-Proj…		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	46	335	6	81	505	509	11	39	63	324	54	37

Signal Information			
Cycle, s	100.0	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	61.0	30.0	0.0	0.0	0.0	0.0						
Yellow	4.0	3.0	0.0	0.0	0.0	0.0						
Red	1.0	1.0	0.0	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6		8		4
Case Number		6.0		6.0		8.0		8.0
Phase Duration, s		66.0		66.0		34.0		34.0
Change Period, ($Y+R_c$), s		5.0		5.0		4.0		4.0
Max Allow Headway (*MAH*), s		3.3		3.3		3.2		3.2
Queue Clearance Time (g_s), s		63.0		56.3		6.0		31.2
Green Extension Time (g_e), s		0.0		2.2		1.1		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		1.00		0.80		0.00		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	47	352		84	1028			96			425	
Adjusted Saturation Flow Rate (*s*), veh/h/ln	549	1864		1029	1766			1829			1444	
Queue Service Time (g_s), s	6.7	9.1		4.2	54.3			0.0			25.2	
Cycle Queue Clearance Time (g_c), s	61.0	9.1		13.3	54.3			4.0			29.2	
Green Ratio (*g/C*)	0.61	0.61		0.61	0.61			0.30			0.30	
Capacity (*c*), veh/h	109	1137		607	1077			589			498	
Volume-to-Capacity Ratio (*X*)	0.436	0.309		0.138	0.954			0.163			0.854	
Back of Queue (*Q*), ft/ln (50 th percentile)	30.5	85.3		23.8	613.8			41.9			296.4	
Back of Queue (*Q*), veh/ln (50 th percentile)	1.2	3.4		0.9	24.2			1.7			11.7	
Queue Storage Ratio (*RQ*) (50 th percentile)	0.25	0.00		0.17	0.00			0.00			0.00	
Uniform Delay (d_1), s/veh	47.4	9.4		12.6	18.2			25.9			34.7	
Incremental Delay (d_2), s/veh	1.0	0.1		0.0	17.3			0.0			12.9	
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0			0.0			0.0	
Control Delay (*d*), s/veh	48.4	9.4		12.6	35.5			25.9			47.6	
Level of Service (LOS)	D	A		B	D			C			D	
Approach Delay, s/veh / LOS	14.1	B		33.8	C		25.9	C		47.6	D	
Intersection Delay, s/veh / LOS	32.4						C					

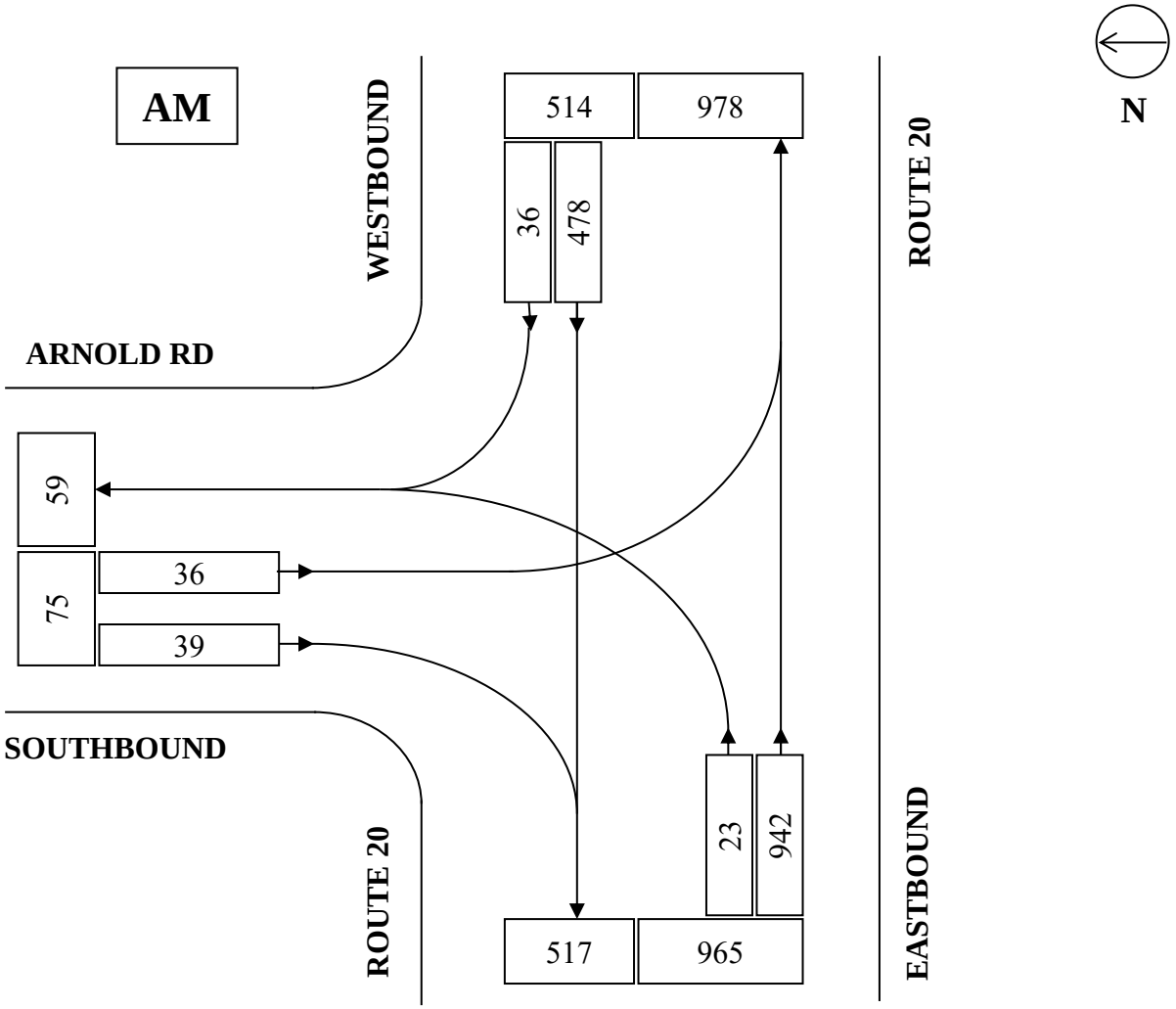
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.68	B	1.66	B	1.95	B	1.93	B
Bicycle LOS Score / LOS	1.15	A	2.32	B	0.65	A	1.19	A

 HCS™ Streets Version 7.7 Generated: 1/8/2019 8:57:43 AM

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 10/10/18 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 20 / Arnold Road

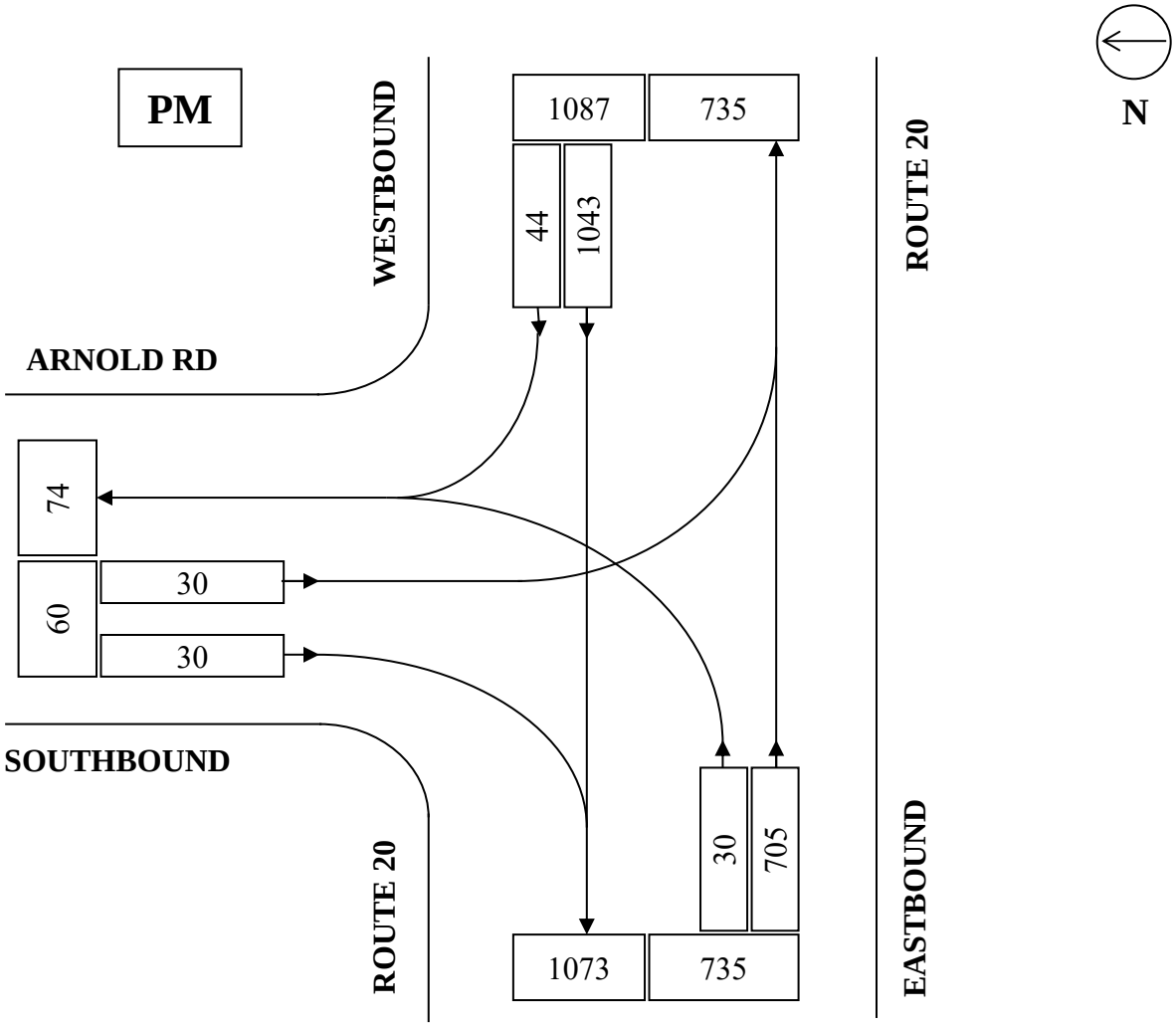


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:00 - 8:00 AM
Route 20 EB	965	62.1%	
			PHF = .91
Route 20 WB	514	33.1%	
			VEHICLES COUNTED
Arnold Rd SB	75	4.8%	
			ALL VEHICLES: 1554
TOTAL	1554	100.0%	**TRUCKS:** 102
			PERCENT TRUCKS: 6.56%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 10/10/18 **DAY OF WEEK:** Wednesday
INTERSECTION: Route 20 / Arnold Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			5:00 - 6:00 PM
Route 20 EB	735	39.1%	
			PHF = .96
Route 20 WB	1087	57.7%	
			VEHICLES COUNTED
Arnold Rd SB	60	3.2%	
			ALL VEHICLES: 1882
TOTAL	1882	100.0%	**TRUCKS:** 35
			PERCENT TRUCKS: 1.86%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Sturbridge

DATE: 10/10/2018

LOCATION: Route 20 / Arnold Road

DAY OF WEEK: Wednesday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: DC

Time Period	Route 20 EB				Route 20 WB								Arnold Rd SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	4	197	0	7	0	142	6	16					9	0	15	0	373	
7:15 - 7:30	5	232	0	12	0	109	8	5					10	0	7	0	371	
7:30 - 7:45	7	294	0	20	0	110	6	6					5	0	7	0	429	
7:45 - 8:00	7	219	0	19	0	117	16	14					12	0	10	3	381	1554
8:00 - 8:15	12	199	0	11	0	84	8	6					21	0	8	0	332	1513
8:15 - 8:30	7	221	0	9	0	108	9	3					12	0	8	4	365	1507
8:30 - 8:45	2	177	0	8	0	100	3	8					9	0	4	0	295	1373
8:45 - 9:00	4	156	0	11	0	115	13	10					11	0	11	2	310	1302
TOTAL	48	1695	0	97	0	885	69	68	0	0	0	0	89	0	70	9	2856	
		EBPct	62.1			**WBPct**	33.1			**NBPct**	0.0			**SBPct**	4.8			
Peak Sums:	**23**	**942**	**0**	**58**	**0**	**478**	**36**	**41**	**0**	**0**	**0**	**0**	**36**	**0**	**39**	**3**	**1554**	
Total Trucks	102					**TrkPct**	6.56			**PHF**	0.91							

Time Period	Route 20 EB				Route 20 WB								Arnold Rd SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	8	146	0	6	0	210	13	3					3	0	6	1	386	
4:15 - 4:30	6	134	0	3	0	179	36	3					3	0	9	0	367	
4:30 - 4:45	2	153	0	6	0	245	14	10					7	0	7	0	428	
4:45 - 5:00	9	161	0	12	0	255	19	2					6	0	7	2	457	1638
5:00 - 5:15	17	150	0	3	0	246	6	9					3	0	9	0	431	1683
5:15 - 5:30	3	192	0	5	0	246	13	6					11	0	6	0	471	1787
5:30 - 5:45	3	176	0	6	0	283	8	3					8	0	10	0	488	1847
5:45 - 6:00	7	187	0	2	0	268	17	1					8	0	5	0	492	1882
TOTAL	55	1299	0	43	0	1932	126	37	0	0	0	0	49	0	59	3	3520	
		EBPct	39.1			**WBPct**	57.8			**NBPct**	0.0			**SBPct**	3.2			
Peak Sums:	**30**	**705**	**0**	**16**	**0**	**1043**	**44**	**19**	**0**	**0**	**0**	**0**	**30**	**0**	**30**	**0**	**1882**	
Total Trucks	35					**TrkPct**	1.86			**PHF**	0.96							

HCS7 Two-Way Stop-Control Report

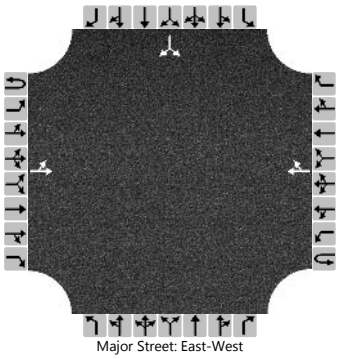
General Information

Analyst	KK
Agency/Co.	CMRPC
Date Performed	10/15/2018
Analysis Year	2018
Time Analyzed	7:00 - 8:00 AM
Intersection Orientation	East-West
Project Description	Balanced

Site Information

Intersection	Route 20/Arnold Rd
Jurisdiction	Sturbridge
East/West Street	Route 20
North/South Street	Arnold Rd
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		23	942				514	41						36		39
Percent Heavy Vehicles (%)		7												1		1
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage																

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.17												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.26												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		25													82	
Capacity, c (veh/h)		935													168	
v/c Ratio		0.03													0.49	
95% Queue Length, Q_{95} (veh)		0.1													2.4	
Control Delay (s/veh)		9.0													45.4	
Level of Service (LOS)		A													E	
Approach Delay (s/veh)		0.8												45.4		
Approach LOS														E		

HCS7 Two-Way Stop-Control Report

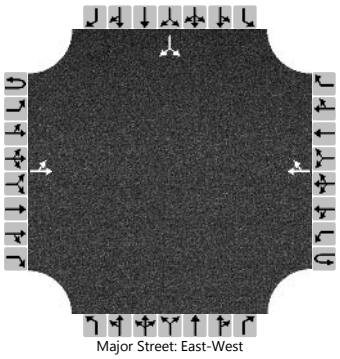
General Information

Analyst	KK
Agency/Co.	CMRPC
Date Performed	10/15/2018
Analysis Year	2018
Time Analyzed	5:00 - 6:00 PM
Intersection Orientation	East-West
Project Description	Balanced

Site Information

Intersection	Route 20/Arnold Rd
Jurisdiction	Sturbridge
East/West Street	Route 20
North/South Street	Arnold Rd
Peak Hour Factor	0.96
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		30	735				1108	49						33		30
Percent Heavy Vehicles (%)		2												1		1
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage																
	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		31													66	
Capacity, c (veh/h)		572													90	
v/c Ratio		0.05													0.73	
95% Queue Length, Q_{95} (veh)		0.2													3.7	
Control Delay (s/veh)		11.7													114.2	
Level of Service (LOS)		B													F	
Approach Delay (s/veh)		1.5												114.2		
Approach LOS														F		

HCS7 Two-Way Stop-Control Report

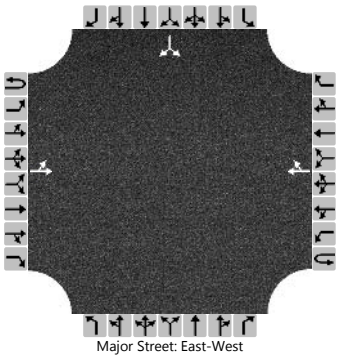
General Information

Analyst	KK
Agency/Co.	CMRPC
Date Performed	10/15/2018
Analysis Year	2018
Time Analyzed	7:00 - 8:00 AM
Intersection Orientation	East-West
Project Description	Projected 2028

Site Information

Intersection	Route 20/Arnold Rd
Jurisdiction	Sturbridge
East/West Street	Route 20
North/South Street	Arnold Rd
Peak Hour Factor	0.91
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		24	990				540	43						38		41
Percent Heavy Vehicles (%)		7												1		1
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage																
	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.17												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.26												3.51		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		26													87	
Capacity, c (veh/h)		910													150	
v/c Ratio		0.03													0.58	
95% Queue Length, Q_{95} (veh)		0.1													3.0	
Control Delay (s/veh)		9.1													57.9	
Level of Service (LOS)		A													F	
Approach Delay (s/veh)		0.9												57.9		
Approach LOS														F		

HCS7 Two-Way Stop-Control Report

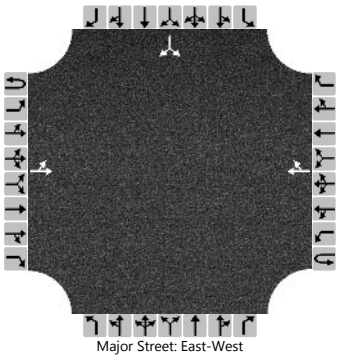
General Information

Analyst	KK
Agency/Co.	CMRPC
Date Performed	10/15/2018
Analysis Year	2018
Time Analyzed	5:00 - 6:00 PM
Intersection Orientation	East-West
Project Description	Projected 2028

Site Information

Intersection	Route 20/Arnold Rd
Jurisdiction	Sturbridge
East/West Street	Route 20
North/South Street	Arnold Rd
Peak Hour Factor	0.96
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		32	773				1165	52						35		32
Percent Heavy Vehicles (%)		2												1		1
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.12												6.41		6.21
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.22												3.51		3.31

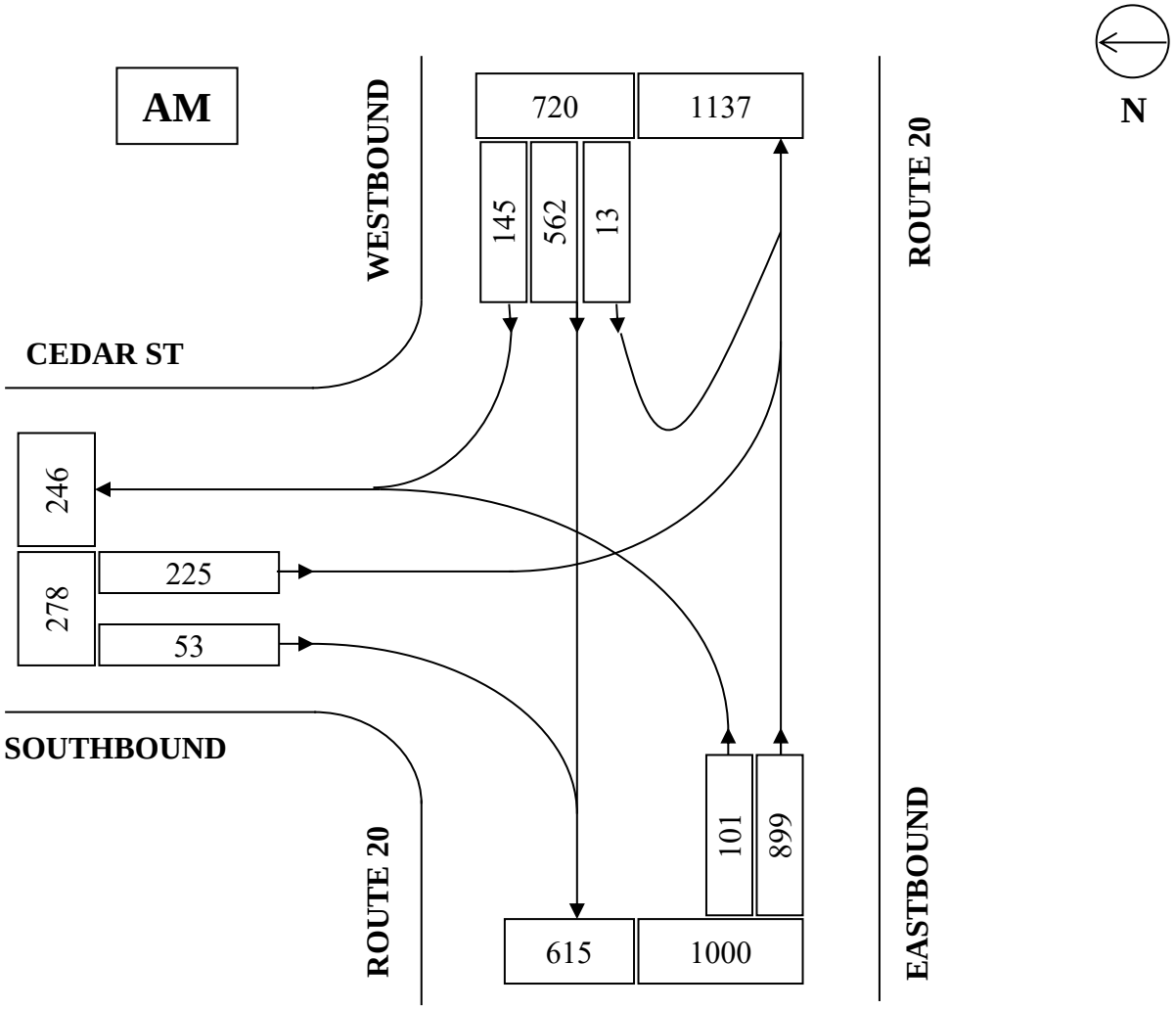
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		33													70	
Capacity, c (veh/h)		541													77	
v/c Ratio		0.06													0.90	
95% Queue Length, Q_{95} (veh)		0.2													4.7	
Control Delay (s/veh)		12.1													169.6	
Level of Service (LOS)		B													F	
Approach Delay (s/veh)	1.8												169.6			
Approach LOS													F			

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 10/16/18 **DAY OF WEEK:** Tuesday
INTERSECTION: Route 20 / Cedar Street

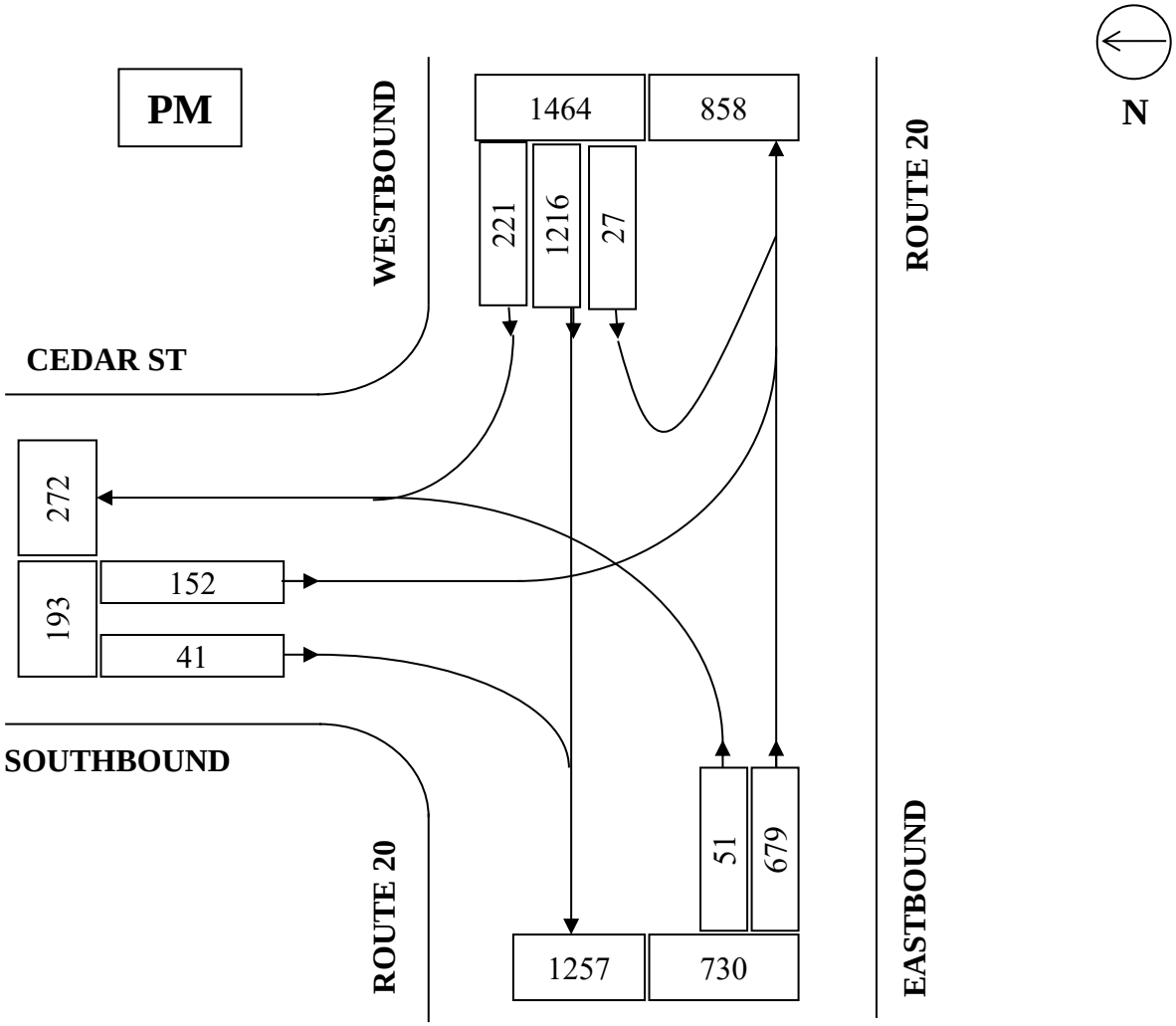


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			7:45 - 8:45 AM
Route 20 EB	1000	50.1%	
			PHF = .87
Route 20 WB	720	36.0%	
			VEHICLES COUNTED
Cedar St SB	278	13.9%	
			ALL VEHICLES: 1998
TOTAL	1998	100.0%	**TRUCKS:** 1081
			PERCENT TRUCKS: 5.41%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 10/16/18 **DAY OF WEEK:** Tuesday
INTERSECTION: Route 20 / Cedar Street



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
			4:45 - 5:45 PM
Route 20 EB	730	30.6%	
			PHF = .96
Route 20 WB	1464	61.3%	
			VEHICLES COUNTED
Cedar St SB	193	8.1%	
			ALL VEHICLES: 2387
TOTAL	2387	100.0%	**TRUCKS:** 32
			PERCENT TRUCKS: 1.34%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Sturbridge — DATE: 10/16/2018

LOCATION: Route 20 / Cedar Street — DAY OF WEEK: Tuesday

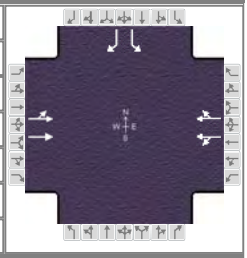
WEATHER: AM: Clear PM: Clear — TECHNICIAN: DC

Time Period	Route 20 EB				Route 20 WB								Cedar St SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	9	108	0	4	0	96	11	12					24	0	9	0	257	
7:15 - 7:30	10	246	0	21	0	141	33	4					43	0	7	1	480	
7:30 - 7:45	13	278	0	22	0	140	13	9					48	0	7	0	499	
7:45 - 8:00	13	262	0	13	0	146	19	8					36	0	9	2	485	1721
8:00 - 8:15	21	214	0	10	0	150	29	17					37	0	3	1	454	1918
8:15 - 8:30	47	184	0	14	0	106	59	10					67	0	14	1	477	1915
8:30 - 8:45	20	239	0	12	0	160	38	16					85	0	27	4	569	1985
8:45 - 9:00	9	211	0	19	0	137	21	13					50	0	6	2	434	1934
TOTAL	142	1742	0	115	0	1076	223	89	0	0	0	0	390	0	82	11	3655	
		EBPct	50.4			**WBPct**	35.6			**NBPct**	0.0			**SBPct**	14.0			
Peak Sums:	**101**	**899**	**0**	**49**	**0**	**562**	**145**	**51**	**0**	**0**	**0**	**0**	**225**	**0**	**53**	**8**	**1985**	
Total Trucks	108					**TrkPct**	5.44			**PHF**	0.87							

Time Period	Route 20 EB				Route 20 WB								Cedar St SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	7	126	0	3	0	213	37	12					35	0	16	1	434	
4:15 - 4:30	18	112	0	4	0	284	47	4					36	0	8	2	505	
4:30 - 4:45	7	150	0	8	0	211	45	7					25	0	11	2	449	
4:45 - 5:00	9	159	0	4	0	299	53	3					31	0	3	0	554	1942
5:00 - 5:15	5	189	0	3	0	301	45	5					40	0	11	1	591	2099
5:15 - 5:30	15	171	0	2	0	315	63	3					37	0	13	0	614	2208
5:30 - 5:45	22	160	0	4	0	301	60	5					44	0	14	2	601	2360
5:45 - 6:00	15	171	0	7	0	265	36	1					22	0	10	0	519	2325
TOTAL	98	1238	0	35	0	2189	386	40	0	0	0	0	270	0	86	8	4267	
		EBPct	30.9			**WBPct**	60.9			**NBPct**	0.0			**SBPct**	8.2			
Peak Sums:	**51**	**679**	**0**	**13**	**0**	**1216**	**221**	**16**	**0**	**0**	**0**	**0**	**152**	**0**	**41**	**3**	**2360**	
Total Trucks	32					**TrkPct**	1.36			**PHF**	0.96							

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 18, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:45 - 8:45 AM	PHF	0.87
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:45
Intersection	Route 20/Cedar St	File Name	18_Route 20 & Cedar St_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	101	899		13	562	145				225		53

Signal Information			
Cycle, s	64.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	0.0	41.0	11.0	0.0	0.0	0.0	5	6	7	8
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				

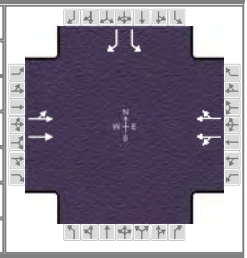
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	0.0	14.0		8.3				9.0
Phase Duration, s	0.0	47.0		47.0				17.0
Change Period, ($Y+R_c$), s	6.0	6.0		6.0				6.0
Max Allow Headway (*MAH*), s	0.0	3.2		3.2				3.2
Queue Clearance Time (g_s), s		14.7		9.5				10.9
Green Extension Time (g_e), s	0.0	5.2		4.8				0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.05		0.18				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		1	6	16				7		14
Adjusted Flow Rate (*v*), veh/h	534	615		436		379				259		61
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1462	1728		1779		1548				1795		1586
Queue Service Time (g_s), s	4.0	12.7		0.0		7.5				8.9		2.1
Cycle Queue Clearance Time (g_c), s	9.1	12.7		7.2		7.5				8.9		2.1
Green Ratio (*g/C*)	0.64	0.64		0.64		0.64				0.17		0.17
Capacity (*c*), veh/h	1005	1107		1198		992				309		273
Volume-to-Capacity Ratio (*X*)	0.532	0.555		0.364		0.382				0.838		0.223
Back of Queue (*Q*), ft/ln (50 th percentile)	62.5	84.2		47.8		42				125.4		18.8
Back of Queue (*Q*), veh/ln (50 th percentile)	2.5	3.2		1.9		1.7				5.0		0.7
Queue Storage Ratio (*RQ*) (50 th percentile)	0.32	0.42		0.00		0.00				0.00		0.00
Uniform Delay (d_1), s/veh	5.8	6.4		5.4		5.5				25.6		22.8
Incremental Delay (d_2), s/veh	0.3	0.4		0.1		0.1				17.2		0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0		0.0				0.0		0.0
Control Delay (*d*), s/veh	6.1	6.8		5.5		5.6				42.8		23.0
Level of Service (LOS)	A	A		A		A				D		C
Approach Delay, s/veh / LOS	6.5	A		5.5	A		0.0			39.0	D	
Intersection Delay, s/veh / LOS	10.7						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	0.66	A	1.63	B	2.15	B	2.14	B
Bicycle LOS Score / LOS	1.44	A	1.16	A				F

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 18, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:45 - 5:45 PM	PHF	0.96
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:45
Intersection	Route 20/Cedar St	File Name	18_Route 20 & Cedar St_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	51	807		27	1216	221				187		41

Signal Information			
Cycle, s	71.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4
Green	0.0	47.0	12.0	0.0	0.0	0.0	5	6	7	8
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				

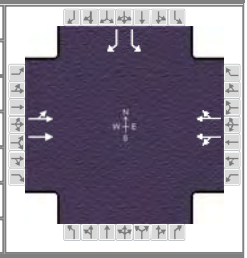
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	0.0	14.0		8.3				9.0
Phase Duration, s	0.0	53.0		53.0				18.0
Change Period, ($Y+R_c$), s	6.0	6.0		6.0				6.0
Max Allow Headway (*MAH*), s	0.0	3.2		3.2				3.2
Queue Clearance Time (g_s), s		21.9		20.9				9.2
Green Extension Time (g_e), s	0.0	7.3		6.4				0.1
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.17		0.35				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		1	6	16				7		14
Adjusted Flow Rate (*v*), veh/h	402	492		801		716				195		43
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1283	1785		1830		1625				1795		1598
Queue Service Time (g_s), s	4.0	9.1		0.0		18.9				7.2		1.6
Cycle Queue Clearance Time (g_c), s	19.9	9.1		17.7		18.9				7.2		1.6
Green Ratio (*g/C*)	0.66	0.66		0.66		0.66				0.17		0.17
Capacity (*c*), veh/h	907	1181		1264		1076				303		270
Volume-to-Capacity Ratio (*X*)	0.443	0.416		0.634		0.665				0.642		0.158
Back of Queue (*Q*), ft/ln (50 th percentile)	45.4	61.3		131.6		123.8				80.6		14.9
Back of Queue (*Q*), veh/ln (50 th percentile)	1.8	2.4		5.3		5.0				3.2		0.6
Queue Storage Ratio (*RQ*) (50 th percentile)	0.23	0.31		0.00		0.00				0.00		0.00
Uniform Delay (d_1), s/veh	5.5	5.6		7.1		7.2				27.5		25.2
Incremental Delay (d_2), s/veh	0.1	0.1		0.8		1.3				3.6		0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0		0.0				0.0		0.0
Control Delay (*d*), s/veh	5.6	5.7		7.9		8.5				31.0		25.3
Level of Service (LOS)	A	A		A		A				C		C
Approach Delay, s/veh / LOS	5.7	A		8.2	A		0.0			30.0	C	
Intersection Delay, s/veh / LOS	9.3						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	0.66	A	1.63	B	2.15	B	2.14	B
Bicycle LOS Score / LOS	1.22	A	1.74	B				F

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 18, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:45 - 8:45 AM	PHF	0.87
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:45
Intersection	Route 20/Cedar St	File Name	18_Route 20 & Cedar St_AM-Proj.xus		
Project Description	Projected 2028				



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	945		14	591	152				237		56

Signal Information			
Cycle, s	64.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4	
Green	0.0	41.0	11.0	0.0	0.0	0.0	5	6	7	8	
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					

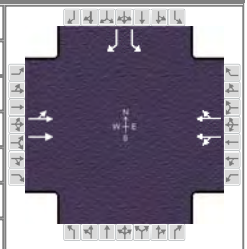
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2		6				4
Case Number	0.0	14.0		8.3				9.0
Phase Duration, s	0.0	47.0		47.0				17.0
Change Period, ($Y+R_c$), s	6.0	6.0		6.0				6.0
Max Allow Headway (*MAH*), s	0.0	3.3		3.3				3.2
Queue Clearance Time (g_s), s		15.8		10.0				11.5
Green Extension Time (g_e), s	0.0	5.7		5.1				0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.08		0.23				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		1	6	16				7		14
Adjusted Flow Rate (*v*), veh/h	559	649		458		400				272		64
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1422	1728		1772		1549				1795		1586
Queue Service Time (g_s), s	4.0	13.8		0.0		8.0				9.5		2.2
Cycle Queue Clearance Time (g_c), s	9.7	13.8		7.7		8.0				9.5		2.2
Green Ratio (*g/C*)	0.64	0.64		0.64		0.64				0.17		0.17
Capacity (*c*), veh/h	980	1107		1194		992				309		273
Volume-to-Capacity Ratio (*X*)	0.571	0.586		0.384		0.403				0.883		0.236
Back of Queue (*Q*), ft/ln (50 th percentile)	67.9	92.5		50.9		45.1				145.1		19.9
Back of Queue (*Q*), veh/ln (50 th percentile)	2.7	3.6		2.0		1.8				5.8		0.8
Queue Storage Ratio (*RQ*) (50 th percentile)	0.35	0.46		0.00		0.00				0.00		0.00
Uniform Delay (d_1), s/veh	6.1	6.6		5.5		5.6				25.9		22.9
Incremental Delay (d_2), s/veh	0.5	0.5		0.1		0.1				23.8		0.2
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0		0.0				0.0		0.0
Control Delay (*d*), s/veh	6.6	7.2		5.6		5.7				49.6		23.0
Level of Service (LOS)	A	A		A		A				D		C
Approach Delay, s/veh / LOS	6.9	A		5.6	A		0.0			44.5	D	
Intersection Delay, s/veh / LOS	11.7						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	0.66	A	1.63	B	2.15	B	2.14	B
Bicycle LOS Score / LOS	1.48	A	1.20	A				F

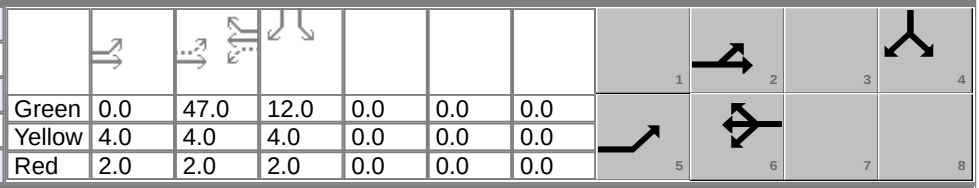
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 18, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:45 - 5:45 PM	PHF	0.96
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:45
Intersection	Route 20/Cedar St	File Name	18_Route 20 & Cedar St_PM-Proj.xus		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	54	848		28	1278	232				197		43

Signal Information			
Cycle, s	71.0	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	0.0	47.0	12.0	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				4
Case Number	0.0	14.0		8.3				9.0
Phase Duration, s	0.0	53.0		53.0				18.0
Change Period, ($Y+R_c$), s	6.0	6.0		6.0				6.0
Max Allow Headway (*MAH*), s	0.0	3.3		3.3				3.2
Queue Clearance Time (g_s), s		25.1		22.8				9.6
Green Extension Time (g_e), s	0.0	7.8		6.5				0.1
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.26		0.46				1.00

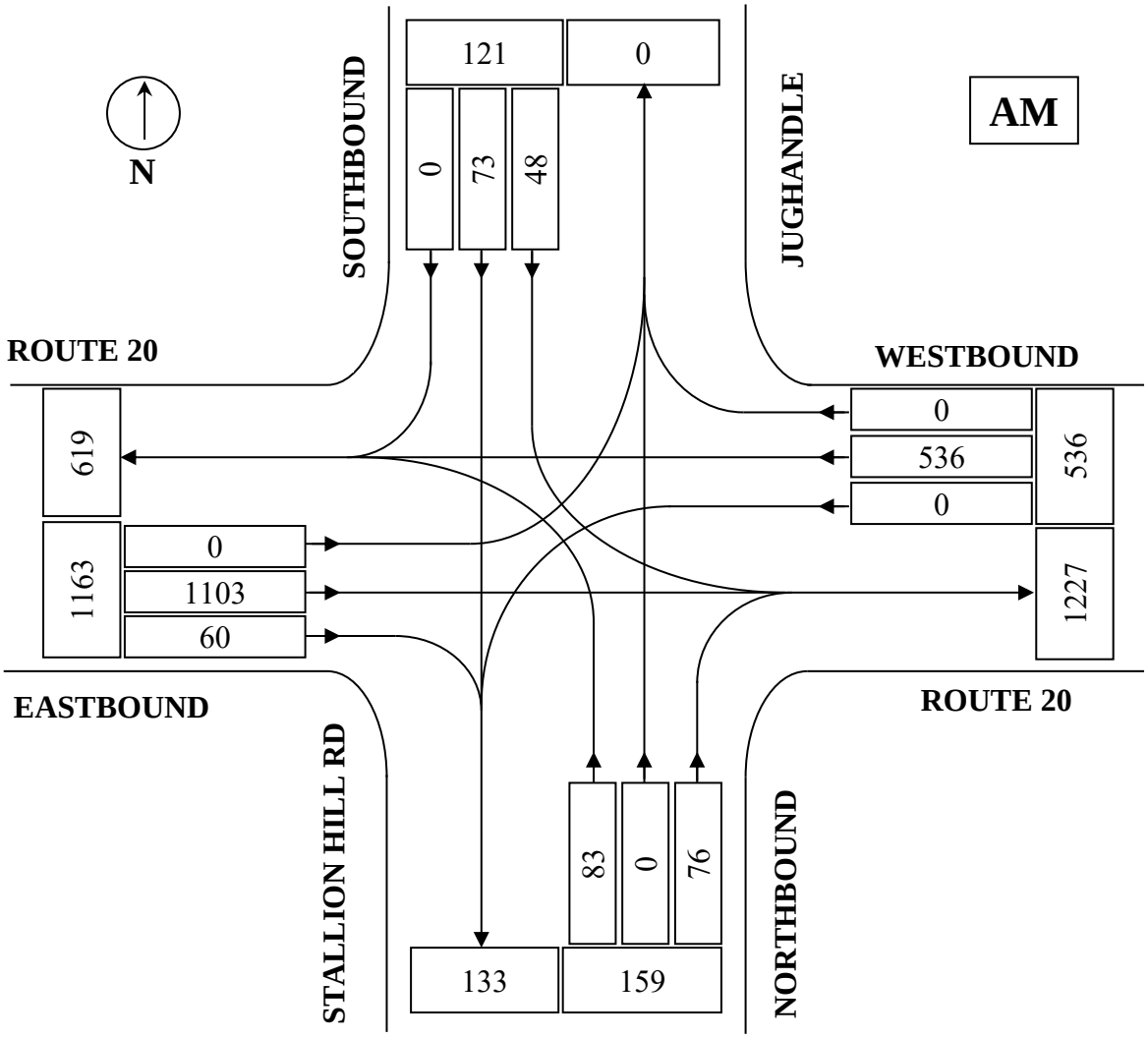
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2		1	6	16				7		14
Adjusted Flow Rate (*v*), veh/h	415	524		840		753				205		45
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1191	1785		1826		1625				1795		1598
Queue Service Time (g_s), s	4.0	10.0		0.0		20.8				7.6		1.7
Cycle Queue Clearance Time (g_c), s	23.1	10.0		19.3		20.8				7.6		1.7
Green Ratio (*g/C*)	0.66	0.66		0.66		0.66				0.17		0.17
Capacity (*c*), veh/h	846	1181		1261		1076				303		270
Volume-to-Capacity Ratio (*X*)	0.491	0.444		0.666		0.701				0.676		0.166
Back of Queue (*Q*), ft/ln (50 th percentile)	47.4	67.2		144.9		138.5				87.7		15.6
Back of Queue (*Q*), veh/ln (50 th percentile)	1.9	2.7		5.8		5.5				3.5		0.6
Queue Storage Ratio (*RQ*) (50 th percentile)	0.24	0.34		0.00		0.00				0.00		0.00
Uniform Delay (d_1), s/veh	5.9	5.7		7.3		7.6				27.7		25.2
Incremental Delay (d_2), s/veh	0.2	0.1		1.1		1.7				4.8		0.1
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0		0.0				0.0		0.0
Control Delay (*d*), s/veh	6.0	5.8		8.4		9.3				32.5		25.3
Level of Service (LOS)	A	A		A		A				C		C
Approach Delay, s/veh / LOS	5.9	A		8.8	A		0.0			31.2	C	
Intersection Delay, s/veh / LOS	9.9						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	0.66	A	1.63	B	2.15	B	2.14	B
Bicycle LOS Score / LOS	1.26	A	1.80	B				F

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 10/18/18 **DAY OF WEEK:** Thursday
INTERSECTION: Route 20 / Stallion Hill Road

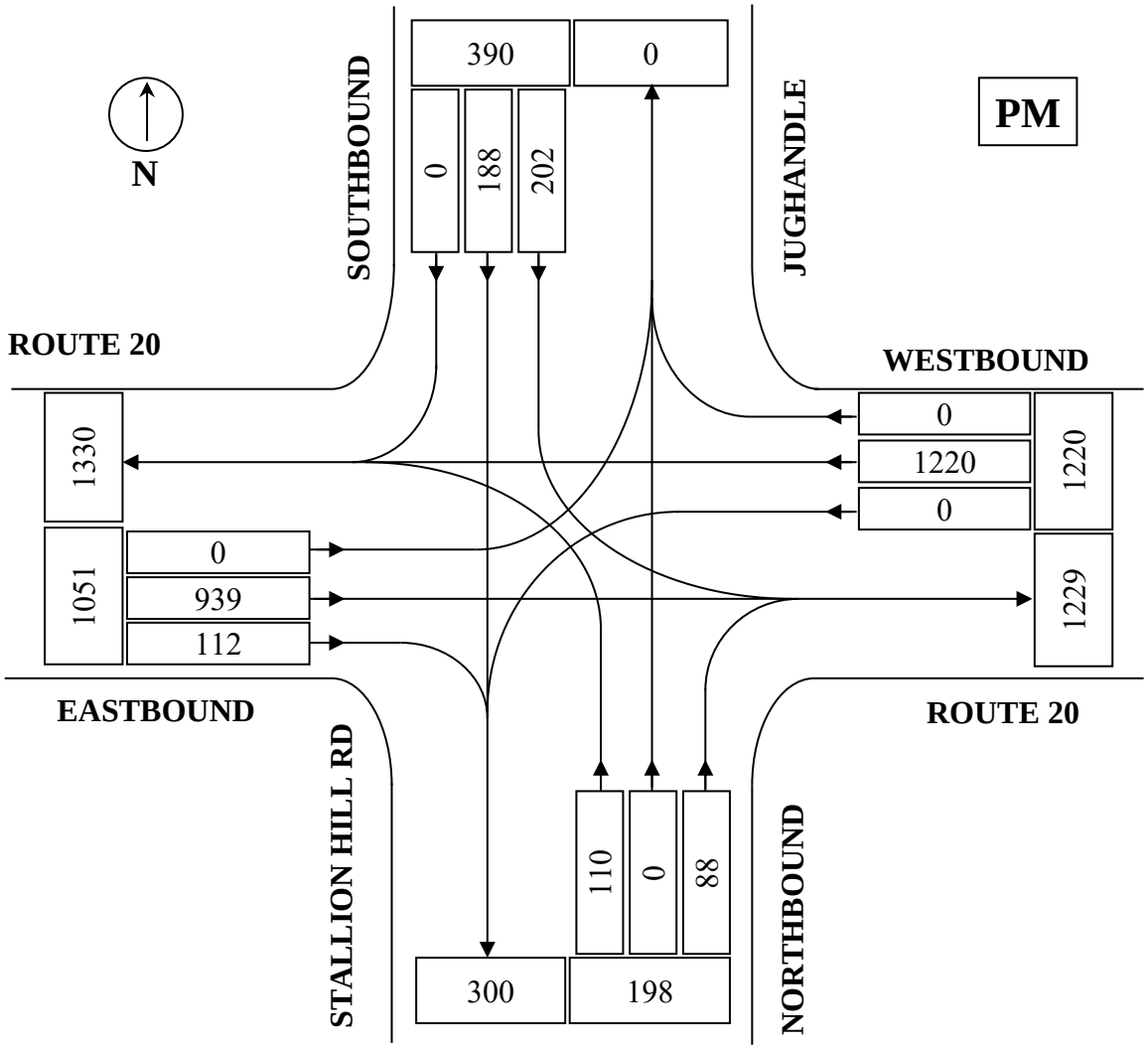


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 20 EB	1163	58.8%	7:00 - 8:00 AM
Route 20 WB	536	27.1%	PHF = .91
Stallion Hill Rd NB	159	8.0%	**VEHICLES COUNTED**
Jughandle SB	121	6.1%	**ALL VEHICLES:** 1979
TOTAL	1979	100.0%	**TRUCKS:** 92
			PERCENT TRUCKS: 4.65%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 10/18/18 **DAY OF WEEK:** Thursday
INTERSECTION: Route 20 / Stallion Hill Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 20 EB	1051	36.8%	4:30 - 5:30 PM
Route 20 WB	1220	42.7%	PHF = .95
Stallion Hill Rd NB	198	6.9%	**VEHICLES COUNTED**
Jughandle SB	390	13.6%	**ALL VEHICLES:** 2859
TOTAL	2859	100.0%	**TRUCKS:** 68
			PERCENT TRUCKS: 2.38%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Sturbridge

DATE: 10/18/2018

LOCATION: Route 20 / Stallion Hill Road

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

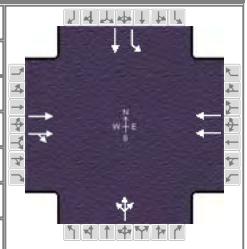
TECHNICIAN: PP

Time Period	Route 20 EB				Route 20 WB				Stallion Hill Rd NB				Jughandle SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	0	245	14	4	0	168	0	12	24	0	17	0	17	11	0	1	496	
7:15 - 7:30	0	271	13	15	0	126	0	3	26	0	17	2	10	14	0	1	477	
7:30 - 7:45	0	286	13	19	0	111	0	4	12	0	18	0	4	18	0	1	462	
7:45 - 8:00	0	301	20	9	0	131	0	12	21	0	24	5	17	30	0	4	544	1979
8:00 - 8:15	0	243	20	10	0	124	0	12	21	0	50	3	7	27	0	2	492	1975
8:15 - 8:30	0	246	14	7	0	150	0	15	15	0	13	2	9	15	0	0	462	1960
8:30 - 8:45	0	234	30	13	0	135	0	13	22	0	24	1	26	19	0	18	490	1988
8:45 - 9:00	0	230	13	12	0	121	0	5	21	0	15	1	21	17	0	2	438	1882
TOTAL	0	2056	137	89	0	1066	0	76	162	0	178	14	111	151	0	29	3861	
		EBPct	58.8			**WBPct**	27.1			**NBPct**	8.0			**SBPct**	6.1			
Peak Sums:	**0**	**1103**	**60**	**47**	**0**	**536**	**0**	**31**	**83**	**0**	**76**	**7**	**48**	**73**	**0**	**7**	**1979**	
Total Trucks	92					**TrkPct**	4.65			**PHF**	0.91							

Time Period	Route 20 EB				Route 20 WB				Stallion Hill Rd NB				Jughandle SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	0	210	19	2	0	316	0	6	25	0	25	0	38	28	0	0	661	
4:15 - 4:30	0	200	19	8	0	300	0	11	24	0	36	3	34	31	0	1	644	
4:30 - 4:45	0	265	20	12	0	297	0	3	29	0	19	1	35	38	0	1	703	
4:45 - 5:00	0	211	29	3	0	291	0	9	31	0	13	1	48	50	0	0	673	2681
5:00 - 5:15	0	236	36	7	0	317	0	8	23	0	24	0	68	49	0	2	753	2773
5:15 - 5:30	0	227	27	8	0	315	0	7	27	0	32	2	51	51	0	4	730	2859
5:30 - 5:45	0	181	31	2	0	316	0	2	17	0	13	1	33	40	0	0	631	2787
5:45 - 6:00	0	187	24	4	0	298	0	2	13	0	14	0	39	31	0	1	606	2720
TOTAL	0	1717	205	46	0	2450	0	48	189	0	176	8	346	318	0	9	5401	
		EBPct	36.8			**WBPct**	42.7			**NBPct**	6.9			**SBPct**	13.6			
Peak Sums:	**0**	**939**	**112**	**30**	**0**	**1220**	**0**	**27**	**110**	**0**	**88**	**4**	**202**	**188**	**0**	**7**	**2859**	
Total Trucks	68					**TrkPct**	2.38			**PHF**	0.95							

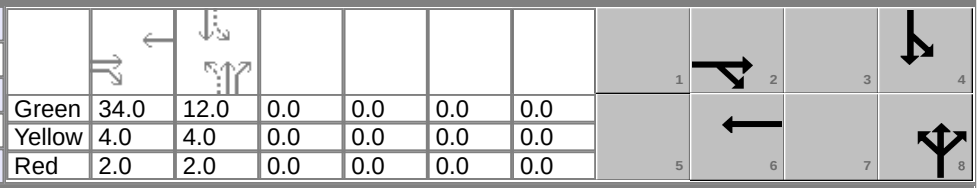
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 19, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:00 - 8:00 AM	PHF	0.91
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Route 20/Stallion Hill Rd	File Name	18_Route 20 & Stallion Hill Rd_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		1103	60		602		93	0	76	48	73	

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	34.0	12.0	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		2		6		8		4
Case Number		8.0		8.0		8.0		6.0
Phase Duration, s		40.0		40.0		18.0		18.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s		3.0		3.0		3.2		3.2
Queue Clearance Time (g_s), s		15.1		7.6		8.2		10.3
Green Extension Time (g_e), s		4.6		4.8		0.2		0.1
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.08		0.03		0.61		1.00

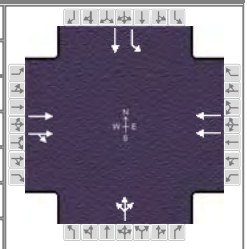
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12		6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h		643	632		662			153		53	80	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1826	1794		1738			1373		1362	1885	
Queue Service Time (g_s), s		13.0	13.1		5.6			4.2		2.1	2.0	
Cycle Queue Clearance Time (g_c), s		13.0	13.1		5.6			6.2		8.3	2.0	
Green Ratio (*g/C*)		0.59	0.59		0.59			0.21		0.21	0.21	
Capacity (*c*), veh/h		1070	1051		2038			388		260	390	
Volume-to-Capacity Ratio (*X*)		0.600	0.601		0.325			0.394		0.203	0.206	
Back of Queue (*Q*), ft/ln (50 th percentile)		96.6	91.5		38			42.9		16	20.6	
Back of Queue (*Q*), veh/ln (50 th percentile)		3.7	3.7		1.5			1.7		0.6	0.8	
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00		0.00			0.00		0.00	0.00	
Uniform Delay (d_1), s/veh		7.7	7.7		6.1			20.9		24.5	19.1	
Incremental Delay (d_2), s/veh		0.7	0.7		0.0			0.2		0.1	0.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0			0.0		0.0	0.0	
Control Delay (*d*), s/veh		8.3	8.4		6.2			21.1		24.6	19.1	
Level of Service (LOS)		A	A		A			C		C	B	
Approach Delay, s/veh / LOS	8.3	A		6.2	A		21.1	C		21.3	C	
Intersection Delay, s/veh / LOS	9.3						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.68	B	1.86	B	2.10	B	2.11	B
Bicycle LOS Score / LOS	1.54	B	1.03	A	0.74	A	0.71	A

 HCS™ Streets Version 7.7 Generated: 12/18/2018 10:09:01 AM

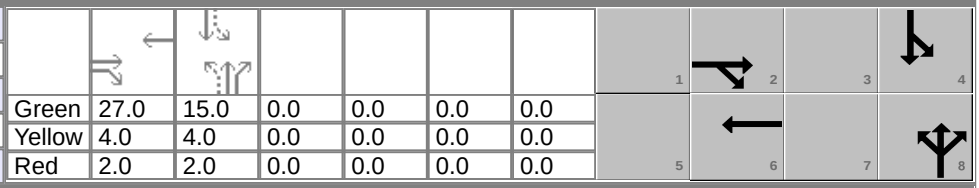
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 19, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:30 - 5:30 PM	PHF	0.95
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:30
Intersection	Route 20/Stallion Hill Rd	File Name	18_Route 20 & Stallion Hill Rd_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		939	112		1310		124	0	88	202	188	

Signal Information			
Cycle, s	54.0	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	27.0	15.0	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		2		6		8		4
Case Number		8.0		8.0		8.0		6.0
Phase Duration, s		33.0		33.0		21.0		21.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s		3.0		3.0		3.2		3.2
Queue Clearance Time (g_s), s		13.6		19.1		12.3		17.0
Green Extension Time (g_e), s		5.9		4.4		0.5		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.35		0.61		1.00		1.00

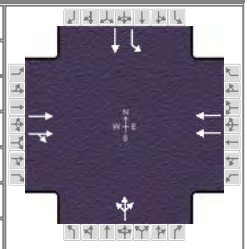
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12		6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h		562	541		1379			192		213	198	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1870	1802		1781			1054		1352	1885	
Queue Service Time (g_s), s		11.6	11.6		17.1			5.7		4.7	4.6	
Cycle Queue Clearance Time (g_c), s		11.6	11.6		17.1			10.3		15.0	4.6	
Green Ratio (*g/C*)		0.50	0.50		0.50			0.28		0.28	0.28	
Capacity (*c*), veh/h		935	901		1781			405		251	524	
Volume-to-Capacity Ratio (*X*)		0.601	0.601		0.774			0.473		0.846	0.378	
Back of Queue (*Q*), ft/ln (50 th percentile)		94.2	89.6		137.5			49.5		101.4	43.6	
Back of Queue (*Q*), veh/ln (50 th percentile)		3.7	3.6		5.4			2.0		4.0	1.7	
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00		0.00			0.00		0.00	0.00	
Uniform Delay (d_1), s/veh		9.6	9.7		11.0			18.7		25.7	15.7	
Incremental Delay (d_2), s/veh		0.8	0.8		2.0			0.3		21.5	0.2	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0			0.0		0.0	0.0	
Control Delay (*d*), s/veh		10.4	10.4		13.0			19.0		47.2	15.9	
Level of Service (LOS)		B	B		B			B		D	B	
Approach Delay, s/veh / LOS	10.4	B		13.0	B		19.0	B		32.1	C	
Intersection Delay, s/veh / LOS	15.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.69	B	1.87	B	2.09	B	2.10	B
Bicycle LOS Score / LOS	1.40	A	1.63	B	0.80	A	1.16	A

 HCS™ Streets Version 7.7 Generated: 12/18/2018 10:10:46 AM

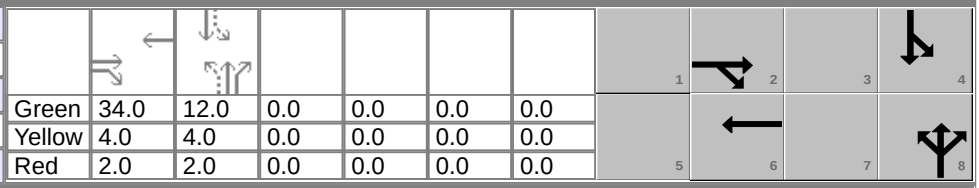
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 19, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:00 - 8:00 AM	PHF	0.91
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Route 20/Stallion Hill Rd	File Name	18_Route 20 & Stallion Hill Rd_AM-Proj.xus		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		1159	63		633		98	0	80	50	77	

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	34.0	12.0	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		2		6		8		4
Case Number		8.0		8.0		8.0		6.0
Phase Duration, s		40.0		40.0		18.0		18.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s		3.0		3.0		3.2		3.2
Queue Clearance Time (g_s), s		16.1		8.0		8.7		10.9
Green Extension Time (g_e), s		4.8		5.2		0.2		0.1
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.12		0.04		0.93		1.00

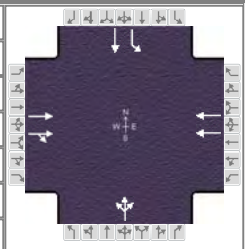
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement		2	12		6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h		675	665		696			163		55	85	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1826	1794		1738			1361		1357	1885	
Queue Service Time (g_s), s		14.1	14.1		6.0			4.5		2.2	2.2	
Cycle Queue Clearance Time (g_c), s		14.1	14.1		6.0			6.7		8.9	2.2	
Green Ratio (*g/C*)		0.59	0.59		0.59			0.21		0.21	0.21	
Capacity (*c*), veh/h		1070	1051		2038			385		248	390	
Volume-to-Capacity Ratio (*X*)		0.631	0.632		0.341			0.423		0.222	0.217	
Back of Queue (*Q*), ft/ln (50 th percentile)		106	100.6		40.5			46		16.9	21.8	
Back of Queue (*Q*), veh/ln (50 th percentile)		4.1	4.0		1.6			1.8		0.7	0.9	
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00		0.00			0.00		0.00	0.00	
Uniform Delay (d_1), s/veh		7.9	7.9		6.2			21.1		25.0	19.1	
Incremental Delay (d_2), s/veh		0.9	0.9		0.0			0.3		0.2	0.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0			0.0		0.0	0.0	
Control Delay (*d*), s/veh		8.8	8.8		6.2			21.4		25.1	19.2	
Level of Service (LOS)		A	A		A			C		C	B	
Approach Delay, s/veh / LOS	8.8	A		6.2	A		21.4	C		21.5	C	
Intersection Delay, s/veh / LOS	9.7						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.68	B	1.86	B	2.10	B	2.11	B
Bicycle LOS Score / LOS	1.59	B	1.06	A	0.76	A	0.72	A

 HCS™ Streets Version 7.7 Generated: 1/8/2019 9:05:34 AM

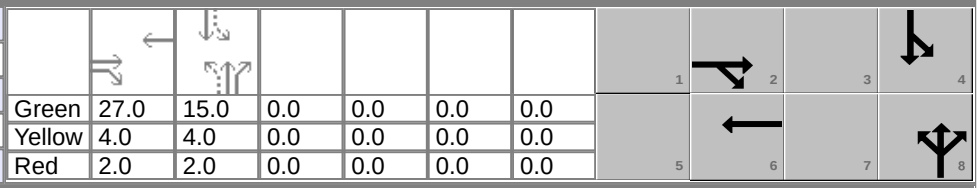
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Oct 19, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:30 - 5:30 PM	PHF	0.95
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:30
Intersection	Route 20/Stallion Hill Rd	File Name	18_Route 20 & Stallion Hill Rd_PM-Proj.xus		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		987	118		1377		130	0	93	212	198	

Signal Information			
Cycle, s	54.0	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	27.0	15.0	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		2		6		8		4
Case Number		8.0		8.0		8.0		6.0
Phase Duration, s		33.0		33.0		21.0		21.0
Change Period, ($Y+R_c$), s		6.0		6.0		6.0		6.0
Max Allow Headway (*MAH*), s		3.0		3.0		3.2		3.2
Queue Clearance Time (g_s), s		14.5		20.5		13.1		17.0
Green Extension Time (g_e), s		6.1		4.0		0.4		0.0
Phase Call Probability		1.00		1.00		1.00		1.00
Max Out Probability		0.43		0.74		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		2	12		6		3	8	18	7	4	
Adjusted Flow Rate (*v*), veh/h		590	570		1449			203		223	208	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1870	1801		1781			1029		1346	1885	
Queue Service Time (g_s), s		12.4	12.5		18.5			6.2		3.9	4.8	
Cycle Queue Clearance Time (g_c), s		12.4	12.5		18.5			11.1		15.0	4.8	
Green Ratio (*g/C*)		0.50	0.50		0.50			0.28		0.28	0.28	
Capacity (*c*), veh/h		935	901		1781			397		231	524	
Volume-to-Capacity Ratio (*X*)		0.631	0.632		0.814			0.511		0.967	0.398	
Back of Queue (*Q*), ft/ln (50 th percentile)		102.8	98.3		153.7			53.9		146.6	46.2	
Back of Queue (*Q*), veh/ln (50 th percentile)		4.0	3.9		6.1			2.1		5.8	1.8	
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00		0.00			0.00		0.00	0.00	
Uniform Delay (d_1), s/veh		9.9	9.9		11.4			19.1		26.1	15.8	
Incremental Delay (d_2), s/veh		1.1	1.1		2.8			0.5		49.5	0.2	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0			0.0		0.0	0.0	
Control Delay (*d*), s/veh		10.9	11.0		14.2			19.6		75.6	16.0	
Level of Service (LOS)		B	B		B			B		E	B	
Approach Delay, s/veh / LOS	10.9	B		14.2	B		19.6	B		46.8	D	
Intersection Delay, s/veh / LOS	17.7						B					

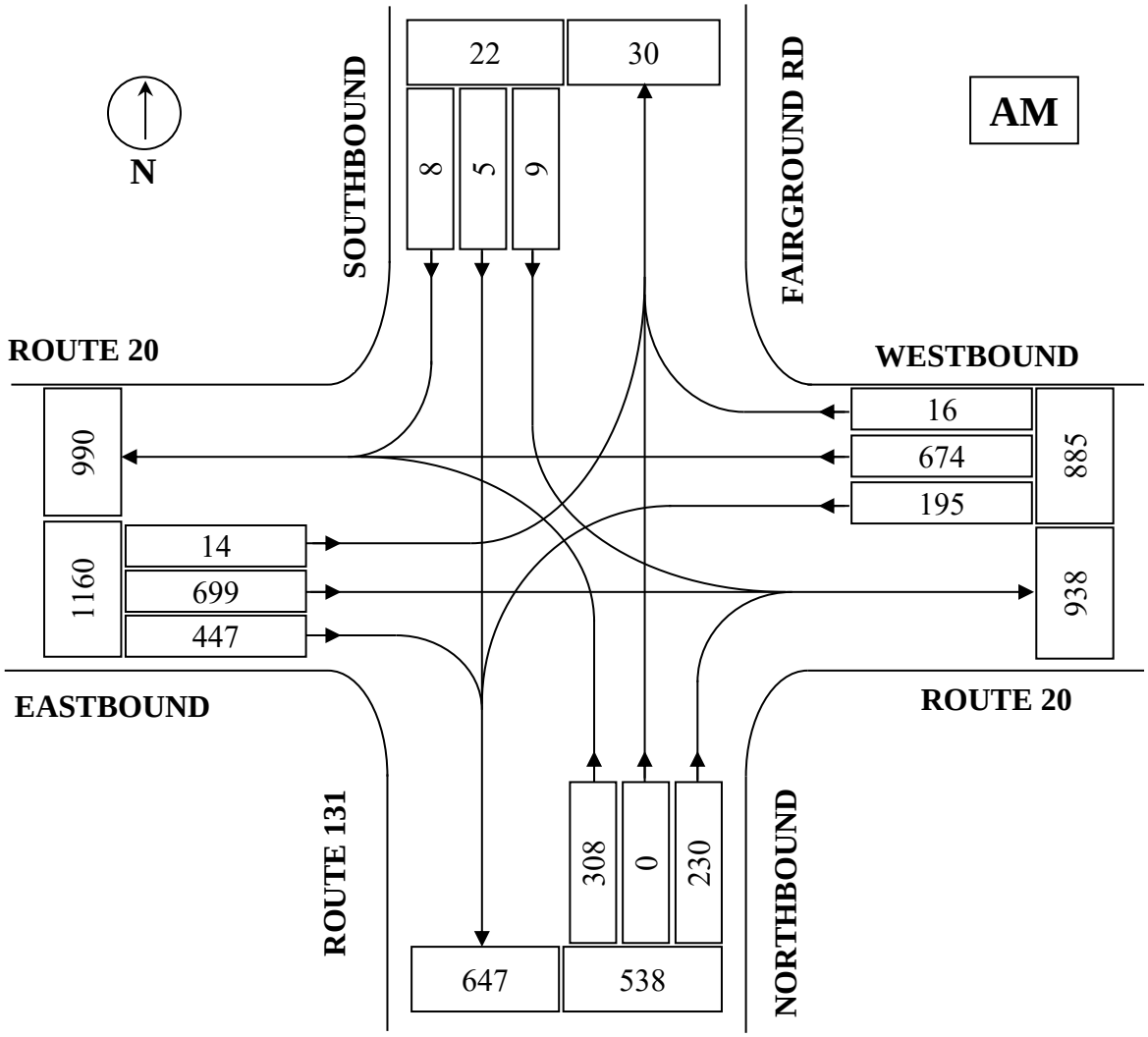
Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.69	B	1.87	B	2.09	B	2.10	B
Bicycle LOS Score / LOS	1.44	A	1.68	B	0.82	A	1.20	A

 HCS™ Streets Version 7.7 Generated: 1/8/2019 9:07:39 AM

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 11/8/18 **DAY OF WEEK:** Thursday
INTERSECTION: Route 20 / Route 131 / Fairground Road

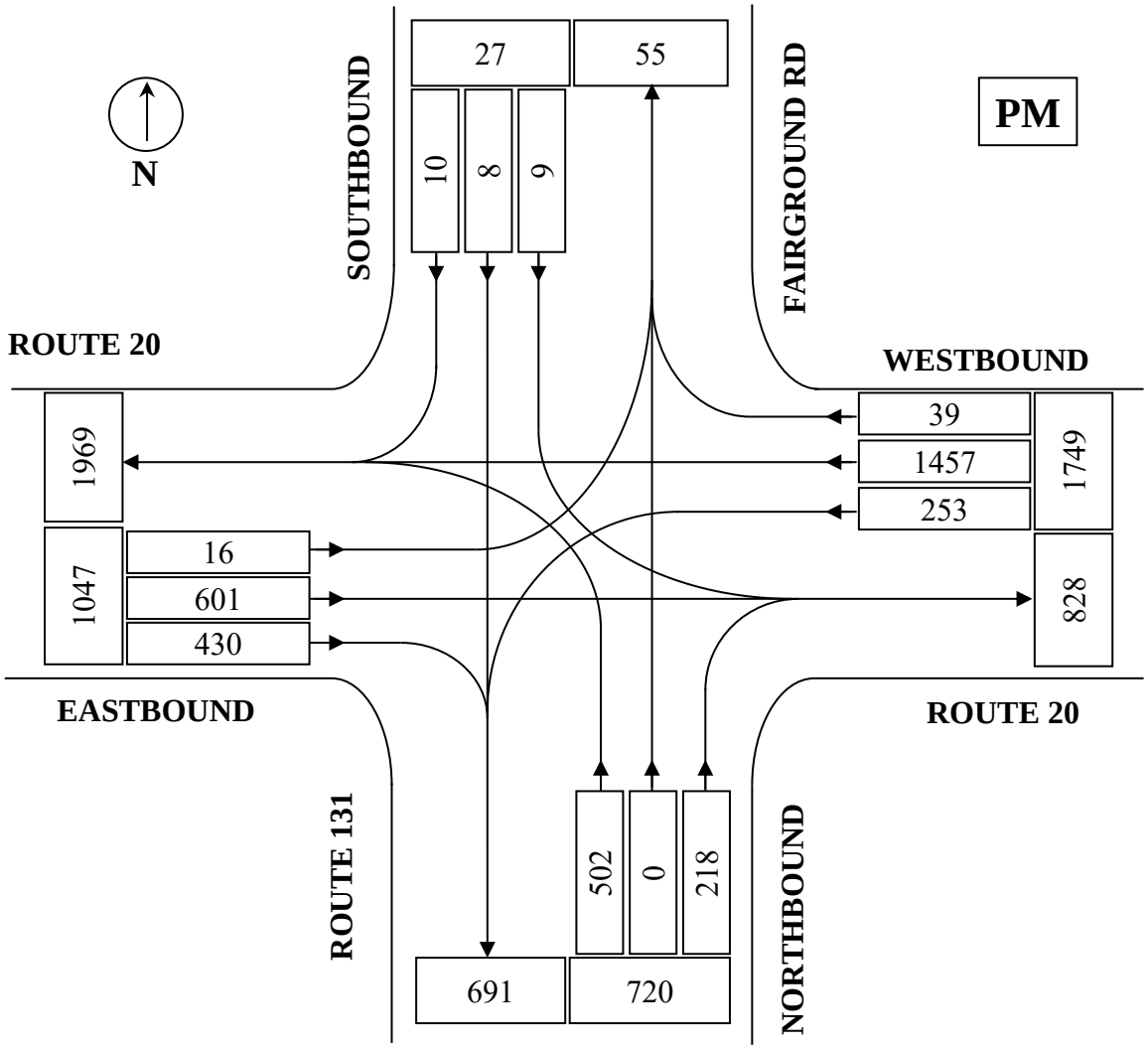


STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 20 EB	1160	44.5%	7:45 - 8:45 AM
Route 20 WB	885	34.0%	PHF = .91
Route 131 NB	538	20.7%	**VEHICLES COUNTED**
Fairgrounds Rd SB	22	0.8%	**ALL VEHICLES:** 2605
TOTAL	2605	100.0%	**TRUCKS:** 140
			PERCENT TRUCKS: 5.37%

CMRPC

INTERSECTION TURNING MOVEMENT COUNT

CITY: Sturbridge **DATE:** 11/8/18 **DAY OF WEEK:** Thursday
INTERSECTION: Route 20 / Route 131 / Fairground Road



STREET	ENTERING VOLUMES	PERCENT OF FLOW	TIME OF COUNT
Route 20 EB	1047	29.6%	4:30 - 5:30 PM
Route 20 WB	1749	49.4%	PHF = .94
Route 131 NB	720	20.3%	**VEHICLES COUNTED**
Fairgrounds Rd SB	27	0.7%	**ALL VEHICLES:** 3543
TOTAL	3543	100.0%	**TRUCKS:** 56
			PERCENT TRUCKS: 1.58%

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Sturbridge

DATE: 11/8/2018

LOCATION: Route 20 / Fairground Road

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

TECHNICIAN: PP/KK

Time Period	Route 20 EB				Route 20 WB								Fairgrounds Rd SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	3	192	76	12	0	193	1	17					1	0	2	0	468	
7:15 - 7:30	1	190	85	9	0	156	1	13					4	0	0	0	437	
7:30 - 7:45	2	159	113	13	0	131	1	11					1	0	1	0	408	
7:45 - 8:00	5	190	123	15	0	185	3	9					2	1	3	0	512	1825
8:00 - 8:15	2	188	96	10	0	137	6	9					0	0	1	0	430	1787
8:15 - 8:30	6	166	101	12	0	198	1	17					4	0	3	1	479	1829
8:30 - 8:45	1	155	127	25	0	154	6	10					3	4	1	0	451	1872
8:45 - 9:00	2	172	106	14	0	167	4	10					3	0	2	0	456	1816
TOTAL	22	1412	827	110	0	1321	23	96	0	0	0	0	18	5	13	1	3641	
		EBPct	62.0			**WBPct**	36.9			**NBPct**	0.0			**SBPct**	1.2			
Peak Sums:	**14**	**699**	**447**	**62**	**0**	**674**	**16**	**45**	**0**	**0**	**0**	**0**	**9**	**5**	**8**	**1**	**1872**	
Total Trucks	108					**TrkPct**	5.77			**PHF**	0.91							

Time Period	Route 20 EB				Route 20 WB								Fairgrounds Rd SB				Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	3	144	115	7	0	319	14	11					5	0	2	0	602	
4:15 - 4:30	4	142	100	4	0	332	10	10					4	2	3	0	597	
4:30 - 4:45	2	158	108	5	0	346	8	7					2	1	2	0	627	
4:45 - 5:00	3	155	112	6	0	355	10	6					3	2	4	0	644	2470
5:00 - 5:15	4	170	118	7	0	351	13	6					4	4	2	0	666	2534
5:15 - 5:30	7	118	92	5	0	405	8	3					0	1	2	0	633	2570
5:30 - 5:45	6	96	82	3	0	307	4	2					4	0	5	0	504	2447
5:45 - 6:00	1	125	72	2	0	302	14	4					2	1	3	0	520	2323
TOTAL	30	1108	799	39	0	2717	81	49	0	0	0	0	24	11	23	0	4793	
		EBPct	40.7			**WBPct**	58.2			**NBPct**	0.0			**SBPct**	1.1			
Peak Sums:	**16**	**601**	**430**	**23**	**0**	**1457**	**39**	**22**	**0**	**0**	**0**	**0**	**9**	**8**	**10**	**0**	**2570**	
Total Trucks	45					**TrkPct**	1.75			**PHF**	0.96							

TURNING MOVEMENT COUNT WORKSHEET

CMRPC

MUNICIPALITY: Town of Sturbridge

DATE: 11/8/2018

LOCATION: Route 20 / Route 131

DAY OF WEEK: Thursday

WEATHER: AM: Clear PM: Clear

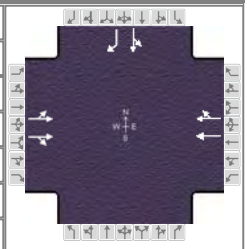
TECHNICIAN: PP/KK

Time Period	Route 20 EB				Route 20 WB				Route 131 NB								Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
7:00 - 7:15	0	192	0	12	33	193	0	18	110	0	46	10					574	
7:15 - 7:30	0	190	0	9	22	156	0	18	69	0	60	7					497	
7:30 - 7:45	0	159	0	13	40	131	0	16	52	0	49	7					431	
7:45 - 8:00	0	190	0	15	61	185	0	12	86	0	55	5					577	2079
8:00 - 8:15	0	188	0	10	42	137	0	14	58	0	50	12					475	1980
8:15 - 8:30	0	166	0	12	50	198	0	23	87	0	70	7					571	2054
8:30 - 8:45	0	155	0	25	42	154	0	15	77	0	55	8					483	2106
8:45 - 9:00	0	172	0	14	43	167	0	15	74	0	49	8					505	2034
TOTAL	0	1412	0	110	333	1321	0	131	613	0	434	64	0	0	0	0	4113	
		EBPct	33.2			**WBPct**	41.3			**NBPct**	25.5			**SBPct**	0.0			
Peak Sums:	**0**	**699**	**0**	**62**	**195**	**674**	**0**	**64**	**308**	**0**	**230**	**32**	**0**	**0**	**0**	**0**	**2106**	
Total Trucks	158					**TrkPct**	7.50			**PHF**	0.91							

Time Period	Route 20 EB				Route 20 WB				Route 131 NB								Total	Peak
	L	S	R	HV	L	S	R	HV	L	S	R	HV	L	S	R	HV		
4:00 - 4:15	0	144	0	7	54	319	0	13	137	0	47	7					701	
4:15 - 4:30	0	142	0	4	47	332	0	12	130	0	56	3					707	
4:30 - 4:45	0	158	0	5	69	346	0	11	130	0	47	2					750	
4:45 - 5:00	0	155	0	6	77	355	0	7	108	0	63	3					758	2916
5:00 - 5:15	0	170	0	7	52	351	0	6	156	0	64	4					793	3008
5:15 - 5:30	0	118	0	5	55	405	0	4	108	0	44	2					730	3031
5:30 - 5:45	0	96	0	3	69	307	0	4	105	0	38	3					615	2896
5:45 - 6:00	0	125	0	2	69	302	0	5	115	0	68	7					679	2817
TOTAL	0	1108	0	39	492	2717	0	62	989	0	427	31	0	0	0	0	5733	
		EBPct	19.8			**WBPct**	56.4			**NBPct**	23.8			**SBPct**	0.0			
Peak Sums:	**0**	**601**	**0**	**23**	**253**	**1457**	**0**	**28**	**502**	**0**	**218**	**11**	**0**	**0**	**0**	**0**	**3031**	
Total Trucks	62					**TrkPct**	2.05			**PHF**	0.96							

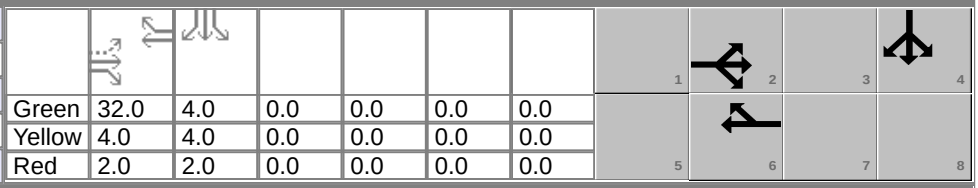
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Nov 13, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:45 - 8:45 AM	PHF	0.92
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:45
Intersection	Route 20/Fairground Rd	File Name	18_Route 20 & Fairground Rd_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	14	699	447		674	16				9	5	8

Signal Information			
Cycle, s	48.0	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	32.0	4.0	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		2		6				4
Case Number		8.0		8.0				11.0
Phase Duration, s		38.0		38.0				10.0
Change Period, ($Y+R_c$), s		6.0		6.0				6.0
Max Allow Headway (*MAH*), s		3.1		3.1				3.2
Queue Clearance Time (g_s), s		12.3		6.1				2.4
Green Extension Time (g_e), s		4.7		4.9				0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.11		0.05				1.00

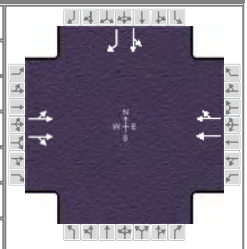
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12		6	16				7	4	14
Adjusted Flow Rate (*v*), veh/h	699		562		375	373					15	8
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1807		1438		1826	1813					1841	1593
Queue Service Time (g_s), s	0.0		10.3		4.1	4.1					0.4	0.2
Cycle Queue Clearance Time (g_c), s	9.9		10.3		4.1	4.1					0.4	0.2
Green Ratio (*g/C*)	0.67		0.67		0.67	0.67					0.08	0.08
Capacity (*c*), veh/h	1281		958		1217	1208					153	133
Volume-to-Capacity Ratio (*X*)	0.546		0.586		0.308	0.308					0.099	0.057
Back of Queue (*Q*), ft/ln (50 th percentile)	39.9		34.6		16.7	16					3.6	1.8
Back of Queue (*Q*), veh/ln (50 th percentile)	1.6		1.4		0.6	0.6					0.1	0.1
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00		0.00		0.00	0.00					0.00	0.02
Uniform Delay (d_1), s/veh	4.3		4.4		3.4	3.4					20.3	20.3
Incremental Delay (d_2), s/veh	0.3		0.6		0.1	0.1					0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0		0.0	0.0					0.0	0.0
Control Delay (*d*), s/veh	4.6		5.0		3.4	3.4					20.4	20.3
Level of Service (LOS)	A		A		A	A					C	C
Approach Delay, s/veh / LOS	4.8	A		3.4	A		0.0			20.4	C	
Intersection Delay, s/veh / LOS	4.5						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.32	A	1.61	B	2.13	B	2.13	B
Bicycle LOS Score / LOS	1.53	B	1.10	A			0.53	A

 HCS™ Streets Version 7.7 Generated: 12/18/2018 10:13:40 AM

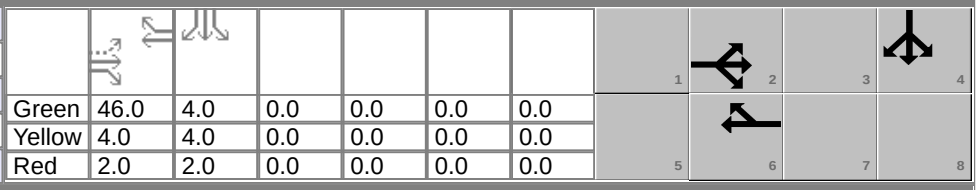
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Nov 13, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:30 - 5:30 PM	PHF	0.94
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:30
Intersection	Route 20/Fairground Rd	File Name	18_Route 20 & Fairground Rd_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	18	636	455		1567	39				9	8	13

Signal Information			
Cycle, s	62.0	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	46.0	4.0	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		

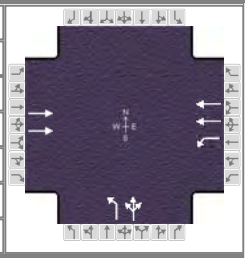
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2		6				4
Case Number		8.0		8.0				11.0
Phase Duration, s		52.0		52.0				10.0
Change Period, ($Y+R_c$), s		6.0		6.0				6.0
Max Allow Headway (*MAH*), s		3.1		3.1				3.2
Queue Clearance Time (g_s), s		11.2		15.5				2.6
Green Extension Time (g_e), s		9.7		9.5				0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.16		0.20				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		6	16				7	4	14
Adjusted Flow Rate (*v*), veh/h	645		534		853	850					18	13
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1773		1463		1870	1856					1851	1595
Queue Service Time (g_s), s	0.0		9.2		13.5	13.5					0.6	0.5
Cycle Queue Clearance Time (g_c), s	8.4		9.2		13.5	13.5					0.6	0.5
Green Ratio (*g/C*)	0.74		0.74		0.74	0.74					0.06	0.06
Capacity (*c*), veh/h	1375		1086		1388	1377					119	103
Volume-to-Capacity Ratio (*X*)	0.469		0.492		0.615	0.617					0.151	0.124
Back of Queue (*Q*), ft/ln (50 th percentile)	33.6		28.8		58.8	57.9					6.1	4.3
Back of Queue (*Q*), veh/ln (50 th percentile)	1.3		1.2		2.3	2.3					0.2	0.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00		0.00		0.00	0.00					0.00	0.04
Uniform Delay (d_1), s/veh	3.2		3.3		3.8	3.8					27.4	27.3
Incremental Delay (d_2), s/veh	0.1		0.1		0.6	0.6					0.2	0.2
Initial Queue Delay (d_3), s/veh	0.0		0.0		0.0	0.0					0.0	0.0
Control Delay (*d*), s/veh	3.2		3.4		4.4	4.4					27.6	27.5
Level of Service (LOS)	A		A		A	A					C	C
Approach Delay, s/veh / LOS	3.3	A		4.4	A		0.0			27.6	C	
Intersection Delay, s/veh / LOS	4.2						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.31	A	1.60	B	2.14	B	2.13	B
Bicycle LOS Score / LOS	1.46	A	1.89	B			0.54	A

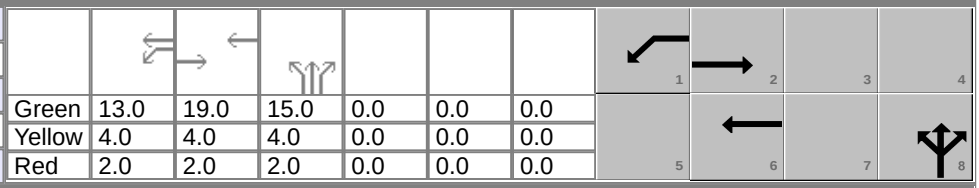
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Nov 13, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:45 - 8:45 AM	PHF	0.91
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:45
Intersection	Route 20/Route 131	File Name	18_Route 20 & Route 131_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		708		195	382		308	0	230			

Signal Information			
Cycle, s	65.0	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	13.0	19.0	15.0	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

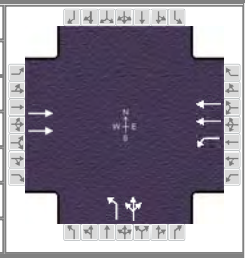
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		8.3	2.0	4.0		10.0		
Phase Duration, s		25.0	19.0	44.0		21.0		
Change Period, ($Y+R_c$), s		6.0	6.0	6.0		6.0		
Max Allow Headway (*MAH*), s		3.0	3.1	3.0		3.2		
Queue Clearance Time (g_s), s		15.3	9.3	5.7		13.7		
Green Extension Time (g_e), s		1.4	0.1	2.7		0.2		
Phase Call Probability		1.00	1.00	1.00		1.00		
Max Out Probability		0.79	0.58	0.03		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		2		1	6		3	8	18			
Adjusted Flow Rate (*v*), veh/h		778		214	420		338	226				
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1738		1739	1738		1781	1585				
Queue Service Time (g_s), s		13.3		7.3	3.7		11.7	8.3				
Cycle Queue Clearance Time (g_c), s		13.3		7.3	3.7		11.7	8.3				
Green Ratio (*g/C*)		0.29		0.20	0.58		0.23	0.23				
Capacity (*c*), veh/h		1016		348	2032		411	366				
Volume-to-Capacity Ratio (*X*)		0.766		0.616	0.207		0.823	0.619				
Back of Queue (*Q*), ft/ln (50 th percentile)		137.6		78	27.4		149.1	78.3				
Back of Queue (*Q*), veh/ln (50 th percentile)		5.3		3.0	1.1		5.9	3.1				
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00		0.23	0.00		0.00	0.00				
Uniform Delay (d_1), s/veh		21.0		23.7	6.4		23.7	22.4				
Incremental Delay (d_2), s/veh		3.2		2.4	0.0		12.0	2.4				
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0		0.0	0.0				
Control Delay (*d*), s/veh		24.2		26.1	6.4		35.7	24.8				
Level of Service (LOS)		C		C	A		D	C				
Approach Delay, s/veh / LOS	24.2	C		13.1	B		31.3	C		0.0		
Intersection Delay, s/veh / LOS	22.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.35	A	2.30	B	2.13	B
Bicycle LOS Score / LOS	1.13	A	1.01	A	1.42	A		

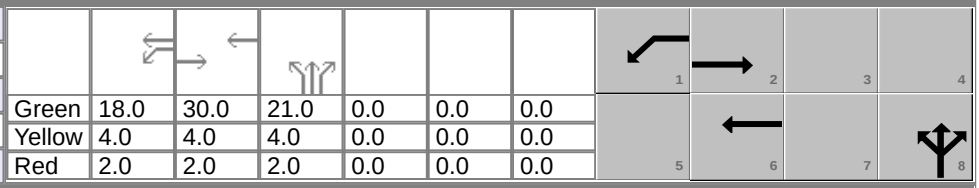
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Nov 13, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:30 - 5:30 PM	PHF	0.94
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:30
Intersection	Route 20/Route 131	File Name	18_Route 20 & Route 131_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		645		253	1059		537	0	218			

Signal Information			
Cycle, s	87.0	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	18.0	30.0	21.0	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						

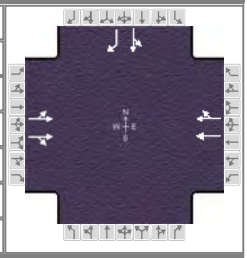
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		8.3	2.0	4.0		10.0		
Phase Duration, s		36.0	24.0	60.0		27.0		
Change Period, ($Y+R_c$), s		6.0	6.0	6.0		6.0		
Max Allow Headway (*MAH*), s		3.0	3.1	3.0		3.2		
Queue Clearance Time (g_s), s		15.6	14.3	17.3		23.0		
Green Extension Time (g_e), s		4.5	0.2	4.0		0.0		
Phase Call Probability		1.00	1.00	1.00		1.00		
Max Out Probability		0.12	0.60	0.23		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		2		1	6		3	8	18			
Adjusted Flow Rate (*v*), veh/h		686		269	1127		571	205				
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1781		1781	1781		1795	1598				
Queue Service Time (g_s), s		13.6		12.3	15.3		21.0	9.7				
Cycle Queue Clearance Time (g_c), s		13.6		12.3	15.3		21.0	9.7				
Green Ratio (*g/C*)		0.34		0.21	0.62		0.24	0.24				
Capacity (*c*), veh/h		1228		369	2210		433	386				
Volume-to-Capacity Ratio (*X*)		0.559		0.730	0.510		1.318	0.532				
Back of Queue (*Q*), ft/ln (50 th percentile)		138.8		145.6	127.8		700.5	92.3				
Back of Queue (*Q*), veh/ln (50 th percentile)		5.5		5.7	5.0		27.8	3.7				
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00		0.42	0.00		0.00	0.00				
Uniform Delay (d_1), s/veh		23.1		32.2	9.2		33.0	28.7				
Incremental Delay (d_2), s/veh		0.3		6.3	0.1		158.7	0.7				
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0		0.0	0.0				
Control Delay (*d*), s/veh		23.5		38.6	9.2		191.7	29.5				
Level of Service (LOS)		C		D	A		F	C				
Approach Delay, s/veh / LOS	23.5	C		14.9	B		148.8	F		0.0		
Intersection Delay, s/veh / LOS	53.3						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.95	B	1.35	A	2.31	B	2.14	B
Bicycle LOS Score / LOS	1.05	A	1.64	B	1.77	B		

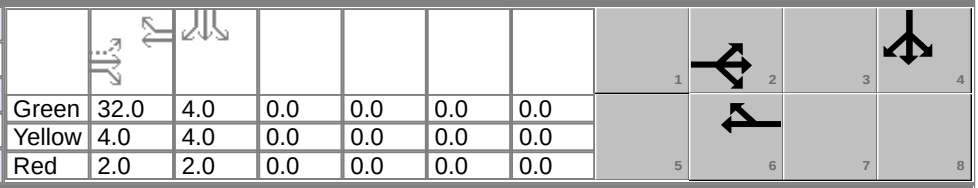
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Nov 13, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:45 - 8:45 AM	PHF	0.92
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:45
Intersection	Route 20/Fairground Rd	File Name	18_Route 20 & Fairground Rd_AM-Proj.xus		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	15	735	470		708	17				9	5	8

Signal Information			
Cycle, s	48.0	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	32.0	4.0	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		2		6				4
Case Number		8.0		8.0				11.0
Phase Duration, s		38.0		38.0				10.0
Change Period, ($Y+R_c$), s		6.0		6.0				6.0
Max Allow Headway (*MAH*), s		3.1		3.1				3.2
Queue Clearance Time (g_s), s		13.2		6.4				2.4
Green Extension Time (g_e), s		5.1		5.3				0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.15		0.07				1.00

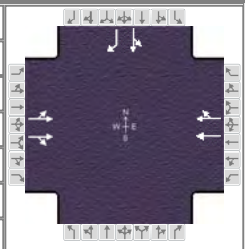
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12		6	16				7	4	14
Adjusted Flow Rate (*v*), veh/h	733		593		394	392					15	8
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1805		1439		1826	1812					1841	1593
Queue Service Time (g_s), s	0.0		11.2		4.4	4.4					0.4	0.2
Cycle Queue Clearance Time (g_c), s	10.7		11.2		4.4	4.4					0.4	0.2
Green Ratio (*g/C*)	0.67		0.67		0.67	0.67					0.08	0.08
Capacity (*c*), veh/h	1280		959		1217	1208					153	133
Volume-to-Capacity Ratio (*X*)	0.573		0.618		0.324	0.324					0.099	0.057
Back of Queue (*Q*), ft/ln (50 th percentile)	44.3		39.4		17.9	17.1					3.6	1.8
Back of Queue (*Q*), veh/ln (50 th percentile)	1.8		1.6		0.7	0.7					0.1	0.1
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00		0.00		0.00	0.00					0.00	0.02
Uniform Delay (d_1), s/veh	4.5		4.5		3.4	3.4					20.3	20.3
Incremental Delay (d_2), s/veh	0.4		0.9		0.1	0.1					0.1	0.1
Initial Queue Delay (d_3), s/veh	0.0		0.0		0.0	0.0					0.0	0.0
Control Delay (*d*), s/veh	4.9		5.4		3.5	3.5					20.4	20.3
Level of Service (LOS)	A		A		A	A					C	C
Approach Delay, s/veh / LOS	5.1	A		3.5	A		0.0			20.4	C	
Intersection Delay, s/veh / LOS	4.7						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.32	A	1.61	B	2.13	B	2.13	B
Bicycle LOS Score / LOS	1.58	B	1.14	A			0.53	A

 HCS™ Streets Version 7.7 Generated: 1/8/2019 9:09:21 AM

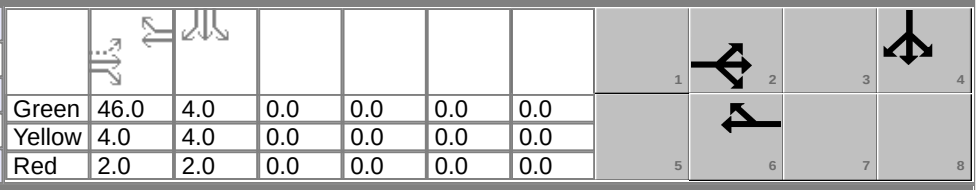
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Nov 13, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:30 - 5:30 PM	PHF	0.94
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:30
Intersection	Route 20/Fairground Rd	File Name	18_Route 20 & Fairground Rd_PM-Proj.xus		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	19	669	478		1647	41				9	8	14

Signal Information			
Cycle, s	62.0	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	46.0	4.0	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		2		6				4
Case Number		8.0		8.0				11.0
Phase Duration, s		52.0		52.0				10.0
Change Period, ($Y+R_c$), s		6.0		6.0				6.0
Max Allow Headway (*MAH*), s		3.2		3.2				3.2
Queue Clearance Time (g_s), s		12.0		16.9				2.6
Green Extension Time (g_e), s		10.8		10.4				0.0
Phase Call Probability		1.00		1.00				1.00
Max Out Probability		0.21		0.27				1.00

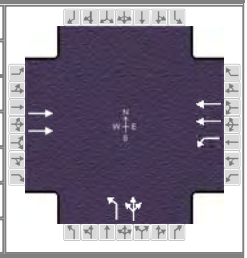
Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12		6	16				7	4	14
Adjusted Flow Rate (*v*), veh/h	675		565		896	894					18	14
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1760		1465		1870	1856					1851	1595
Queue Service Time (g_s), s	0.0		10.0		14.8	14.9					0.6	0.5
Cycle Queue Clearance Time (g_c), s	9.0		10.0		14.8	14.9					0.6	0.5
Green Ratio (*g/C*)	0.74		0.74		0.74	0.74					0.06	0.06
Capacity (*c*), veh/h	1366		1087		1388	1377					119	103
Volume-to-Capacity Ratio (*X*)	0.495		0.520		0.646	0.649					0.151	0.134
Back of Queue (*Q*), ft/ln (50 th percentile)	36.2		32.2		66.2	65.3					6.1	4.7
Back of Queue (*Q*), veh/ln (50 th percentile)	1.4		1.3		2.6	2.6					0.2	0.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00		0.00		0.00	0.00					0.00	0.04
Uniform Delay (d_1), s/veh	3.2		3.4		4.0	4.0					27.4	27.4
Incremental Delay (d_2), s/veh	0.1		0.2		0.8	0.9					0.2	0.2
Initial Queue Delay (d_3), s/veh	0.0		0.0		0.0	0.0					0.0	0.0
Control Delay (*d*), s/veh	3.3		3.6		4.8	4.8					27.6	27.6
Level of Service (LOS)	A		A		A	A					C	C
Approach Delay, s/veh / LOS	3.4	A		4.8	A		0.0			27.6	C	
Intersection Delay, s/veh / LOS	4.5						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.31	A	1.60	B	2.14	B	2.13	B
Bicycle LOS Score / LOS	1.51	B	1.96	B			0.54	A

 HCS™ Streets Version 7.7 Generated: 1/8/2019 9:11:01 AM

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Nov 13, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	7:45 - 8:45 AM	PHF	0.91
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 7:45
Intersection	Route 20/Route 131	File Name	18_Route 20 & Route 131_AM-Proj.xus		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		744		205	402		324	0	242			

Signal Information			
Cycle, s	65.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	Yes	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On

							1	2	3	4	
Green	13.0	19.0	15.0	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	5	6	7	8	

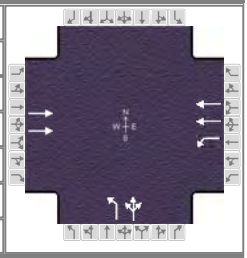
Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		2	1	6		8		
Case Number		8.3	2.0	4.0		10.0		
Phase Duration, s		25.0	19.0	44.0		21.0		
Change Period, ($Y+R_c$), s		6.0	6.0	6.0		6.0		
Max Allow Headway (*MAH*), s		3.0	3.1	3.0		3.2		
Queue Clearance Time (g_s), s		16.1	9.7	5.9		14.5		
Green Extension Time (g_e), s		1.2	0.1	2.8		0.1		
Phase Call Probability		1.00	1.00	1.00		1.00		
Max Out Probability		1.00	0.88	0.04		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		2		1	6		3	8	18			
Adjusted Flow Rate (*v*), veh/h		818		225	442		356	240				
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1738		1739	1738		1781	1585				
Queue Service Time (g_s), s		14.1		7.7	3.9		12.5	8.9				
Cycle Queue Clearance Time (g_c), s		14.1		7.7	3.9		12.5	8.9				
Green Ratio (*g/C*)		0.29		0.20	0.58		0.23	0.23				
Capacity (*c*), veh/h		1016		348	2032		411	366				
Volume-to-Capacity Ratio (*X*)		0.805		0.648	0.217		0.866	0.655				
Back of Queue (*Q*), ft/ln (50 th percentile)		150.6		84.4	29.2		170.1	85.9				
Back of Queue (*Q*), veh/ln (50 th percentile)		5.8		3.2	1.1		6.7	3.4				
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00		0.24	0.00		0.00	0.00				
Uniform Delay (d_1), s/veh		21.3		23.9	6.4		24.0	22.7				
Incremental Delay (d_2), s/veh		4.4		3.3	0.0		16.7	3.3				
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0		0.0	0.0				
Control Delay (*d*), s/veh		25.7		27.2	6.4		40.8	26.0				
Level of Service (LOS)		C		C	A		D	C				
Approach Delay, s/veh / LOS	25.7	C		13.4	B		34.8	C		0.0		
Intersection Delay, s/veh / LOS	24.4						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.35	A	2.30	B	2.13	B
Bicycle LOS Score / LOS	1.16	A	1.04	A	1.47	A		

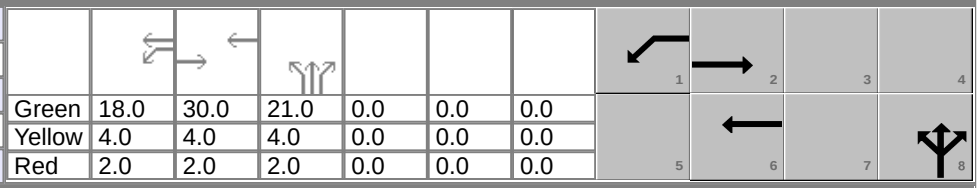
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	CMRPC			Duration, h	0.25
Analyst	KK	Analysis Date	Nov 13, 2018	Area Type	Other
Jurisdiction	Sturbridge	Time Period	4:30 - 5:30 PM	PHF	0.94
Urban Street	Route 20	Analysis Year	2018	Analysis Period	1> 4:30
Intersection	Route 20/Route 131	File Name	18_Route 20 & Route 131_PM-Proj.xus		
Project Description	Projected 2028				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h		678		266	1113		564	0	229			

Signal Information			
Cycle, s	87.0	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	18.0	30.0	21.0	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		2	1	6		8		
Case Number		8.3	2.0	4.0		10.0		
Phase Duration, s		36.0	24.0	60.0		27.0		
Change Period, ($Y+R_c$), s		6.0	6.0	6.0		6.0		
Max Allow Headway (*MAH*), s		3.0	3.1	3.0		3.2		
Queue Clearance Time (g_s), s		16.5	15.0	18.4		23.0		
Green Extension Time (g_e), s		4.7	0.2	4.0		0.0		
Phase Call Probability		1.00	1.00	1.00		1.00		
Max Out Probability		0.16	1.00	0.32		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		2		1	6		3	8	18			
Adjusted Flow Rate (*v*), veh/h		721		283	1184		600	217				
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1781		1781	1781		1795	1598				
Queue Service Time (g_s), s		14.5		13.0	16.4		21.0	10.4				
Cycle Queue Clearance Time (g_c), s		14.5		13.0	16.4		21.0	10.4				
Green Ratio (*g/C*)		0.34		0.21	0.62		0.24	0.24				
Capacity (*c*), veh/h		1228		369	2210		433	386				
Volume-to-Capacity Ratio (*X*)		0.587		0.768	0.536		1.384	0.563				
Back of Queue (*Q*), ft/ln (50 th percentile)		148.2		159.4	138.1		785.9	99.5				
Back of Queue (*Q*), veh/ln (50 th percentile)		5.8		6.3	5.4		31.2	3.9				
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00		0.46	0.00		0.00	0.00				
Uniform Delay (d_1), s/veh		23.4		32.5	9.4		33.0	29.0				
Incremental Delay (d_2), s/veh		0.5		8.6	0.1		186.9	1.2				
Initial Queue Delay (d_3), s/veh		0.0		0.0	0.0		0.0	0.0				
Control Delay (*d*), s/veh		23.9		41.1	9.5		219.9	30.1				
Level of Service (LOS)		C		D	A		F	C				
Approach Delay, s/veh / LOS	23.9	C		15.6	B		169.5	F		0.0		
Intersection Delay, s/veh / LOS	59.4						E					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.95	B	1.35	A	2.31	B	2.14	B
Bicycle LOS Score / LOS	1.08	A	1.70	B	1.84	B		

Route 20 Segments Level of Service Analysis

Route 148/Holland Road to Arnold Road

Arnold Road to Cedar Street

Cedar Street to Stallion Hill Road

Stallion Hill Road to Fairground Road/Route 131

HCS7 Two-Lane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Route 148 & Arnold Road - Existing	Unit	United States Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2745
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	35	Access Point Density, pts/mi	37.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1006	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	0.94	Total Trucks, %	6.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.59

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	28.4
Speed Slope Coefficient	2.06805	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.39299	PF Power Coefficient	0.63699
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	28.7
%Improved % Followers	0.0	% Improved Avg Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2745	-	-	26.4

Vehicle Results

Average Speed, mi/h	26.4	Percent Followers, %	75.3
Segment Travel Time, minutes	1.18	Followers Density, followers/mi/ln	28.7
Vehicle LOS	E		

HCS7 Two-Lane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Route 148 & Arnold Road - Existing	Unit	United States Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2745
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	35	Access Point Density, pts/mi	37.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1211	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	0.94	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.71

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	28.5
Speed Slope Coefficient	2.07527	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.39464	PF Power Coefficient	0.63718
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	36.5
%Improved % Followers	0.0	% Improved Avg Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2745	-	-	26.3

Vehicle Results

Average Speed, mi/h	26.3	Percent Followers, %	79.3
Segment Travel Time, minutes	1.19	Followers Density, followers/mi/ln	36.5
Vehicle LOS	E		

HCS7 Two-Lane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Route 148 & Arnold Road - Projected 2028	Unit	United States Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2745
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	35	Access Point Density, pts/mi	37.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1057	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	0.94	Total Trucks, %	6.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.62

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	28.4
Speed Slope Coefficient	2.06805	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.39299	PF Power Coefficient	0.63699
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	30.7
%Improved % Followers	0.0	% Improved Avg Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2745	-	-	26.3

Vehicle Results

Average Speed, mi/h	26.3	Percent Followers, %	76.4
Segment Travel Time, minutes	1.19	Followers Density, followers/mi/ln	30.7
Vehicle LOS	E		

HCS7 Two-Lane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Route 148 & Arnold Road - Projected 2028	Unit	United States Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2745
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	35	Access Point Density, pts/mi	37.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1273	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	0.94	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.75

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	28.5
Speed Slope Coefficient	2.07527	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.39464	PF Power Coefficient	0.63718
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	39.0
%Improved % Followers	0.0	% Improved Avg Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2745	-	-	26.3

Vehicle Results

Average Speed, mi/h	26.3	Percent Followers, %	80.3
Segment Travel Time, minutes	1.19	Followers Density, followers/mi/ln	39.0
Vehicle LOS	E		

HCS7 Two-Lane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Arnold Road and Cedar Street - Existing	Unit	United States Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2534
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	35	Access Point Density, pts/mi	33.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1040	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	0.94	Total Trucks, %	6.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.61

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	29.4
Speed Slope Coefficient	2.11934	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.40747	PF Power Coefficient	0.64092
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	29.1
%Improved % Followers	0.0	% Improved Avg Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2534	-	-	27.3

Vehicle Results

Average Speed, mi/h	27.3	Percent Followers, %	76.4
Segment Travel Time, minutes	1.06	Followers Density, followers/mi/ln	29.1
Vehicle LOS	E		

HCS7 Two-Lane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Arnold Road and Cedar Street - Existing	Unit	United States Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2534
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	35	Access Point Density, pts/mi	33.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1337	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	0.94	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.79

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	29.5
Speed Slope Coefficient	2.12656	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.40902	PF Power Coefficient	0.64109
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	40.2
%Improved % Followers	0.0	% Improved Avg Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2534	-	-	27.2

Vehicle Results

Average Speed, mi/h	27.2	Percent Followers, %	81.7
Segment Travel Time, minutes	1.06	Followers Density, followers/mi/ln	40.2
Vehicle LOS	E		

HCS7 Two-Lane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Arnold Road and Cedar Street - Projected 2028	Unit	United States Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2534
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	35	Access Point Density, pts/mi	33.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1094	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	0.94	Total Trucks, %	6.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.64

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	29.4
Speed Slope Coefficient	2.11934	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.40747	PF Power Coefficient	0.64092
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	31.1
%Improved % Followers	0.0	% Improved Avg Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2534	-	-	27.2

Vehicle Results

Average Speed, mi/h	27.2	Percent Followers, %	77.5
Segment Travel Time, minutes	1.06	Followers Density, followers/mi/ln	31.1
Vehicle LOS	E		

HCS7 Two-Lane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Arnold Road and Cedar Street - Projected 2028	Unit	United States Customary

Segment 1

Vehicle Inputs

Segment Type	Passing Constrained	Length, ft	2534
Lane Width, ft	12	Shoulder Width, ft	3
Speed Limit, mi/h	35	Access Point Density, pts/mi	33.0

Demand and Capacity

Directional Demand Flow Rate, veh/h	1405	Opposing Demand Flow Rate, veh/h	-
Peak Hour Factor	0.94	Total Trucks, %	2.00
Segment Capacity, veh/h	1700	Demand/Capacity (D/C)	0.83

Intermediate Results

Segment Vertical Class	1	Free-Flow Speed, mi/h	29.5
Speed Slope Coefficient	2.12656	Speed Power Coefficient	0.41674
PF Slope Coefficient	-1.40902	PF Power Coefficient	0.64109
In Passing Lane Effective Length?	No	Total Segment Density, veh/mi/ln	42.9
%Improved % Followers	0.0	% Improved Avg Speed	0.0

Subsegment Data

#	Segment Type	Length, ft	Radius, ft	Superelevation, %	Average Speed, mi/h
1	Tangent	2534	-	-	27.1

Vehicle Results

Average Speed, mi/h	27.1	Percent Followers, %	82.7
Segment Travel Time, minutes	1.06	Followers Density, followers/mi/ln	42.9
Vehicle LOS	E		

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Cedar St & Stallion Hill Rd - Existing	Unit	United States Customary

Direction 1 Geometric Data

Direction 1	Eastbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	1.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	42.0		

Direction 1 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 1 Demand and Capacity

Volume(V) veh/h	1124	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	628
Total Trucks, %	5.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.35

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	39.9
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	15.7
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (f_A)	0.3		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	598	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.71
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	F

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Cedar St & Stallion Hill Rd - Existing	Unit	United States Customary

Direction 2 Geometric Data

Direction 2	Westbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	41.0		

Direction 2 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 2 Demand and Capacity

Volume(V) veh/h	695	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	388
Total Trucks, %	5.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.22

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.9
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	10.0
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	1.3		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	370	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.47
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Cedar St & Stallion Hill Rd - Existing	Unit	United States Customary

Direction 1 Geometric Data

Direction 1	Eastbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	1.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	42.0		

Direction 1 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 1 Demand and Capacity

Volume(V) veh/h	994	Heavy Vehicle Adjustment Factor (f_{HV})	0.980
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	540
Total Trucks, %	2.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.30

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	39.9
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	13.5
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (f_A)	0.3		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	529	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.00
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Cedar St & Stallion Hill Rd - Existing	Unit	United States Customary

Direction 2 Geometric Data

Direction 2	Westbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	41.0		

Direction 2 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 2 Demand and Capacity

Volume(V) veh/h	1434	Heavy Vehicle Adjustment Factor (f_{HV})	0.980
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	778
Total Trucks, %	2.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.44

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.9
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	20.0
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	1.3		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	763	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.18
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

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Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Cedar St & Stallion Hill Rd - Projected 2028	Unit	United States Customary

Direction 1 Geometric Data

Direction 1	Eastbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	1.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	42.0		

Direction 1 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 1 Demand and Capacity

Volume(V) veh/h	1182	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	660
Total Trucks, %	5.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.37

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	39.9
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	16.5
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (f_A)	0.3		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	629	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.74
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	F

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Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Cedar St & Stallion Hill Rd - Projected 2028	Unit	United States Customary

Direction 2 Geometric Data

Direction 2	Westbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	41.0		

Direction 2 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 2 Demand and Capacity

Volume(V) veh/h	731	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	408
Total Trucks, %	5.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.23

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.9
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	10.5
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	1.3		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	389	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.49
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Cedar St & Stallion Hill Rd - Projected 2028	Unit	United States Customary

Direction 1 Geometric Data

Direction 1	Eastbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	1.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	42.0		

Direction 1 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 1 Demand and Capacity

Volume(V) veh/h	1045	Heavy Vehicle Adjustment Factor (f_{HV})	0.980
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	567
Total Trucks, %	2.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.32

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	39.9
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	14.2
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (f_A)	0.3		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	556	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.02
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

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Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Cedar St & Stallion Hill Rd - Projected 2028	Unit	United States Customary

Direction 2 Geometric Data

Direction 2	Westbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	5.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	41.0		

Direction 2 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 2 Demand and Capacity

Volume(V) veh/h	1507	Heavy Vehicle Adjustment Factor (f_{HV})	0.980
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	818
Total Trucks, %	2.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.46

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.9
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	21.0
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	1.3		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	802	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.21
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Stallion Hill Rd & Route 131 - Existing	Unit	United States Customary

Direction 1 Geometric Data

Direction 1	Eastbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	6.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	40.7		

Direction 1 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 1 Demand and Capacity

Volume(V) veh/h	1227	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	686
Total Trucks, %	5.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.38

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.7
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	17.7
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (f_A)	1.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	653	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.76
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	F

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
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Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Stallion Hill Rd & Route 131 - Existing	Unit	United States Customary

Direction 2 Geometric Data

Direction 2	Westbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	8.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	40.2		

Direction 2 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 2 Demand and Capacity

Volume(V) veh/h	602	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	336
Total Trucks, %	5.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.19

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.2
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	8.8
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	2.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	320	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.40
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

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Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Stallion Hill Rd & Route 131 - Existing	Unit	United States Customary

Direction 1 Geometric Data

Direction 1	Eastbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	6.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	40.7		

Direction 1 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 1 Demand and Capacity

Volume(V) veh/h	1229	Heavy Vehicle Adjustment Factor (f_{HV})	0.980
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	667
Total Trucks, %	2.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.37

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.7
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	17.2
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	B
Access Point Density Adjustment (f_A)	1.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	654	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.11
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

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Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Stallion Hill Rd & Route 131 - Existing	Unit	United States Customary

Direction 2 Geometric Data

Direction 2	Westbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	8.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	40.2		

Direction 2 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 2 Demand and Capacity

Volume(V) veh/h	1310	Heavy Vehicle Adjustment Factor (f_{HV})	0.980
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	711
Total Trucks, %	2.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.40

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.2
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	18.6
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	2.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	697	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.14
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

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Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Stallion Hill Rd & Route 131 - Projected 2028	Unit	United States Customary

Direction 1 Geometric Data

Direction 1	Eastbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	6.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	40.7		

Direction 1 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 1 Demand and Capacity

Volume(V) veh/h	1289	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	720
Total Trucks, %	5.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.40

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.7
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	18.6
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	1.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	686	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.78
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	F

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	AM
Project Description	Between Stallion Hill Rd & Route 131 - Projected 2028	Unit	United States Customary

Direction 2 Geometric Data

Direction 2	Westbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	8.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	40.2		

Direction 2 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 2 Demand and Capacity

Volume(V) veh/h	633	Heavy Vehicle Adjustment Factor (f_{HV})	0.952
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	354
Total Trucks, %	5.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.20

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.2
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	9.3
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	A
Access Point Density Adjustment (f_A)	2.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	337	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.42
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Stallion Hill Rd & Route 131 - Projected 2028	Unit	United States Customary

Direction 1 Geometric Data

Direction 1	Eastbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	6.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	40.7		

Direction 1 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 1 Demand and Capacity

Volume(V) veh/h	1292	Heavy Vehicle Adjustment Factor (f_{HV})	0.980
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	702
Total Trucks, %	2.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.39

Direction 1 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.7
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	18.1
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	1.5		

Direction 1 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	687	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.13
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

HCS7 Multilane Highway Report

Project Information

Analyst	KK	Date	7/31/2019
Agency	CMRPC	Analysis Year	2019
Jurisdiction	Sturbridge	Time Period Analyzed	PM
Project Description	Between Stallion Hill Rd & Route 131 - Projected 2028	Unit	United States Customary

Direction 2 Geometric Data

Direction 2	Westbound		
Number of Lanes (N), ln	2	Terrain Type	Level
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	45.0	Access Point Density, pts/mi	8.0
Lane Width, ft	12	Left-Side Lateral Clearance (LC_R), ft	1
Median Type	Divided	Total Lateral Clearance (TLC), ft	2
Free-Flow Speed (FFS), mi/h	40.2		

Direction 2 Adjustment Factors

Driver Population	Balanced Mix	Final Speed Adjustment Factor (SAF)	0.950
Driver Population SAF	0.950	Final Capacity Adjustment Factor (CAF)	0.939
Driver Population CAF	0.939		

Direction 2 Demand and Capacity

Volume(V) veh/h	1377	Heavy Vehicle Adjustment Factor (f_{HV})	0.980
Peak Hour Factor	0.94	Flow Rate (V_p), pc/h/ln	748
Total Trucks, %	2.00	Capacity (c), pc/h/ln	1900
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	1784
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.42

Direction 2 Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	38.2
Total Lateral Clearance Adj. (f_{LLC})	2.8	Density (D), pc/mi/ln	19.6
Median Type Adjustment (f_M)	0.0	Level of Service (LOS)	C
Access Point Density Adjustment (f_A)	2.0		

Direction 2 Bicycle LOS

Flow Rate in Outside Lane (v_{OL}),veh/h	732	Effective Speed Factor (S_t)	3.84
Effective Width of Volume (W_v), ft	13	Bicyle LOS Score (BLOS)	5.16
Average Effective Width (W_e), ft	13	Bicycle Level of Service (LOS)	E

Route 20 @ Route 148 & Holland Road
Proposed Roundabout Analysis

HCS7 Roundabouts Report

General Information

Analyst	KK
Agency or Co.	CMRPC
Date Performed	10/1/2019
Analysis Year	2019
Time Analyzed	AM
Project Description	Route 20 Corridor Profile

Site Information

Intersection	Rt 20/Rt 148/Holland Rd
E/W Street Name	Route 20
N/S Street Name	Route 148/Holland Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Sturbridge

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	24	461	2	0	21	197	325	0	6	44	68	0	465	21	38
Percent Heavy Vehicles, %	3	5	5	5	3	5	5	5	3	5	5	5	3	5	5	5
Flow Rate (v_{PCE}), pc/h	0	27	526	2	0	24	225	371	0	7	50	78	0	531	24	43
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		555			620			135			598	
Entry Volume, veh/h		529			590			129			570	
Circulating Flow (v_c), pc/h	579			84			1084			256		
Exiting Flow (v_{ex}), pc/h	1135			275			448			50		
Capacity (c_{pce}), pc/h		765			1267			457			1063	
Capacity (c), veh/h		728			1206			435			1012	
v/c Ratio (x)		0.73			0.49			0.30			0.56	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		20.5			8.3			13.2			10.8	
Lane LOS		C			A			B			B	
95% Queue, veh		6.3			2.8			1.2			3.6	
Approach Delay, s/veh	20.5			8.3			13.2			10.8		
Approach LOS	C			A			B			B		
Intersection Delay, s/veh | LOS	13.0						B					

HCS7 Roundabouts Report

General Information

Analyst	KK
Agency or Co.	CMRPC
Date Performed	10/1/2019
Analysis Year	2019
Time Analyzed	PM
Project Description	Route 20 Corridor Profile

Site Information

Intersection	Rt 20/Rt 148/Holland Rd
E/W Street Name	Route 20
N/S Street Name	Route 148/Holland Rd
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Sturbridge

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Lane Assignment			LTR				LTR				LTR				LTR	
Volume (V), veh/h	0	46	335	6	0	81	505	509	0	11	39	63	0	324	54	37
Percent Heavy Vehicles, %	3	2	2	2	3	2	2	2	3	2	2	2	3	2	2	2
Flow Rate (v_{PCE}), pc/h	0	51	371	7	0	90	560	564	0	12	43	70	0	359	60	41
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1				1				1				1			
Pedestrians Crossing, p/h	0				0				0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763			4.9763			4.9763			4.9763	
Follow-Up Headway (s)		2.6087			2.6087			2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		429			1214			125			460	
Entry Volume, veh/h		421			1190			123			451	
Circulating Flow (v_c), pc/h	509			106			781			662		
Exiting Flow (v_{ex}), pc/h	800			613			658			157		
Capacity (c_{pce}), pc/h		821			1239			622			702	
Capacity (c), veh/h		805			1214			610			689	
v/c Ratio (x)		0.52			0.98			0.20			0.65	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		11.9			39.8			8.4			17.9	
Lane LOS		B			E			A			C	
95% Queue, veh		3.1			19.7			0.7			4.9	
Approach Delay, s/veh	11.9			39.8			8.4			17.9		
Approach LOS	B			E			A			C		
Intersection Delay, s/veh | LOS	28.1						D					

Route 20 @ Fairground Road & Route 131
Proposed Roundabout Analysis

HCS7 Roundabouts Report

General Information

Analyst	KK
Agency or Co.	CMRPC
Date Performed	10/1/2019
Analysis Year	2019
Time Analyzed	AM
Project Description	Route 20 Corridor Profile

Site Information

Intersection	Route 20/Route 131
E/W Street Name	Route 20
N/S Street Name	Route 131
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Sturbridge

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	1	1	0	0	1	0	1	0	0	0	0
Lane Assignment	T		R		L		T		L		R					
Volume (V), veh/h	0		744	470	0	205	402		0	324		242				
Percent Heavy Vehicles, %	3		5	5	3	5	5		3	5		5				
Flow Rate (v_{PCE}), pc/h	0		849	536	0	234	459		0	370		276				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				2							
Pedestrians Crossing, p/h	0				0				0							

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276		4.6453	4.3276		4.6453	4.3276				
Follow-Up Headway (s)	2.6667	2.5352		2.6667	2.5352		2.6667	2.5352				

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	849	536		234	459		370	276				
Entry Volume, veh/h	809	510		223	437		352	263				
Circulating Flow (v_c), pc/h	234			370			849			1063		
Exiting Flow (v_{ex}), pc/h	1125			829			0			770		
Capacity (c_{pce}), pc/h	1089	1164		960	1037		618	690				
Capacity (c), veh/h	1037	1108		915	987		589	657				
v/c Ratio (x)	0.78	0.46		0.24	0.44		0.60	0.40				

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	18.4	8.3		6.4	8.7		17.8	11.1				
Lane LOS	C	A		A	A		C	B				
95% Queue, veh	8.2	2.5		1.0	2.3		3.9	1.9				
Approach Delay, s/veh	14.5			7.9			14.9					
Approach LOS	B			A			B					
Intersection Delay, s/veh | LOS	12.9						B					

HCS7 Roundabouts Report

General Information

Analyst	KK
Agency or Co.	CMRPC
Date Performed	10/1/2019
Analysis Year	2019
Time Analyzed	PM
Project Description	Route 20 Corridor Profile

Site Information

Intersection	Route 20/Route 131
E/W Street Name	Route 20
N/S Street Name	Route 131
Analysis Time Period (hrs)	0.25
Peak Hour Factor	0.92
Jurisdiction	Sturbridge

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	1	0	1	1	0	0	1	0	1	0	0	0	0
Lane Assignment	T		R		L		T		L		R					
Volume (V), veh/h	0		678	478	0	266	1113		0	564		229				
Percent Heavy Vehicles, %	3		2	2	3	2	2		3	2		2				
Flow Rate (v_{PCE}), pc/h	0		752	530	0	295	1234		0	625		254				
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	2				2				2							
Pedestrians Crossing, p/h	0				0				0							

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)	4.6453	4.3276		4.6453	4.3276		4.6453	4.3276				
Follow-Up Headway (s)	2.6667	2.5352		2.6667	2.5352		2.6667	2.5352				

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h	752	530		295	1234		625	254				
Entry Volume, veh/h	737	520		289	1210		613	249				
Circulating Flow (v_c), pc/h	295			625			752			2154		
Exiting Flow (v_{ex}), pc/h	1006			1859			0			825		
Capacity (c_{pce}), pc/h	1029	1105		760	835		676	749				
Capacity (c), veh/h	1009	1083		745	818		663	735				
v/c Ratio (x)	0.73	0.48		0.39	1.48		0.92	0.34				

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh	16.2	8.7		9.8	237.4		43.6	9.1				
Lane LOS	C	A		A	F		E	A				
95% Queue, veh	6.8	2.7		1.8	56.9		12.4	1.5				
Approach Delay, s/veh	13.1			193.5			33.6					
Approach LOS	B			F			D					
Intersection Delay, s/veh | LOS	92.8						F					

Central Massachusetts Regional Planning Commission

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Central Mass Regional Planning Commission

1 Mercantile Street, Suite 520
Worcester, MA 01608