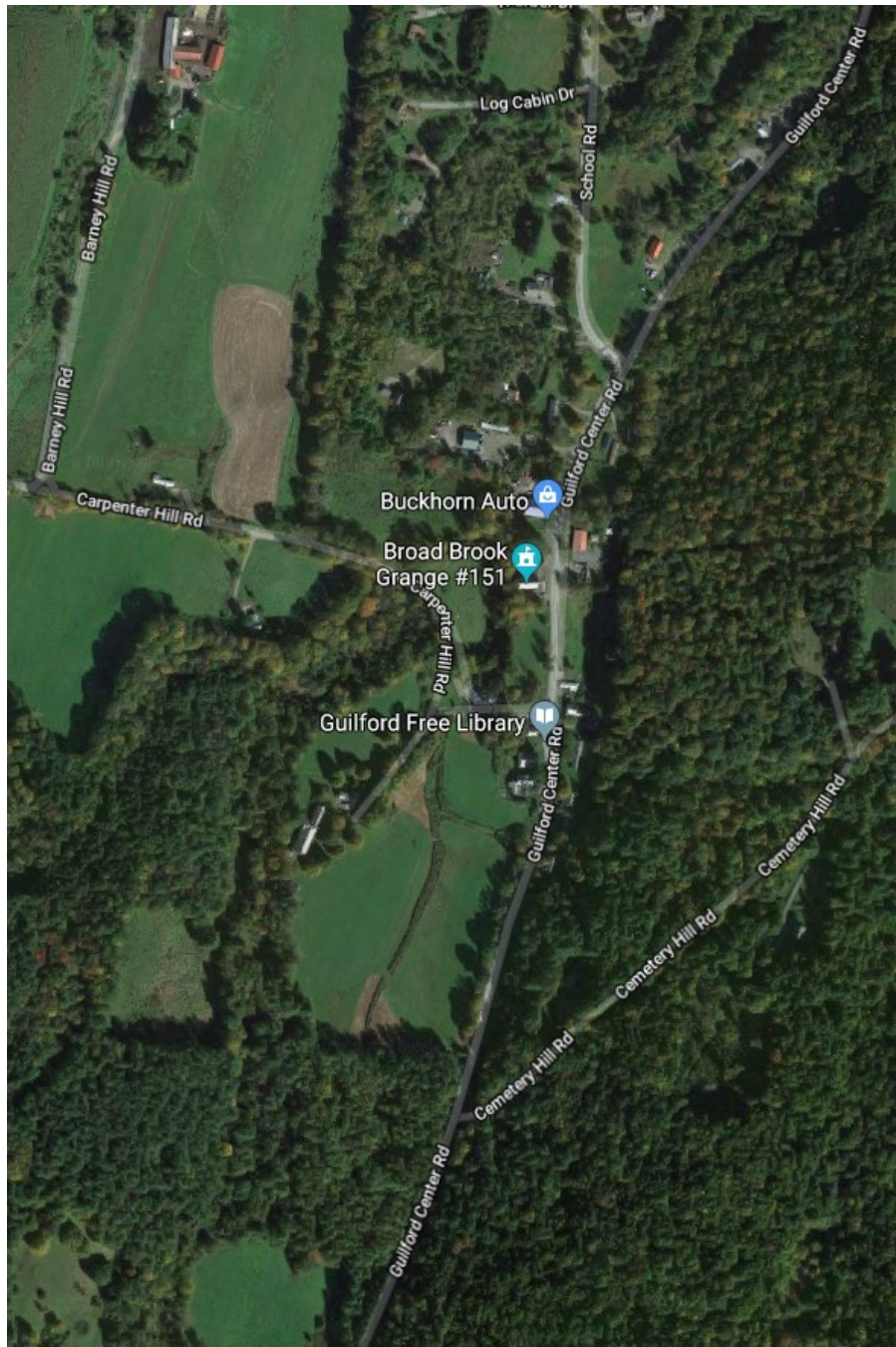


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Road Safety Audit Review

Town:	Guilford	Date Reviewed:	June 13, 2019
Route:	Guilford Center Road	Mile points:	~ 6.35 – 6.85

Location Map



Note: THIS DOCUMENT IS EXEMPT FROM DISCOVERY OR ADMISSION UNDER 23 U.S.C. 409

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RSAR Process

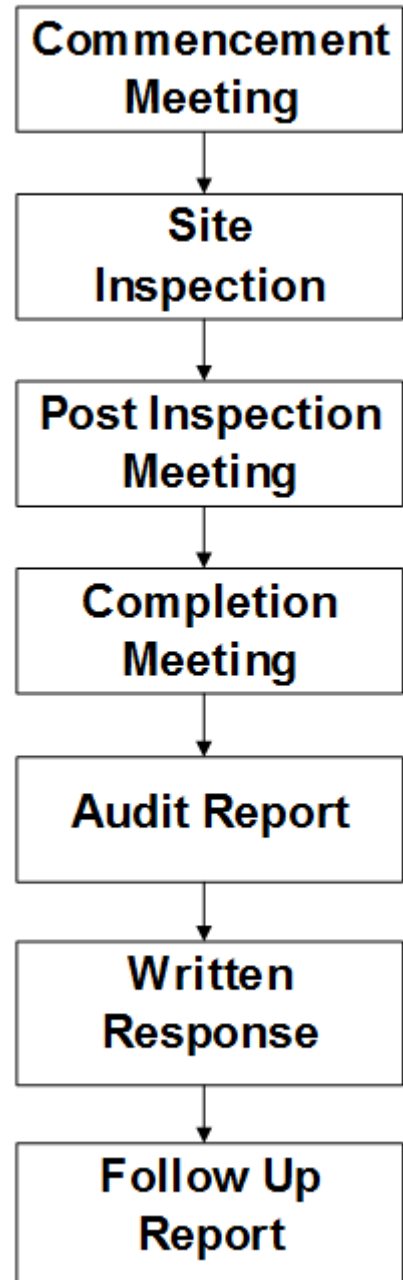
A Road Safety Audit Review (RSAR) is a formal examination of an existing road in which an independent, multi-discipline team (the Audit Team) reports on potential safety issues.

According to the Federal Highway Administration (FHWA), the purpose of a RSAR is to determine which elements of the road may present a safety concern, to what extent and under what circumstances as well as to identify opportunities to mitigate the identified safety concerns.

The RSAR process is composed of several steps as shown in Figure 1. The process starts with a Commencement Meeting during which the Audit Team reviews data and gathers community concerns. A Site Inspection is then performed by the Audit Team. The site visit involves the identification of safety deficiencies as seen in the field. The Audit Team will usually drive through the location of interest to “get a feel” for the area, traveling through each approach in the case of intersections. The team is to then drive at a slower speed to make observations. If needed, the team will also walk the location. Following the site inspection, the Audit Team holds a Post Inspection Meeting. It is during this meeting that the team members discuss their observations and identify safety issues. The team is to reach a consensus on the importance of each safety issue mentioned. Only those issues for which a consensus is reached are included in the RSAR findings. A RSAR report (Written Report) is prepared.

The Written Report identifies safety concerns and proposes guidance. These issues and solutions are presented in a tabular format associated to each Responsible Entity for ease of reporting. The Responsible Entities

Figure 1 - Road Safety Audit Process



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Road Safety Audit Review

are any groups who own a roadway feature or who are responsible for making an improvement or for initiating further studies. These could include for example, the VTrans design section, the local town, the local police or the local RPC.

Site for the RSAR

The location of this RSAR is an approximate 0.5-mile section of Guilford Center Road between School Road and Cemetery Hill Road, with the central point being at the intersection of Carpenter Hill Road in Guilford Center Village.

Purpose of the RSAR

This RSAR was conducted at the request of the Town of Guilford to address the following local concerns:

- Speeding through the village
- Lack of safe space for pedestrians and bicyclists
- Safety of students between the school and this corridor

The RSAR herein has sought to identify potential safety hazards and physical features which may affect road user safety. However, it is possible that not every deficiency has been identified. It should further be recognized that the implementation of the guidance in this report might contribute to improve the level of safety of the facility reviewed but not necessarily remove all the risks.

RSAR Participants

Mario Dupigny-Giroux from the Office of Highway Safety, VTrans, was the RSAR coordinator.

The other participants were:

Tyler Birchmore,	Dist 2, VTrans
Megan Brunk,	Dist 2, VTrans
Jon Kaplan,	Bike & Ped, VTrans
Marcos Miller,	Traffic Ops, VTrans
Bill Jerkins,	SHSO, VTrans

Christopher Buckley, VSP

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Sheila Morse, Selectboard Chair, Town of Guilford
Peder Rude, Town Administrator, Town of Guilford
Richard Wizansky, Selectboard, Town of Guilford
Dan Zumbroski, Road Commissioner, Town of Guilford

Chris Campany Windham Regional Commission

Laura Lawson Tucker, Resident

Information Reviewed

Land Use

This section of Guilford Center Road is located in Guilford Center Village. Two important public buildings are the Guilford Free Library and the Broad Brook Community Center.

The Guilford Free Library is located at 4024 Guilford Center Road. It opens four days a week on the following days and times: Tuesday, 9:30 am – 6 pm; Wednesday, 1 pm – 8 pm; Thursday, 3 pm – 6 pm; Saturday, 9:30 am – 3 pm.

The Broad Brook Community Center is located in the Broad Brook Grange at 3940 Guilford Center Rd. It offers a number of social events to the community and is also available for rental.

A parcel use map of Guilford Center Village can be found in Appendix B.

Geometry

Guilford Center Road is a two-lane road with a roadway width of twenty-two feet.

Speed

The 2017 traffic ordinance indicates that due to a thickly settled area with pedestrian, bicycle and horseback riders, and historical buildings, the speed limit is 35 mph on Guilford Center Road starting at a distance of 3.7 miles from the junction of SH 5 Coolidge Highway westerly to a distance of 4.5 miles.

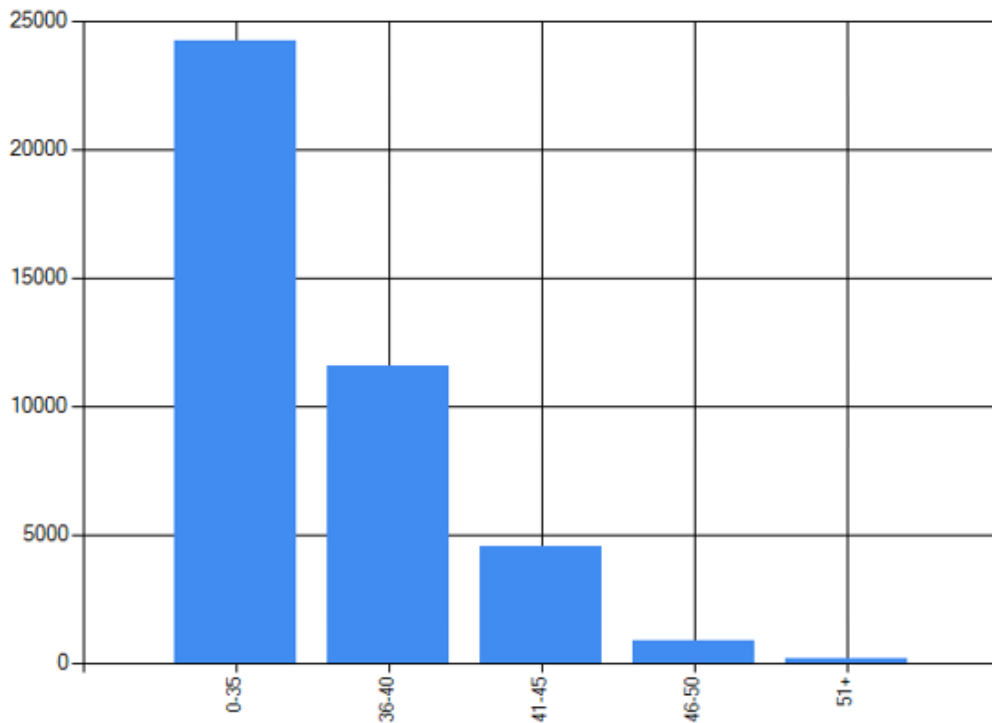
The traffic ordinance also stipulates that, due to the results of traffic studies done by Windham Regional Commission, the speed limit is 45 mph starting at a distance of 4.1 miles from SH 5

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Coolidge Highway to the end of Guilford Center Road at the “Y” intersection of Sweet Pond Road and Stage Road.

The Town of Guilford provided speed data for this road safety audit from a radar speed cart that was placed near the Broad Brook Grange by the Vermont State Police between June 7 and August 8, 2018, to capture speeds from vehicles traveling southbound.



The graph shown above displays the distribution of vehicles by speed ranges. The data shows that the speed that 85% of the traffic travels at in the southbound direction (85th percentile speed) was 40 mph and that the highest speed recorded was 83 mph.

It was reported during the commencement meeting that school buses were observed to be traveling above the speed limit. It was also mentioned that some local businesses were speeding through the village and that these businesses had been contacted by the Town (but without change in behavior).

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Road Safety Audit Review

Traffic Data

The 2009 Average Annual Daily Traffic (AADT) just north of Carpenter Hill Road was 810 vehicles per day. The 2009 AADT is the latest available known traffic data for this area.

Anecdotally, it was reported during the commencement meeting that during the summer, the Guilford Free Library offers three one-week summer camps in July and August and that during those times, children walk between the library and the community center. Most of the time, this is done through the field (if the grass is not too tall).

Traffic Control Devices

The traffic signs in the area of concern are related to the 35 mph speed zone. In the southbound direction, there is a Reduced Speed Limit Ahead - 35 mph sign (W3-5) north of School Street followed by an oversized 35 mph Speed Limit sign (R2-1). Traveling northbound, there is a Speed Zone Ahead¹ sign just south of Cemetery Road followed by a 35 mph Speed Limit sign (R2-1).

Pictures of the existing sign signage obtained from VTrans in summer 2018 are displayed in Appendix C.

Past Projects

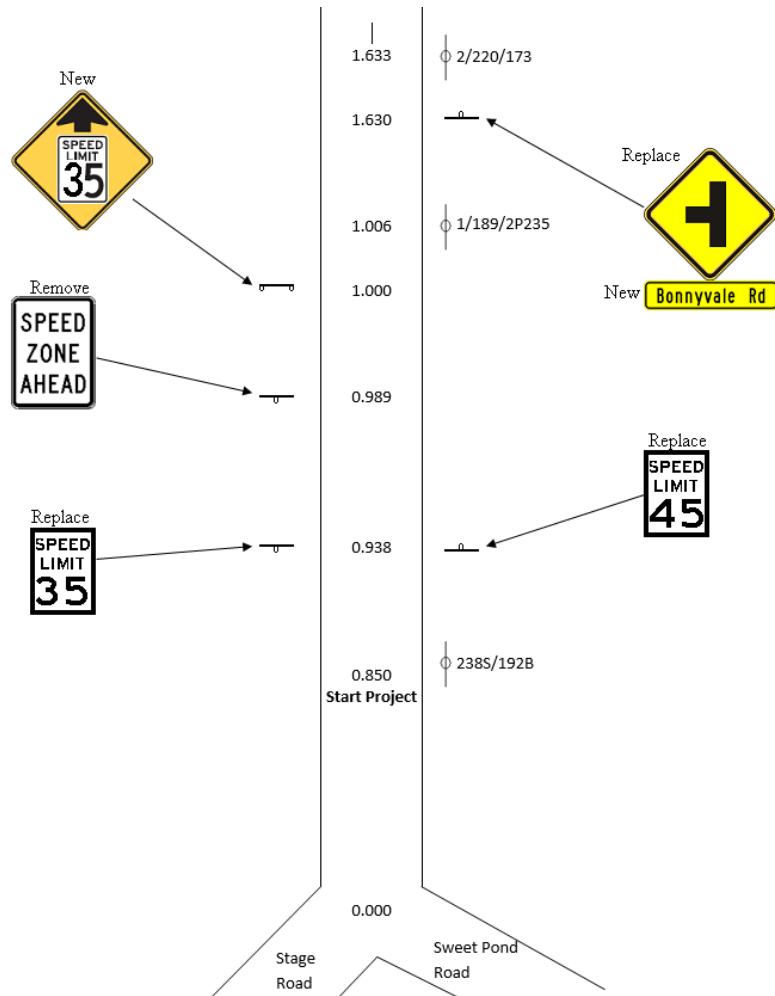
STP HRRR(23) was a VTrans project from the High Risk Rural Roads Program for the installations of signs on Guilford Center Road starting from Sweet Pond Road. The work done in the area of the road safety audit per this project is shown in the layout below. The work was completed during construction season 2018.

In 2016, the Selectboard minutes from the 8/22/2016 meeting indicate that the northbound 35 mph speed limit sign before the village was moved north of Cemetery Hill Rd to bring the 35 mph zone closer to the village.

¹ The Speed Zone Ahead sign is no longer supported by the Manual on Uniform Traffic Devices. Its usage was replaced by the warning sign W3-5, Reduced Speed Limit Ahead with the appropriate speed limit displayed.

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Road Safety Audit Review



Future Projects

There are no known projects.

Crash History

There have been two crashes reported in this section of road since 2010.

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Both crashes were reported in 2011. In one case, the operator was making a left turn onto School Road and lost control. The other case happened just north of School Road at driveway 3644. In this case, a plow operator was backing out of the driveway and got hit by a southbound vehicle.

The crash narratives can be reviewed in Appendix D.

Identified Safety Concerns

The areas of safety concern identified by the audit team along with the potential safety enhancements suggested by the team are summarized in the table below. These concerns and remedial actions are further discussed in the section following the table.

In the table, the entities listed under the column called "Potential Responsibility" are suggested groups that could possibly implement some of the countermeasures.

In formulating suggested remedial actions, time frames and costs were qualified as follows: Short term, < 1 year; mid-term 1-3 years; long term > 3 years; low cost, < \$15,000; medium cost, \$15,001 - \$75,000; high cost, > \$ 75,001.

The following safety concerns were identified by the audit team (the concerns are not necessarily listed in order of importance):

1. There is evidence of speeding through the village
2. There is a lack of safe space for pedestrians and bicyclists
3. The view to Carpenter Hill Road is hidden when traveling southbound
4. Some stop signs are faded or missing
5. There is no centerline break at the Cemetery Hill Road Intersection

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Road Safety Audit Review

Potential Safety Enhancements Summary Table										
	Safety Concerns						Potential Responsibility	Safety Payoff ²	Time Frame	Cost
Safety Enhancement	1	2	3	4	5					
Replace the NB Speed Zone Ahead sign with a W3-5 Reduce Speed Limit Ahead Sign	X						Town		Now to Short	Low
Increase the size of the NB 35 mph Speed Limit sign	X						Town		Now to Short	Low
Install a reminder speed limit sign midway in both directions	X						Town		Now to Short	Low

² The CMF Clearinghouse explains that the star quality rating indicates the quality or confidence in the results of the study producing the CMF. The star rating is based on a scale (1 to 5), where a 5 indicates the highest or most reliable rating. The review process considers five categories for each study: study design, sample size, standard error, potential bias, and data source.

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Road Safety Audit Review

Potential Safety Enhancements Summary Table

Safety Enhancement	Safety Concerns						Potential Responsibility	Safety Payoff ²	Time Frame	Cost
	1	2	3	4	5					
Consider seasonal lane narrowing	X						Town	22-57% reduction in % of vehicles traveling 10 or 15 mph over speed limit ³	Short	Low
Consider Village Signs	X						Town	average of 5 mph reduction in mean speed ⁴	Short	Low
Consider a Speed Radar Feedback sign	X						Town	10-73% reduction in % of vehicles traveling 5 and 10 mph over the speed limit ⁵	Short	Low

³ https://safety.fhwa.dot.gov/speedmgt/ref_mats/ePrimer_modules/module6.cfm#mod64

⁴ https://safety.fhwa.dot.gov/speedmgt/ref_mats/ePrimer_modules/module5.cfm#mod52

⁵ https://safety.fhwa.dot.gov/speedmgt/ref_mats/ePrimer_modules/module5.cfm#mod52

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Potential Safety Enhancements Summary Table										
	Safety Concerns						Potential Responsibility	Safety Payoff ²	Time Frame	Cost
Safety Enhancement	1	2	3	4	5					
Delineate a pedestrian zone		X					Town		Now to Short	Low
Continue Speed Enforcement	X						Town		Ongoing	Low to Med
Conduct a pedestrian facility study ⁶		X					Town (with WRC)		Now to Mid	Low to Med
Relocate the Carpenter street name sign to the north side			X				Town		Short	Low
Consider adding a side road sign			X				Town		Short	Low

⁶ The application deadline for the upcoming round of VTrans bike/ped grants is June 28, 2019 and could be used for this purpose (<https://vtrans.vermont.gov/highway/local-projects/bike-ped>)

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Road Safety Audit Review

Potential Safety Enhancements Summary Table										
Safety Enhancement	Safety Concerns						Potential Responsibility	Safety Payoff ²	Time Frame	Cost
	1	2	3	4	5					
Replace the stop sign on Carpenter Hill. Install a new stop sign on Cemetery Hill				X			Town		Now	Low
Make a note to create a centerline break at Cemetery Hill Rd the next time the centerline is painted					X		VTrans Paint Shop		Done ⁷	Low

⁷ The double yellow centerline was recently painted and a centerline break was created (07/15/2019).

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Potential Safety Enhancements Summary Table										
	Safety Concerns						Potential Responsibility	Safety Payoff ²	Time Frame	Cost
Safety Enhancement	1	2	3	4	5					
Revive a discussion with area business owners about consequences of high speeds (even a small change in speed in the order of 3 miles per hour can reduce the severity of a crash)	X						Town		Now to Short	Low

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Note that a layout of potential signage improvements is provide in Appendix A.

Concern 1: There is evidence of speeding through the village

Traveling Speeds are high given the context. The current posted speed limit is 35 mph. The 85th percentile speed in the southbound direction is 40 mph. The distribution of those traveling above 40 mph indicates that most drivers travel at speeds between 41 and 45 mph but that there are cases in excess of this range. Pedestrians (and especially school-age children) are walking along the road. It is known from research that the risk of serious injury to this group of users increases with higher speeds.

Research has also shown that most motorists drive at speeds that are comfortable to them based on the surroundings. In the current situation, there is no change in character as one approaches and travels through Guilford Center Village.

Safety Enhancements:

Ongoing

- Continue Speed Enforcement

Immediate to Short Term

- Replace the NB Speed Zone Ahead sign with a Reduce Speed Limit Ahead Sign (W3-5)
- Increase the size of the NB 35 mph Speed Limit sign (R2-1) from 18" x 24" to 30" x 36" to improve awareness of the beginning of the 35 mph speed zone
- Install a reminder speed limit sign midway in each direction (use the standard size 24" x 30")

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Short Term

- Consider seasonal lane narrowing by using removable traffic control devices such as in the example below to create a sense of narrowed lanes and to provide additional awareness of the transition zone.

The devices would be installed beginning at the Reduce Speed Limit Ahead sign in each direction. The devices would be removed during snow season months to permit for winter maintenance.

A study in Iowa showed that 85th percentile speeds decreased by 1 and up to 3 mph and that there was a sustained reduction in the percentage of vehicles traveling 10 or 15 mph over the posted speed limit (up to 22- 50 percent for 10 mph and 25 to 57 percent for 15 mph).



- Consider the installation of village signs (gateway signs)

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- Manage speeds approaching the village by using a speed radar feedback sign (make it portable and switch locations at either end. The speed radar feedback sign should be installed next to a speed limit sign).
- A representative from the Town should revive a discussion with area business owners about the consequences of high speeds and explain that even a small change in speed in the order of 3 miles per hour can reduce the severity of a crash.

The following video explains that this is the case because when we brake, half of our speed is being reduced in the last moment of braking as illustrated in the graph⁸. In this video, the speed is referred to in kilometers

https://www.youtube.com/watch?v=SuY_VHzKdjC.

This second video shows the effect that traveling 3 miles per hour slower has when colliding with a pedestrian

<https://www.youtube.com/watch?v=XUXJ6ky69kI> (this video is graphic but it illustrates very well the resulting difference in severity impact. Speeds are also in kilometers).



Concern 2: There is a lack of safe space for pedestrians and bicyclists

The roadway width on Guilford Center Road is twenty-two feet.

Safety Enhancements:

Immediate to Short Term

- Delineate a pedestrian zone by installing at each end a pedestrian assembly composed of a pedestrian sign (W11-2, 30" x 30") with either a NEXT1500 FT plaque (W16-4P, 30" x 24") or a STAY ALERT sign (State of Vermont code VW-249P, 24" x 18"). Use fluorescent yellow-green sheeting.

⁸ For example, a car travelling at 37 mph will take about 145 feet to come to a complete stop. Another car braking from 40 mph will still be traveling at about 20 mph.

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Road Safety Audit Review

Short to Mid Term

- Conduct a pedestrian facility study to determine how to provide walkable space for pedestrians. A VTrans bike/ped grant could be used for this purpose. These grants are available every year and applications are usually due in June. The current application deadline for the upcoming round is June 28, 2019 (<https://vtrans.vermont.gov/highway/local-projects/bike-ped>).

Concern 3: The view to Carpenter Hill Road is hidden when traveling southbound

Trees are currently obscuring Carpenter Hill Rd when traveling southbound. In addition, when traveling northbound, the street name sign is obscured by the utility pole. These issues are illustrated in the picture below.



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Safety Enhancements:

Immediate to Short Term

- Consider installing a side road warning sign (W2-2R, 30" x 30"). Additionally, consider supplementing this sign with a "Carpenter Hill Rd" advance street name plaque (W16-8p)
- Relocate the "Carpenter Hill Rd" street name sign from the southerly side of the intersection, adjacent and obscured by the utility pole, to the northerly side of the intersection, adjacent to the concrete highway marker

Concern 4: Some stop signs are faded or missing

It was observed during the conduct of the road safety audit that the stop sign on Carpenter Hill Road was faded and that a stop sign on Cemetery Hill Road was missing.

The 2017 traffic ordinance mentions that the intersection of TH 22 Cemetery Hill Road entering TH 1 Guilford Center Road and the intersection of TH18 Carpenter Hill Rd entering TH 1 Guilford Center Road are designated as "STOP" intersections and that they shall be signed accordingly.

Safety Enhancements:

Immediate

- Replace the stop sign on Carpenter Hill
- Install a stop sign on Cemetery Hill

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Concern 5: There is no Centerline Break at the Cemetery Hill Road Intersection



It was observed during the conduct of the road safety audit that there was no centerline break at the Cemetery Hill intersection. VTrans Standard 193 indicates that centerline breaks are to be present at all state highways and at town highways that have a stop sign installed. As per the previous concern, there is currently no stop sign at this intersection.

Safety Enhancements:

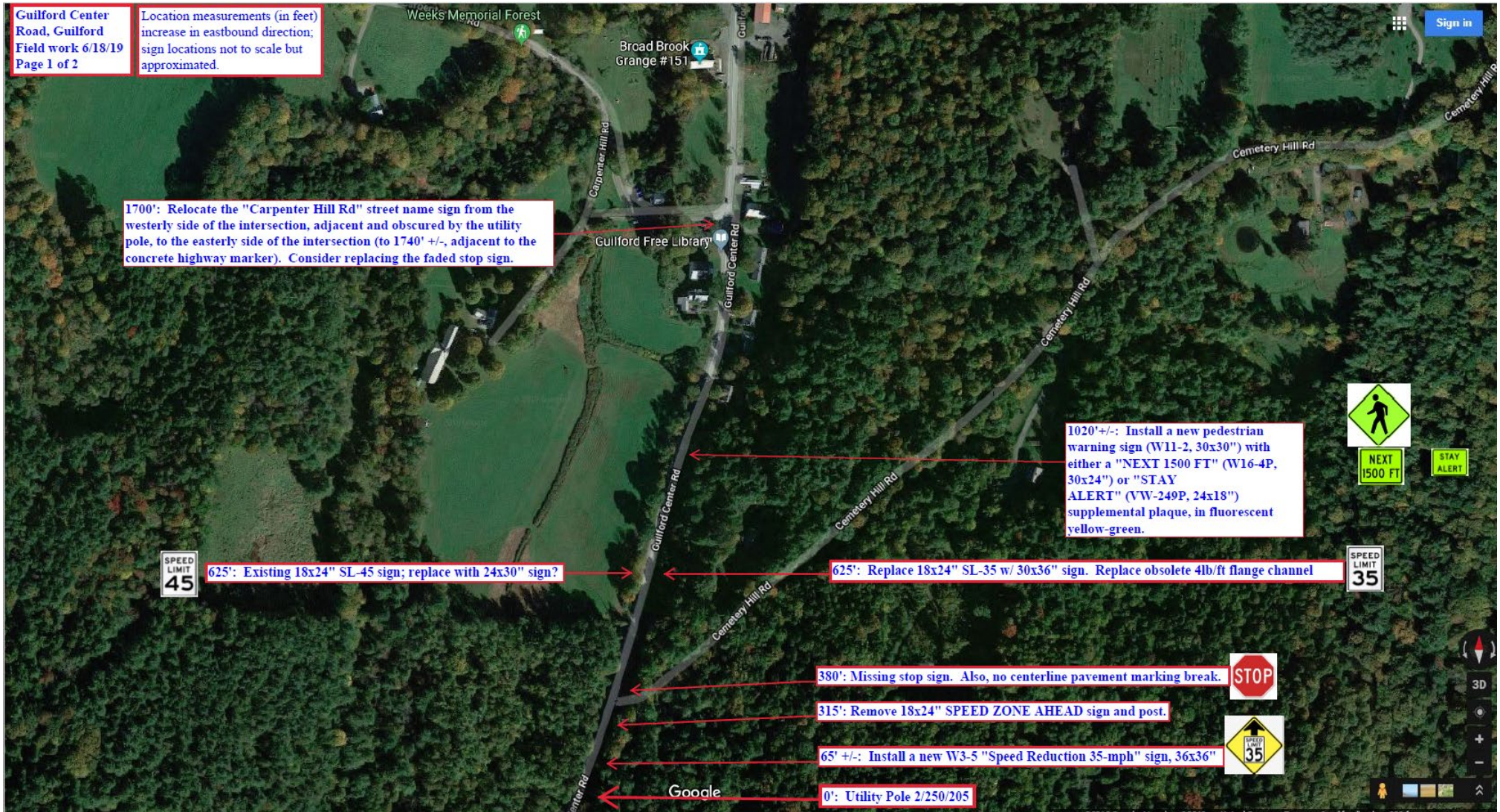
Short Term

- VTrans to mark in the field for the next time the centerline is painted to create a break (Note that, since the conduct of the road safety audit, the yellow centerline was painted and that a break was created. No further actions necessary).

Appendix A

Layout of Suggested Sign Improvements

Note: In the layout, eastbound is taken
as being towards US 5



Appendix B

Guilford Center Road Land Use Map

Source:
Guilford Town Plan
2015-2020

Guilford Center Village Center

Town of Guilford, Vermont

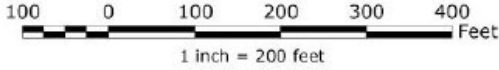
Village Center District

Parcel use:

- | | |
|--|---|
|  Public/Institutional |  Commercial building |
|  Commercial |  Mixed Use building |
|  Mixed Use |  Public/Institutional building |
|  Residential |  Residential building |

 Photo location

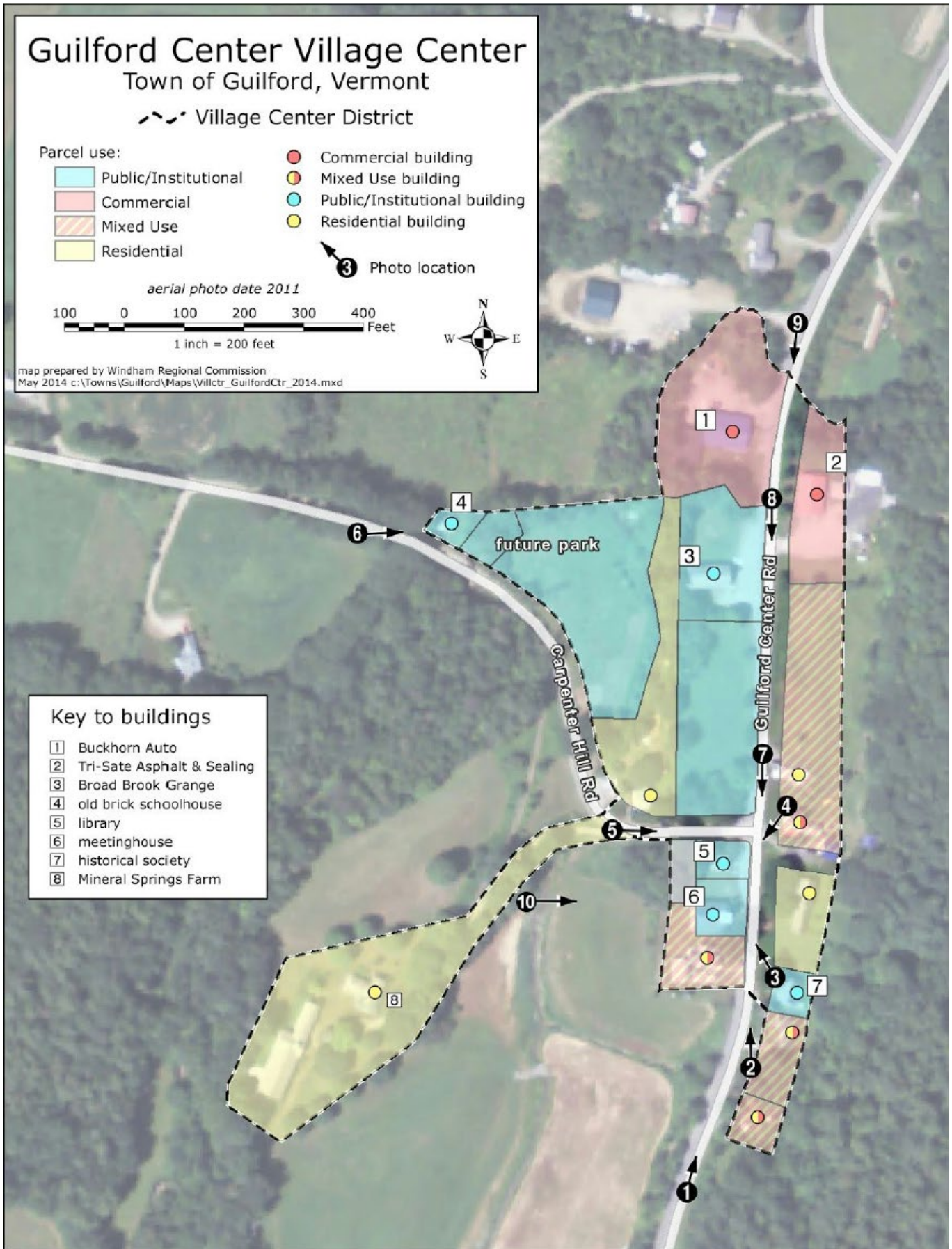
aerial photo date 2011



map prepared by Windham Regional Commission
 May 2014 c:\Towns\Guilford\Maps\Villctr_GuilfordCtr_2014.mxd

Key to buildings

-  Buckhorn Auto
-  Tri-Sate Asphalt & Sealing
-  Broad Brook Grange
-  old brick schoolhouse
-  library
-  meetinghouse
-  historical society
-  Mineral Springs Farm



Appendix C
Existing Signage
*(June 2018
VTrans Field Work)*

Southbound









Appendix D

Crash Data

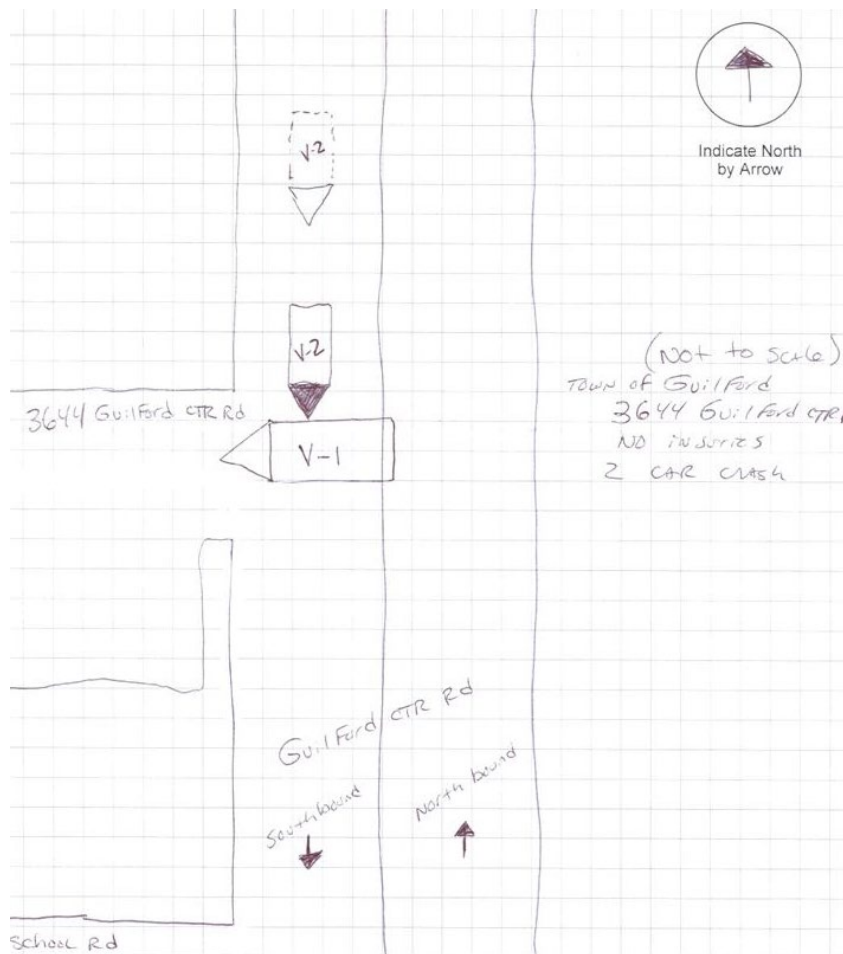
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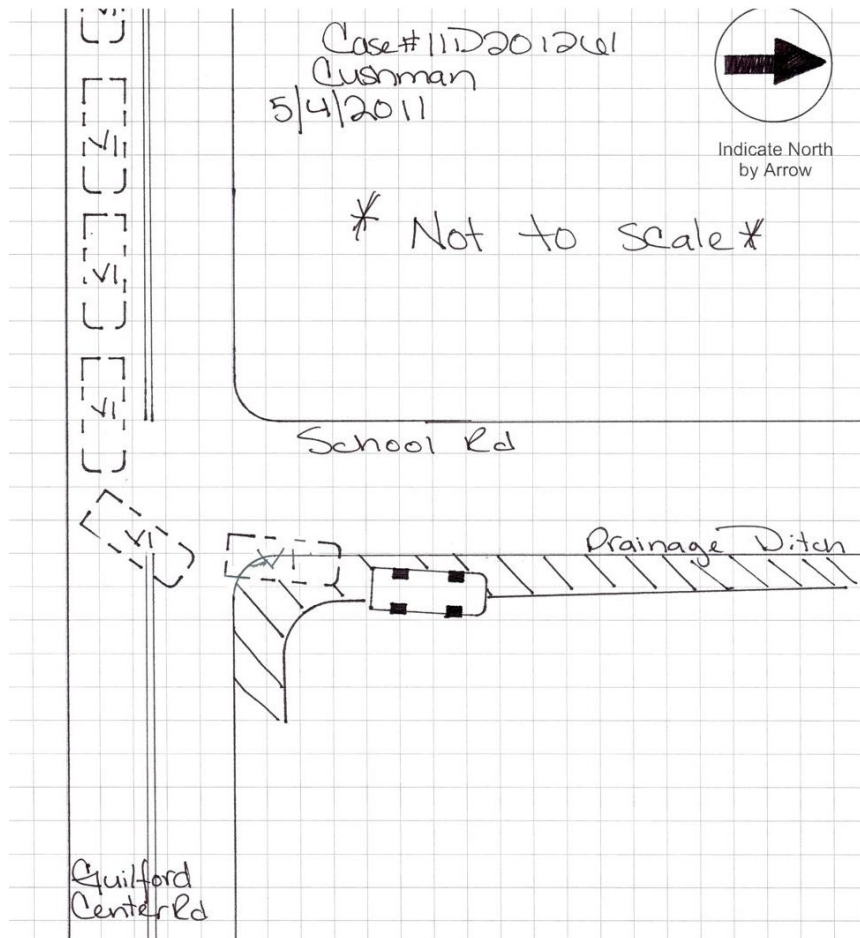
On 02/01/11 at 1620 hours, 3644 Guilford Center Road for a two-car crash. The roadway at this location is black top. The roadway was snow covered and the speed limit is posted at 35 MPH southbound. It was snowing at the time.

Operator #1 was backing out of the driveway at #3644 Guilford Center Road to begin plowing this residence when vehicle #2 slammed into his passenger door. Operator #1 said he was traveling approximately 1 MPH.

Operator #2 was traveling southbound on Guilford Center Road approximately 25 MPH and vehicle #1 backed out right in front of her. Operator #2 said she could not stop in time and struck vehicle #1.

Witness #1 said vehicle #2 skidded then hit vehicle #1.





On May 5, 2011 at approximately 1453 hours, a slide off at the intersection of Guilford Center Road and School Road. The weather was cloudy and dry. Operator 1 advised that he was turning onto School Road and missed the turn. He stated that he tried to make the turn but wound up sliding off the road. Officer pointed out that he did not slide off the road but that he drove off the road into the drainage ditch. Operator 1 did state that he was not paying attention and was talking with his passenger.

Investigation. The point of contact occurred when Vehicle 1 left the roadway and went into the ditch. This caused Vehicle 1 to overturn. Vehicle 1 sustained major contact damage and was most likely a total loss.

Conclusion. Operator 1 was traveling east on Guilford Center Road when the crash occurred. Operator 1 was not paying attention and almost missed the turn for School Road. While attempting to make a late turn onto School Road, Operator 1 drove off the roadway and into a drainage ditch