

## Church Hill Road Speed Study

### Introduction

The Town of Charlotte requested the Chittenden County Regional Planning Commission (CCRPC) staff to conduct a speed study on Church Hill Road between US 7 and Hinesburg Road. As per the latest Motor Vehicle and Traffic Regulation ordinance adopted by the Town, no speed limit was adopted for Church Hill Road within the study area. In order for a Legislative Body to determine a safe and reasonable speed on town highways, a traffic engineering investigation (speed study) is required by the Vermont Statutes Annotated Title 23, § 1007. This document provides supporting findings that were used to develop recommendations for setting a speed limit on Church Hill Road.

### Existing Conditions

Church Hill Road is paved and classified by the state as a Class II Town Highway and functionally classified as a Rural Minor Collector. The CCRPC installed three Automatic Traffic Recorders (ATR) along Church Hill Road at locations shown in Figure 1 to collect traffic volume and speed data. Data were collected between May 07, 2019 to May 13, 2019. Figure 1 shows the study area and ATR locations.



**Figure 1: Study Area and ATR Locations**

## **Findings of Windshield Survey**

A windshield reconnaissance survey was conducted in both travel directions on Church Hill Road by the team to identify safety related issues, roadway characteristics, limited sight distance locations and roadside safety hazards. The following is a list of findings from the windshield survey:

1. The roadway width varies between 20 and 22 ft. The typical travel lane width along Church Hill Road is 10 ft.
2. Shoulders are not marked along the road, however, a narrow gravel shoulder is present intermittently along the study area.
3. No posted speed limit within the study area.
4. Some driveways located along the roadway section are obscured due to roadside vegetation.

## **Crash History and Analysis**

There was one crash reported, near 1091 Church Hill Road, in the last 5 years (2014 – 2019) on Church Hill Road. The crash was reported as a single vehicle property damage crash and occurred in December 2014 on a clear day. The contributing factor for the crash was reported as failure to keep in proper lane.

## **Speed Data Analysis**

The average 85<sup>th</sup> percentile speed for both directions of travel associated with the traffic counts at Locations A, B and C are observed as 44, 43 and 43 mph, respectively. Statutory speed limit for Church Hill Road is not posted. This indicates that 85 percent of drivers are comfortable driving at an operating speed of 44 mph or less along the study corridor.

A widely used metric in setting speed limits is the 85<sup>th</sup> percentile speed. This is defined as the speed in which 85% of motorists are traveling at or below. Based on the best available evidence and previous research, speed limits set using the 85<sup>th</sup> percentile speed data are not only acceptable by the majority of motorists, but also fall within the speed range where crash risk is lowest<sup>1</sup>. The Manual on Uniform Traffic Control Devices (MUTCD), which is adopted as the standard for all traffic control devices in Vermont (Title 23 V.S.A. Section 1025), recommends setting speed limits within 5 mph of the 85<sup>th</sup> percentile speed while taking into consideration other factors such as roadway characteristics, shoulder condition, grade, the speed pace, land uses, development setbacks, parking, crash history, and bicycle/pedestrian activity.

### Pedestrian Activity Factor

As mentioned above, other factors should be considered in determining a safe and reasonable speed limit. There were no severe crashes within the reporting period and parking along Church Hill Road is not allowed within the study area. Based on research work in other states, the prevailing speeds may be reduced by 5 percent when the total pedestrian traffic exceeds 10 people per hour for any three hours within any eight-hour period. Pedestrian volume data are not available for the study area. There are neither pedestrian traffic generators nor pedestrian facilities along the study area. From general observation of the study area and anecdotal information, it can be concluded that no significant pedestrian volume exists in the study area and does not exceed 10 people per hour for any three hours in a day.

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<sup>1</sup> Synthesis of Speed Zoning Practice, FHWA-RD-85-096, Technical Summary.

USLIMITS2

The Federal Highway Administration (FHWA) developed a web based tool, called USLIMITS2, to assist practitioners in determining reasonable, safe and consistent speed limits for specific segments of roads. FHWA disclaimer: “This tool does not constitute a standard, specification or regulation”<sup>2</sup>.

With the given roadway conditions, traffic volume, 85<sup>th</sup> percentile speed, crash data, on-street parking and pedestrian activity, the USLIMITS2 tool recommends setting 45 mph speed limit for Church Hill Road. See the USLIMITS2 report in Appendix A.

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<sup>2</sup> <https://safety.fhwa.dot.gov/uslimits/index.cfm>

**Table 1: Technical Summary**

Municipality:	Town of Charlotte
Road Name:	Church Hill Road
Location:	Between US 7 and Hinesburg Road
Recommended Speed Limit:	<b>40 mph</b>
Evaluation By:	Sai Sarepalli, P.E. Transportation Planning Engineer
<b>Final Report Document Date:</b>	<b>07/31/2019</b>

85th Percentile Speed (mph):	<p style="text-align: center;"><b>Location A:</b>  <b>46 MPH:</b> Northbound  <b>43 MPH:</b> Southbound  <b>Location B:</b>  <b>46 MPH:</b> Northbound  <b>41 MPH:</b> Southbound  <b>Location C:</b>  <b>43 MPH:</b> Northbound  <b>43 MPH:</b> Southbound</p>
10 mph Pace Speed (mph) & Percentage in the range	<p style="text-align: center;"><b>Location A:</b>  <b>36-45 MPH:</b> Northbound (62.5%)  <b>31-40 MPH:</b> Southbound (59.6%)  <b>Location B:</b>  <b>36-45 MPH:</b> Northbound (53.0 %)  <b>31-40 MPH:</b> Southbound (60.4%)  <b>Location C:</b>  <b>36-45 MPH:</b> Northbound (60.6%)  <b>36-45 MPH:</b> Southbound (56.5%)</p>
Average Test Car Speed (mph)	<b>40 MPH</b>
Safety problem related to speed:	Motorists driving at excessive speeds along curves can pose safety hazard
Average Daily Traffic (Vehicles per Day)	<p style="text-align: center;"><b>Location A: 508</b>  <b>Location B: 457</b>  <b>Location C: 446</b></p>
Town Highway and Functional Classification	Class II Town Highway - Rural Minor Collector
Road Surface	Paved
Road Width	Varies between 20 and 22 ft.
Shoulder Surface	Gravel
Shoulder Width	0 ft to 1 ft
Parking	No Parking
Pedestrian/Bicycles	No marked bike lanes
Adjacent Land use	Residential and Agricultural

## **Conclusion and Recommendations**

Church Hill Road along the study area is fairly a straight section with wide curves and exhibits steep grade for a section between Museum Road and Hinesburg Road. As per the observed bidirectional 85<sup>th</sup> percentile speed data, majority of drivers are traveling at or below 44 mph speed. Depending on the traffic volume, 85<sup>th</sup> percentile speed and crash data, the USLIMITS2 analysis recommended a 45 mph speed limit for this road section, however, other factors such as lack of proper shoulder widths, road side development and land use characteristics, and occasional presence of pedestrians and bikers along the road should be considered in setting a reasonable speed limit. Based on the above stated observations, **it is recommended to set a speed limit of 40 mph for the study area and adopt it into the Town's Motor Vehicle and Traffic Regulations ordinance.**

It is recommended the Town consider implementing traffic calming measures such as speed feedback radar signs on poles and optical speed bars at appropriate locations to warn and slow motorists traveling on Church Hill Road. Optical speed bars are a series of white rectangular pavement markings typically 1 foot wide placed just inside both edges of the lane and spaced progressively closer to create an illusion of traveling faster as well as the impression of narrower lane. See picture in Appendix B.

In addition, the Town should consider developing on-street bicyclist and pedestrian facilities such as widened shoulders with marked travel-edge line along Church Hill Road to facilitate occasional bicyclists and pedestrians.

Appendix A – USLIMITS2 Speed Zoning Report

# USLIMITS2 Speed Zoning Report

## Project Name: ChurchHillRoad\_SpeedStudy

**Analyst:** Sai Kumar Sarepalli

**Date:** 07-09-2019

### Basic Project Information

Route Name: 110 West Canal Street Ste 202  
From: US 7  
To: Hinesburg Road  
State: Vermont  
County: Chittenden County  
City: Rural  
Route Type: Road Section in Developed Area  
Route Status: Existing

### Crash Data Information

Crash Data Years: 5.00  
Crash AADT: 470 veh/day  
Total Number of Crashes: 1  
Total Number of Injury Crashes: 0  
Section Crash Rate: 111 per 100 MVM  
Section Injury Crash Rate: 0 per 100 MVM  
Crash Rate Average for Similar Roads: 292  
Injury Rate Average for Similar Roads: 72

### Roadway Information

Section Length: 1.05 mile(s)  
Statutory Speed Limit: None  
Existing Speed Limit: No Speed Limit mph  
Adverse Alignment: No  
One-Way Street: No  
Divided/Undivided: Undivided  
Number of Through Lanes: 2  
Area Type: Residential-Collector/Arterial  
Number of Driveways: 29  
Number of Signals: 0

### Traffic Information

85th Percentile Speed: 44 mph  
50th Percentile Speed: 37 mph  
AADT: 470 veh/day  
On Street Parking and Usage: Not High  
Pedestrian / Bicyclist Activity: Not High

**Project Description:** Church Hill Road Speed study

### Recommended Speed Limit:



**Disclaimer:** The U.S. Government assumes no liability for the use of the information contained in this report. This report does not constitute a standard, specification, or regulation.

### Equations Used in Crash Data Calculations

#### Exposure (M)

$$M = (\text{Section AADT} * 365 * \text{Section Length} * \text{Duration of Crash Data}) / (100000000)$$
$$M = (470 * 365 * 1.05 * 5.00) / (100000000)$$
$$M = 0.0090$$

#### Crash Rate (Rc)

$$Rc = (\text{Section Crash Average} * 100000000) / (\text{Section AADT} * 365 * \text{Section Length})$$
$$Rc = (0.20 * 100000000) / (470 * 365 * 1.05)$$
$$Rc = 111.03 \text{ crashes per 100 MVM}$$

#### Injury Rate (Ri)

$$Ri = (\text{Section Injury Crash Average} * 100000000) / (\text{Section AADT} * 365 * \text{Section Length})$$
$$Ri = (0.00 * 100000000) / (470 * 365 * 1.05)$$
$$Ri = 0.00 \text{ injuries per 100 MVM}$$

#### Critical Crash Rate (Cc)

$$Cc = \text{Crash Average of Similar Sections} + 1.645 * (\text{Crash Average of Similar Sections} / \text{Exposure})^{(1/2)} + (1 /$$

Appendix B – Traffic Calming Measures



Sample of Optical Speed Bars

*Photo Courtesy: [usatoday30.usatoday.com](http://usatoday30.usatoday.com)*



Sample of Speed Feedback Radar Sign

*Photo Courtesy: [www.radarsign.com](http://www.radarsign.com)*