CHITTENDEN COUNTY RPC
Communities Planning Together

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# *TECHNICAL MEMORANDUM*

**TO:** **Nate Bareham; Town Administrator, Charlotte**
**FROM:** **Sai Kumar Sarepalli, P.E.; CCRPC**
**DATE:** **06/21/2024**
**RE:** **Ferry Road Speed Study & Traffic Calming Analysis**

The Town of Charlotte requested the Chittenden County Regional Planning Commission (CCRPC) staff to investigate and evaluate safety concerns and traffic calming along Ferry Road between Greenbush Road and the Railroad track in the West Charlotte Village area.

## 1. Existing Conditions

Ferry Road is a paved road classified by the state as a Class II Town Highway and functionally classified as a Major Collector. The study area extends from Greenbush Road to the railroad track. The posted speed limit on Ferry Road within the study area is 40 mph. Figure 1 shows the study area.

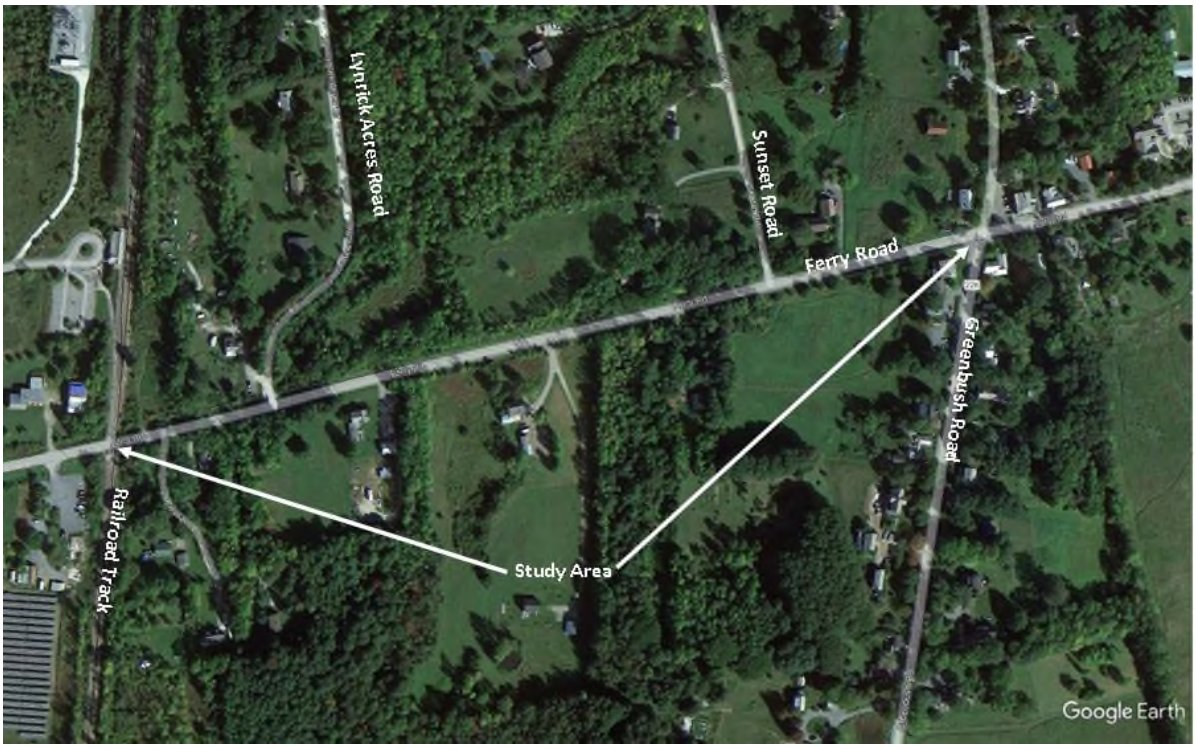



**Figure 1: Study Area**

**Field Observations**

The CCRPC staff conducted a field reconnaissance survey on May 14, 2024 to observe the traffic operation, land use and roadway characteristics, and pedestrian and bicycle activities in the study area. The following are some of the observations along the study area.

- Primarily residential land use, agricultural and some commercial properties along Ferry Road.
- Pavement width varies between 22 ft and 24 ft with narrow shoulders varying between 0.5 ft and 1 ft.
- The vertical grade is at an average of 9% from Greenbush Road to Sunset Road and about 4% from Sunset Road to the railroad track. See Figure 2 below.
- A steep drop in the road elevation was observed approximately at 585 Ferry Road which created a vertical crest in the road. See Figures 3 and 4below.
- An access to the new boardwalk trail was located on Ferry Road. See Figure 5 below.
- There are 7 access points, including the trail access, off Ferry Road within the study area.
- The edge of pavement is delineated with 4-inch fog lines/white lines.
- Vegetation at some locations obstructing signs on Ferry Road.

**Figure 2: Steep grade of Ferry Road looking west from Greenbush intersection**

**Figure 3: Difference in vertical elevation creating a crest, looking towards west**

**Figure 4: Difference in vertical elevation creating a crest, looking towards east**

**Figure 5: A New boardwalk Trail access from Ferry Road**

**Figure 6: Vegetation obstructing signs, looking east**

**Traffic Volume and Speed Data Analysis**

The CCRPC staff installed an Automatic Traffic Recorder (ATR) on Ferry Road to collect traffic volume and speed data. The data were collected from 05/07/2024 through 05/13/2024. Pedestrian and bicyclist data were not collected. The following table shows directional average, 85th percentile speed, 10 mph pace speed and Average Daily Traffic (ADT).

**Table 1: Volume and Speed Data**

| | WB | EB | Combined |
|---|---|---|---|
| Average Speed in MPH | 44.1 | 42.2 | 43.2 |
| 85th Percentile Speed in MPH | 49.0 | 47.0 | 48.0 |
| 10 MPH Pace Speed | 41-50 | 37-46 | 39-48 |
| Average Daily Traffic (ADT) veh/day | 1,548 | | |

It is evident from the data that the majority of motorists are exceeding the posted speed limit in both directions. The 85th percentile speed for the westbound direction is higher than the eastbound direction which can be attributed to the steep downgrade for westbound traffic. The 85th percentile speed is defined as the speed at which 85 percent of motorists are traveling at or below. Motorists have a natural tendency to drive faster on a downgrade.

## 2. Traffic Calming

The Federal Highway Administration (FHWA) describes traffic calming as *"supporting the livability and vitality of residential and commercial areas through improvements in non-motorist safety, mobility, and comfort. These objectives are typically achieved by reducing vehicle speeds or volumes on a single street or a street network. Traffic calming measures consist of* ***horizontal, vertical, lane narrowing, roadside, and other features that use self-enforcing physical or psycho-perception means*** *to produce desired effects.[1]"*

The primary traffic calming objectives are:

1. Achieving slower vehicle speeds
2. Increasing the safety and perception of safety for non-motorized users
3. Increasing the quality of life in residential and commercial areas
4. Reducing the necessity of police enforcement
5. Increasing access for all modes of transportation

**Traffic Calming Measures**

The applicability of traffic calming measures depends on roadway characteristics, land use and desired effects such as lowering speed, reducing volumes or increasing safety. Traffic calming measures can be categorized primarily into four types:

1. Horizontal Deflection
2. Vertical Deflection
3. Road or Lane Narrowing
4. Routing Restriction

[1] https://safety.fhwa.dot.gov/speedmgt/ePrimer_modules/module2.cfm

The following table shows a list of traffic calming measures.

**Table 2: Traffic Calming Measures**

| Horizontal Deflection | Vertical Deflection | Road/Lane Narrowing | Routing Restriction |
|---|---|---|---|
| Lateral Shift | Speed Hump | Curb/Corner Extension | Diagonal Diverter |
| Chicane | Speed Cushion | Choker | Full Road Closure |
| Realigned Intersection | Speed Table | Median Island | Half Road Closure |
| Traffic Circle | Offset Speed Table | On-street Parking | Median Barrier |
| Small and Mini Roundabout | Raised Crosswalk | Road Diet | Forced Turn Island |
| | Raised Intersection | | |

Ferry Road is a two-lane collector road with narrow shoulders that mostly serve the ferry traffic. Given the roadway characteristics of Ferry Road, steep grade and limited width, horizontal and vertical deflection are not acceptable traffic calming measures for Ferry Road, and routing restriction measures are applicable for controlling traffic volume. Road/lane narrowing, median islands are acceptable traffic calming measures for Ferry Road that may impact vehicle speeds.

**Median Island**

According to the FHWA Safety ePrimer, "a median island is a raised island located along the street centerline that narrows the travel lanes at that location". A median island may simply be a painted island and/or textured colored pavement along the road centerline. However, the research found that a median island is most effective in reducing vehicle speeds when it is defined by a raised curb or barrier, delineators, and landscaped to further reduce the open feel of a road.

When a median island is installed at or near the entrance to a village or a neighborhood, it provides a visual cue of change in land use, sense of entering the village area to the motorists. Eight field studies with median islands found speed reductions between the range of 1 mph and 8 mph for 85$^{th}$ percentile speeds. The following table shows different types of median islands, their effectiveness and cost estimate.

**Table 3: Type of Median Islands and Cost Estimates**

| Types of Median Islands | Traffic Calming Effectiveness | Approximate Cost* |
|---|---|---|
|  | • Simple pavement marking<br>• 12 inches to 14 inches width<br>• Flush with pavement<br>• Vehicles may drive over pavement markings<br>• Less effective in traffic calming | • Low cost at $1.50 to $2.0 per linear foot |

| | | |
|---|---|---|
|  | • Centerline tubular posts with pavement marking<br>• 12 inches to 14 inches width between yellow lines<br>• 12 inches to 24 inches tall tubular posts with reflective tape<br>• Tubular posts can be installed on pavement and removed in winter season<br>• Low to Medium effective | • Tubular post $30 per each<br>• $1.50 to $2.00 per linear foot for pavement marking |
|  | • Seasonal Center Median with tubular posts and 25 MPH temporary sign<br>• 12 inches to 20 inches width<br>• 12 inches to 24 inches tall tubular posts with reflective tape<br>• Tubular posts can be installed on pavement and removed in winter season<br>• Low to Medium effective | • Tubular post $30 per each<br>• $30 to $50 per sign |
|  | • Mountable curb with textured surface median<br>• 12 inches to 14 inches wide<br>• Larger vehicles able to mount the curb<br>• Can be supplemented with a speed sign at the beginning of the median<br>• Appropriate at the entrance of the village<br>• Medium effective | • $40 to $50 per square foot<br>• $35 to $50 per sign |
|  | • 4” vertical concrete curb with textured surface median<br>• 16 inches to 24 inches wide<br>• Impede larger vehicles ability to mount the curb<br>• Can be supplemented with a speed sign at the beginning of the median<br>• Appropriate at the entrance of the village<br>• Medium to very effective | • Textured concrete $50 to $75 per square foot<br>• Concrete curb $7 to $12 per linear foot<br>• $35 to $50 per sign |

| | | |
|---|---|---|
|  | • Concrete curb with vegetation median<br>• 18 inches to 24 inches wide<br>• Impede larger vehicles ability to mount the curb<br>• Can be supplemented with a speed sign at the beginning of the median<br>• Steet lights are recommended<br>• Appropriate at the entrance of the village<br>• Very effective | • Concrete curb $7 to $12 per linear foot<br>• Vegetation cost varies depending on type of plants and shrubs<br>• Solar powered Street lights $1,000 to $1,500 each (recommended) |
| **** Note – Approximate Costs do not include labor charges***<br>***Pictures are taken from the internet*** | | |

## 3. Considerations and Recommendations

Speed management and speed control are a significant challenge for local municipalities, especially through small and rural communities. Ferry Road functionality changes from a low-speed (25 mph) route east of the Greenbush intersection to a higher speed (40 mph) straight section with steep grade to the west of the intersection. The land-use characteristics are different on the east side of the Greenbush intersection with a village setting such as post office, library and senior citizen center whereas lesser density residential development with long driveways was observed on the west side of the intersection. Motorists traveling westbound exiting the west village area tend to drive at higher speeds due to the open landscape, and straight road section with a steep downgrade. This presents safety concerns for all road users including pedestrians and bicyclists and speed enforcement becomes a challenge within the study area. Law enforcement alone may accomplish speed management for a temporary period at significantly higher costs and cannot address the safety and speeding issue permanently. Traffic calming measures, discussed earlier, should be implemented strategically along Ferry Road to address the speeding and unsafe passing issues within the study area. According to the FHWA, agencies often set speed limits concurrently with implementing speed management strategies such as traffic calming measures and increased enforcement to achieve desired operating speeds[1].

This memo provides feasible and acceptable traffic calming measures for the Town's discretion and assists in making an informed decision for implementation. The Town can pick and choose from the traffic calming measures listed depending on available budget and public feedback. The following are some considerations and recommendations for implementing traffic calming measures along Ferry Road between Greenbush Road and the railroad track.

[1] https://safety.fhwa.dot.gov/provencountermeasures/appropriate-speed-limits.cfm

1. Widen the existing fog line/white line from 4 to 6 inches wide along the edge of pavement. Research found that wider edge line pavement markings have a positive safety relationship on rural two-lane two-way highways[1].
2. Based on the speed data, windshield survey and roadway characteristics, and potential safety hazard due to the roadway vertical alignment, it is recommended to **lower the posted speed limit to 35 mph for the study area**.
3. Install speed limit pavement legend (35 MPH) and SLOW pavement markings at appropriate locations within the study area. See sample pictures below.


4. Install speed feedback radar signs at appropriate locations. See the attached implementation plan.
5. Install median islands with pavement markings or textured pavement of 50 ft to 100 ft in length within the study area. Maintain at least 9 ft travel lanes at the median locations. See the attached implementation plan for approximate location.
6. Centerline rumble strips are recommended on Ferry Road to warn motorists crossing the centerline reducing likeliness of lane departure crashes and unsafe passing behavior. Centerline rumble strips are not recommended where residences are located within 100 ft of centerline. Design details of the centerline rumble strips can be found on the VTrans website: https://vtrans.vermont.gov/sites/aot/files/highway/documents/highway/213.02_Milled%20Rumble%20Strips%20%28Centerline%29.pdf
7. Clear vegetation to provide a clear view of warning signs in the study area.
8. Install Trail Crossing warning signs (W11-15) supplemented with a TRAIL X-ING (W11-15P)

plaque for the new boardwalk trail in both travel directions.

9. Centerline rumble strips and median islands may tend to discourage unsafe passing behavior. As a low-cost measure, the Town can install the Vermont Standard "Unsafe to Pass" (VW-092) sign 

at appropriate locations in both travel directions within the study area to discourage unsafe passing.
10. As mentioned earlier, establish a lower speed limit of 35 mph supplemented with recommended traffic calming measures to achieve desired operating speeds.
11. A traffic calming implementation plan is attached with this memo. The traffic calming measures and new signs are shown at approximate locations. Actual locations should be surveyed in the field prior to installation and discussed with residents.

[1] https://safety.fhwa.dot.gov/roadway_dept/night_visib/pavement_marking/ch3.cfm

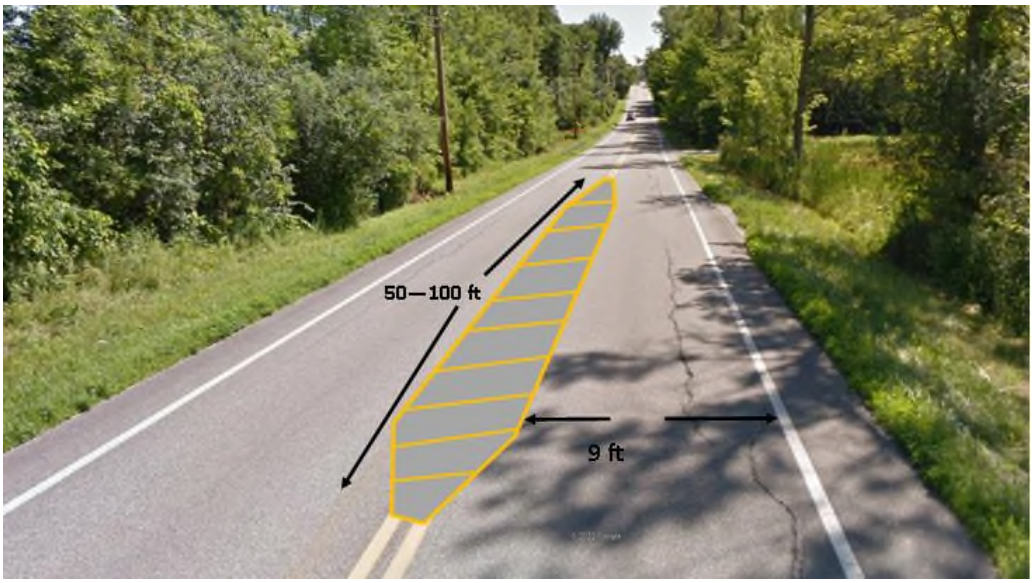
## Attachment A

# Traffic Calming Measures Implementation Plan

# Ferry Road between Greenbush Road and Railroad Track

# Traffic Calming Measures Implementation Plan for Ferry Road between Greenbush Rd. and Railroad Track

## Traffic Calming Measures Details

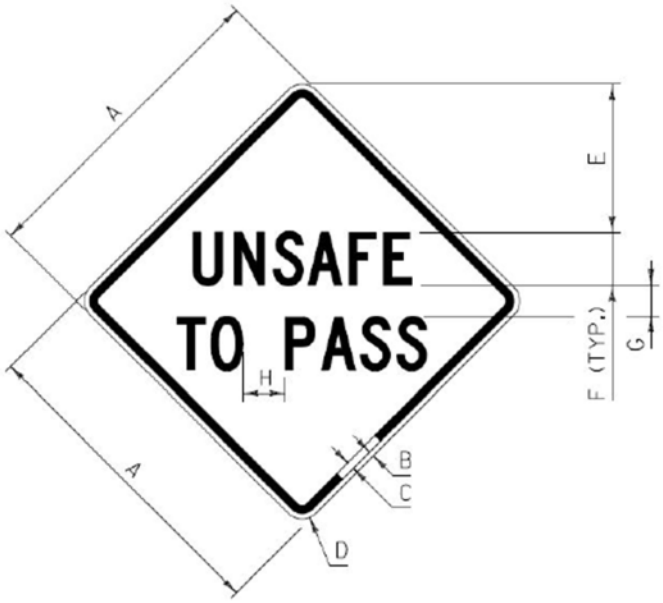



**Median Island**

**Centerline Rumble Strips**


**Trail Crossing Sign**


**Radar Speed Feedback Sign**




**VW–092**

| A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|
| 30 | 1/2 | 3/4 | 1 7/8 | 13 7/8 | 5C | 3 | 4 |
| 36 | 5/8 | 7/8 | 2 1/4 | 16 | 6C | 4 | 5 |

**Unsafe To Pass Sign with Yellow background**