

Candia NH 43 at Old Candia Road

Discussion of safety
concerns and possible
countermeasures

March 11, 2024



Introductions

- NHDOT
 - Bill Lambert, Highway Safety/Active Transportation Administrator
 - Lee Baronas, State Traffic Engineer
 - Rich Radwanski, Highway Maintenance District 5 Engineer
 - Corey Spetelunas, Highway Safety Project Manager
 - Amanda Joe Zatecka, Senior Highway Safety Engineer
- Town of Candia
- Other

Why are we here?

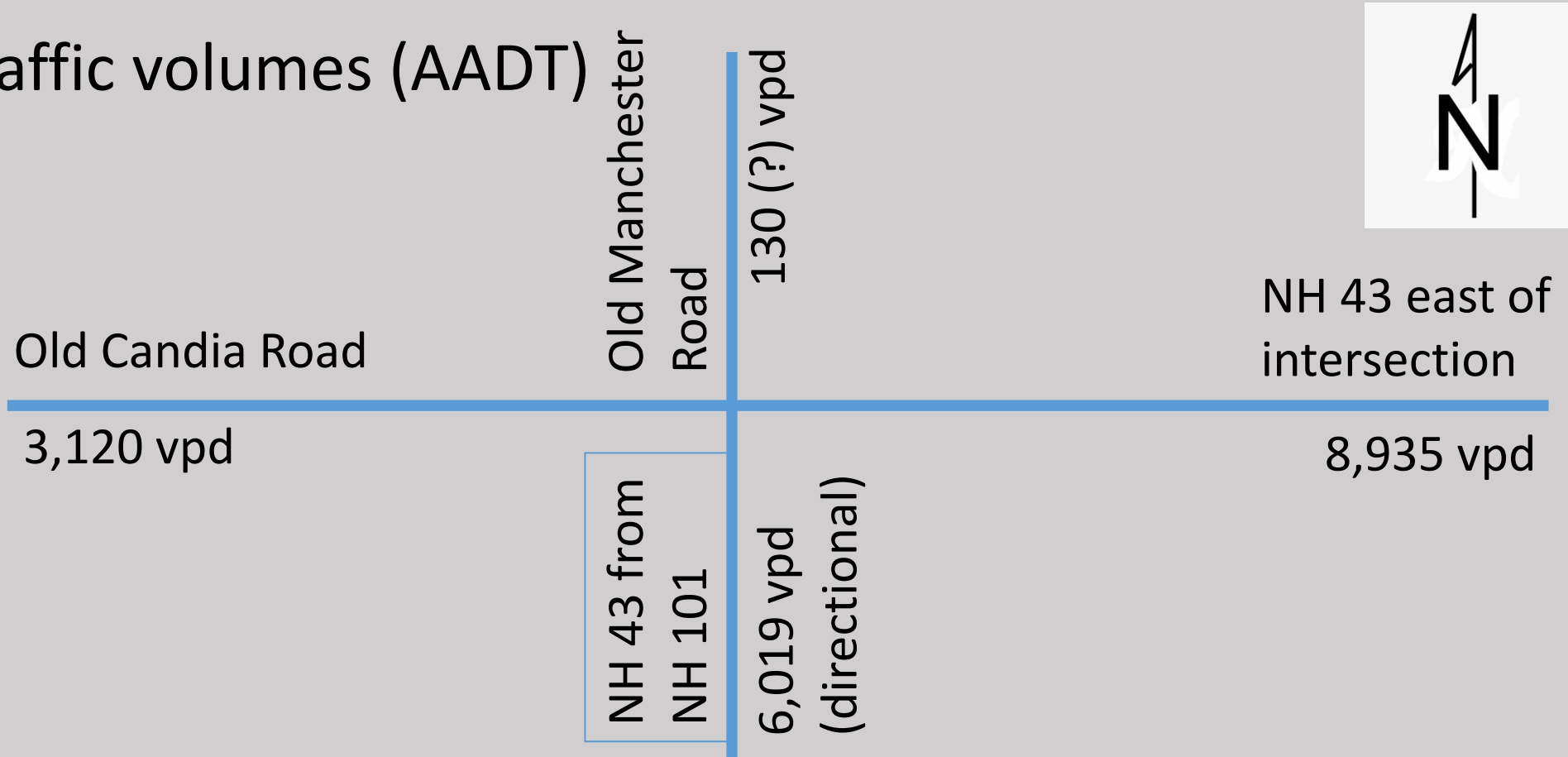
- History of safety concerns with the subject intersection
- Previous countermeasures/Capital improvement project
- Discussion of 2-way versus all-way stop control for rural intersections
- Discussion/Questions
- Next steps

NH 43 at Old Candia Road

- Posted speed limits
 - NH 43 = 35-mph
 - Old Candia Road = 35-mph
- Speeds approaching intersection (85th percentile from TomTom probe data)
 - NH 43 from NH 101 = 36-mph
 - NH 43 from Candia = 41-mph
 - Old Candia Road approaching intersection = 25-mph

NH 43 at Old Candia Road

- Traffic volumes (AADT)



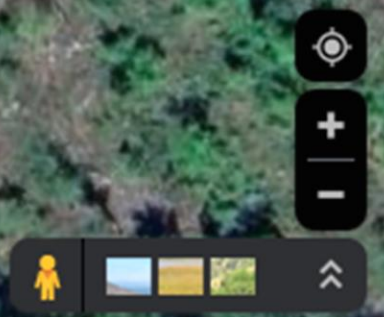
Safety concerns and behavior

- Speed, particularly NH 43 approaching the intersection
- NH 43 geometry results in “major” route turning through the intersection
- Failure to yield
 - Old Candia Road drivers enter intersection expecting opposing left-turning traffic to stop/yield
 - NH 43 westbound left-turning drivers stop/pause thinking opposing traffic does not have to stop (may not recognize STOP sign shape behind other signing)
 - NH 43 eastbound through/left drivers enter intersection expecting traffic from their right to stop/yield
- Others?

Safety Concerns In pictures

Old Candia Road drivers enter intersection expecting opposing left-turning traffic to stop/yield

NH 43 westbound left-turning drivers stop/pause thinking opposing traffic does not have to stop (may not recognize STOP sign shape behind other signing)



Safety Concerns In pictures

NH 43 eastbound through/left drivers enter intersection expecting traffic from their right to stop/yield



Previous countermeasures

- Flanking STOP signs (state)
- STOP AHEAD warning signs (state)
- Discussion of possible geometric changes to create more traditional intersection geometry
 - Realign NH 43 as the primary route through the intersection
 - Realign Old Candia Road to intersect radially
 - Realign Old Manchester Road to intersect with Old Candia Road
 - Reconstruct intersection as:
 - Traffic signal control
 - Roundabout
 - Other

Discussion of geometric improvements

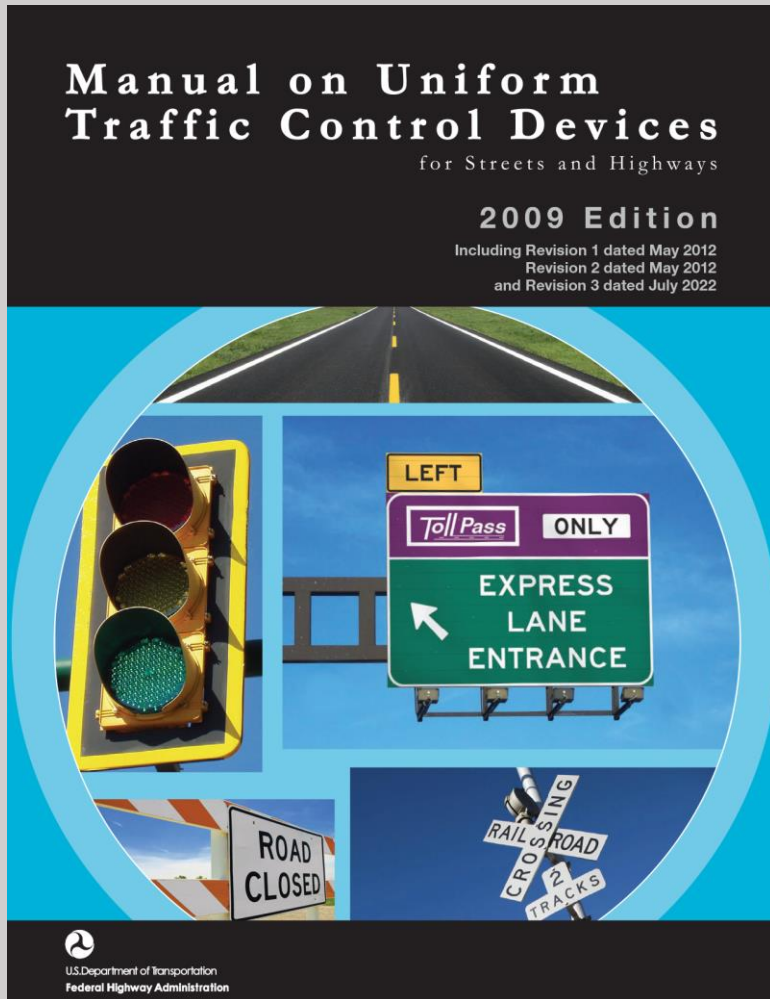
- Traffic signal control
- Roundabout
- Other



2-way versus all-way stop control

- Federal Guidelines (MUTCD)
- New Hampshire DOT past-experience, what has changed?
- Recent experience and crash reduction by other states
 - North Carolina
 - Delaware
- Recent New Hampshire success stories
 - Franconia, Gilmanton, Auburn, Eaton

Federal guidance (MUTCD)



- Factors to consider include:
 - Traffic volumes on all approaches
 - Driver yield behavior with regard to all modes of conflicting traffic, including bicycles and pedestrians
 - Number and angle of approaches
 - Approach speeds
 - Sight distance available on each approach
 - Reported crash experience

Federal guidance (MUTCD)

Guidance:

The decision to install multi-way stop control should be based on an engineering study.

The following criteria should be considered in the engineering study for a multi-way STOP sign installation:

A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

B. Five or more reported crashes in a 12-month period that are susceptible to correction by a multi-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.

C. Minimum volumes:

1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and

2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but

3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.

D. Where no single criterion is satisfied, but where Criteria B, C.1, and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.

Federal Guidance (MUTCD)

Option:

Other criteria that may be considered in an engineering study include:

- A. **The need to control left-turn conflicts;**
- B. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;
- C. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and
- D. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

New Hampshire DOT—What has changed?

- Long history of standing by the MUTCD guidance and objective traffic volume warrants
- “The best control is the least control”
- Past practice resulting in a growing list of intersections with elevated traffic control elements to “improve STOP recognition, compliance but where crashes continue to occur
 - Recent changes to all-way stop at intersections where “warrants” were not met
- National recognition given to two states for converting 2-way stops to all-way stops

FHWA/Roadway Safety Foundation Honor 10 “Life-Saving Projects”

- “2023 National Roadway Safety Awards recognize innovations to protect pedestrians, cyclists, and motorists as pandemic spike in road fatalities continues mostly unabated”
- “Ten innovative highway safety projects, representing the very best of the nation’s roadway safety practices,...honored with National Roadway Safety Awards...”
- Delaware Department of Transportation (DelDOT) for converting 20 low-volume intersections from two-way to all-way stops.
- North Carolina Department of Transportation (NCDOT) for significantly reducing the number of fatal and serious crashes at rural intersections.

Delaware

Table 2. Annual Crashes at 25 Newly Converted AWSC Intersections

Total Annual Crashes from All Study Intersections	Crash Type					Severity		
	Total	Angle	Rear End	Single Vehicle	All Others	PDO	Injury	Fatal
Before	120.67	67.33	17.00	19.33	17.00	70.33	48.67	1.67
After	52.33	22.67	12.17	11.33	6.17	43.67	8.67	0.00
% Change	-57%	-66%	-28%	-41%	-64%	-38%	-82%	-100%

Delaware

#	Major Road	Intersecting Road	Rural/ Urban	Major Road 2019 AADT	Minor Road 2019 AADT	Major Road Speed Limit	Functional Class	Crash Warrants Met	Met Reduced Crash Thresholds	Years of Before Crash Data	Years of After Crash Data
1	Delaware Ave	Woodland Beach Rd / Beach Ave	Rural	572	513	25	Minor Collector	No	No	3	3
2	K241 (Peach Basket Rd)	K240 (Turkey Point Rd)	Rural	3183	2485	50	Local	Yes	Yes	3	3
3	K371 (Barratts Chapel Rd)	K381 (Fox Chase Rd)	Rural	1765	990	35	Major Collector	Yes	Yes	3	3
4	N53 (Thompson Station Rd)	N301 (Pleasant Hill Rd) / N302 (Hopkins Rd)	Rural	4260	3464	35	Local	Yes	Yes	3	3
5	S326 (Bethesda Rd)	S86 (Avenue of Honor)	Rural	1353	2035	50	Local	No	Yes	3	3
6	S326 (Bethesda Rd)	S432 (Governor Stockley Rd)	Rural	887	1542	50	Local	No	Yes	3	3
7	S38 (Clendaniel Pond Rd)	S224 (Fleatown Rd)	Rural	1189	1714	50	Local	Yes	Yes	3	3
8	S46 (Old Furnace Rd)	S535 (Middleford Rd)	Rural	5208	7483	35	Major Collector	Yes	No	3	3
9	S47 (Johnson Rd)	S290 (Hurdle Ditch Rd)	Rural	1384	1268	45	Local	Yes	Yes	3	3
10	S62 (East Trap Pond Rd)	S329 (W. Piney Grove Rd / Whaleys Corner Rd)	Rural	978	630	50	Local	Yes	Yes	3	3
11	S750 (Shockley Town Rd)	S920 (Gum Rd)	Rural	849	1507	50	Local	No	Yes	3	3
12	SR 30 (Gravel Hill Rd)	S47 (Springfield Rd / Johnson Rd)	Rural	4546	1384	50	Major Collector	No	Yes	3	3
13	SR 30 (Whitesville Rd)	S66 (Pepperbox Rd)	Rural	1141	1485	50	Major Collector	No	Yes	3	3
14	SR 30 (Whitesville Rd)	S68 (Old Stage Rd)	Rural	1881	2206	50	Major Collector	No	No	3	3
15	SR 5 (Harbeson Rd)	S292 (Forest Rd) / Anderson Corner Rd	Rural	4549	1106	50	Major Collector	Yes	Yes	3	3
16	K103 (Hourglass Rd)	K182 (Slaughter Station Rd)	Rural	1175	1016	50	Local	Yes	Yes	3	2
17	N216 (Rockwood Rd)	N217 (Miller Rd)	Urban	4057	2822	35	Minor Collector	No	No	3	2
18	N243 (Old Kennett Rd)	N246 (Center Mill Rd)	Rural	3299	539	40	Major Collector	Yes	Yes	3	2
19	Munchy Branch Rd	Field Lane / Shady Ridge Dr	Urban	5230	Unknown	35	Local	No	No	3	2
20	S48 (Zoar Rd)	S317 (Peterkins Rd)	Urban	7586	801	45	Major Collector	Yes	Yes	3	2
21	SR 5 (Indian Mission Rd)	S302 (Harmons Hill Rd / Phillips Branch Rd)	Rural	6738	1360	50	Major Collector	No	No	3	1
22	SR 30 (Cedar Creek Rd)	S38 (Jefferson Rd / Sylvan Acres Rd)	Rural	6938	519	50	Major Collector	No	Yes	3	1
23	K388 (Canterbury Rd)	K404 (Church Hill Rd)	Rural	6578	829	50	Minor Arterial	Yes	Yes	3	1
24	SR 30 (Cedar Creek Rd)	S207 (Johnson Rd)	Rural	4848	1674	40	Major Collector	Yes	Yes	3	1
25	S410 (Godwin School Rd)	S433 (Country Living Rd)	Rural	404	794	45	Local	No	No	3	1

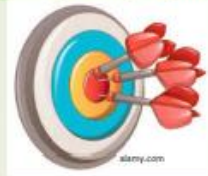
North Carolina

Safety Treatments – 2-Ln Minor Road Stop



All Way Stop

Most Confident in Big Safety Improvement



Roundabouts



Vehicle Entering When Flashing

Middling and Scattered Safety Results



Enhanced Intersection Signing



Stop Ahead Pavement Markings

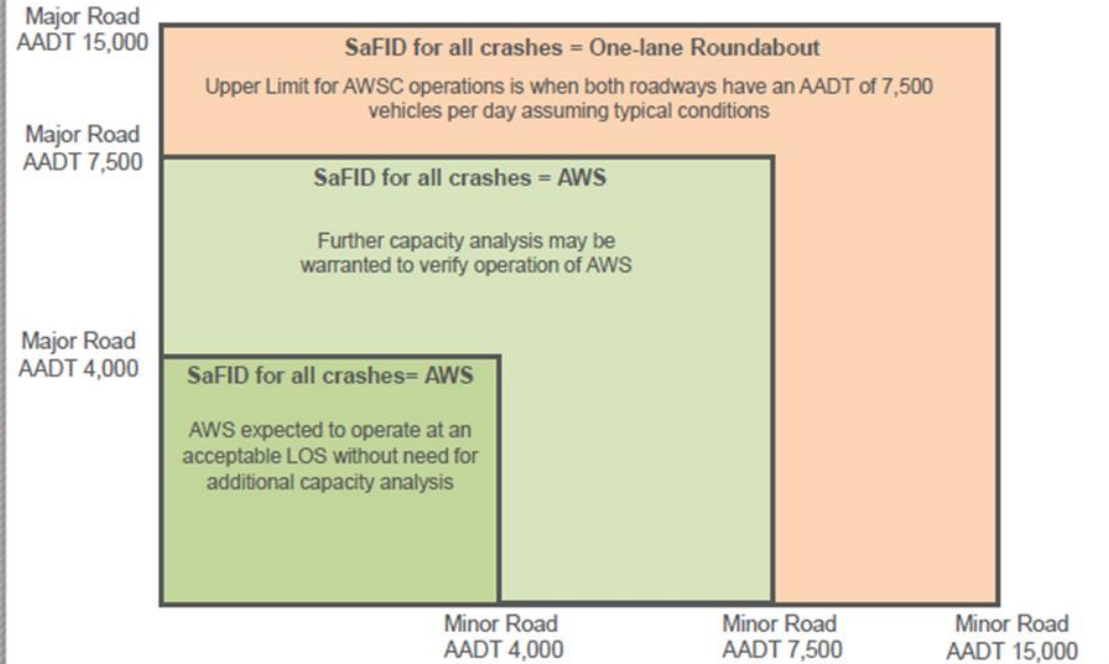
Most Likely Missing the Safety Target



Overhead Flashing Beacon

Volume Thresholds

General Rules of Thumb Regarding Volumes (2 lane at 2 lane intersections):



North Carolina

- Study Findings
 - 68% Reduction in Total Crashes
 - 77% Reduction in Fatal and Injury Crashes
 - 75% Reduction in Frontal Impact Crashes
- Benefits
 - Low cost (\$20,000 per intersection)
 - Benefit to Cost ratio of 83:1
- All-way stop control can be installed on primary routes without violating driver expectations or creating safety concerns.

Recent NH Successes

- Franconia, NH 18 at NH 116
 - NH 116 approach crosses over a bridge which may restrict sight lines (or extend sight lines to the nearby intersection with I-93 ramps)
 - Overhead beacon, flashing beacon on STOP sign had not mitigated crashes
- Gilmanton, NH 107 at NH 140
 - Flashing beacons on STOP AHEAD signs did not mitigate crashes
 - NH 107 speeds likely exceeded posted speed limit
- Auburn, NH 121 at Hooksett Road
 - NH 121 turns 90 degrees at the intersection, stop control is unorthodox
- Eaton, NH 153 at Ridge Road and Glines Hill Road
 - NH 153 turns 90 degrees at the intersection, stop control is for the two Class V roads

Franconia NH 18 at NH 116

- NH 18 = 3,049 vpd
- NH 116 = 2,272 vpd

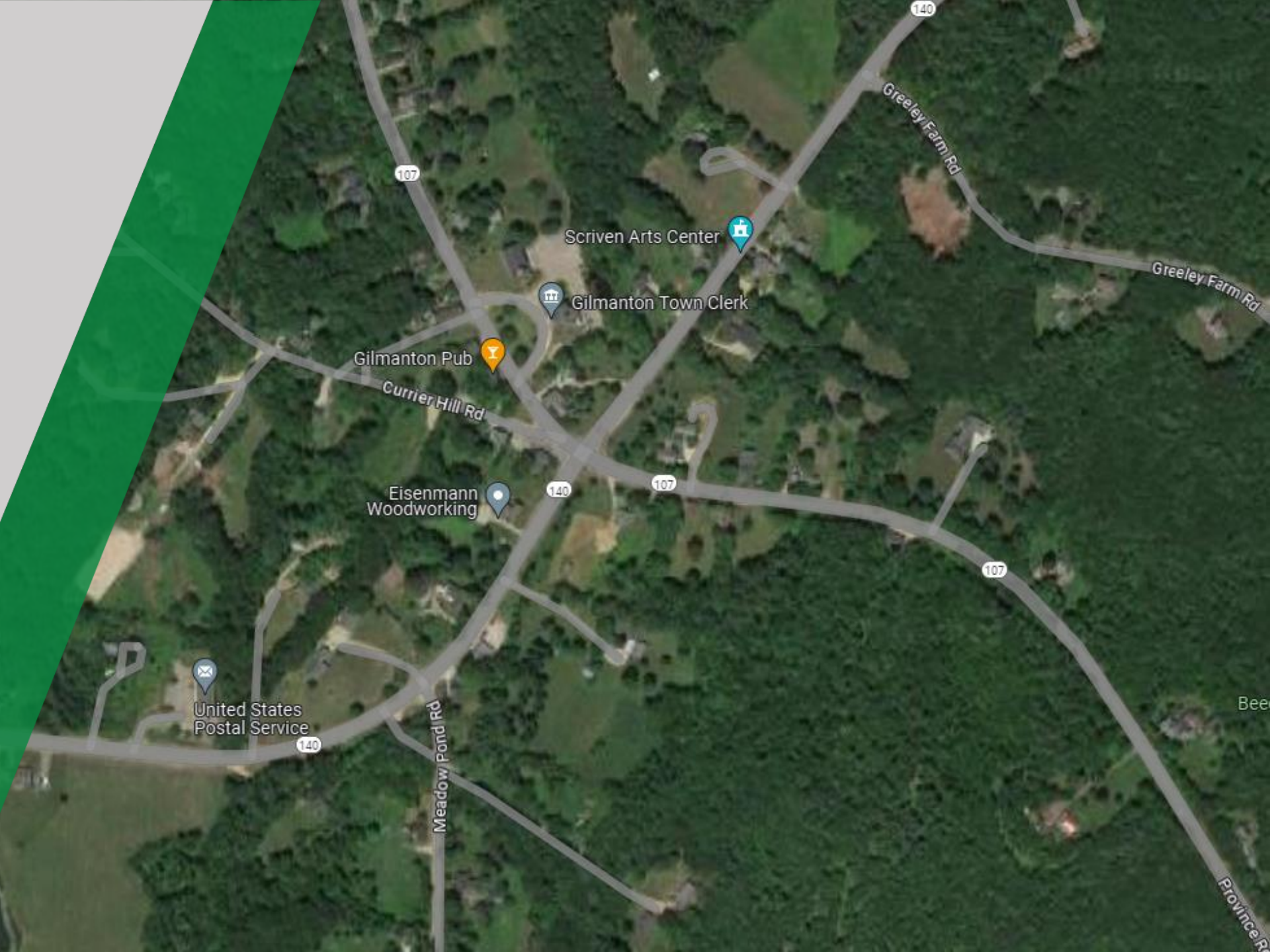


Franconia NH 18 at NH 116



Gilmanton NH 107 at NH 140

- NH 107 = 2,861 vpd
- NH 140 = 3,978 vpd

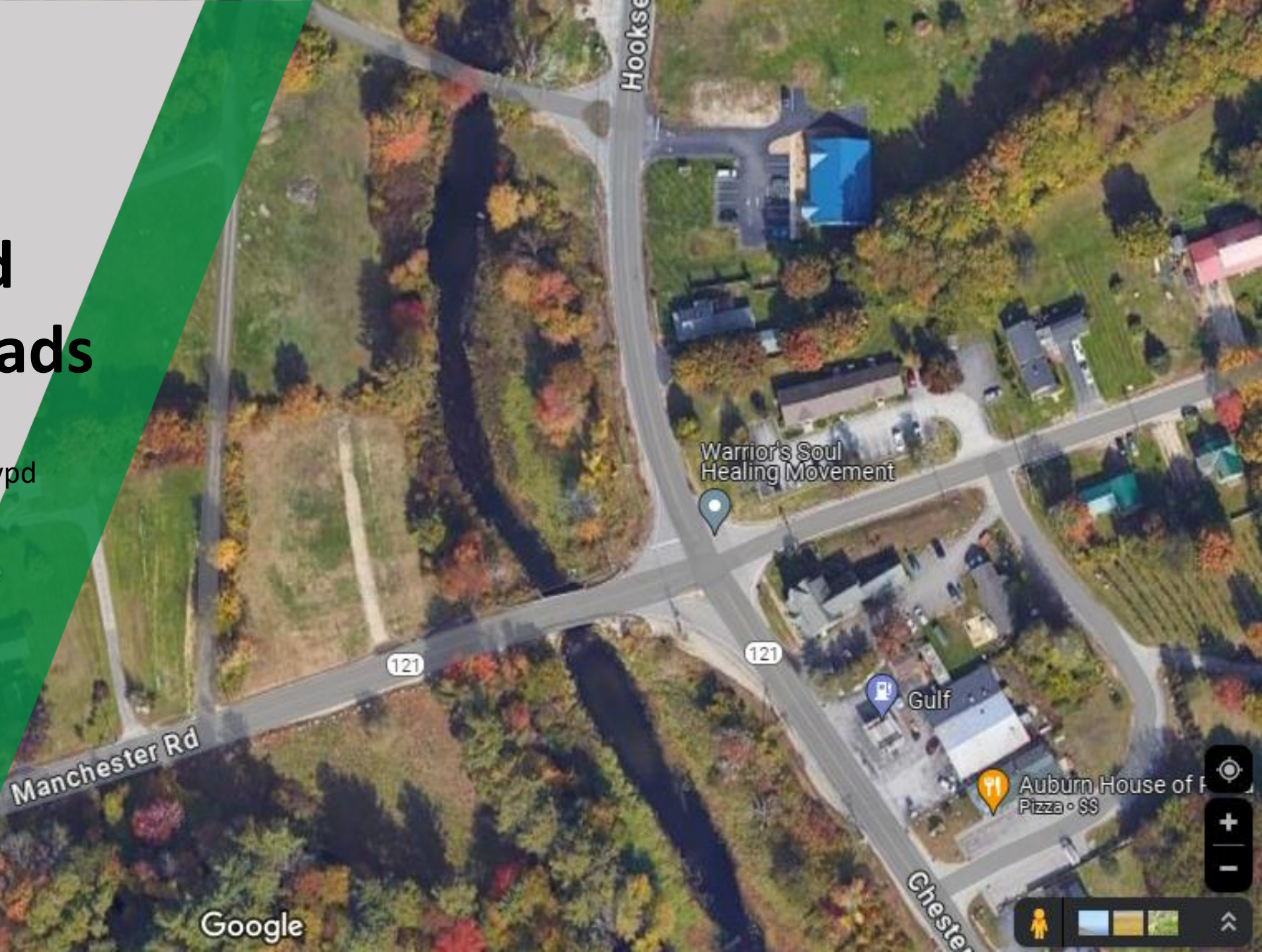


Gilmanton NH 107 at NH 140



Auburn NH 121 at Hooksett and Raymond Roads

- NH 121 = 5,102 vpd
- Hooksett Road = 4,881 vpd

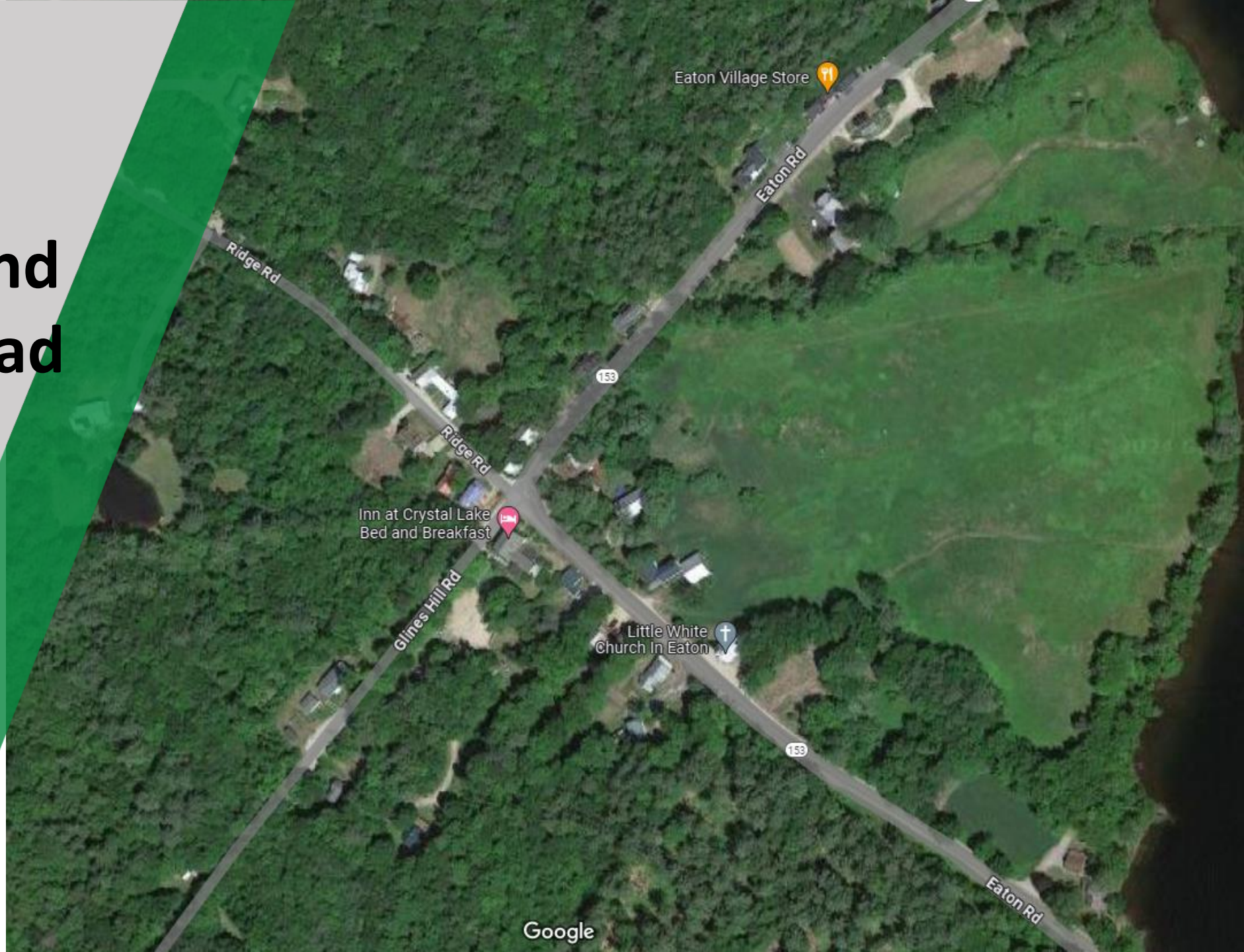


Auburn NH 121 at Hooksett and Raymond Roads



Eaton NH 153 at Ridge Road and Glines Hill Road

- NH 153 = 2,999 vpd
- Class V roads, negligible



Eaton NH 153 at Ridge Road and Glines Hill Road



All-way stop control

- Pros

- Promotes safer speeds
- Requires all drivers to stop, reduces odds of two drivers entering intersection at the same time
- Slower/stopped traffic provides a safer environment for pedestrians
- Does not require long-term commitment to flashing beacons or other STOP sign enhancements
- Can be implemented almost immediately

- Cons

- Requires short-term re-education of familiar drivers (enhanced conspicuity for new STOP signs and short-term deployment of changeable message signs)
- Introduces minor delay for NH 43 traffic

Questions/Comments

