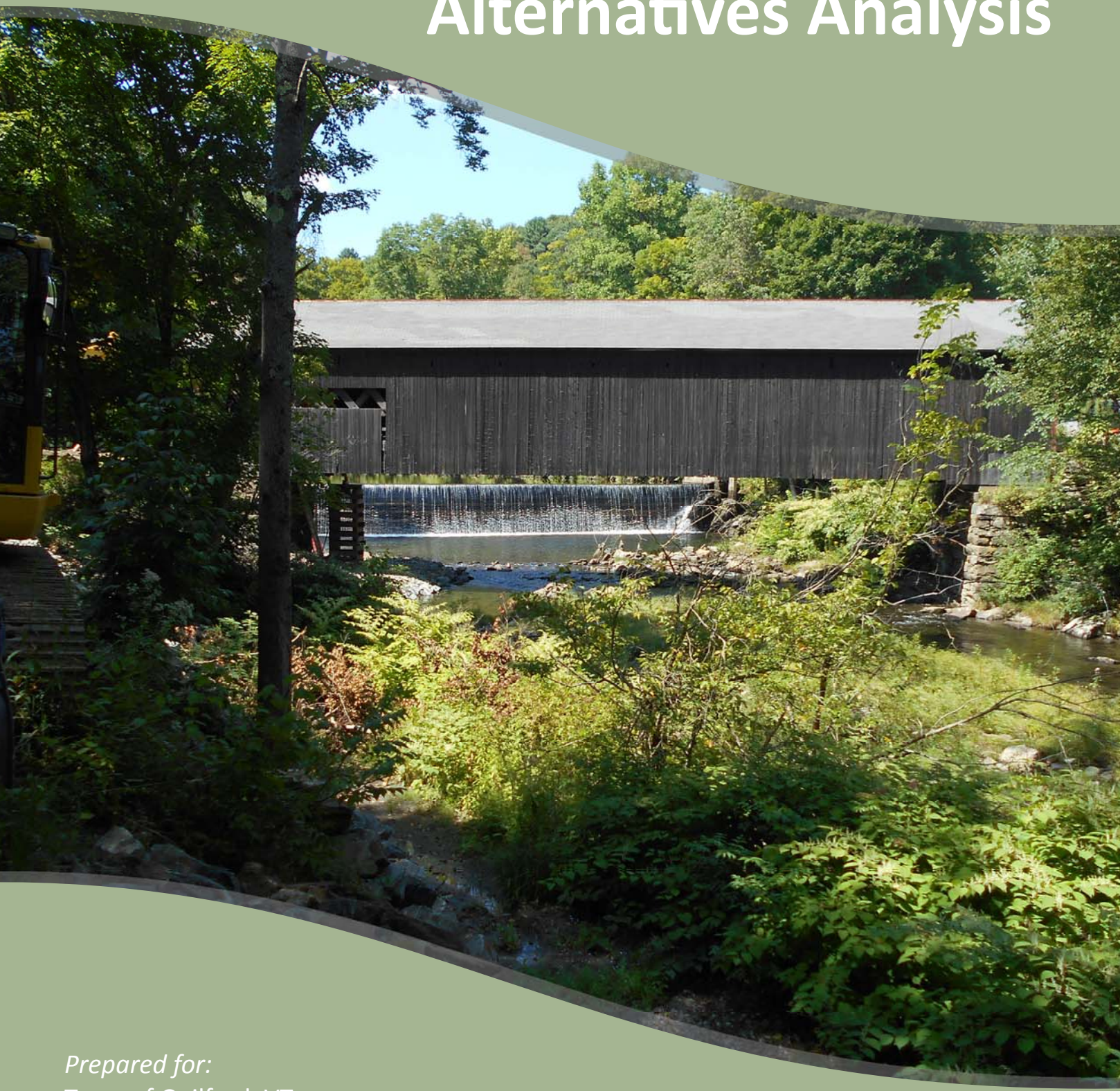
Green River Covered Bridge Alternatives Analysis



Prepared for:
Town of Guilford, VT
236 School Road
Guilford, VT 05301

October 2014

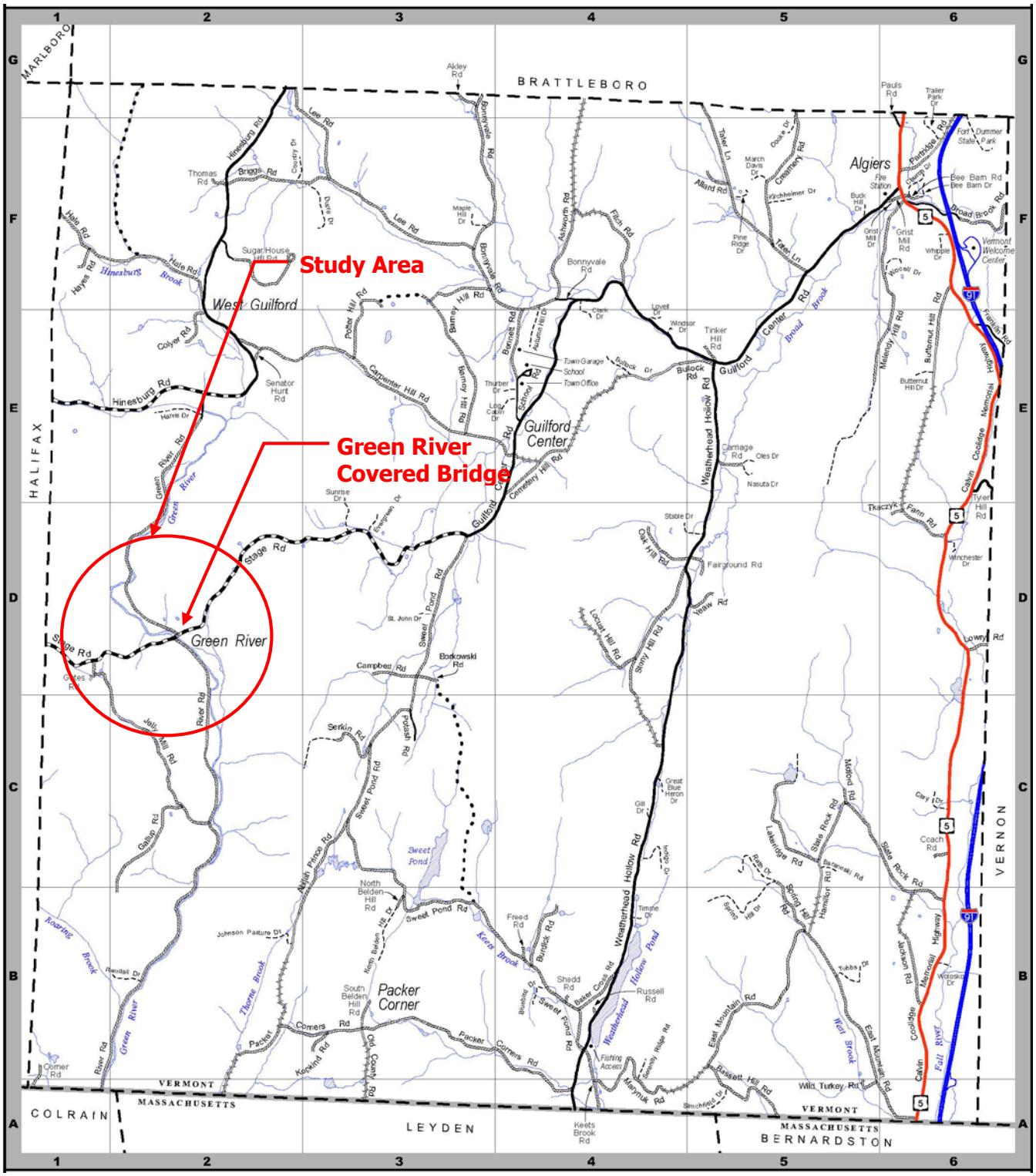
Hoyle, Tanner & Associates, Inc.

TABLE OF CONTENTS

TABLE OF CONTENTS

APPENDICES

MAP OF STUDY AREA



1 STUDY DESCRIPTION

1.1 Overview

Hoyle, Tanner & Associates, Inc. (Hoyle, Tanner) was retained by the Town of Guilford, VT to perform a study of alternate Green River crossings to the Green River Covered Bridge. The goal of this study is provide a systematic review of potential Green river crossing locations that will aid the Town of Guilford in their future planning.

The Green River Covered Bridge does not meet the Town of Guilford's needs for an unposted river crossing without height restrictions and currently requires a long detour: approximately 14 miles to the north, or 19 miles to the south for vehicles weighing greater than four tons and/or greater than 11 feet 6 inches in height, depending on which route is taken. The limitations of the Green River Covered Bridge adversely affect activities such as road maintenance and emergency/life safety response times.

This study was conducted in four phases. Phase 1 included a review of existing information and solicitation of Town input through a local concerns meeting. Phase 2 included review of the 6 potential locations that are detailed in this report. A discussion of the bridge and roadway criteria used is included in Section 3, while resource constraints are summarized in Section 4, and the design considerations and constraints are included in Section 5. Phase 3 of the study included development of conceptual designs for the three locations selected for further consideration that are detailed in Section 6. The final Phase (4) included a public alternatives presentation and Town review and comment, which has been incorporated throughout the study.

To orient the reader of this study, the following are defined in terms of their use in this study:

- Alternatives Analysis (Study) – This is the final deliverable product for this project.
- Study Area – The total extents of area studied as part of this study. This area extends within a ½ mile radius of the Green River Covered Bridge.
- Location – A smaller area within the study area. A total of six locations were reviewed within the study area with three Alternatives selected for more detailed study.
- Alternative – An alternative is a roadway alignment and bridge within a location of study.

1.2 Purpose and Need

The Town of Guilford prepared an Alternatives Analysis Scope dated August 4, 2014 that set the limits and purpose and need for this study and is included as Appendix A. This scope was used by the study team in the site selection and alternative analysis phases of the project. The purpose and need for the study, as taken from this Scope, is as follows:

The top priority for the Town is to provide safe and convenient transportation access for all Guilford residents, while serving their basic needs. The project area is a .5-mile radius with the Green River Covered Bridge at its center. This bridge currently is the only convenient access over the Green River for daily access of +/-45 properties on the western side of the river and travelers from points west and southwest.

The Town is requesting an Alternatives Analysis to identify all of the transportation alternatives (and provide a preferred alternative) to accommodate safe, convenient, and heavy vehicle access over/around the Green River, in the specified project area.

Based on discussions to date, a few examples of the alternatives may include build a new bridge within the project area, rehabilitating the GRCB to accommodate heavier vehicles, create a new road that circumvents the GRCB near an existing Bridge #9 (see enclosed map "New Road Alternative")

The preferred alternative should address the needs of the Town, which include: safety, bridge access for basic needs, the bridge being a viable connector, and historic preservation.

- *Safety: The preferred alternative shall accommodate multi-modal activities, and the project corridor (including new roads, a new bridge, sight distance, rehabilitation etc…) should have safety as the number priority.*

- *Bridge access for basic needs: The preferred alternative shall accommodate heavy and/or large vehicles, including: Town Highway vehicles, fire/rescue service vehicles, fuel and other delivery trucks, etc., to serve the basic needs of the residents on the western side of the river.*

- *Linkage: – The preferred alternative shall be considered as a vital connection to the residents, the town and the surrounding towns. The preliminary traffic counts data for the GRCB has an Average Daily Traffic (ADT) of 320.*

- *Historic: - The GRCB is an historic covered bridge, listed on the National Register. The preferred alternative shall strongly consider having this designation remain if possible.*

Details & Considerations:

- *The project limit is a .5-mile radius from the Green River Covered Bridge*
- *The maximum load capacity that the Town will consider acceptable for the GRCB is 12 tons*
- *The Town will consider alternatives that might compromise the GRCB's National Register listing*
- *The Town will consider alternatives that create new sections of Town Highway(s) instead of the construction of a new bridge or rehab of the GRCB.*
- *The Town will consider use of eminent domain if necessary*

2 SITE SELECTION METHODOLOGY

2.1 USGS Map Review

The initial potential crossing locations were determined from examination of United States Geological Survey (USGS) contour maps, other publicly available maps and orthographic photos. These examinations were followed by site visits to further examine the corridor and narrow down constraints to, and the feasibility of, the initially identified potential crossing sites. Contours were established from the overall USGS area map and a uniform base map was

produced. USGS map contours are not extremely accurate in the study area but for the purposes of this study provide a general idea of the existing conditions and allow the Engineers to establish design constraints. Local tax maps were separately layered onto the base map, which were then able to be overlaid, when necessary, to present or examine different features of the overall corridor. This also allowed Hoyle, Tanner's Engineers to model potential river crossings and overlay their impact upon the existing site.

2.2 Site Visits and Information Resources

Hoyle Tanner's Engineers visited the Guilford, Vermont area on August 25, 2014 to examine the Green River corridor and to take photographs of the potential crossing sites. Copies of tax maps and other reference documents were obtained from the Town of Guilford. Additional site inspections were performed as necessary on later dates.

2.3 Town Goals

The Town of Guilford has long recognized the importance of a balance between meeting the transportation needs of the community while preserving its rural character, natural resources and historical features. This is evident and has been defined in several concrete ways.

The Guilford Town Plan, as updated in 2010, establishes goals and objectives for future social, economic and land use development of the Town to benefit the people of Guilford, the region and the State. The Plan is meant to serve as a guide for responsible development and the preservation of the natural, historic and cultural resources, and the vitality of the Town.

As listed in the Plan, Goal #4 is to provide for safe, convenient, economic and energy efficient transportation systems that respect the integrity of the natural environment. The transportation system of the Town of Guilford should provide convenience and service commensurate with need while respecting the quality of the natural environment. Every reasonable effort must be made to preserve the scenic wealth of our landscape for future generations.

This Goal ties closely with Goal #5: to identify, protect and preserve important natural and historic features of the Guilford landscape, including outstanding water resources and wetlands, agricultural and forest land, significant scenic landscapes and views, important archaeological sites, and historic structures, sites and districts. These resources include productive agricultural and forest lands, wetlands, floodplains, ponds and streams, ridges and steep slopes with fragile soils, and wildlife areas. They also include archaeological, architectural and historic sites, and other places of significant value.

These goals are reflected in the Town Policies identified in the Plan. Transportation policies note that when bridges on public roads need to be replaced, the Town shall consider the impact of the new structures, both in terms of safety and the rural character of the Town. The construction or expansion of public facilities shall not significantly reduce the resource value of adjoining forestry or agricultural lands, unless there is no reasonable alternative. Any construction shall be planned to minimize its effect on adjoining lands and property.

Land Use Policies note that it is the policy of the town of Guilford to encourage the preservation of forest and farm land through taxation based on Current Use, to encourage the use of such organizations as the Vermont Land Trust to conserve large tracts of land, provided such tracts remain open to certain public uses and have management plans, and to discourage the development of new roads on agricultural lands or in large tracts of undeveloped forest.

Additionally, the Vermont Council on Rural Development (VCRD) is dedicated to helping Vermont communities develop their capacity to create a prosperous and sustainable future through coordination, collaboration, and the effective use of public and private resources. The VCRD Community Visit Program is a structured process that enables a community to identify and prioritize goals. Through this program, over series of visits and meeting from 2013 to 2014, Guilford has established priorities for action. These priorities clearly reflect what is laid out in the Town Plan and support the citizen's desire to retain their rural character while supporting growth and development.

2.4 Town Input

Town input for this study is critical and was solicited at the beginning of the project. During the initial scoping meeting the overall study limits were established and five potential crossing locations were selected as well as an Alternative to strengthen the existing bridge. The locations were a combination of areas suggested by Hoyle, Tanner and areas often discussed by Town residents as potential river crossings.

Hoyle, Tanner presented the potential crossing locations to the public on August 25, 2014 prior to a Selectman's meeting to inform the public of the study and to solicit concerns from the public (see Appendix E for meeting minutes of this meeting).

After the meeting, the Town requested that Hoyle, Tanner also investigate the possibility of moving the existing covered bridge and providing a new bridge in the existing location. This Alternative has been designated as one option under Alternative F.

After Alternatives A, B, C, D, E, and F were developed in more detail, a meeting was held at the Broad Brook Grange Hall on October 6, 2014 with members of the select board and the public (see Appendix E for meeting minutes of this meeting). As discussed in the following portions of this report, locations C, D and E were eliminated from further consideration for a variety of reasons and the discussion at this meeting focused on locations A, B and F.

3 DESIGN CRITERIA

3.1 Bridge

The May 13, 2013 Guilford Town Road and Bridge Standards (see Appendix F) require that new bridges must be designed in accordance with the Vermont Agency of Transportation (VTrans) Hydraulics Manual. Existing and/or new roads reviewed in this study are classified as local roads. The 1998 VTrans Hydraulics Manual (with 2001 corrections) principally requires for local roads and minor collectors, at a minimum, that the bridge be designed to pass the 25-year frequency (4% exceedance probability) flood with a minimum clearance of 1 foot between the water surface elevation and the low chord of the bridge (freeboard).

Consideration of the 100-year (1% exceedance probability) flood on upstream property should also be considered. For purposes of this study a 1 foot freeboard above the 100-year flood is used as an evaluation criteria for new bridges. This higher flood elevation is used since FEMA regulations do not allow for a new bridge to affect the current flood elevations without extensive study and map revision. It is also believed that this requirement would not add significant cost to the estimated construction costs while providing a much higher level of service to the Town.

The 2010 VTrans Structures Manual provides the minimum width of lanes and shoulders for bridges on two lane rural connectors and local roads. The minimum widths vary depending upon the roadway design speed and average daily traffic (ADT). For a local road with a design speed of 30 miles per hour and an ADT of 100-400 vehicles per day, the minimum bridge width includes two, 9' wide lanes and two, 2' wide shoulders. However, as discussed in Section 3.2 below, a wider roadway section of two, 11' wide lanes and two, 3' wide shoulders is recommended at the conceptual level. This wider roadway and bridge section would satisfy the VTrans Structures Manual requirements for an ADT of over 2000 vehicles per day. Adding a 1'-6" wide curb to each side of the bridge would give a total bridge width of 31'. The Green River Covered Bridge crossing provides an approximately 12'-6" foot wide crossing with the addition of proposed wood curbs within the bridge.

The design live loading for a new bridge is HL-93 in conformance with the American Association of State Highway Transportation Officials (AASHTO) LRFD Bridge Design Specifications as adopted by the Vermont Agency of Transportation.

3.2 Roadway and Typical Section Design Elements

Potential roadways are envisioned to be designed to meet AASHTO and VTrans standards. All viable alternatives have been estimated utilizing a two-way roadway having 11 foot wide lanes and 3 foot wide shoulders. This leads to a 28 foot wide roadway section. This typical section is used to assume ideal and maximum impacts at the study phase of this project. Daily vehicle counts of less than 400 vehicles per day would allow an acceptable narrower configuration composed of 9 foot wide lanes with 2 foot wide shoulders for a total footprint width of 22 feet if desired. This reduction would not be recommended in light of anticipated emergency vehicle and truck traffic and roadway curves involved.

The two lanes are anticipated to be crowned at the centerline using 4% cross slopes to provide proper drainage of the gravel surface. Due to the rolling/mountainous terrain and the need to avoid environmental constraints, some locations along the roadway would require steeper side slopes. Side slopes vary from 1' vertical to 1.5' horizontal (1:1.5) to 1' vertical to 4' horizontal (1:4). The 1:1.5 and 1:2 side slope locations would generally require guardrail and additional roadway widening. The 1:1.5 side slopes would require stone slope protection.

4 RESOURCE CONSTRAINTS

Each of the alternatives reviewed has the potential to impact natural and historic resources. Such impacts would require federal and/or state permits and coordination with various resource agencies. The degree and types of impacts, the cost associated with, and the time required to complete such permitting efforts, varies with each of the alternatives.

The project area for each Alternative was reviewed using the Vermont Agency of Natural Resources (ANR) Natural Resources Atlas, which is an online mapping tool developed for use in identifying resources protected or regulated by the various state and municipal departments and agencies. Map layers reviewed include the following:

- Hazardous Waste Sites
- Hazardous Waste Generators
- Underground Storage Tanks
- Waste Water Facilities
- Invasive Plant Atlas
- Designated Public Sites
- Designated Trail Corridors
- Rare, Threatened and Endangered Species
- Significant Natural Communities
- Uncommon Species and Other Features
- Deer Wintering Areas
- Indiana Bat Hibernacula and Summer Range
- Class A Watersheds
- 303(d) List of Impaired Streams and Watersheds
- VT List of Priority Rivers and Streams
- Vernal Pools Confirmed and Unconfirmed
- Wetlands
- DEC Managed Lands
- Floodable Soils-NRCS
- DFIRM Floodways
- Special Flood Hazard Areas
- Prime Agricultural Soils
- Private Wells
- Public Water Sources
- Surface Water SPA
- Ground Water SPA
- State Natural Areas
- Fragile Areas Registry
- Managed Lands
- Conserved Lands

Additional online mapping review included the US Fish and Wildlife Service (FWS) National Wetland Inventory (NWI) Wetlands Mapper, the USFWS listing of threatened or endangered species in Vermont by County, the US Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey, the NOAA National Marine Fisheries Service (NMFS) Habitat Conservation Essential Fish Habitat Mapper, and the Federal Emergency Management Agency (FEMA) Flood Map Service Center.

Resource maps for 100 year floodplain, floodable soils and wetlands, prime agricultural land, conservation lands and well locations as discussed in the following sections are included in Appendix C for Alternatives C, D and E and Appendix D for Alternatives A and B.

4.1 Soils

The NRCS Farmland Protection Policy Act (FPPA) is intended to minimize the impact of irreversible conversion of farmland to nonagricultural uses. For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Soils designated as such are protected, with priority given to those listed first. Each of the Alternatives studied with the exception of Alternative F would impact Prime Farmland, Statewide Farmland, or both. Projects are subject to FPPA requirements if they may irreversibly convert farmland to nonagricultural use and are completed by a Federal agency or with financial assistance from a Federal agency; this includes any Federal grants, and the creation

of new State highways or bridges.

NRCS uses a land evaluation and site assessment (LESA) system to establish a farmland conversion impact rating score on proposed sites of such projects. This score is used as an indicator for the project sponsor to consider alternative sites if the potential adverse impacts on the farmland exceed the recommended allowable level. The assessment is completed on Form AD-1006, Farmland Conversion Impact Rating. Avoidance and minimization of impacts must be shown on this form. Mitigation may be required based on the amount and types of impacts for the project, and could include permanent protection for an equivalent or greater amount of farmland that is impacted.

4.2 Wetlands/River Crossing/Floodplains

Impacts to jurisdictional wetlands and their buffers, the riparian areas around the Green River, and the floodways/floodplains of the Green River are regulated by Federal and State agencies. The US Army Corps of Engineers (USACOE) has jurisdictional authority over rivers and floodways, under the Section 10 of the Rivers and Harbors Act of 1899, and over waterways of the US (wetlands) under Section 404 of the Clean Water Act (CWA). In connection with these programs, FEMA identifies Special Flood Hazard Areas or those areas within the 100-year floodplain (also described as areas having a 1% chance to flood annually). Placement of fill in a wetland, river or floodplain requires a permit from the USACOE as well as mitigation to replace the functions and values of the lost resource. Based on the amount of potential impact to wetlands and floodways, a Category 2 General Permit or an Individual Permit could be required. Compensatory mitigation via wetland or floodplain creation, restoration/enhancement, or preservation would be required based on the amount of impact.

The Vermont Wetland Rules identify and protect 10 functions and values of significant wetlands and establishes a 3-tier wetland classification system to identify such wetlands. The first two classes of wetlands (Class I and Class II) are considered significant and protected under the wetland rules along with their buffer zones (generally 100-foot for Class I and 50-foot for Class II). The VT Wetlands Program is administered by VTDEC Watershed Management Division and retains jurisdictional authority over wetlands listed on the Vermont Significant Wetlands Inventory (VSWI). For projects impacting such wetlands, VTDEC issues two types of permits: an individual permit or a general permit, based on the area of impact and the value of the wetland. Mitigation could be required similar to that requested for USACOE wetland impacts.

Vermont's River Management and River Corridor and Floodplain Management are administered by the VTDEC Watershed Management Division Rivers Program. A General Permit pursuant to the Vermont Stream Alteration Rule (Environmental Protection Rule, Chapter 27), 10 V.S.A. chapter 41 (regulation of stream flow) would be required for any stream alteration work which exceeds 10 cubic yards of fill in a perennial stream, including the Green River. Stream alteration performance standards would need to be met when designing river crossings, and the" Guidelines for the Design of Stream/Road Crossings for Passage of Aquatic Organisms in Vermont" would need to be adhered to.

Mitigation for these types of impacts could be expensive and time-consuming, since it would be required to be located within the immediate watershed. Locating and purchasing land to create wetlands, or place under conservation, or remove fill from the Green River floodplain,

would be the outstanding variable in assessing each of the Alternatives with such impacts.

4.3 Private Wells

Email correspondence with Emily Tully, Vermont Department of Environmental Conservation (VTDEC) Drinking Water and Groundwater Protection Division stated that, per Chapter 21 of the Vermont Water Supply Rule (Table A11-1), water supplies must be at least 25 feet from the outer edge of the shoulder of roadways. Thus, any new roads must maintain a 25 foot separation distance. In addition, water supplies and wells must be 10 feet from property lines, including right-of-ways. Each of the Alternatives has the potential to impact an existing well used for private water supply, based on the approximate locations on the VTANR Atlas, however, the roadway alignment could be shifted slightly to meet these requirements. There would not be a required permit for this constraint, however the potential change in alignment would have an associated cost, and is listed here for comparison purposes.

4.4 Wildlife and Fisheries

There are no Federally-listed or State-listed threatened or endangered species or their habitat within the potential project work area for any of the alignments. There is no federally-designated Critical Habitat in the State of Vermont. The Green River has not been designated as Essential Fish Habitat by the National Marine Fisheries Service. Impacts to such resources would have required permitting and mitigation efforts.

The Vermont Fish and Game Department (VFGD) habitat block is defined as a contiguous area of natural vegetative cover with little or no permanent internal fragmentation from human development. The boundaries of habitat blocks are delimited by roads, other forms of permanent development, and agricultural lands. The term habitat block is used instead of forest block to reflect the varied habitat types that occur within these blocks, including interior forest habitat, forested and open wetlands, ponds and streams, cliffs, rock outcrops, and early successional forest.

Two Alternatives would cross through areas noted as having high scores for unfragmented wildlife habitat. While this would not require a specific permit, this would be a consideration for issuance of permits for wetland impacts via VTDEC, and VTFWD would be consulted for review on these applications. Specific mitigation efforts targeted at wildlife could potentially be requested by these agencies.

4.5 Conserved Lands

The 38.45 acre parcel located in the southeast corner of the project area and currently owned by Michael B. and Laura Knapp is encumbered by a perpetual conservation easement held by the Vermont Land Trust (VLT). Listed under the "Restricted Uses of the Protected Property" is the following: No rights-of-way, easements of ingress or egress, driveways, roads or utility lines shall be constructed, developed or maintained into, on, over, under or across the property.

The property has also been actively managed for wildlife habitat, and efforts to improve the parcel have been supported by grants from the Wildlife Habitat Incentive Program (WHIP) administered by NRCS. Impacts to these improved areas would require negotiation with NRCS and mitigation for such efforts.

Use of this parcel for Alternatives D or E would require lengthy and costly legal endeavors, which may sufficiently render these alternatives non-viable.

4.6 Historic Resources

Historic resources such as the Green River Covered Bridge are protected by Section 106 of the National Historic Preservation Act of 1966 (NHPA). This act requires federal agencies to take into account the effects of their undertakings on historic properties, and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment.

The FHWA, VTrans, the Vermont State Historic Preservation Officer (SHPO), and the ACHP have a Programmatic Agreement (PA) that authorizes FHWA to fulfill its Section 106 responsibilities for the Federal Aid Highway Program in Vermont through VTrans, who has assumed the authority for final review of almost all transportation projects. The PA allows VTrans to complete Section 106 review in-house. VTrans established a Historic Covered Bridge Preservation Committee which reviews and comments on work to be performed on covered bridges.

Any work done on the existing structure, including maintenance or rehabilitation efforts, would require coordination with these agencies. Work that would be viewed as having an adverse effect on the covered bridge would require mitigation for those lost resources, such as development of signage, an informational kiosk, or brochure highlighting the bridge and its role in the community.

5 DESIGN CONSIDERATIONS AND CONSTRAINTS

5.1 Proximity to Fire Station

The Guilford Volunteer Fire Department is on the westerly side of Guilford Center Road approximately 550’ south of Route 5 in Guilford, Vermont. The Fire Station is approximately 7.0 miles from the easterly side of the existing covered bridge. For those emergency vehicles able to cross the existing covered bridge, roadways on the west side of the Green River are 7.0 miles from the Fire Station. If a vehicle is too large or too heavy to cross the existing covered bridge, emergency vehicles needing to access roadways on the westerly side of the Green River have to travel via a detour route which is approximately 18.3 miles to the west side of the bridge and takes approximately 49 minutes. Without the use of the bridge the response time is increased by approximately 34 minutes. Similarly, the Town Garage is located on the east side of Green River, so maintenance vehicles also face the issue of difficult and lengthy access to the roadways on the westerly side of the Green River.

5.2 Live Load Capacity of Covered Bridge

The Green River Covered Bridge (GRCB) is located on a Class 2 town highway, therefore Per 23 V.S.A. § 1392, the maximum vehicle weight on bridge with a wood floor, wood subfloor or wood stringers is 20,000 unless otherwise posted by the Selectboard. The GRCB was posted in June for a live load capacity of four tons which was reduced from the previous eight ton rating. The reduced posting was based on a recommendation from the Vermont Agency of Transportation (VTrans).

A detailed structural analysis of the GRCB has not been completed, however, based on past analysis on similar bridges performed by Hoyle, Tanner, it is believed that the eight ton live load posting could be achieved with only minor modifications to the bridge. Live load postings above the eight ton level would require additional structural support to the bridge which is discussed in more detail in Section 6.3.

5.3 Existing Traffic Patterns

Traffic within the study area primarily uses the Green River Covered Bridge as an east/west connection along Jacksonville Stage Road. Traffic at the bridge averages 273 cars per day according to traffic counts recently performed by the Windham Regional Commission. The detour to the north is approximately 13.6 miles and takes about 34 minutes traveling along gravel roads. The detour to the south is approximately 19.1 miles and takes about 47 minutes traveling along paved roads.

5.4 Village Features

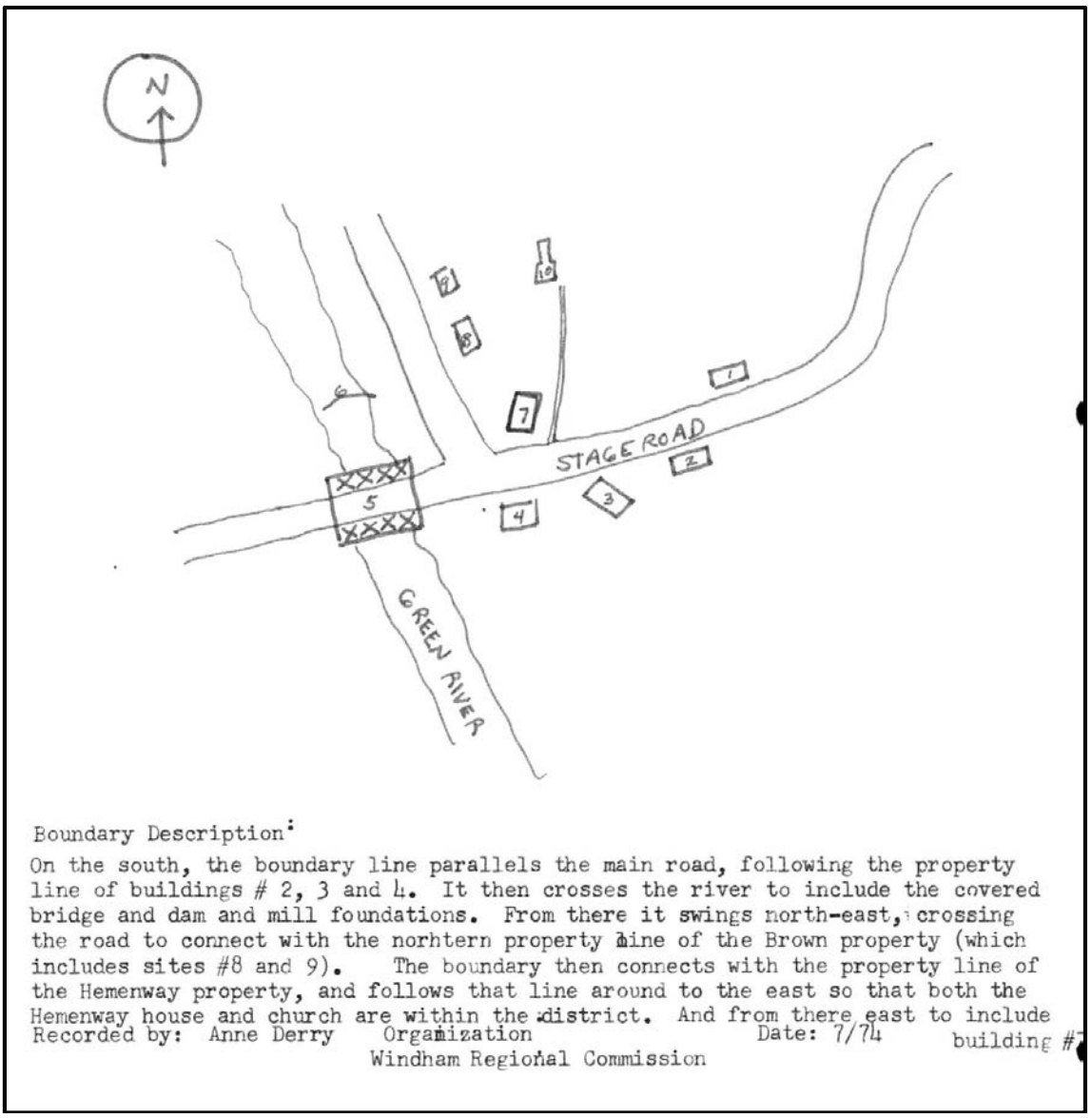
The Green River Covered Bridge is located in the Green River Historic District which is listed on the Vermont State Register of Historic Places. The Historic Register Form includes the following statement of significance:

A small hamlet in the town of Guilford, Green River is a town which stopped growing about 1880. Most of the mills which made Green River prosperous throughout the last century burned in the first quarter of this century. Farm building too burned and the open farmland and fields have grown over. All commercial activity has died: the Curtiss House no longer operates as store, and the old General Store and Post Office (once located across from the Vinton House) burned early in this century. Today the town consists simply of a handful of houses and an empty church. These line the old Stagecoach Road, a shady unpaved road which winds through the village and forks at the covered bridge. The Green River spills over the dam near the bridge: it once provided the power for a chair factory and baby buggy factory.Both burned about 1920.

The outstanding aspect of Green River is the interrelationship of buildings to their natural environment. All of the buildings are surrounded by bushes, trees and open space: meadows, gardens or lawns. The road and driveways are unpaved; there are no sidewalks or streetlamps. There are no "hard" edges—no curbs or metal street furniture, but the visual character of the street is determined by the screen of overhanging bushes and trees and the dirt road. The scale and visual form of the town relates directly to human scale and use, rather than to those of the automobile.

The district boundary is described both graphically and with a narrative that is included below as Figure 1. The district includes a total of ten structures including the Green River Covered Bridge and the Timber Crib Dam which are also individually listed on the National Register of Historic Places.

Figure 1 – Green River Historic District Boundary Description



Boundary Description:

On the south, the boundary line parallels the main road, following the property line of buildings # 2, 3 and 4. It then crosses the river to include the covered bridge and dam and mill foundations. From there it swings north-east, crossing the road to connect with the norhtern property line of the Brown property (which includes sites #8 and 9). The boundary then connects with the property line of the Hemenway property, and follows that line around to the east so that both the Hemenway house and church are within the district. And from there east to include building #

Recorded by: Anne Derry Organization Windham Regional Commission Date: 7/74

During the study of alternatives within this area, building removal was not considered to be an attractive alternative and particular attention was paid to the fact that removal of certain buildings within a Historic District would not likely be permitted under the Section 106 review process. This was a contributing factor against constructing a new bridge immediately upstream or downstream of the covered bridge.

5.5 Bridge Type Selection

5.5.1 Bridge Types

There are many bridge types that provide cost effective solutions for structures of varying span arrangements and lengths. Although certain bridge types are well suited for a particular span length range, many bridge types are viable at most typical span lengths due to overlapping of applicable span length ranges. Selecting the appropriate type is an essential element for the design and construction of a cost-effective bridge. The following bridge types may be appropriate and cost-effective solutions for the Green River crossing:

- Welded steel plate girder bridges are economical and cost effective for span lengths ranging from 90 to 500 feet.
- Precast concrete girder bridges are generally economical and cost effective for span lengths up to approximately 150 feet.
- Steel truss bridges are generally cost effective for span lengths greater than 450 feet.

Welded steel plate girder bridges are generally the easiest type to construct for longer spans such as those being considered in this study. Steel girder bridges are generally constructed without the use of temporary erection towers when spans are less than 200 feet in length. Steel girder bridges also offer flexibility to accommodate horizontally and vertically curved roadway geometry, however, the minimum girder radius is limited by shipping width restrictions.

Precast concrete girder bridges generally provide lower life cycle costs than steel structures since they require very little long-term maintenance, however, precast concrete beams are usually deeper and heavier than steel girders of the same length. Shipping and erection becomes more difficult as the span length and weight increases. In addition, this type of bridge can require a larger substructure than steel. Although beam size and weight may be reduced by splicing multiple sections together to obtain longer lengths, there are additional costs associated with this technique. Additionally, temporary erection towers are likely required to support the beam sections as they are spliced together.

Although truss bridges are comprised of smaller and lighter sized members, their construction is much more complex than that of welded steel plate girder bridges. Truss bridges have many more labor intensive connections. Single span truss bridges also require the use of temporary erection towers to support sections of the bridge as it is constructed.

In summary, a welded steel plate girder bridge with a reinforced concrete bridge deck is the alternate river crossing solution presented in this report based on the following:

- Welded steel girder bridges are commonly constructed in VT.
- Local contractors have experience in erecting long span steel girder bridges.
- Welded steel plate girder bridges provide cost effective solutions.

5.5.2 Bridge Geometric Layout

Bridge abutment and pier locations are often constrained by existing geographical and topographical features. Existing road locations and the flood plain limits are existing features that constrain the studied abutment and pier locations for the alternate river crossing locations evaluated in this study. The following design considerations served as the basis for developing bridge costs for the Alternatives investigated:

- Since a regulatory floodway was not established for the Green River, the bridge layout is based on no fills being placed within the 100-year flood plain limits. Therefore abutments were located beyond the 100-year flood plain limits.

- Bridge span lengths were limited to 200 feet.

    - Temporary erection towers are not usually required to erect steel girders for span lengths less than 200 feet, however temporary erection towers are required for curved steel girder erection.
    - Girder stability during erection becomes increasingly critical as the span lengths exceed 200 feet.

- Span arrangement selection:

    - An economical design balances the superstructure and substructure costs to provide the lowest total cost.
        - Longer spans results in higher superstructure costs.
        - Shorter spans results in higher substructure costs.
    - End span lengths that are approximately 80% of the interior span lengths provide the most economical girder designs.
    - Equal span lengths provide relatively economical designs.
    - End spans longer than interior spans should be avoided since they are less efficient and economical designs.

5.6 Roadway Layout and Design

The roadway layouts are designed for a specified speed limit and safety issues. For this study we have used a design speed of 30 mph (5 mph over the posted speed limit) to be consistent with the posted speed limit of 25 mph for other roadways in the area. Design elements include lane and shoulder widths, inner radius of curves, superelevation, roadway grades, stopping sight distance, roadway side slopes, and proposed roadway matches into the existing roads.

The following design elements served as the basis for the study alignments:

- Average Annual Daily Traffic (AADT) = 273 vehicles per day
- Design Speed – 30 mph
- Posted Speed – 25 mph
- Maximum Grade – 10% for rolling terrain to 14% for mountainous terrain
- Horizontal Curves – minimum inner radius of 200 feet
- Superelevation – None, used normal crown

- Stopping sight distance - 115' minimum
- Lane width – 11' lanes and 3' shoulders – total width = 28 feet
- Side slopes of 2:1 where possible with a maximum of 1.5:1 where needed

Roadway alignment locations are often dictated by minimizing impacts to environmental resource areas (floodplain, wetlands, endangered species, well locations, etc.), right of way location, building and structure locations, existing topographic features (i.e. hills and water bodies) and constructability.

The environmental resources areas associated with this project are discussed in detail in Section 4 of this study. Specific constraints for each alignment are further discussed in Section 6 of this study. In general the following constraints were reviewed when developing the alignments:

- The roadway layout is based on minimizing fills placed within the 100-year floodplain limits. The slope limits were generated from conceptual horizontal and vertical alignments and the typical section. The 100-year floodplain limits are as shown on the Federal Emergency Management Agency (FEMA) flood maps.

- Other environmental resource areas were also reviewed in an attempt to avoid impacts, including the wetland area mapping, agricultural lands and well locations.

An attempt is made at minimizing impacts to private properties. An alignment would typically follow a property line in an effort to not subdivide the property or render the property unusable.

5.7 Parcel Ownership

The parcel ownerships shown on the alternative study maps are from existing tax map information received from the Town and/or as shown on GIS mapping

6 DISCUSSION OF CROSSING ALTERNATIVES

6.1 Alternatives Eliminated from Further Consideration

6.1.1 Alternative C – South of the Green River Covered Bridge

Alternative C would begin approximately 600 linear feet southeast of the existing covered bridge on Green River Road and end approximately 500 linear feet northeast of the covered bridge on Stage Road and would be approximately 650 linear feet in length. This alternative was evaluated for the following reasons:

- The alternative would avoid Conservation Land.

- The alternative would be one of the shorter alternatives for crossing the Green River and bypassing the covered bridge location without having to remove a structure or impact archeological land.

- The existing terrain is much flatter for this alternative as compared to the terrain for the alternatives north of the existing bridge.

Several concerns/issues were evaluated during the design of this alternative and are listed as follows:

- A significant portion of the overall land area on this parcel would be require land acquisition to construct the roadway.
- This alternative would traverse a wetland. Filling of the wetland would likely require wetland mitigation.
- This alternative would traverse the 100-year floodplain limits. Filling of the 100-year floodplain would likely require floodplain mitigation and the filing of a Letter of Map Revision (LOMR) with FEMA for any potential floodway changes.
- A bridge at this location would have to be constructed above the 100-year floodplain elevation. A bridge approximately 300 feet long would be required. Green River Road would need to be reconstructed and raised at the Alignment C connection in order to meet the bridge elevation further impacting the 100-year floodplain limit.
- The construction of this alternative including the 300 foot long bridge would be significantly more expensive than some of the other alternative considered.
- A viable alternative which has significantly less impact to the 100-year floodplain and wetlands exists.

Based on these concerns/issues, this alternative was eliminated from further consideration.

6.1.2 Alternatives D & E – South of the Green River Covered Bridge at Trust Land

Alternatives D & E have similar design constraints and concerns, therefore are being discussed together. Alternative D would begin approximately 900 linear feet southeast of the existing covered bridge on Green River Road and end approximately 575 linear feet northeast of the covered bridge on Stage Road. This alternative would be approximately 1000 linear feet in length. Alternative E would begin approximately 1300 linear feet southeast of the existing covered bridge on Green River Road and end approximately 575 linear feet northeast of the covered bridge on Stage Road. This alternative would be approximately 1300 linear feet in length. These alternatives were evaluated for the following reasons:

- The alternatives would utilize an existing field entrance and an established vehicle trail.
- The majority of each of these alternatives would be constructed in an open field potentially reducing construction costs.
- The existing terrain is much flatter for these alternatives as compared to the terrain for the alternatives north of the existing bridge.

Several concerns/issues were evaluated during the design of these alternatives and are listed as follows:

- The roadway and bridge construction would require land acquisition from land protected under a conservation easement for the majority of their entire length.

- These alternatives would traverse the 100-year floodplain limits. Filling of the 100-year floodplain would likely require floodplain mitigation and the filing of a Letter of Map Revision (LOMR) with FEMA for any potential floodway changes and can be extremely time consuming.

- A bridge at these locations would have to be constructed above the 100-year floodplain elevation. A bridge over 600 feet long would be required at each of these locations. Green River Road would need to be reconstructed and raised at each of these alternative tie-in locations in order to meet the raised bridge elevation further impacting the 100-year floodplain limit.

- The construction of these alternatives including a 600 foot long bridge would be significantly more expensive than some of the other alternatives considered.

- A viable alternative which has significantly less impacts to the 100-year floodplain and wetland areas exists.

Based on these concerns/issues, these alternatives were eliminated from further consideration.

6.2 Alternatives Selected for Further Consideration

6.2.1 Alternative A – North of the Green River Covered Bridge at Existing Bridge

Alternative A would begin approximately 1,200 linear feet west of the existing covered bridge on Stage Road and end approximately 2,600 linear feet north of the covered bridge on Green River Road with a total length of 3,200 linear feet. This alternative was evaluated for the following reasons:

- This alternative would utilize an existing bridge crossing on Green River Road to bypass the existing covered bridge, eliminating the need to construct a new bridge, significantly reducing construction costs.

- The 100-year floodplain generally follows the river basin. Alternative A could be constructed away from the 100-year floodplain and other environmental constraints. With special design considerations environmental impacts could be minimized.

- This alternative would have no conservation land impacts.

Several concerns/issues were evaluated during the design of this alternative and are listed as follows:

- Avoiding the 100-year floodplain may involve special design elements such as steeper roadway side slopes, stone slope protection and the installation of guardrail.
- The rolling/mountainous terrain may require steep cut and fill side slopes to match existing ground. These side slopes may also require special design elements such as stone slope protection and the installation of guardrail.
- This alternative would require steep grades (10% to 14%) to match into the existing roadway at Stage Road.
- There is an existing house immediately adjacent to this alignment at the Green River Road connection. The roadway design may need to take this house into consideration.
- The majority of this alternative would cross wildlife habitat land. This roadway alternative may separate wildlife from the Green River.
- From aerial views and site visits, it has been determined that there is a residential home in close proximity to the alignment. It is estimated the home would be approximately 150 feet from the edge of the proposed roadway.
- This alternative would involve partial land acquisition from more than one owner.
- The total estimated cost for this alternative, including survey, engineering, land acquisition, permitting and construction would be estimated at $1.7 million.

6.2.2 Alternative B – North of the Green River Covered Bridge

Alternative B would begin approximately 1,200 linear feet west of the existing covered bridge on Stage Road and end approximately 1,470 linear feet north of the covered bridge on Green River Road with a total length of 1,250 linear feet. This alternative was evaluated for the following reasons:

- This alternative would cross the 100-year floodplain at its narrowest location minimizing the required bridge length to approximately 200 feet.
- Alternative B would have no conservation land impacts.

Several concerns/issues were evaluated during the design of this alternative and are listed as follows:

- This alternative would require steep grades (10% to 14%) to match into the existing roadway at Stage Road.

- The rolling/mountainous terrain may require steep cut and fill side slopes to match existing ground. These side slopes may require special design elements such as stone slope protection and the installation of guardrail.

- There would be a significant drop from Green River Road to the 100-year floodplain elevation almost immediately adjacent to the roadway, therefore a very high bridge would be required for this alternative. A tall bridge pier may need to be constructed within the 100-year floodplain.

- A portion of this alternative would cross wildlife habitat land. This roadway alternative may separate some wildlife from the Green River.

- This alternative would involve partial land acquisition from more than one owner.

- The construction cost for this alternative, including survey, engineering, land acquisition, permitting and construction would be estimated at $5.0 million.

6.3 Alternative F - Green River Covered Bridge

Six alternatives were evaluated at the current location of the Green River Covered Bridge (GRCB) which range in scope from maintenance repairs to relocation of the covered bridge and construction of a modern bridge in its place. The bridge is currently posted for a live load of four tons, has a clear distance between trusses of approximately 15' and a vertical opening of approximately 11'-6".

Each alternative, would require review and approval by the Vermont Covered Bridge Committee with the exception of maintenance repairs which were previously approved by the Committee. The Committee reviews projects in accordance with Section 106 of the National Historic Preservation Act of 1966 (see Section 4.6 for further discussion of this Act) and their approval would be required to obtain environmental permits and/or as a condition of certain funding sources.

Each alternative at the GRCB location is described in more detail below.

6.3.1 Maintenance and Repairs

This alternative includes construction of previously designed maintenance work to the GRCB and generally includes the following items:

- Replacement of the existing asphalt shingle roof with a new standing seam metal roof.
- Replacement or sistering of select bridge members.
- Epoxy repairs to select bridge members.
- Installation of a wood new curb within the bridge.
- In-filling of the gap between existing wood running planks.
- Re-alignment of the bridge to correct racking.
- Regrading of the approach roadway and installation of drainage improvements.
- Installation of new wood guardrail.
- Application of a fire retardant and insecticide/fungicide to all wood bridge members.

As discussed above, these repairs are 'shovel ready' and have been previously approved by the Vermont Covered Bridge Committee. This alternative would preserve the bridge but would not improve the live load capacity of the bridge.

The total estimated construction cost for this alternative is $315,000 and the expected time to completion (including design, permitting and construction) is one year.

6.3.2 Upstream or Downstream Bypass Bridge

Installation of a new bypass bridge either just upstream or downstream of the bridge was evaluated. Under this alternative, the GRCB would remain in place and serve pedestrian traffic only while a new bridge would be constructed to carry vehicular traffic.

A previous evaluation of the area surrounding the bridge was conducted by Jeannine Russell, VTrans Archaeology Officer (see Appendix B). The area at the northeast quadrant of the GRCB was identified as containing remains of a previous mill which was tied to the crib dam upstream of the GRCB. The crib dam is listed on the National Register of Historic Places, therefore disturbance of this area would most likely not be allowed by resource agencies as part of the project Section 106 review. In addition, the location and alignment of the existing dry laid stone masonry retaining wall at the northwest quadrant of the GRCB would further restrict installation of an upstream bypass bridge.

Installation of a bypass bridge just downstream of the GRCB would require land acquisition and removal of an existing garage which is associated with a home in the Green River Historic District. Removal of the garage would likely face opposition during the Section 106 review and it is likely that it would not be permitted. In addition, due to the existing road configuration just downstream of the bridge, a bypass bridge would not link well to the existing road network.

Due to the significant Section 106 review concerns and poor alignment with the existing road network, this alternative is not considered to be viable and therefore a cost estimate and project duration were not completed.

6.3.3 Eight Ton Live Load Posting

The GRCB historically was posted for a live load capacity of eight tons until May 2014 when the posting was reduced to four tons by the Town of Guilford at the recommendation of VTrans. This alternative includes all maintenance repairs described in Section 6.3.1 as well as necessary repairs to increase the live load posting to eight tons.

A detailed structural analysis of the bridge would be required as part of this alternative to determine the exact repairs required to increase the live load posting. For purposes of this study, based upon previous covered bridge analysis of similar bridges completed by Hoyle, Tanner, the repairs are expected to include replacement of previously repaired members in the lower chord of the north truss, replacement of the existing deck and the addition of supplemental members at the truss bearings. Due to the minimal nature of the repairs included in this alternative, it is not anticipated that the Vermont Covered Bridge Committee would object to this alternative.

The total estimated project cost for this alternative is $550,000 and the expected time to completion (including design, permitting and construction) is two years.

6.3.4 Twelve Ton Live Load Posting

The necessary improvements to the GRCB to increase the live load posting to 12 tons were evaluated as requested in the Town of Guilford's Request for Alternatives Analysis (See Appendix A). This higher live load posting was selected as it would allow for some additional Town vehicles to utilize the bridge that could not do so with an eight ton posting.

As discussed in Section 6.3.3, a detailed structural analysis of the bridge was not conducted for this alternative, however based on previous analyses of similar covered bridges it appears that extensive member replacement would be required to achieve a 12 ton posting. This replacement would likely include extensive replacement of the lower truss chord and end lattice as well as replacement of the existing floor system. In addition, it is likely that a secondary top chord would need to be added to the bridge. The GRCB was built based on an early version of the Town Lattice patent that does not have a secondary top chord. A second patent included a secondary top chord for longer span bridges and to reduce issues with sweep in the top chord that we noted on early Town Lattice bridges. Due to the extensive amount of original bridge fabric that would be required to meet the 12 ton posting, this option was eliminated from further consideration.

A second alternative to increase the live load capacity would include installation of four longitudinal steel beams under the existing wood floor beams. The existing vertical clearance would need to be maintained under the bridge to meet hydraulic requirements, therefore this alternative would also require reconfiguration of the abutment backwalls and raising of the bridge approaches. Since the bridge is at a low point in the roadway, the approach improvements would be limited. The advantage to this alternative is that it is reversible; i.e. the beams could be removed at a later date to restore the bridge to its original configuration should the higher live load posting not be required. The main disadvantage to this alternative is that the steel beams would carry the majority of the live load; the trusses would largely carry their own dead load and the snow load on the bridge. This type of load sharing is generally not favored by the Vermont Covered Bridge Committee as the covered bridge does not function in the way that it was originally built since it doesn't support vehicular load.

This alternative includes all maintenance repairs described in Section 6.3.1 as well as necessary repairs to increase the live load posting to 12 tons discussed above. The total estimated project cost for this alternative is $1,600,000 and the expected time to completion (including design, permitting and construction) is two to three years.

6.3.5 Twenty Ton Live Load Posting

The necessary improvements to the GRCB to increase the live load posting to 20 tons are very similar to those discussed in Section 6.3.4 with the exception of the substructure. The existing substructure for the GRCB consists of dry laid stone masonry abutment founded on an unknown base. The load demands on the abutments from the additional live load and additional dead load from the larger steel beams required to support a 20 ton live load are expected to exceed the substructure capacity, therefore replacement of the existing abutments

with new reinforced concrete abutments would be required for this alternative. This alternative would also require approach roadway improvements, that while relatively minor, would exceed the length of those required for the 12 ton alternative discussed above.

This alternative, while similar to the 12 ton alternative, would likely not be approved by the Vermont Covered Bridge Committee. As discussed in Section 6.3.4, the introduction of steel beams to the bridge would likely not be viewed favorably by the Committee. In addition, the loss of the existing abutments make it very unlikely that the Committee would approve this alternative.

This alternative includes all maintenance repairs described in Section 6.3.1 as well as necessary repairs to increase the live load posting to 20 tons discussed above. The total estimated project cost for this alternative is $2,500,000 and the expected time to completion (including design, permitting and construction) is three to four years.

6.3.6 Relocate Green River Covered Bridge / New Bridge

The 20 ton live load alternative discussed in 6.3.5 would greatly improve the carrying capacity of the GRCB, however the bridge would still be limited to one lane and vehicles under 11'-6" in height. This alternative would include relocation of the GRCB to another location within the Town of Guilford and installation of a new modern steel or prestressed concrete bridge on reinforced concrete abutments in the same location as the existing bridge. Since the new bridge would require a deeper structural section below the deck than the GRCB, the approaches to the bridge would require reconstruction. In addition, the approaches would be widened to accommodate the new bridge.

This is the most expensive alternative studied at the existing GRCB site and would likely face significant resistance from the Vermont Covered Bridge Committee. In particular, it would affect both a National Register of Historic Places listed property (the GRCB) and significantly change the viewscape within the state register historic district. It is therefore unlikely that this alternative would be approved for construction.

The total estimated project cost for this alternative is $3,600,000 and the expected time to completion (including design, permitting and construction) is three to five years.

6.4 Funding Alternatives

The currently available funding programs for all alternatives studied were reviewed. For roadway projects there is no dedicated funding for new roadways, however limited funding for preservation of existing roadways is available. VTrans offers three programs for both new and existing bridge projects. Each program is described below in more detail which was largely obtained from The Orange Book, 2014-2016 prepared by the Vermont Agency of Transportation.

6.4.1 Town Highway Bridge Program

This program includes state assistance for major rehabilitation or reconstruction of bridges with a span of six feet or more on Class 1, 2 or 3 town highways per 19 V.S.A. Section 306. The assistance amounts are not limited for a project but do require a 10% local match for replacement projects or a 5% match for rehabilitation projects. The local match is capped at a local tax rate of $0.50 on the Grand List.

Projects included in this program are first submitted to the Town's Regional Planning Commission (RPC). The RPC reviews the needs of each community and prioritizes the projects which are then recommended to VTrans. Once VTrans has selected a project for the program, it generally takes 5-7 years or more for it be constructed. Since the funding is limited for this program, prioritization is generally based on preservation of the existing infrastructure. Selection of a new bridge would require demonstration of a strong need for the project that is greater than preservation of other existing bridges.

Due to the anticipated cost of Alternative B, this program would be the best source of funding for this alternative. As discussed above however, funding of this alternative may be difficult to obtain.

6.4.2 Town Highway Structures Program

This VTrans program provides funding assistance to Towns for existing bridges on Class 1, 2 or 3 town highways per 19 V.S.A. 306 §306. The assistance amounts are limited to $175,000 and require a 10% local match for Towns such as Guilford that have adopted Town Highway Standards that meet minimum VTrans requirements. This funding would be applicable to Alternatives A and potentially F.

6.4.3 Transportation Alternatives Program

The Transportation Alternatives Program (TAP) is a federal aid program authorized under the Moving Ahead for Progress in the 21st Century legislation (Map-21). The program funding is generally limited to non-highway bridges that show a strong transportation link such as off road trails, safe routes to schools and environmental mitigation. The program also includes "historic preservation and rehabilitation of historic transportation facilities". Any of the Alternative F options that make use of the Green River Covered Bridge would be potentially eligible for this funding.

The TAP funding is administered through VTrans on a bi-annual basis and is awarded based on a competitive review of applications. Typically the funding requests for this program far outweigh the available funding. The TAP funds are limited in any one year to a total project cost of $375,000 and require a 20% local match.

7 SUMMARY

Hoyle, Tanner & Associates, Inc. (Hoyle, Tanner) was retained by the Town of Guilford, VT to perform a study of alternate Green River crossings to the Green River Covered Bridge (GRCB). The goal of this study is provide a systematic review of potential Green River crossing locations that will aid the Town of Guilford in their future planning. The GRCB does not meet the Town of Guilford's needs for an unposted river crossing without height restrictions and currently requires a long detour for vehicles over 11'-6" in height or with a weight exceeding four tons.

The study area was limited to a ½ mile radius around the GRCB and included a total of six potential alternatives (two to the north, the GRCB itself and 3 to the south). The three southerly alternatives (C, D & E) were eliminated from further consideration due to significant floodplain regulatory and conservation land constraints. The two northern alignments included use of an existing Green River bridge crossing and new road (alternative A) and a new road and bridge (alternative B). Alternative A is considered to be a viable alternative with a total estimated project cost of $1,700,000. Alternative B, while technically viable, is considered too expensive to be practical with a total estimated project cost of $5,000,000.

Six alternatives were studied at the location of the GRCB including maintenance repairs, upstream or downstream bypass bridge, eight ton live load posting, 12 ton live load posting, 20 ton live load posting and relocation of the GRCB with a new modern bridge constructed in its place. The estimated total project cost for these alternatives ranges from $315,000 to $3,600,000 with the bypass bridge alternative being considered not feasible due to the built environment and archaeological issues near the GRCB. The maintenance repairs and eight ton live load posting alternatives are considered viable alternatives while the 12 and 20 ton live load posting and relocation of the GRCB alternatives would all face significant regulatory issues and may not be approved by applicable resource agencies.

Limited funding is available for design and construction of the studied alternatives. Three sources were identified for potential funding including the Town Highway Bridge Program, Town Highway Structures Program and the Transportation Alternatives Program. All programs require a local match which ranges from 5 to 20% of the project cost and are highly competitive. In addition, each program focuses on preservation of the existing transportation infrastructure and would not fund new roadway construction.

The decision of which alternative to select is clearly a local decision that must be made within the constraints of cost and state and federal regulations. In summary, Alternative A or one of lower cost Alternative F options appear to be the most viable, cost-effective alternatives studied with the least regulatory concerns. All Alternative F options, with the exception of maintenance repairs, would require review and approval from the Vermont Covered Bridge Committee as part of the project Section 106 process.

APPENDIX A

Town of Guilford Request for Alternatives Analysis

TOWN OF GUILFORD – Green River Covered Bridge Alternatives Analysis

A. Introduction

Currently, there are limited means by vehicle of accessing the west side of the Village of Green River, a small hamlet located in Guilford, VT. One way is over the historic Green River Covered Bridge (GRCB), on Stage Road. This bridge is a one lane, single span wooden deck bridge, built 142 years ago. The load rating for the bridge was recently reduced from 8 tons to 4 tons. For a number of years, the Town has discussed exploring an alternative route over the Green River, in the general vicinity of the GRCB, to accommodate heavier vehicles: fire and rescue, fuel and package deliveries, Town equipment, etc. that provide basic services to the +-/45 properties located on the western side of the Green River.

B. Project Area – Attached is a map of the project area.

C. Study Purpose

The top priority for the Town is to provide safe and convenient transportation access for all Guilford residents, while serving their basic needs. The project area is a .5-mile radius with the Green River Covered Bridge at its center. This bridge currently is the only convenient access over the Green River for daily access of +/- 45 properties on the western side of the river and travelers from points west and southwest.

The Town is requesting an Alternatives Analysis to identify all of the transportation alternatives (and provide a preferred alternative) to accommodate safe, convenient, and heavy vehicle access over/around the Green River, in the specified project area.

Based on discussions to date, a few examples of the alternatives may include build a new bridge within the project area, rehabilitating the GRCB to accommodate heavier vehicles, create a new road that circumvents the GRCB near an existing Bridge #9 (see enclosed map "New Road Alternative")

D. Needs

The preferred alternative should address the needs of the Town, which include: safety, bridge access for basic needs, the bridge being a viable connector, and historic preservation.

- *Safety*: The preferred alternative shall accommodate multi-modal activities, and the project corridor (including new roads, a new bridge, sight distance, rehabilitation etc…) should have safety as the number priority.

- *Bridge access for basic needs*: The preferred alternative shall accommodate heavy and/or large vehicles, including: Town Highway vehicles, fire/rescue service vehicles, fuel and other delivery trucks, etc., to serve the basic needs of the residents on the western side of the river.

- *Linkage*: – The preferred alternative shall be considered as a vital connection to the residents, the town and the surrounding towns. The preliminary traffic counts data for the GRCB has an Average Daily Traffic (ADT) of 320.

- *Historic*: - The GRCB is an historic covered bridge, listed on the National Register. The preferred alternative shall strongly consider having this designation remain if possible.

Details & Considerations:

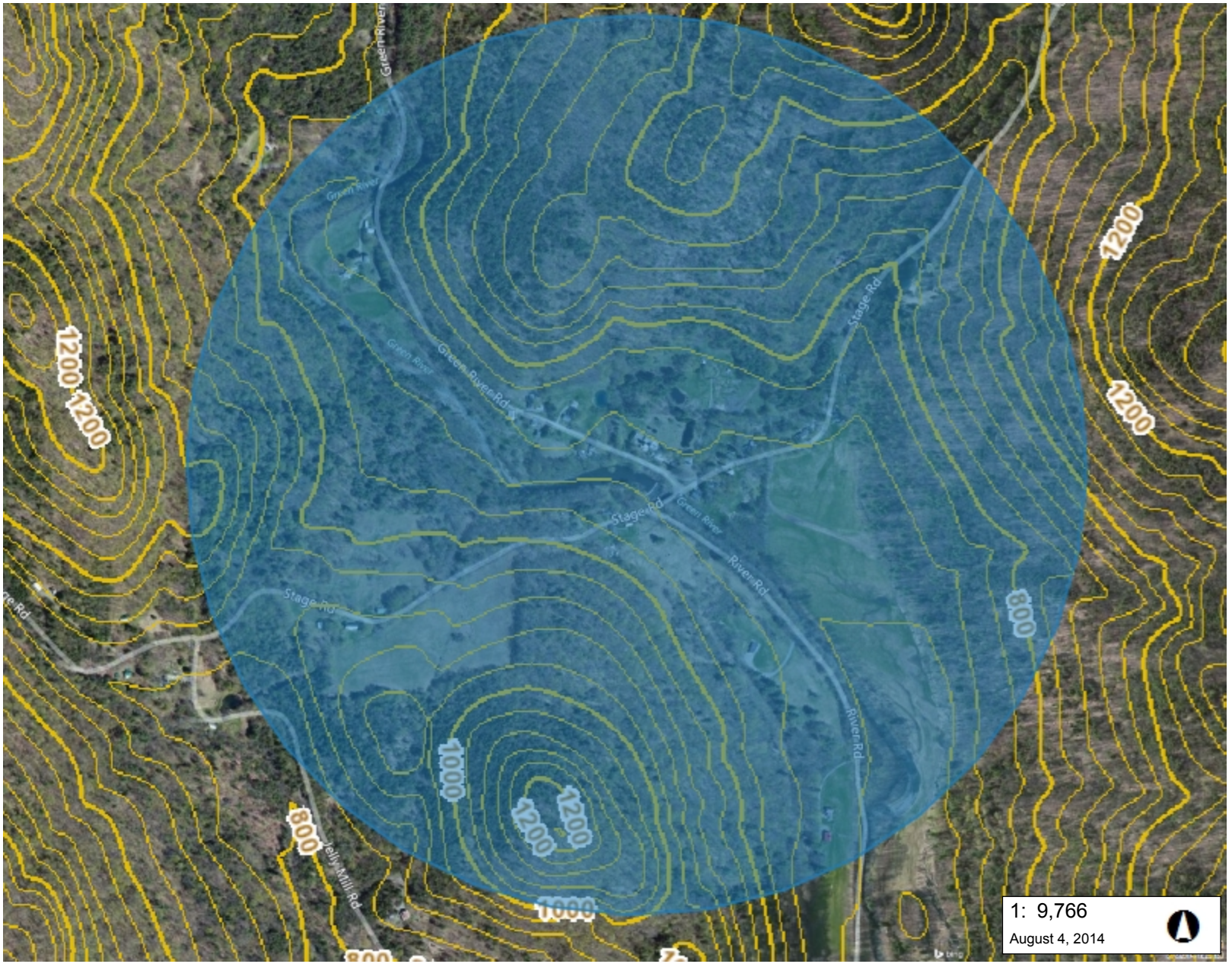
- The project limit is a .5-mile radius from the Green River Covered Bridge
- The maximum load capacity that the Town will consider acceptable for the GRCB is 12 tons
- The Town will consider alternatives that might compromise the GRCB's National Register listing
- The Town will consider alternatives that create new sections of Town Highway(s) instead of the construction of a new bridge or rehab of the GRCB.
- The Town will consider use of eminent domain if necessary

VERMONT

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov



LEGEND

200-40 ft contours

- 200 ft
- 40 ft

Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

496.0 0 248.00 496.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 814 Ft. 1cm = 98 Meters

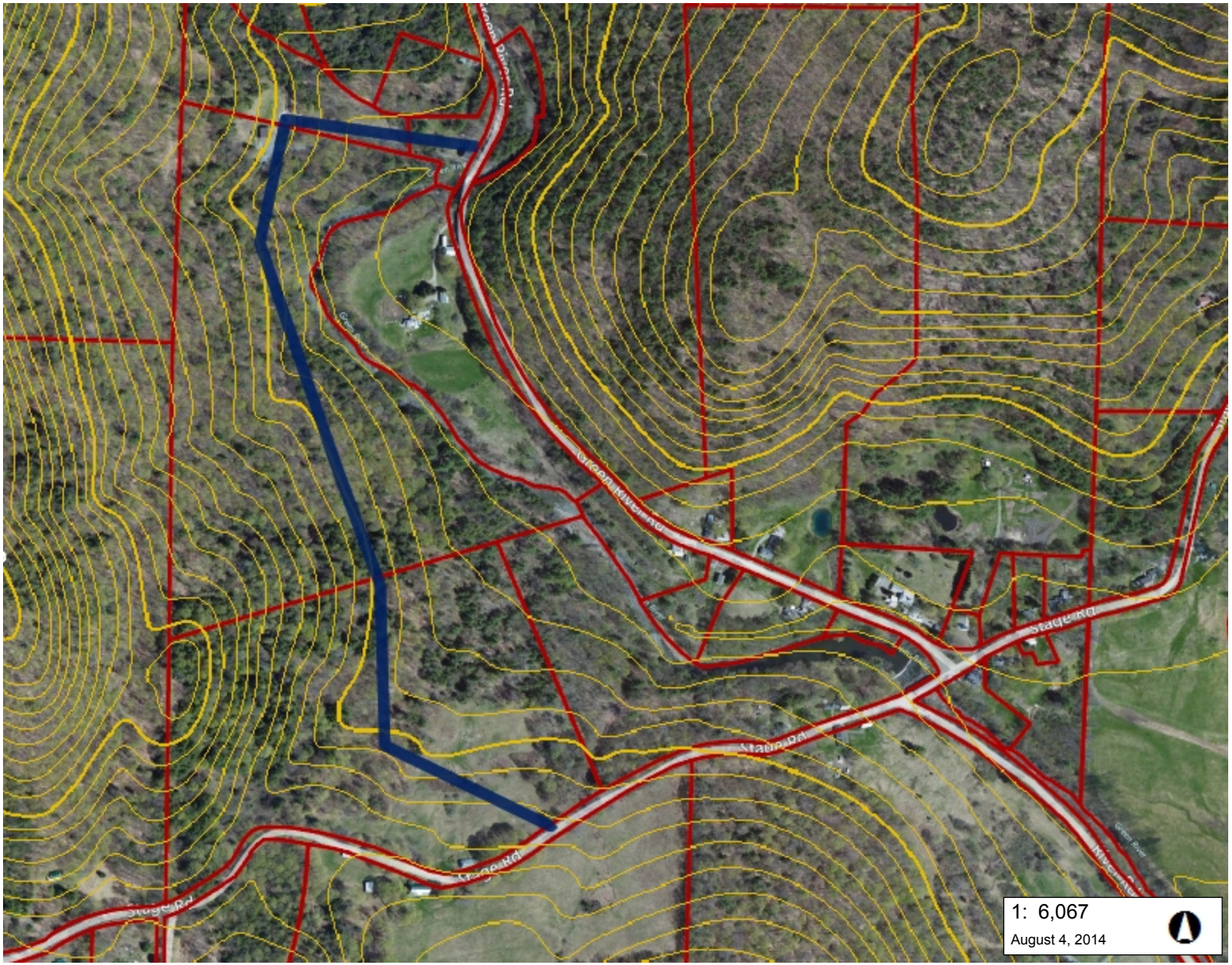
THIS MAP IS NOT TO BE USED FOR NAVIGATION

VERMONT

Natural Resources Atlas

Vermont Agency of Natural Resources

vermont.gov



LEGEND

200-20 ft contours

200 ft

20 ft

Parcels (where available)

Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

308.0 0 154.00 308.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 506 Ft. 1cm = 61 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

APPENDIX B

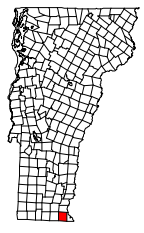
Existing Conditions

GUILFORD ROAD MAP
DECEMBER 2006

Road Map

Town of Guilford, Vermont

December 2006



GIS
Vermont Geographic Information System

WINDHAM REGIONAL COMMISSION

139 Main St • Suite 505 • Brattleboro, VT 05301
(802) 257-4547 www.rpc.windham.vt.us

0.5 0 0.5 1 1.5 Miles

Map scale -- 1:40,000

- Interstate Highway
- Federal Highway
- Class 2 town highway - paved
- Class 2 town highway - unpaved
- Class 3 town highway - paved
- Class 3 town highway - unpaved
- Class 4 town highway (unpaved)
- Legal Town Trail
- Private road/drive
- Stream
- River or pond
- Impassable road

Sources:

- Town highway locations were digitized from 1989 1:5000 orthophotos by Greenhorne & O'Mara Inc. under contract with OGIS. Some road locations were updated by microDATA using GPS during data collection for Enhanced 9-1-1. Other road locations were corrected by WRC GIS staff in 2006 using rights-of-way locations as shown on the VGIS 1:5000 PARCEL coverage. Information for these latter corrections were provided by officials from the Town of Guilford.

- Town highway attributes (i.e. class and pavement) are from AOT highway maps. These data were corrected by WRC GIS staff using information provided by officials from the Town of Guilford.

- Road names data were provided by the Town of Guilford.

- Surface waters are from the Vermont Hydrography Dataset (VGIS data layer SWnnnnnnnn). The dataset was generated at a scale of 1:5000 and was developed using digital orthophotos, topographic maps, color infrared aerial

May 2008
c:\Towns\Guilford\Maps\RoadMap_11x17.mxd

ARCHAEOLOGICAL RESOURCE ASSESSMENT

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

FROM: Jeannine Russell, VTrans Archaeology Officer
DATE: 9/06/2011
SUBJECT: **ARCHAEOLOGICAL RESOURCE ASSESSMENT ONLY. NOT A CLEARANCE.**
Field Visit: YES ☒ **NO** ☐

Project Name: Guilford Covered Bridge Rehab
Project Number: STP EH 11(4)

On 9/06/2011, the VTrans Archaeology Officer reviewed the above project with the Transportation Archaeologist(s) and agreed to the following:

**********Archaeological Resource Assessment**********

☒ That the Archaeological Resource Assessment of the Area of Potential Effect (APE) conducted by **VTrans** ☒, **Consultant** ☐ _____, or **Sub-consultant** ☐ _____and dated 9/06/2011 is adequate to identify archaeological resources, and **Does** have a CADD map with the archaeological resources on it.
Date ARA was approved 9/06/2011.

☐ **Plans dated** _____reviewed by **VTrans** ☒, **Consultant** ☐_____or **Sub-consultant** ☐_____.

Recommendations:

☐ Project **CLEARED** as **EXEMPT** (based on the PA 12/28/00).
☐ Project **CLEARED** with avoidance to all archaeologically sensitive areas.
☐ Project **CLEARED** with the following Conditions(See Conditions below)
☐ Recommend more archaeological study - **Phase I**

**********PHASE 1 & Beyond**********

☐ **ARA Proposal received** _____ and **approved** _____.

☐ **The above project is being reviewed at which level: ARA.**
Authorization Date: _____ Consultant Firm _____.
End of field letter/report Date _____.
Determination of Effect: **NO EFFECT**(NE) ☐
CONDITIONAL NO ADVERSE EFFECT ☐(See conditions below)
NO ADVERSE EFFECT(NAE) ☐ **ADVERSE EFFECT**(AE) ☐
Consultant Recommends:_____
Draft Report Received:_____
Comments to Consultant:_____
Final Report Received:_____
Clearance of **Phase I** Date:_____
Phase I Costs: $_____
Number of sites found:_____
Number of National Register(NR) sites:_____
Number of NR sites Mitigated:_____

☒ **Additional comments or conditions that apply to this project.(see page 2 for additional conditions)**

J Russell

_____ 9-6-11
(***Signature of VTrans Archaeology Officer***) (***Date***)

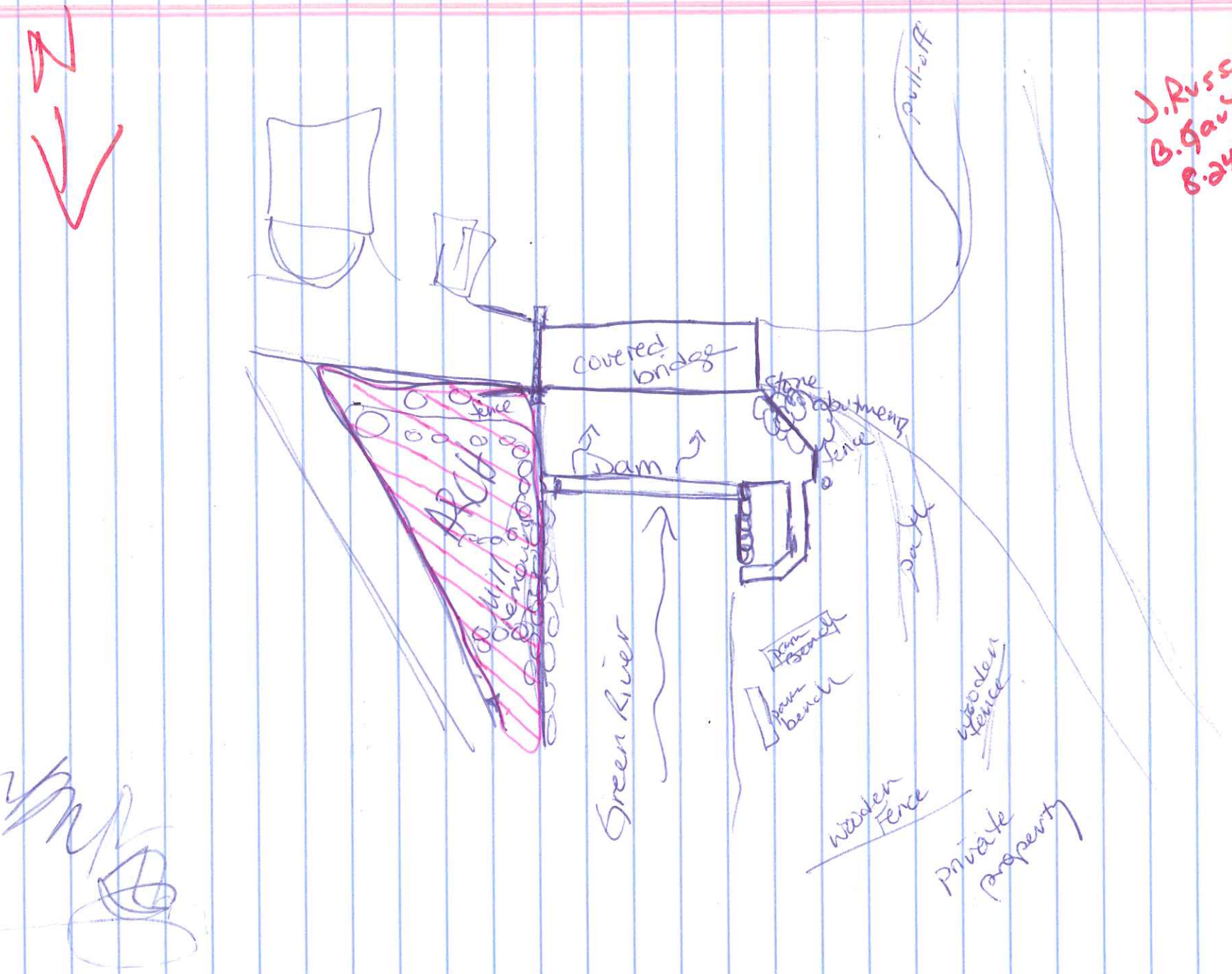
Prepared by Brennan Gauthier, VTrans Assistant Archaeologist

Project: Guilford STP EH 11(4)

Additional Comments from Page 1:

A field visit conducted on 8/24/2011 by VTrans Archaeological Officer Jen Russell and Assistant Archaeologist Brennan Gauthier located one area of archaeological sensitivity in the NE quadrant of the project area. Considerable mill remains are present and are related to the extant crib dam and covered bridge, which are both listed on the NR.

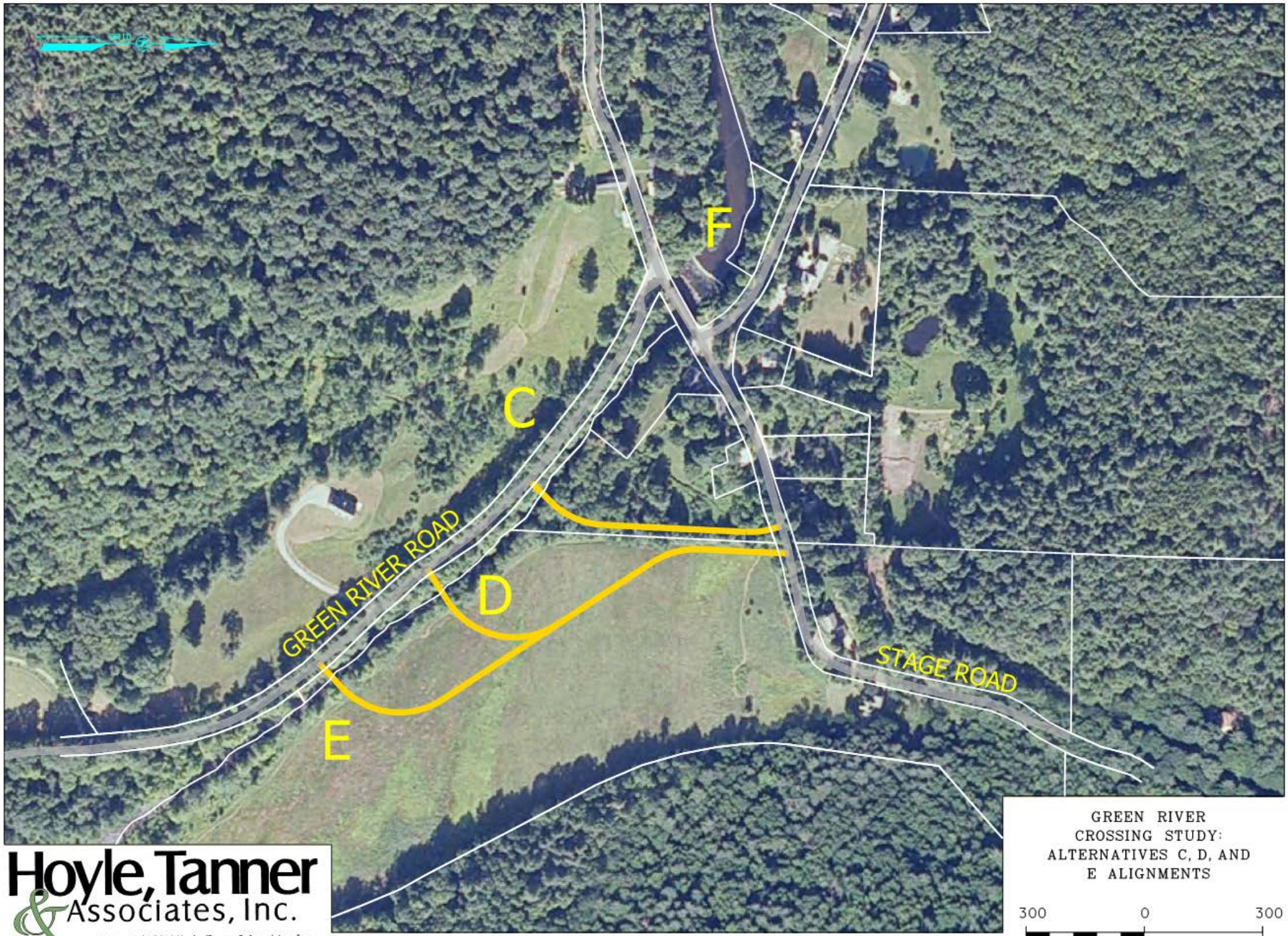
J. Russell
B. Gaumier
8.24.11



APPENDIX C

Alternatives Eliminated From Further Consideration

PLAN VIEW OF
ALTERNATIVES C, D & E



GREEN RIVER CROSSING STUDY: ALTERNATIVES C, D, AND E ALIGNMENTS

300 0 300

SCALE IN FEET

Hoyle, Tanner & Associates, Inc.

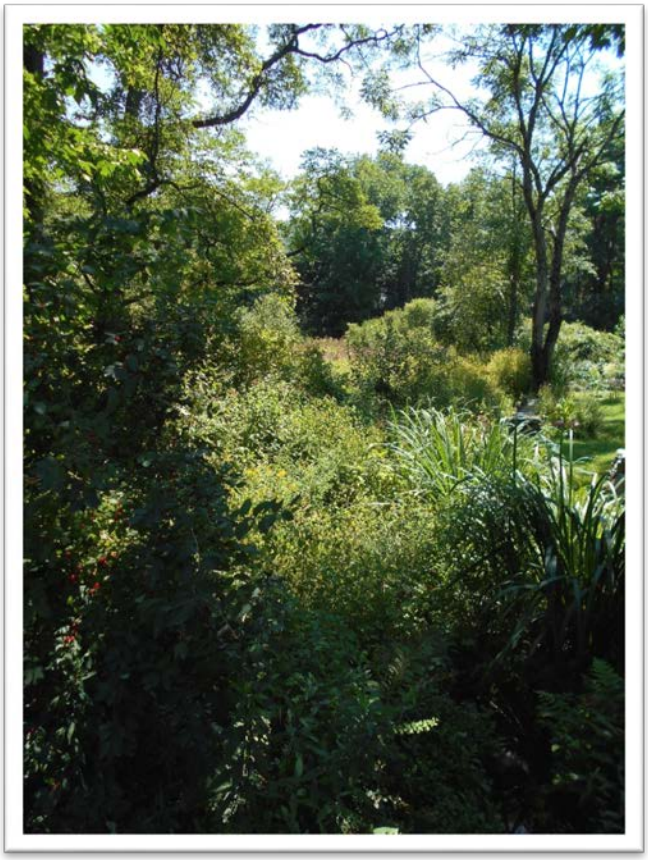
www.HoyleTanner.com

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND, ©2010 NCTEQ, ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF VERMONT CENTER FOR GEOGRAPHIC INFORMATION

PHOTOS

Looking East on Stage Road Near Alternative C

Looking West on Stage Road Near Alternative C



Approximate Location of Alternative C off Stage Road (Looking South)

Approximate Location of Alternative C From Green River Road

Looking East on Stage Road Near Entrance to Alternatives D & E

Looking South From Stage Road at Entrance to Alternatives D & E

Looking South From Stage Road Near Entrance to Alternatives D & E

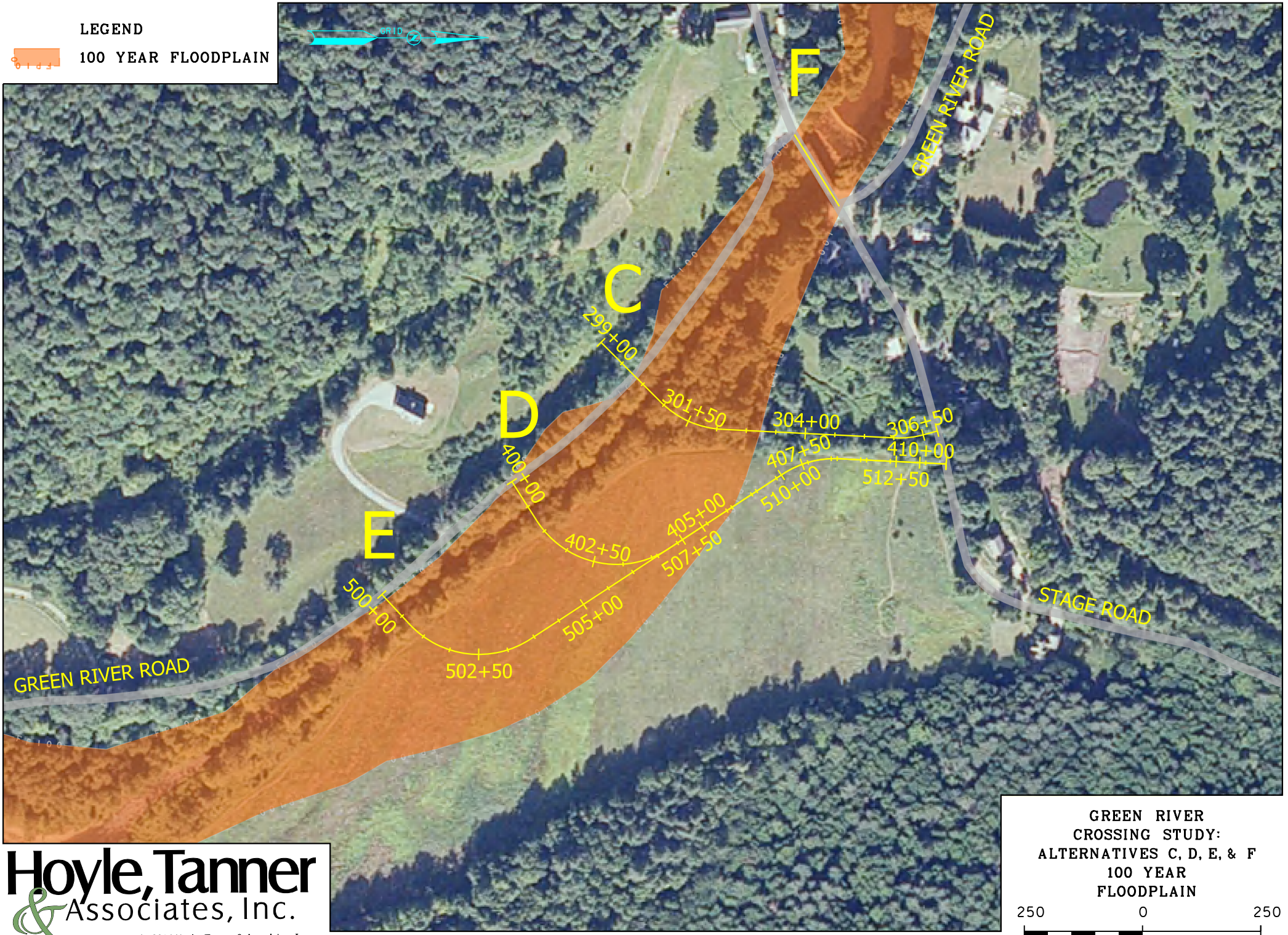
Green River Road in Vicinity of West End of Alternatives D & E

Approximate River Crossing Location for Alternative D

Approximate River Crossing Location for Alternative E

Green River near Alternatives D & E

ALTERNATIVES C, D & E
RESOURCE MAPS



Hoyle, Tanner & Associates, Inc.

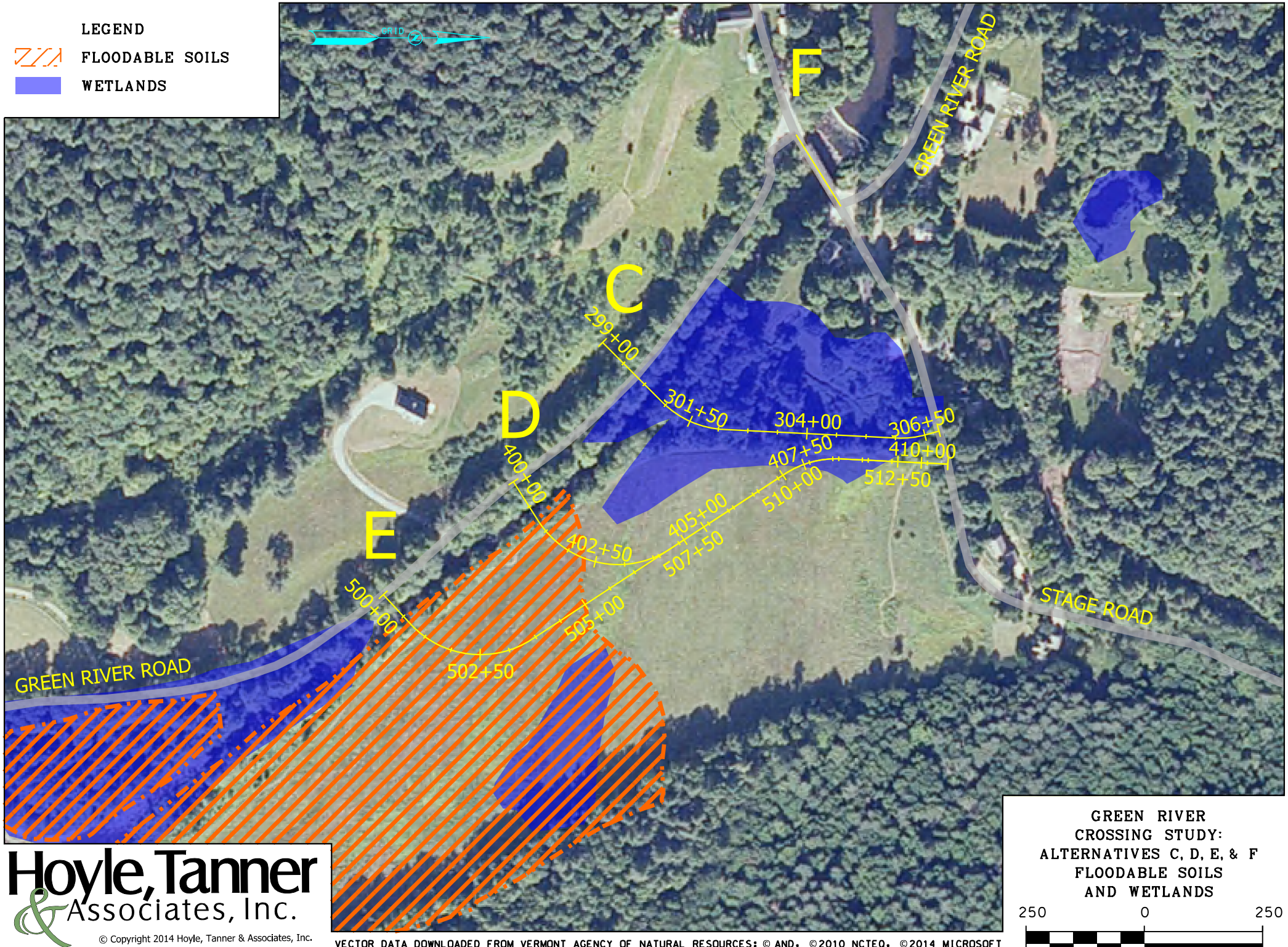
www.HoyleTanner.com

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND. ©2010 NCTEO. ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF VERMONT CENTER FOR GEOGRAPHIC INFORMATION

GREEN RIVER CROSSING STUDY: ALTERNATIVES C, D, E, & F 100 YEAR FLOODPLAIN

250 0 250

SCALE IN FEET



Hoyle, Tanner & Associates, Inc.

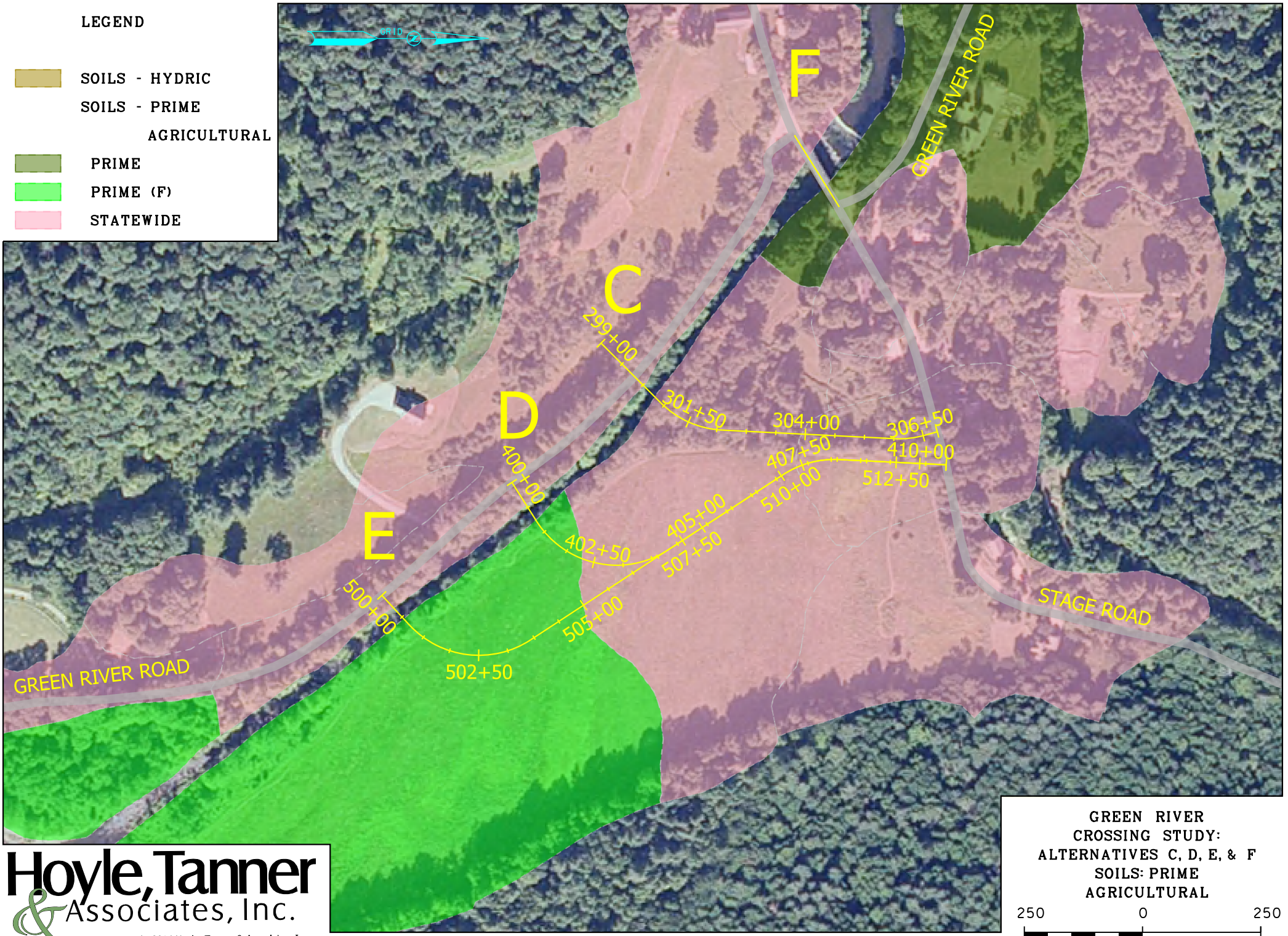
www.HoyleTanner.com

GREEN RIVER CROSSING STUDY: ALTERNATIVES C, D, E, & F FLOODABLE SOILS AND WETLANDS

250 0 250

SCALE IN FEET

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND, ©2010 NCTEO, ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF VERMONT CENTER FOR GEOGRAPHIC INFORMATION



Hoyle, Tanner & Associates, Inc.

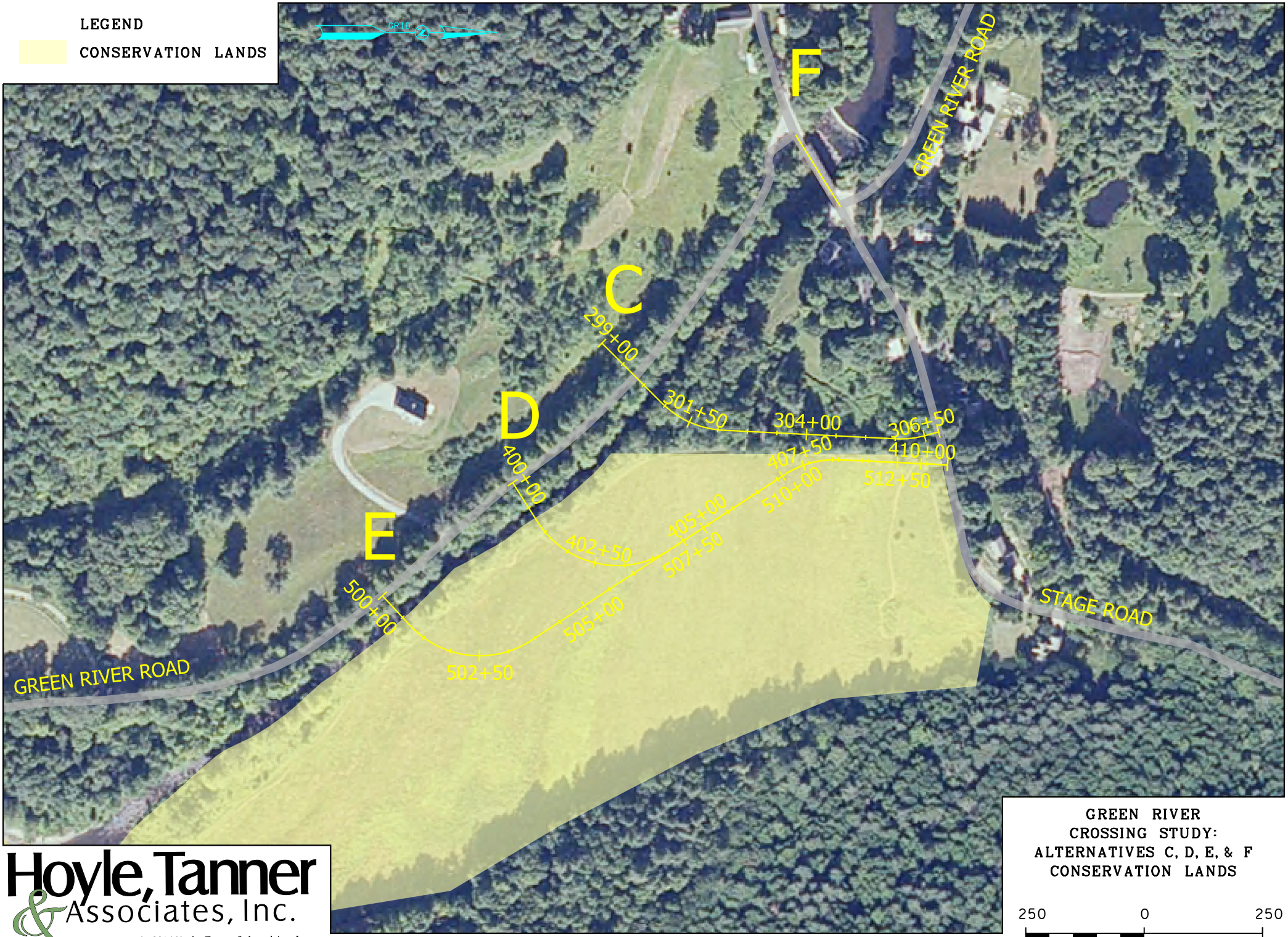
www.HoyleTanner.com

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND. ©2010 NCTEO. ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF VERMONT CENTER FOR GEOGRAPHIC INFORMATION

GREEN RIVER CROSSING STUDY:
ALTERNATIVES C, D, E, & F
SOILS: PRIME AGRICULTURAL

250 0 250

SCALE IN FEET



Hoyle, Tanner & Associates, Inc.

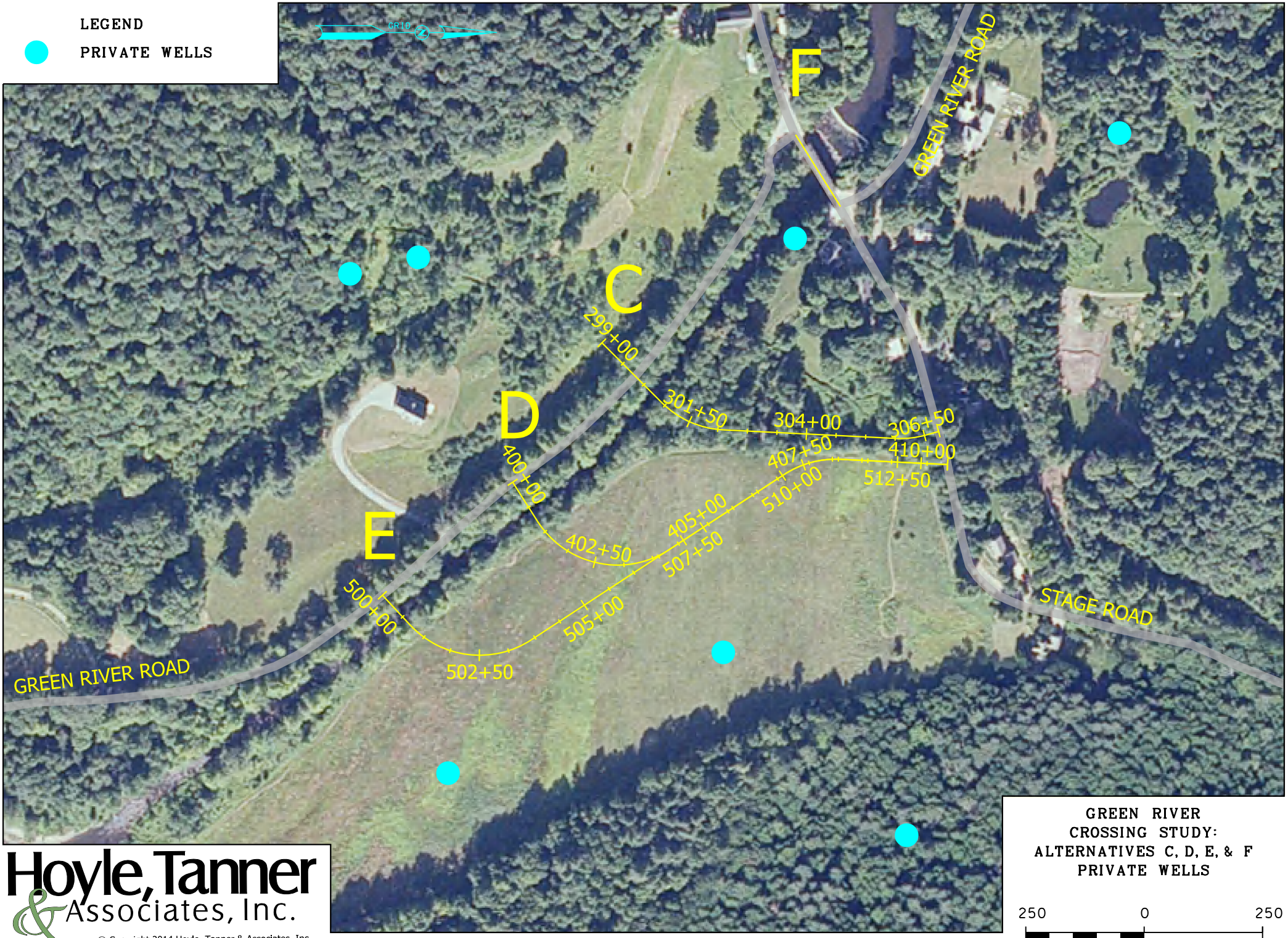
www.HoyleTanner.com

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND, ©2010 NCTEO, ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF VERMONT CENTER FOR GEOGRAPHIC INFORMATION

GREEN RIVER CROSSING STUDY: ALTERNATIVES C, D, E, & F CONSERVATION LANDS

250 0 250

SCALE IN FEET



Hoyle, Tanner & Associates, Inc.

www.HoyleTanner.com

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND. ©2010 NCTEO. ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF VERMONT CENTER FOR GEOGRAPHIC INFORMATION

GREEN RIVER CROSSING STUDY: ALTERNATIVES C, D, E, & F PRIVATE WELLS

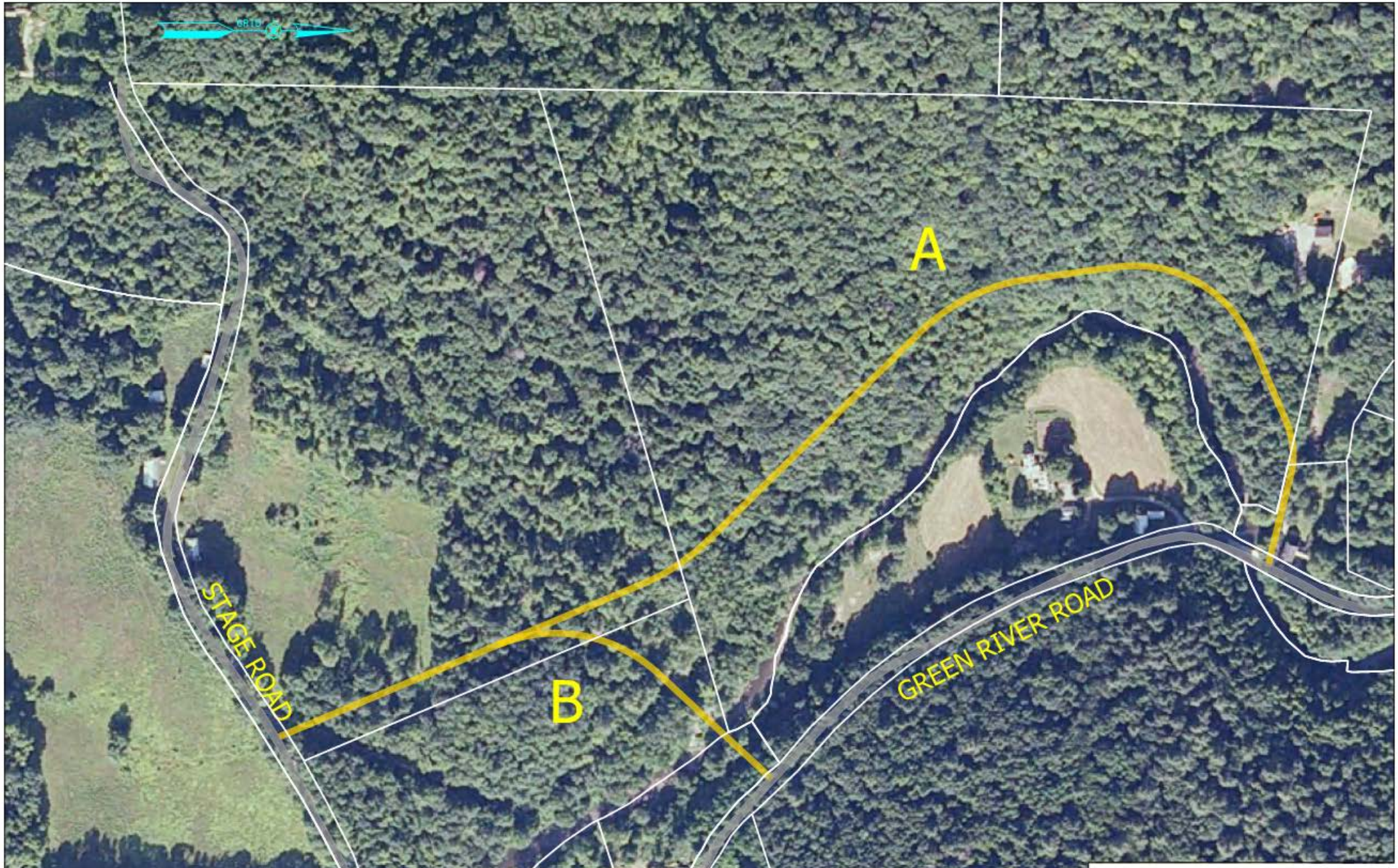
250 0 250

SCALE IN FEET

APPENDIX D

Alternatives Selected For Further Consideration

PLAN VIEW OF
ALTERNATIVES A & B



Hoyle, Tanner & Associates, Inc.

www.HoyleTanner.com

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND, ©2010 NCTEQ, ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF VERMONT CENTER FOR GEOGRAPHIC INFORMATION

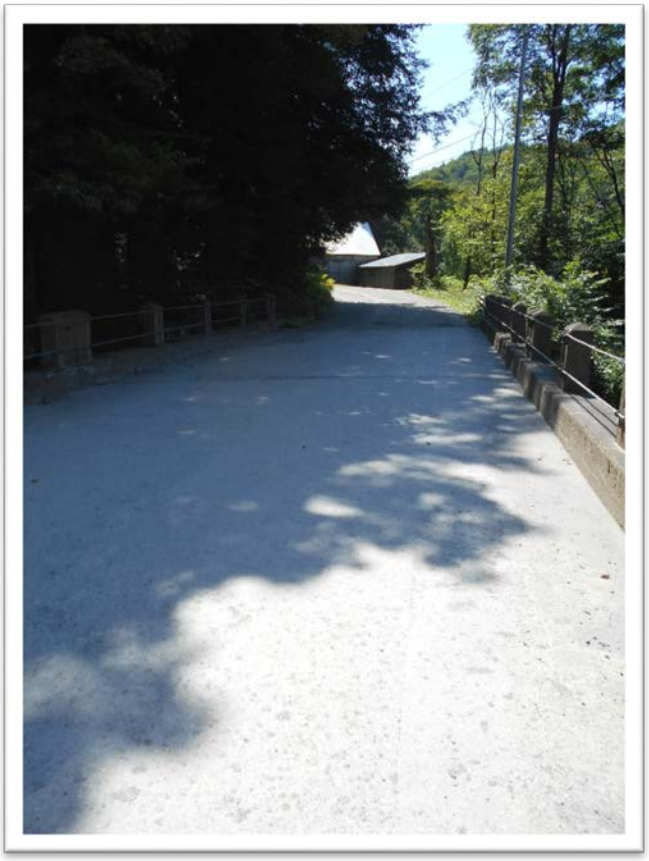
GREEN RIVER CROSSING STUDY: ALTERNATIVES A AND B ALIGNMENTS

300 0 300

SCALE IN FEET

PHOTOS

GREEN RIVER COVERED BRIDGE ALTERNATIVES ANALYSIS
Alternative A – North of Green River Covered Bridge at Existing Bridge
(VTrans Bridge No. 00009, District 2)



South Approach Looking South at Bridge No. 00009

Looking South Approach at Bridge No. 00009

Former Mill Building at 1428 Green River Road

Drive at 1428 Green River Road

Downstream Elevation of Bridge No. 00009

Spalling of Exterior Concrete Tee Beam

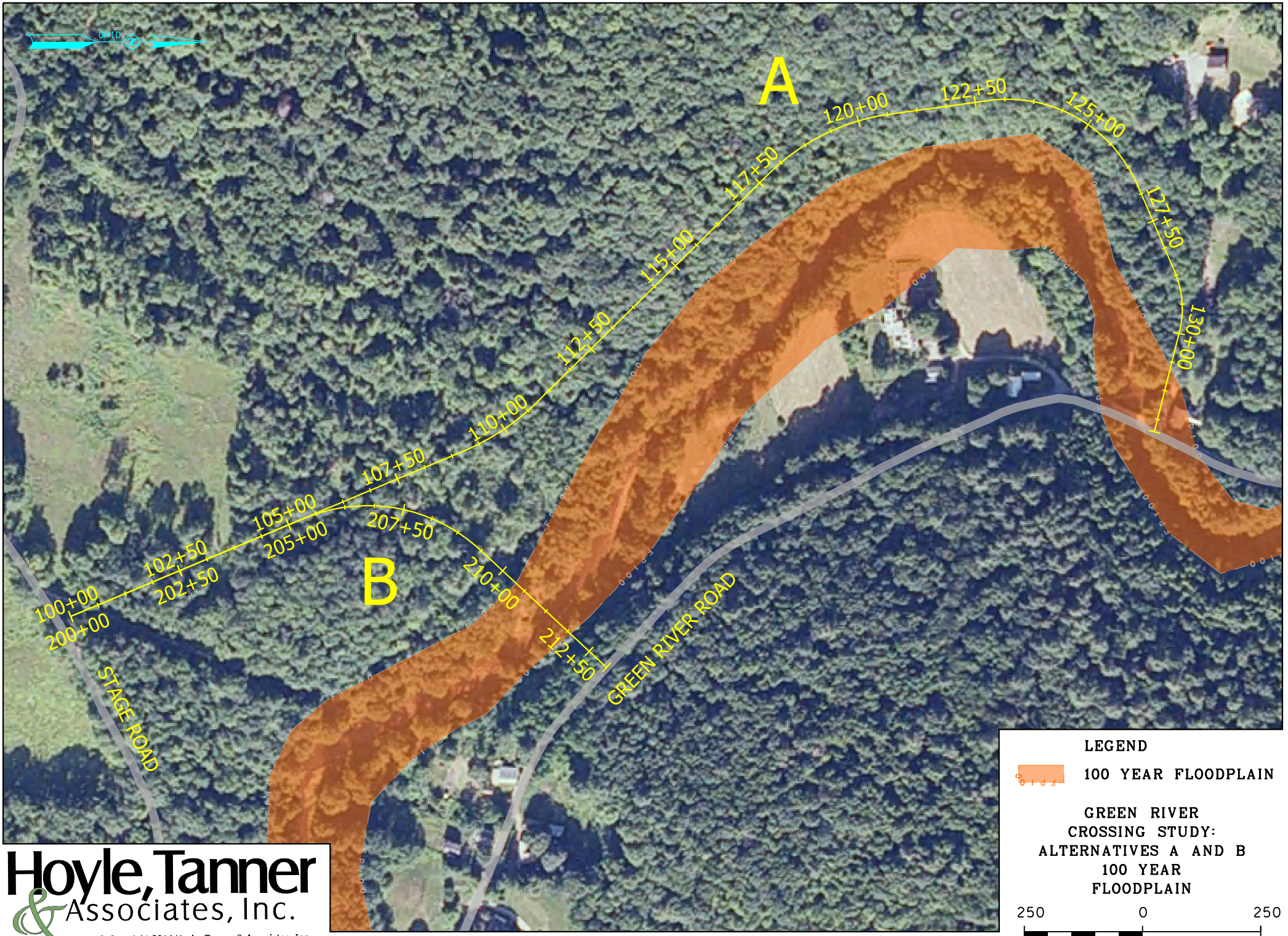
Looking North on Green River Road near Alternative B

Looking South on Green River Road Near Alternative B

Looking West at Entrance to Alternative B

Approximate West End of Alternative B

ALTERNATIVES A & B
RESOURCE MAPS



LEGEND

100 YEAR FLOODPLAIN

GREEN RIVER CROSSING STUDY: ALTERNATIVES A AND B 100 YEAR FLOODPLAIN

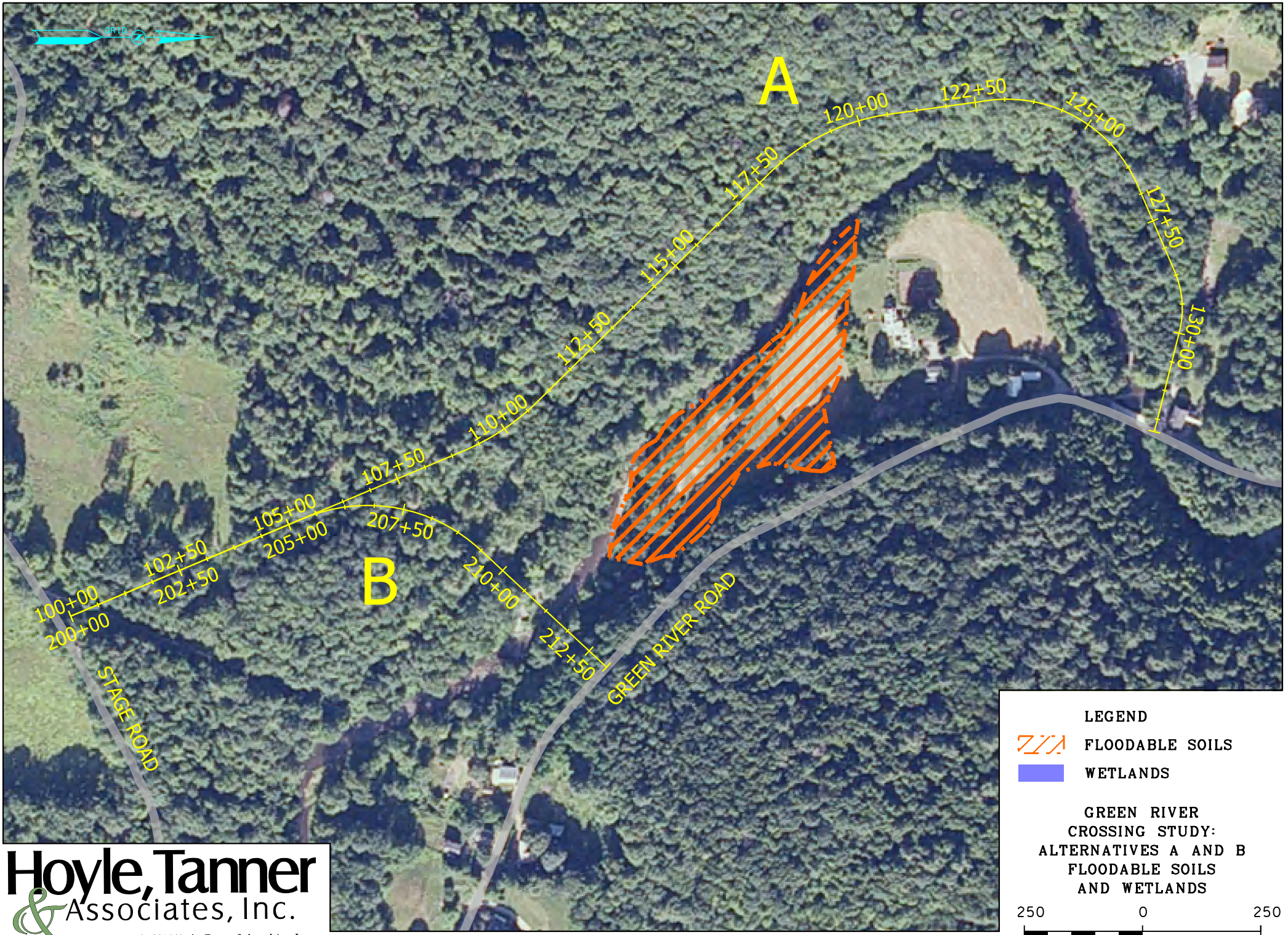
250 0 250

SCALE IN FEET

Hoyle, Tanner & Associates, Inc.

www.HoyleTanner.com

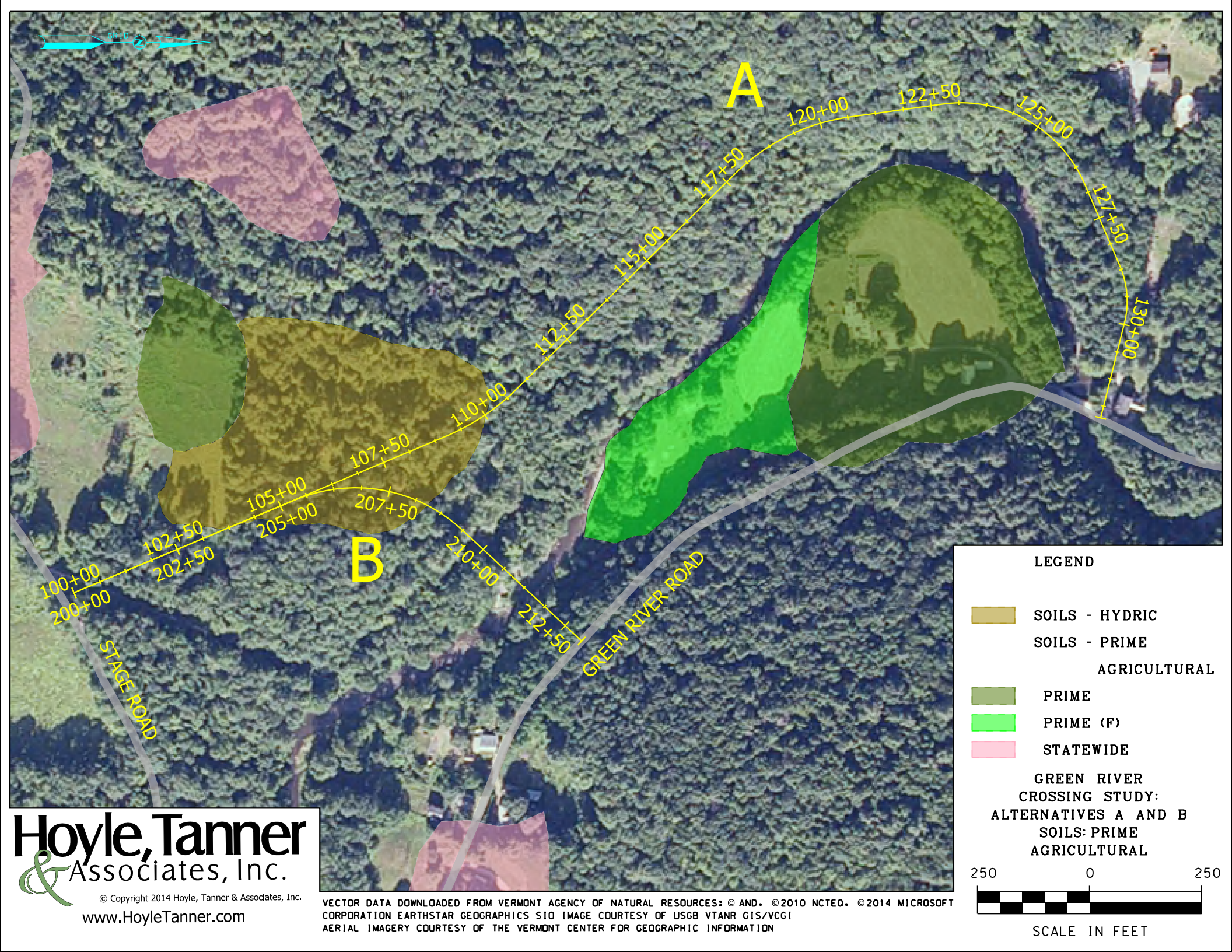
VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND. ©2010 NCTEO. ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF THE VERMONT CENTER FOR GEOGRAPHIC INFORMATION



Hoyle, Tanner & Associates, Inc.

www.HoyleTanner.com

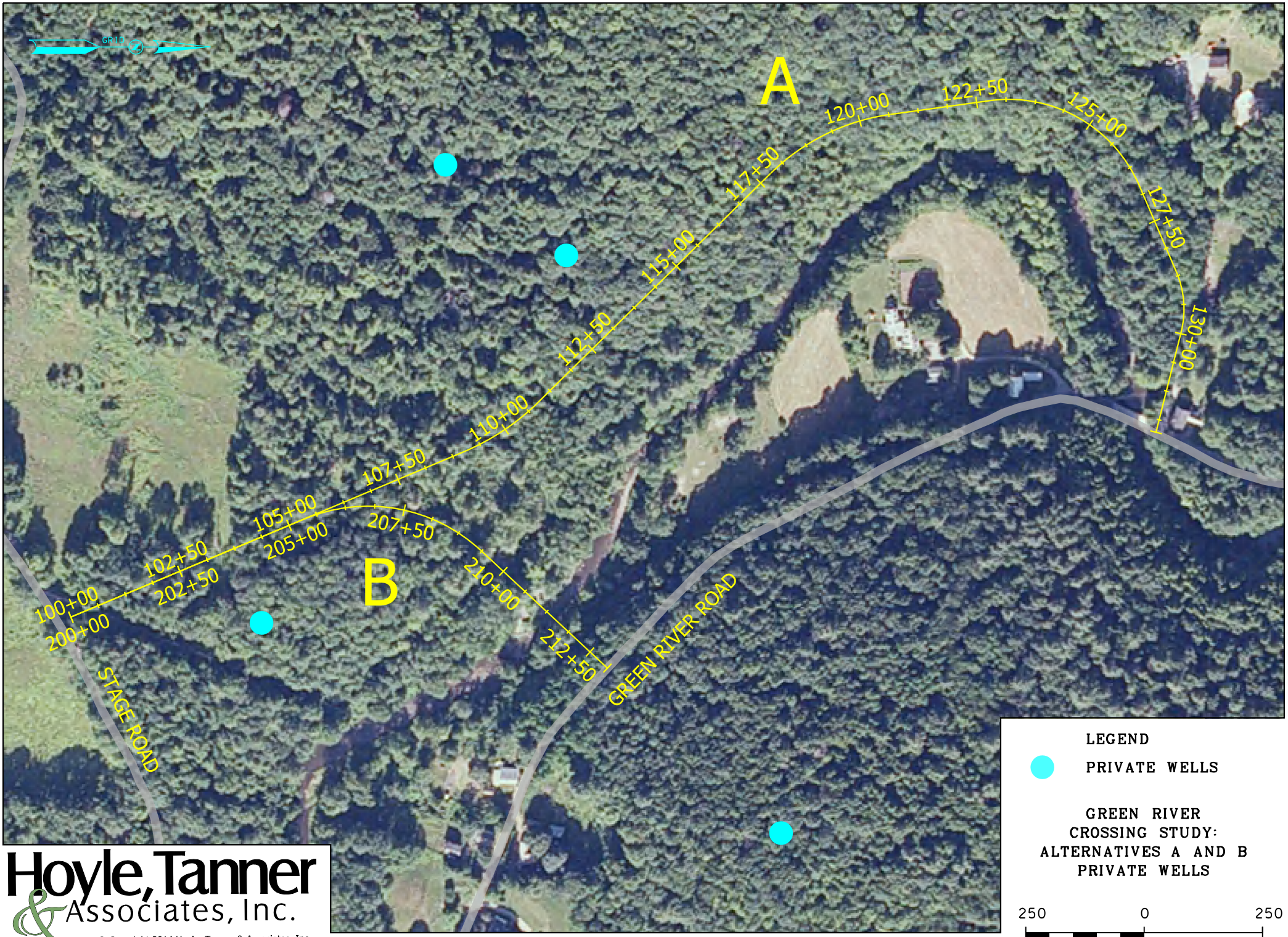
VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND. ©2010 NCTEO. ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF THE VERMONT CENTER FOR GEOGRAPHIC INFORMATION



Hoyle, Tanner & Associates, Inc.

www.HoyleTanner.com

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND, ©2010 NCTEO, ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF THE VERMONT CENTER FOR GEOGRAPHIC INFORMATION



LEGEND

PRIVATE WELLS

GREEN RIVER CROSSING STUDY: ALTERNATIVES A AND B PRIVATE WELLS

250 0 250

SCALE IN FEET

Hoyle, Tanner & Associates, Inc.

www.HoyleTanner.com

VECTOR DATA DOWNLOADED FROM VERMONT AGENCY OF NATURAL RESOURCES: © AND. ©2010 NCTEO. ©2014 MICROSOFT CORPORATION EARTHSTAR GEOGRAPHICS SIO IMAGE COURTESY OF USGB VTANR GIS/VCGI
AERIAL IMAGERY COURTESY OF THE VERMONT CENTER FOR GEOGRAPHIC INFORMATION

PHOTOS

Southeast Roadway Approach

Northeast Roadway Approach

Northwest Roadway Approach

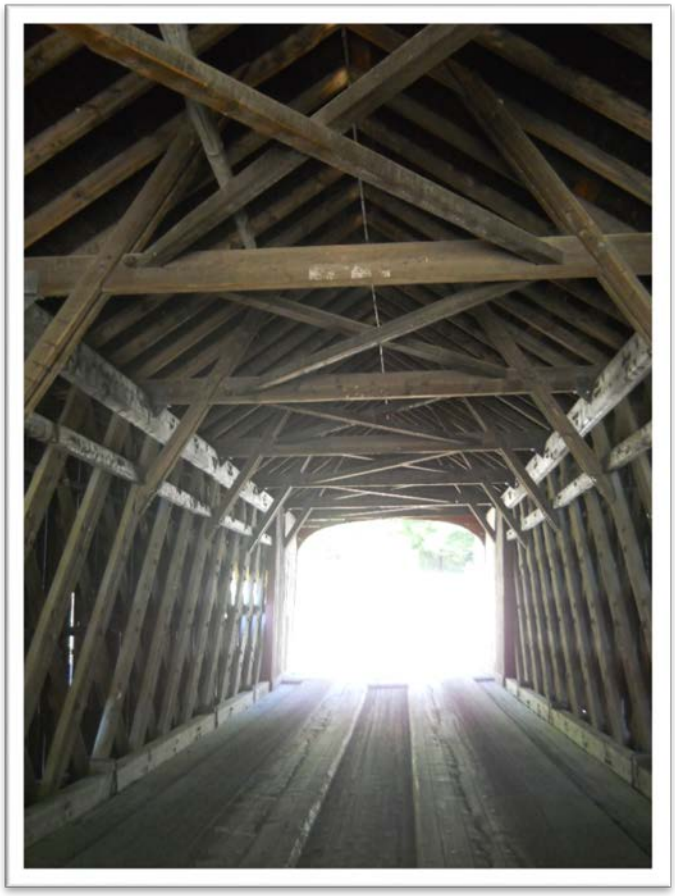
Southwest Roadway Approach

Upstream Timber Crib Dam

View of Upstream Timber Crib Dam from the Green River Covered Bridge

Upstream Elevation View

Downstream Elevation View



Interior View

Floor Framing

East Abutment

West Abutment (Prior to 2014 Repairs)

Northwest Wingwall During 2014 Repairs

West Roadway Approach During 2014 Repairs

APPENDIX E

Public Information Meeting Feedback

AUGUST 25, 2014
LOCAL CONCERNS MEETING MINUTES

Green River Feasibility Study
Local Concerns Meeting
August 25, 2014

PRESENT: Dick Clark (Chair), Troy Revis, Jr., Anne Rider

TOWN STAFF and OFFICIALS: Katie Buckley (Town Administrator), Herb Meyer (Co-EMD), Candace Stoumen (Co-EMD)

PUBLIC: See attached sign-in sheet

Dick Clark called the meeting to order at 5:00 PM.

Dick introduced William Nebelski who talked about the rehab of the Green River Covered Bridge in 1965; he was a member of Lindy Squires labor team who worked on that project. He told the story of how four men worked the whole summer to complete the job.

Sean James and Chris Dunlop, both engineers with Hoyle, Tanner & Associates, presented the order of the presentation:

- Purpose & Need – Vehicular crossing options near the GRCB. Discussed the length of the detours.
- Scope of the Sudy - .5 mile radius of the GRCB, evaluation of GRCB for heavier loads, new crossings, new crossings with a new bridge.
- The main purpose of the meeting is to gather public input.
- GRCB –
    - Built in 1872 by Marcus Worden, National Register Listed in 1973.
    - The depth of the abutment is 7 feet at the bottom and well constructed.
    - There are concerns for all the areas. All roads converge at this spot.
    - To increase 12 tons+ requires extensive member replacement or structural support (steel beams), also requires detailed substructure evaluation. This will introduce significant historical review concerns (VT Covered Bridge Committee review).
- Alternative Concepts - General Considerations: land ownership, terrains and grade, wetlands/environmental issues, flood plain, historic/archaeological resources, schedule and cost
- 2 alignments to the north (A & B), 3 to the south (C, D & E) and GRCB
    - A – use existing concrete bridge (near Kratz's Mill) with newly created roadway to Jacksonville Stage Rd.
    - B – new bridge – really steep slope with lots of issues – good on a map but not in the field.

- C – new bridge and roadway; closest to the GRCB; wetlands present create permitting issues.
- D – new bridge, new roadway (following existing unimproved access); it is conservation land (VLT); there is flood plain
- E - new bridge, new roadway (following existing unimproved access); it is conservation land (VLT); there is flood plain
- GRCB – rehab the existing bridge to accommodate increase loads of 12, 15 and 20-ton capacities.

Summary – in the beginning stages of analysis, staying within the .5 mile radius, there will be a 2nd presentation in late September to look at the research gathered.

Concerns/Questions From the Public:

- Dick Clark asked if the bridge load rating would go back to 8-tons after the wing wall repair was completed. HTA ANSWER: No. This repair was only for the wing wall and a portion of the abutment. None of this work will add load capacity to the bridge.
- Karen Murphy – Can we look at wetland remediation for option C? HTA ANSWER: It can sometimes be done; that is something we will explore in that alternative.
- Addison Minott - Rehabbing the GRCB is just a short-term fix because loads are getting heavier with each passing year; pretty soon 20 tons wont be enough capacity. Also many trucks are oversized and hitting the top of the bridge. Even if it is brought up to 20-ton capacity there is still the architectural problem of the bridge height.
- Alex Bell - If the bridge load capacity were increased to 20 tons could the Town's grader make it through GRCB – is there a height issue? HTA ANSWER: No, it is not an issue of height for the grader, it is a weight issue. The grader weighs approximately 40,000 lbs. Dick Clark pointed out that the dump truck with a wing cannot make it through.
- Michael Baram - The GRCB is grandfathered for permitting whereas new bridges would require them. How does this effect time and cost for the regulatory requirements? HTA ANSWER: Permitting will certainly add time to any new project which will add cost. Right-of-way acquisitions could add years to the project.
- Michael Knapp – Is cost the only factor in the feasibility analysis or are there other factors involved? HTA ANSWER: Cost is just one of the considerations. HTA is looking at short-term construction costs of alternatives not long-term life of an alternative if chosen. How does the role of conservation easements play out from an eminent domain perspective on not only the local level but the national level? Sometimes it takes an act of legislature to make it happen – is this something that the Town would want to undertake? HTA ANSWER: This is a big question but one that the Selectboard and town will have to consider; HTA is merely providing them with information to help make a

more informed decision as it relates to time and cost. HTA clarified that a full rehab of GRCB IS one of the alternatives. Michael Knapp asked about adding steel beams to the GRCB and how it would affect the elevation of it. HTA ANSWER: If steel beams are added, the bridge would most likely be raised up and they would be visible. There was a brief discussion about building a new road in a flood plain and the downfalls of doing so.

- Anne Rider – if steel beams were added how much load could GRCB handle? –HTA ANSWER: 8-tons you'd have to strengthen members. Above 8 tons, adding steel beams would get us in the 12-20 ton range. 12 ton is reasonable for the existing abutments; if you get higher than that might require them to be fortified.
- David Pollack - There was a question about option A – What is the rating on the concrete bridge by Kratz's Mill? What are the negatives to this option? HTA ANSWER: The bridge is not posted so HTA does not know the weight limit; they will find this out. The road is posted for 24,000 lbs. It is steep and the road would have to be terraced in. Specific locations would have to be determined – this meeting was just about concept only, not specific details.
- Chris Wocell – We need to weigh the advantage of quickly integrating an option. He supported Option A because it would be easier than a whole new bridge or a rehab of GRCB. HTA ANSWER: The advantages of each Option will be explored. Advantage is that there is already an existing bridge. It does involve private property and a longer length of new road. There was a question that this was once a Class 4 road.
- Addison wanted to point out to folks who live on the west side of Green River that Option A would have people going out of their way to get home. Many commented that it would be a lot shorter than what they are doing now. He also noted that concrete trucks pass by his house often; they can't fit through the GRCB.
- Sean Murphy - How are the current conditions of the GRCB? HTA ANSWER: This project started with an evaluation of the bridge. The original task was to look at it and create a plan for maintaining it. As it currently stands it is in good condition and the Town had a good plan to perform regular maintenance and repair of it. There is racking and sweep (caused by overweight vehicles going through it) – this was part of the original rehab plan that was deferred.
- Jared Bristol – He will get a list of all the GVFD vehicles – size and weight to pass along to HTA. The trucks
- Ron Lenker – If steel could be added to the cross members vs. the bottom? HTA ANSWER: Probably not. The bottom chords would have to be addressed. Hard to introduce steel into wood joinery.
- David Pollack – asked about having the bypass road for large trucks and using the GRCB for passenger vehicles.
- Dan Systo – downgrade GRCB to a pedestrian bridge and invest in the bypass road; there is no need for two bridges. Not worth investing $1.2 million in GRCB.

- Dick Clark – For years the Town has been looking at new bridge but putting one is will be a huge expense.
- Frank Larkin – A new bridge also includes the cost of building a new section of road and having to maintain both – bridge and roadway - over time.
- Ben Knapp (?) – why was the scope limited to .5 mile radius not longer? HTA ANSWER: The reason was mainly cost – the further out you go the more expensive the study. Additionally the farther out the alternative the less useful it is.
- Steve Lembke – Thanked the Selectboard for deciding to do this study. This study helps guide informed choices. He also thanked HTA for taking all options and exploring them equally. Question for the Town – at what point does this issue go from a Selectboard decision to a town-wide vote? The SB thought it would go to a town-wide vote.
- Laura Metsch – Would it be possible to include a "combo" as in getting the GRCB to 8-10 ton and getting a bypass road? HTA ANSWER: Yes.
- Chris Wocell – Please describe the process for determining the costs of each alternative. HTA ANSWER: They will work with existing contours to determine an alignment and work with the Town, property values, ROW acquisition cost, environmental permitting and historic components that will be factored in. Chris Wocell clarified by saying that he would like to be guaranteed that this process will be an unbiased approach not skewed in any way. HTA ANSWER: They will use similar project costs using current industry averages. How will it get constructed? HTA ANSWER: Identify where there is funding if any, design it and put it out to bid.
- Dick Clark pointed out that there is a historic mill on the bypass route.
- Eddie Charbonneau – Where is the comparison of GRCB against other towns with covered bridges? How do they work around it – do heavier vehicles go through those? HTA ANSWER: Union Covered Bridge, Thetford VT. That town went with steel beams. Montgomery went with a whole new covered bridge (reproduction) in the same spot. There are all sorts of solutions that different towns choose to go with. It is hard to know what is the right choice. You can't make everyone happy with one choice. Eddie Charbonneau – Is our bridge different than most bridges – anything that would make it prohibitive to adding load? HTA ANSWER: No it is fairly typical.
- Ed Burke - Could HTA provide some examples of other towns that have gone through this and provide materials on how they handled it. HTA ANSWER: Usually they (HTA) are brought in after the town has already had the hard discussions. Guy - All of the alternatives being presented for Guilford have permitting issues but is the GRCB the only alternative that doesn't have permitting issues? HTA ANSWER: Yes. They will use experience and history to help determine some hurdles.
- Andy Cotton – Did the Thetford project maintain its historic integrity and pass the Covered Bridge Committee review despite the work they did to it? HTA ANSWER: Yes. It is too difficult to know what they will or wont allow given the unique conditions of each community.

- David Pollack – Will the estimated time to completion for each of the alternatives be part of the analysis? HTA ANSWER: Yes.
- Dick Clark explained that a temporary bridge is being explored.
- Linda Lembke – What will HTA be involved with after the feasibility study? HTA ANSWER: There will be no involvement after the feasibility study unless the Town chooses to move ahead with their services.
- Michael Knapp – Dept. of Agriculture grant funding (Wildlife Habitat Incentive Program) on the conserved land – what is the precedent in undoing that? HTA ANSWER: They would need to consult with their environmental staff people to find answers to that.
- Kerry Doyle – VLT – Curious if part of the analysis includes contemplating flooding, meandering, moving and shifting of the river in a long-term lens; it seems there is more instability in the river dynamics below the GRCB vs. above it? HTA ANSWER: This would become a in a deeper consideration of the southern alternatives – this is final analysis type of exploration.

Sean James appreciated everyone's valuable input and said they would be back in about a month.

Richard Clark, Chair Troy Revis, Jr. Anne Rider

44

8/25/2014

TOWN OF GUILFORD
Green River Feasibility Study/Alternatives Analysis
LOCAL CONCERNS MEETING
ATTENDANCE

PRINTED NAME	SIGNATURE
Andy Cotton	
William Nebelski	
Addison Minott	
* DAVID POLLACK	
Joan Seymour	
Adelaide Minott	
TROY E REEVES JR	
Dick Clark	
Kerry Doyle (Vermont Land Trust)	
Ian Kibbie (for BCTV)	
Anne Rider	
Michael Knapp	
Ed Burke	
Denise Peasche	
Sharon Murphy	
Karen Murphy	
Eddie Charbonneau	
ROB GOLDENHILL	
Peter Welch	
Carol Jaenson	
Frank Larkin	
MARTY RAMSBURG	
Linda Lamb	
Steve Lamb	
PETER COLEMAN	
Laura Metsch	
Benjamin Knapp	
Jacob Knapp	
Jessica Cheslawski	

Print NAME	Signature
Alex Bell	Alex Bell
Dina Kail	Dina Kail
MATT MANN, WRC	Matt Mann
Christopher Wocell	Carleen Wocell
Connie Wocell	
Jared Bristol	Jared Bristol
Tammi Bell	Tammi Bell
Ben Bell Jr. Ben Bell Jr.	Ben Bell Jr.
Alice Revis	Alice Revis
Melissa Kent	
Ryan Moon	Ryan Moon
Nancy Kent	Nancy Kent
Dolores Clark	
Heidi + Michael Barden	
Ron Lenker	Ron Lenker

OCTOBER 6, 2014
ALTERNATIVES PRESENTATION MEETING
MINUTES

Green River Covered Bridge – Alternatives Presentation
October 6, 2014

PRESENT: Dick Clark (Chair), Troy Revis, Jr., Anne Rider

TOWN STAFF and OFFICIALS: Katie Buckley (Town Administrator), Herb Meyer (Co-EMD), Candace Stoumen (Co-EMD), Dan Zumbruski (Highway Foreman/Road Commissioner)

PUBLIC: See attached sign-in sheet

Dick Clark called the meeting to order at 6:00 PM.

Sean James introduced his team of engineers - Chris Dunlap (Engineer - roadway specialist) and Kimberly Peace (Engineer - permitting/resources specialist) and outlined the presentation. He presented some background that was provided during the 8/25/2014 Local Concerns presentation. He discussed the purpose, need and scope of the study. He talked about the site selection methodology of the various alternatives.

Kimberly Peace – Shared information about resource constraints:

- The Town Plan was an important reference document; it lists the values that are important to us as a community.
- She went on the list the various resources used to determine constraints.
- Resources regulations (permitting) were listed; they are many.

Chris Dunlap– Shared details of Alternatives A – E (all options with the exception of the GRCB):

- Design criteria of the roadway – uses Federal, State and Town standards
- Roadway Criteria - width of 28', gravel surface, speed limit of 30 mph, etc.
- Bridge Criteria – used VTrans Hydraulic Manual, width = 31', 1' Freeboard over Q25 for local roads, 1' above floodplain
- Alternatives C, D & E (3 options south of the GRCB) were presented together since they all share the same resource constraint issues. These alternatives were so costly and lengthy in the permitting/construction that they were eliminated from the study. Any bridge constructed in this area would have to be between 300'-600' in length!
- Alternative A – is the bypass road to be constructed just north of Br. 09 (concrete bridge next to Kratz's Mill). Dolores Clark asked for clarification on the definition of "property takings". Chris explained that if "friendly," then there would be a negotiation; if "adversarial," then eminent domain would be used. It would involve some steep grades (10-14%) in a section. Permitting would be somewhat insignificant. Estimated cost $1.7M (this includes about $85K of repairs to Br. 09). Project duration – 3-5 years.

- Alternative B – would involve a significant grade down the 25-30' slope; it would be an extremely high and long (300') and very expensive bridge. Estimated cost $5.2M. Costs include: roadway, bridge, survey, bidding, utility coordination, permitting, property taking, etc. Estimated Project Duration – 3-5 years.

Sean James talked about Alternative F = Green River Covered Bridge. There were 6 options related to the GRCB:

- Upstream or downstream bypass bridge issues (similar concept to what Brattleboro did with the Creamery Bridge):
    - North - Archaeological mill remains, crib dam, wing walls
    - South- House and garage in the way and the alignments don't line up with the roadways
    - Not feasible
- 4-tons (current load) - maintenance repairs only – this involves the scope of work for which the town has already received funding of $315, 000 through the VTrans Transportation Alternatives Program. Project duration – 1 year.
- 8-tons
    - Need to do a detailed structural analysis deeper than VTrans
    - Bottom chord, upstream truss, ends of the bridge need to be addressed
    - Estimated Project Cost - $550,000 (the Town already has $315,000)
    - Project duration - 2 years
- 12-tons
    - Will require the addition of steel beams (30-36" deep – 24" would most likely show), concrete caps and abutments, raise in approach grade to deal with flood plain
    - VTrans Covered Bridge Committee may not approve
    - Estimated Project Costs - $1.6M (the Town already has $315,000)
    - Project duration - 2-3 years
- 20-tons
    - Will require supplemental steel beams, replacement of stone masonry abutments with concrete, raise in approach and grade
    - VTrans Covered Bridge Committee will likely not approve
    - Estimated Project Cost - $2.5M
    - Project duration - 3-4 years
- Relocate GRCB and put modern bridge in its place
    - Replace abutments
    - Significant regulatory issues (understatement)
    - Estimated Project Cost - $3.6M
    - Project duration - 3-5 years

Funding Sources

- Town Highway Bridge Program – falls into a priority schedule based on need; goal of the program is to maintain existing infrastructure not fund new projects; 5-7 year timeline for project acceptance.
- Town Highway Structures and Class 2 Roadway Program – this could be used for Option A repairing Br. 09 – short timeline 1-2 years
- Transportation Alternatives Program – Historic Preservation funding; $375,000 application cap – could only be used for GRCB options that don't compromise the historic integrity of the bridge.

Dick asked Sean James if there is any chance that the weight limit on the bridge could go back up to 8 tons after the wing wall and abutment repairs are made. Sean explained that these repairs were unrelated to the live load capacity issues that are associated specifically with the structure of the bridge itself.

There was discussion about the background surrounding VTrans' requirement on the Town to lower the load rating from 8-tons to 4-tons. Anne asked if we got back to 8-ton what would be the problems associated with this? Dan talked about some of the ways the Town Highway Department has dealt with the 8-ton load for years. Anne questioned if the GVFD would get their equipment through at 8 tons.

There was a lengthy discussion about Alternatives A and F.

Steve Lembke asked the Selectboard if they will make a decision on this topic during their next meeting Tuesday, October 14th at 8:30 AM. Dick replied that they would; he felt the public has had enough time to weigh in on this matter already. Anne disagreed. She felt that the board is not yet ready to make a decision and this timetable feels too rushed. There was general discussion that followed. It was decided that the Town would need to take the time it needs to be thoughtful about how to proceed and not let funding deadlines force a shortsighted decision.

_____	_____	_____
Richard Clark, Chair	Troy Revis, Jr.	Anne Rider

APPENDIX F

Town Road and Bridge Standards

TOWN ROAD AND BRIDGE STANDARDS
TOWN OF GUILFORD, VERMONT

The Town of Guilford, Vermont, hereby adopts the following Town Road and Bridge Standards that shall apply to the construction, repair and maintenance of all town roads and bridges.

The standards listed here are considered minimum and apply to construction projects and repair and maintenance activities. The standards include management practices and are designed to: ensure the safety of the traveling public, minimize damage to road infrastructure during flood events, and enhance water quality protections by minimizing sediment delivery to surface waters and/or wetlands.

The select board reserves the right to modify the standards for a particular project or repair or maintenance activities where, because of unique physical circumstances or conditions, there is no possibility that the project or activities can be completed in strict conformance with these provisions. Any modifications to the standards must be done in a manner that serves the underlying intent of the management practice, be it public safety, flood hazard avoidance, or water quality protection. Fiscal reasons are not a basis for modification of the standards. Questions about modifications to the standards should be directed to the VTrans District Office.

Municipalities must comply with all applicable state and federal approvals, permits and duly adopted standards when undertaking road and bridge activities and projects.

Any new road regulated by and/or to be conveyed to the municipality shall be constructed according to the minimums of these standards. If any federal and/or state funding is involved in a project, the VTrans district office must be notified prior to any field changes taking place that would alter the original scope of work.

Roadways

- All new or substantially reconstructed gravel roads shall have at least a 12-inches thick processed gravel sub-base, with an additional six (6) inches (minimum) top course of crushed gravel.
- All new or substantially reconstructed paved roads shall have at least a15 inches thick processed gravel sub-base.
- All roadways shall be graded so water does not remain on the road surface. For roadways that are not super-elevated, this generally means a 2-4% (1/4"-1/2" per foot) crown for gravel roads and 1-2% (1/8"-1/4" per foot) crown for paved roads to promote sheeting of water.
- Proper grading techniques for gravel roadways must be used to avoid creating a ridge or berm between the crown and the ditch.
- Any berm along the roadway shoulder that prevents the proper sheeting of water must be removed.

Ditches and Slopes

Soil exposed during ditch and slope construction, repair or maintenance must be treated immediately following the operation and temporary erosion prevention and sediment control practices must be installed and maintained during construction activities and until the ditch or slope is permanently stabilized.

The following are minimum erosion control measures. Careful attention must be given to areas vulnerable to erosion and immediately adjacent or discharging to surface waters and/or roadway drainage facilities:

- Seed and mulch all ditches with grades less than 5% when undertaking projects or repairs or maintenance activities that will result in exposed soil. Vegetation must be established and monitored. If vegetation is not established within ten (10) days of placement, install biodegradable non-welded matting with seed.
- Stone line all new or reconstructed ditches or whenever soils are disturbed by maintenance activities with grades equal to and greater than 5%; alternatively, install stone check dams. The check dams must meet criteria outlined in the *"Standards and Specifications for Check Dams,"* from the *"Vermont Standards and Specifications for Erosion Prevention and Sediment Control."* Specifically, dams must be placed so that the crest of the downstream check dam is at the same elevation as the base of the upstream dam.
- Create parabolic (wide "U" shaped) ditches when constructing new or substantially reconstructing ditches, rather than narrow "V" shaped ditches wherever lateral space allows. Ditches with gradual side slopes (maximum of 1:2, vertical to horizontal ratio) and a wide bottom (at least 2 feet) are preferred. Use biodegradable, non-welded matting to stabilize side-slopes where slopes are greater than 1:2 and less than 1:1 ½; apply seed and mulch to any raw or exposed side-slope if slopes are less than 1:2.
- All ditches must be turned out to avoid direct outlet into surface waters. There must be adequate outlet protection at the end of the turnout, either a structural (rock) or vegetative filtering area.
- If in the best professional engineering judgment of the VTrans Operations Division, there is a cost effective ditch treatment that will meet the intent of the management practices described above, but represents a departure from these standards, the municipality may implement the more cost effective ditch treatment alternative with the professional recommendation submitted in written form by VTrans prior to the municipality executing the work.
- When constructing new or substantially reconstructing side slopes, use appropriately sized stone armament on slopes that are 1:1 ½ or greater. If the toe of slope affects perennial streams, then the project must conform to the statewide Stream Alteration standards.

Culverts and Bridges

- Replacement of existing culverts and any new culvert must have a minimum culvert diameter of eighteen inches (18").
- Replacement of existing bridges and culverts and any new bridges and culverts must be designed in accordance with the VTrans Hydraulics Manual, and, in the case of perennial streams, conform to the statewide Stream Alteration standards.
- All new driveway culverts must have a minimum diameter of fifteen inches (15").

- When installing or replacing culverts, use appropriate techniques such as headwalls and wing-walls, where there is erosion or undermining or where it is expected to occur.
- Install a splash pad or plunge pool at the outlet of new or repaired drainage culverts where there is erosion or where erosion may occur. Splash pads and plunge pools are not appropriate for use in streams supporting aquatic life.

Guardrails

When roadway, culvert, bridge, or retaining wall construction or reconstruction projects result in hazards such as fore-slopes, drop offs, or fixed obstacles within the designated clear-zone, a roadside barrier such as guardrail must be installed. The most current version of the AASHTO Roadside Design Guide will govern the analysis of the hazard and the subsequent treatment of that hazard.

Access Management

The town must have a process in place, formal or informal, to review all new drive accesses and development roads where they intersect Town roads, as authorized under 19 V.S.A. Section 1111. Towns may reference VTrans A-76 Standards for Town & Development Roads and B-71 Standards for Residential and Commercial Drives; and the VTrans Access Management Program Guidelines for other design standards and specifications.

Training

Town highway maintenance crews must collectively attend a minimum total of 6 hours of training per year on best road management practices. The town must keep documentation of their attendance for a period of three years.

Passed and adopted by the Selectboard of the Town of Guilford, State of Vermont on May 13, 2013.

The Guilford Selectboard:

Richard J. Clark, Chair

Troy Revis, Jr.

Anne Rider

RECEIVED & RECORDED
On May 22, 2013
At 9:30 a M
Book 4 Page 115-117
Town Clerk Guilford, VT

APPENDIX G

References

References:

FEMA Flood Map Service Center: https://msc.fema.gov/portal

Guilford Town Plan, 2010. http://www.guilfordvt.net/vertical/sites/%7B372CBFCC-DD14-4AC7-862E-8EA2C377FFD3%7D/uploads/2010_Guilford_Town_Plan(1).pdf

Hydraulics Manual, Vermont Agency of Transportation, 1998

NOAA Habitat Conservation Essential Fish Habitat Mapper: http://www.habitat.noaa.gov/protection/efh/habitatmapper.html

The Orange Book 2014-2016, A Handbook for Local Officials, Vermont Agency of Transportation, 2013 (Revised)

USDA NRCS Web Soil Survey: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

USFWS Federally Listed Endangered and Threatened Species in Vermont: http://www.fws.gov/newengland/pdfs/VT%20species%20by%20town.pdf

USFWS NWI Wetlands Mapper: http://www.fws.gov/wetlands/Data/Mapper.html

Vermont Council on Rural Development (VCRD) , 2014. Guilford Community Visit, Report and Action Plan. Montpelier, VT. www.vtrural.org

Vermont Division of Historic Preservation web site. http://accd.vermont.gov/strong_communities/preservation

2010 VTrans Structures Design Manual, Published by the VTrans Structures Section.