October 20, 2014

Greenhill Road Bridge over Isinglass River



Selectboard and
Public Information Meeting

Prepared by:
Hoyle, Tanner & Associates, Inc.

Presentation Outline

- Hoyle, Tanner & Associates
- NHDOT Municipal Bridge Program
- Project Background
- Project Alternatives
- What's Next?

Hoyle, Tanner & Associates, Inc.

Hoyle, Tanner & Associates

- NH Based Engineering and Planning Firm
  - Corporate Headquarters in Manchester
  - Established in 1973
  - Multi-Year Consultant Agreements with NHDOT, MassDOT and VTrans
  - 40 Years of Successful Service to NH Municipalities
- Experienced Staff of Transportation Personnel
  - Highway/Structures Group Staff of 26 Personnel
    - 6 Licensed Structural Engineers
    - 5 Licensed Transportation Engineers

Hoyle, Tanner & Associates

Hoyle, Tanner was Selected by the Town for Bridge Engineering Services

- Young Road Bridge over Unnamed Brook
  - **COMPLETED** - Hydraulic Analysis & FEMA Benefit Cost Analysis
- Old Canaan Road over Spruce Brook Culvert
  - **COMPLETED** - Hydraulic Analysis & FEMA Benefit Cost Analysis
  - Submitted to NHDOT for Bridge Aid



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Hoyle, Tanner & Associates

Hoyle, Tanner was Selected by the Town for Bridge Engineering Services

- Tolland Road over Green Hill Brook Culvert
  - **COMPLETED** – Condition Evaluation and Hydraulic Analysis

- **Greenhill Road Bridge over Isinglass River**
  - **IN-PROGRESS**



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NHDOT Municipal Bridge Program

- State-level program
- All NH municipalities are eligible
- 80% reimbursement; 20% Town share
- Historically averaged 10-12 projects per year, with $8.5M in funding
- Average Project is $900k
- New projects programmed in State FY 2023
  - This project is funded for the 2022 construction season
- Program is currently funded at $17M per year

New Hampshire DOT

Hoyle, Tanner & Associates, Inc.

NHDOT Municipal Bridge Program

Program Overview

- Basic Steps
  1. **Engineering Study (current phase of project)**
  2. Preliminary Design & Permitting
  3. Final Design
  4. Bid Phase
  5. Construction
- Main Requirements (for replacement structure)
  1. Follow NHDOT's "Attachment B"
  2. 24 Foot Wide Roadway
  3. HL93 Design Load
  4. 1 Foot Freeboard over Q50

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Project Background

Greenhill Road Bridge

- Isinglass River Crossing
- Steel Stringer with Concrete Deck
- Posted C-2
- Constructed 1955
- Narrow Bridge – Approx. 18 feet curb to curb
- 3 Girder System





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Project Background

Engineering Study Tasks Completed to Date:

- Topographic Survey
- Subsurface Investigation
- Hydrology and Hydraulics



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Project Background

Engineering Study Tasks Completed to Date

- Conceptual Structural Engineering
  - Rehabilitation or Replacement
- Conceptual Roadway Engineering
  - Design Speed and Impacts
- Outreach and Coordination
  - NHDES One-Stop
  - NHDOT Cultural Resources
  - Town of Barrington Historical Society

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Project Background

Hydrology and Hydraulics

- 66 sq. mi. Watershed, Begins Above Bow Lake
- Adequate Freeboard
  - ~9' for 50-year Event
  - ~8.5' for 100-year Event
- Very High Stream Velocity
  - ~10 feet per second for 2.33-year Event
  - ~16 feet per second for 50-year Event

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Project Background

NH Stream Crossing Guidelines

- Rules Apply to New or Replacement Structures
- Guidelines Generally Produce Longer Spans
  - 1.2 Times Bankfull Plus 2 Feet Minimum (95')
  - Upper Limit of Approx. 150' Span
  - Existing 66' Structure Does not Meet Guidelines
- Open Bottom Structures Preferred
- Must Accommodate 100-year Flood
- Alternative Designs Allowed

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Project Background



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Project Background

Existing Structure

- Bridge Very Narrow
  - 18’ curb-to-curb width narrower than 24’ NHDOT requirement



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Project Background

Bridge in Overall "Satisfactory Condition"

- Asphalt Deck Heavily Cracked
- Paint in Poor Condition
  - Peeling and Flaking with Exposed Metal Rusting
- Bridge and Approach Rail are Substandard
- Substructure has Cracks and Areas of Missing Mortar



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Project Background

Roadway Geometry

- Existing Vertical Alignment is Substandard
  - Existing Profile Design Speed ~20 m.p.h.
  - Design Exception for Less than 30 m.p.h.
- Existing Horizontal Alignment is Satisfactory
  - Minor modifications will be incorporated into revised alignment
- Approach Roadway Width is Satisfactory
  - ~22 feet Wide at Bridge

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Project Background



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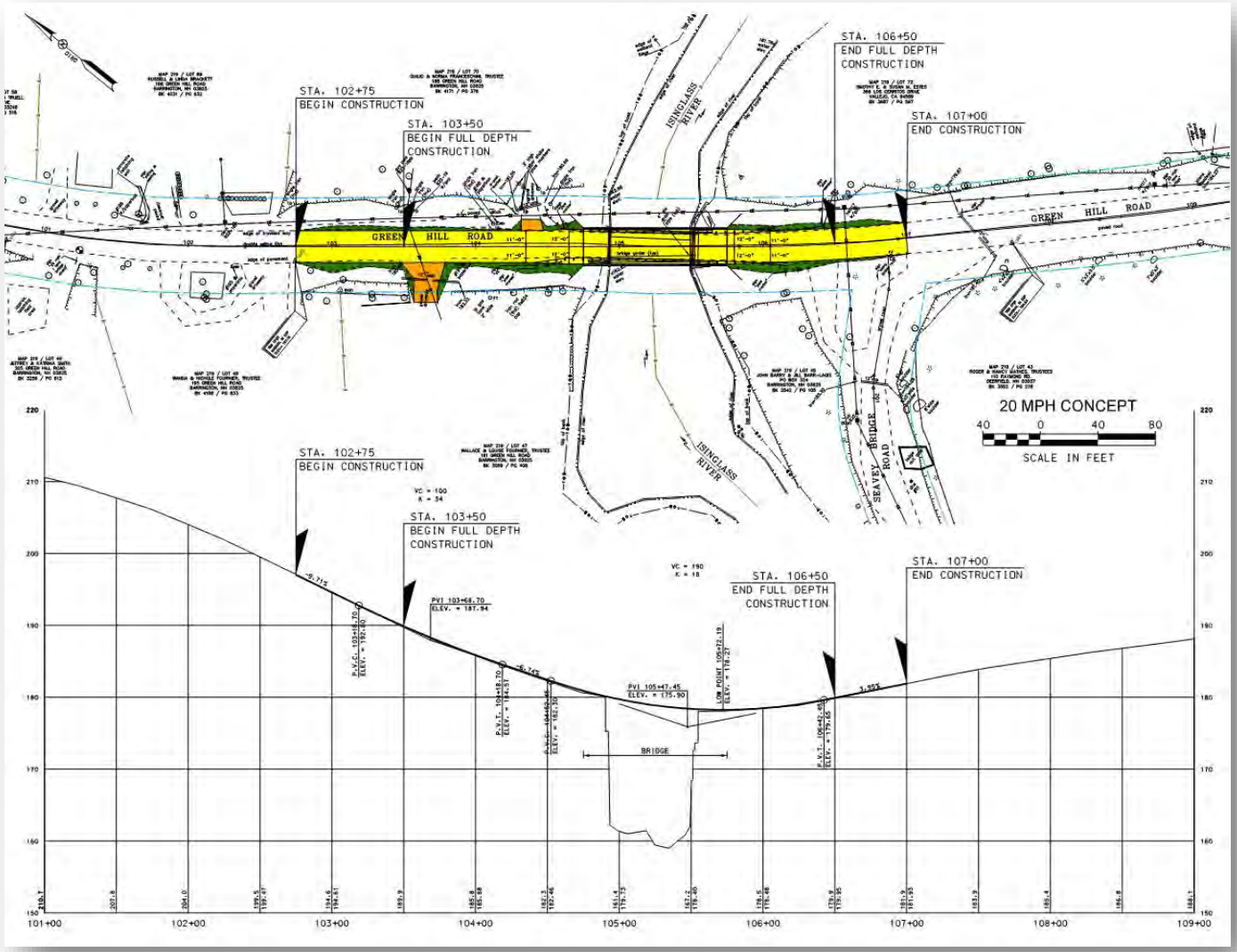
Project Alternatives

Project Will Need to Strike a Balance Between:

- Design Roadway Speed
  - 20 m.p.h. design
  - 25 m.p.h. design
  - 30 m.p.h. design
- Impacts to Abutting Properties
  - Higher Design Speed = More Slope Impacts
- Limits of Construction and Construction Cost
  - Higher Design Speed = Increased Limits of Construction
- Bridge Choices
  - Rehabilitation and Widening
  - Replacement

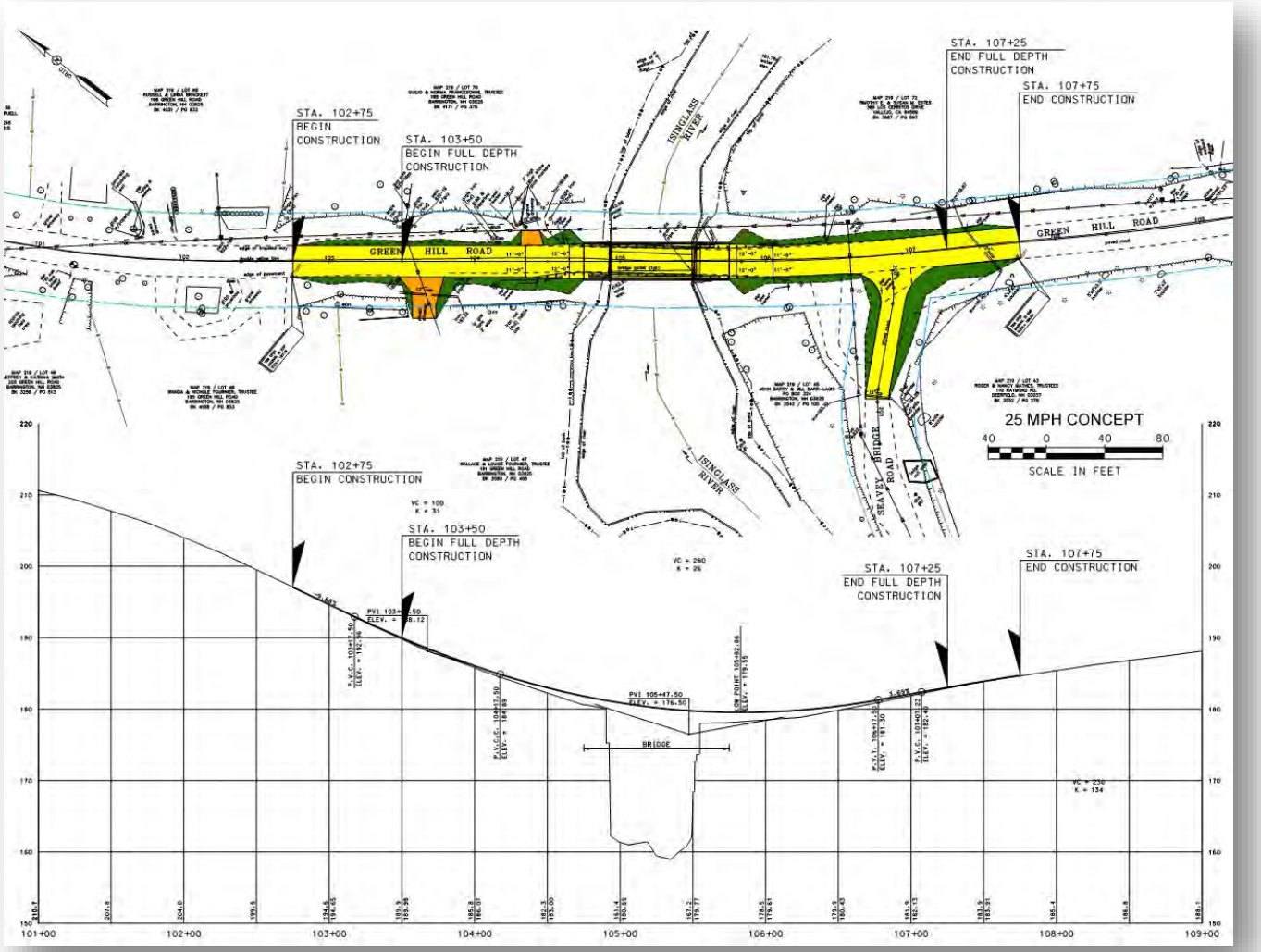
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20 MPH Vertical Alignment



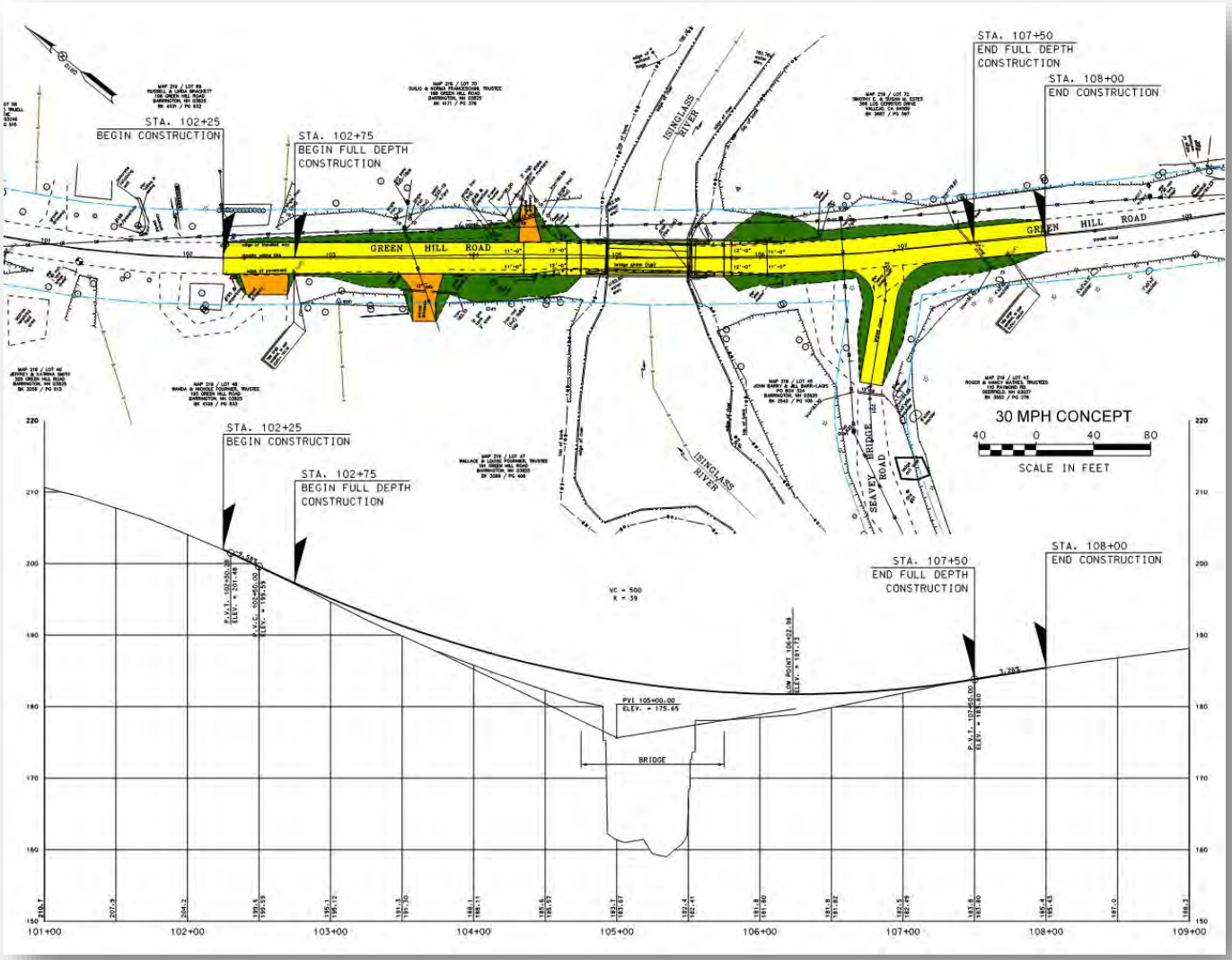
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25 MPH Vertical Alignment



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30 MPH Vertical Alignment



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Project Alternatives

Potential Actions

- **<u>Rehabilitation and Widening</u>**
  - Steel Stringer Replacement (Lead-Based Paint?) and Widening
  - Rail Replacement
  - Substructure Widening and Repairs
  - Only Viable for 20 m.p.h. Profile
  - Phased Construction not Possible



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Project Alternatives

Potential Actions

- **Replacement**
  - Superstructure and Substructure Replacement
  - Widen Bridge to meet NHDOT Requirements
  - Longer Bridge due to NHDES Stream Crossing Guidelines
    - Decreased Stream Velocity

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Project Alternatives

Steel Stringer Bridge - NH Route 137 over Moose Brook, Hancock, NH



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Project Alternatives

Prestressed Box Beam Bridge - Broad Brook Road over Broad Brook, Sharon, VT



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Project Alternatives

Traffic Management

1. Maintain Traffic on Existing Structure and Alignment During Construction
   - Single Lane, Alternating One-Way Traffic
   - Requires Phased Construction
   - Increased Cost
   - **NOT Feasible**
2. Temporary Bridge
   - Located Either Up- or Downstream from Existing Bridge
   - Extensive Clearing
   - Likely Very Costly
   - **NOT Feasible**

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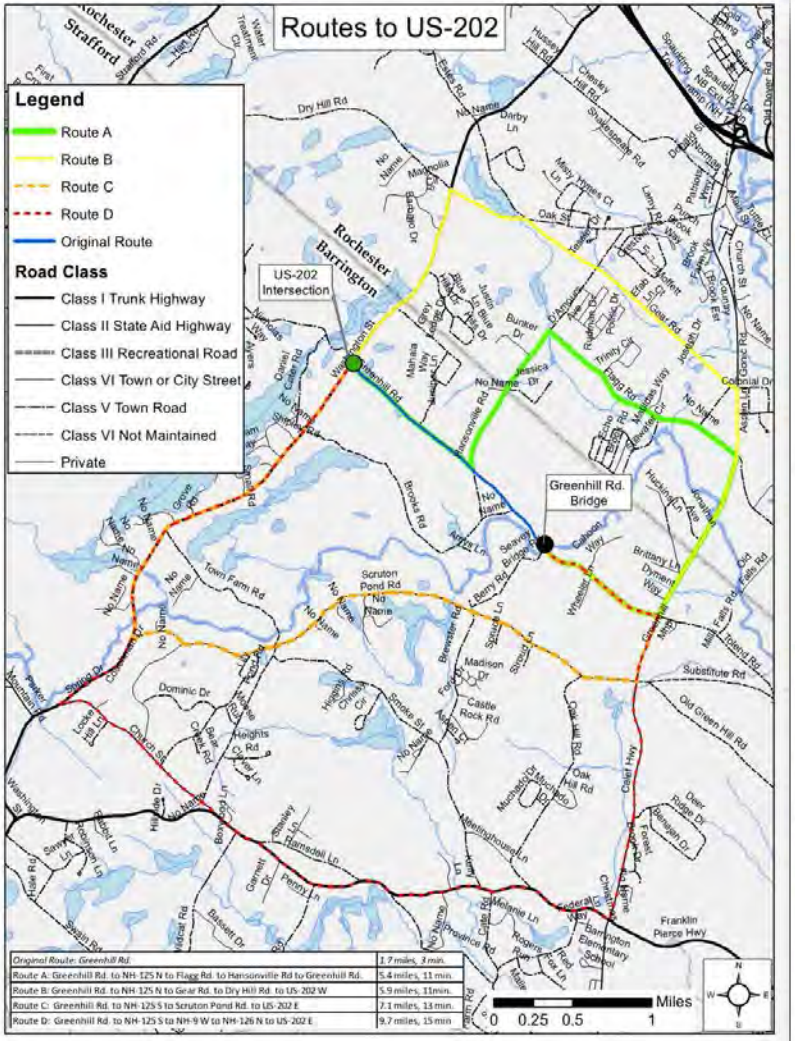
Project Alternatives

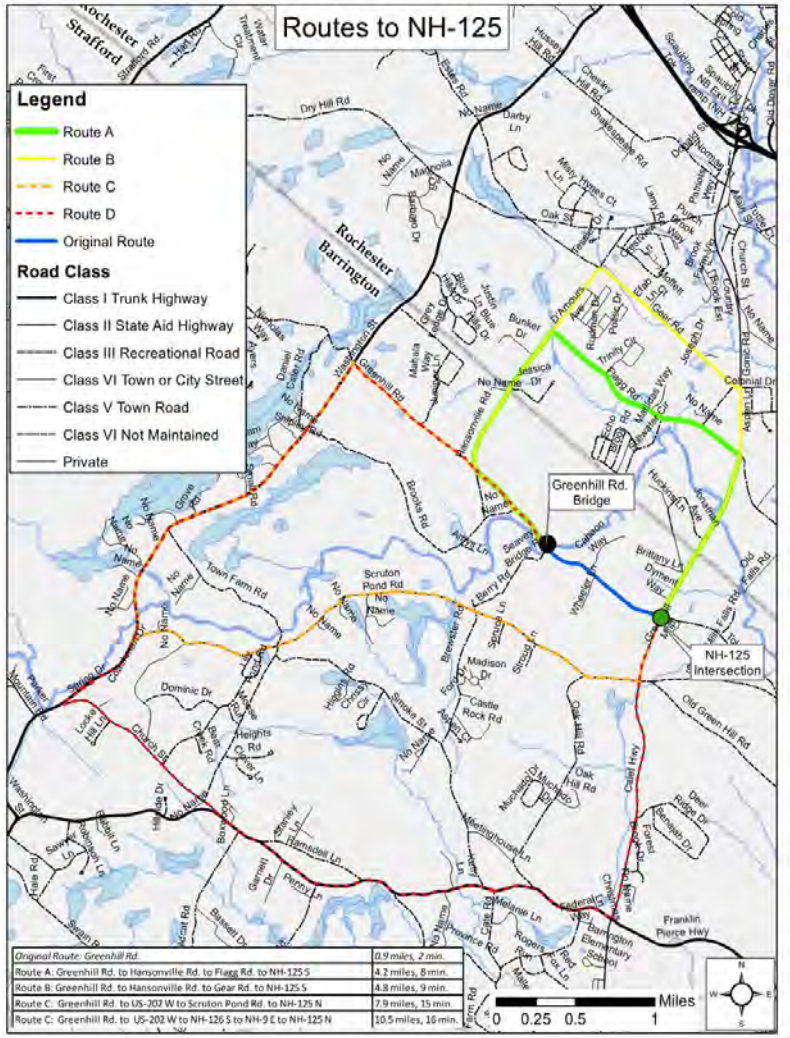
Traffic Management

3. Complete Closure and Detour
    - Only Truly Feasible Alternative
    - Least Costly
    - Routes Evaluated by Strafford Regional Planning Commission
    - Typical Detour Increases Commuter Trip Length **3.7 miles and 8 minutes**

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Detour Routes





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Project Alternatives

Outreach and Coordination

- Town of Barrington Historical Society
  - Stated there was "no concern on any historical aspects of the existing bridge"
- NHDOT Cultural Resource Committee
  - Requested "continuing consultation when plans are known more"
  - Presentation at November Cultural Resources Meeting
  - Additional Study may be Required

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Outreach and Coordination

- Local River Advisory Committee
  - Contact During Preliminary Design
- Town of Barrington Conservation Commission
  - Contact During Preliminary Design
- Town of Barrington Selectboard
  - Decisions are Needed to Guide Project

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What's Next?

Proceed with Engineering Study

- Obtain Input from Board on Design Options
  - Complete Replacement, Including Substructure?
  - Preferred Vertical Profile?
  - Traffic Management Concurrence?
- Progress with Preferred Alternative
  - Investigation of Replacement Structure Types
- Present Preferred Alternative to Selectboard
  - Tentative Date of January 12, 2015
- Submit Engineering Study to Town & NHDOT
  - Tentative Date of January 23, 2015

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