VERGENNES PLANNING AND ENVIRONMENT LINKAGES STUDY

# Attachment 5: Alternatives Evaluation

February 2025

VERMONT
AGENCY OF TRANSPORTATION

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# 1. Introduction

The Vermont Agency of Transportation (VTrans), in cooperation with the Addison County Regional Planning Commission (ACRPC) and Federal Highway Administration (FHWA), is preparing a Planning and Environment Linkages Study (Vergennes PEL Study) to evaluate transportation alternatives to reduce the impacts of large trucks on VT Route 22A (Route 22A) in downtown Vergennes while also enhancing the quality of life and economic vitality for residents in the city and surrounding towns. The Vergennes PEL Study will build upon previous planning efforts completed over the last 25 years that considered alternatives at different levels of detail. Improvements to the transportation system that could be constructed as a result of the Vergennes PEL Study and are federally funded would require FHWA approval under the National Environmental Policy Act (NEPA). Additional information and current and future reports can be found on the Vergennes PEL Study website (www.vergennespel.com).

Two of the primary outcomes of the Vergennes PEL Study are a purpose and need statement that receives federal and state resource agency concurrence and a list of reasonable transportation alternatives (concepts[1]) that may move forward for evaluation in a future NEPA environmental review. NEPA compliance is required whenever a federal agency proposes an action, grants a permit, or agrees to fund or authorize any other entity to undertake an action that could affect environmental resources. Another important outcome of the PEL Study is the coordination of reasonable transportation concepts with local land use planning. The Vergennes PEL Study will also include an implementation plan, which will include next steps for the future NEPA environmental review, local land use planning recommendations, and an identification of project financing strategies.

Five possible routes have been advanced to a conceptual level of detail. Figure 1-1 presents the five routes, categorized by color, recommended for further study. A summary of the screening results is presented in Table 1-1.

The screening process included soliciting feedback from local agencies, regional stakeholders, federal and state agencies, and the public. A variety of outreach methods were used including meetings, attendance at local events, and the deployment of an online survey.

[1] The term “concept” is used to describe the more conceptual level of the proposed improvement, versus “alternative,” which was used during the spring outreach.

Figure 1-1 Routes Recommended for Further Study

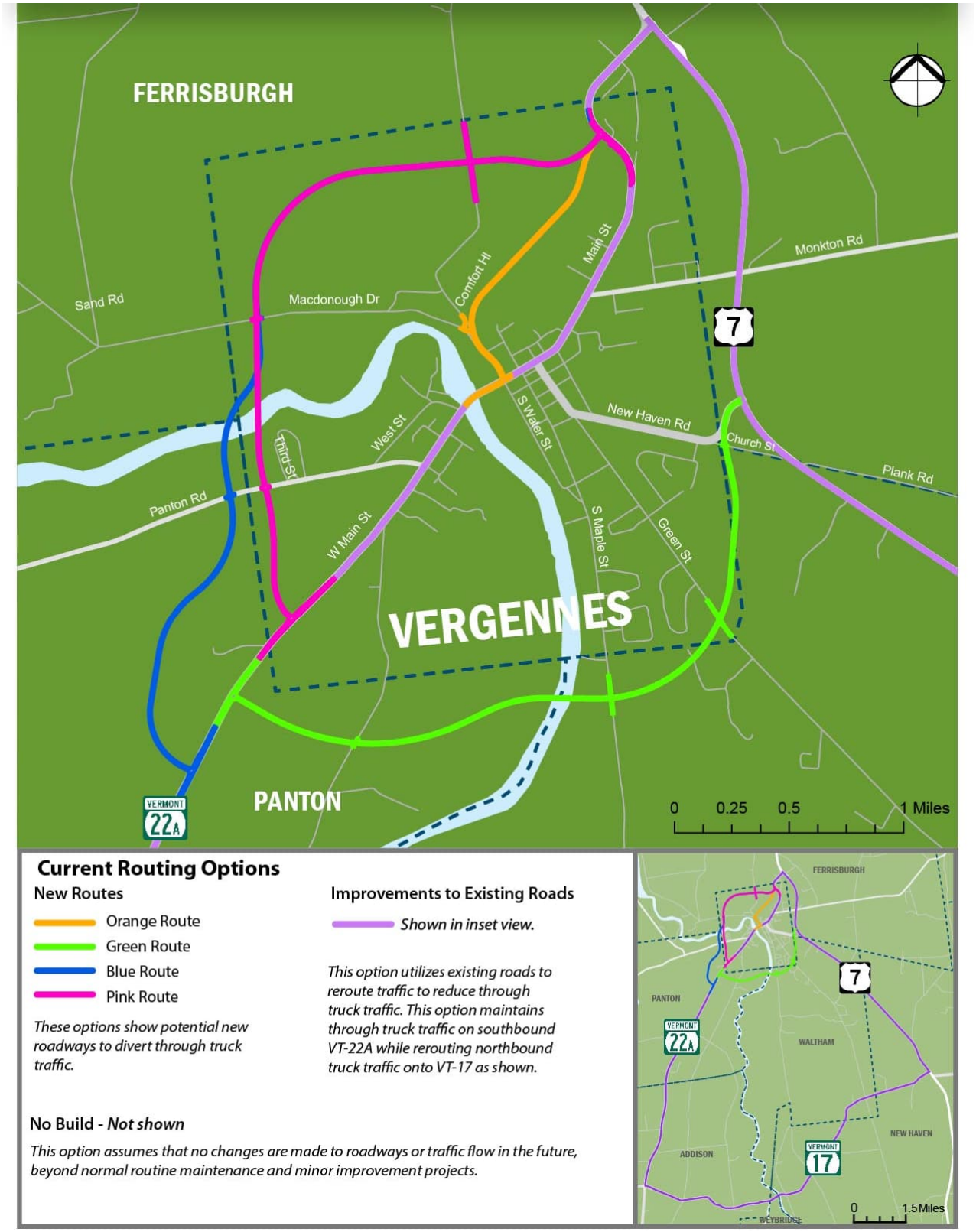


Table 1-1 Secondary Screening Results

| ROUTE ALTERNATIVE / CONCEPT NAME | MEETS PURPOSE AND NEED | SECONDARY SCREENING RESULTS |
|---|---|---|
| Purple – Route 17 Northbound/Route 22A Southbound | Yes | The Route 17 Northbound/Route 22A Southbound concept (Purple Route) meets the purpose and need and scored high during the initial screening. |
| Pink – Vergennes New Roadway (West Routing Option 3) | Yes | The Vergennes New Roadway West Routing Option 3 (Pink Route) meets the Purpose and Need and scored high during the initial screening. . |
| Blue– Vergennes-Panton New Roadway (West Routing Option 4) | Yes | The Vergennes New Roadway West Routing Option 4 (Blue Route) meets the Purpose and Need and scored high during the initial screening. . |
| Green – Panton-Vergennes-Waltham New Roadway (Southeast Routing) | Yes | The Panton-Vergennes-Waltham New Roadway (Southeast Routing) concept (Green Route) meets the Purpose and Need but scored lower than the Pink, Blue, and Purple Routes during the initial screening.<br>During the secondary screening, potential environmental impacts (particularly to wetlands) were identified. However, a new Otter Creek crossing upstream of the Vergennes Falls may be less challenging than the proposed crossings downstream ( Blue, and Pink Routes) due to reduced waterway clearance requirements. |
| Orange – Vergennes Main Street New Parallel Route | Yes | The Vergennes Main Street New Parallel Route concept (Orange Route) meets the purpose and need and scored high during the initial screening. The secondary screening identified extensive property impacts in the vicinity of the MacDonough Drive/Comfort Hill intersection. |

## 1.1 ROUTE ALTERNATIVES

Following the initial and secondary screenings, conceptual designs were developed for each of the five route alternatives, as described in the *April 2024 Conceptual Design Technical Memorandum*. The conceptual designs provided a footprint to allow for a preliminary evaluation of impacts to environmental resources as well as an estimate of potential property acquisitions specific to a particular horizonal and vertical alignment. Table 1-2 presents an overview of the route alternatives including the mileage, design speed, number of intersections, number of river crossings, and municipalities the route alternatives would traverse.

Table 1-2 Route Alternatives

| ROUTE ALTERNATIVE | | MILEAGE | DESIGN SPEED | # OF INTERSECTIONS | # OF STREAM CROSSINGS | MUNICIPALITIES |
|---|---|---|---|---|---|---|
| Pink Route Alternative | | 2.3 miles | 50 mph | 5 (New) | 6 (New) | Panton, Vergennes |
| Blue Route Alternative | | 2.5 miles | 50 mph | 5 (New) | 6 (New) | Panton, Vergennes |
| Green Route Alternative | | 2.3 miles | 50 mph | 6 (New) | 10 (New) | Panton, Waltham, Vergennes, Ferrisburgh |
| Orange Route Alternative | | 1 mile | 35 – 45 mph | 1 (Existing)<br>2 (New) | 2 (New) | Vergennes |
| Purple Route Alternative | Route 17 | 10.2 miles | 45mph | 13(Existing) | 20 (Existing) | Addison, Weybridge, Waltham, New Haven |
| | Route 7 | 7.5 miles | 50mph | 10 (Existing) | 15 (Existing) | New Haven, Waltham, Ferrisburgh |
| | Route 22A | 12.7 miles | 50 mph | 36 (Existing) | 25 (Existing) | Vergennes, Panton, Addison Ferrisburgh |

## 1.2 NO BUILD ALTERNATIVE

The No Build Alternative assumes no improvements in the Route 22A study corridor, other than those that already programmed for design and construction and routine maintenance, and asset management activities.

Although the No-Build Alternative does not address the Purpose and Need identified for the study corridor through the Vergennes PEL Study, any future project-level NEPA review for future projects within the Route 22A study corridor would require an analysis and comparison to a No-Build Alternative. The No Build Alternative also serves as the baseline condition against which the potential benefits and effects of the build alternative(s) that are a part of the Vergennes PEL Study are evaluated.

This technical memorandum describes the evaluation of the five route alternatives, compared to the No Build Alternative. Section 2 presents the purpose and need statement developed through the Vergennes PEL Study. Section 3 presents the traffic analysis conducted for the study. Section 4 presents the existing conditions and potential constraints for environmental resources. The information in this section was used to evaluate the route alternatives. Section 6 discusses the potential for environmental justice impacts from the proposed transportation alternatives. Section 7 summarizes an evaluation of each of the five route alternatives based on the information outlined within the preceding sections of this memorandum and identifies the proposed alternatives that could be advanced for further study through a NEPA review.

# 2. Purpose and Need

With public and agency input, the study team developed the Vergennes PEL Study Purpose and Need Technical Memorandum,[2] which identified the purpose and need for the project along with the goals of the study. A purpose and need statement is an important component of PEL studies and environmental reviews prepared by VTrans, as it sets the stage for the specific problems to be addressed. The *purpose* defines the transportation problem to be solved. The *need* provides evidence that supports the assertion made in the *purpose*. The purpose and need statement developed for this PEL study builds upon the purpose and need from the 2019 VT 22A Alternative Truck Route Study and reflects extensive public outreach and data collection efforts.

The *purpose* is to reduce the impacts of through truck traffic, including safety, congestion, noise, vibration, and dust on Route 22A in downtown Vergennes. Transportation solutions that reduce truck -related quality of life impacts should also meet the mobility, safety, and economic vitality needs of Vergennes and neighboring communities. A summary of the *needs* identified are detailed below.

| | |
|---|---|
|  | **Mobility and Access:** Maintain opportunities for the movement of freight in the region and minimize and/or mitigate traffic impacts to other transportation corridors. |
|  | **Safety, Circulation, and Resilience:** Support the continued movement, resilience, and safety of travel through downtown Vergennes and in neighboring communities. |
|  | **Quality of Life:** Improve the quality of life and minimize negative property and environmental resource impacts in downtown Vergennes and neighboring communities. |
|  | **Economic Vitality:** Promote the economic vitality of downtown Vergennes and the movement of goods in Vergennes and neighboring communities and support the rural economy. |
|  | **Land Use:** Support local and regional land use plans and policies and state land use goals. |

[2] https://vergennespel.com/media/iiodtusc/vergennes-pel-study_purpose-and-need-final-march-2022.pdf

# 3. Traffic Analysis

## 3.1 VOLUME DEVELOPMENT

Existing volumes within the study area were obtained from the Vermont Agency of Transportation (VTrans) Traffic Data Management System (https://vtrans.public.ms2soft.com/tcds/) for twelve intersections along the following roadways – VT Route 22A, VT Route 17, and US Route 7. A Google Earth file (kmz) was developed to use as the baseline for the traffic analysis and included the following intersections.

- VT Route 22A intersections at:
  - VT Route 17
  - Panton Road
  - MacDonough Drive/S. Water Street
  - Green Street
  - Monkton Road
  - US Route 7
- VT Route 17 intersections at:
  - Weybridge Road
  - Hallock Road/Quaker Village Road
  - Green Street/Pearson Road
  - US Route 7
- US Route 7 intersections at:
  - New Haven Road
  - Monkton Road

Baseline conditions were used to establish an existing conditions analysis, while the future design year used for this analysis is 2046. Based on the current (2022) VTrans Continuous Traffic Counter Report (The Redbook - dated June 2023[3]), an overall 10% traffic growth factor (1.10) was identified for the future design year (2046). This was based off of the 20-year growth factor table provided in The Redbook, which shows an annual growth rate of 0.4%/year compounded annually. Based on the results of the 2019 VT 22A Truck Route Study, an additional 3% growth (0.03 growth factor) was utilized for truck traffic and was also included in the background growth, to account for the

[3] The Redbook is "is an annual compilation of continuous traffic counter statistics; including Annual Average Daily Traffic (AADT), Design Hourly Volume (DHV), Seasonal Adjustment Factors, and AADT Growth Factors." Available: https://vtrans.vermont.gov/sites/aot/files/documents/Redbook%202022.pdf
Since the initial development of the memorandum, an update to the Redbook was released in July 2024 (Based on 2023 Traffic Data). This memo continued to reference the Redbook dated 2023, as this previous version showed more conservative growth rates.

expected increase in truck traffic. The result is a total growth factor of 1.13 utilized for the purpose of this analysis.

To reflect the movement of traffic from existing intersections to each of the proposed alternatives (Purple, Pink, Blue, Green, and Orange), as documented within the Task 4 Technical Memorandum the following volume diversions[4] were assumed for each alternative route. For each alternative (with the exception of the purple route), the analysis assumes that 90 percent of all heavy vehicles: and 10 percent of all passenger vehicles would use the alternative route. For the Purple Route, all northbound through heavy vehicles no passenger vehicles are expected to divert from VT Route 22A.

- Weekday AM peak hour:
  - Northbound VT 22A - Total of 102 vehicles (86 heavy vehicles and 16 cars)
  - Southbound VT 22A – Total of 51 vehicles (38 heavy vehicles and 13 cars)
- Weekday PM peak hour:
  - Northbound VT 22A – Total of 52 vehicles (41 heavy vehicles and 11 cars)
  - Southbound VT 22A – Total of 66 vehicles (36 heavy vehicles and 30 cars)

Using the diversion volumes noted above, turning movement volumes were developed for the following scenarios:

- Existing Conditions
- Future 2046 No Build
- Future 2046 Build – Purple Route Alternative
  - Only northbound VT Route 22A heavy vehicles utilize the Purple Route; southbound traffic continues to utilize VT Route 22A through the City of Vergennes.
- Future 2046 Build – Pink Route Alternative
- Future 2046 Build – Blue Route Alternative
- Future 2046 Build – Green Route Alternative
- Future 2046 Build – Orange Route Alternative

A volume summary table was developed that summarizes turning movements for all intersections within each scenario for both the AM and PM peak periods. For the purposes of the traffic analysis, the Pink and Blue Route alternatives are expected to have nearly identical operating conditions. The following intersections were analyzed within all scenarios:

- VT Route 22A at VT Route 17
- VT Route 17 at Weybridge Road
- VT Route 17 at Hallock Road/Quaker Village Road

[4] These traffic volumes were determined by the most currently available 24-hour traffic count data along VT Route 22A, which was located approximately 1.2 miles north of VT Route 17, with passenger vehicles (FHWA vehicle classification 1 – 4) and heavy vehicles (FHWA vehicles classifications 5 – 13) summarized during each specific peak hour. Based on the 2019 VT 22A Truck Route Study, a 50% increase in truck traffic is expected while approximately 90% of the trucks traversing through Vergennes along VT Route 22A are passing through the city without stopping.

- VT Route 17 at Green Street/Pearson Road
- US Route 7 at VT Route 17
- US Route 7 at New Haven Road
- US Route 7 at VT Route 22A
- VT Route 22A at Panton Road
- VT Route 22A at Green Street
- VT Route 22A at MacDonough Drive/S. Water Street
- US Route 7 at Monkton Road
- VT Route 22A at Monkton Road

The summary below outlines additional intersections proposed for each alternative route (Purple, Blue, Pink, Green, and Orange). These include additional scenarios reviewed due to identified mitigation needs at the intersections of US Route 7 & VT Route 17 and VT Route 22A & Panton Road:

- Future 2046 No Build
    - VT Route 22A at Panton Road intersection (Signalized)
- Future 2046 Build – Purple Route Alternative
    - US Route 7 at VT Route 17 (Signalized)
    - US Route 7 at VT Route 17 (All-way Stop)
- Future 2046 Build – Blue Route Alternative
    - VT Route 22A at Blue Route (south)
    - Panton Road at Blue Route
    - MacDonough Drive at Blue Route
    - Comfort Hill at Blue Route
    - VT Route 22A at Blue Route (north)
- Future 2046 Build – Pink Route Alternative
    - VT Route 22A at Pink Route (south)
    - Panton Road at Pink Route
    - MacDonough Drive at Pink Route
    - Comfort Hill at Pink Route
    - VT Route 22A at Pink Route (north)
- Future 2046 Build – Green Route Alternative
    - VT Route 22A at Green Route
    - Hopkins Road at Green Route
    - Maple Street at Green Route
    - Green Street at Green Route
    - US Route 7 at New Haven Road (signalized)
- Future 2046 Build – Orange Route Alternative
    - VT Route 22A at MacDonough Drive/S. Water Street (signalized)
    - Orange Route at MacDonough Drive
    - VT Route 22A at Orange Route (north)

Turning movement volumes generated for each of the intersections identified above were used to review operational conditions for each intersection, as well as overall travel time within each alternative.

## 3.2 LEVEL OF SERVICE

Synchro software (Version 11) was used to model traffic operations for all alternatives listed above for Weekday AM and PM peak hours. This model included grades, speed limits, heavy vehicle percentages, saturation flow rates, signal timings, storage lane lengths, and lane widths. Highway Capacity Manual (HCM) 6th Edition and Highway Capacity Software (HCS) were used to generate levels of service (LOS) and delay (seconds) at each intersection.

Within each scenario, most intersection approaches would operate at LOS D or better, which is deemed as acceptable based on current VTrans guidelines.[5] The following exceptions are approaches within each scenario where an LOS E or F has been identified:

- Existing Conditions:
  - PM Peak Hour: VT Route 22A at Panton Road: Panton Road EB – LOS E
  - PM Peak Hour: VT Route 22A at McDonough Drive: Water Street WB – LOS E
  - PM Peak Hour: VT Route 22A at McDonough Drive: MacDonough Drive EB – LOS E
- No Build Alternative:
  - PM Peak Hour: VT Route 22A at Panton Road: Panto Road EB – LOS F
  - AM Peak Hour: VT Route 22A at McDonough Drive: MacDonough Drive EB – LOS E
  - PM Peak Hour: VT Route 22A at McDonough Drive: Water Street WB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: MacDonough Drive EB – LOS F
- Purple Route Alternative:
  - PM Peak Hour: VT Route 17 at US Route 7: VT Route 17 EB – LOS F
  - PM Peak Hour: VT Route 22A at Panton Road: Panton Road EB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: Water Street WB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: MacDonough Drive EB – LOS F
- Blue Route Alternative:
  - PM Peak Hour: VT Route 22A at Panton Road: Panton Road EB – LOS E
  - PM Peak Hour: VT Route 22A at McDonough Drive: Water Street WB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: MacDonough Drive EB – LOS E
- Pink Route Alternative:
  - PM Peak Hour: VT Route 22A at Panton Road: Panton Road EB – LOS E
  - PM Peak Hour: VT Route 22A at McDonough Drive: Water Street WB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: MacDonough Drive EB – LOS E
- Green Route Alternative:
  - PM Peak Hour: VT Route 22A at Panton Road: Panton Road EB – LOS E

[5] VTrans Highway Design "Level of Service" Policy. Available: https://vtrans.vermont.gov/sites/aot/files/highway/documents/publications/LevelOfServicePolicy2007.pdf

  - AM Peak Hour: US Route 7 at New Haven Road: New Haven Road EB – LOS E
  - PM Peak Hour: US Route 7 at New Haven Road: New Haven Road EB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: Water Street WB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: MacDonough Drive EB – LOS E
- Orange Route Alternative:
  - PM Peak Hour: VT Route 22A at Panton Road: Panton Road EB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: Water Street WB – LOS F
  - PM Peak Hour: VT Route 22A at McDonough Drive: MacDonough Drive EB – LOS F

Within all scenarios – the stop-sign controlled approaches of MacDonough Drive/Water Street as well as Panton Road as they intersect with Route 22A would operate at LOS E or worse by 2046. A complete summary of the LOS analysis is included as an appendix to this memorandum, with approaches that operate at LOS E or F highlighted in orange or red, respectively.

## 3.3 TRAVEL TIMES

Travel times within each scenario identified above were reviewed to compare trip diversion times between each proposed route and a corresponding trip on VT Route 22A. For each scenario, travel times were reviewed by direction (northbound and southbound) for both Weekday AM and PM peak hour scenarios utilizing the intersections of VT Route 22A & VT Route 17 and VT Route 22A & US 7 as the southern and northern control points, respectively.

To model the travel times along each of the proposed routes, the following design speeds were utilized:

- Blue / Pink / Green Route Alternatives – 50 mph design speed – 45 mph posted speed limit assumed.
- Orange Route Alternative – 35 / 45 mph design speed – 35 mph posted speed limit assumed.
- Purple Route Alternative – Existing design speeds and speed limits on US Route 7, VT Route 22A, and VT Route 17 are maintained.

Along existing roadways, current speed limits were utilized:

- VT Route 22A:
  - 40mph - VT Route 17 to north of Farr Cross Road
  - 50mph – North of Farr Cross Road to north of Sunset Knoll Road
  - 30mph – North of Sunset Knoll Road to Canal Street
  - 25mph – Canal Street to Monkton Road
  - 30mph – Monkton Road to US Route 7
- VT Route 17:
  - 45 mph – VT Route 22A to US Route 7
- US Route 7
  - 40mph – VT Route 17 to north of Lime Kiln Road
  - 50mph – North of Lime Kiln Road to VT Route 22A

Table 3-1 illustrates the travel times for each scenario, incorporating speed limits, roadway grades, and intersection delays along with the travel distance. For scenarios that result in a shorter time (when compared to a similar trip on VT Route 22A), the resultant diversion time is highlighted in yellow.

Table 3-1 Travel Time Summary

| Scenario | Distance | Travel Times | | | |
|---|---|---|---|---|---|
| | | AM | | PM | |
| | | NB | SB | NB | SB |
| Existing (Route 22A) | 7.5 mi | 12:05 | 11:34 | 12:17 | 11:35 |
| 2046-No Build (Route 22A) | 7.5 mi | 12:16 | 11:40 | 12:38 | 11:50 |
| Purple Route Alternative | 12.7 mi | 17:38 | 11:40 | 17:33 | 11:40 |
| Route 22A (Under Purple Route Alternative) | 7.5 mi | 12:05 | 11:34 | 12:17 | 11:35 |
| Purple Route Alternative Diversion | 5.2 mi | 5:23 | - 0:06 | 5:16 | - 0:05 |
| Blue Route Alternative | 7.9 mi | 11:30 | 10:48 | 11:39 | 10:50 |
| Route 22A (Under Blue Route Alternative) | 7.5 mi | 12:14 | 11:38 | 12:35 | 11:44 |
| Blue Route Alternative Diversion | 0.4 mi | - 0:44 | - 0:50 | - 0:56 | - 0:54 |
| Pink Route Alternative | 7.9 mi | 11:26 | 10:45 | 11:36 | 10:47 |
| Route 22A (Under Pink Route Alternative) | 7.5 mi | 12:14 | 11:38 | 12:35 | 11:44 |
| Pink Route Alternative Diversion | 0.4 mi | - 0:48 | - 0:53 | - 0:59 | - 0:57 |
| Green Route Alternative | 8.4 mi | 12:15 | 10:59 | 12:43 | 11:14 |
| Route 22A (Under Green Route Alternative) | 7.5 mi | 12:08 | 11:48 | 12:28 | 11:56 |
| Green Route Alternative Diversion | 0.9 mi | 0:07 | - 0:49 | 0:15 | - 0:42 |
| Orange Route Alternative | 7.4 mi | 12:16 | 11:19 | 12:30 | 11:37 |
| Route 22A (Under Orange Route Alternative) | 7.5 mi | 12:34 | 11:51 | 13:01 | 12:06 |
| Orange Route Alternative Diversion | - 0.1 mi | - 0:18 | - 0:32 | - 0:31 | - 0:29 |

The Purple Route Alternative has the overall longest travel time due to the overall travel distance of 12.7 miles, taking a motorist over 17 minutes to traverse northbound through the study area. This represents a diversion of approximately 5 minutes for northbound traffic within the AM or PM peak hour.

The Pink and Blue Route Alternatives exhibit a shorter trip (time) than the corresponding trip on VT Route 22A. Within the Pink and Blue Route Alternatives, the proposed alignment shows shorter travel times (between 44 and 59 seconds shorter) within the AM or PM peak hours in each direction. The Green Route Alternative shows travel times slightly longer for the alternative during the northbound AM and PM peak hours and between 42 and 49 seconds shorter during the southbound AM and PM peak hours. The Orange Route Alternative shows shorter travel times when compared to VT Route 22A, ranging between 18 and 32 seconds quicker.

## 3.4 SIGNAL WARRANTS

Based on the traffic analysis, the following intersections within future scenarios would require intersection-specific treatments due to deficient level of service conditions:

### 3.4.1 US Route 7 and VT Route 17 (Purple Route Alternative)

A traffic signal warrant analysis was conducted at the US Route 7 & VT Route 17 intersection using traffic data from traffic counts conducted on Wednesday, August 8th, 2018 and Friday, July 31, 2015. The intersection of US Route 7 & VT Route 17 warrants a traffic signal in existing conditions as Warrants 1 (eight-hour vehicular volume) and 2 (four-hour vehicular volume) are met, as noted in Table 3-2. An additional consideration for signalization at this intersection is the presence of the Vermont Railway traversing the intersection. Installation of a traffic signal would provide the opportunity to include a Railroad Preemption phase to improve overall safety at the intersection.

Table 3-2 US Route 7 at VT Route 17 Signal Warrant Analysis

| TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS | | |
|---|---|---|
| | Applicable? | Warrant Met? |
| Warrant 1, Eight-Hour Vehicular Volume | Yes | Yes |
| Warrant 2, Four-Hour Vehicular Volume | Yes | Yes |
| Warrant 3, Peak Hour | Yes | No |
| Warrant 4, Pedestrian Volume | No | N/A |
| Warrant 5, School Crossing | No | N/A |
| Warrant 6, Coordinated Signal System | No | N/A |
| Warrant 7, Crash Experience | Yes | No |
| Warrant 8, Roadway Network | No | N/A |
| Warrant 9, Intersection Near a Grade Crossing | No | N/A |
| Warrant PA-1, ADT Volume Warrant | No | N/A |
| Warrant PA-2, Midblock and Trail Crossings | No | N/A |

### 3.4.2 VT Route 22A and Panton Road

A traffic signal warrant analysis was conducted (for all scenarios) at the VT Route 22A & Panton Road intersection using traffic data from traffic counts conducted on Tuesday, August 17, 2010 and Wednesday, August 18, 2010. The intersection of VT Route 22A & Panton Road warrants a traffic signal in existing conditions as Warrants 1 (eight-hour vehicular volume) and 2 (four-hour vehicular volume) are met, as noted in Table 3-3.

Table 3-3 VT Route 22A at Panton Road Signal Warrant Analysis

| TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS | | |
|---|---|---|
| | Applicable? | Warrant Met? |
| Warrant 1, Eight-Hour Vehicular Volume | Yes | Yes |
| Warrant 2, Four-Hour Vehicular Volume | Yes | Yes |
| Warrant 3, Peak Hour | Yes | No |
| Warrant 4, Pedestrian Volume | No | N/A |
| Warrant 5, School Crossing | No | N/A |
| Warrant 6, Coordinated Signal System | No | N/A |
| Warrant 7, Crash Experience | Yes | No |
| Warrant 8, Roadway Network | No | N/A |
| Warrant 9, Intersection Near a Grade Crossing | No | N/A |
| Warrant PA-1, ADT Volume Warrant | No | N/A |
| Warrant PA-2, Midblock and Trail Crossings | No | N/A |

### 3.4.3 US Route 7 and New Haven Road

A traffic signal warrant analysis (for all scenarios) was conducted at the US Route 7 & New Haven Road intersection using traffic data from traffic counts conducted on Thursday, June 28, 2012 and Friday, June 29, 2012. The intersection of US 7 & New Haven Road warrants a traffic signal in existing conditions as Warrants 1 (eight-hour vehicular volume) and 2 (four-hour vehicular volume) are met, as noted in Table 3-4.

Table 3-4 US Route 7 & New Haven Road Warrant Analysis

| TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS | | |
|---|---|---|
| | Applicable? | Warrant Met? |
| Warrant 1, Eight-Hour Vehicular Volume | Yes | Yes |
| Warrant 2, Four-Hour Vehicular Volume | Yes | Yes |
| Warrant 3, Peak Hour | Yes | No |
| Warrant 4, Pedestrian Volume | No | N/A |
| Warrant 5, School Crossing | No | N/A |
| Warrant 6, Coordinated Signal System | No | N/A |
| Warrant 7, Crash Experience | Yes | No |
| Warrant 8, Roadway Network | No | N/A |
| Warrant 9, Intersection Near a Grade Crossing | No | N/A |
| Warrant PA-1, ADT Volume Warrant | No | N/A |
| Warrant PA-2, Midblock and Trail Crossings | No | N/A |

### 3.4.4 VT Route 22A and MacDonough Drive (Orange Route Alternative)

Based on the level of service analysis summarized above, signalization at this intersection is warranted due to side-street delays on the MacDonough Road/Water Street approaches to VT Route 22A. Additionally, a left turn lane would be required for VT Route 22A northbound, given the increase of trucks accessing the proposed Orange Route at this intersection.

## 3.5 TURN LANE WARRANTS

Left-turn and right-turn lane warrant analyses were conducted at the intersections of VT Route 22A with the Blue, Pink, Green, and Orange Route Alternatives, as well as the intersection of US Route 7 & New Haven Road, which is the northern terminus of the Green Route Alternative. Left turn lane warrant analyses were conducted utilizing the Kukuchi Chakraborty modified volume warrants (Appendix H of the VTrans' 2019 Traffic Impact Study Guidelines). Right turn lane warrant analyses were conducted utilizing Appendix I of the VTrans 2019 Traffic Impact Study Guidelines, which utilizes a ratio concept to compare the advancing volume.

The following intersections warrant a left turn lane per VTrans Guidelines:

- US Route 7 northbound at New Haven Road (Green Route Alternative) – there currently is an approximately 500' left turn lane plus taper provided here. We verified the warrant and calculated turn storage length.
- VT Route 22A northbound at MacDonough Drive (Orange Route Alternative) – A review of 95$^{th}$ percentile queues in Synchro indicates a need for a minimum 90' left turn lane plus taper.

The following intersections warrant a right turn lane per VTrans Guidelines:

- US 7 Southbound at New Haven Road (Green Route Alternative) – 260' right turn lane plus taper.

Additional coordination with VTrans will be necessary to understand design preferences for junctions between proposed routes as they diverge or turn from VT Route 22A or Route 7. In addition to signage (advance and at the diverge points), turn lanes may be preferred to reinforce the presence of the impending alternate route choice.

## 3.6 INTERSECTION CONTROL

The volumes at the proposed intersections along the Blue, Pink, Green, and Orange Route Alternatives were examined to determine the necessary stop-control treatments for each. Intersection control (two-way stop, all-way stop, or signalization) was determined based on a review of volumes, signal warrant analysis, and LOS. Higher volume roadways would have free-flow conditions while lower volume roadways would have the stop control condition (at a two-way stop-controlled intersection). Both AM and PM peak hour conditions were reviewed to verify that volumes were consistently higher for an approach for both weekday peak periods. The following three tables (Table 3-5, Table 3-6, and Table 3-7) summarize the priority for each intersection along the Blue/Pink, Green, and Orange Route Alternatives for proper approach intersection control. Within each table, the stop-controlled approach at each intersection is highlighted in red, while signal-controlled intersections are highlighted in yellow.

Table 3-5 Blue/Pink Route Alternative Intersection Control Summary

| Blue/Pink Route Alternative Intersections | Streets | AM Volumes | PM Volumes | Intersection Control |
|---|---|---|---|---|
| VT Route 22A (South) | Pink/Blue Route | 51 | 66 | Stop |
| Panton Road | Pink/Blue Route | 153 | 118 | Stop |
| | Panton Road | 431 | 500 | Free |
| MacDonough Drive | Pink/Blue Route | 153 | 118 | Free |
| | MacDonough Drive | 42 | 65 | Stop |
| Comfort Hill Road | Pink/Blue Route | 153 | 118 | Free |
| | Comfort Hill Road | 22 | 22 | Stop |
| VT Route 22A (North) | Pink/Blue Route | 102 | 52 | Stop |
| | VT Route 22A | 437 | 626 | Free |

Table 3-6 Green Route Alternative Intersection Control Summary

| Green Route Alternative Intersections | Streets | AM Volumes | PM Volumes | Intersection Control |
|---|---|---|---|---|
| VT Route 22A (South) | Green Route | 51 | 66 | Stop |
| | VT Route 22A | 360 | 405 | Free |
| Hopkins Road | Green Route | 153 | 118 | Free |
| | Hopkins Road | 16 | 24 | Stop |
| Maple Street | Green Route | 153 | 118 | All-Way Stop |
| | Maple Street | 98 | 134 | |
| Green Street | Green Route | 153 | 118 | All-Way Stop |
| | Green Street | 125 | 146 | |
| New Haven Road | Green Route | 102 | 52 | Stop |
| | New Haven Road | 413 | 588 | Free |
| US Route 7 | New Haven Road | 284 | 255 | Signal |
| | US Route 7 | 757 | 1191 | |

Table 3-7 Orange Route Alternative Intersection Control Summary

| Orange Route Alternative Intersections | Streets | AM Volumes | PM Volumes | Intersection Control |
|---|---|---|---|---|
| VT Route 22A (South) | Orange Route | 191 | 243 | Signal |
| | VT Route 22A | 901 | 1122 | |
| MacDonough Drive | Orange Route | 153 | 118 | Free |
| | MacDonough Drive | 21 | 31 | Stop |

| | | | | |
|---|---|---|---|---|
| VT Route 22A (North) | Orange Route | 102 | 52 | Stop |
| | VT Route 22A | 437 | 626 | Free |

## 3.7 SIGHT DISTANCE

All proposed intersections were reviewed for sight distance needs. The intersections below have been specifically highlighted based on specific identified geometric concerns following a screening-level analysis by Civil and Traffic Engineering project team staff.

### 3.7.1 US Route 7 at New Haven Road (Green Route Alternative northern terminus)

The intersection of US Route 7 at New Haven Rd (unsignalized intersection) was reviewed for sight distance for motorists traveling from the stop-sign approach of New Haven Road and attempting to either turn left or right to US Route 7. This intersection was reviewed as it is proximate to the proposed location of the northern terminus of the Green Route Alternative at US Route 7.

The following assumptions were used, based on AASHTO Sight Distance Values for Turning Vehicles:

- NB Grade (US Route 7) is +4%
- SB Grade (US Route 7) is -4%
- EB Grade (New Haven Rd) is -4%
- Speed Limit on US Route 7 is 50 mph, assumed 60 mph design speed
- Utilized a combination vehicle turning left, passenger vehicle turning right

Based on these assumptions, the stop-distance requirements at this intersection are as follows:

- Right Turn from Stop distance requirement: 575 ft
- Left Turn from Stop distance requirement: 1,085 ft

The estimated available distance, based on existing mapping is:

- Right Turn from Stop: 1,000+ ft
- Left Turn from Stop: ~990 ft

Given this initial analysis, the current sight distance is insufficient for the left turn from the stop condition for the New Haven Road approach. Further review during design will be necessary to determine potential additional accommodations, such as geometric improvements, the installation of advance warning signage for the northbound approach, or signalization of the intersection.

### 3.7.2 VT Route 22A & Blue/Pink/Orange Route Alternatives

The proposed intersection of the northern terminus of the Blue/Pink/Orange Route Alternatives at VT Route 22A (unsignalized intersection) was reviewed for sight distance for motorists traveling

from the stop controlled northbound approach of the Blue/Pink/Orange Route Alternatives and attempting to either turn left or right to VT Route 22A.

For this analysis, the following assumptions, based on AASHTO Intersection Sight Distance Values for Left and Right Turns from Minor Road, were used:

- EB Grade (Blue/Pink/Orange Route Alternative) is less than 3 percent
- Speed Limit on VT Route 22A is 30 mph, assumed 35 mph design speed
- Combination truck is the proposed design vehicle

Based on these assumptions, the stop-distance requirements at this intersection are as follows:

- Left Turn from Stop distance requirement: 595 ft
- Right Turn from Stop distance requirement: 545 ft

Based on a review of existing mapping, sight distance for a left or right turn is likely sufficient. Additional accommodations at this proposed intersection should be conducted during subsequent design phases.

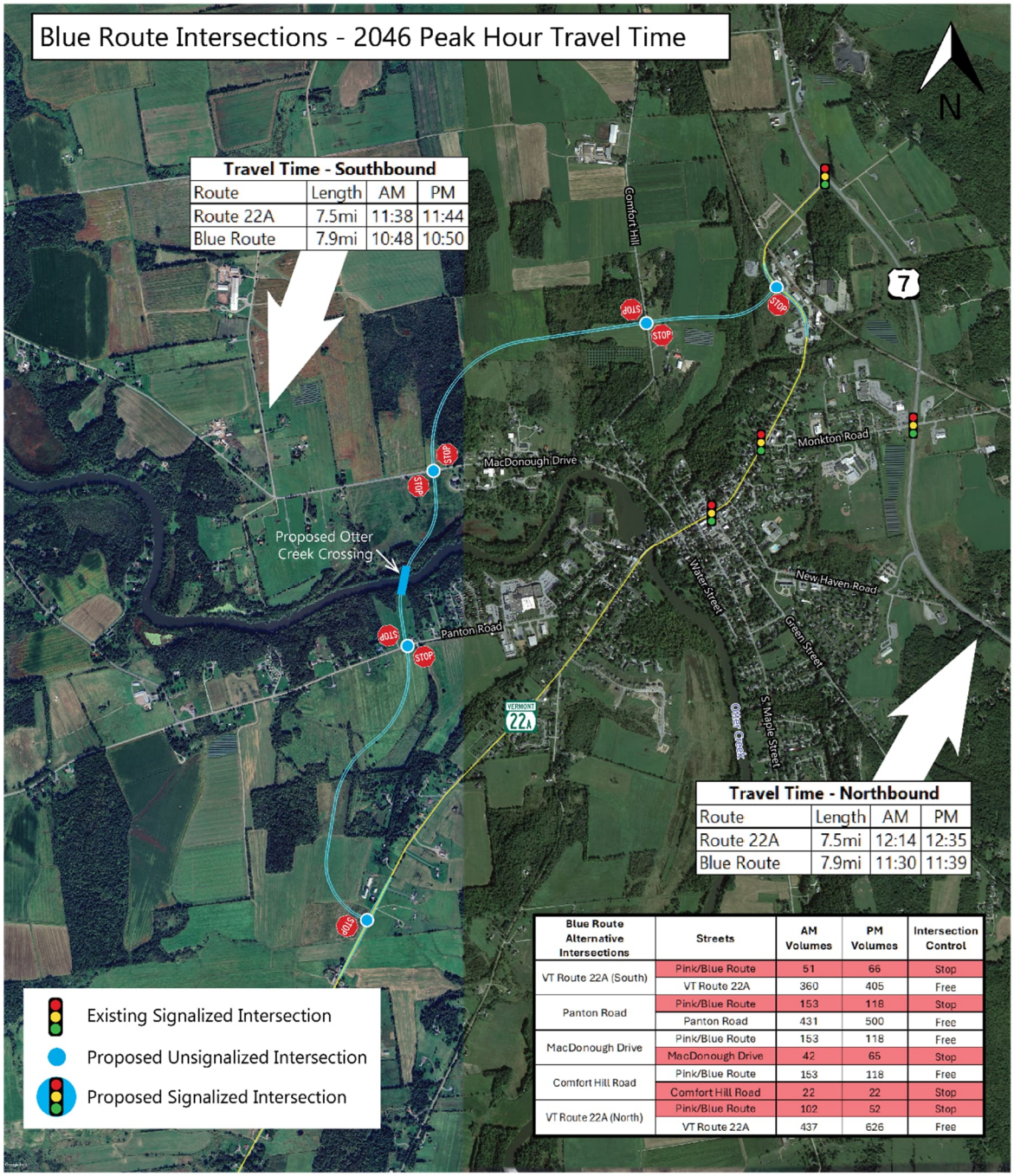
### 3.7.3 MacDonough Drive and Orange Route Alternative

Based on sight triangles developed for the conceptual design at the proposed intersection of MacDonough Drive (stop-sign controlled) and the Orange Route Alternative (near Comfort Hill Road), no sight distance issues were noted. This is based on the 500 foot required sight distance provided looking left or right from MacDonough Drive at the proposed intersection with the Orange Route.

## 3.8 SUMMARY OF TRAVEL TIMES AND INTERSECTION CONTROLS

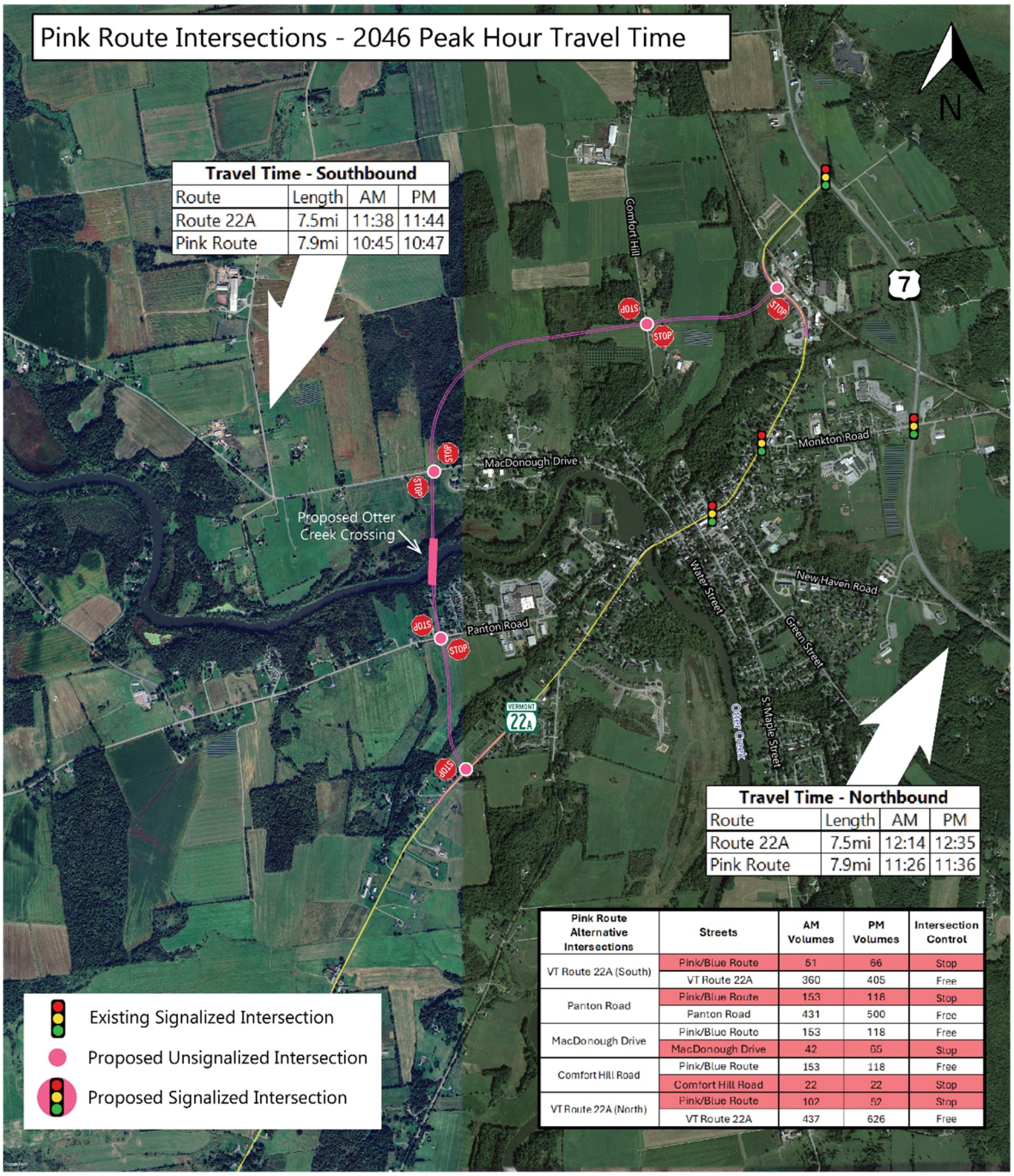
A summary of travel times (by direction and peak hour), as well as proposed intersection controls based on the traffic operations analysis summarized above, are detailed for each of the proposed routes within the following figures.

Figure 3-1 Blue Route Alternative- Peak Hour Travel Times and Intersection Controls




| Blue Route Alternative Intersections | Streets | AM Volumes | PM Volumes | Intersection Control |
|---|---|---|---|---|
| VT Route 22A (South) | Pink/Blue Route | 51 | 66 | Stop |
| | VT Route 22A | 360 | 405 | Free |
| Panton Road | Pink/Blue Route | 153 | 118 | Stop |
| | Panton Road | 431 | 500 | Free |
| MacDonough Drive | Pink/Blue Route | 153 | 118 | Free |
| | MacDonough Drive | 42 | 65 | Stop |
| Comfort Hill Road | Pink/Blue Route | 153 | 118 | Free |
| | Comfort Hill Road | 22 | 22 | Stop |
| VT Route 22A (North) | Pink/Blue Route | 102 | 52 | Stop |
| | VT Route 22A | 437 | 626 | Free |

Figure 3-2 Pink Route - Peak Hour Travel Times and Intersection Controls




| Pink Route Alternative Intersections | Streets | AM Volumes | PM Volumes | Intersection Control |
|---|---|---|---|---|
| VT Route 22A (South) | Pink/Blue Route | 51 | 66 | Stop |
| | VT Route 22A | 360 | 405 | Free |
| Panton Road | Pink/Blue Route | 153 | 118 | Stop |
| | Panton Road | 431 | 500 | Free |
| MacDonough Drive | Pink/Blue Route | 153 | 118 | Free |
| | MacDonough Drive | 42 | 65 | Stop |
| Comfort Hill Road | Pink/Blue Route | 153 | 118 | Free |
| | Comfort Hill Road | 22 | 22 | Stop |
| VT Route 22A (North) | Pink/Blue Route | 102 | 52 | Stop |
| | VT Route 22A | 437 | 626 | Free |

Figure 3-3 Orange Route Alternative - Peak Hour Travel Times and Intersection Controls

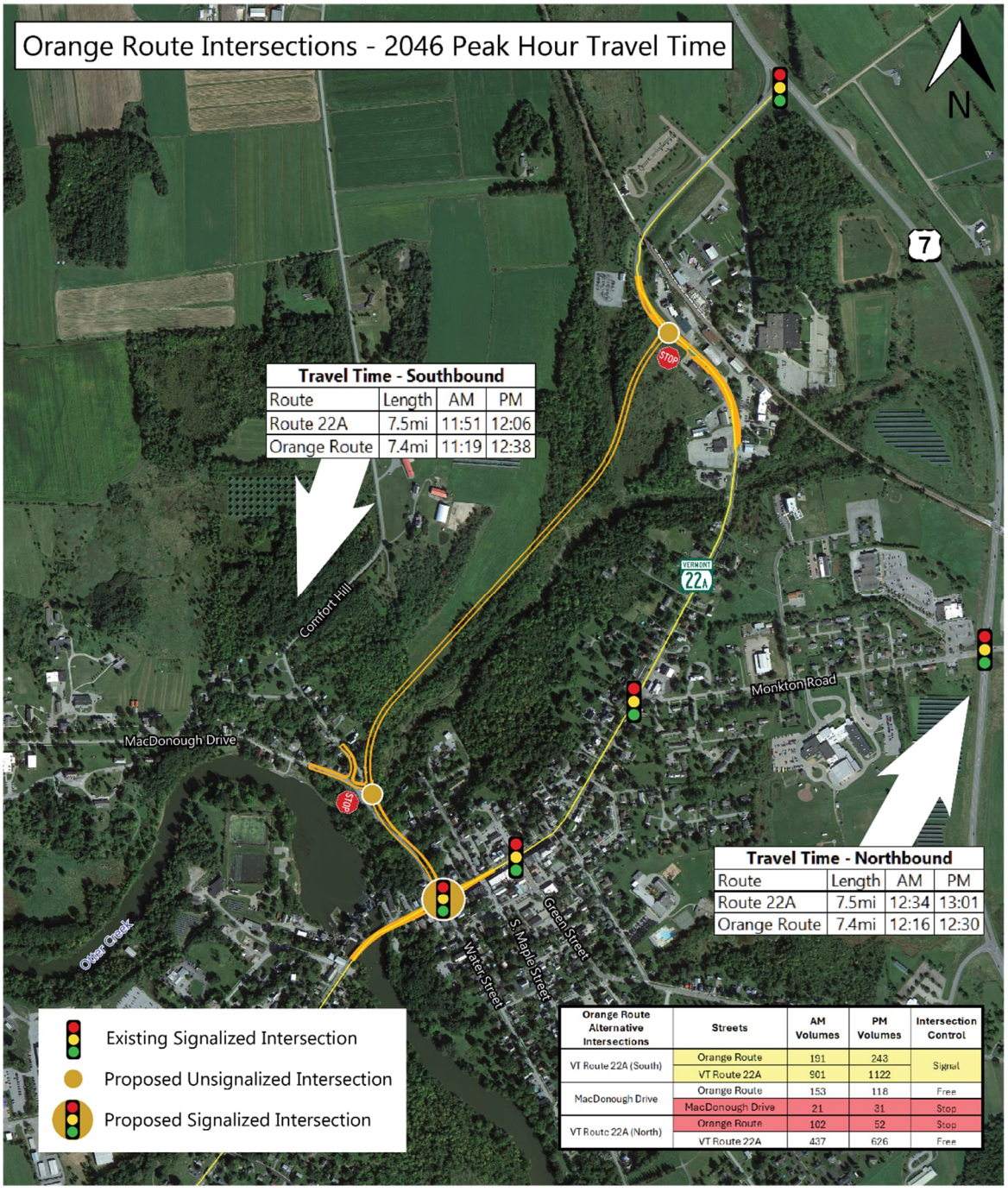
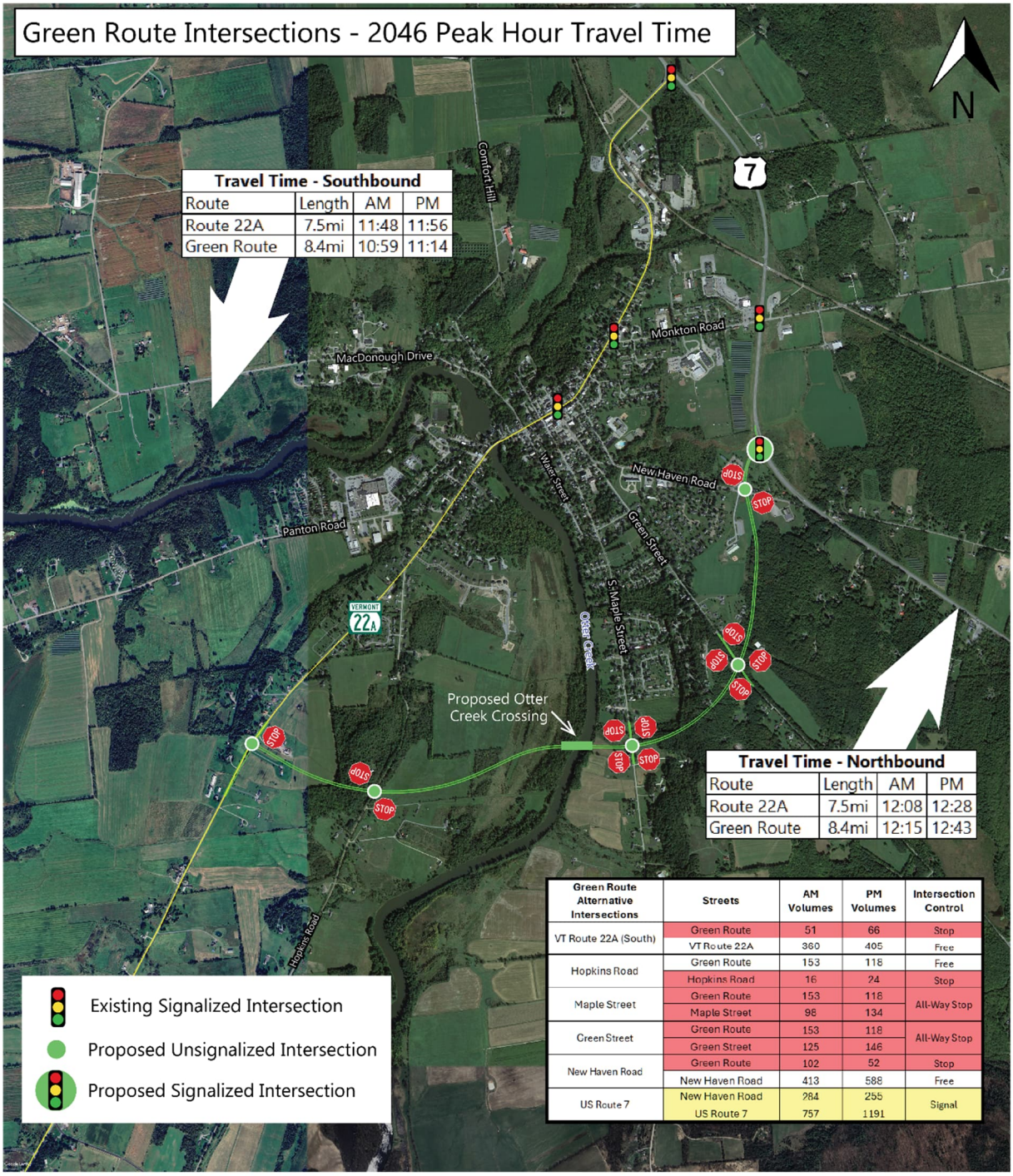
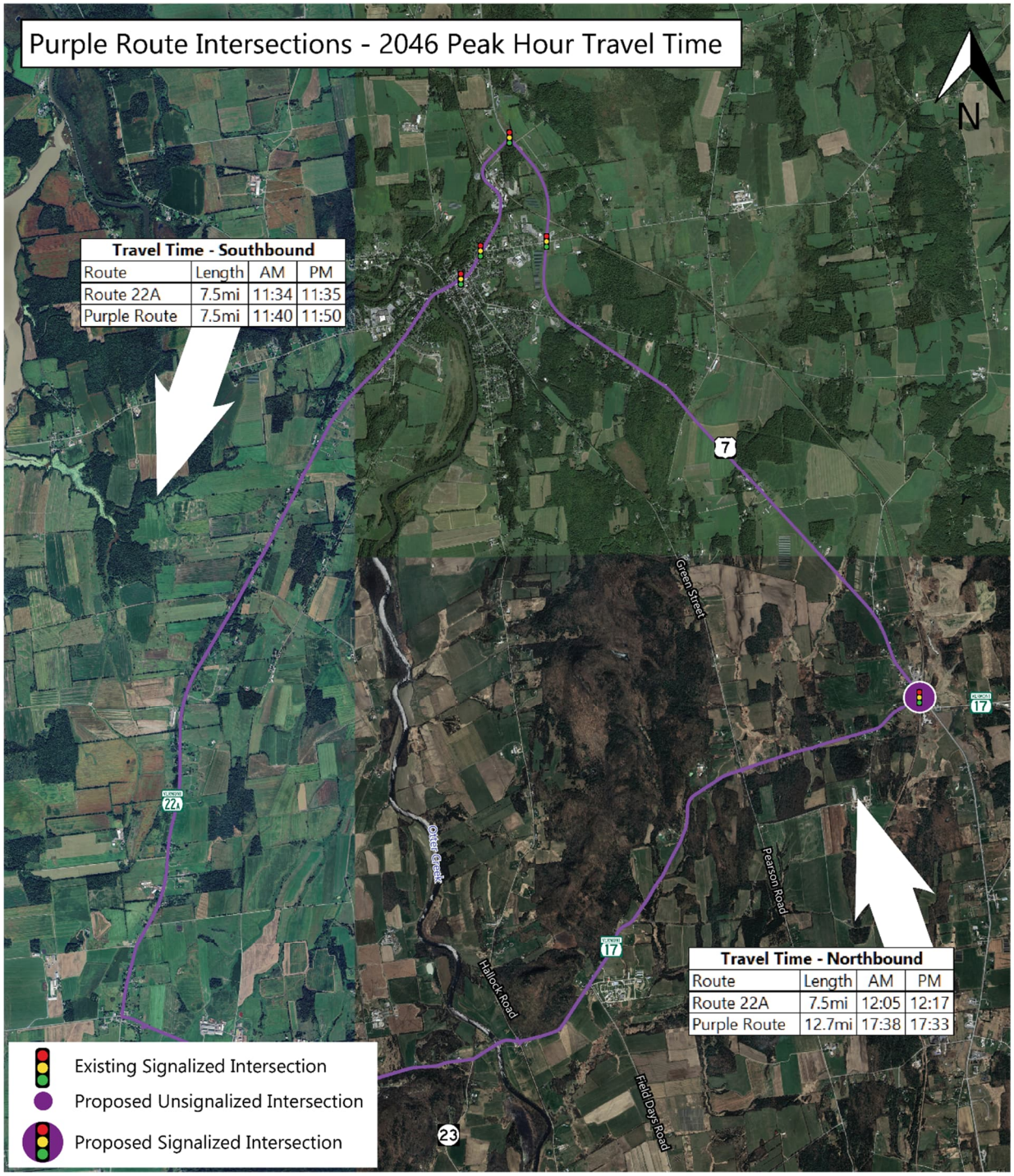


Figure 3-4 Green Route Alternative - Peak Hour Travel Times and Intersection Controls




| Green Route Alternative Intersections | Streets | AM Volumes | PM Volumes | Intersection Control |
|---|---|---|---|---|
| VT Route 22A (South) | Green Route | 51 | 66 | Stop |
| | VT Route 22A | 360 | 405 | Free |
| Hopkins Road | Green Route | 153 | 118 | Free |
| | Hopkins Road | 16 | 24 | Stop |
| Maple Street | Green Route | 153 | 118 | All-Way Stop |
| | Maple Street | 98 | 134 | |
| Green Street | Green Route | 153 | 118 | All-Way Stop |
| | Green Street | 125 | 146 | |
| New Haven Road | Green Route | 102 | 52 | Stop |
| | New Haven Road | 413 | 588 | Free |
| US Route 7 | New Haven Road | 284 | 255 | Signal |
| | US Route 7 | 757 | 1191 | |

Figure 3-5 Purple Route Alternative - Peak Hour Travel Times and Intersection Controls



# APPENDIX: LEVEL OF SERVICE SUMMARIES

| Existing Condition | | | |
|---|---|---|---|
| Intersection | Movement | Weekday AM Peak Hour | Weekday PM Peak Hour |
| Route 22A & Route 17 | EB | B (14.9) | C (18.0) |
| | WB | B (11.7) | C (15.4) |
| | ILOS | A (5.7) | A (7.0) |
| Route 17 & Weybridge Road | NB | A (9.1) | A (9.3) |
| | ILOS | A (1.2) | A (3.3) |
| Route 17 & Hallock Road / Quaker Village Road | SB | A (9.5) | A (9.3) |
| | NB | A (9.6) | A (9.6) |
| | ILOS | A (3.0) | A (4.1) |
| Route 17 & Pearson Road | SB | A (9.7) | A (9.6) |
| | NB | A (9.6) | A (9.7) |
| | ILOS | A (3.4) | A (4.0) |
| Route 7 & Route 17 | NB L | A (8.3) | A (9.1) |
| | EB | B (12.7) | C (20.3) |
| | ILOS | A (1.5) | A (3.4) |
| Route 7 & New Haven Road | EB | B (12.7) | C (17.7) |
| | NB L | A (8.1) | A (9.2) |
| | ILOS | A (3.8) | A (3.8) |
| Route 7 & Route 22A | EB L | B (13.1) | B (13.7) |
| | EB R | A (8.6) | A (8.4) |
| | NB L | B (10.8) | B (13.4) |
| | NB T | A (9.6) | B (11.0) |
| | SB R | A (9.4) | B (11.2) |
| | ILOS | B (10.7) | B (11.9) |
| Green Street & Route 22A (HCS) | EB | B (11.4) | B (17.0) |
| | WB | A (9.7) | A (9.0) |
| | NB | C (21.9) | C (30.5) |
| | SB | B (19.4) | C (28.9) |
| | ILOS | B (13.4) | B (17.4) |
| Route 22A & S. Water Street / MacDonough Drive | WB L/T | D (25.0) | E (45.2) |
| | WB R | B (10.8) | B (11.7) |
| | EB | D (25.9) | E (38.7) |
| | ILOS | A (3.1) | A (4.8) |
| Route 7 & Monkton Road (Signalized) | NB L | B (10.2) | B (10.1) |
| | NB R | B (12.0) | B (12.3) |
| | EB | B (14.2) | B (18.4) |
| | SB L | A (9.7) | A (9.2) |
| | SB T | B (17.4) | B (18.7) |
| | SB R | B (11.6) | B (11.6) |
| | WB | B (13.6) | B (17.2) |
| | ILOS | B (14.0) | B (15.7) |
| Route 22A & Monkton Road (Signalized) | NB | A (7.6) | B (10.3) |
| | SB | A (6.2) | A (8.3) |
| | WB | B (11.4) | B (14.3) |
| | ILOS | A (7.7) | B (10.4) |
| Route 22A & Panton Road | EB | C (15.5) | E (35.8) |
| | WB | A (9.3) | A (9.5) |
| | ILOS | A (3.0) | A (9.4) |
| Route 22A & Panton Road (Signalized) | EB | C (22.5) | C (22.6) |
| | WB | B (19.9) | B (17.4) |
| | NB | A (4.6) | A (9.5) |
| | SB | A (4.5) | B (10.3) |
| | ILOS | A (7.7) | B (13.1) |

| 2046 Future No Build | | | |
|---|---|---|---|
| Intersection | Movement | Weekday AM Peak Hour | Weekday PM Peak Hour |
| Route 22A & Route 17 | EB | C (17.2) | C (23.6) |
| | WB | B (12.4) | C (17.8) |
| | ILOS | A (6.4) | A (8.7) |
| Route 17 & Weybridge Road | NB | A (9.2) | A (9.6) |
| | ILOS | A (1.2) | A (3.4) |
| Route 17 & Hallock Road / Quaker Village Road | SB | A (9.6) | A (9.5) |
| | NB | A (9.7) | A (9.6) |
| | ILOS | A (3.0) | A (4.1) |
| Route 17 & Pearson Road | SB | A (9.9) | A (9.7) |
| | NB | A (9.7) | A (9.8) |
| | ILOS | A (3.5) | A (4.1) |
| Route 7 & Route 17 | NB L | A (8.4) | A (9.9) |
| | EB | B (13.8) | D (28.6) |
| | ILOS | A (1.6) | A (4.4) |
| Route 7 & New Haven Road | EB | B (14.2) | C (22.6) |
| | NB L | A (8.3) | A (9.7) |
| | ILOS | A (4.1) | A (4.6) |
| Route 7 & Route 22A | EB L | B (14.3) | B (15.4) |
| | EB R | A (8.6) | A (8.6) |
| | NB L | B (11.6) | B (16.4) |
| | NB T | B (10.2) | B (12.8) |
| | SB R | A (9.9) | B (13.3) |
| | ILOS | B (11.4) | B (13.7) |
| Green Street & Route 22A (HCS) | EB | B (12.3) | B (19.2) |
| | WB | A (10.0) | A (9.4) |
| | NB | C (22.4) | C (31.3) |
| | SB | B (19.4) | C (29.3) |
| | ILOS | B (14.0) | B (18.6) |
| Route 22A & S. Water Street / MacDonough Drive | WB L/T | D (33.3) | F (82.4) |
| | WB R | B (11.4) | B (12.5) |
| | EB | E (35.6) | F (69.1) |
| | ILOS | A (4.0) | A (8.0) |
| Route 7 & Monkton Road (Signalized) | NB L | B (10.2) | B (11.5) |
| | NB R | B (12.0) | B (13.3) |
| | EB | B (15.4) | C (20.6) |
| | SB L | A (9.5) | A (9.7) |
| | SB T | B (18.0) | C (20.9) |
| | SB R | B (11.6) | B (12.0) |
| | WB | B (14.6) | B (18.8) |
| | ILOS | B (14.5) | B (17.3) |
| Route 22A & Monkton Road (Signalized) | NB | A (8.9) | B (11.4) |
| | SB | A (6.7) | A (9.2) |
| | WB | B (11.4) | B (17.2) |
| | ILOS | A (8.5) | B (11.8) |
| Route 22A & Panton Road | EB | C (17.8) | F (79.5) |
| | WB | A (9.5) | A (9.7) |
| | ILOS | A (3.4) | C (20.1) |
| Route 22A & Panton Road (Signalized) | EB | C (22.5) | C (23.8) |
| | WB | B (19.5) | B (16.9) |
| | NB | A (5.3) | B (11.2) |
| | SB | A (5.2) | B (13.3) |
| | ILOS | A (8.2) | B (15.4) |

| Blue Route | | | |
|---|---|---|---|
| Intersection | Movement | Weekday AM Peak Hour | Weekday PM Peak Hour |
| Route 22A & Route 17 | EB | C (17.2) | C (23.6) |
| | WB | B (12.4) | C (17.8) |
| | ILOS | A (6.4) | A (8.7) |
| Route 7 & Route 22A | EB L | B (14.3) | B (15.4) |
| | EB R | A (8.6) | A (8.6) |
| | NB L | B (11.6) | B (16.4) |
| | NB T | B (10.2) | B (12.8) |
| | SB R | A (9.9) | B (13.3) |
| | ILOS | B (11.4) | B (13.7) |
| Green Street & Route 22A (HCS) | EB | B (10.4) | B (16.7) |
| | WB | A (9.4) | A (8.8) |
| | NB | C (22.7) | C (31.4) |
| | SB | B (19.4) | C (29.3) |
| | ILOS | B (13.7) | B (18.0) |
| Route 22A & Blue Route/Pink Route/Orange Route (North) | EB | C (15.2) | C (17.9) |
| | ILOS | A (1.2) | A (0.5) |
| Comfort Hill Road & Blue Route/Pink Route | NB | B (10.3) | B (10.2) |
| | SB | B (10.2) | B (10.2) |
| | ILOS | A (8.1) | A (7.8) |
| Route 22A & Blue Route (South) | EB | A (9.9) | B (11.4) |
| | ILOS | A (1.9) | A (1.7) |
| Route 22A & S. Water Street / MacDonough Drive | WB L/T | C (24.5) | F (55.5) |
| | WB R | B (10.5) | B (11.9) |
| | EB | D (25.6) | E (46.2) |
| | ILOS | A (3.6) | A (6.1) |
| Blue Route & Panton Road | NB | C (17.8) | C (17.0) |
| | SB | C (15.4) | C (16.6) |
| | ILOS | A (4.5) | A (3.2) |
| Blue Route/Pink Route & Macdonough Drive | EB | B (10.2) | B (10.0) |
| | WB | B (10.2) | B (10.0) |
| | ILOS | A (2.2) | A (3.6) |
| Route 7 & Monkton Road (Signalized) | NB L | B (10.4) | B (10.8) |
| | NB R | B (11.4) | B (13.1) |
| | EB | B (13.9) | B (17.9) |
| | SB L | A (9.9) | A (9.9) |
| | SB T | B (16.7) | B (19.1) |
| | SB R | B (12.4) | B (12.8) |
| | WB | B (13.1) | B (16.4) |
| | ILOS | B (13.6) | B (15.9) |
| Route 22A & Monkton Road (Signalized) | NB | A (7.2) | B (11.0) |
| | SB | A (6.2) | A (8.9) |
| | WB | B (12.3) | B (16.9) |
| | ILOS | A (7.7) | B (11.6) |
| Route 22A & Panton Road | EB | B (13.1) | E (43.0) |
| | WB | A (8.9) | A (9.4) |
| | ILOS | A (3.0) | B (12.5) |
| Route 22A & Panton Road (Signalized) | EB | C (22.5) | C (22.7) |
| | WB | B (19.5) | B (16.4) |
| | NB | A (4.0) | A (7.6) |
| | SB | A (4.5) | A (9.0) |
| | ILOS | A (8.5) | B (12.5) |

| Pink Route | | | |
|---|---|---|---|
| Intersection | Movement | Weekday AM Peak Hour | Weekday PM Peak Hour |
| Route 22A & Route 17 | EB | C (17.2) | C (23.6) |
| | WB | B (12.4) | C (17.8) |
| | ILOS | A (6.4) | A (8.7) |
| Route 7 & Route 22A | EB L | B (14.3) | B (15.4) |
| | EB R | A (8.6) | A (8.6) |
| | NB L | B (11.6) | B (16.4) |
| | NB T | B (10.2) | B (12.8) |
| | SB R | A (9.9) | B (13.3) |
| | ILOS | B (11.4) | B (13.7) |
| Green Street & Route 22A (HCS) | EB | B (10.4) | B (16.7) |
| | WB | A (9.4) | A (8.8) |
| | NB | C (22.7) | C (31.4) |
| | SB | B (19.4) | C (29.3) |
| | ILOS | B (13.7) | B (18.0) |
| Route 22A & Blue Route/Pink Route/Orange Route (North) | EB | C (15.2) | C (17.9) |
| | ILOS | A (1.2) | A (0.5) |
| Comfort Hill Road & Blue Route/Pink Route | NB | B (10.3) | B (10.2) |
| | SB | B (10.2) | B (10.2) |
| | ILOS | A (8.1) | A (7.8) |
| Route 22A & Pink Route (South) | SB | A (9.9) | B (11.4) |
| | ILOS | A (1.9) | A (1.7) |
| Route 22A & S. Water Street / MacDonough Drive | WB L/T | C (24.5) | F (55.5) |
| | WB R | B (10.5) | B (11.9) |
| | EB | D (25.6) | E (46.2) |
| | ILOS | A (3.6) | A (6.1) |
| Pink Route & Panton Road | NB | C (17.8) | C (17.0) |
| | SB | C (15.4) | C (16.6) |
| | ILOS | A (4.5) | A (3.2) |
| Blue Route/Pink Route & Macdonough Drive | EB | B (10.2) | B (10.0) |
| | WB | B (10.2) | B (10.0) |
| | ILOS | A (2.2) | A (3.6) |
| Route 7 & Monkton Road (Signalized) | NB L | B (10.4) | B (10.8) |
| | NB R | B (11.4) | B (13.1) |
| | EB | B (13.9) | B (17.9) |
| | SB L | A (9.9) | A (9.9) |
| | SB T | B (16.7) | B (19.1) |
| | SB R | B (12.4) | B (12.8) |
| | WB | B (13.1) | B (16.4) |
| | ILOS | B (13.6) | B (15.9) |
| Route 22A & Monkton Road (Signalized) | NB | A (7.2) | B (11.0) |
| | SB | A (6.2) | A (8.9) |
| | WB | B (12.3) | B (16.9) |
| | ILOS | A (7.7) | B (11.6) |
| Route 22A & Panton Road | EB | B (13.1) | E (43.0) |
| | WB | A (8.9) | A (9.4) |
| | ILOS | A (3.0) | B (12.5) |
| Route 22A & Panton Road (Signalized) | EB | C (22.5) | C (22.7) |
| | WB | B (19.5) | B (16.4) |
| | NB | A (4.0) | A (7.6) |
| | SB | A (4.5) | A (9.0) |
| | ILOS | A (8.5) | B (12.5) |

| Green Route | | | |
|---|---|---|---|
| ion | Movement | Weekday AM Peak Hour | Weekday PM Peak Hour |
| Route 22A & Route 17 | EB | C (17.2) | C (23.6) |
| | WB | B (12.4) | C (17.8) |
| | ILOS | A (6.4) | A (8.7) |
| Route 7 & New Haven Road (Signalized) | EB L/R | D (39.9) | C (32.7) |
| | NB T | B (11.3) | C (27.4) |
| | NB L | A (7.3) | A (6.8) |
| | SB T/R | A (8.5) | B (16.4) |
| | ILOS | B (15.8) | B (17.8) |
| Route 7 & New Haven Road | EB | E (41.1) | F (71.4) |
| | NB L | A (2.5) | A (3.1) |
| | ILOS | B (12.2) | B (13.7) |
| Route 7 & Route 22A | EB L | B (12.3) | B (15.7) |
| | EB R | A (9.8) | B (10.2) |
| | NB L | B (11.6) | B (16.1) |
| | NB T | B (11.7) | B (11.8) |
| | SB R | A (9.4) | B (12.3) |
| | ILOS | B (11.0) | B (13.1) |
| Green Street & Route 22A (HCS) | EB | B (10.4) | B (16.7) |
| | WB | A (9.4) | A (8.8) |
| | NB | C (22.7) | C (31.4) |
| | SB | B (19.4) | C (29.3) |
| | ILOS | B (13.7) | B (18.0) |
| Route 22A & Green Route | WB | B (12.9) | B (13.8) |
| | ILOS | A (1.3) | A (1.6) |
| Hopkins Road & Green Route | NB | A (10.2) | A (10.2) |
| | SB | A (10.1) | A (10.2) |
| | ILOS | A (8.5) | A (7.7) |
| Maple Street & Green Route | NB | B (10.9) | B (11.2) |
| | SB | B (10.8) | B (11.2) |
| | ILOS | A (5.0) | A (3.9) |
| Green Street & Green Route | NB | B (11.2) | B (11.3) |
| | SB | B (11.1) | B (11.3) |
| | ILOS | A (4.5) | A (3.8) |
| Route 22A & S. Water Street / MacDonough Drive | WB L/T | C (24.5) | F (54.2) |
| | WB R | B (10.6) | B (12.1) |
| | EB | D (25.2) | E (46.6) |
| | ILOS | A (3.6) | A (6.1) |
| Route 7 & Monkton Road (Signalized) | NB L | B (10.3) | B (12.5) |
| | NB R | B (14.4) | B (13.4) |
| | EB | B (17.6) | C (25.3) |
| | SB L | A (9.7) | A (9.4) |
| | SB T | B (19.4) | C (24.0) |
| | SB R | B (10.6) | B (11.1) |
| | WB | B (16.6) | C (23.1) |
| | ILOS | B (16.2) | B (19.7) |
| Route 22A & Monkton Road (Signalized) | NB | A (7.2) | B (10.7) |
| | SB | A (6.2) | A (8.6) |
| | WB | B (11.4) | B (14.8) |
| | ILOS | A (7.6) | B (10.9) |
| Route 22A & Panton Road | EB | B (13.8) | E (39.1) |
| | WB | A (8.8) | A (9.3) |
| | ILOS | A (3.5) | B (11.4) |
| Route 22A & Panton Road (Signalized) | EB | C (22.5) | C (22.7) |
| | WB | B (19.5) | B (16.4) |
| | NB | A (4.0) | A (7.6) |
| | SB | A (4.5) | A (9.0) |
| | ILOS | A (8.5) | B (12.5) |

| Orange Route | | | |
|---|---|---|---|
| ion | Movement | Weekday AM Peak Hour | Weekday PM Peak Hour |
| Route 22A & Route 17 | EB | C (17.2) | C (23.6) |
| | WB | B (12.4) | C (17.8) |
| | ILOS | A (6.4) | A (8.7) |
| Route 7 & Route 22A | EB L | B (14.3) | B (15.4) |
| | EB R | A (8.6) | A (8.6) |
| | NB L | B (11.6) | B (16.4) |
| | NB T | B (10.2) | B (12.8) |
| | SB R | A (9.9) | B (13.3) |
| | ILOS | B (11.4) | B (13.7) |
| Green Street & Route 22A (HCS) | EB | B (10.4) | B (16.7) |
| | WB | A (9.4) | A (8.8) |
| | NB | C (22.7) | C (31.4) |
| | SB | B (19.4) | C (29.3) |
| | ILOS | B (13.7) | B (18.0) |
| Route 22A & Orange Route (North) | EB | C (15.2) | C (17.9) |
| | ILOS | A (1.2) | A (0.5) |
| Route 22A & S. Water Street / MacDonough Drive | WB L/T | F (56.3) | F (134.7) |
| | WB R | B (10.5) | B (11.9) |
| | EB | E (41.8) | F (72.3) |
| | ILOS | A (8.1) | B (14.2) |
| Route 22A & S. Water Street / MacDonough Drive (Signalized) | EB L | C (21.9) | C (20.4) |
| | EB R | B (15.0) | B (19.2) |
| | WB L | B (11.4) | B (13.1) |
| | NB L/T | B (14.6) | B (19.9) |
| | NB R | B (14.7) | B (19.8) |
| | SB | B (16.8) | C (23.5) |
| | ILOS | B (14.6) | B (17.2) |
| Orange Route & MacDonough Drive | NB | A (7.5) | A (7.5) |
| | EB | A (8.8) | A (9.0) |
| | ILOS | A (8.8) | A (9.0) |
| Route 7 & Monkton Road (Signalized) | NB L | A (6.2) | B (10.8) |
| | NB R | A (7.1) | B (13.3) |
| | EB | C (32.2) | B (17.9) |
| | SB L | A (5.9) | A (9.9) |
| | SB T | A (9.5) | B (19.1) |
| | SB R | A (7.9) | B (12.8) |
| | WB | C (29.9) | B (16.4) |
| | ILOS | B (16.6) | B (15.9) |
| Route 22A & Monkton Road (Signalized) | NB | A (7.2) | B (10.7) |
| | SB | A (6.2) | A (8.6) |
| | WB | B (11.4) | B (14.8) |
| | ILOS | A (7.6) | B (10.9) |
| Route 22A & Panton Road | EB | C (24.4) | F (152.6) |
| | WB | B (10.2) | B (10.1) |
| | ILOS | A (3.6) | D (34.5) |
| Route 22A & Panton Road (Signalized) | EB | C (22.5) | C (23.8) |
| | WB | B (19.5) | B (16.9) |
| | NB | B (11.7) | B (18.1) |
| | SB | A (6.3) | B (18.4) |
| | ILOS | B (10.7) | B (19.5) |

| Purple Route | | | |
|---|---|---|---|
| ion | Movement | Weekday AM Peak Hour | Weekday PM Peak Hour |
| Route 22A & Route 17 | EB | C (16.2) | C (22.6) |
| | WB | B (11.8) | C (17.2) |
| | ILOS | A (6.1) | A (8.4) |
| Route 17 & Weybridge Road | NB | A (9.8) | A (9.9) |
| | ILOS | A (0.8) | A (2.9) |
| Route 17 & Hallock Road / Quaker Village Road | SB | B (10.1) | A (9.6) |
| | NB | B (10.5) | B (10.0) |
| | ILOS | A (1.8) | A (3.2) |
| Route 17 & Pearson Road | SB | B (10.6) | B (10.0) |
| | NB | B (10.3) | B (10.1) |
| | ILOS | A (2.5) | A (3.5) |
| Route 7 & Route 17 | NB L | A (3.0) | A (9.9) |
| | EB | D (31.5) | F (122.5) |
| | ILOS | A (5.8) | C (16.8) |
| Route 7 & Route 17 (Signalized) | NB L | B (14.6) | D (36.1) |
| | NB T | B (11.6) | B (13.0) |
| | SB | B (12.2) | B (16.0) |
| | EB | C (33.8) | C (22.4) |
| | ILOS | B (15.8) | B (19.0) |
| Route 7 & Route 17 (All Way Stop) | NB L | A (8.7) | B (12.6) |
| | NB T | B (14.5) | C (22.1) |
| | SB | C (15.5) | D (32.1) |
| | EB | B (13.1) | B (13.5) |
| | ILOS | B (14.4) | C (23.5) |
| Route 7 & New Haven Road | EB | B (14.9) | C (23.4) |
| | NB L | A (2.0) | A (2.7) |
| | ILOS | A (3.8) | A (4.6) |
| Route 7 & Route 22A | EB L | B (12.1) | B (14.9) |
| | EB R | A (9.7) | A (9.4) |
| | NB L | B (10.5) | B (14.3) |
| | NB T | B (11.9) | B (12.6) |
| | SB R | A (8.9) | B (11.3) |
| | ILOS | B (11.0) | B (12.8) |
| Green Street & Route 22A (HCS) | EB | B (10.6) | B (16.9) |
| | WB | B (10.0) | A (9.4) |
| | NB | C (22.7) | C (31.4) |
| | SB | B (19.4) | C (29.3) |
| | ILOS | B (13.6) | B (17.7) |
| Route 22A & S. Water Street / MacDonough Drive | WB L/T | D (28.0) | F (72.1) |
| | WB R | B (10.6) | B (12.1) |
| | EB | D (29.3) | F (61.1) |
| | ILOS | A (3.7) | A (7.4) |
| Route 7 & Monkton Road (Signalized) | NB L | B (10.0) | B (11.2) |
| | NB R | B (17.0) | B (14.8) |
| | EB | B (15.9) | B (19.2) |
| | SB L | B (10.3) | B (10.1) |
| | SB T | B (16.9) | C (21.3) |
| | SB R | B (11.4) | B (12.0) |
| | WB | B (15.9) | C (21.0) |
| | ILOS | B (15.9) | B (17.8) |
| Route 22A & Monkton Road (Signalized) | NB | A (7.3) | B (10.4) |
| | SB | A (6.7) | A (9.7) |
| | WB | B (11.4) | B (15.8) |
| | ILOS | A (7.7) | B (11.2) |
| Route 22A & Panton Road | EB | C (15.4) | F (64.8) |
| | WB | A (8.9) | A (9.4) |
| | ILOS | A (3.4) | B (17.2) |
| Route 22A & Panton Road (Signalized) | EB | C (22.5) | C (23.8) |
| | WB | B (19.5) | B (16.9) |
| | NB | A (4.1) | A (9.1) |
| | SB | A (5.2) | B (13.3) |
| | ILOS | A (8.4) | B (15.0) |

# 4. Existing Conditions and Potential Constraints

The Planning and Environment Linkages (PEL) process facilitates meeting environmental review requirements under the National Environmental Policy Act (NEPA) and other regulatory requirements that may be required for future transportation projects in the Route 22A study corridor. The Vergennes PEL Study is not a substitute for the project-level environmental review and documentation required by NEPA but could accelerate project delivery by allowing the Federal Highway Administration (FHWA), as the lead NEPA agency, to use this information to inform the NEPA reviews and documentation for future projects in the Route 22A study corridor. VTrans intends to use the information, analysis, and products developed as a part of the Vergennes PEL Study for the environmental review process under NEPA and expects reduced redundancy and duration of the NEPA phase of the project development process as a result of the study. This section documents preliminary data, analysis and information, including the existing environmental conditions and potential environmental constraints for any reasonable alternative identified by the Vergennes PEL Study.

## 4.1 WETLANDS

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soils. Wetland areas evaluated include the Vermont Significant Wetlands Inventory (VSWI) mapped wetlands, U.S. Fish & Wildlife Service (USFWS) National Wetlands Inventory (NWI) wetlands, and wetlands inferred by Dubois & King, Inc. (D&K). Existing wetlands, including inferred wetlands and vernal pools, are based on review of available mapping data, including but not limited to hydric soils, 1-foot contours, NWI, UAS (drone) imagery, VT Wetlands Advisory data, VT Agency of Natural Resources (ANR) Atlas, aerial imagery review, and field observations. In addition, the evaluation includes wetlands delineated in the vicinity of the routes as part of projects unassociated with this PEL. It is assumed the preliminary analysis, consisting of desktop review and limited field investigation, does not capture all wetlands, specifically ones less than half acre, that may be present.

In accordance with the Vermont Wetland Rules (VWR), subject wetlands are classified as Class 2 or Class 3. These wetland classes are defined as follows, according to the VT DEC website on Jurisdictional Wetlands:

- Class 1 - Often large, exceptional and/or irreplaceable due to a heightened level or significance of certain functions or values. This class refers to a preordained selection of

wetlands that have, according to a determination decision, previously met these requirements. These wetlands generally have a wider (100ft) wetland buffer.

- Class 2 - These wetlands can fall under several different categories, as follows: 1) wetlands over a half-acre in size; 2) wetlands over 2,500 square feet (sf) in size, adjacent to a stream, river or open body of water, and contain dense, persistent woody vegetation; 3) wetland contains a species in the Vermont Natural Heritage Inventory (VNHI) database as rare, threatened, endangered or uncommon; or contains a state significant natural community as defined by VNHI; 4) vernal pools that provide amphibian breeding habitat; and 5) headwater wetlands. Class 2 wetlands generally have a 50 ft. buffer.

- Class 3 - Any wetland that does not fall under the categories of the previously mentioned classes. These are not protected under the Vermont Wetland Rules. These wetlands do not have buffers unless specifically designated by town regulations.

State and federally regulated wetlands of varying sizes and covertypes (i.e. emergent, forested, scrub-shrub) are located in or adjacent to all route alternatives. No VT Class 1 wetlands were identified in the route alternatives. Wetlands discussed below consist of a combination of NWI and VSWI mapped wetlands and inferred wetlands. Based on preliminary analysis, there are no mapped vernal pools and none were observed during the field investigations within or in the immediate vicinity of the route alternatives.

Wetlands located within and surrounding the route alternatives are shown on Figure 4-1 through Figure 4-13.

Figure 4-1 Biological Resources, Purple Route Alternative, Page 1

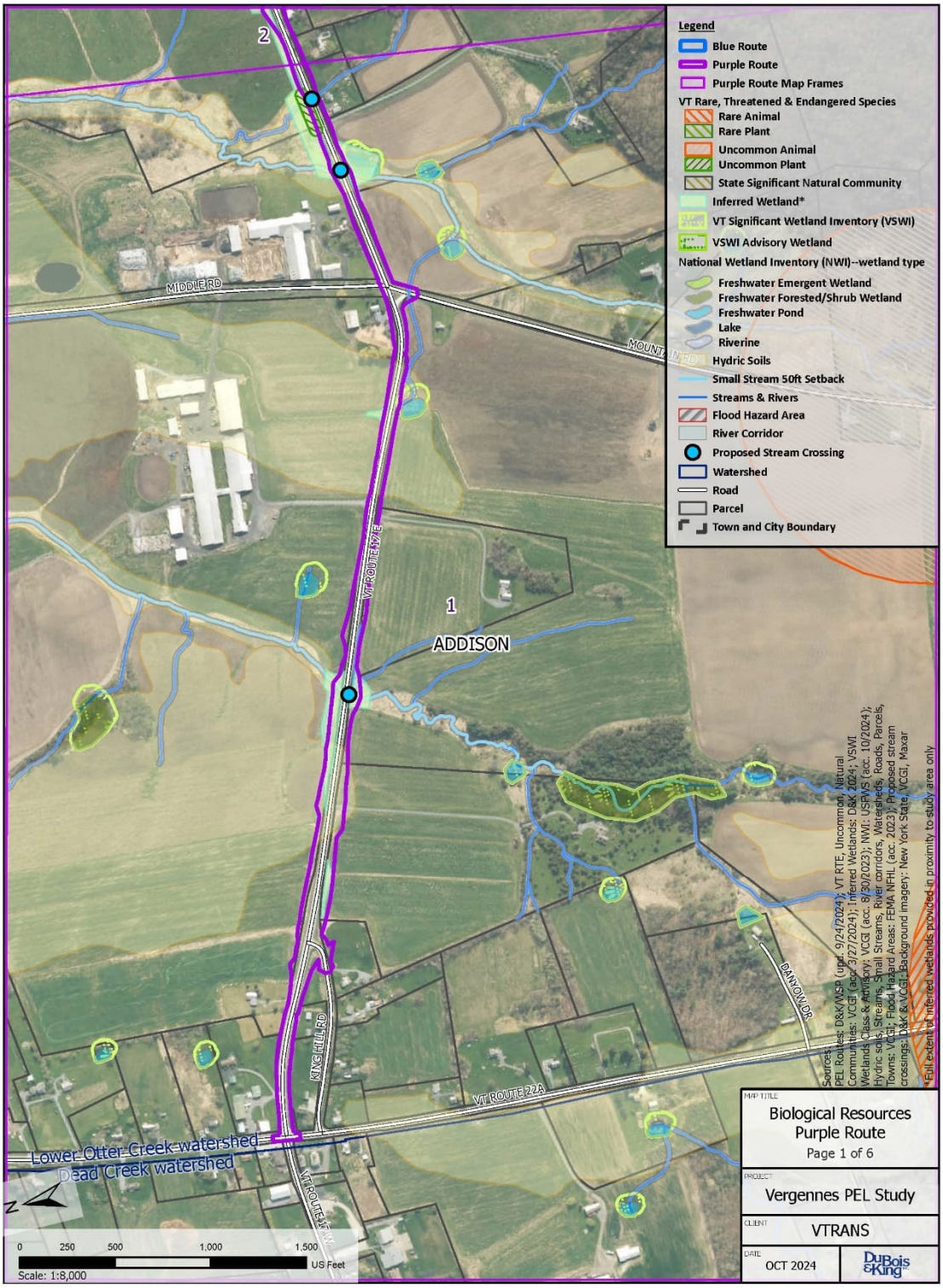


Figure 4-2 Biological Resources, Purple Route Alternative, Page 2

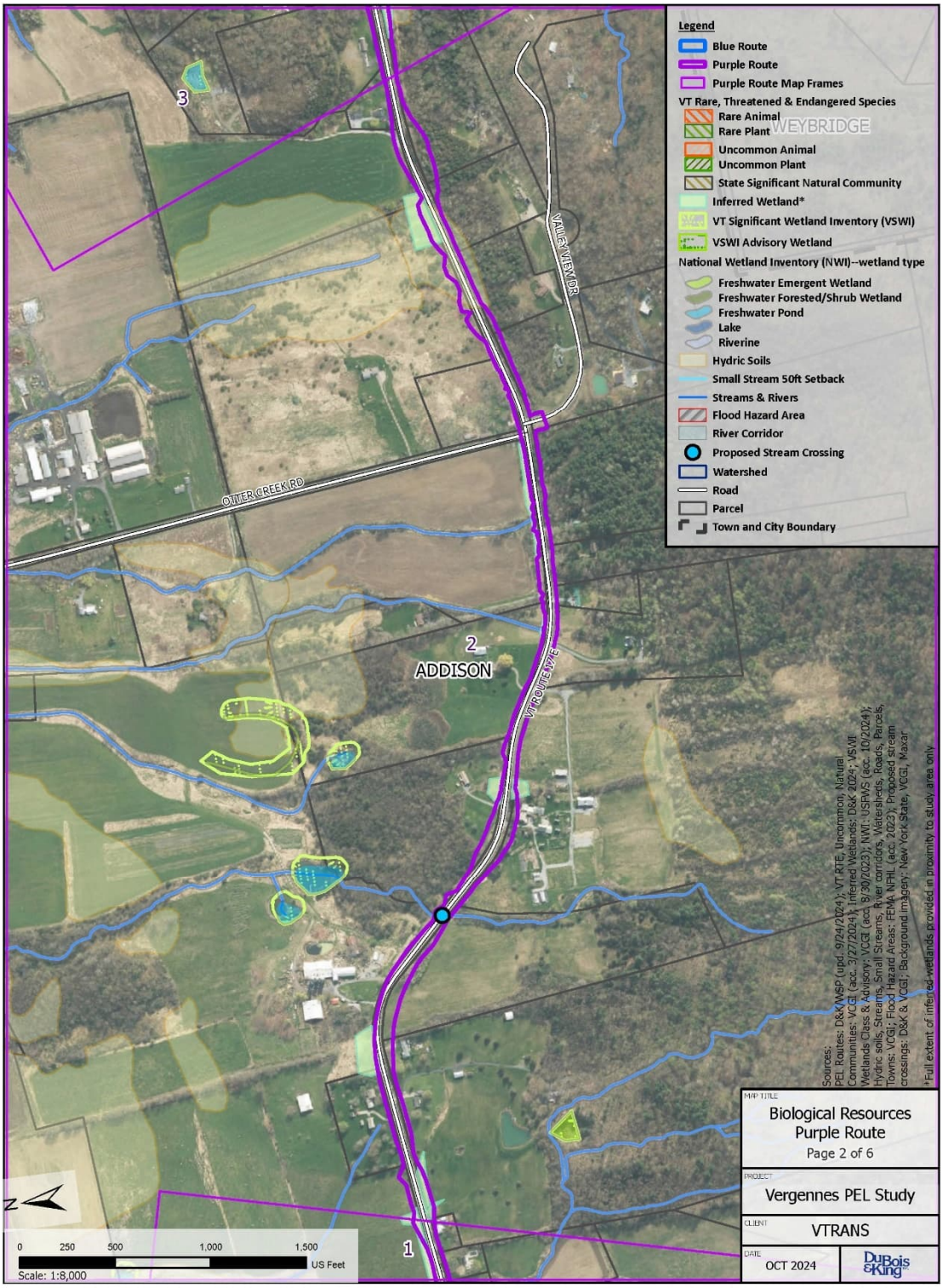


Figure 4-3 Biological Resources, Purple Route Alternative, Page 3

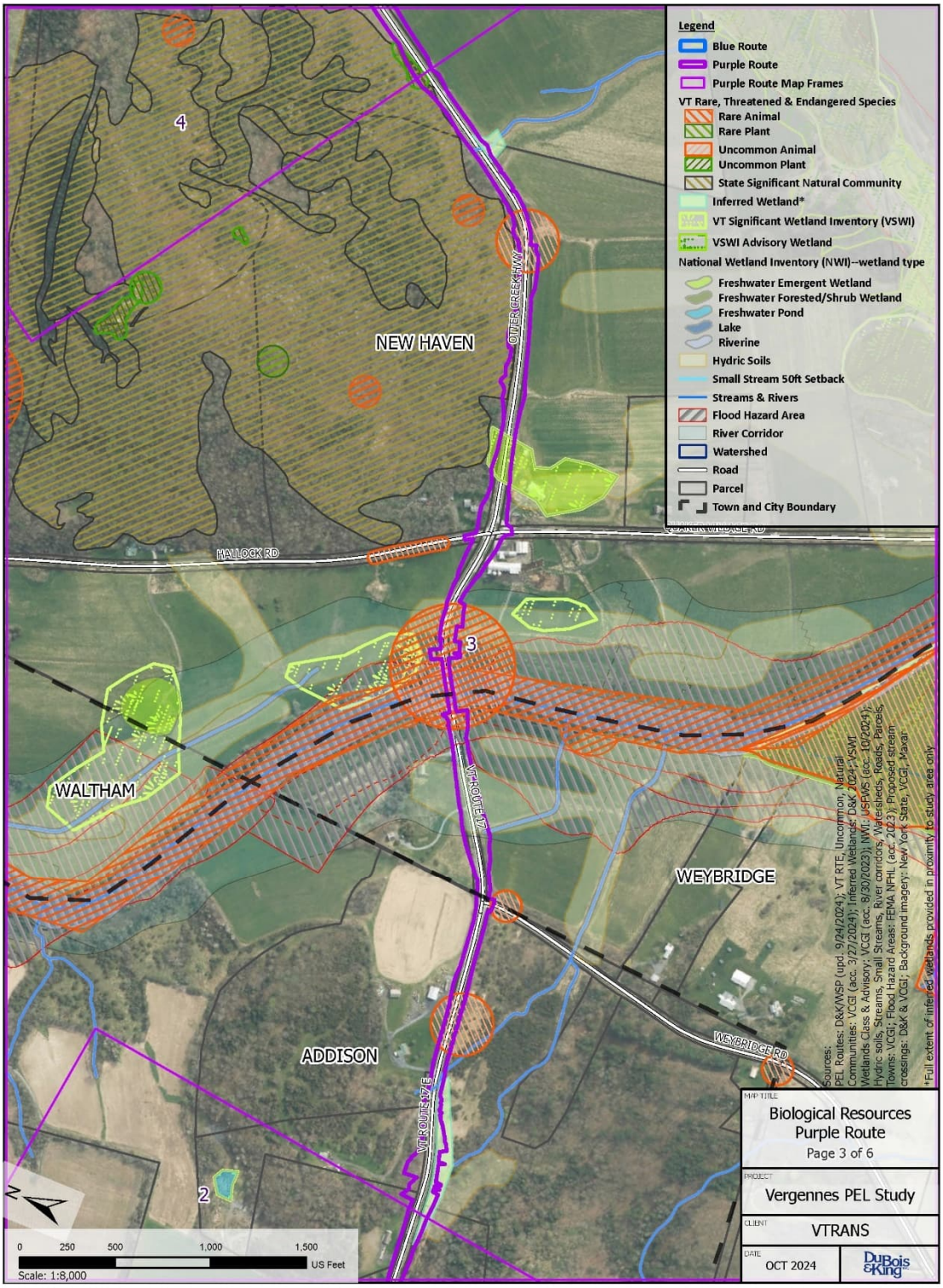


Figure 4-4 Biological Resources, Purple Route Alternative, Page 4

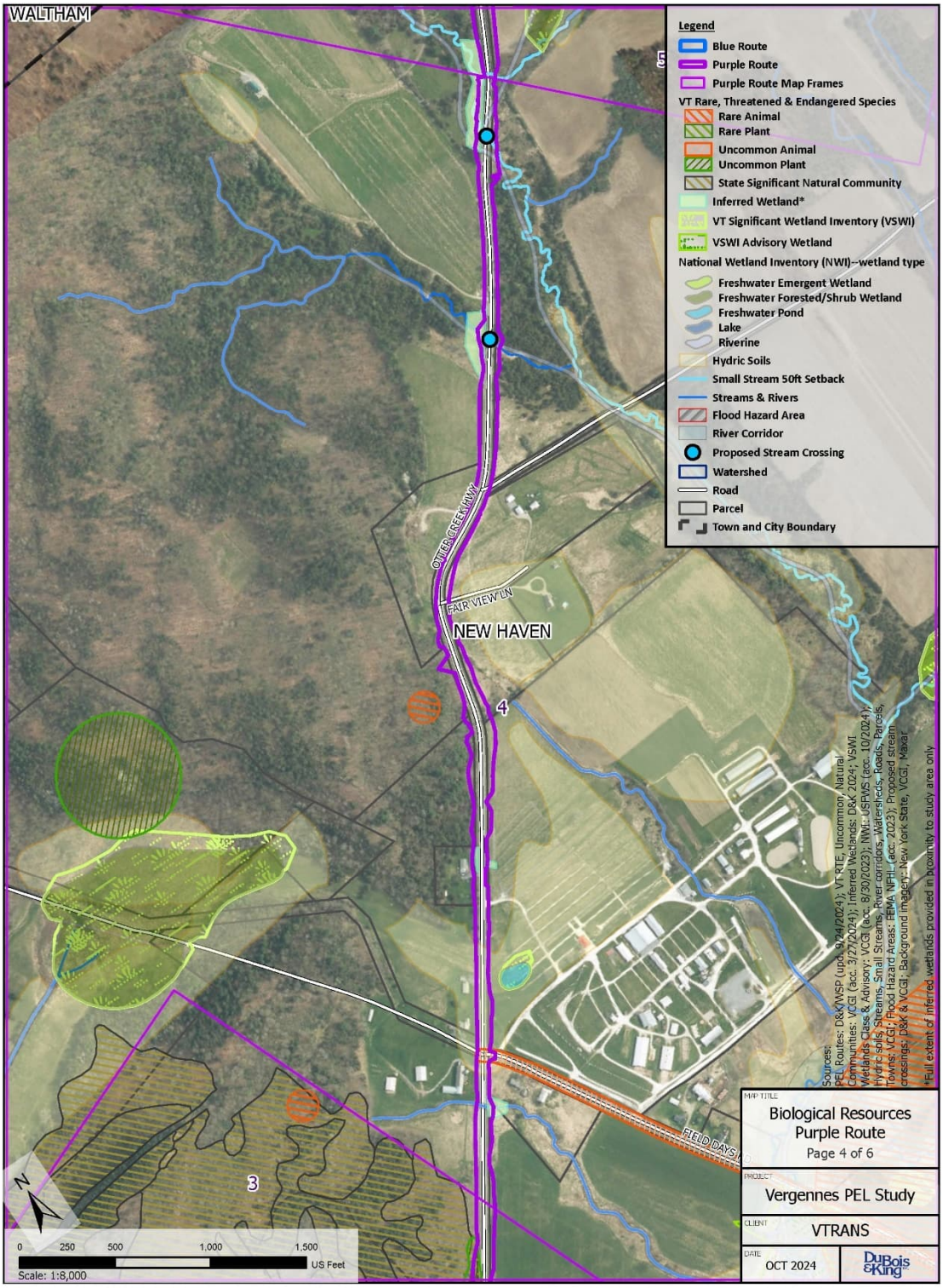


Figure 4-5 Biological Resources, Purple Route Alternative, Page 5

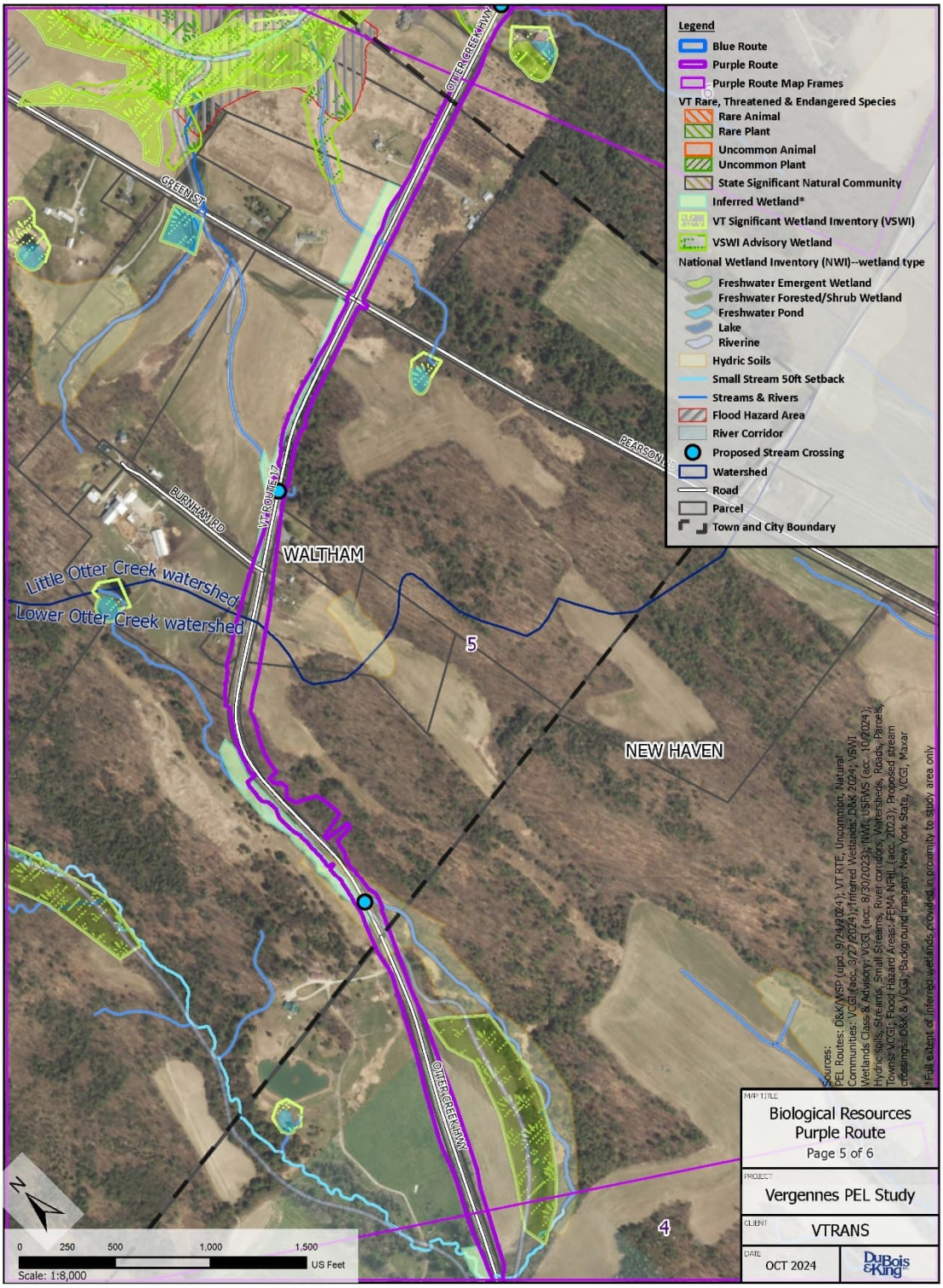


Figure 4-6 Biological Resources, Purple Route Alternative, Page 6

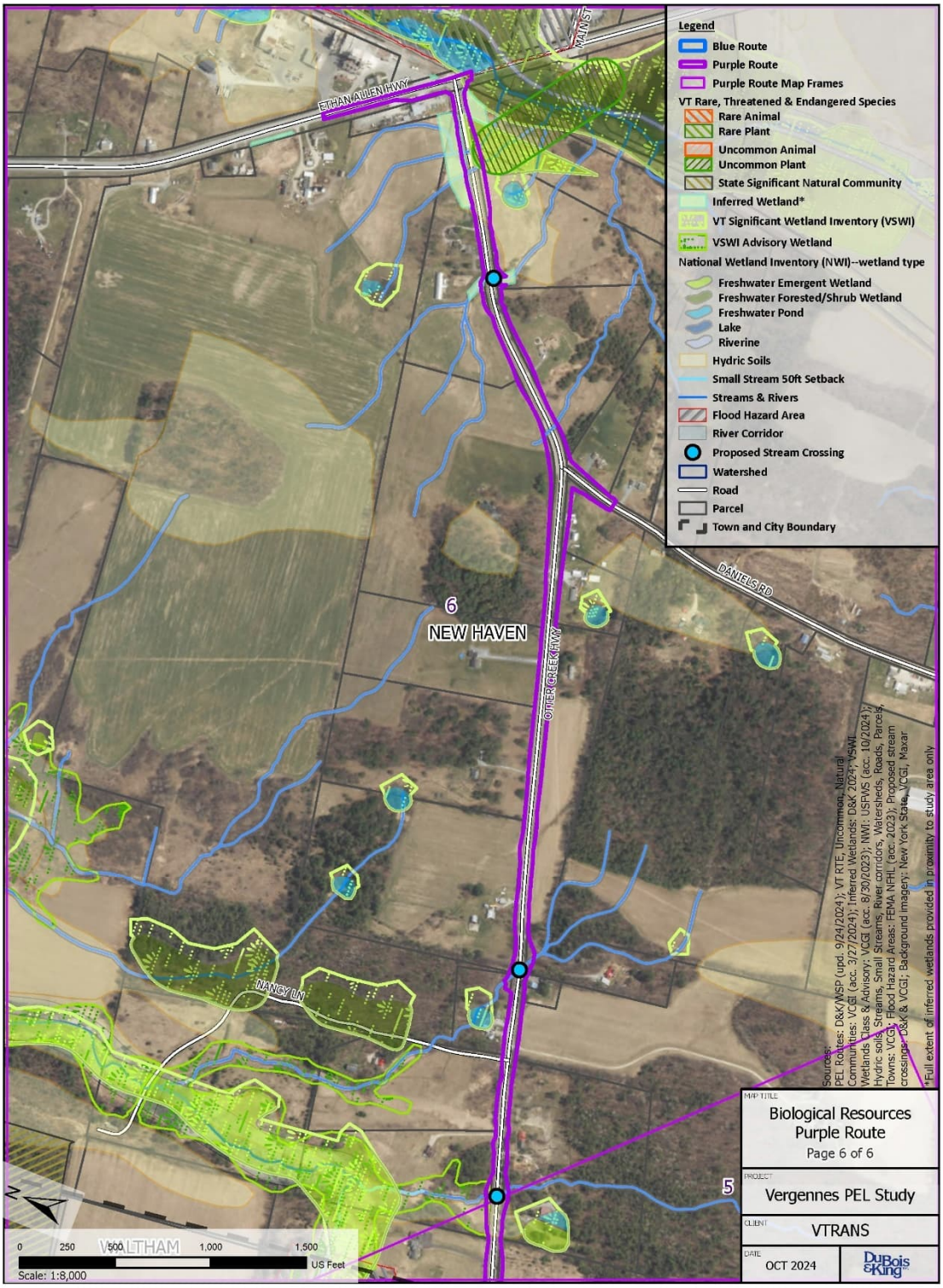


Figure 4-7 Biological Resources, Blue Route Alternative, Page 1

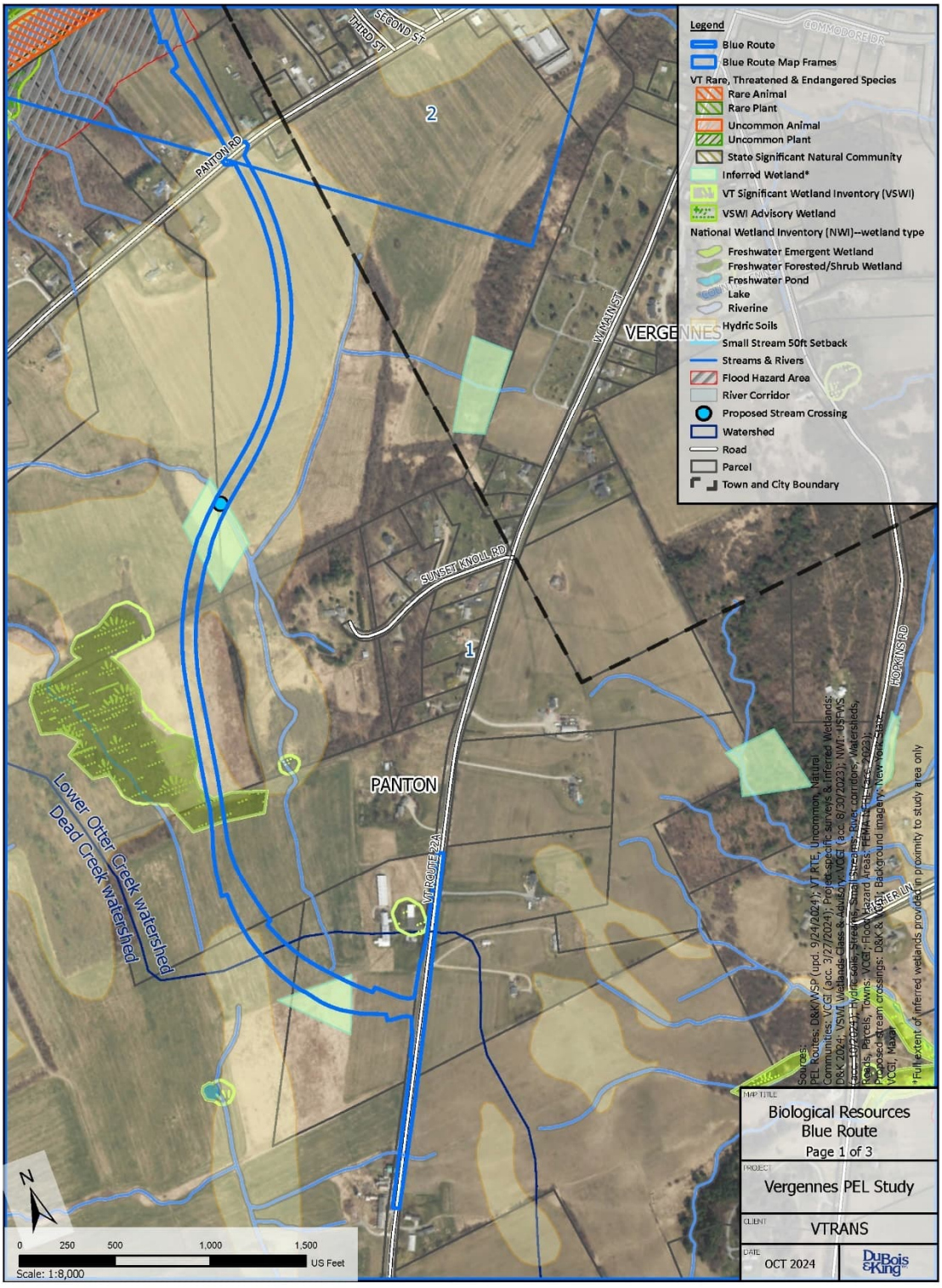


Figure 4-8 Biological Resources, Blue Route Alternative, Page2

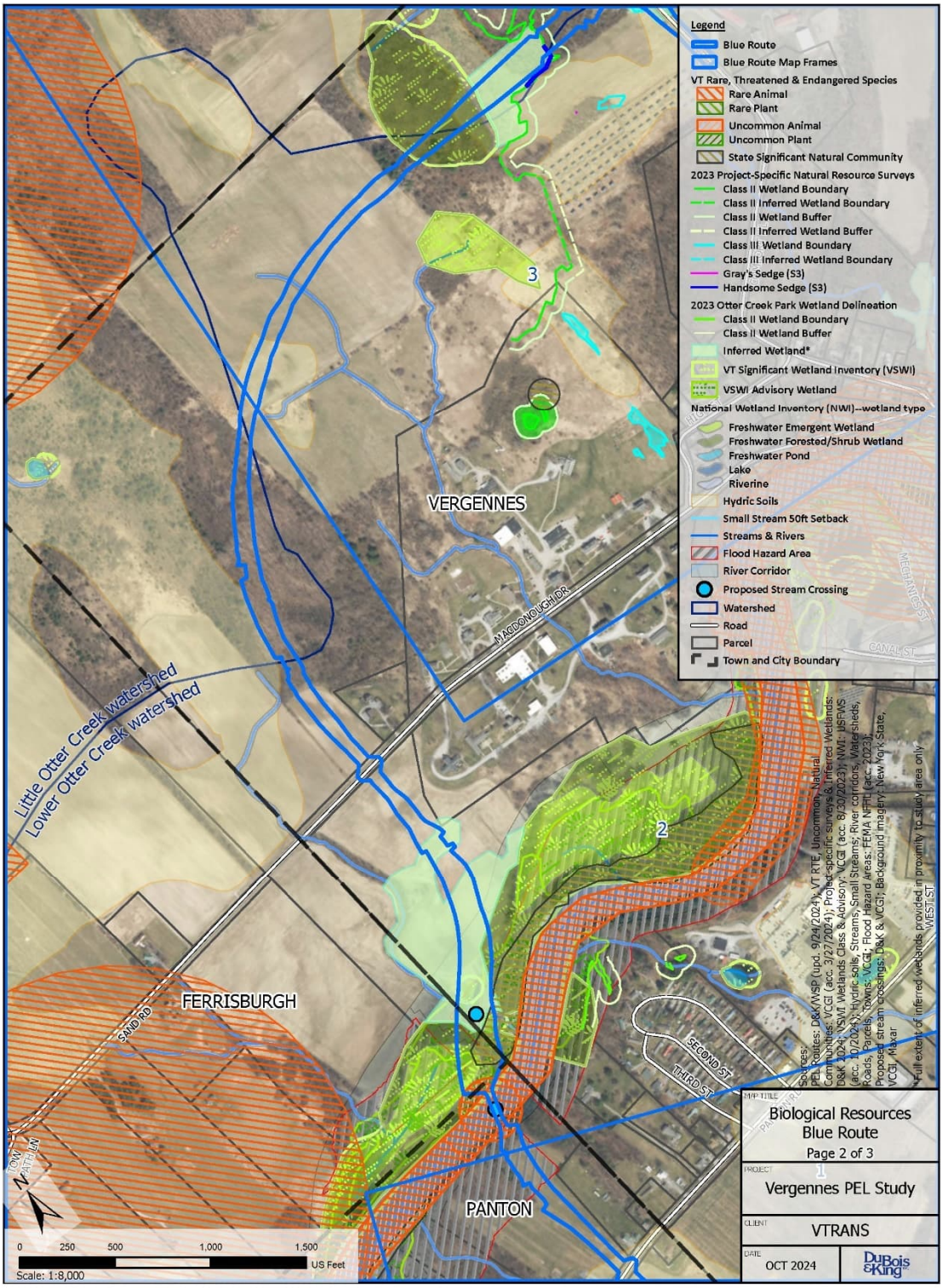


Figure 4-9 Biological Resources, Blue Route Alternative, Page 3

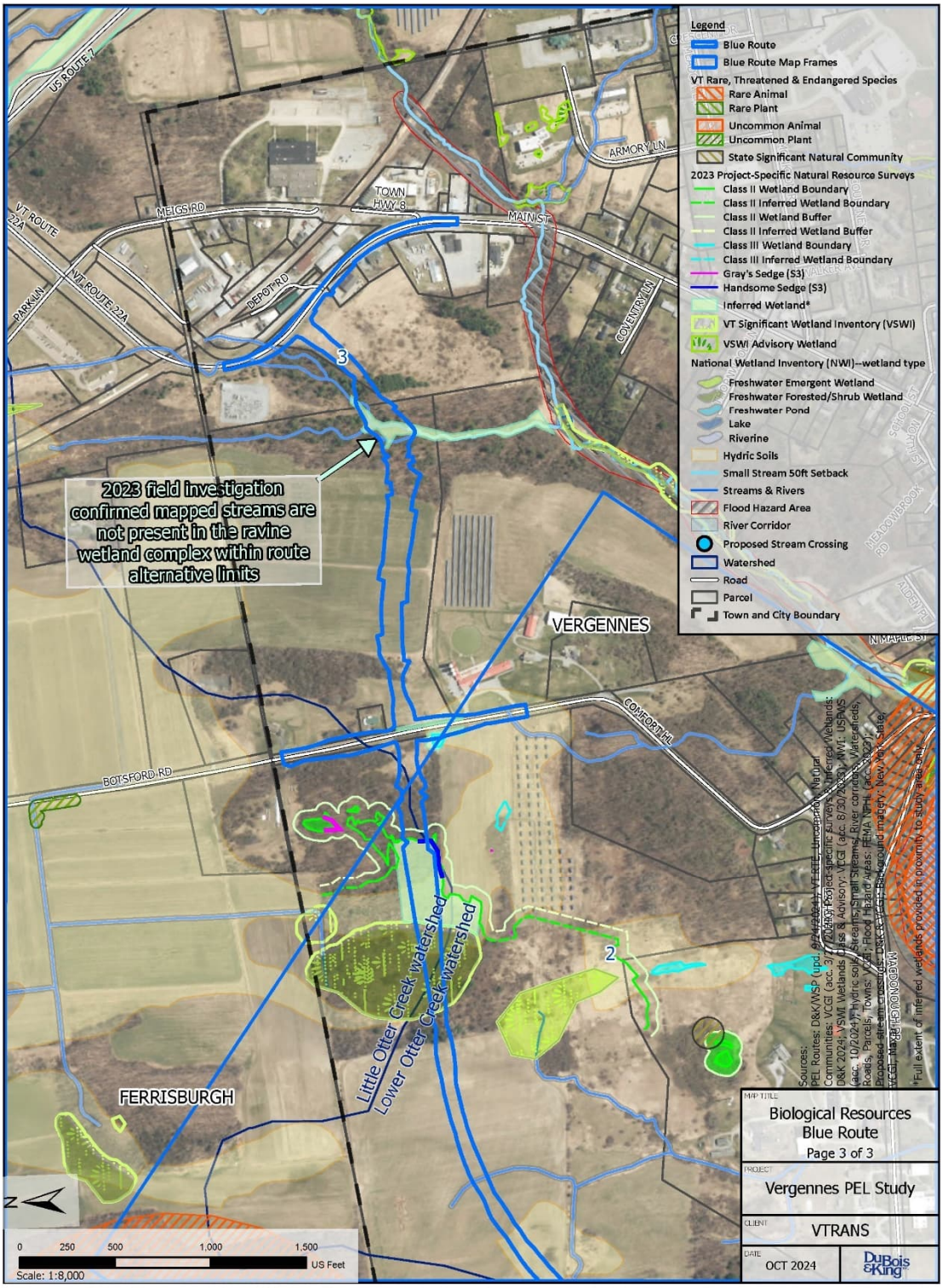


Figure 4-10 Biological Resources, Pink Route Alternative, Page 1

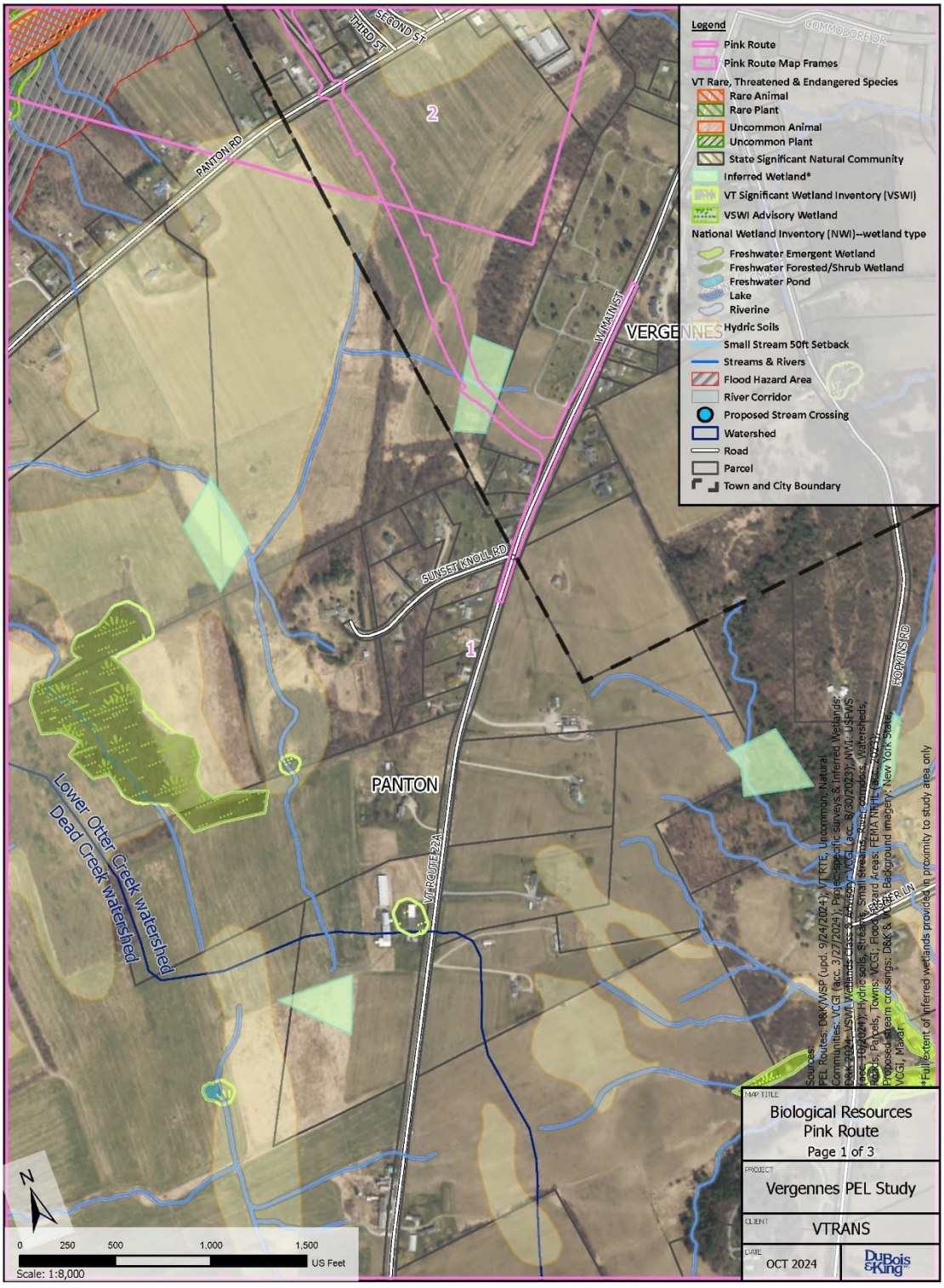


Figure 4-11 Biological Resources, Pink Route Alternative, Page 2

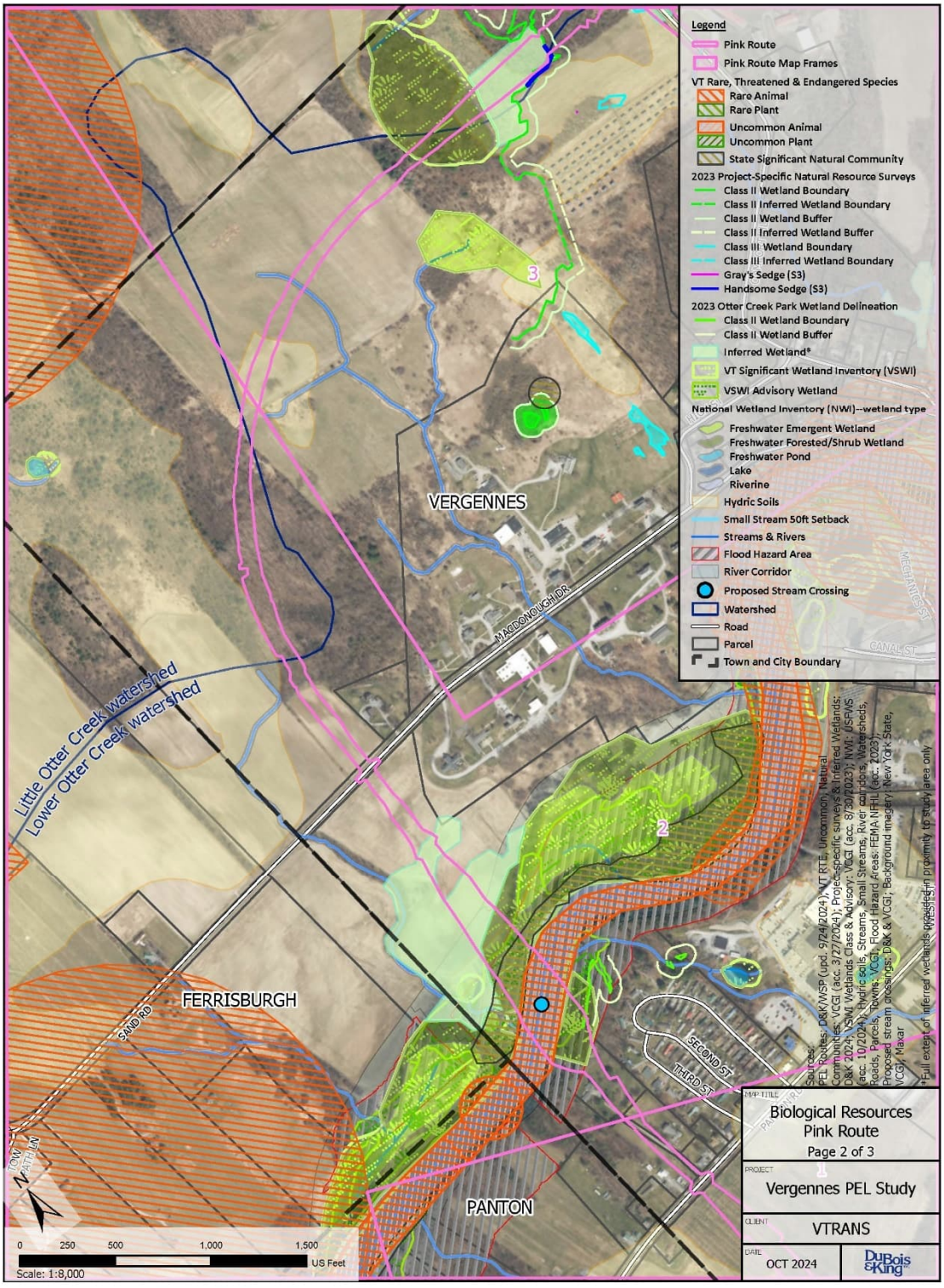


Figure 4-12 Biological Resources, Pink Route Alternative, Page 3

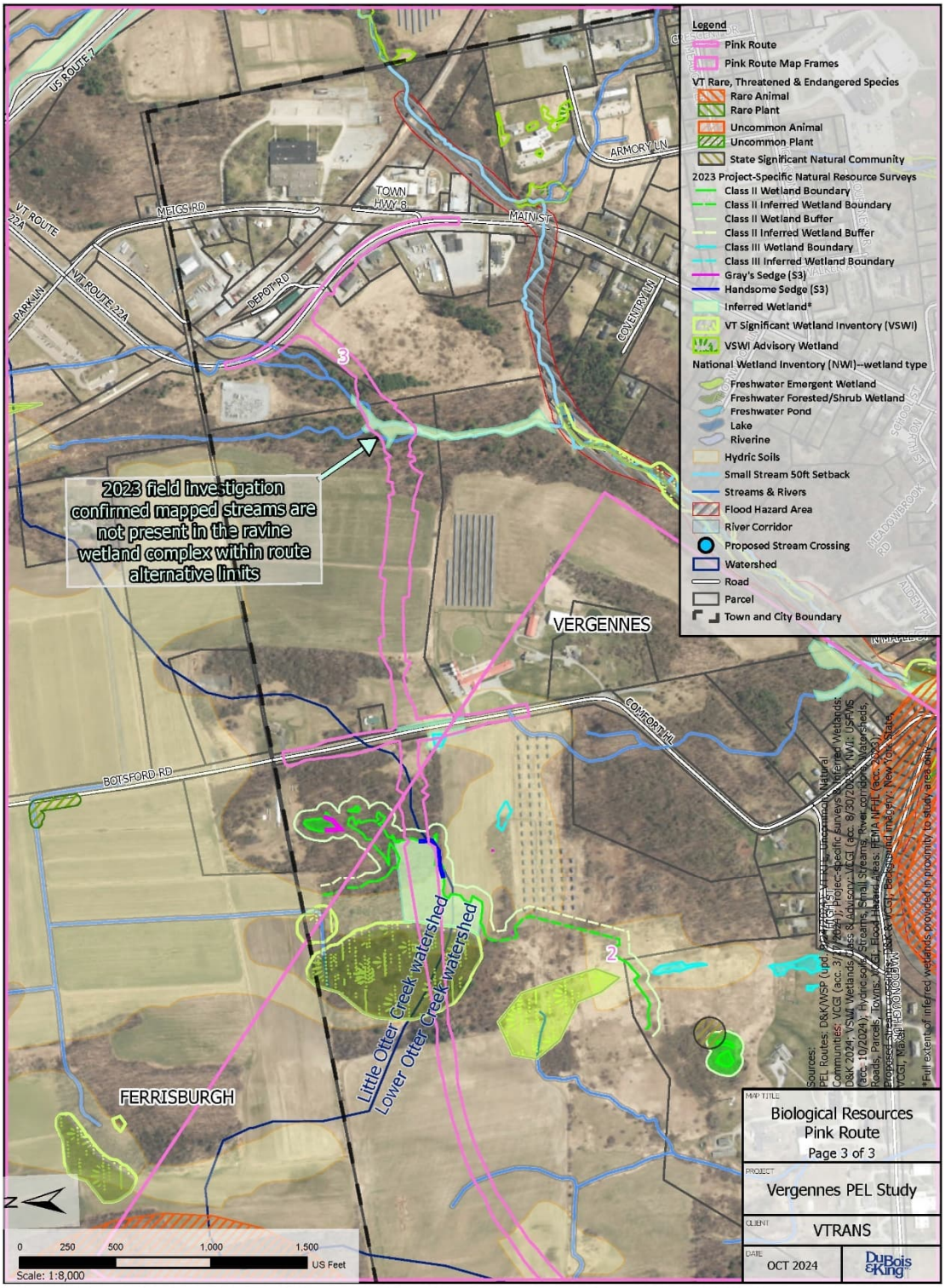


Figure 4-13 Biological Resources, Green Route Alternative, Page 1

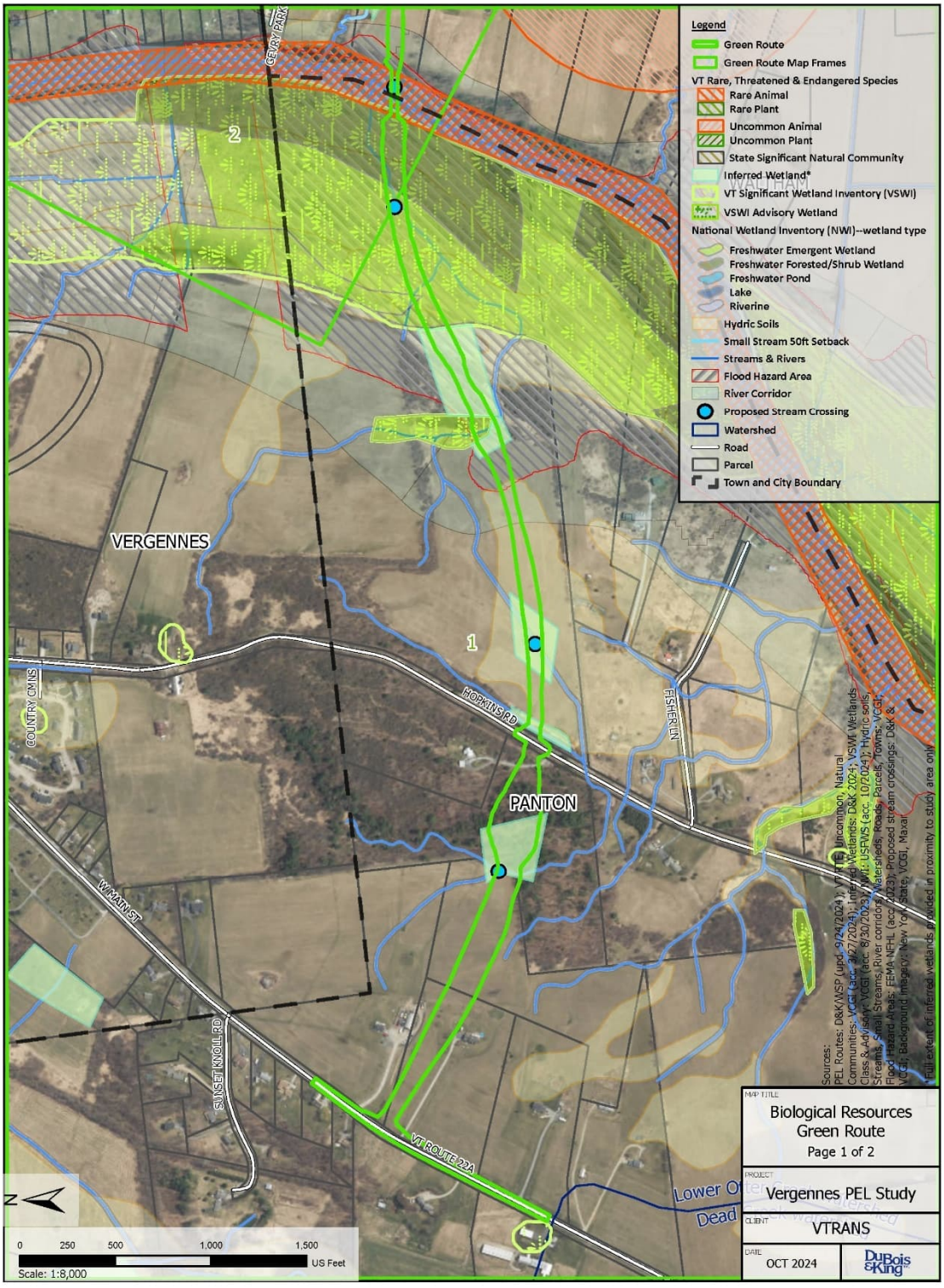


Figure 4-14 Biological Resources, Green Route Alternative, Page 2

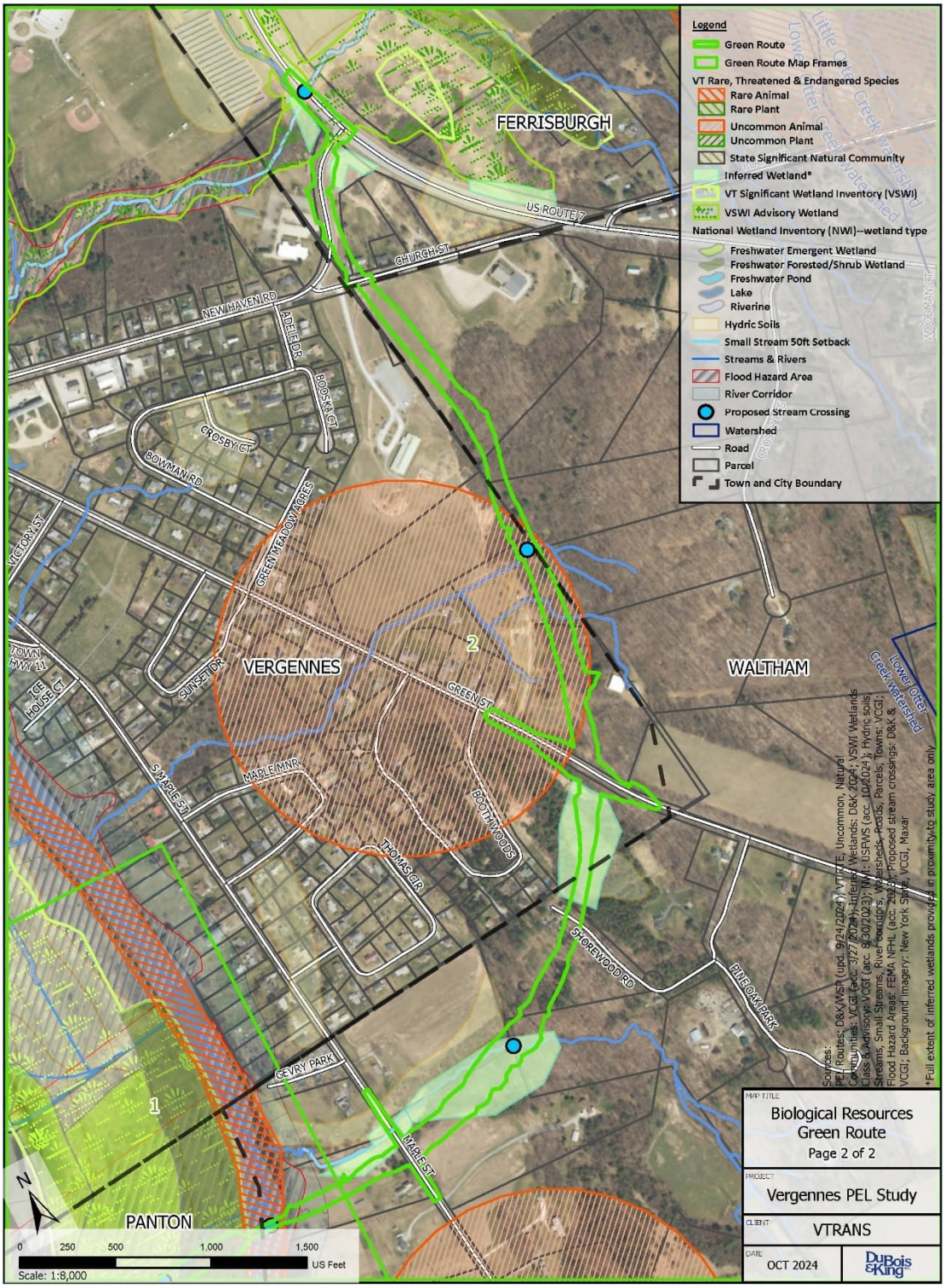
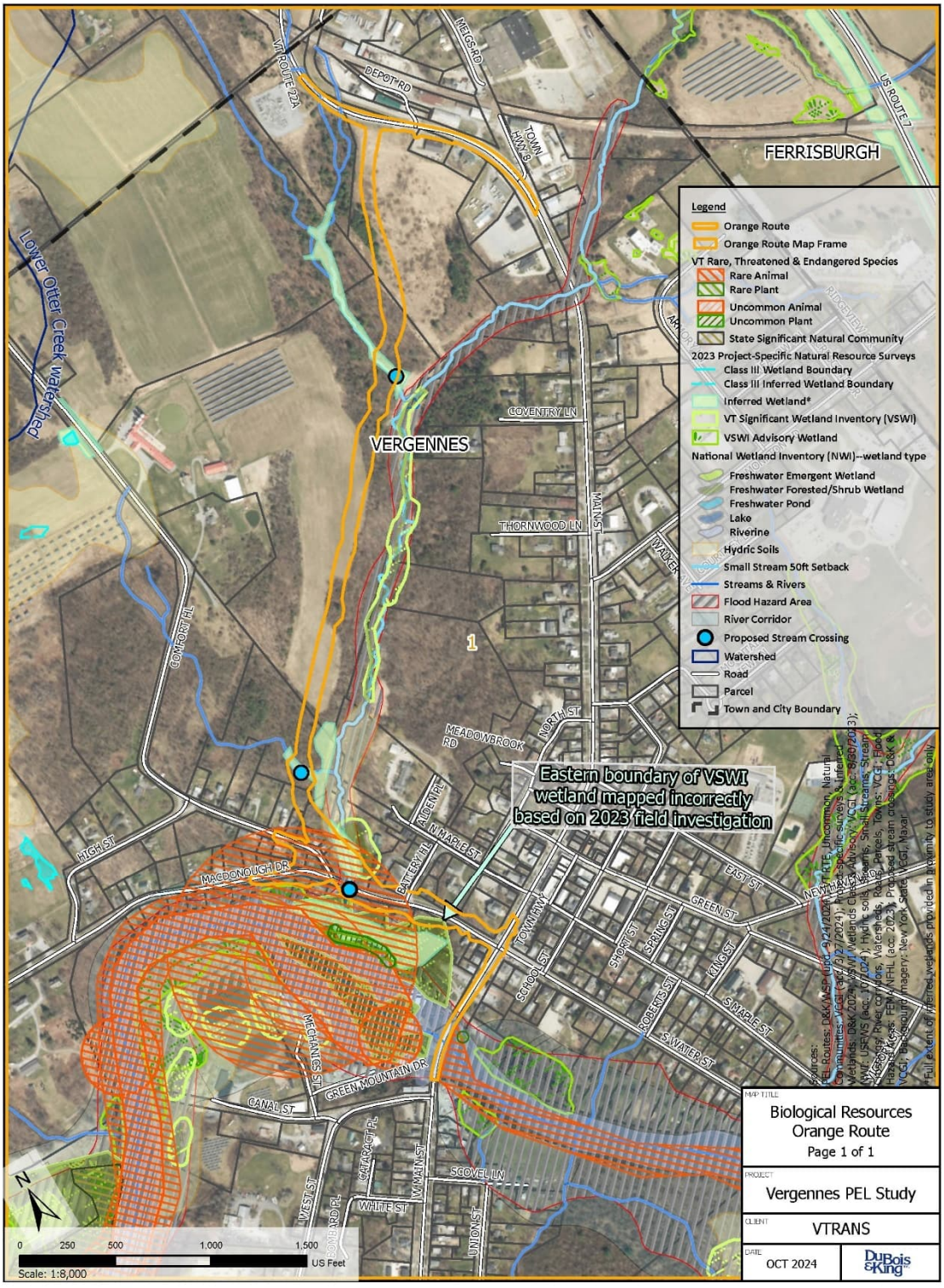


Figure 4-15 Biological Resources, Orange Route Alternative



*Orange Route Alternative* - A large wetland complex, consisting of emergent, forested, and scrub-shrub covertypes and streams, parallels and crosses the Orange Route Alternative. Part of the wetland complex is an emergent/scrub-shrub wetland located within a ravine that generally runs in a north to south direction approximately 850 feet west of State Route 22A.

*Blue Route Alternative*- The eastern portion of the route intercepts the same emergent/scrub-shrub ravine wetland complex as described for the Orange Route Alternative. A large, mostly forested, clayplain wetland complex, including wetlands in agricultural fields, is located west of Comfort Hill Street. This wetland complex is classified as a state Class II wetland. The route intersects a large, state Class II, forested floodplain wetland complex located on the north side of Otter Creek. The southern portion of the wetland intercepts three separate meadow and forested wetland areas located mostly in agricultural fields and hedgerows. One of the three wetland areas is designated as a state Class II wetland.

*Pink Route Alternative* - The eastern portion of the route intercepts the same emergent/scrub-shrub ravine wetland complex as described above. Similar to the Blue Route, the Pink Route intercepts a large, mostly forested, clayplain Class II wetland complex, including wetlands in agricultural fields, located west of Comfort Hill Street. It also intersects a large, state Class II, forested floodplain wetland complex located on the north side of Otter Creek. t On the south side of Otter Creek, the route crosses a Class II floodplain wetland complex located . Further to the south, the route intercepts a forested wetland located 300 feet northwest of State Route 22A.

*Green Route Alternative* - The eastern portion of the route crosses two separate forested and agricultural wetland areas adjacent to streams and drainage features. The central portion of the route intersects a large, state Class II, floodplain wetland complex located west of Otter Creek. The wetland complex consists of emergent, forested, and scrub-shrub covertypes with stream and drainage features throughout. One of the three wetland areas is designated as a state Class II wetland. The route crosses two separate wetland areas between Green Street and Otter Creek. One is located in a ravine and adjacent to a stream and is presumed to be a state Class II wetland. The route intercepts two presumably state Class II wetlands located west of the intersection of Route 7 and New Haven Road.

*Purple Route Alternative* - In general, the existing Route 17 is adjacent to wetlands and intersects multiple wetland complexes. A majority of the wetlands are associated with drainage features, such as streams and agricultural ditches. There are only four Class II VSWI mapped wetlands intercepted by the route alternative. Throughout the approximate 7.5 mile route alternative associated with the widening of Route 17, the route intercepts 28 wetlands.

### 4.1.1 Potential Constraints

Table 4-1 describes existing conditions based on preliminary analysis of existing information and potential constraints associated with each of the evaluated route alternatives. It is assumed the preliminary analysis, consisting of desktop review and limited field investigation, does not capture all wetlands presence. Only wetlands directly impacted by the route alternatives were evaluated. State designated Class III wetlands are difficult to identify during a preliminary analysis with no detailed field investigation. In addition, typically the U.S. Army Corps of Engineers (USACE) and VT Department of Environmental Conservation (DEC)would not have jurisdiction over Class III wetlands. Therefore, Class III wetlands were not included in the evaluation of potential constraints. Wetland buffers were not taken into consideration since the exact boundary of most of the mapped wetlands is approximated.

Table 4-1 Potential Class II Wetland Constraints

| ROUTE ALTERNATIVE | CLASS II WETLANDS |
|---|---|
| Purple | 4.25 acres |
| Blue | 9.26 acres |
| Pink | 7.92 acres |
| Green | 9.86 acres |
| Orange | 0.82 acres |

### 4.1.2 Next Steps

All route alternatives involve impacts to state and federally regulated wetlands. During the next phase of project development the proposed route should be further investigated to identify and delineate all wetlands. Wetland delineations should be verified by VT DEC and USACE as necessary. Both agencies should be consulted throughout the project design, and NEPA and permitting processes. The project should be designed to avoid or minimize impacts to wetlands to the extent practicable. It is expected that some mitigation for impacts to wetlands would be required and work would adhere to all permit conditions.

An Executive Order 11990 Wetland Finding would need to be approved by FHWA stating and supporting that (1) there are no practicable alternatives to construction in the wetland(s), and (2) the proposed action includes all practicable measures to minimize harm to the wetland(s) which may result from such use.

In accordance with the Vermont Wetland Rules (10 V.S.A. § 905b(18)), any activity, with the exception of allowed uses, within a Class II wetland or buffer zone (50 feet) requires a permit. Authorization by the USACE under Section 404 (Clean Water Act) is required for fill and/or excavation in Waters of the U.S. (WOUS), including wetlands. Work within regulated waterways

would require a USACE General Permit or Individual Permit. In addition, a VT Section 401 Water Quality Certification may be required, pursuant to 10 V.S.A. Chapter 47.

In accordance with Criterion 1(G) of Vermont's Act 250 (10 V.S.A. Chapter 151), any project that encroaches on a wetland considered significant under the Vermont Wetland Rules should be designed to avoid and minimize project impacts on the wetland and the wetland buffer.

## 4.2 SURFACE WATERS

Surface waters include streams, rivers, lakes, and ponds. Aside from excavated farm/agricultural ponds, there are no natural lakes or ponds located within or immediately adjacent to the route alternatives. Surface waters within the route alternatives are located within three watersheds, Lower Otter Creek, Little Otter Creek, and Dead Creek. Existing conditions and potential constraints are based on review of available mapping data, such as USGS topographic maps and VT ANR Atlas, aerial imagery review, and field observations.

Surface waters located within and surrounding the route alternatives are shown on Figure 4-1 through Figure 4-13

### 4.2.1 Streams

*Purple Route Alternative* - The route alternative crosses over 25 mapped streams, including the Otter Creek beneath Route 17. A majority of the mapped streams consist of drainage ditches and wetlands, or are not physically present based on a review of aerial imagery, the VTrans small culvert inventory data, and field investigations. Based on a desktop review and field investigations, it appears that approximately 12 streams would be regulated by the VT DEC and/or USACE. A majority of the regulated streams have existing crossings on Route 17. Route 17 is located within two watersheds, Otter Creek and Little Otter Creek. The Otter Creek watershed encompasses a majority of Route 17 and the Little Otter Creek watershed encompasses the eastern portion of Route 17 within the route alternative. With the exception of Otter Creek, the regulated streams do not appear to be used for recreational purposes (boating and fishing).

*Blue Route Alternative* - The route alternative crosses over six mapped streams, including the Otter Creek. Of the six streams, only three appear to be regulated streams, consisting of the Otter Creek and its tributaries. The remaining three appear to consist of an agricultural drainage feature and a wetland within a ravine. The ravine wetland area was observed during field investigations and there was no evidence of streams in the location of the blue route. With the exception of the Otter Creek, the regulated streams do not appear to be used for recreational purposes (boating and fishing).

*Pink Route Alternative* - The route alternative crosses over six mapped streams, including the Otter Creek. Of the six mapped streams, only one, the Otter Creek, appears to be a regulated stream.

The remaining streams are mapped on agricultural fields and a wetland within a ravine. The ravine wetland area was observed during field investigations and there was no evidence of streams in the location of the pink route. With the exception of the Otter Creek, the regulated streams do not appear to be used for recreational purposes (boating and fishing).

*Green Route Alternative* - The route alternative crosses over ten mapped streams, including the Otter Creek. Of the ten mapped streams, seven appear to be regulated streams, including the Otter Creek. The remaining streams appear to drainage features in agricultural fields and mapped within a wooded upland area. With the exception of the Otter Creek, the regulated streams do not appear to be used for recreational purposes (boating and fishing).

*Orange Route Alternative*- There are two state regulated streams within the route alternative. The streams are unnamed tributaries of the Otter Creek. There is a third stream mapped on the VT ANR Atlas, however, based on its drainage area (<0.25 sq mi), it would not be regulated by the state. All three streams are likely regulated by the USACE. The streams do not appear to be used for recreational purposes (boating and fishing).

### 4.2.2 Impaired Waters

According to the 303(d) list of impaired waters approved by the EPA on September 17, 2020 and the VT ANR Atlas, the only impaired surface water within a route alternative is the Otter Creek, downstream of the Vergennes dam, located within the pink and blue route alternatives. The impaired water is described as "Lower Otter Creek, Mouth Upstream to Vergennes Dam (Approx 7.6 Miles)" with the problem of "periodic & recurring overflows at pump stations within the collection system" and the pollutant, Escherichia coli (E. coli)", have caused it to not meet the Vermont Water Quality Standards. The Lower Otter Creek is impaired where a total maximum daily load (TMDL) is required. A *Vermont Statewide Total Maximum Daily Load (TMDL) for Bacteria-Impaired Waters* (September 2011) was developed. The Lower Otter Creek is listed in the TMDL as being impaired for E.coli due to the influence of wastewater treatment facilities (WWTFs) and combined sewer overflows (CSOs). The Lower Otter Creek is not covered under the TMDL but specifics regarding their location and management status is included for informational purposes. Accordingly, improvements were made to the Vergennes collection system and will continue to be made in the future.

The larger Lake Champlain watershed, which includes both Otter Creek and Little Otter Creek watersheds, is subject to a TMDL for phosphorous.

### 4.2.3 Potential Constraints

#### Stream Crossings

With the exception of the purple route alternative, all route alternatives would require new stream crossings. The widening of Route 17 associated with the purple route alternative would

impact existing stream crossings and potentially have new impacts to side channels adjacent to existing stream crossings. Based on the preliminary analysis of existing information, navigability of Otter Creek is not expected to be affected.

When field observation was not feasible, a conservative approach was taken when interpreting whether mapped streams were physically present. In some instances, streams were mapped but field observations and/or desktop review indicated they were instead a wetland, man-made ditch, or an unregulated ephemeral stream. Only regulated streams, based on preliminary analysis, are included under potential constraints. Route alternative stream crossings are shown on Figure 4-1 through Figure 4-13.

Table 4-2 describes existing conditions based on preliminary analysis of existing information and potential constraints associated with each of the route alternatives.

Table 4-2 Stream Crossing Existing Conditions and Potential Constraints

| ROUTE ALTERNATIVE | EXISTING CONDITIONS | POTENTIAL CONSTRAINTS |
|---|---|---|
| Purple | 12 regulated streams and existing stream crossings located along Route 17. | Widening of Route 17 would likely involve replacement of 11 regulated stream crossings with larger culverts and would potentially impact side channels adjacent to the existing stream crossings. Modifications to the existing Otter Creek crossing would not be required. |
| Pink | The Otter Creek is located in the southern half of the route. | One new stream crossing of an approximate 300-foot wide section of the Otter Creek. |
| Blue | Three regulated streams, located in the southern half of the route. | Three new stream crossings, including one spanning an approximate 200-foot wide section of the Otter Creek. |
| Green | Seven regulated streams located throughout the route. | Seven new stream crossings, including one spanning an approximate 220-foot wide section of the Otter Creek and one expansion of an existing stream crossing. |
| Orange | Three regulated streams, located in the northern and southern portions of the route. | Three regulated stream crossings, consisting of two new stream crossings and one expansion or modification of an existing stream crossing. |

### Impaired Waters

The Blue and Pink Route Alternatives would cross a section of the Otter Creek classified as an impaired water for E coli associated with the Vergennes WWTG and CSOs. A stream crossing is not anticipated to affect the waterway impairment of E coli or phosphorous for the larger Lake Champlain TMDL.

### 4.2.4 Next Steps

All route alternatives involve modifications to or new existing stream crossings. During the next phase of project development a proposed route should be further investigated to identify and locate all regulated and unregulated waterways. Delineation of the ordinary high water of regulated streams should be completed during the next phase of project development in areas that could be impacted by project-related activities. The project would be designed to avoid or minimize impacts to surface waters to the extent practicable.

Since all route alternatives would require one or more stream crossing, it is assumed future project activities would require excavation and/or fill in regulated waterways. In accordance with the Vermont Stream Alteration Rule (10 V.S.A. Chapter 41), VT DEC requires a Stream Alteration Permit for movement, excavation, or fills involving 10 or more cubic yards annually in any perennial stream. Authorization by the USACE under Section 10 (Rivers and Harbors Act) is required for work affecting navigable waters (Otter Creek) and Section 404 (Clean Water Act) is required for fill and/or excavation in waters of the U.S, including streams that aren't navigable. Impacts to waterways should be avoided where feasible. Depending on the amount of impacts, work within regulated waterways would require a USACE General Permit or Individual Permit.

Coordination with the US Coast Guard and USACE NY District required for bridge crossings of the Otter Creek downstream of the Vergennes falls would be critical. The US Coast Guard (USCG) regulates bridge opening and structures. The USCG would require that the project consider the horizontal and vertical clearances that may be required, other locations which may affect navigation, and analysis of engineering, social, economic and environmental benefit and impacts. A USACE Section 408 (Clean Water Act) permit may be required for a bridge across Otter Creek, which is considered a navigable water maintained and surveyed by USACE. The USACE would likely suggest a larger and higher bridge opening for boats compared to the USCG. The USACE has the authority to make final determinations regarding jurisdiction, permitting, and mitigation.

In addition, in accordance with Criterion 1(E) of Vermont's Act 250 (10 V.S.A. Chapter 151), if a project encroaches on a stream, a natural riparian zone buffer should be provided along the stream to provide and protect essential ecosystem functions. Riparian zone buffers can be 50-100 feet wide depending on site characteristics.

There is the potential for increased impervious surface from a future project to result in increased runoff that would impact the water quality of surface waters. However, stormwater management practices would be implemented as part of the project to provide both water quality treatment and runoff reduction for stormwater volumes prior to discharge into nearby surface waters.

Permits would be obtained once the location and the extent of the impacts are ascertained. Work would not commence until the permit(s) are acquired and would adhere to any conditions set forth by the permit requirements.

## 4.3 FLOODPLAINS AND RIVER CORRIDORS

Based on a review of the Federal Emergency Management Agency (FEMA) National Flood Hazard Layer (NFHL) data and the VT ANR Atlas, floodplains are present within all of the route alternatives. The NFHL data represents the current effective flood data for the study area. It is a compilation of effective Flood Insurance Rate Map (FIRM) databases and Letters of Map Revisions (LOMRs).

### 4.3.1 Floodplains

In general, floodplains throughout the corridors of the route alternatives are associated with the Otter Creek (Lower Reach), which flows in a south to north direction and east to west direction downstream of the Vergennes Falls. The floodplain of an unnamed tributary of the Otter Creek is located in Vergennes west of Main Street and runs parallel to the east of the Orange Route Alternative. Lastly, the floodplain of an unnamed tributary of the Otter Creek is located east of the intersection of Routes 7 and 17. Each route alternative crosses a floodplain associated with the Otter Creek or a tributary of the creek. With the exception of the Orange Route Alternative, all route alternatives would cross the Otter Creek and its associated floodplain.

### 4.3.2 River Corridors

River corridors are regulated by VT DEC and encompass an area around and adjacent to the present channel where fluvial erosion, channel evolution and down-valley meander migration are most likely to occur. River corridor widths vary and are calculated to represent the riparian land necessary to accommodate the least erosive channel and floodplain geometry that would be created and maintained naturally within a given valley setting.

Streams with a drainage area of less than or equal to two square miles, have a river corridor of 50 feet on either side of the stream unless field data verifies a specific stream sensitivity type.

The Otter Creek river corridor is located within all route alternatives. The Otter Creek river corridor varies in width along the river and is an average of 840 feet wide in the vicinity of the pink and blue route crossings and 2,680 feet wide near the Green Route Alternative crossing. The river corridor, approximately 210 feet wide, of an unnamed tributary of the Little Otter Creek is located in the eastern portion of the purple route near the intersection of U.S. Route 7 and VT Route 17. In addition to the Otter Creek river corridor, one 50 foot river corridor, associated with a small stream, is located within the Orange Route Alternative, one located within the blue and pink route alternative, and four are located within the purple route alternative.

The flood hazard areas, river corridors, and stream setbacks located within and surrounding the route alternatives are shown on Figure 4-1 through Figure 4-13.

### 4.3.3 Potential Constraints

#### Floodplains

Only floodplains directly impacted by the route alternatives were identified. There are discrepancies in the available NFHL digitized data, which included gaps or misalignment in mapped flood zones when overlaid and evaluated in ArcGIS. Obvious gaps were present along the blue route and misalignment along the purple route, and therefore, potential constraints were inferred for these routes based on review of the FEMA FIRMs. Table 4-3 describes existing conditions based on preliminary analysis of existing information and potential constraints associated with each of the route alternatives.

Table 4-3 Floodplain Existing Conditions and Potential Constraints

| ROUTE ALTENRATIVE | EXISTING CONDITIONS | POTENTIAL CONSTRAINTS |
|---|---|---|
| Purple | The Otter Creek and the associated 100-year floodplain are located within the central portion of the route corridor along Route 17. | Approximately 0.50 acres of the 100-year floodplain associated with the Otter Creek crossing and the floodplain of the unnamed tributary, are located within the proposed route along Route 17. |
| Blue | The 100-year floodplain associated with the Otter Creek is located in the central portion of the route corridor. | Approximately 3.45 acres of the 100-year floodplain associated with the Otter Creek is present within the proposed route. |
| Pink | The 100-year floodplain associated with the Otter Creek is located within the route corridor. | Approximately 4.44 acres of the 100-year floodplain associated with the Otter Creek is present within the proposed route. |
| Green | The 100-year floodplain associated with the Otter Creek is located within the central portion of the route, west of Maple Street. | Approximately 4.89 acres of the 100-year floodplain associated with the Otter Creek is present within the proposed route. |
| Orange | The 100-year floodplain associated with an unnamed tributary of the Otter Creek and the 100-year floodplain associated with the Otter Creek.are located in the southern portion of the route corridor. | Approximately 0.62 acres, consisting mostly of the 100-year floodplain associated with an unnamed tributary of the Otter Creek and a sliver of the Otter Creek 100-year floodplain is present within the proposed route. |

### River Corridors

Potential constraints include route alternatives located within all river corridors, including small stream 50-foot setbacks. Table 4-4describes existing conditions based on preliminary analysis of existing information and potential constraints associated with each of the route alternatives.

Table 4-4 River Corridors Existing Conditions and Potential Constraints

| ROUTE ALTERNATIVE | EXISTING CONDITIONS | POTENTIAL CONSTRAINTS |
|---|---|---|
| Purple | An approximate 1,240 foot wide river corridor associated with the Otter Creek, a 210 foot wide river corridor associated with an unnamed tributary of the Little Otter Creek, and four 50-foot river corridors associated with tributaries of the Otter Creek is located within the route. | Approximately 2.50 acres of river corridor associated with the Otter Creek, approximately 0.04 acre of river corridor associated with Little Otter Creek, and approximately 0.77 acre of the 50' small stream river corridors, totaling 3.31 acres. |
| Pink | An approximate 830 foot wide river corridor associated with the Otter Creek and a 50-foot river corridor associated with a tributary of the Otter Creek is located within the route. | Approximately 4.90 acres of river corridor associated with the Otter Creek. |
| Blue | The width of the Otter Creek river corridor in the vicinity of the route is approximately 830 feet wide. In addition, a 50-foot river corridor associated with an unnamed tributary of the Otter Creek is located within the route. | Approximately 4 acres of river corridor associated with the Otter Creek, and approximately 0.04 acre of the 50-foot small stream river corridor, totaling 4.04 acres, is located within the route alternative. The alternative's Otter Creek river crossing is skewed and therefore, the river corridor width within the area of the crossing is 1,060 feet. |
| Green | An approximate 2,680 foot wide river corridor associated with the Otter Creek is located within the route. | Approximately 5.43 acres of river corridor associated with the Otter Creek is located within the route alternative. |
| Orange | An approximate 1,000 foot wide river corridor associated with the Otter Creek extends northeast of MacDonough Drive and a 50-foot river corridor associated with a tributary of the Otter Creek is located within the route. | Approximately 1.14 acres of river corridor associated with the Otter Creek and approximately 0.41 acre of the 50' small stream setback/river corridor, totaling 1.55 acres, is located within the route alternative. |

### 4.3.4 Next Steps

In order to comply with Executive Order 11988, Floodplain Management, an evaluation of potential effects of any actions taken within the floodplain, and alternatives to avoid any adverse effects will be considered. If a specific project requires the use of a floodplain, there will be an attempt to minimize potential impacts, and consistent with the regulations issued in accordance with section 2(d) of the EO, VTrans will prepare and circulate a notice containing an explanation of why the action is proposed to be located within the floodplain.

Similarly, in accordance with the Vermont Flood Hazard Area & River Corridor (FHA&RC) Rule (effective 3/1/2015), project should not adversely affect the public safety by increasing flood elevations, flood velocities, or decreasing flood storage volume. In addition, in accordance with Criterion 1(D) of Vermont's Act 250 (10 V.S.A. Chapter 151), projects proposed within flood hazard areas and/or river corridors should not impede floodwaters or cause increases in peak flood levels or flood-related erosion hazards. If a project impinges on a flood hazard area, it should be designed to withstand flooding and avoid causing any significant increase in the flood

elevation or flood-related erosion. If necessary, hydrologic and hydraulic analyses will be conducted during a future design phase to further evaluate the presence of floodplains and potential effects.

## 4.4 VEGETATIVE COMMUNITIES AND WILDLIFE HABITAT

Existing conditions and potential constraints of vegetative communities and wildlife habitat are based on review of available mapping data, such as data included in the VT ANR BioFinder mapper and Atlas, Vermont Wildlife Action Plan (2015), aerial imagery review, and field observations.

The existing roadside vegetation along the route alternative corridors include (ordered approximately by frequency) hayfields and other agricultural lands, maintained lawn areas, drainage and wetland areas, forested areas, and early successional woodlands.

Habitat block, as defined by the VT F&W, is *a contiguous area of natural vegetative cover with little or no permanent internal fragmentation from human development.* Habitat block boundaries are delimited by roads, other forms of permanent development, and agricultural lands. Habitat blocks can have varied habitat types, including interior forest habitat, forested and open wetlands, ponds and streams, cliffs, rock outcrops, and early successional forest. Habitat blocks were evaluated as part of this PEL because they provide many ecological and biological values critical for protecting native species, natural systems, and are part of the larger goal of conserving Vermont's biological diversity.

In addition to habitat blocks, wildlife road crossings, mapped by VT F&W were evaluated. Wildlife road crossings are locations where wildlife are likely to cross over roads where there is forest shrubland and/or wetland on both sides. Crossings identify road segments with a high percentage of habitat block on both sides of the road. Priority wildlife road crossings are located within the Green and Purple Route Alternatives only.

Deer wintering areas (DWA) were evaluated as they provide critical winter habitat for the long term survival of white-tailed deer (*Odocoileus virginianus*). DWAs are generally characterized by rather dense softwood (conifer) cover, such as hemlock, balsam fir, red spruce, or white pine. They are essential to maintain stable populations of deer in many years when and where yarding conditions occur. DWAs are located in the vicinity of the purple route. A large DWA, approximately 3,200 acres, is located south of Route 17 between Otter Creek and Route 22A. Two separate DWAs, approximately 290 and 42 acres, are located east of the Route 17 Otter Creek crossing, on the north and south sides of the road, respectively.

Managed by VT F&W, Wildlife Management Areas (WMA) conserve fish, wildlife and their habitat, while providing people with opportunities for fish and wildlife-based recreation. The Lower Otter Creek WMA is located along the Otter Creek and overlaps with a small portion of

the blue route near the Otter Creek crossing. The Otter Creek Access, located on Route 17 in Weybridge overlaps with a small portion of the purple route. In addition, the purple route along the Weybridge/Addison town line comes within 2,550 feet of Snake Mountain WMA.

Table 4-5 describes potential habitat blocks and their ranking associated with each of the evaluated route alternatives.

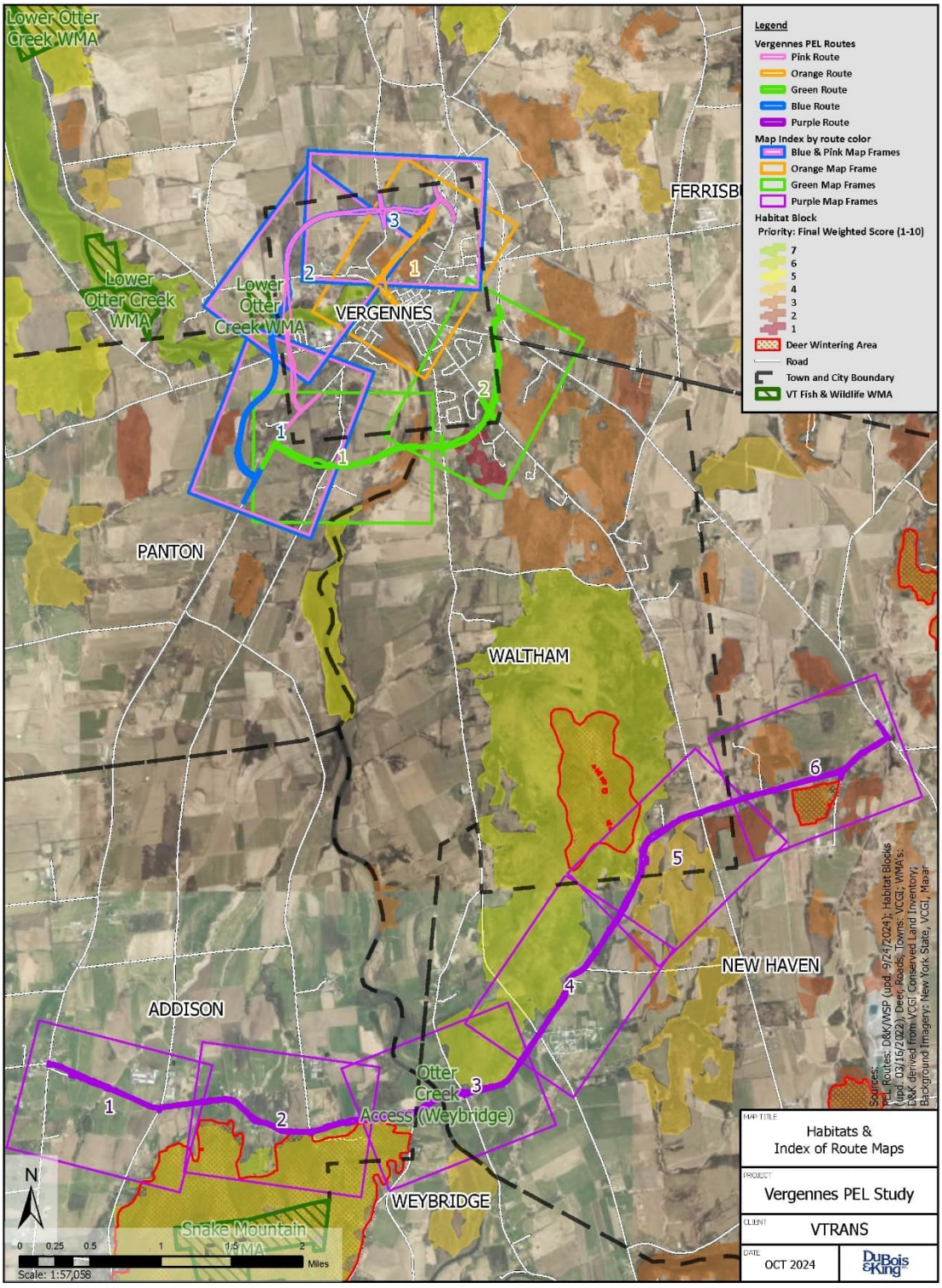
Table 4-5 Habitat Blocks and Ranking

| ROUTE ALTERNATIVE | EXISTING CONDITIONS | HABITAT BLOCK (PRIORITY RANK 1-10) | WILDLIFE ROAD CROSSING | DWA | WMA |
|---|---|---|---|---|---|
| Purple | The route passes through habitat blocks consisting of connectivity (high priority core habitat), interior forest, and surface water and riparian areas and overlaps with the Otter Creek Access area. Wildlife road crossings are located in four separate areas along the route. DWAs are located in three separate areas near the route. | 2, 3, 4, & 6 | X | X | X |
| Blue | The route passes through habitat blocks consisting of interior forest and surface water and riparian areas and overlaps with the Lower Otter Creek WMA. | 7 | — | — | X |
| Pink | The route passes through habitat blocks consisting of interior forest and surface water and riparian areas. | 7 | — | — | — |
| Green | The route passes through habitat blocks consisting of connectivity (core habitat), interior forest, and surface water and riparian areas. Wildlife road crossings are located at the intersection of the route and Green Street. | 1 & 3 | X | — | — |
| Orange | The route passes through habitat blocks consisting of surface water and riparian areas. | 3 | — | — | — |

Notes: X = Present within the vicinity of the route. — = Not Present
Habitat Block Priority Ranking: 1 (Lower Priority) to 10 (Higher Priority)
Existing conditions and resources within 500 feet of the route alternative were evaluated.

Habitat blocks, DWAs, and WMAs located within and surrounding the route alternatives are shown on Figure 4-16.

Figure 4-16 Habitats and Index for Route Alternatives



### 4.4.1 Potential Constraints

Table 4-6 presents habitat potential constraints for the route alternatives.

Table 4-6 Vegetative Communities and Wildlife Habitat Potential Constraints

| ROUTE ALTERNATIVE | POTENTIAL CONSTRAINTS |
|---|---|
| Purple | Approximately 0.27 acre of habitat block with a ranking of 4 is located within the route. |
| Blue | Approximately 1.89 acres of habitat block with a ranking of 7 is located within the route associated with the Otter Creek crossing. |
| Pink | Approximately 3.21 acres of habitat block with a ranking of 7 is located within the route associated with the Otter Creek crossing. |
| Green | A total of 7.80 acres, consisting of approximately 4.31 acres of habitat block with a ranking of 3, 2.33 acres with a ranking of 1, and 1.16 acres with a ranking of 3, is located within the route. |
| Orange | Approximately 0.79 acre of habitat block with a ranking of 3 is located within the route. |

Note: Habitat Block Priority Ranking: 1 (Lower Priority) to 10 (Higher Priority)

### 4.4.2 Next Steps

The project would be designed to avoid or mitigate any undue adverse impacts to significant habitat. If a project cannot be designed to avoid the destruction or significant threat to necessary wildlife habitat, then justification must be provided, which could include economic, social, or other benefit to the public; or continued application of preventing or lessening threat to habitat, such as wildlife crossing; or a reasonably acceptable alternative site is not owned or controlled by the applicant which would allow the development to meet its intended purpose.

Deer wintering areas and other necessary wildlife habitat are protected under Criterion 8(A) of Vermont's Act 250 (10 V.S.A. Chapter 151). Criterion 8(A) states that projects should not destroy or significantly threaten deer wintering areas or other necessary wildlife habitat. Also, if the project site itself does not contain necessary wildlife habitat, the project should not disrupt wildlife use of habitat that is located off of the project site.

## 4.5 RARE, THREATENED AND ENDANGERED SPECIES

Rare, threatened, and endangered (RTE) species consist of state and federally listed RTE animal and plant species. This section includes the review and evaluation of state listed uncommon species and state significant natural communities as well. Existing conditions and potential constraints are based on review of available mapping data, such as, VT ANR Atlas, USFWS IPaC, and field observations. In addition, RTE species identified in the vicinity of the routes as part of projects unassociated with this PEL were included in the evaluation

VT F&W have not mapped all locations and habitats of RTE. Therefore, if RTE or habitats have been documented within a half mile of the route alternative, that could be an indication that the habitat or species extends onto the project site. Therefore, the presence of species and significant natural communities within a half mile from the route alternatives were taken into consideration.

The Otter Creek, the longest river in Vermont, is known for its diverse mix of animal and plant species and supporting habitat. With the Otter Creek and associated diverse floodplains and wetlands flowing through the middle of the study area under all route alternatives, with the Blue and Pink routes alternatives directly linked to Lake Champlain hydrology where they cross below the fall line, and with calcareous forested ecosystems and clayplains known in surrounding uplands, it is likely that that the route alternatives provide significant habitat for multiple rare and uncommon species of animals and plants.

According to the VT ANR Atlas, RTE plant and animal species to the state of Vermont are located within or near the route alternatives. Additionally, the USFWS IPaC database, reviewed on October 7, 2024, lists endangered, proposed endangered, and candidate species in or near the study area (within a half mile). The IPaC did not identify any critical habitat within the route alternatives study area.

According to the VT ANR Atlas, there has been observed summer range habitat for the Indiana bat (*Myotis sodalis*) within the towns within and surrounding the route alternatives study area, consisting of Addison, Ferrisburgh, New Haven, Panton, Vergennes, and Weybridge. There is the potential for summer range habitat for the Indiana bat for the town of Waltham. The nearest mapped Indiana bat hibernacula is located 17 miles south of the Purple Route Alternative.

Vermont Significant Natural Communities are the best-known examples of natural communities, which are defined as "*an assemblage of plants and animals that repeats across the landscape wherever similar environmental conditions occur. A natural community type is a concept, or a category, not a place. Each type is described by summarizing the known examples of the type, and these types are used to classify the landscape of Vermont. As more is learned over time, the classification continues to evolve*." Additionally, Mesic Clayplain Forest and Wet Clayplain Forest are both rare (S2) natural communities in Vermont that were once common in the Champlain Valley before much of these forests were converted to rich agricultural land. Examples of both natural communities are located within the vicinity of the route alternatives and more may be unmapped. There are a total of seven mapped significant natural communities located within and within a half mile of the route alternatives.

The RTE and significant natural communities located within and surrounding the route alternatives are shown on Figure 4-1 through Figure 4-13.

Table 4-7 lists the presence of species and significant natural community within and within a half mile from the route alternatives.

Table 4-7 Species and Significant Natural Community within Proximity to Route Alternatives

| Common Name | Scientific Name | State Listing / Rank[1] | Federal Listing / Rank | Route Alternative and Proximity[2] (mile)(# of occurrences) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Orange | Blue | Pink | Green | Purple |
| **Animals** | | | | | | | | |
| **Mammals** | | | | | | | | |
| Indiana bat | *Myotis sodalis* | E | E | O | O | O | 0.34 | 0.02-0.5 (7) |
| Northern long-eared bat | *Myotis septentrionalis* | E | E | UK | UK | UK | UK | 0.48 (1) |
| Tri-colored bat | *Perimyotis subflavus* | E | PE | UK | UK | UK | UK | UK |
| Monarch butterfly | *Danaus plexippus* | — | C | UK | UK | UK | UK | UK |
| **Fishes** | | | | | | | | |
| Eastern Silvery Minnow | *Hybognathus regius* | S3S4 | — | 0.04 | 0 | 0 | — | — |
| Silver Lamprey | *Ichthyomyzon unicuspis* | S2 | — | 0.03 | 0 | 0 | — | — |
| Eastern Sand Darter | *Ammocrypta pellucida* | T/S1 | — | 0.03 | 0 | 0 | — | — |
| Spotfin Shiner | *Cyprinella spiloptera* | S3S4 | — | 0.04 | 0 | 0 | — | — |
| Brook Silverside | *Labidesthes sicculus* | SU | — | 0.04 | 0 | 0 | — | — |
| Channel Darter | *Percina copelandi* | E/S1 | — | 0.03 | 0 | 0 | — | — |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Lake Sturgeon | *Acipenser fulvescens* | E/S1 | — | 0.03 | 0 | 0 | — | — |
| Spindle Lymnaea | *Acella haldemani* | S1S3 | — | 0.03 | 0 | 0 | — | — |
| **Amphibians** | | | | | | | | |
| Blue-spotted Salamander | *Ambystoma laterale* | S3 | — | — | — | — | 0-0.03 (2) | 0-0.33 (5) |
| Mudpuppy | *Necturus maculosus* | S2 | — | 0 | 0 | 0 | — | — |
| **Mussels** | | | | | | | | |
| Pink Heelsplitter | *Potamilus alatus* | E/S2 | — | 0.02 | 0 | 0 | — | — |
| Creeper | *Strophitus undulatus* | S3 | — | 0.04 | 0 | 0 | — | — |
| Giant Floater | *Pyganodon grandis* | T/S2S3 | — | 0.02 | 0 | 0 | 0 | — |
| Black Sandshell | *Ligumia recta* | E/S1 | — | 0.03 | 0 | 0 | — | — |
| Fragile Papershell | *Leptodea fragilis* | E/S2 | — | 0.02 | 0 | 0 | — | — |
| Flutedshell | *Lasmigona costata* | E/S2 | — | 0.02 | 0 | 0 | 0 | — |
| Pocketbook | *Lampsilis ovata* | E/S2 | — | 0.02 | 0 | 0 | 0 | — |
| Creek Heelsplitter | *Leptodea fragilis* | S2 | — | — | — | — | 0 | — |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Triangle Floater | *Alasmidonta undulata* | S3 | — | — | — | — | — | — |
| **Birds** | | | | | | | | |
| Upland Sandpiper | *Bartramia longicauda* | E/S2B | — | — | 0.14-0.45 (3) | 0.14-0.45 (3) | — | 0.32 |
| Eastern Meadowlark | *Sturnella magna* | T/S2B | — | — | 0.33 | 0.33 | — | — |
| Golden-winged Warbler | *Vermivora chrysoptera* | S3B | UR | — | — | — | — | 0 |
| Osprey | *Pandion haliaetus* | S3B | — | — | — | — | — | 0 |
| **Plants** | | | | | | | | |
| Cursed Crowfoot | *Ranunculus sceleratus var. sceleratus* | S3 | — | 0.03 | — | — | — | — |
| Red-root Flatsedge | *Cyperus erythrorhizos* | S2S3 | — | 0.03 | — | — | — | — |
| Creeping Love-grass | *Eragrostis hypnoides* | S3 | — | 0.03 | — | — | — | — |
| Tufted Beggar-ticks | *Bidens tripartita ssp. comosa* | SU | — | 0.03 | — | — | — | — |
| Blunt-leaf Sandwort | *Moehringia lateriflora* | S3S4 | — | — | — | — | 0.32 | — |
| Virginia Spring Beauty | *Claytonia virginica* | S2 | — | — | — | — | 0.38 | — |
| Large Marsh Bedstraw | *Galium obtusum ssp. obtusum* | S2S3 | — | — | — | — | 0.38 | — |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Handsome Sedge | *Carex formosa* | S3 | — | — | 0 | 0 | — | — |
| Grey’s sedge | *Carex grayi* | S3 | — | — | 0 | 0 | — | — |
| Troublesome Sedge | *Carex molesta* | S1 | — | — | 0.20 | 0.20 | — | — |
| American Bittersweet | *Celastrus scandens* | S3 | — | — | — | — | — | 0 |
| Greene's Rush | *Juncus greenei* | E/S2 | — | — | — | — | — | 0.37 |
| Short-styled Snakeroot | *Sanicula canadensis var. canadensis* | S2S3 | — | — | — | — | — | 0.46 |
| Hairy Sedge | *Carex trichocarpa* | S3 | — | — | — | — | — | 0.29 (2) |
| Bristly Crowfoot | *Ranunculus pensylvanicus* | S3 | — | — | — | — | — | 0.26 |
| Panicled Tick-trefoil | *Desmodium paniculatum* | S3 | — | — | — | — | — | 0 |
| Coffee Tinker's-weed | *Triosteum aurantiacum var. aurantiacum* | S3 | — | — | — | — | — | 0.33 |
| Back's Sedge | *Carex backii* | S3 | — | — | — | — | — | 0.30 |
| Rock Spikemoss | *Selaginella rupestris* | S3 | — | — | — | — | — | 0.23 |
| Fragrant Sumac | *Rhus aromatica var. aromatica* | S3 | — | — | — | — | — | 0.28 |
| American Ginseng | *Panax quinquefolius* | S3 | — | — | — | — | — | 0.20 |

| **Significant Natural Community** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Silver Maple-Sensitive Fern Floodplain Forest | S3 | — | 0.30 | 0 | 0 | — | — |
| Deep Bulrush Marsh | S4 | — | — | 0.65 | 0.75 | — | — |
| Mesic Clayplain Forest | S2 | — | — | — | — | — | 0.43 |
| Temperate Calcareous Outcrop | S3 | — | — | — | — | — | 0 |
| Dry Transition Hemlock Forest | S4 | — | — | — | — | — | 0.05 |
| Oak-Maple Limestone Talus Woodland | S23 | — | — | — | — | — | 0.30 |
| Mesic Maple-Ash-Hickory-Oak Forest | S3 | — | — | — | — | — | 0 |

[1]E = Endangered, T = Threatened, PE = Proposed Endangered, C = Candidate, O = Observed
S1 = Very rare, S2 = Rare (Imperiled), S3 = Uncommon (Vulnerable), 4 - Common to uncommon (Apparently secure), B - Indicates the preceding rank is for breeding populations, U = Unrankable, UK = Unknown, UR = Under Review
[2] Proximity of the RTEs included identification of the RTEs within ½ of the route alternatives.. A distance of 0 indicates the RTE is mapped within the route footprint. If there is more than 1 occurrence of an RTE, it is provided in parentheses.

In this heavily agricultural Champlain Valley location, rich in valley clayplain ecosystems, there is high potential for invasive species within the right-of-way through all the proposed routes. Invasive plant species currently known along the Blue and Pink Route Alternatives from previous projects include common buckthorn (*Rhamnus cathartica*), Morrow honeysuckle (*Lonicera morrowii*), wild parsnip (*Pastinaca sativa*), moneywort (*Lysimachia nummularia*).

### 4.5.1 Potential Constraints

In general, the route alternatives bisect, or in the case of the Orange Route Alternative, are in close proximity to the Otter Creek and its floodplains which provide diverse habitat for RTE and uncommon animal and plant species. Table 4-8 provides the number of animal and plant species mapped within the route alternative footprint and within a half mile of the route alternatives. In addition, the number of significant natural communities within and within a half mile of the route alternatives and acreage within the route alternatives is included.

Table 4-8 Animal and Plant Species Potential Constraints

| ROUTE ALTERNATIVE | POTENTIAL CONSTRAINTS WITHIN ROUTE ALTERNATIVE[1] | | |
|---|---|---|---|
| | RTE[2] ANIMAL / PLANT | UNCOMMON ANIMAL / PLANT | SIGNIFICANT NATURAL COMMUNITIES |
| Purple | 3/0 | 5/2 | 2 (0.60 acre) |
| Blue | 15/0 | 3/2 | 1 (0.64 acre) |
| Pink | 15/0 | 3/2 | 1 (0.97 acre) |
| Green | 7/0 | 1/0 | 0 |
| Orange | 4/1 | 0/0 | 0 |
| ROUTE ALTERNATIVE | POTENTIAL CONSTRAINTS OUTSIDE OF ROUTE ALTERNATIVE[1] | | |
| | RTE ANIMAL / PLANT | UNCOMMON ANIMAL / PLANT | SIGNIFICANT NATURAL COMMUNITIES |
| Purple | 10/2 | 2/8 | 1 |
| Blue | 7/1 | 0/0 | 1 |
| Pink | 7/1 | 0/0 | 1 |
| Green | 4/2 | 1/1 | 0 |
| Orange | 13/0 | 3/2 | 1 |

[1] Includes unknown presence of T/E bats and separate mapped occurrences of species.
[2] Includes state or federally listed RTE.

### 4.5.2 Next Steps

Consultation with VT F&W and USFWS would continue regarding studies and effects determination as part of NEPA and Section 7 of the Endangered Species Act. Once a project is defined, VT F&W would be contacted to confirm the mapped species of concern in the project area. If necessary, based on potential impacts, site visits and habitat evaluations would be performed to confirm the presence of fish, wildlife and plant species, including invasive species

that are located within the area to be impacted by a specific project. Bat habitat surveys may be required to determine the presence of protected bats in order to avoid project impacts to their habitat or take of the species

If a field survey and site species assessment confirms the presence of any of these species in areas that would be impacted by a specific project, appropriate measures would be taken during design and construction to avoid any direct, indirect, and cumulative impacts to the species or their habitat. Precautions will be taken to prevent the introduction of invasive species during project design and construction.

RTE and other necessary wildlife habitat are protected under Criterion 8(A) of Vermont's Act 250 (10 V.S.A. Chapter 151). Criterion 8(A) states that projects should be designed to avoid impacts to RTE, necessary habitat, and RTE designated (critical) habitat.

## 4.6 FARMLAND

Based on a review of the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) soil survey data for Addison County and the VT ANR Atlas, the route alternatives are located through soil map units classified as Prime Farmland and Farmland of Statewide Importance by the NRCS. There are no soil map units classified as Unique Farmland or Farmland of Local Importance within the route alternatives. The relevant farmland soils are defined as follows:

- Prime - Soil map units that have the best combination of physical and chemical characteristics for producing food, feed fiber, forage, and oilseed crops and are also available for these uses.
- Statewide - Land, in addition to Prime and Unique, that is of statewide importance for the production of food, feed, fiber, forage, and oilseed crops.

The majority of farmland within the route corridors is classified as Farmland of Statewide Importance. Some farmland soils mapped within the route corridors are limited by wetness from an agricultural standpoint. These soils mostly occur between Panton Road and Route 22A and tend to be associated with hydric soils.

Primary agricultural soils located within and surrounding the route alternatives are shown on Figure 4-17 through Figure 4-31.

### 4.6.1 Potential Constraints

Table 4-9 describes existing conditions based on preliminary analysis of existing information and potential constraints associated with each of the evaluated route alternatives. Only farmland that would be directly impacted by the route alternatives were identified.

Table 4-9 Farmland Existing Conditions and Potential Constraints

| ROUTE ALTERNATIVE | EXISTING CONDITIONS | POTENTIAL CONSTRAINTS |
|---|---|---|
| Purple | Prime and Statewide Farmland is present. | Approximately 29.2 acres of prime and statewide farmland are located along most of the route, consisting of 90% of the Route 17 section. |
| Blue | Prime and Statewide Farmland is present. | Approximately 21.87 acres of prime and statewide farmland are located along most of the route, consisting of 27% of the route. |
| Pink | Prime and Statewide Farmland is present. | Approximately 26.16 acres of prime and statewide farmland are located along most of the route, consisting of 35% of the route. |
| Green | Farmland of Statewide Importance is present. | Approximately 21.87 acres of statewide farmland are located along most of the route, consisting of 31% of the route. |
| Orange | Farmland of Statewide Importance is present. | Approximately 6.32 acres of statewide farmland are located along most of the route, consisting of 30% of the route. |

The Vermont Agency of Agriculture, Food and Markets and the NRCS protect farmland under 10 VSA Chapter 151 and the Farmland Protection Policy Act (FPPA), respectively. In accordance with Vermont's Act 250, most route alternatives would have to comply with the following criteria:

- For all projects, demonstrate that the project will not significantly interfere with or jeopardize the continuation of agriculture or forestry on adjoining lands or reduce their potential; and
- For projects located outside of a designated area (i.e. downtown Vergennes), the applicant must demonstrate that there are no lands other than primary agricultural soils owned or controlled by the applicant that are reasonably suited to the purpose of the project; and
- For projects located outside of a designated area, the applicant must demonstrate the project has been planned to minimize the reduction of agricultural potential of the primary agricultural soils through innovative land use design resulting in compact development patterns, so that the remaining primary agricultural soils on the project tract are capable of supporting or contributing to an economic or commercial agricultural operation; and
- For all projects, the applicant must provide "suitable mitigation" for any reduction in the agricultural potential of the primary agricultural soils caused by the project.

### 4.6.2 Next Steps

The Vermont Agency of Agriculture, Food and Markets has potential jurisdiction through the Vermont State Agriculture, Food and Markets Law and the department will be invited to participate in future NEPA processes.

Further evaluation of primary agricultural land is required to determine if there is the potential for impact as a result of a specific project, once properly defined. If necessary, the U.S. Department of Agriculture Farmland Conversion Impact Rating (Form AD-1006) will be completed and submitted to the NRCS, followed by consultation with the NRCS. NRCS would determine whether the site is farmland subject to the Farmland Protection Policy Act (FPPA). If so, the impacted farmland is scored using the AD-1006 form. The higher the score the potential impact severity increases. The scoring would aid the federal lead agency in determining the suitability of the site for protection as farmland, and therefore the relative impact of the proposed action or alternative(s) on farmland resources. Use of land that is not farmland and alternative sites, locations, and designs that would serve the project purpose but convert either

fewer acres of farmland or other farmland that has a lower relative value should be considered.

In addition, an impact assessment for primary agricultural soils would be required under Criterion 9(B) of Vermont's Act 250 to determine project impacts and potential mitigation.

## 4.7 CONSERVED LANDS AND PARKLAND AND RECREATION AREAS

Based on the VTANR Atlas and available data, there are private conserved lands located along US Route 7, Routes 17, Route 22A, and Comfort Hill Road. All conserved lands are managed by the Vermont Land Trust (VLT) and most consist of conservation easements with no public access. The largest connected block of conserved lands adjacent to a route alternative is located south of Route 17 in the town of New Haven. This approximate 550-acre block of conserved land allows limited public access. In addition, an approximate 26-acre parcel associated with the Lower Otter Creek Wildlife Management Area (WMA) is located between Sand Road in Ferrisburgh and Otter Creek. The Lower Otter Creek WMA includes 755 acres of wetland and floodplain forest near the mouth of Otter Creek in Ferrisburgh. The WMA is owned by the State of Vermont and managed by the VT F&W.

Most of the conserved lands have been assigned levels of land conservation under Vermont's Act 59. Act 59, which became law on June 12, 2023, establishes goals of conserving 30 percent of the land of the state by 2030 and 50 percent by 2050. It requires the Vermont Housing and Conservation Board to develop an inventory of the existing conserved lands in the State and a plan on how to reach the goals. The most restrictive level is an Ecological Reserve Area, which is essentially a wilderness designation. This level is not located within or in the vicinity of the route alternatives. The second is a Biodiversity Conservation Area, which envisions "an area having permanent protection from conversion for the majority of the area and that is managed for the primary goal of sustaining species or habitats. These areas may include regular, active interventions to address the needs of particular species or to maintain or restore habitats." The third level is termed a Natural Resource Management Area, which is "an area having permanent protection from conversion for the majority of the area but that is subject to long-

term, sustainable land management." A majority of the conserved lands within and adjacent to the study area are categorized as Natural Resource Management Areas. Three areas are categorized as Biodiversity Conservation Areas, including the 26-acre Lower Otter Creek WMA parcel and areas along Route 17. The remaining conserved land parcels are uncategorized areas.

VTrans conservation easements are located near the intersection of US Route 7 and Route 22A.

Vergennes town owned parks and trails are located along Otter Creek including MacDonough Park and Falls Park located on Mechanics Street and MacDonough Drive downstream of the Otter Creek Falls and Settlers Park located upstream. Falls Park has municipal docks available to the public.

Additional properties associated with park and recreational areas include the Addison County fairgrounds and an Otter Creek boat launch/access area both located on Route 17. Addison County fairgrounds are located on the south side of Route 17 in the town of New Haven. The approximate 128-acre property is owned by Addison County Field Days, Inc. The Otter Creek - Kwonumosk boat launch and fishing access property, owned by VT F&W, is located on the north side of Route 17 in the town of Weybridge. The approximate 0.37-acre access area has a gravel driveway, parking area for five cars, and informational kiosk.

Based on consultation with the Vermont Department of Forests, Parks and Recreation and review of the United States Department of the Interior (DOI) National Park Service (NPS) Land and Water Conservation Fund project list, the only parkland or facility within the study area that has been partially or fully federally funded through the Land and Water Conservation Act (Section 6(f)) is the Vergennes Falls Park. The Vergennes Falls Park is located on the south side of Otter Creek, outside of the footprints of the evaluated routes.

Conserved lands and parkland and recreational areas within and surrounding the route alternatives are shown on Figure 4-17 through Figure 4-31.

Figure 4-17 Farmland, Conserved, and Parklands, Purple Route Alternative, Page 1

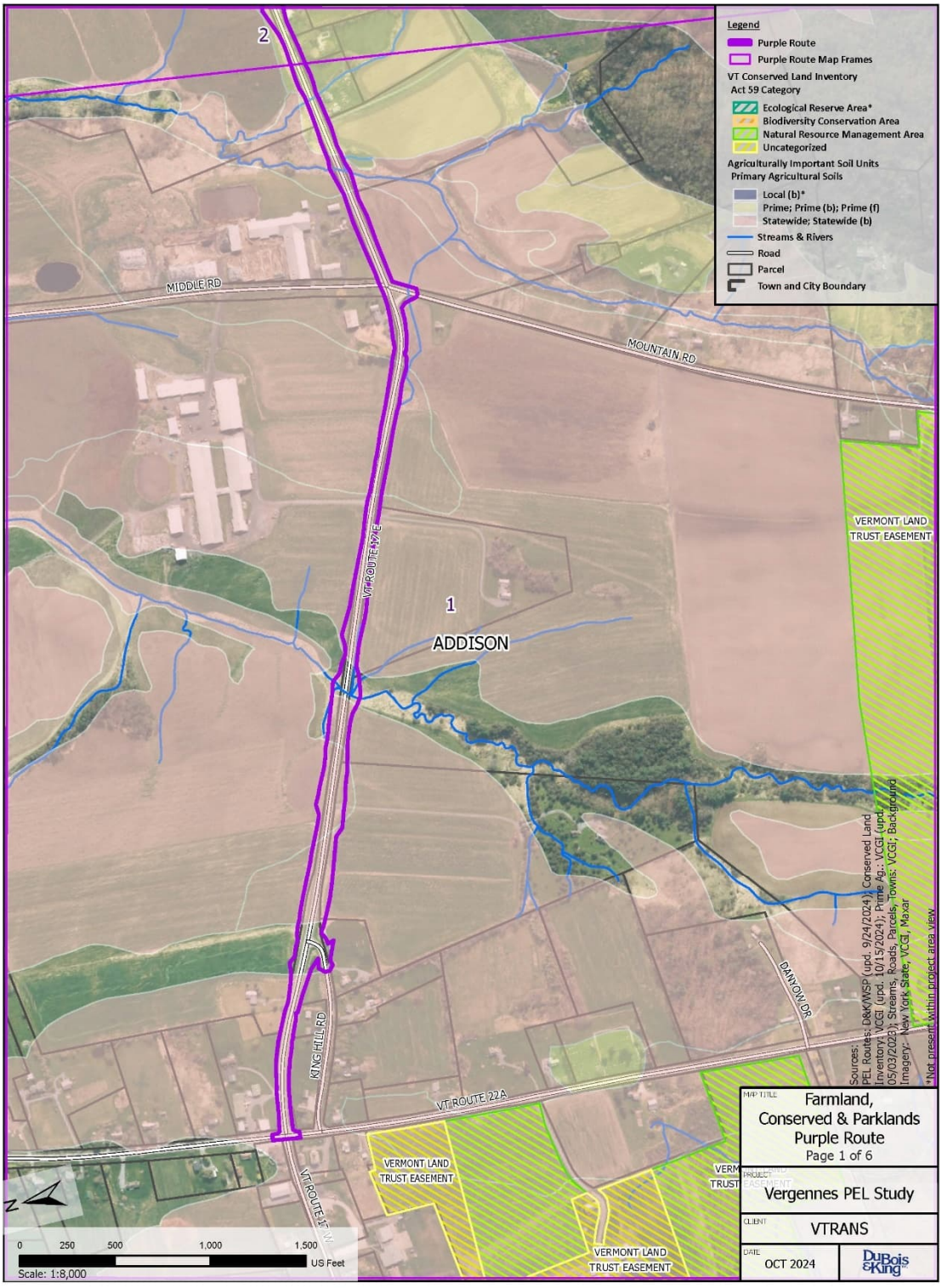


Figure 4-18 Farmland, Conserved, and Parklands, Purple Route Alternative, Page 2

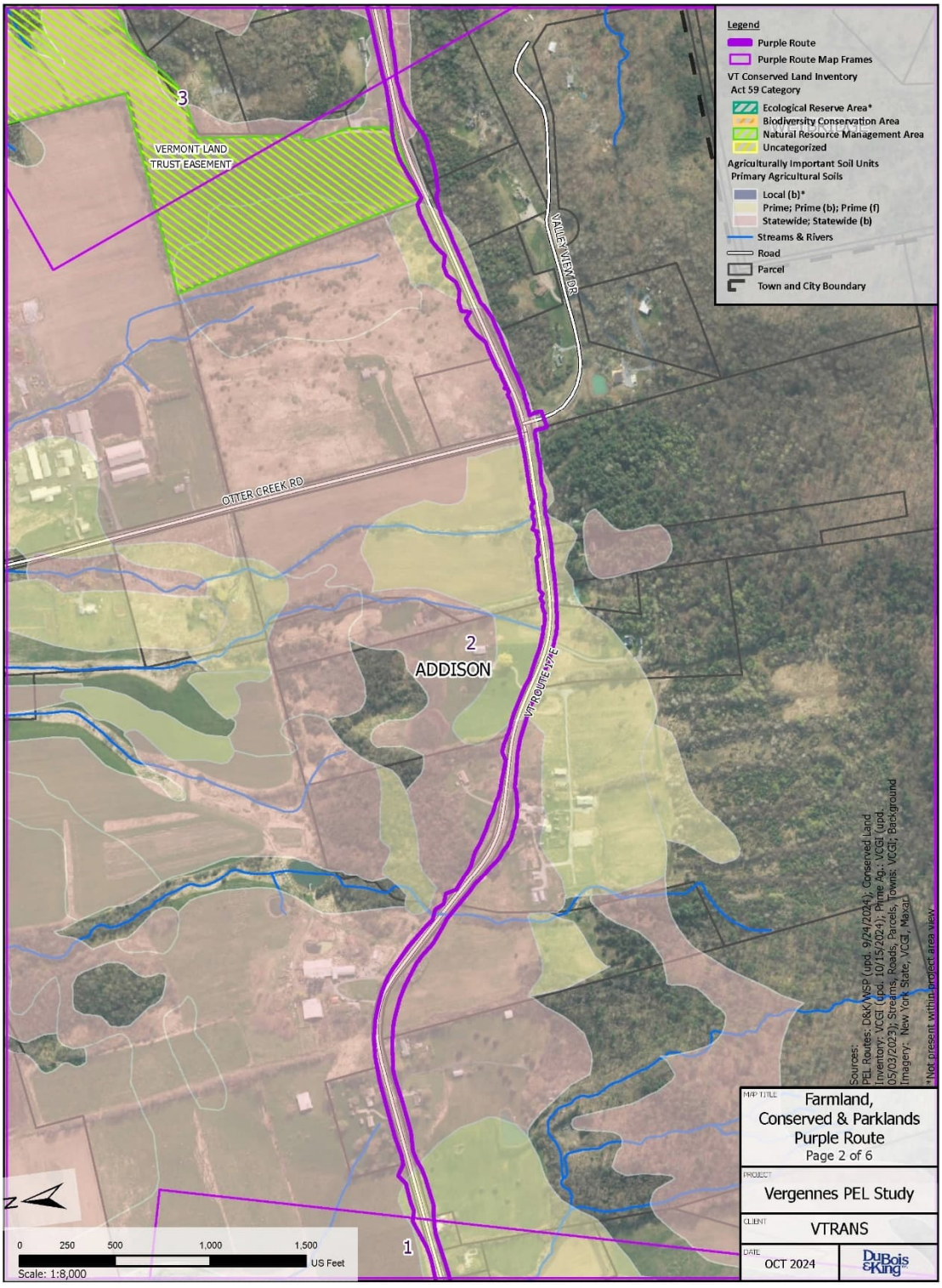


Figure 4-19 Farmland, Conserved, and Parklands, Purple Route Alternative, Page 3

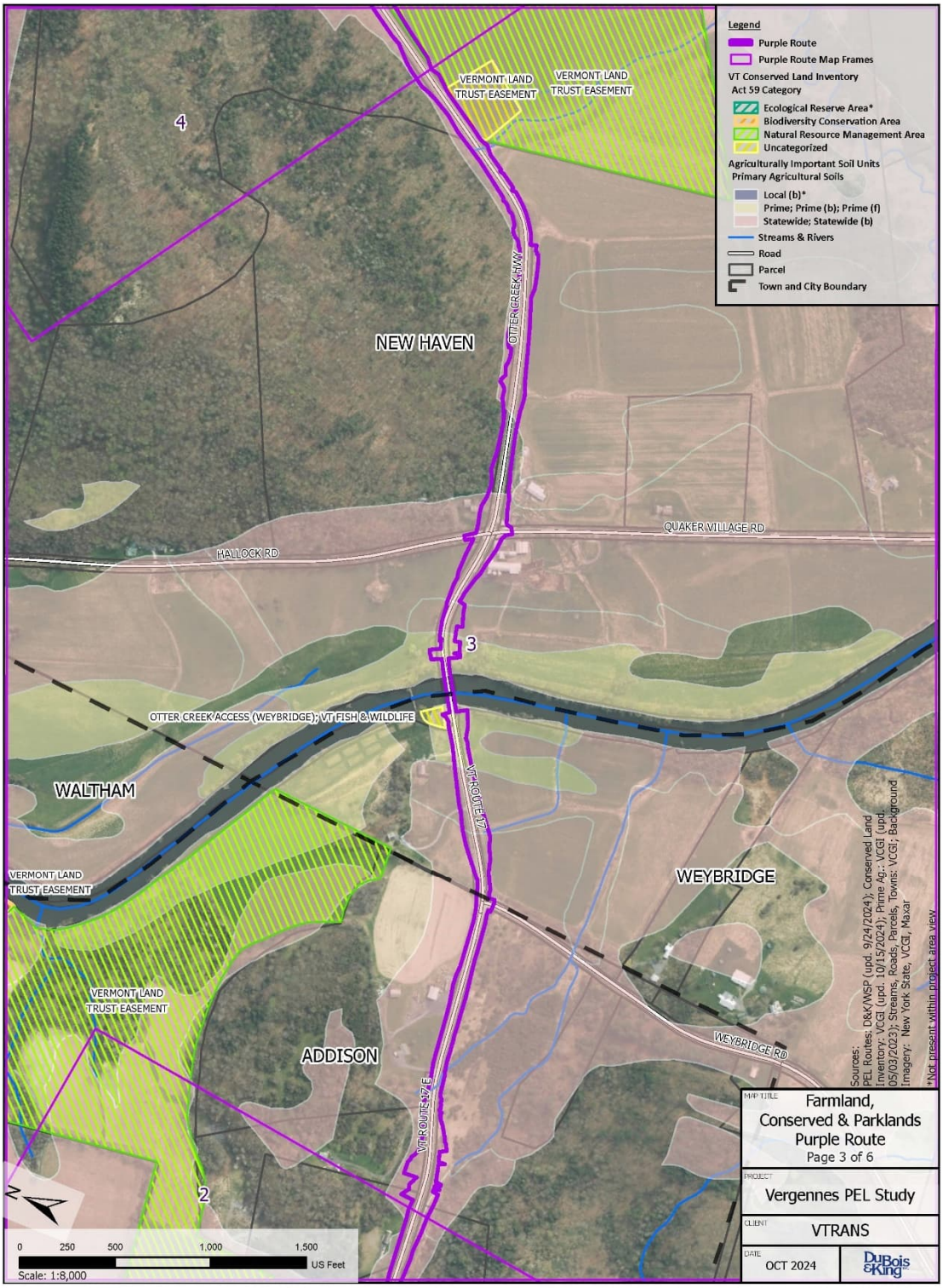


Figure 4-20 Farmland, Conserved, and Parklands, Purple Route Alternative, Page 4

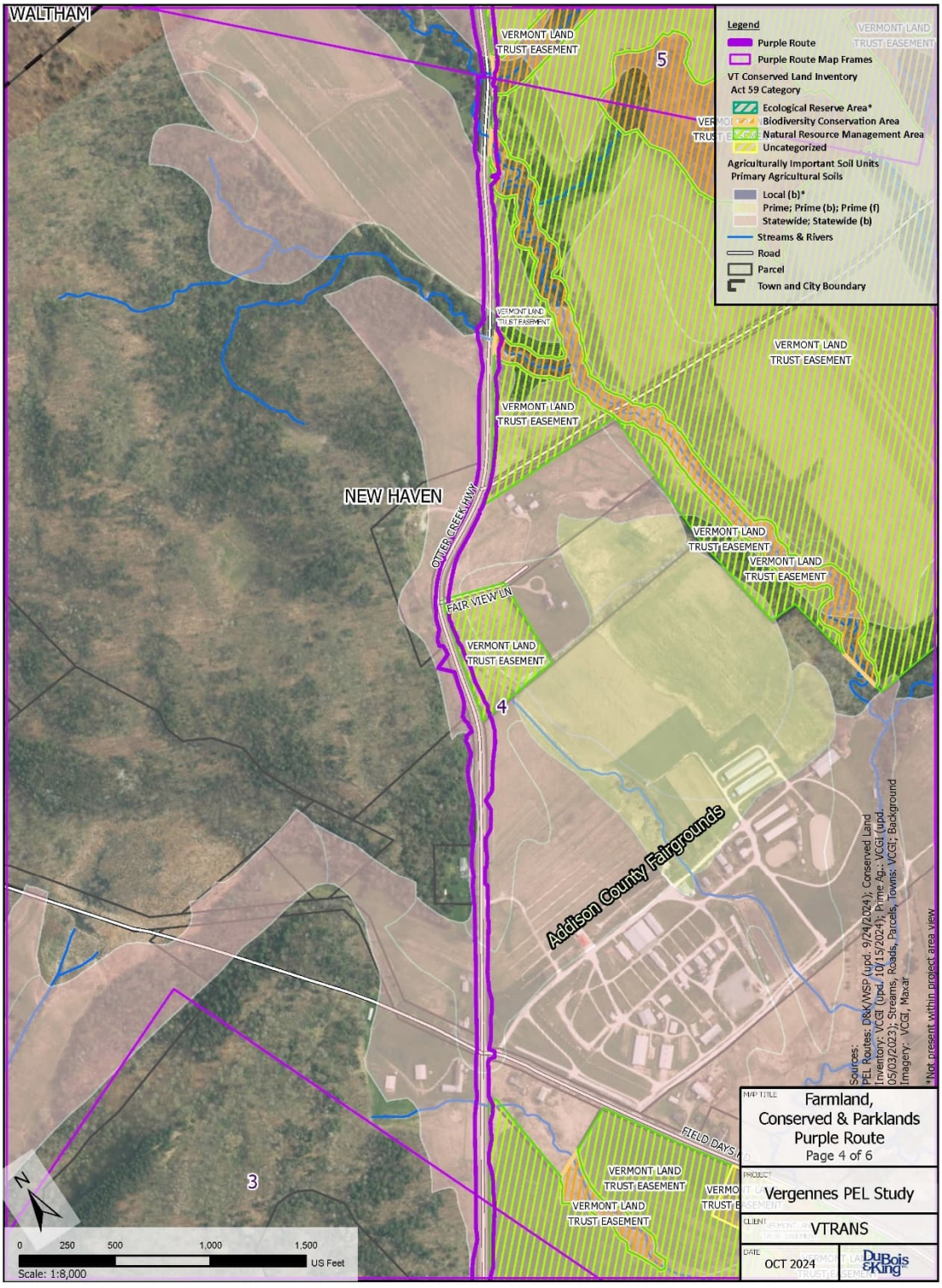


Figure 4-21 Farmland, Conserved, and Parklands, Purple Route Alternative, Page 5

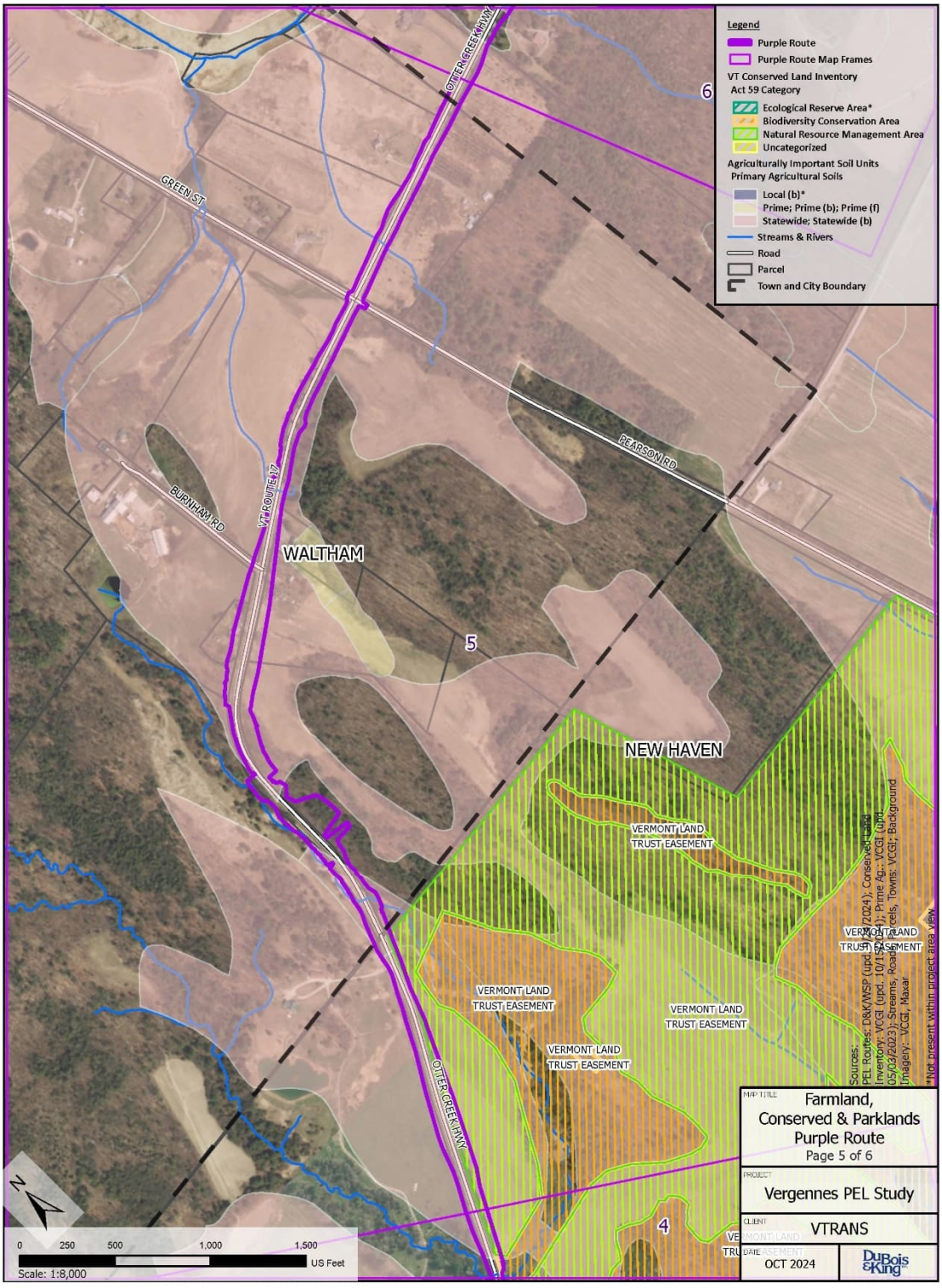


Figure 4-22 Farmland, Conserved, and Parklands, Purple Route Alternative, Page 6

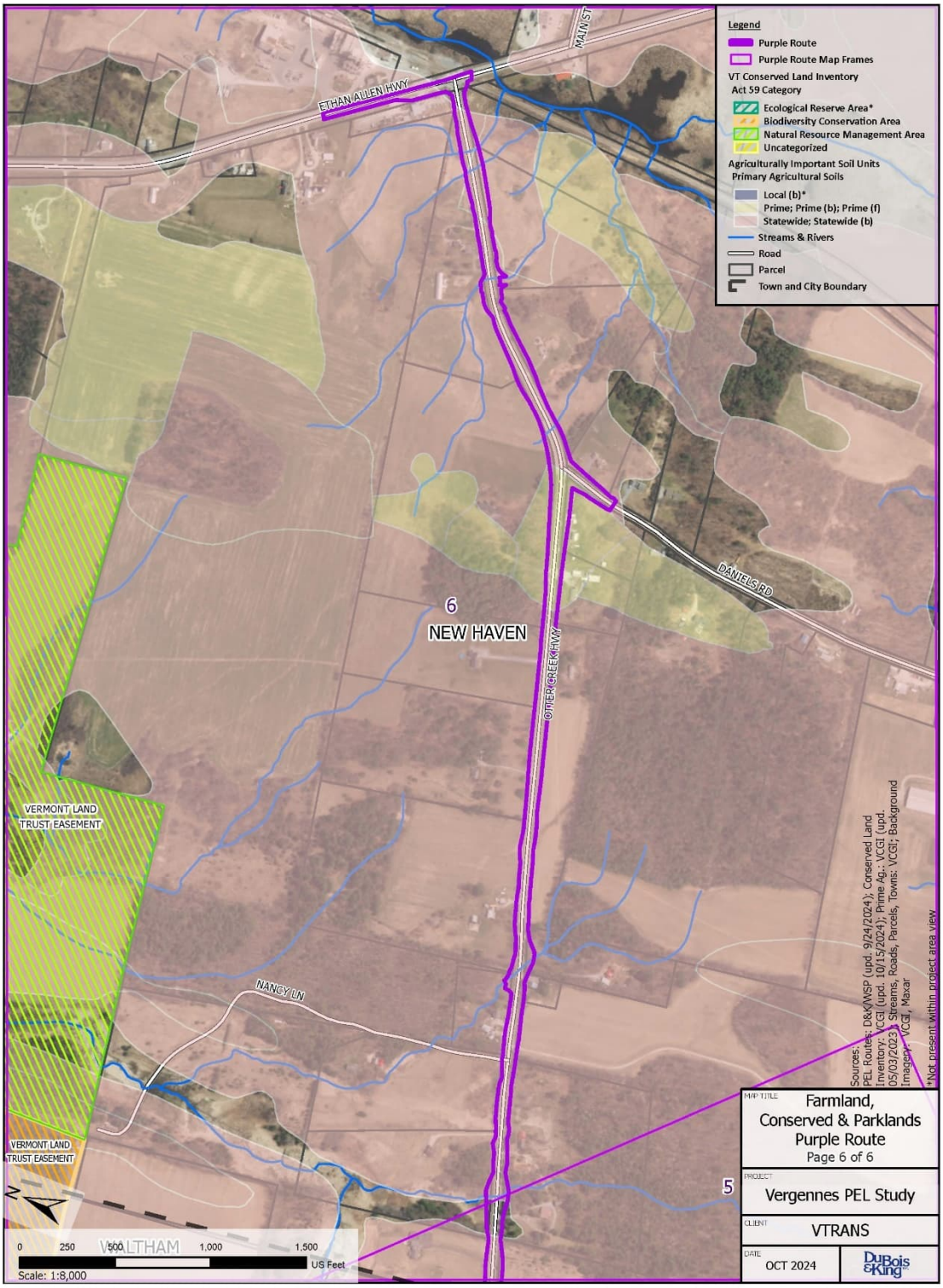


Figure 4-23 Farmland, Conserved, and Parklands, Blue Route Alternative, Page 1

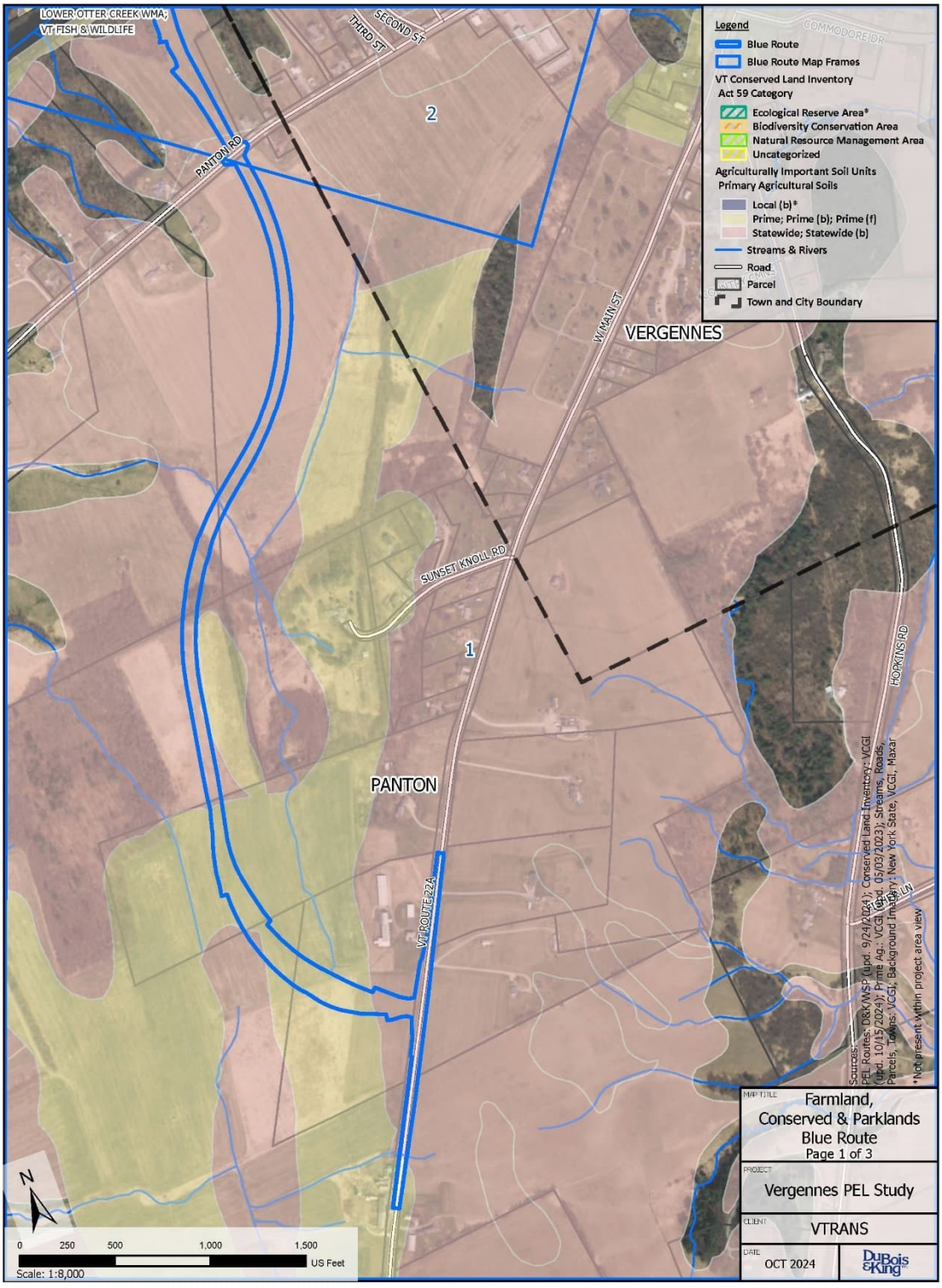


Figure 4-24 Farmland, Conserved, and Parklands, Blue Route Alternative, Page 2

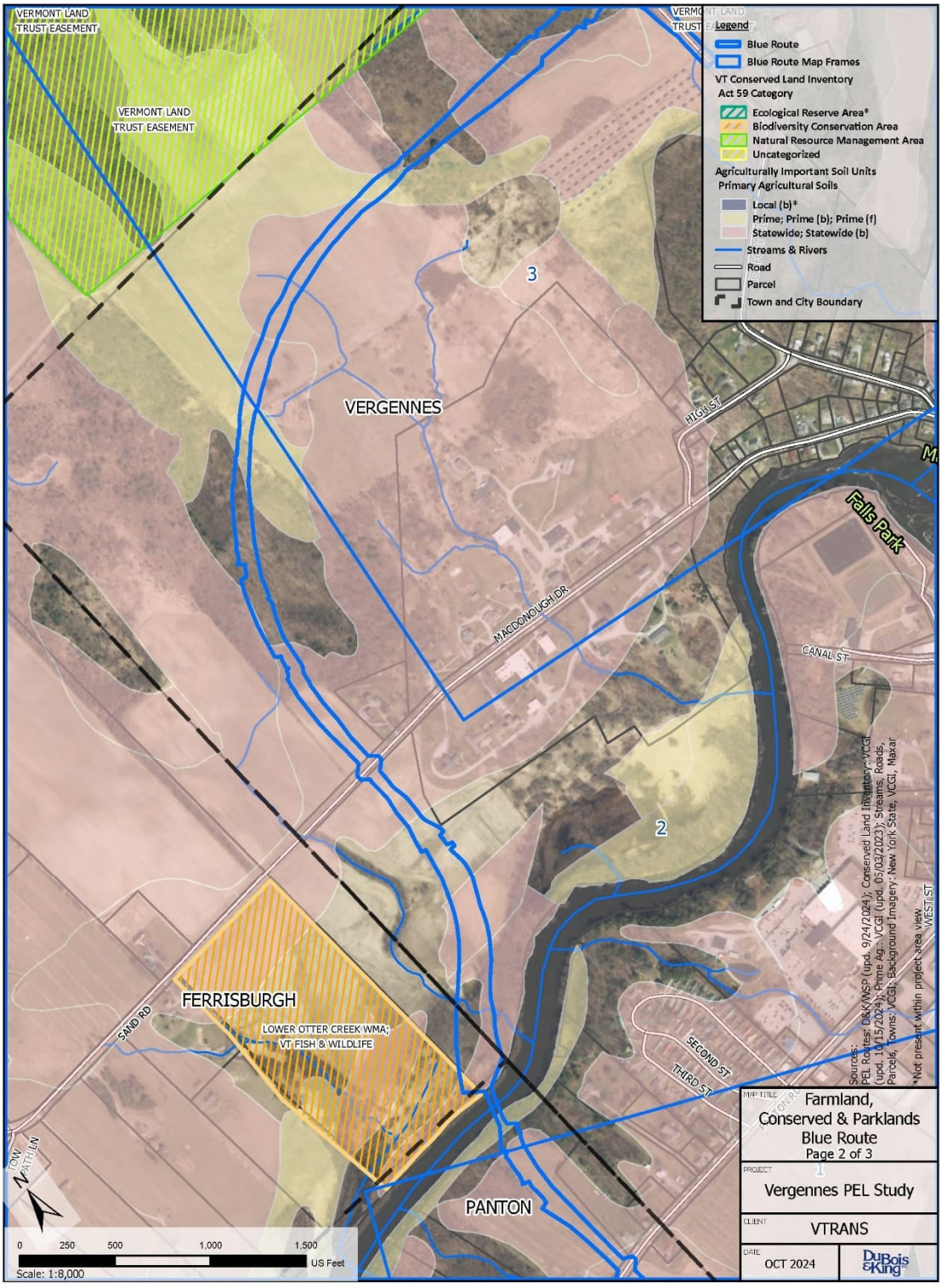


Figure 4-25 Farmland, Conserved, and Parklands, Blue Route Alternative, Page 3

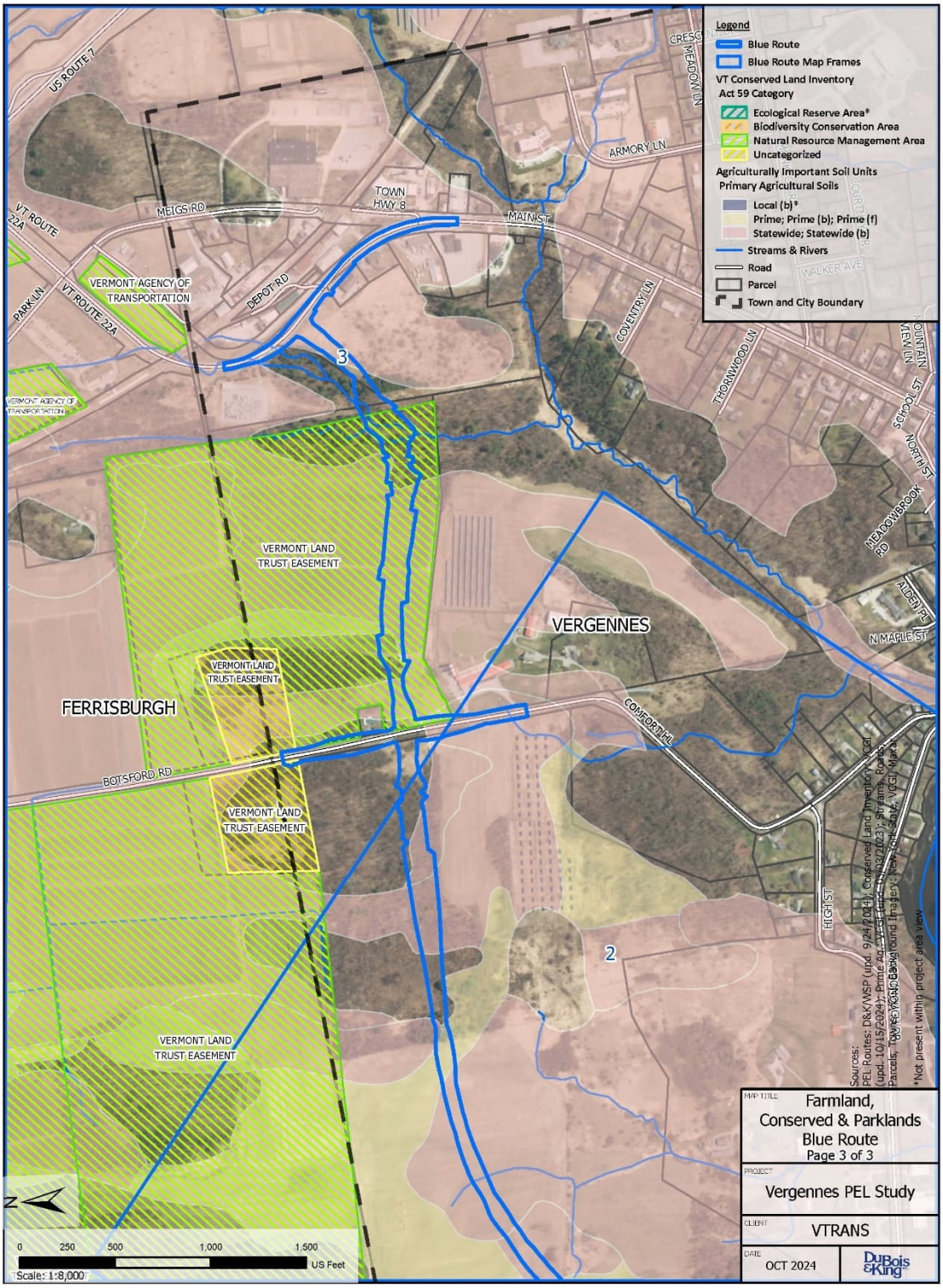


Figure 4-26 Farmland, Conserved, and Parklands, Pink Route Alternative, Page 1

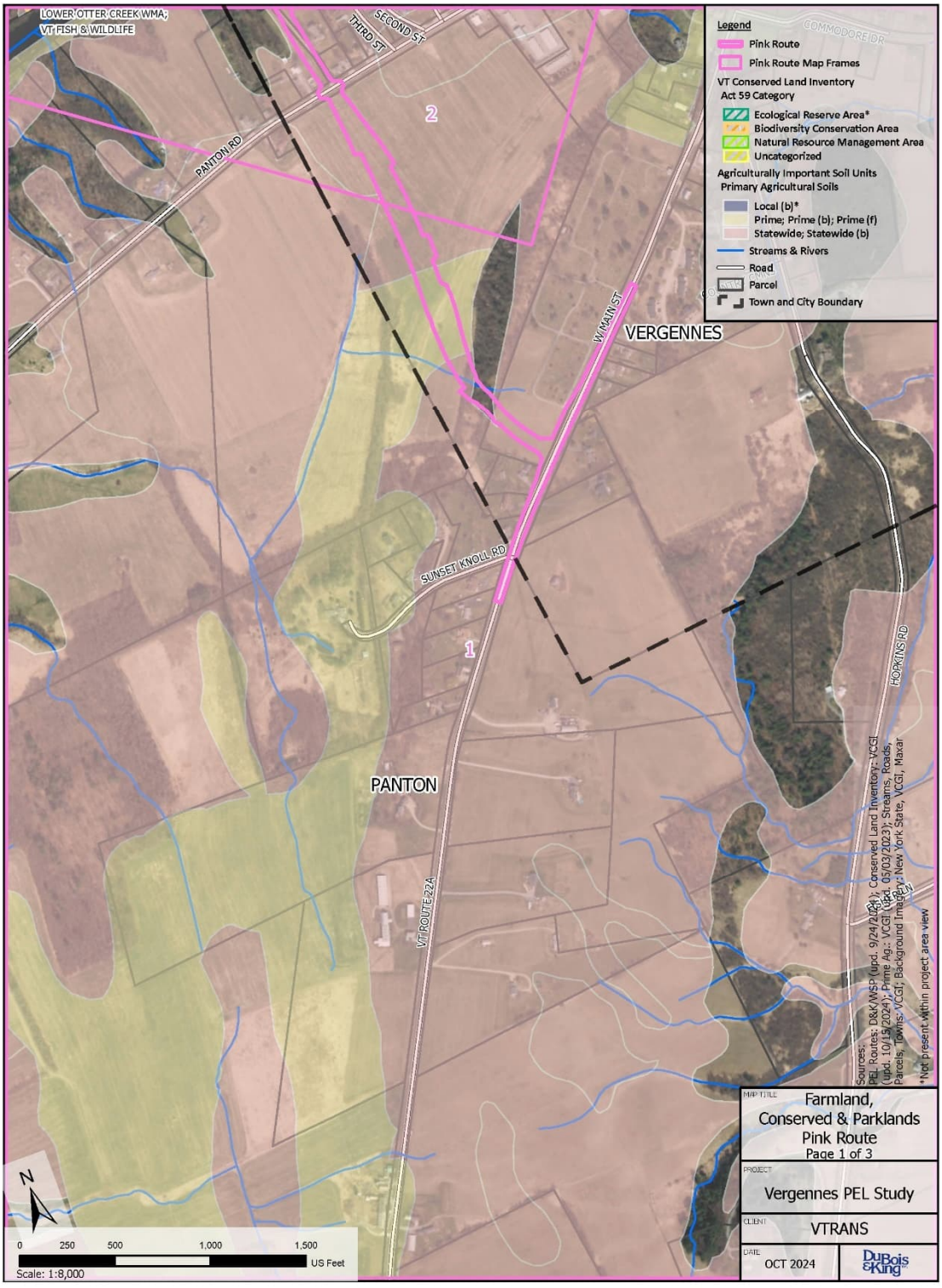


Figure 4-27 Farmland, Conserved, and Parklands, Pink Route Alternative, Page 2

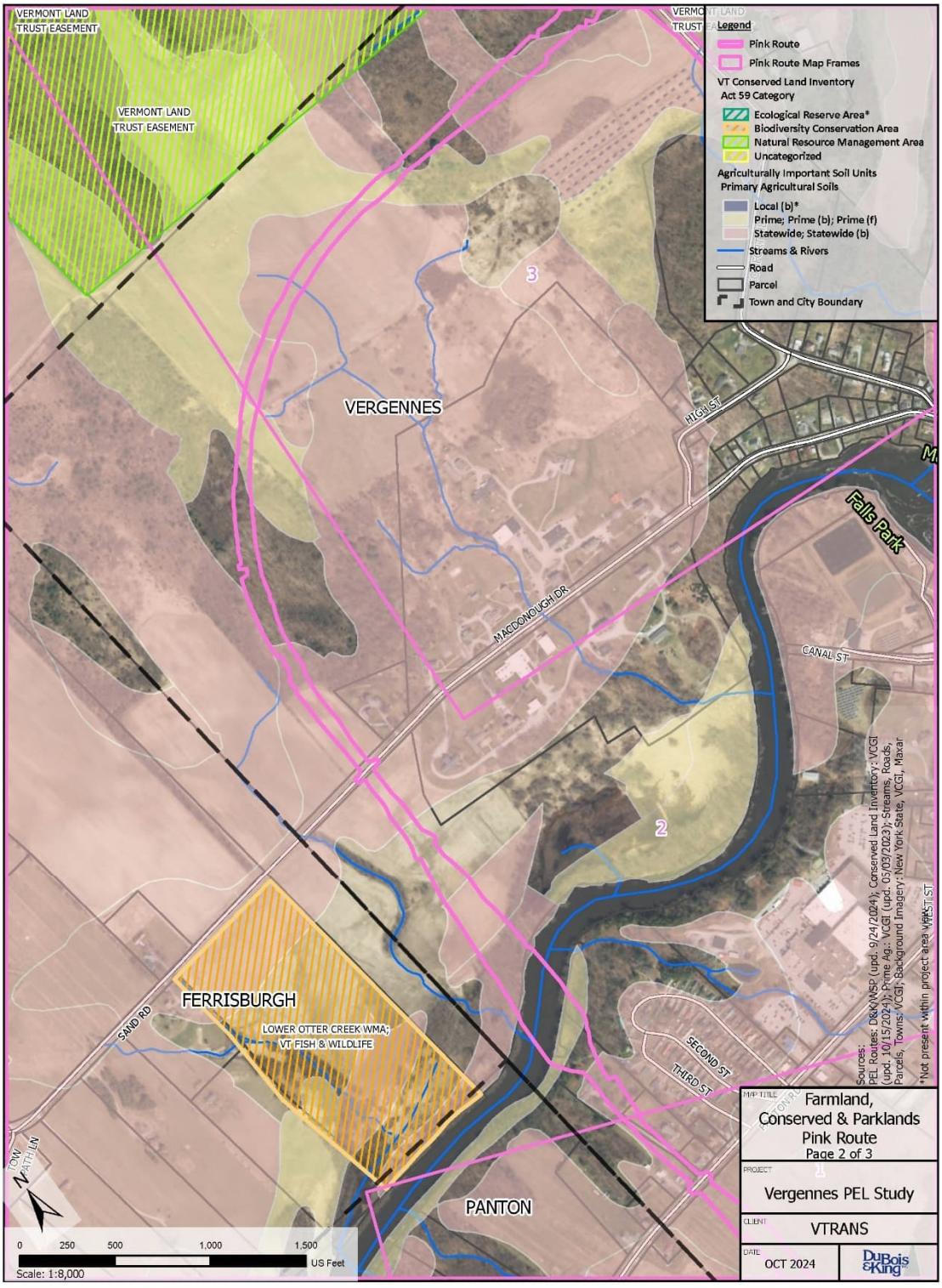


Figure 4-28 Farmland, Conserved, and Parklands, Pink Route Alternative, Page 3

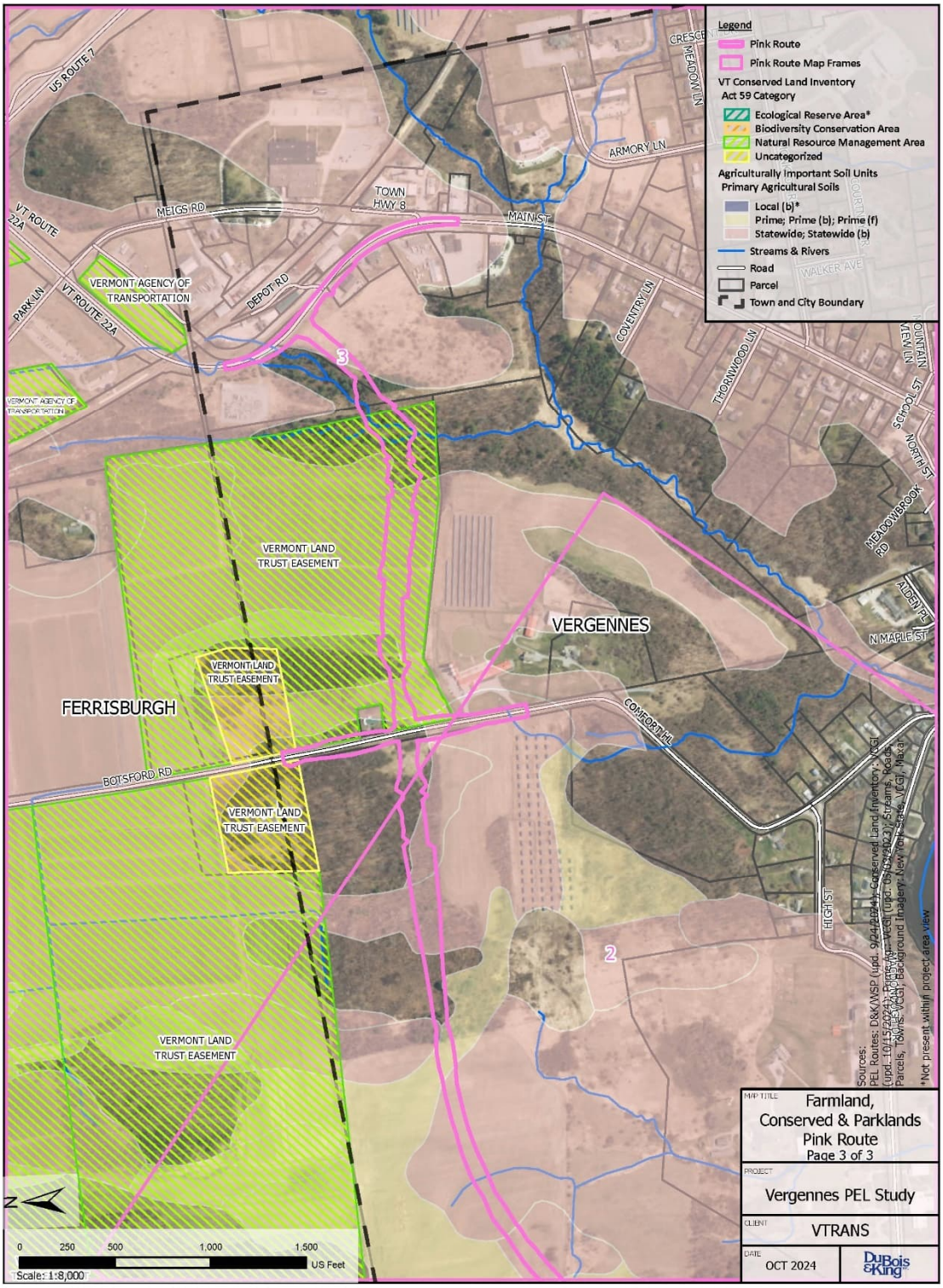


Figure 4-29 Farmland, Conserved, and Parklands, Green Route Alternative, Page 1

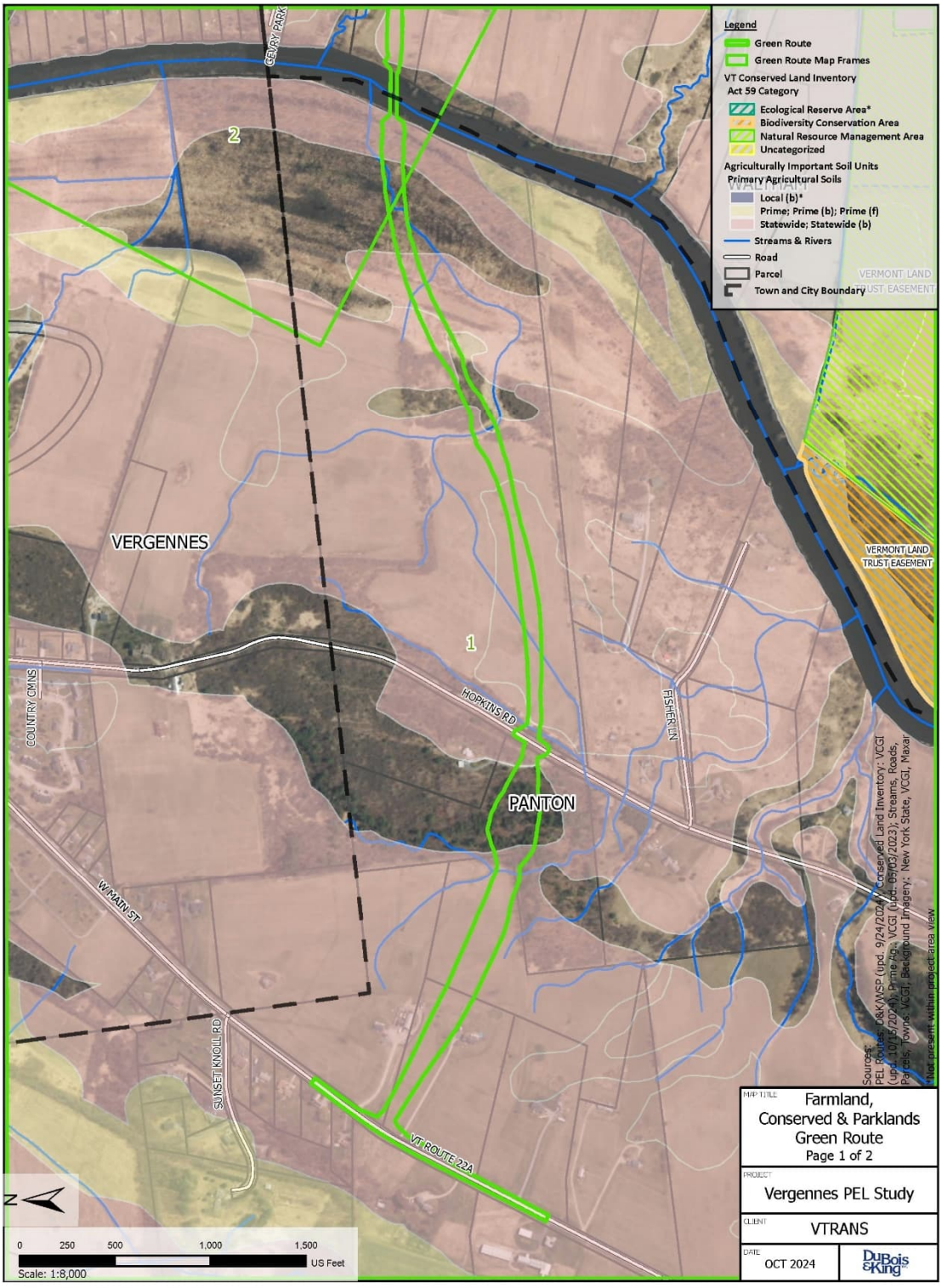
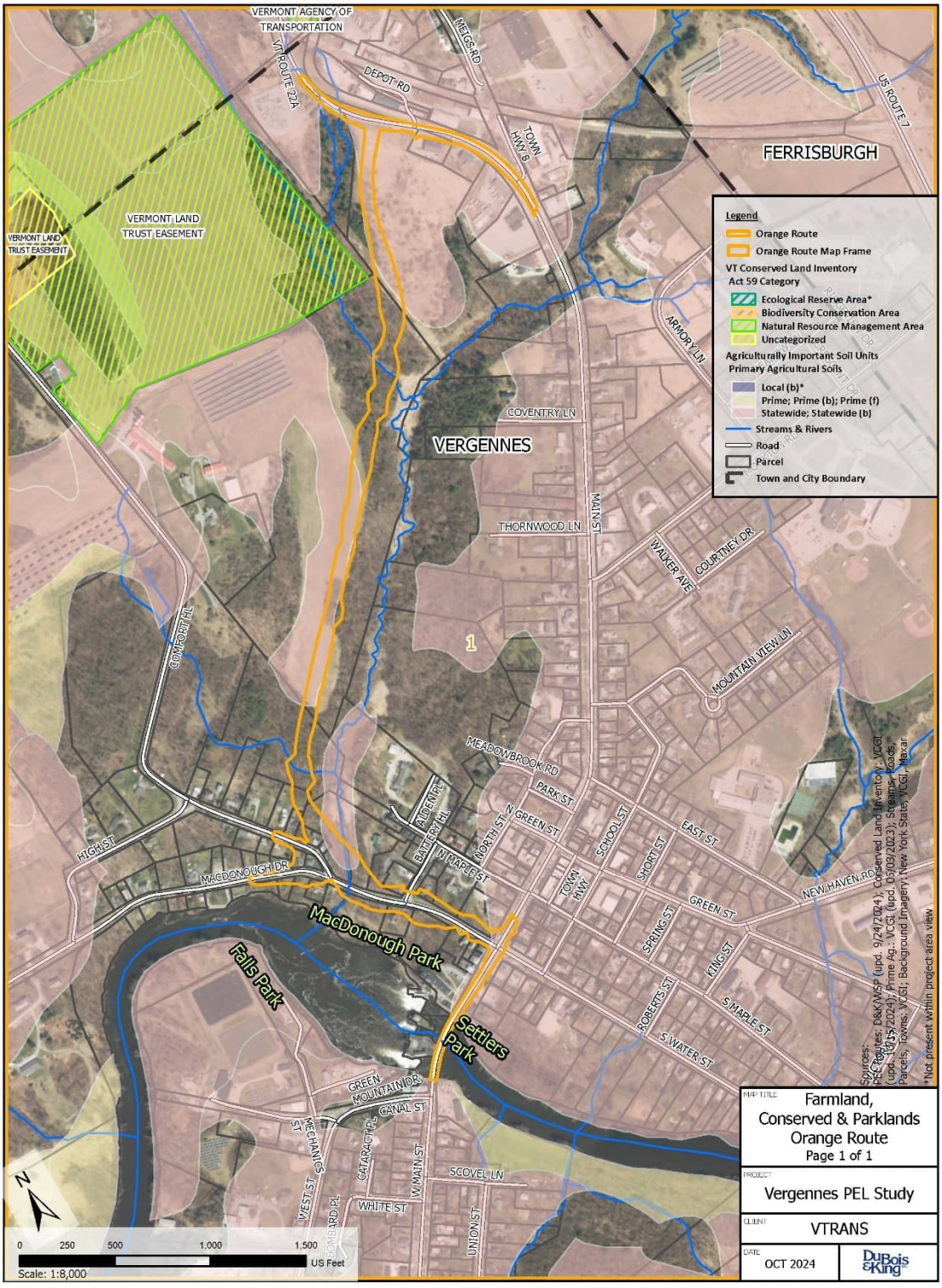


Figure 4-30 Farmland, Conserved, and Parklands, Green Route Alternative, Page 2

Figure 4-31 Farmland, Conserved, and Parklands, Orange Route Alternative



### 4.7.1 Potential Constraints

According to information obtained from the VT ANR Atlas, the route alternatives would not involve work in or near a state park, state forest, National Wildlife Refuge, national park, national forest lands, town forest, nor Vermont designated natural area.

Table 4-10 describes existing conditions based on preliminary analysis of existing information and potential constraints associated with each of the evaluated routes. Only resources directly impacted by the routes were evaluated. The number of parcels identified as conserved lands, parkland, or recreational areas and the acreage are provided in the table below. Indirect impacts were not taken into consideration but would be evaluated during the next phase of the project.

Table 4-10 Conserved Lands Existing Conditions and Potential Constraints

| ROUTE ALTERNATIVE | EXISTING CONDITIONS | POTENTIAL CONSTRAINTS |
|---|---|---|
| Purple | Conservation easements are located in multiple areas along US Route 7, and State Routes 17 and 22A. | Five parcels, consisting of VLT easements with one containing Biodiversity Conservation Areas, would be affected. In addition, the Addison County fairgrounds property would be affected.<br>Areas of conserved land affected include five parcels, approximately 2.43 acres, classified as Natural Resource Management Areas and 0.20 acre of Biodiversity Conservation Areas, totaling 2.63 acres. |
| Blue | Conserved land (easements) between Comfort Hill Road and Route 22A and between Sand Road and Otter Creek. | Four parcels, consisting of three VLT easements and one associated with the Lower Otter Creek WMA Biodiversity Conservation Area, would be affected.<br>Areas of land affected include one parcel, approximately 5.20 acres, classified as Natural Resource Management Area, 0.04 acre on two parcels of uncategorized conserved area, and one parcel, 0.10 acre, categorized as Biodiversity Conservation Area, all totaling **5.34 acres**. |
| Pink | Conserved land (easements) between Comfort Hill Road and Route 22A. | Three VLT easements parcels would be impacted.<br>Areas of land affected include one parcel, approximately 5.18 acres, classified as Natural Resource Management Area and 0.04 acre on two parcels of uncategorized conserved area, all totaling **5.22 acres**. |
| Green | No conserved or protected lands, Section 6(f) land or park and recreation areas. | Not Applicable |
| Orange | Vergennes MacDonough Park is located along the Otter Creek in the southern portion of the route. | One park (MacDonough Park) would be affected by the proposed route. Approximately **0.59 acre** of the parkland adjacent to MacDonough Drive would be impacted by the roadway right of way. However, there would be no impact to the overall function of the park.<br>There are no conserved lands affected by this route. |

There are no listed nationally significant natural areas or Section 6(f) lands or facilities within, or adjacent to, the study corridor.

### 4.7.2 Next Steps

The level of "use" of the MacDonough Park and Lower Otter Creek WMA will be determined once design has progressed on a specific project and a Programmatic or Individual Section 4(f) Evaluation will be prepared, if necessary. Address potential impacts to conserved lands, park and recreational areas in NEPA documentation for the future project.

## 4.8 HISTORIC AND ARCHAEOLOGICAL RESOURCES

Historic resources with a previous determination by the State Historic Preservation Office were identified and evaluated for the potential to be impacted by the proposed route alternatives. The locations of historic and cultural resources were identified by the National Register of Historic Places (NRHP) and using Vermont's State Register of Historic Places (SRHP) special data. Additionally, the Online Resource Center (ORC), the Vermont Parcel Viewer (VPV), the Vermont Archaeological Inventory (VAI) and online rail-related webpage were used to understand the details related to the resource. Additional evaluation of resources older than 50 years of age that have not yet been assessed will be required as part of NEPA and Section 106.

If a project that is identified from this study is a federally funded action, the FHWA will serve as the federal lead agency upon initiation of NEPA environmental review, including Section 106 review, with VTrans serving as the sponsoring agency and joint lead agency under 23 U.S.C. section 139. For the Vergennes PEL Study, VTrans is the lead state agency with FHWA advising as the lead federal agency under NEPA for future environmental studies. VTrans, in cooperation with FHWA, each have responsibilities for this PEL study. VTrans will manage the PEL review and documentation process; prepare all study reports and other documents; and provide opportunities for likely NEPA and Section 106 cooperating and participating agency involvement and public involvement. FHWA will participate in the Vergennes PEL Study process and, if satisfied at the conclusion of the study, will provide its concurrence that information and data developed for the Vergennes PEL Study can be used in subsequent NEPA and Section 106 environmental reviews for projects in this corridor.

### 4.8.1 Historic Resources Potential Constraints

Figure 32 through Figure 36 present the conceptual design footprints of the Blue, Pink, Green, Orange, and Purple Route Alternatives, respectively, along with the locations of known historic resources. Table 11 through Table 15 present a listing of these historic buildings, along with their proximity to the route alternatives.

The Blue Route Alternative footprint intersects with one historic resource, an SRHP-listed farm at 392 VT-22A in Panton. Ten historic resources, listed in the SRHP, are near the Blue Route Alternative from approximately 20 feet up to 740 feet.

The Pink and Green Route Alternatives do not intersect with identified historic resources. Seven historic resources are near the Pink Route Alternative from approximately 20 feet up to 740 feet. Three historic buildings are near the Green Route Alternative from approximately 20 feet up to 740 feet.

The Orange Route Alternative footprint intersects with the two historic districts. These are the NRHP-listed Vergennes Historic District, which runs along Main Street from west Canal Street, east across Otter Creek to include MacDonough Drive northwest of Comfort Hill Street, and terminating at its eastern boundary at Monkton Road, and the SRHP-listed Main Street Historic District, which runs along Main Street from east of MacDonough Drive to approximately Thornwood Lane. These two historic districts include significant buildings in downtown Vergennes, such as the Vergennes Opera House, Post Office, and City Hall. One historic district, the NRHP-listed Vergennes Residential Historic District, is located approximately 100 feet near the Orange Route Alternative. There are seven historic buildings located near the Orange Route Alternative, including the NRHP-listed Capts. Louis and Philomene Daniels House located approximately 725 feet near the Orange Route Alternative. The remaining six historic buildings are listed in the SRHP and are near the Orange Route Alternative from approximately 20 feet up to 740 feet.

The conceptual design footprint of the Purple Route Alternative intersects with nine identified historical resources, all SRHP-listed as shown in Figure 36. These properties, which include farmsteads, are Barber-Gray House, Wintonbury Farm, Resnick House, Stone Farm Complex, Barber-Andrews House, Hodgman Residence, McKinley Residence, and Justus Smith-DuBois House, are presented in Table 4-12. One SHRP-listed property, Derrick House, when compared to the inventory photograph, has likely been extensively altered by modern siding, windows, and an asymmetrical gable roof. The current building retains is general form, massing, and five-bay arrangement, and the surrounding topography and aerial imagery showing the associated garage indicate that these may be the same property. However, it is unknown if these two buildings are the same without further examination.

Five historic resources are located near the Purple Route Alternative, as presented in Table 15. These are the NRHP-listed Addison Baptist Church, and the SRHP-listed Grant House, Addison Town Hall, Burpee's Garage, and George Willmarth House, located approximately 100 feet up to 240 feet from the aforementioned footprint. One NRHP-listed historic building as shown in Figure 4-36, New Haven Junction Depot, was relocated approximately 1.5 miles east to the Village of New Haven (Trains.com 2024).

Figure 32 Blue Route Alternative, Historic Resources

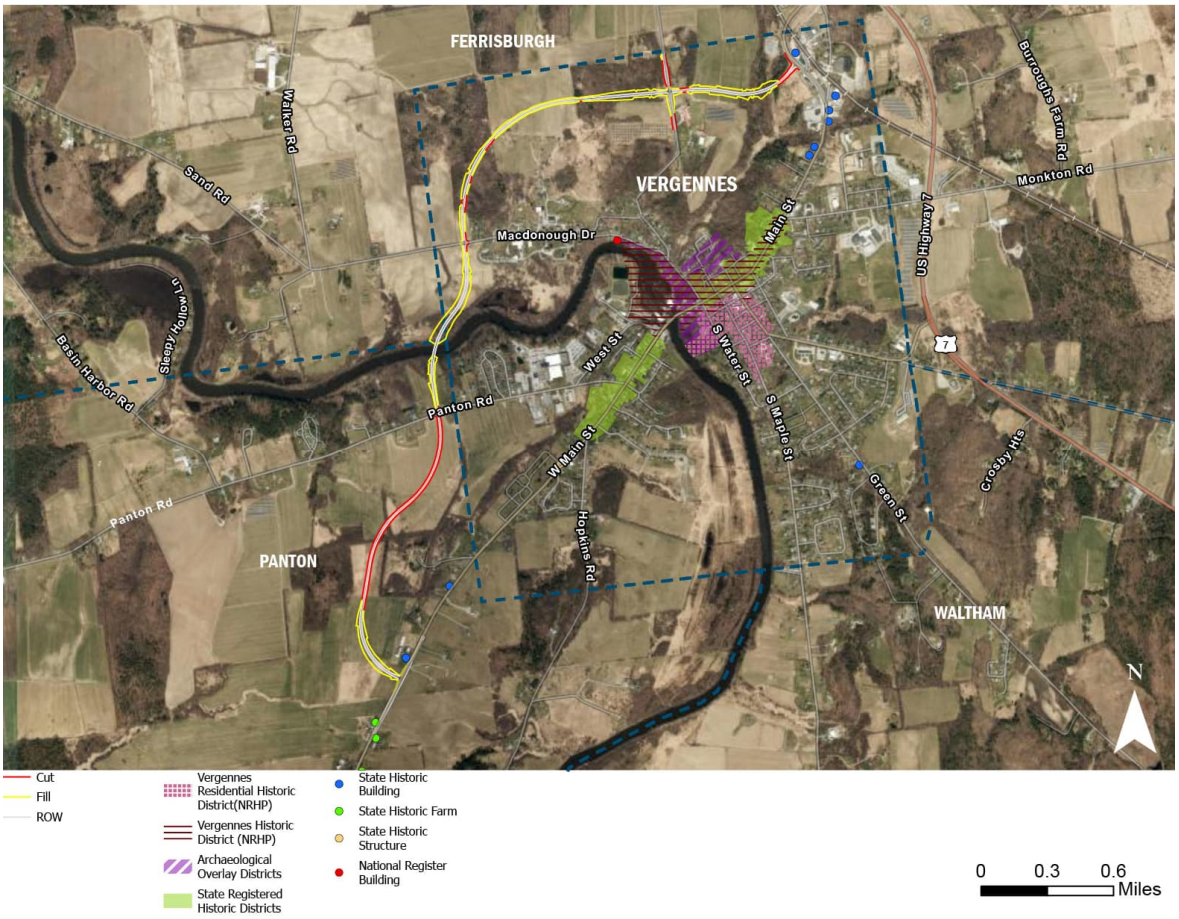



Table 11 Known Historic Resources Near Blue Route Alternative

| HISTORIC RESOURCE | PROXIMITY TO BLUE ROUTE | AREA OF POTENTIAL IMPACT (ACRES) |
|---|---|---|
| Farm, 392 VT-22A, Panton | Intersects | 2.49 |
| House, 13 Main, Vergennes | ~20 feet | None |
| House, 19 Main, Vergennes | ~20 feet | None |
| House, 30 Main, Vergennes | ~225 feet | None |
| Farm, 628 VT-22A, Panton | ~20 feet | None |
| Farm, 685 VT-22A, Panton | ~25 feet | None |
| Factory, 11 Main, Vergennes | ~120 feet | None |
| House, 30 Main, Vergennes | ~220 feet | None |
| House, 26 Main, Vergennes | ~540 feet | None |
| Farm, 799 VT-22A, Panton | ~640 feet | None |
| House, 128 VT-22A, Panton | ~740 feet | None |

Figure 39 Pink Route Alternative, Historic Resources

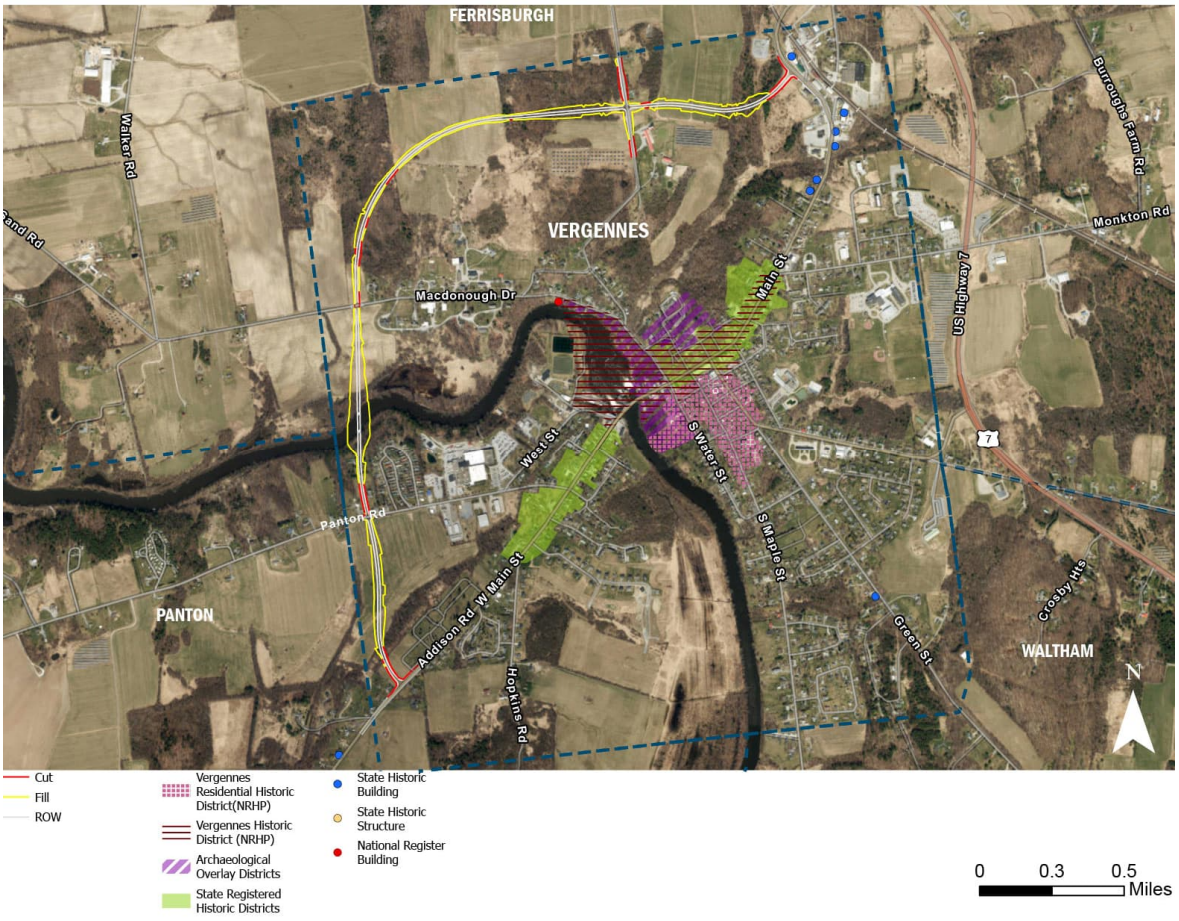



Table 21 Known Historic Resources Near Pink Route Alternative

| HISTORIC RESOURCE | PROXIMITY TO PINK ROUTE | AREA OF POTENTIAL IMPACT (ACRES) |
|---|---|---|
| **House, 13 Main, Vergennes** | ~20 feet | None |
| **House, 19 Main, Vergennes** | ~115 feet | None |
| **Factory, 11 Main, Vergennes** | ~120 feet | None |
| **House, 26 Main, Vergennes** | ~225 feet | None |
| **House, 128 VT-22A, Panton** | ~380 feet | None |
| **Prospect Cemetery Gate, Vergennes** | ~600 feet | None |
| **House, 30 Main, Vergennes** | ~740 feet | None |

Figure 40 Green Route Alternative, Historic Resources

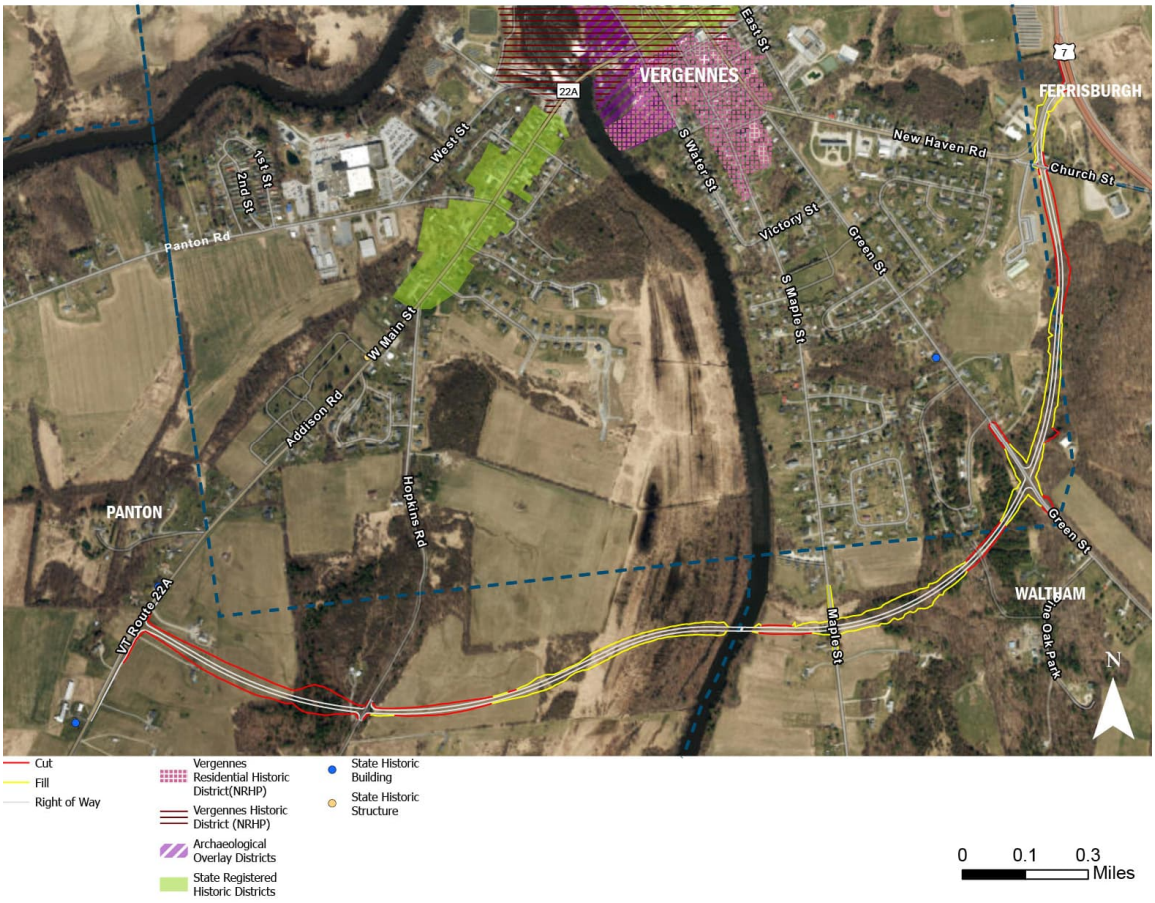



Table 22 Known Historic Resources Near Green Route Alternative

| HISTORIC RESOURCE | PROXIMITY TO GREEN ROUTE | AREA OF POTENTIAL IMPACT (ACRES) |
|---|---|---|
| **House, 128 VT-22A, Panton** | ~20 feet | None |
| **Farm, 392 VT-22A, Panton** | ~42 feet | None |
| **House, 188 Green, Vergennes** | ~740 feet | None |

Figure 41 Orange Route Alternative, Historic Resources

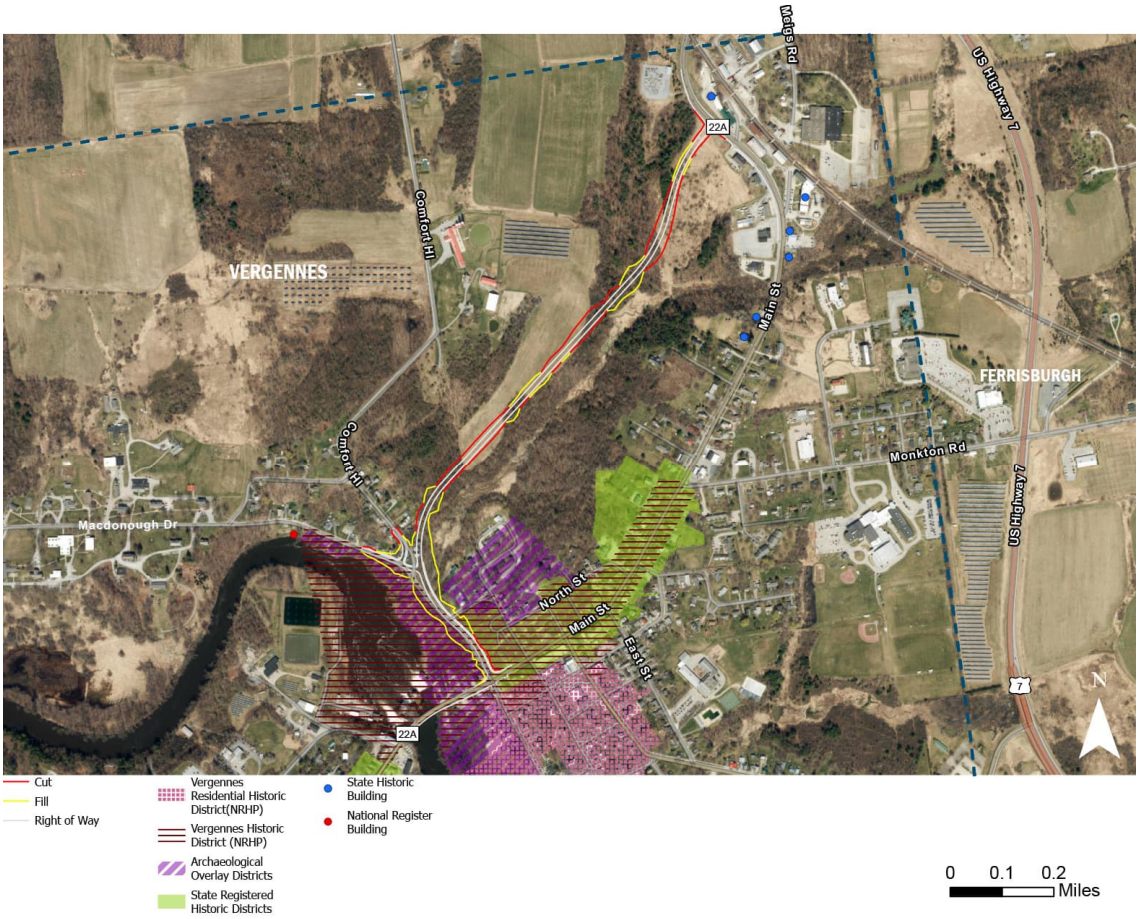



Table 23 Known Historic Resources Near Orange Route Alternative

| HISTORIC RESOURCE | PROXIMITY TO ORANGE ROUTE | AREA OF POTENTIAL IMPACT (ACRES) |
|---|---|---|
| **National Register Historic District**<br>**Vergennes Historic District** | Intersects | 2.80 |
| **National Register Historic District**<br>**Vergennes Residential Historic District** | ~ 100 feet | None |
| **State Register Historic District**<br>**Main Street Historic District** | Intersects | 0.80 |
| **Capts. Louis and Philomene Daniels House** | ~ 725 feet | None |
| **State Register Building** | | |
| **House, 13 Main, Vergennes** | ~20 feet | None |
| **House, 19 Main, Vergennes** | ~115 feet | None |
| **Factory, 11 Main, Vergennes** | ~120 feet | None |
| **House, 26 Main, Vergennes** | ~225 feet | None |
| **Vergennes Station** | ~ 580 feet | None |
| **House, 30 Main, Vergennes** | ~740 feet | None |

Figure 36 Purple Route Alternative, Historic Resources

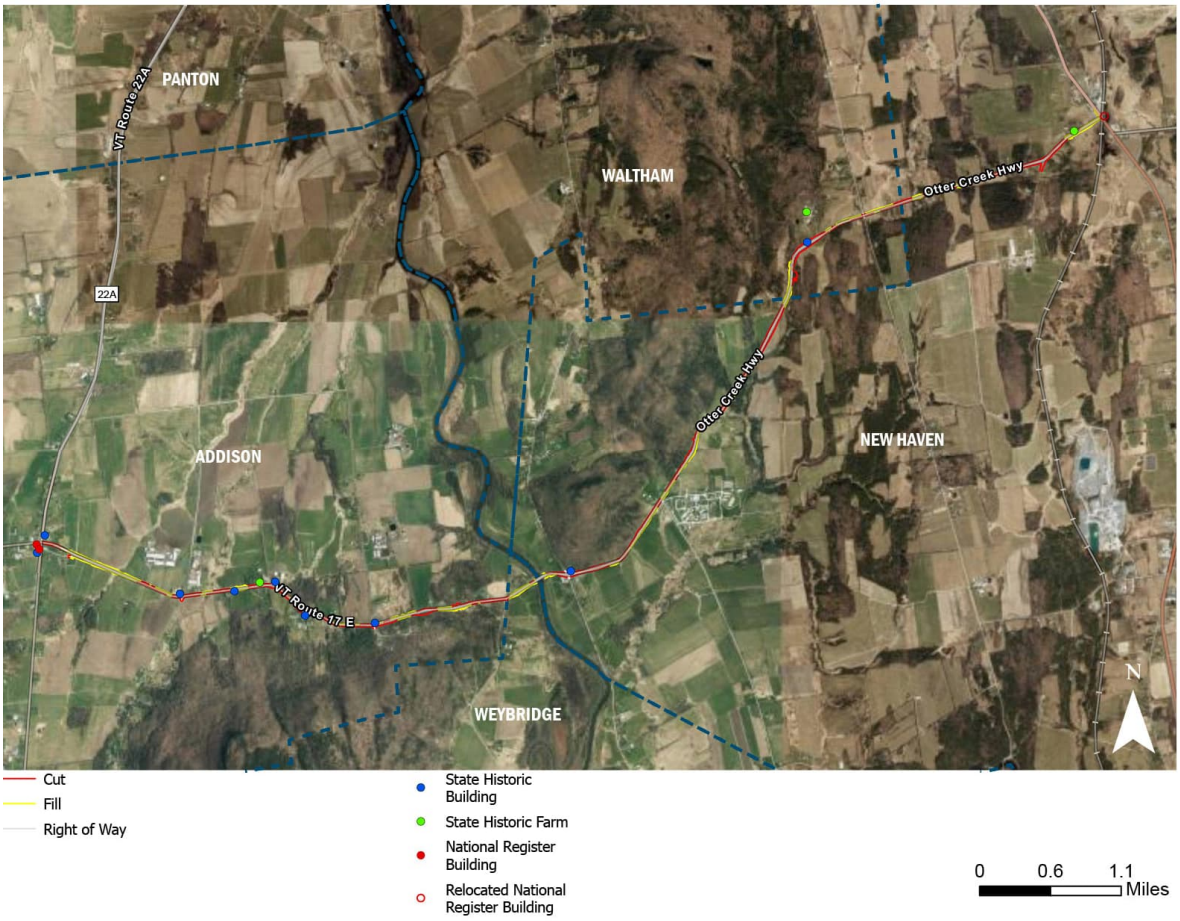


Table 15 Known Historic Resources Near Purple Route Alternative

| HISTORIC RESOURCE | PROXIMITY TO PURPLE ROUTE ALTERNATIVE | AREA OF POTENTIAL IMPACT (ACRES) |
|---|---|---|
| **National Register Building** | | |
| Addison Town Hall | ~100 feet | None |
| Addison Baptist Church | ~ 200 feet | None |
| New Haven Junction Depot (Moved to New Haven Village in 2022) | N/A | N/A |
| **State Register Building** | | |
| Barber-Gray House | Intersects | 0.07 |
| Resnick House | Intersects | 0.22 |
| Phillips and Petruisch Complex | Intersects | 0.29 |
| Wintonbury Farm | Intersects | 0.50 |
| Hodgman Residence | Intersects | 0.56 |
| Stone Farm Complex | Intersects | 0.70 |
| Barber-Andrews House | Intersects | 0.79 |
| McKinley Residence | Intersects | 2.10 |
| Justus Smith-DuBois House | Intersects | 2.43 |
| Grant House | ~100 feet | None |
| Burpee's Garage | ~200 feet | None |
| George Willmarth House | ~240 feet | None |

### 4.8.2 Archaeological Resources Potential Constraints

The Blue and Pink Route Alternatives do not intersect with any known archaeological sites but there are two archaeological sites within 300 feet of both routes. Both of the known archaeological sites are recorded as pre-Contact sites. The Vermont Division of Historic Preservation (VDHP) Pre-Contact Native American sensitivity model shows varying degrees sensitivity for the Blue and Pink Routes to contain pre-Contact archaeological resources. The areas with the highest sensitivity are mapped around the known archaeological sites and in dry, upland areas in proximity to drainages and other waterbodies such as Otter Creek.

Figure 6 Blue Route Alternative, Pre-Contact Native American Sensitivity

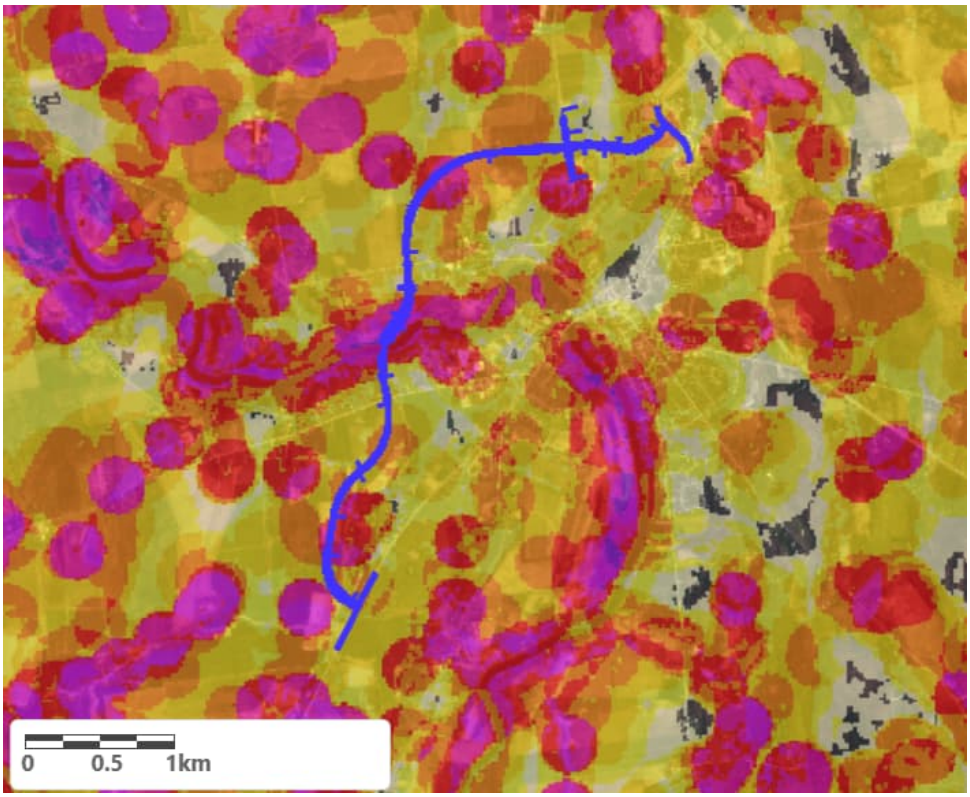
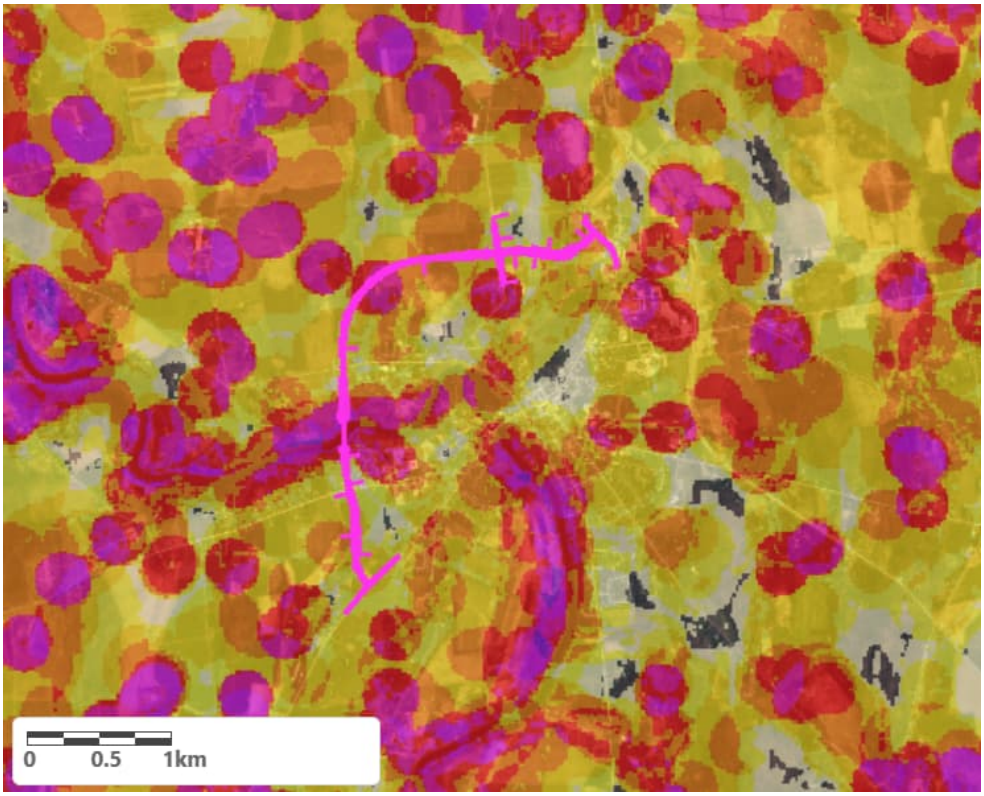
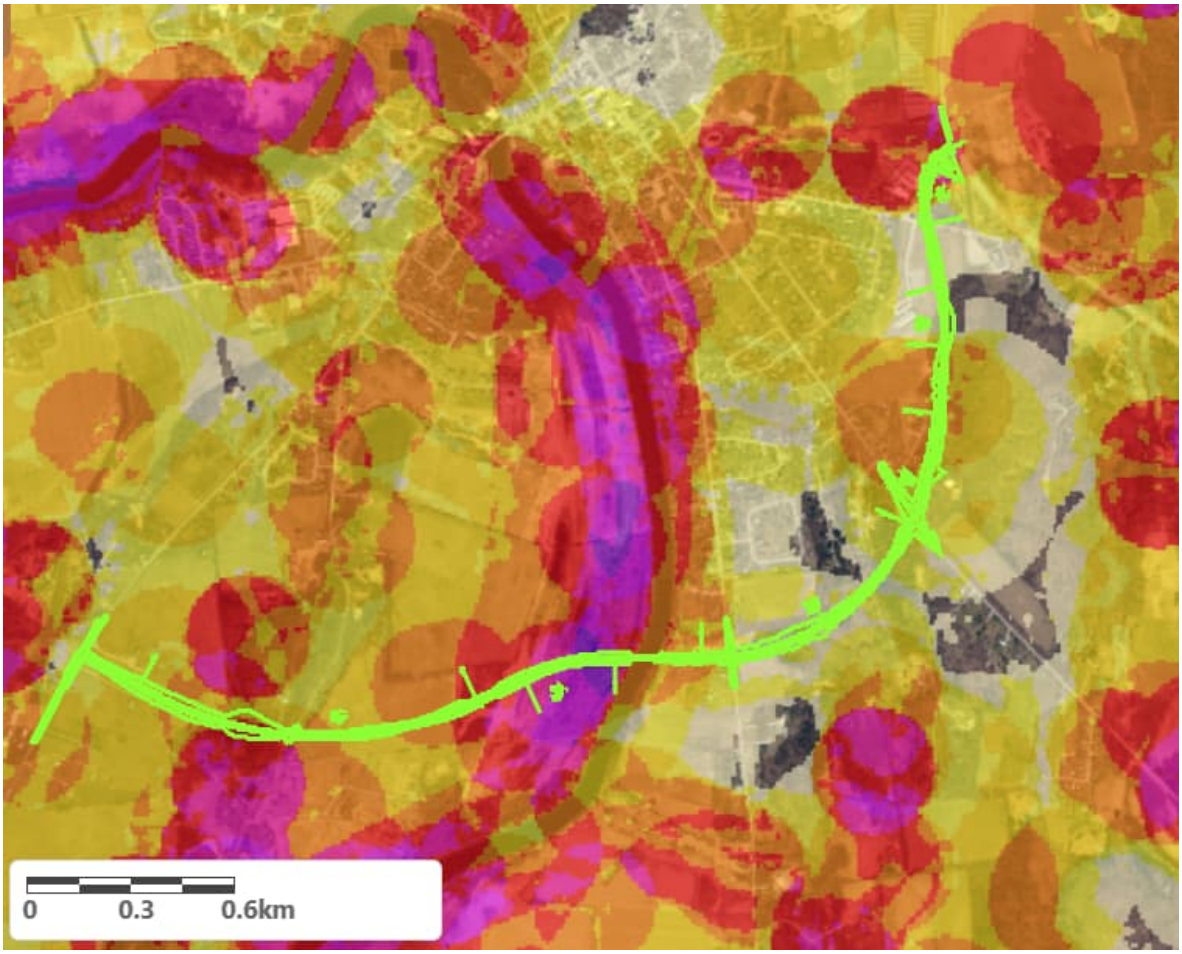



Figure 7 Pink Route Alternative, Pre-Contact Native American Sensitivity



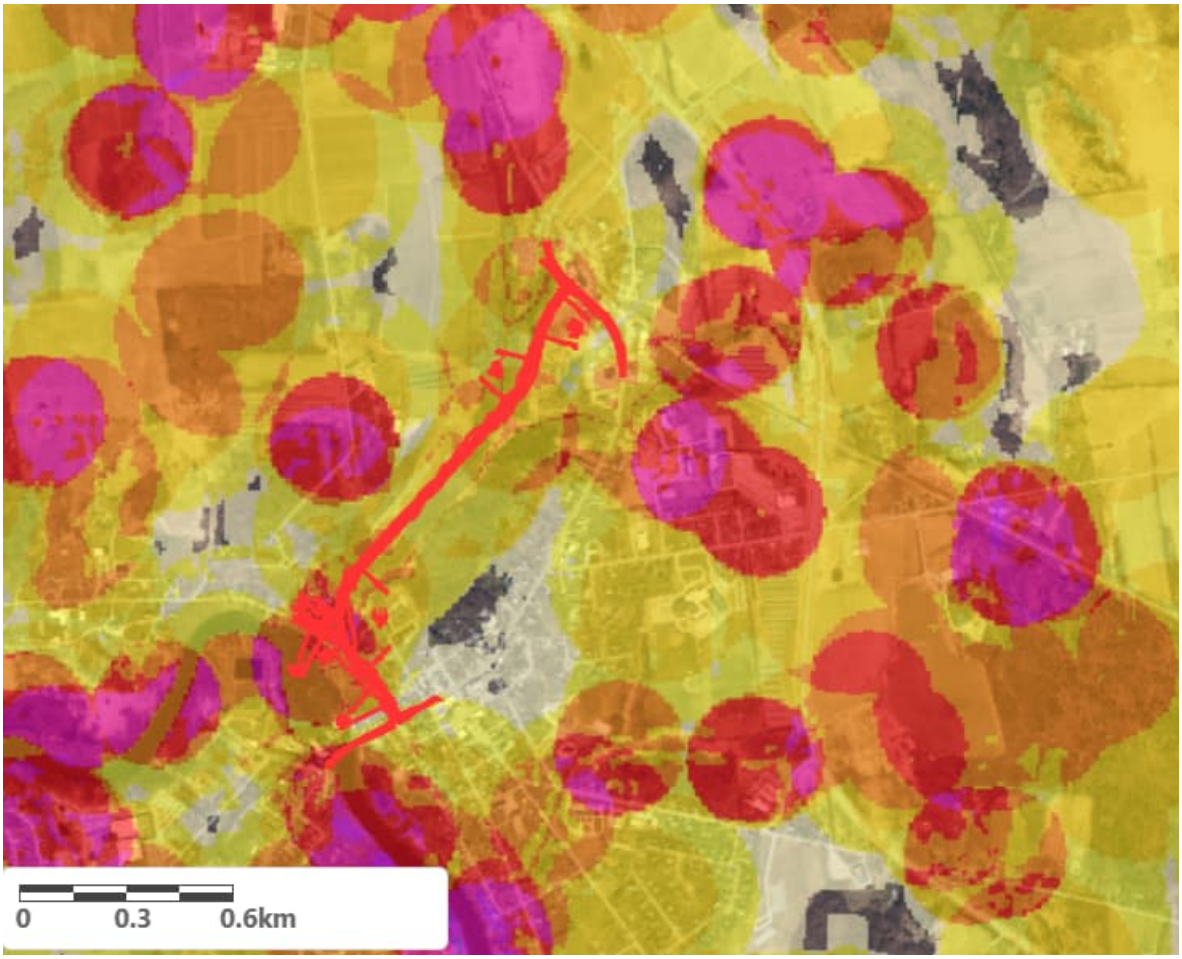
The Green Route Alternative does not intersect with any known archaeological sites. The closest known archaeological site is approximately 560 feet from the route and is recorded as a pre-Contact archaeological site. Similar to the Blue and Pink routes, pre-Contact archaeological site is mapped in proximity to drainages and waterbodies in mostly upland locations.

Figure 8 Green Route Alternative, Pre-Contact Native American Sensitivity



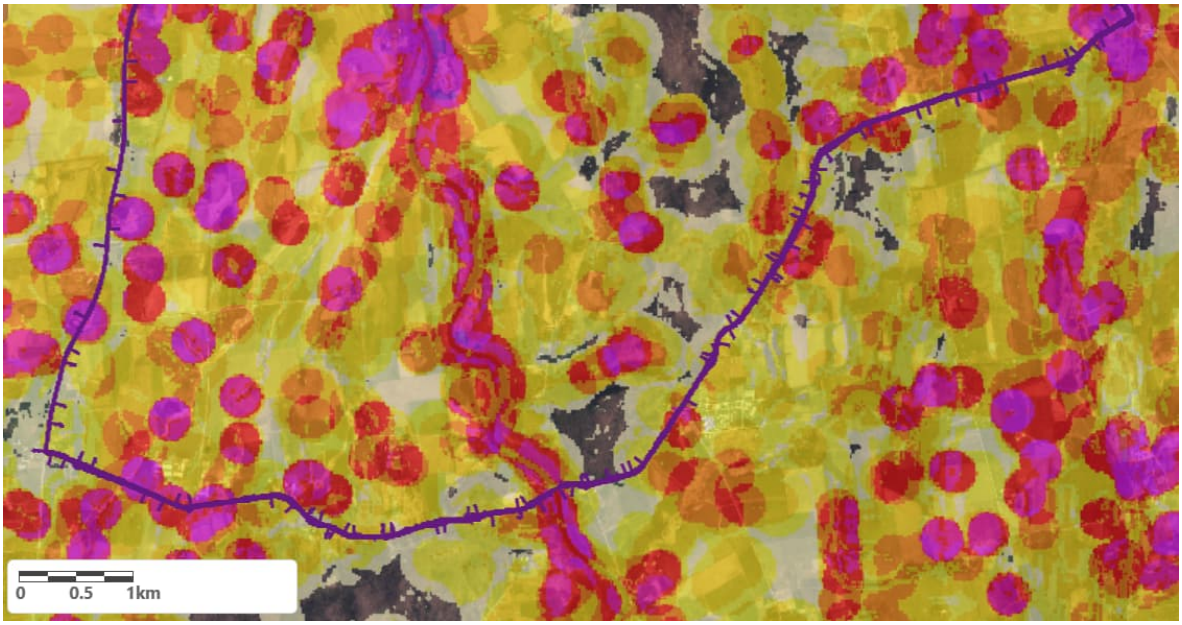
There are two pre-Contact archaeological sites within 300 feet of the Orange Route. Mapped pre-Contact sensitivity is highest near the known archaeological site and near Otter Creek.

Figure 9 Orange Route Alternative, Pre-Contact Native American Sensitivity



The conceptual design for the Purple Route intersects one known archaeological site which is recorded as a national register-eligible pre-Contact archaeological site. There are two additional pre-Contact sites mapped within 300 feet of the Purple Route. Similar to the other routes, the highest pre-Contact sensitivity is mapped near the known archaeological sites and the drainages and waterbodies.

Figure 10 Purple Route Alternative, Pre-Contact Native American Sensitivity




### 4.8.3 Next Steps

VTrans will develop an area of potential effect (APE) for the Preferred Alternative. Once defined, VTrans will identify and evaluate historic properties within the APE to determine if any resources meet the criteria for listing on the State and National Registers of Historic Places. Then, VTrans will prepare an effects assessment to determine if the proposed work would result in an adverse effect and coordinate with VDHP

A Phase I archaeological survey will be conducted to determine the presence of archaeological resources. If necessary, a Phase II archaeological survey will be conducted to more precisely determine the locations, quantity, and significance of the resources. This report will help fully identify and evaluate potential impacts from the project and determine if a data recovery effort will be necessary, as well as what mitigation measures will be appropriate.

VTrans, in cooperation with FHWA, will identify likely Section 106 consulting parties and will also send letters to federally-recognized Native American tribes to initiate Government-to-Government outreach. Tribal contact will be part of the ongoing consultation with FHWA as part of the intergovernmental consultation. Other agencies will not contact the tribal nations directly about this PEL Study.

Consultation with the tribal nations should continue to determine if there are areas of concern, particularly related to archaeology, within the project limits, and identify areas with religious or cultural significance to sites within the APE.

## 4.9 HAZARDOUS MATERIALS

### 4.9.1 Potential Constraints

A review of Vermont Agency of Natural Resources online databases found that there are no hazardous material sites within the conceptual design footprints of the proposed route alternatives. In addition to the footprints of the route alternatives, a screening distance of 150 feet on either side of the route alternatives was reviewed (hazardous materials study area), as shown in Figure 4-43. Seven sites were identified within the hazardous materials study area. Table 15 presents these sites and their contaminant. Four of these sites are located within the 150-foot buffer of the Purple Route Alternative. Three of these sites are also located within the 150-foot buffer of the Orange Route Alternative.

Figure 4-43 Hazardous Sites, Pink, Blue, Green, and Orange Route Alternatives

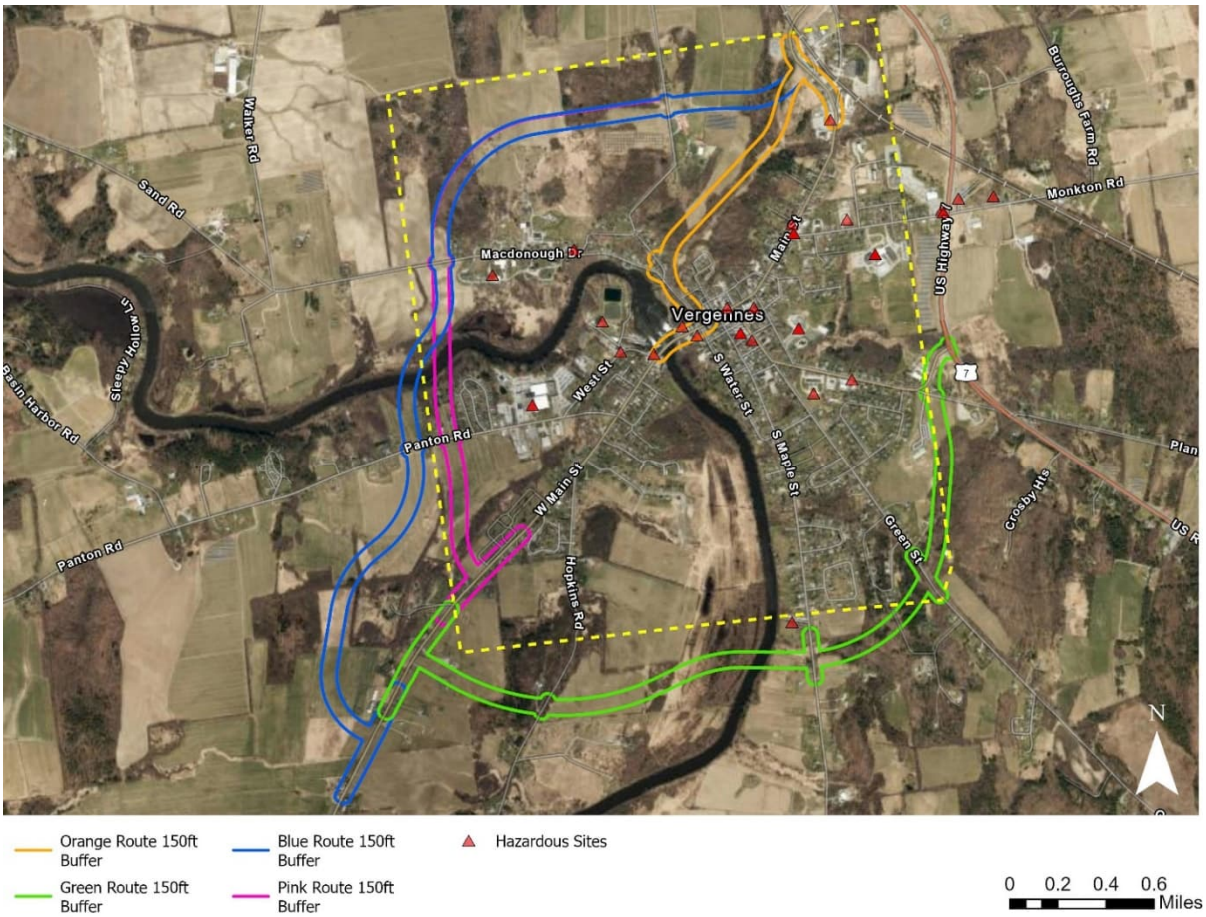
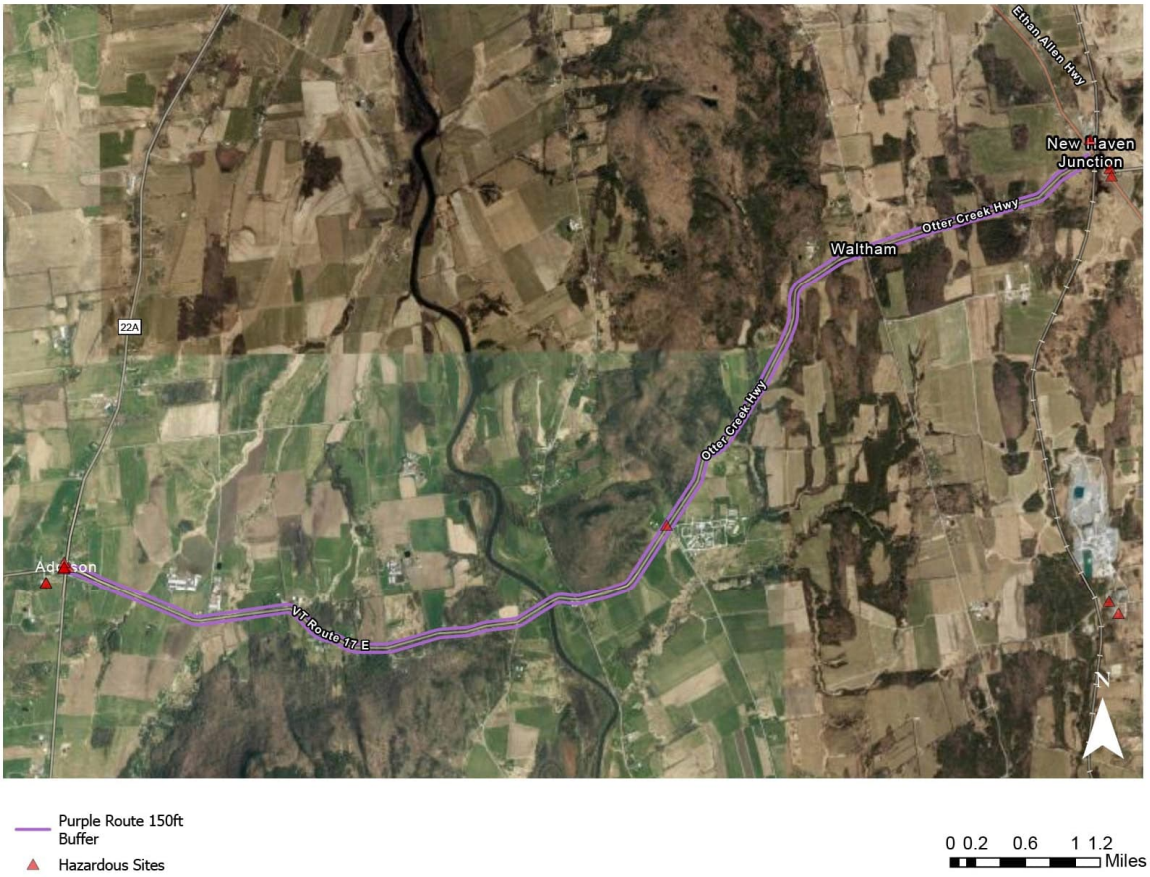


Figure 4-44 Hazardous Sites, Purple Route Alternative




Source: Vermont Agency of Natural Resources

Table 4-25 Hazardous Sites within 150 feet of Route Alternatives

| SITE | MUNICIPALITY | CONTAMINATE |
|---|---|---|
| **Purple Route Alternative** | | |
| Addison Four Corners Store | Addison | Gasoline, Kerosene |
| AOT Addison | Addison | Gasoline |
| Burpees Garage | Addison | Gasoline |
| Choquette Residence | New Haven | Gasoline |
| **Orange Route Alternative** | | |
| Riverside Apartments | Vergennes | Gasoline |
| Denecker Chevrolet | Vergennes | Waste Oil |
| Haviland Shade Roller Mill and Annex | Vergennes | Chlorinated Solvents, Other Metals, Other Petroleum, PAH, PCB |

### 4.9.3 Next Steps

When a project is further developed, a Hazardous Waste/Contaminated Materials Site Screening would be conducted in accordance with VTrans Project Delivery Manual, in order to document the likely presence or absence of hazardous/contaminated environmental conditions. A hazardous/contaminated environmental condition is the presence or likely presence of any hazardous substances or petroleum products (including products currently in compliance with applicable regulations) on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface water of the property.

# 5. Air Quality

## 5.1 AIR POLLUTANTS AND STANDARDS

### 5.1.1 Clean Air Act and National Ambient Air Quality Standards

The Clean Air Act (CAA) is a federal law passed in 1963 and amended in 1967, 1970, 1974, 1977, and 1990. The CAA Amendments of 1990 and the Final Transportation Conformity Rule [40 CFR Parts 51 and 93] direct the US Environmental Protection Agency (USEPA) to implement environmental policies and regulations that will ensure acceptable levels of air quality. The CAA and the Final Transportation Conformity Rule affect the funding and approval of proposed transportation projects. According to CAA Title I, Section 176 (c) 2:

> *No federal agency may approve, accept or fund any transportation plan, program or project unless such plan, program or project has been found to conform to any applicable State Implementation Plan (SIP) in effect under this act.*

According to section 176(c)2(A) of the CAA, conformity to an implementation plan means eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards; and that such activities will not:

- Cause or contribute to any new violation of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS in any area; or
- Delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area.

As required by the CAA, NAAQS have been established by USEPA for the following six major air pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide ($NO_2$), ozone ($O_3$), particulate matter ($PM_{10}$ and $PM_{2.5}$), and sulfur dioxide ($SO_2$). The standards are summarized in Table 5-1. These pollutants are also known as “criteria” pollutants.

The “primary” standards have been established to protect public health. The “secondary” standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation and other aspects of the general welfare. Vermont has adopted these standards (both primary and secondary) as the state standards.

Section 107 of the 1977 Clean Air Act Amendments requires that the USEPA publish a list of all geographic areas in compliance with the NAAQS, plus those not attaining the NAAQS. Areas not in NAAQS compliance are deemed non-attainment areas. Areas that have insufficient data to make a

determination are deemed unclassified and are treated as being attainment areas until proven otherwise. A maintenance area is an area that was previously designated as nonattainment for a particular pollutant but has since demonstrated compliance with the NAAQS for that pollutant. An area's designation is based on data collected by the state monitoring network on a pollutant-by-pollutant basis.

Addison County is classified as attainment for all current NAAQS. A brief description of each pollutant is given below.

Table 5-1. National Ambient Air Quality Standards

| POLLUTANT | | PRIMARY / SECONDARY | AVERAGING TIME | LEVEL | FORM |
|---|---|---|---|---|---|
| Carbon Monoxide | | Primary | 8-hour | 9 ppm | Not to be exceeded more than once per year |
| | | | 1-hour | 35 ppm | |
| Lead | | Primary and secondary | Rolling 3-month average | 0.15 µg/m$^3$ (1) | Not to be exceeded |
| Nitrogen Dioxide | | Primary | 1-hour | 100 ppb | 98th percentile of 1-hour daily maximum concentrations, averaged over 3 years |
| | | Primary and secondary | Annual | 53 ppb (2) | Annual Mean |
| Ozone | | Primary and secondary | 8-hour | 0.070 ppm (3) | Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years |
| Particulate Matter | $PM_{2.5}$ | Primary | Annual | 9.0 µg/m$^3$ | Annual mean, averaged over 3 years |
| | | Secondary | Annual | 15 µg/m$^3$ | Annual mean, averaged over 3 years |
| | | Primary and secondary | 24-hour | 35 µg/m$^3$ | 98th percentile, averaged over 3 years |
| | $PM_{10}$ | Primary and secondary | 24-hour | 150 µg/m$^3$ | Not to be exceeded more than once per year on average over 3 years |
| Sulfur Dioxide | | Primary | 1-hour | 75 ppb (4) | 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years |
| | | Secondary | 3-hour | 0.5 ppm | Not to be exceeded more than once per year |

Source: USEPA Office of Air and Radiation

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m3 as a calendar quarter average) also remain in effect.

(2) The level of the annual NO2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O3 standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1-hour (1979) and 8-hour (1997) O3 standards.

(4) The previous SO2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2)any area for

which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO2 standards or is not meeting the requirements of a SIP call under the previous SO2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

### 5.1.2 Carbon Monoxide

Carbon monoxide is a colorless gas that interferes with the transfer of oxygen to the brain. CO is emitted almost exclusively from the incomplete combustion of fossil fuels. Motor vehicle emissions (on-road motor vehicle exhaust) are the primary source of CO. In cities, 85 to 95 percent of all CO emissions may come from motor vehicle exhaust. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, or heart disease. Relatively high concentrations of CO are typically found near congested intersections, along heavily used roadways carrying slow-moving traffic, and in areas where atmospheric dispersion is inhibited by urban "street canyon" conditions. Due to the Clean Air Act, national 8-hour average CO levels have decreased by 81% between 1980 and 2020.

### 5.1.3 Lead

Pb is a stable element that persists and accumulates both in the environment and in animals. Its principal effects in humans are on the blood-forming, nervous, and renal systems. Lead levels in the urban environment from mobile sources have substantially decreased due to the federally mandated switch to lead-free gasoline.

### 5.1.4 Nitrogen Dioxide

$NO_2$, a brownish gas, irritates the lungs. It can cause breathing difficulties at high concentrations. Like $O_3$, $NO_2$ is formed through a reaction between nitric oxide (NO) and atmospheric oxygen. NO and $NO_2$ are collectively referred to as nitrogen oxides (NOx) and are major contributors to ozone formation.

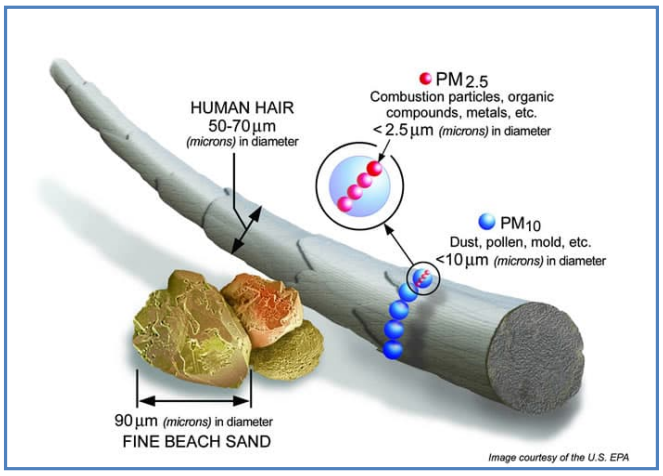
### 5.1.5 Ozone

Ozone ($O_3$) is a colorless toxic gas. $O_3$ is found in both the Earth's upper and lower atmospheric levels. In the upper atmosphere, $O_3$ is a naturally occurring gas that helps to prevent the sun's harmful ultraviolet rays from reaching the Earth. In the lower layer of the atmosphere, the formation of $O_3$ is mostly the result of human activity, although $O_3$ also occurs because of hydrocarbons released by plants and soil. $O_3$ is not directly emitted into the atmosphere; in the lower atmosphere, it forms through a series of photochemical reactions in the presence of sunlight, hydrocarbons (HC) (primarily Volatile Organic Compounds or VOCs) and nitrogen oxides (NOx). VOCs and NOx are emitted from industrial sources and from automobiles. $O_3$ enters the bloodstream through the respiratory system and interferes with the transfer of oxygen, depriving sensitive tissues in the heart and brain of oxygen.

### 5.1.6 Particulate Matter

Particulate pollution is composed of solid particles or liquid droplets that are small enough to remain suspended in the air. In general, particulate pollution can include dust, soot, salts, acids, metals and smoke; these can be irritating but usually are not poisonous. Particulate pollution also can include bits of solid or liquid substances that can be highly toxic. Of particular concern are those particles that are smaller than, or equal to, 10 microns ($PM_{10}$) or 2.5 microns ($PM_{2.5}$) in size. A micron, also referred to as a micrometer, is a millionth of a meter. $PM_{10}$ refers to particulate matter less than or equal to 10 microns in diameter, about one seventh the thickness of a human hair (Figure 5-1).

Figure 5-1. Relative Particulate Matter Size




Source: USEPA Office of Air and Radiation

Major sources of $PM_{10}$ include motor vehicles; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions. Suspended particulates produce haze and reduce visibility.

A small portion of particulate matter is the product of fuel combustion processes. In the case of $PM_{2.5}$, the combustion of fossil fuels accounts for a large portion of this pollutant. The main health effect of airborne particulate matter is on the respiratory system.

### 5.1.7 Sulfur Dioxide

$SO_2$ is a product of high-sulfur fuel combustion. The main sources of $SO_2$ are coal and oil used in power stations, industry and for domestic heating. Industrial chemical manufacturing is another source of $SO_2$. $SO_2$ is an irritant gas that attacks the throat and lungs. It can cause acute respiratory symptoms and diminished ventilator function in children. $SO_2$ can also yellow plant leaves and erode iron and steel.

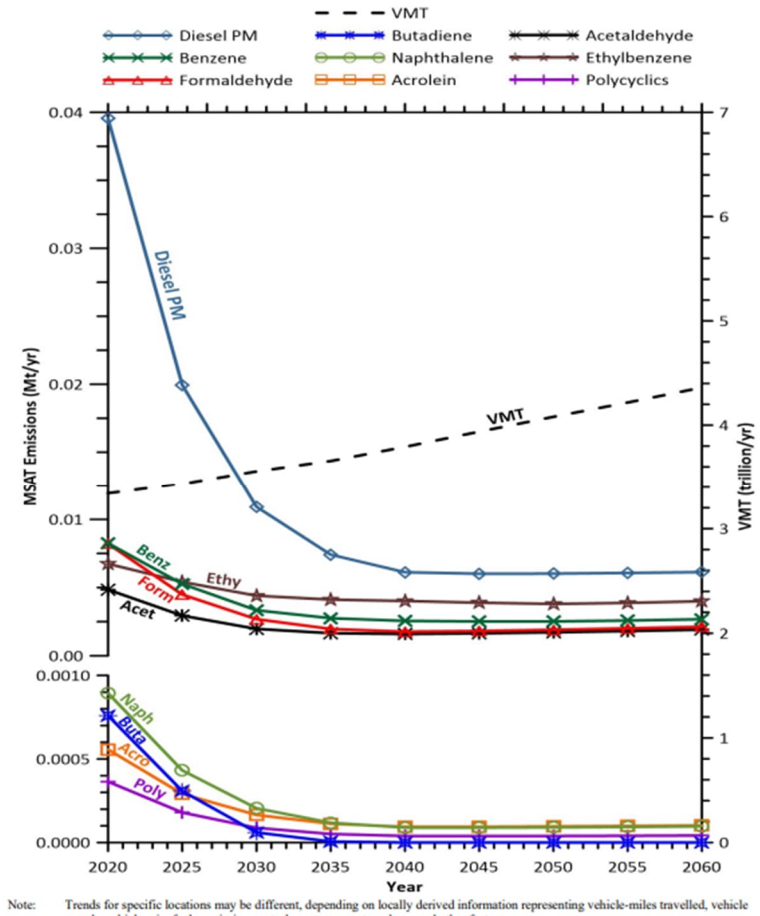
## 5.2 MOBILE SOURCE AIR TOXICS

In addition to the criteria pollutants for which there are NAAQS, the USEPA also regulates air toxics. Toxic air pollutants are those pollutants known or suspected to cause cancer or other serious health effects. Most air toxics originate from human made sources, including on road mobile sources, nonroad mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

Controlling air toxic emissions became a national priority with the passage of the Clean Air Act Amendments of 1990, whereby Congress mandated that the USEPA regulate 188 air toxics, also known as hazardous air pollutants. The USEPA has assessed this expansive list in their latest rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol. 72, No. 37, page 8,430, February 26, 2007) and identified a group of 93 compounds emitted from mobile sources that are listed in their Integrated Risk Information System (http://www.epa.gov/iris). In addition, the USEPA identified nine compounds with substantial contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 2011 National Air Toxics Assessment (https://www.epa.gov/national-air-toxics-assessment). These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter, ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While the Federal Highway Administration (FHWA) considers these the priority mobile source air toxics (MSATs), the list is subject to change and may be adjusted in consideration of future USEPA rules.

The 2007 USEPA rule requires controls that will dramatically decrease MSAT emissions through cleaner fuels and cleaner engines. Using USEPA's MOVES3 model, as shown in Figure 5-2, the FHWA estimates that even if vehicle-miles traveled (VMT) increases by 31 percent from 2010 to 2060 as forecast, a combined reduction of 76 percent in the total annual emissions for the priority MSATs is projected over the same time period.

Figure 5-2. FHWA Projected National MSAT Emission Trends 2020-2060 for Vehicles Operating On Roadways




## 5.3 CLIMATE CHANGE AND GREENHOUSE GASES

Climate change is a local, national and global concern. While the earth has gone through many natural climate variations in its history, there is general agreement that the earth's climate is currently changing at an accelerated rate and will continue to do so for the foreseeable future. Anthropogenic (human-caused) greenhouse gas (GHG) emissions contribute to this rapid change. Carbon dioxide ($CO_2$) makes up the largest component of these GHG emissions. Other prominent transportation GHGs include methane ($CH_4$) and nitrous oxide ($N_2O$).

## 5.4 ENERGY

Transportation energy use is generally discussed in terms of operational (direct) and construction (indirect) energy consumption. Direct transportation energy is a function of traffic and vehicle characteristics affecting fuel consumption (i.e., volume, speed, distance traveled, vehicle mix, thermal value of the fuel being used for roadway vehicles). Indirect energy

consumption consists of the non-recoverable, one-time energy expenditures associated with the construction of the physical infrastructure associated with a project.

## 5.5 MONITORED POLLUTANT LEVELS

USEPA monitored information for the most recent three years at the location closest to the project area with the most complete recent data set is presented in Table 5-2. There are no active lead monitors in the region; as such, lead levels are not reported.

As shown in the table, there were no violations of the NAAQS for any criteria pollutants.

Table 5-2. Ambient Air Quality Monitored Data

| POLLUTANT (UNITS) | CRITERIA | 96 STATE STREET RUTLAND, VERMONT | | |
|---|---|---|---|---|
| | | 2021 | 2022 | 2023 |
| Carbon Monoxide (ppm) | 1-Hour Maximum | 1.7 | 2.1 | 1.9 |
| | 1-Hour 2nd Maximum | 1.6 | 1.9 | 1.7 |
| | 1-Hour # of Exceedances | 0 | 0 | 0 |
| | 8-Hour Maximum | 0.8 | 0.9 | 1.0 |
| | 8-Hour 2nd Maximum | 0.6 | 0.8 | 0.9 |
| | 8-Hour # of Exceedances | 0 | 0 | 0 |
| Nitrogen Dioxide (ppb) | 1-Hour Maximum | 35 | 37 | 36 |
| | 1-Hour Second Maximum | 33 | 34 | 35 |
| | 98th Percentile | 30 | 33 | 30 |
| | Annual Mean | 5.94 | 6.48 | 5.45 |
| Ozone (ppb) | First Highest | 0.062 | 0.061 | 0.068 |
| | Second Highest | 0.060 | 0.056 | 0.065 |
| | Third Highest | 0.057 | 0.055 | 0.065 |
| | Fourth Highest | 0.056 | 0.054 | 0.063 |
| | # of Days Exceeded | 0 | 0 | 0 |
| $PM_{2.5}$ **(ug/m$^3$)** | 24-Hour 98th Percentile | 14 | 16 | 23 |
| | Mean Annual | 6.6 | 5.8 | 7 |
| $PM_{10}$ **(ug/m$^3$)** | Maximum 24-Hour | 44 | 31 | 42 |
| | Second Maximum | 37 | 24 | 34 |
| | # of Exceedances | 0 | 0 | 0 |
| Sulfur Dioxide (ppb) | 1-Hour Maximum | 2.1 | 2.0 | 1.5 |
| | 24-Hour Maximum | 0.8 | 0.9 | 0.7 |
| | # of Days Standard Exceeded | 0 | 0 | 0 |

Source: USEPA AirData

## 5.6 ANALYSIS

The project is located in an attainment area for all criteria pollutants. Furthermore, the project is not expected to affect regional traffic. As such, air quality analyses are not required per transportation conformity regulations.

Regardless, the re-routing of trucks on the various project alternatives could affect sensitive receptors and their exposure to particulate matter from diesel truck emissions. While truck traffic and emissions will decrease in the downtown area of Vergennes, there will likely be increases along the various alternative bypasses.

A qualitative discussion of the potential impacts from the various project alternatives follows, based upon preliminary traffic analyses and sensitive receptors located along each of the corridors (Table 5-3). This table presents the sensitive receptors located within 500 feet of each alternative bypass. In addition, the table also presents the receptor counts on existing Route 22A in downtown Vergennes.

Table 5-3. Sensitive Receptors Within 500 Feet (Existing and New)

| | PURPLE ROUTE ALTERNATIVE | | BLUE ROUTE ALTERNATIVE | PINK ROUTE ALTERNATIVE | GREEN ROUTE ALTERNATIVE | ORANGE ROUTE ALTERNATIVE | ROUTE 22A DOWNTOWN VERGENNES |
|---|---|---|---|---|---|---|---|
| | ROUTE 17 | ROUTE 7 | | | | | |
| Health Clinic | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| House of Worship | 0 | 3 | 0 | 0 | 0 | 0 | 2 |
| Library | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Residential | 100 | 71 | 13 | 42 | 33 | 40 | 286 |
| School (K/12) | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Total per Route | 174 | | 13 | 42 | 34 | 40 | 290 |

### 5.6.1 Purple Route Alternative

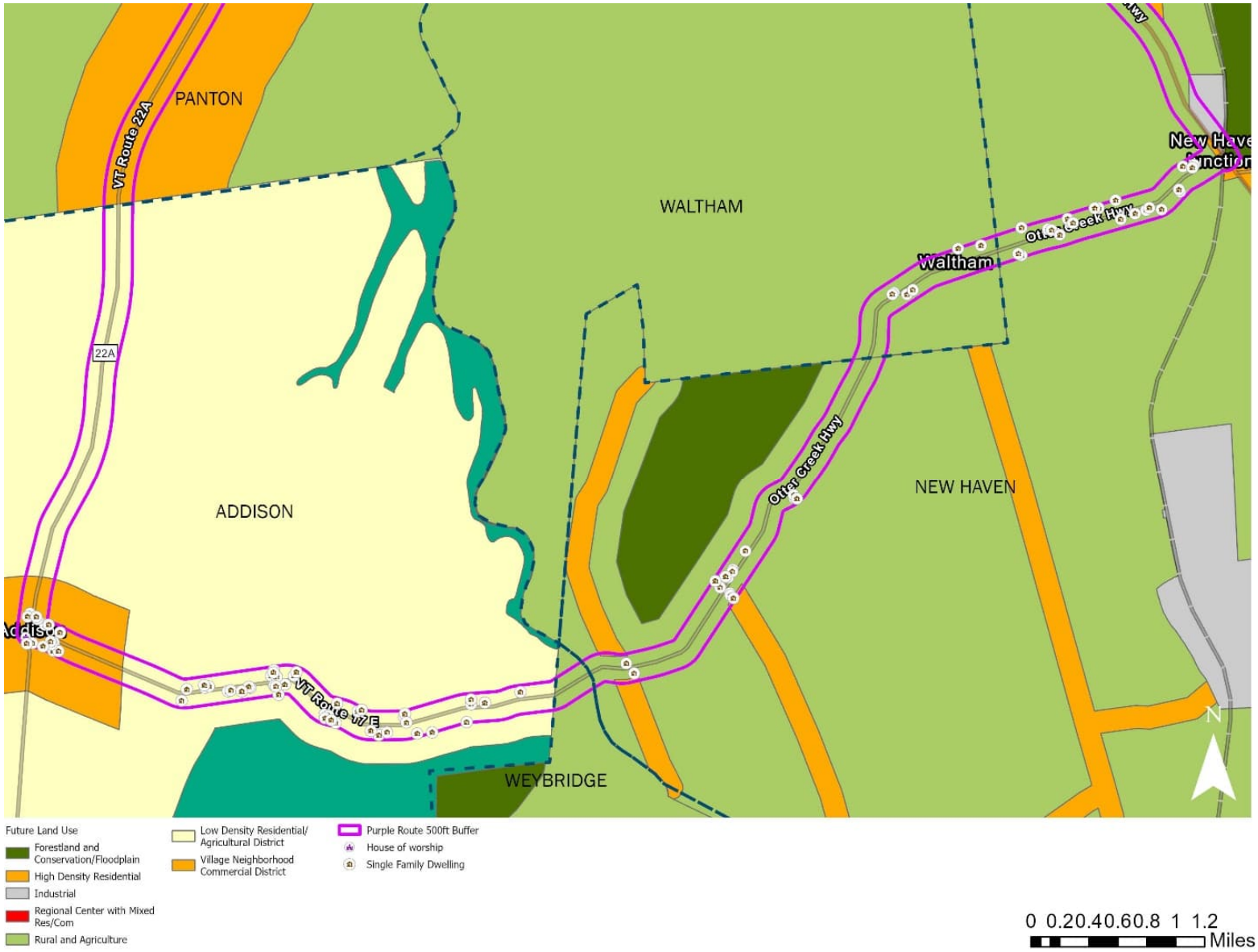
The Purple Alterative operates a bit differently than the others, as it does not include a newly constructed roadway bypass. Rather, it would shift northbound truck traffic from Route 22A to Routes 7 and 17, with southbound truck traffic continuing to use Route 22A in downtown

Vergennes. As such, this alternative would divert vehicles, mainly trucks, from 22A in downtown Vergennes, although to a lesser extent than the other alternatives. While this would decrease emissions and improve air quality in the downtown area, it would expose other sensitive receptors along Routes 7 and 17 to additional vehicle emissions.

The longer bypass route associated with this alternative would expose more sensitive receptors than other alternatives. Newly exposed receptors on Route 17 include 100 residences, and newly exposed receptors on Route 7 include 3 houses of worship and 71 residences, for a total of 174 sensitive receptors (Figure 5-3). These receptors, however, would only be subject to the additional vehicular emissions from northbound traffic.

On the other hand, the Purple Alterative would decrease traffic and emissions exposure to approximately 290 sensitive receptors on Route 22A in downtown Vergennes, including a health clinic, 2 houses of worship, a library, and 286 residences. These receptors, however, would still be subject to the additional vehicular emissions from southbound truck traffic.

Figure 5-3. Sensitive Receptors Within 500 Feet – Purple Alternative



### 5.6.2 Blue Route Alternative

According to preliminary traffic, this alternative would divert vehicles, mainly trucks, from 22A in downtown Vergennes. While this would decrease emissions and improve air quality in the downtown area, it would expose other sensitive receptors along the bypass route to vehicle emissions. Newly exposed receptors include 13 residences (Figure 5-4). However, this alternative would decrease traffic and emissions exposure to approximately 290 sensitive receptors on Route 22A in downtown Vergennes, including a health clinic, 2 houses of worship, a library, and 286 residences.

### 5.6.3 Pink Route Alternative

According to preliminary traffic, this alternative would divert vehicles, mainly trucks, from 22A in downtown Vergennes. While this would decrease emissions and improve air quality in the downtown area, it would expose other sensitive receptors along the bypass route to vehicle emissions. Newly exposed receptors include 42 residences (Figure 5-4). However, this alternative would decrease traffic and emissions exposure to approximately 290 sensitive receptors on Route 22A in downtown Vergennes, including a health clinic, 2 houses of worship, a library, and 286 residences.

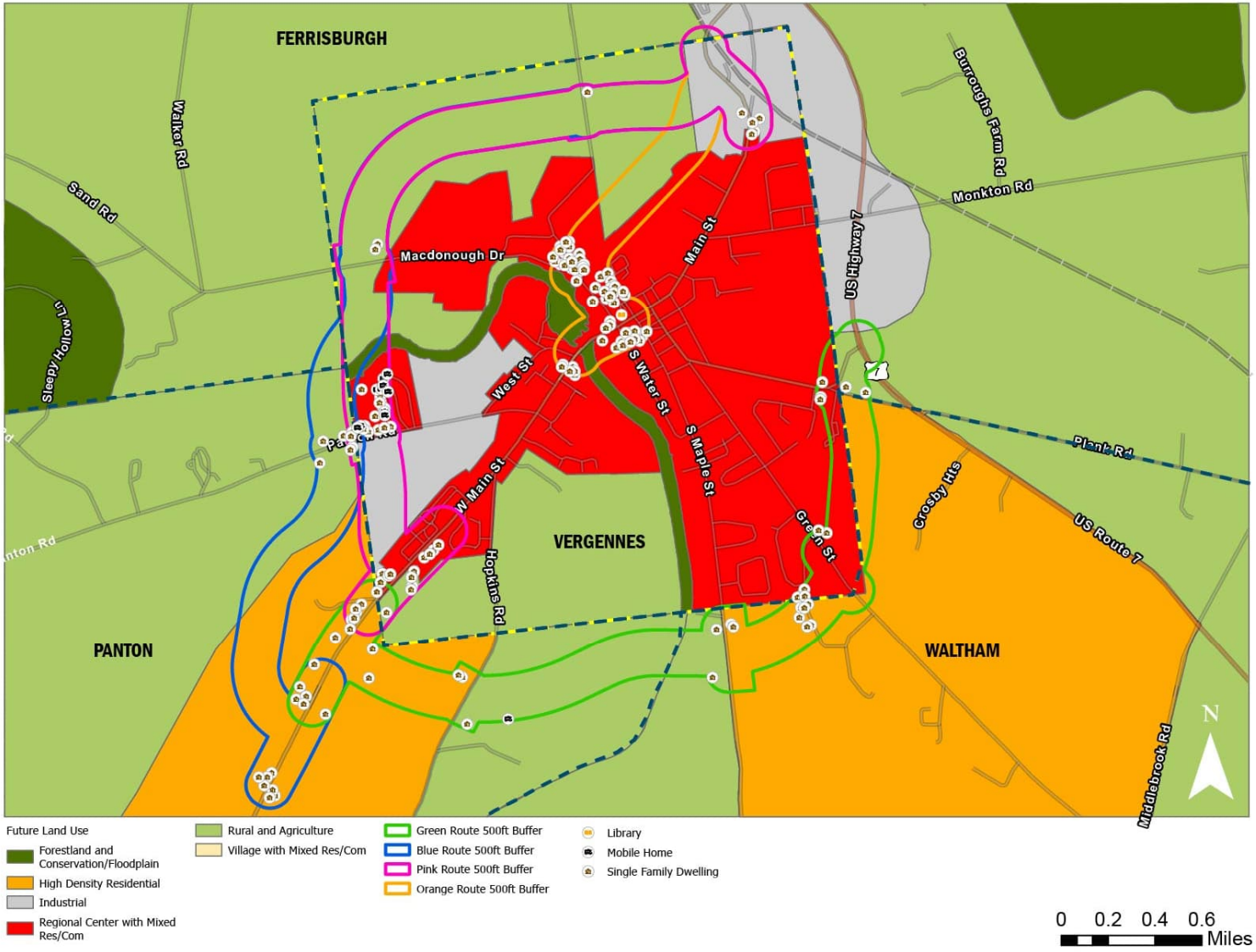
### 5.6.4 Green Route Alternative

According to preliminary traffic, this alternative would divert vehicles, mainly trucks, from 22A in downtown Vergennes. While this would decrease emissions and improve air quality in the downtown area, it would expose other sensitive receptors along the bypass route to vehicle emissions. Newly exposed receptors include 33 residences and 1 school, for a total of 34 sensitive receptors (Figure 5-4). However, this alternative would decrease traffic and emissions exposure to approximately 290 sensitive receptors on Route 22A in downtown Vergennes, including a health clinic, 2 houses of worship, a library, and 286 residences.

### 5.6.5 Orange Route Alternative

According to preliminary traffic, this alternative would divert vehicles, mainly trucks, from 22A in downtown Vergennes. While this would decrease emissions and improve air quality in the downtown area, it would expose other sensitive receptors along the bypass route to vehicle emissions. Newly exposed receptors include 40 residences (Figure 5-4). However, this alternative would decrease traffic and emissions exposure in downtown Vergennes, although to a lesser extent than the Green/Blue/Pink alternatives due to the shorter bypass. Specifically, approximately 115 sensitive receptors on Route 22A in downtown Vergennes would benefit from this alternative, including a health clinic, 2 houses of worship, and 115 residences.

Figure 5-4. Sensitive Receptors Within 500 Feet – Green, Blue, Pink and Orange Alternatives



### 5.6.6 Summary

The project would benefit the air quality in downtown Vergennes by diverting vehicles, mainly diesel trucks, from 22A. However, the various alternatives would expose new sensitive receptors to vehicular emissions along each of the bypass routes.

According to a review of sensitive receptors in the area, the Blue Alternative would impact the least number of new sensitive receptors, whereas the Purple Alternative would impact the most. According to a review of preliminary traffic data, the Pink, Blue, Orange, and Green Alternatives would perform similarly with regards to the number of vehicle diversions, whereas the longer Purple Alternative would divert fewer vehicles.

Under all alternatives, the number of sensitive receptors benefited by the diversion of trucks from downtown Vergennes exceeds the number of newly impacted sensitive receptors on the bypass routes. As such, from an operational standpoint, it can be implied that the project would likely have an overall beneficial impact on air quality.

Construction-related effects of the project would be limited to short-term increased fugitive dust and mobile-source emissions during construction. Since the Purple Route Alternative would operate on existing roadways and not involve the construction of a new bypass, it would have the lowest construction emissions of all alternatives.

### 5.6.7 Next Steps

As discussed earlier, the project is not expected to affect regional traffic and is located in an attainment area for all criteria pollutants. As such, future air quality analyses are not required per transportation conformity regulations, nor would a GHG analysis be appropriate as GHG's are analyzed on a regional basis.

With regards to MSATs and per FHWA's *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents,* this project would likely be a Tier 2 project (Projects with Low Potential MSAT Effects), and a qualitative discussion of traffic changes under the various alternatives will suffice.

If there are community concerns with regards to the emissions along the alternative routes, especially particulate matter from diesel trucks along the bypass routes, a more detailed analysis may be conducted following EPA's *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and $PM_{10}$ Nonattainment and Maintenance Areas*. However, due to the relatively low vehicle and truck volumes along both 22A and the bypass routes, as well as the beneficial ambient air quality per the monitored data, is not expected that there would be a violation of the NAAQS.

## 5.7 REFERENCES

Federal Highway Administration (FHWA), Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents. January 2023. https://www.fhwa.dot.gov/environMent/air_quality/air_toxics/policy_and_guidance/msat//fhwa_nepa_msat_memorandum_2023.pdf

United States Environmental Protection Agency (EPA). AirData. https://www.epa.gov/outdoor-air-quality-data. Accessed October 2024.

United States Environmental Protection Agency (EPA), *Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in $PM_{2.5}$ and $PM_{10}$ Nonattainment and Maintenance Areas*. October 2021. https://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses#pmguidance

# 6. Environmental Justice Assessment

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, directs federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of federal projects on the health or environment of minority and/or low-income populations to the greatest extent practicable and permitted by law. The potential for any project to result in disproportionately high and adverse effects on minority and low income (environmental justice) populations will be assessed as part of future NEPA documentation consistent with the FHWA's "Guidance on Environmental Justice and NEPA" and USDOT Order 5610.2C.

This section discusses the potential for environmental justice impacts from the proposed transportation alternatives.

## 6.1 STUDY AREA

The study area for this environmental justice assessment includes the City of Vergennes and the six other municipalities: the towns of Ferrisburgh, New Haven, Panton, Waltham, Addison, and Weybridge. These seven municipalities are located within Addison County.

The March 2022 Purpose and Need Technical Memorandum prepared for the Vergennes PEL Study provides demographic data for the study area pertaining to environmental justice (EJ) populations, including populations that are low-income, exhibit limited English proficiency, or are predominantly racial or ethnic minority communities, as presented in Table 6-1.

As illustrated in Table 6-1, Census Tract 9603 (the City of Vergennes) exhibits two population groups with a substantially higher percentage when compared to the total of Addison County. Within the City of Vergennes, residents living with a disability or those living below the poverty level are higher than typical communities within Addison County. This indicates that the review of potential alternatives should take into consideration the benefits or burdens to these underserved communities.

Table 6-1 Vulnerable Population – Demographic Study Area, 2019

| | CENSUS TRACT 9602 (FERRISBURGH) | CENSUS TRACT 9603 (VERGENNES) | CENSUS TRACT 9604 (OTHER TOWNS) | ADDISON COUNTY | VERMONT STATE |
|---|---|---|---|---|---|
| Total Population | 2,725 | 2,596 | 5,084 | 36,882 | 624,313 |
| Percent of Population Aged 65+ | 18.79% | 16.02% | 20.52% | 19.2% | 18.8% |
| Percent of Population Under 18 years old | 14.75% | 18.41% | 17.29% | 17.2% | 18.7% |
| Percent of Population Under 5 years old | 3.93% | 2.81% | 4.92% | 4.1% | 4.7% |
| Percent of Population Living with a Disability | 13.4% | 16.4% | 13.6% | 13.4% | 14.5% |
| Percent of Population that is Foreign Born | 3.56% | 4.89% | 4.98% | 4.8% | 4.7% |
| Percent of Population Living Below the Poverty Level | 4.92% | 10.82% | 4.92% | 7.2% | 10.9% |
| Percent of Population who Identify as Non-White | 2.57% | 2.20% | 2.58% | 4.4% | 3.9% |
| Percent of Population with Limited English Proficiency | 1.8% | 0.0% | 0.1% | 1.1% | 1.5% |
| Percent of Population with No Vehicle Access | 1.0% | 3.6% | 1.5% | 4.2% | 6.9% |

Source: U.S. Census Bureau American Community Survey 5-Year Estimates

The following sections build on this initial investigation of environmental justice communities within the study area.

## 6.2 METHODOLOGY

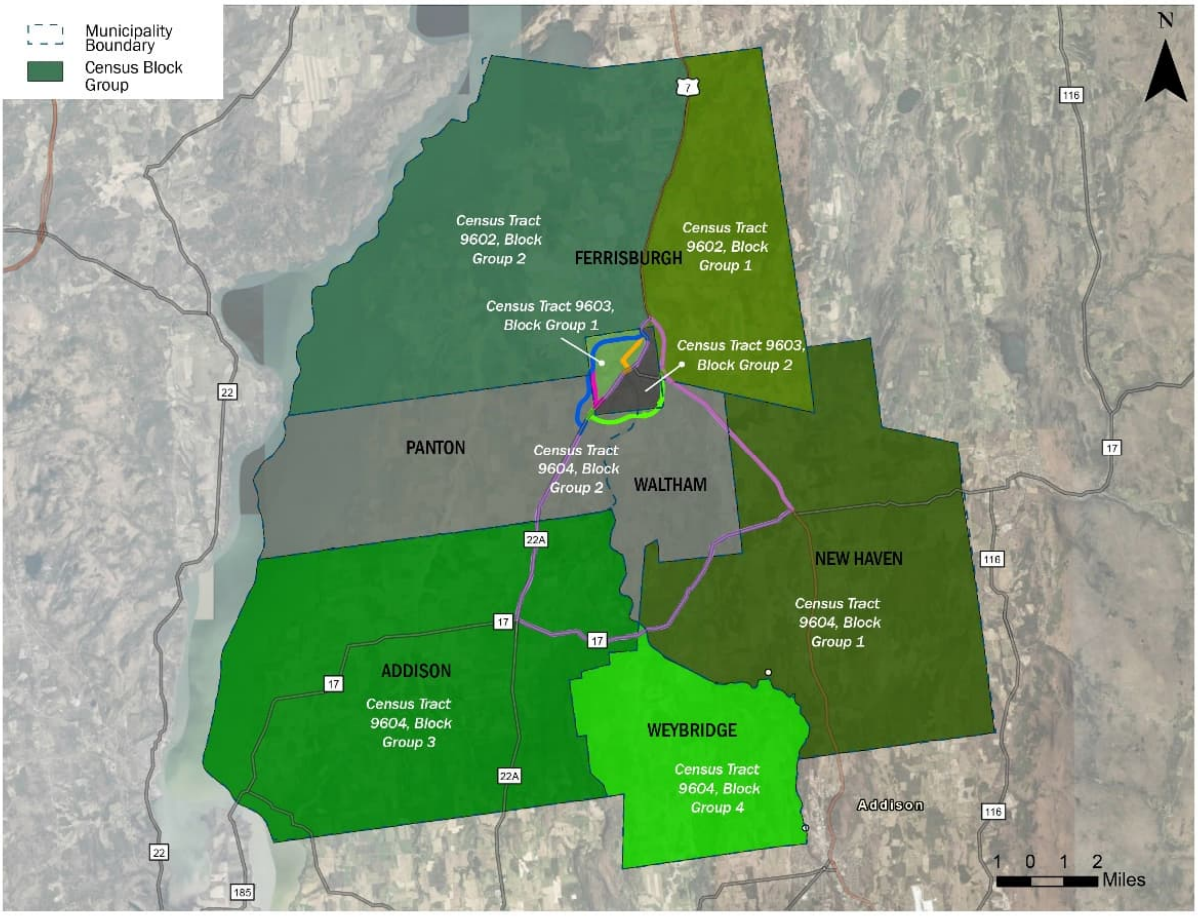
The approach for this environmental justice assessment is two-fold. First, VTrans conducted a block group analysis to identify potential environmental justice communities. Block groups were assessed using the Vermont Environmental Justice Law, Act 154 of 2022. In addition, incomes were assessed further to consider income disparity throughout the block groups. Finally, affordable housing units? were identified within the study area.

Second, VTrans considered current environmental burdens within the study area and along each of the potential route alternatives, using the Environmental Protection Agency (EPA) EJScreen tool.

## 6.3 BLOCK GROUP ANALYSIS

Figure 6-1 presents the block groups within the study area.

Figure 6-1 Block Groups within Study Area




### 6.3.1 Vermont Environmental Justice Law

Also known as Act 154 of 2022, the Vermont Environmental Justice Law is the state's first law specifically meant to address environmental health disparities and improve the health and well-being of all Vermont residents. The Environmental Justice Law establishes Vermont's Environmental Justice State Policy.

The purpose of the Environmental Justice Law is to ensure all Vermonters regardless of race, cultural background, or income have equitable access to environmental benefits such as clean air and water, healthy food, and public transportation. The Environmental Justice Law also protects communities from disproportionate environmental burdens such as polluted air and water, climate change impacts, and limited access to green spaces. The Environmental Justice Law requires State agencies to meaningfully engage Vermonters in the environmental decision-making processes.

The Law defines "Environmental Justice Focus Populations"[6] as any census block group that meests one or more of the following criteria:

- The annual median household income is not more than 80 percent of the State median household income
- Persons of Color and Indigenous Peoples comprise at least six percent or more of the population
- At least one percent or more of households have limited English proficiency

Table 6-2 illustrates the criteria for environmental justice focus populations for the block groups within the study area. Only one block group within the study area exceeds the thresholds of the Vermont Law. Census Tract 9604, Block Group 4, which encompasses the town of Panton, has 8% persons of color, which exceeds the Vermont thershold of 6%. Similarly, Addison County also exeeds the state threshold.

Table 6-2 Environmental Justice Focus Population Criteria

| | MEDIAN HOUSEHOLD INCOME | % PERSONS OF COLOR | % LIMITED ENGLISH-SPEAKING HOUSEHOLDS |
|---|---|---|---|
| Census Tract 9602, Block Group 1 | 108,015 | 2% | 0% |
| Census Tract 9602, Block Group 2 | 98,438 | 2% | 0% |
| Census Tract 9603, Block Group 1 | 88,000 | 4% | 0% |
| Census Tract 9603, Block Group 2 | 70,461 | 5% | 0% |
| Census Tract 9604, Block Group 1 | 92,396 | 4% | 0% |
| Census Tract 9604, Block Group 2 | 92,750 | 8% | 0% |
| Census Tract 9604, Block Group 3 | 103,333 | 3% | 0% |
| Census Tract 9604, Block Group 4 | 106,875 | 4% | 0.30% |
| Addison County | $85,870 | 8% | 0% |
| Vermont Threshold for EJ Focus Populations | $59,193 (80% State Median Income) | 6% | 1% |

Source: U.S. Census Bureau, 20222 ACS 5-Year Estimates

### Census Tract 9602, Block Group 1

This block group includes Ferrisburgh east of Route 7 and would potentially be impacted by the proposed Purple and Green Route Alternatives. The median income is $108,015, which is higher than the median income of Addison County. The non-white population is 2% and there are no limited English speaking households. This block group does not meet the Vermont thresholds for environmental justice populations.

[6] https://legislature.vermont.gov/statutes/fullchapter/03/072

### Census Tract 9602, Block Group 2

This block group is within Ferrisburgh west of Route 7 and would potentially be impacted by the proposed Purple Route Alternative. The median income is above the median income for Addison County at $98,438, and the non-white population is 2%. There are no limited English speaking households with the block group. This block group does not meet the Vermont thresholds for environmental justice populations.

### Census Tract 9603, Block Group 1

This block group is within the City of Vergennes west of Route 22A and would potentially be impacted by the proposed Purple, Orange, Blue, and Green Route Alternatives. The median income is above the median income for Addison County at $88,000, and the non-white population is 4%. There are no limited English speaking households with the block group. This block group does not meet the Vermont thresholds for environmental justice populations.

### Census Tract 9603, Block Group 2

This block group is within the City of Vergennes east of Route 22A and would potentially be impacted by the proposed Purple and Green Route Alternatives as shown in Figure 6-1. The median income is above the median income for Addison County at $70,461, and the minority population is 5%. There are no limited English speaking households with the block group. This block group does not meet the Vermont thresholds for environmental justice populations.

### Census Tract 9604, Block Group 1

This block group includes New Haven and would potentially be impacted by the proposed Purple Route Alternative. The median income is above the median income for Addison County at $92,396, and the non-white population is 4%. There are no limited English speaking households with the block group. This block group does not meet the Vermont thresholds for environmental justice populations.

### Census Tract 9604, Block Group 2

This block group includes Panton and Waltham and would potentially be impacted by the proposed Purple, Blue, and Green Route Alternatives. The median income is above the median income for Addison County at $92,750. The non-white population is 8% and there are no limited English speaking households. This block group exceeds the Vermont thresholds for environmental justice populations because the percent non-white population exceeds the threshold of 6%.

### Census Tract 9604, Block Group 3

This block group includes Addison and would potentially be impacted by the proposed Purple Route Alternative. The median income is above the median income for Addison County at $103,333, and the non-white population is 3%. There are no limited English speaking households within the block group. This block group does not meet the Vermont thresholds for environmental justice populations.

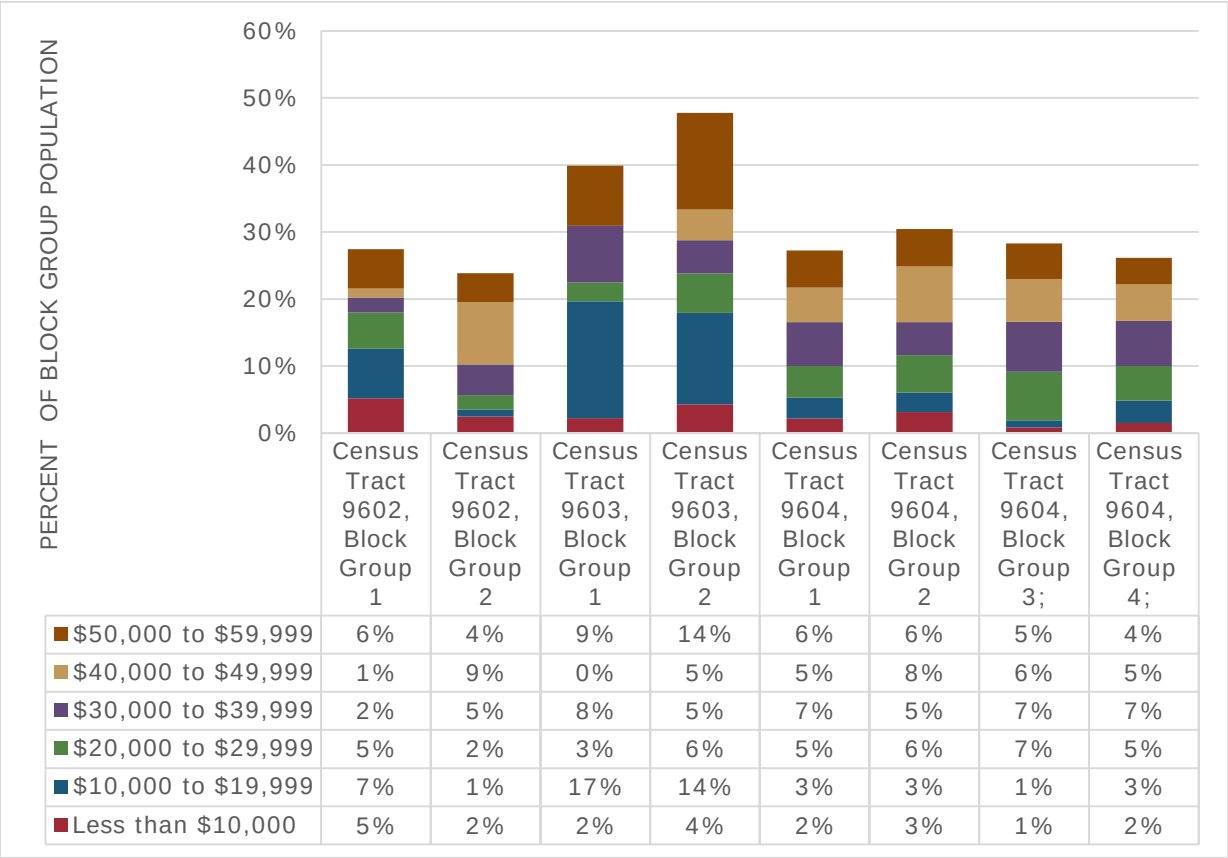
### Census Tract 9604, Block Group 4

This block group is within Addison and would potentially be impacted by the proposed Purple Route Alternative. The median income is above the median income for Addison County at $106,875, and the non-white population is 4%. The percentage of limited English speaking households is less than 1%. This block group does not meet the Vermont thresholds for environmental justice populations.

## 6.3.2 Income Disparity

While none of the block groups exceed the threshold for median income, incomes were assessed further to understand the incomes across the population. Figure 6-2 presents the population percentage earning less than the 80% state median income ($59,193). Note that income is presented in $9,999 increments with the largest income bracket as $50,000 to $59,999, which slightly exceeds the 80% of the state median income of $59,193.

Figure 6-2 Percent of Block Groups Earning less than the 80% Vermont Median Income




| | Census Tract 9602, Block Group 1 | Census Tract 9602, Block Group 2 | Census Tract 9603, Block Group 1 | Census Tract 9603, Block Group 2 | Census Tract 9604, Block Group 1 | Census Tract 9604, Block Group 2 | Census Tract 9604, Block Group 3; | Census Tract 9604, Block Group 4; |
|---|---|---|---|---|---|---|---|---|
| $50,000 to $59,999 | 6% | 4% | 9% | 14% | 6% | 6% | 5% | 4% |
| $40,000 to $49,999 | 1% | 9% | 0% | 5% | 5% | 8% | 6% | 5% |
| $30,000 to $39,999 | 2% | 5% | 8% | 5% | 7% | 5% | 7% | 7% |
| $20,000 to $29,999 | 5% | 2% | 3% | 6% | 5% | 6% | 7% | 5% |
| $10,000 to $19,999 | 7% | 1% | 17% | 14% | 3% | 3% | 1% | 3% |
| Less than $10,000 | 5% | 2% | 2% | 4% | 2% | 3% | 1% | 2% |

Source: U.S. Census Bureau, 20222 ACS 5-Year Estimates

The data indicate that while the overall block group does not exceed the Vermont Environmental Justice Law thresholds, there are individual households within the study area that have a median income lower than $59,999. More than 40% of the population of the City of Vergennes has a median income lower than $59,999. Between 24% and 30% of the remaining study area has a median income lower than $59,999.

### 6.3.3 Affordable Housing

VTrans identified affordable housing sites in the study area using data from Addison Housing Works, a nonprofit affordable housing trust located in downtown Vergennes. Addison Housing Works provides units with rents generally capped at or below 30 percent of household income. Eligibility ranges from those earning 120 percent of the area median income (AMI) to those earning below 30 percent of AMI. In our study area, the eligibility range was between 50 percent and 120 percent of Addison County's AMI. The following table identifies the seven affordable housing developments within the study area.

Table 6-3 Affordable Housing within the Study Area

| NAME | ADDRESS | # OF UNITS | MUNICIPALITY | CENSUS TRACT, BLOCK GROUP |
|---|---|---|---|---|
| Otter Creek Mobile Home Park | Panton Road | 73-unit mobile home park | Vergennes | Census Tract 9603, Block Group 1 |
| Smallest City Limited Partnership | 206 & 224 Main Street | 20 | Vergennes | Census Tract 9603, Block Group 2 |
| Addison Housing Limited Partnership | 97-101 Main St, 10 S Water St, 14 S Maple St | Scattered Site | Vergennes | Census Tract 9603, Block Group 2 |
| Vergennes Community Apartments | 45 Armory Lane | 24 | Vergennes | Census Tract 9603, Block Group 2 |
| Armory Lane Senior Housing | 50 Armory Lane | 25 | Vergennes | Census Tract 9603, Block Group 2 |
| Creekview Housing | 20-36 Hillside Acres | 36 | Vergennes | Census Tract 9604, Block Group 1 |
| McKnight Lane | 5-57 McKnight Lane | 14 | Waltham | Census Tract 9604, Block Group 1 |

Source: Addison Housing Works. Our Multifamily Apartment Buildings. https://www.addisonhousingworks.org/about-multifamily-properties.html

## 6.4 ROUTE ANALYSIS

For the route analysis, VTrans used the EPA's EJScreen tool to identify the environmental indicators surrounding each proposed route alternative. EJScreen utilizes maps and reports to display a wide range of data and information, including environmental burden indicators, socioeconomic indicators, environmental justice indexes, supplemental indexes, climate change, health disparities, and critical service gaps within a defined area. VTrans generated EJSreen reports for a ¼ mile buffer around each route alternative. The full EPA EJScreen reports for the each route alternative are available at the end of this document.

Table 6-4 shows the results of the EPA EJScreen tool for selected environmental indicators. The selected indicators—such as particulate matter, truck traffic, diesel particulate matter, and health indicators like low life expectancy and the percentage of the population with disabilities, along with pollution-related indicators, such as asthma—were chosen because they directly reflect the kinds of environmental and health disparities that have historically disproportionately affected environmental justice (EJ) communities. These indicators provide insight into the compounded effects of traffic-related pollution and other environmental stressors on vulnerable populations such as lower-income households and are used to consider how the proposed route alternatives could exacerbate existing inequities in these communities.

Table 6-4 EPA EJScreen for the Proposed Route Alternatives

| | SELECTED ENVIRONMENTAL INDICATORS | ORANGE ROUTE ALTERNATIVE | GREEN ROUTE ALTERNATIVE | BLUE ROUTE ALTERNATIVE | PINK ROUTE ALTERNATIVE | PURPLE ROUTE ALTERNATIVE | **EXISTING ROUTE 22A** | VERMONT STATE AVERAGE |
|---|---|---|---|---|---|---|---|---|
| Air Pollution | Particulate Matter 2.5 (µg/m3) | 5.98 | 5.99 | 5.98 | 5.98 | 5.99 | 6.11 | 5.70 |
| | Diesel Particulate Matter | 0.092 | 0.091 | 0.092 | 0.092 | 0.089 | 0.060 | 0.080 |
| Health Indicators | Low Life Expectancy | 19% | 19% | 19% | 19% | 19% | 19% | 17% |
| | Asthma | 10.3 | 10.2 | 10.2 | 10.3 | 10.2 | 10.7 | 10.2 |
| | Person with Disabilities | 16.3% | 16.2% | 16.3% | 16.3% | 16.1% | 15.5% | 14.5% |

Source: U.S. Environmental Protection Agency. EJScreen Community Report, EJScreen Version 2.3

As shown in Table 6-4, the existing Route 22A corridor as well as the ¼ mile buffer surrounding the proposed route alternatives has a higher levels of environmental burdens than the Vermont state average. All of the selected health indicators reflect values above the state average for the Orange Route Alternative and Pink Route Alternatives. The Green Route Alternative, Blue Route Alternative, and Purple Route Alternative exceed the state average for the selected health indicators, with the exception of asthma which is at the state level.

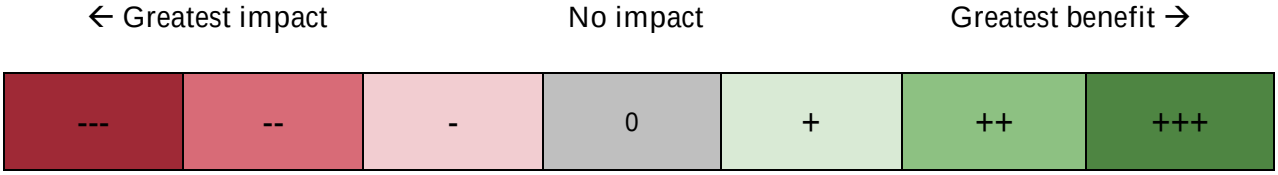
## 6.5 NEXT STEPS

Continued outreach as part of NEPA scoping will ensure there is a focused effort to reach EJ communities, including ways to serve households with limited English proficiency. As specific transportation improvements are selected for advancement and design progresses, consideration will be given to avoiding or minimizing adverse effects on the health or environment of low-income or otherwise vulnerable populations to the greatest extent practicable.

# 7. Alternatives Evaluation

More detailed criteria (qualitative and quantitative) were developed for the alternatives evaluation of the route alternatives. The criteria were divided into categories, including transportation impacts, local and regional issues including quality of life and economic and land use, and environmental resources. The criteria are discussed below.

Section 7.6 presents the evaluation matrix for the route alternatives and the No Build Alternative. Criteria are measured as a benefit (shown in green) or an impact (shown in red). For quantitative measures, a numerical entry is (e.g., acreage, number) is provided in the table. For qualitative measures, a "+" or "-" scale is used. A score of zero (0) indicates that there is no tangible result/impact for that measure within that alternative.




## 7.1 TRANSPORTATION

Transportation criteria were measured quantitatively or qualitatively based on available data or input received. Each measure has been scored to determine a positive or negative result/impact given the implementation of a particular alternative.

Criteria: Traffic Operations – These measures examine the change in condition associated with existing roadways, if a proposed route alternative is implemented.

> Measure: Change in overall network traffic operations – This measure reviews the system-wide change in traffic operations along existing roadways (US Route 7, VT Route 22A, VT Route 17). A "+" score indicates that minor network-wide operational improvements are associated with a given alternative. A "-" score indicates minor degradation of existing roadway or intersection operations. A "--" score indicates that changes to travel patterns associated with a route alternative may require existing intersections to be signalized.

Criteria: Proposed route– These measures examine the change in condition associated with conditions for diverted traffic onto a proposed route alternative.

> Measure: Travel times for freight vehicles – This measure is associated with proposed travel times for diverted trucks using a given alternative. The score reflects an average of

all analyzed time periods and directions (Southbound AM, Southbound PM, Northbound AM, Northbound PM). A "+" score indicates the travel times for trucks associated with a route alternative will be slightly improved from the no build condition. A "-" score indicates a slight increase in travel time associated with a given route. A "---" score indicates a substantial increase in travel time associated with a route alternative.

Measure: Diversion length – This measure is associated with the proposed trip length for diverted vehicles using a given route alternative. A diversion length greater than 0.1 miles but less than 1 mile is considered a minor diversion. A diversion length greater than 1 mile but less than 3 miles is considered a medium diversion. A diversion length greater than 3 miles is considered a major diversion.

Criteria: Bicycle and pedestrian – These measures examine the change in condition for cyclists or pedestrians, if a proposed route alternative is implemented.

Measure: Potential for expansion of regional bicycle network – This measure is a qualitative measure that reviews opportunities to connect to existing regional bicycle routes. A "+" score indicates potential opportunities to connect to existing bicycle routes. Identification and development of specific bicycle infrastructure will follow in subsequent phases of this effort.

Measure: Linear feet of new sidewalk – This measure reviews opportunities to expand pedestrian connections associated with a given alternative. A "+" score indicates limited opportunities to expand the existing sidewalk network.

Measure: Number of additional marked crosswalks – This measure reviews opportunities to include marked crosswalks associated with a given alternative. A "+" score indicates limited opportunities to include crosswalks along a route alterative.

Criteria: Traffic volume – This measure examines the change in traffic volumes along Route 22A, if a proposed route alternative is implemented.

Measure: Change in truck volumes on Route 22A in downtown Vergennes – This measure examines the change in truck volumes (AM and PM peak hour) along Route 22A within downtown Vergennes, if a given route alternative is implemented. A reduction in of less than 100 trucks (northbound and southbound, combined) in the AM or PM peak hour indicates a moderate reduction in truck traffic in downtown Vergennes. A reduction of more than 100 trucks in the AM or PM peak hour indicates a significant reduction in truck traffic in downtown Vergennes.

## 7.2 QUALITY OF LIFE

Criteria: Noise and Air Quality – This measure considers the change in traffic noise and emissions as a result of the proposed route alternatives.

Table 7-1 Predicted Traffic Noise Levels Using the Cadna-A Noise Model

| Site No. | Receptor Name | 2022 Existing (dBA Leq) | 2046 No-Build (dBA Leq) | 2046 Blue Alt (dBA Leq) | 2046 Pink Alt (dBA Leq) | 2046 Green Alt (dBA Leq) | 2046 Orange Alt (dBA Leq) | 2046 Purple Alt (dBA Leq) |
|---|---|---|---|---|---|---|---|---|
| C-1 | Black Sheep Bistro | 69 | 71 | 67 | 67 | 67 | 71 | 70 |
| C-2 | Vergennes Opera House | 65 | 67 | 63 | 63 | 63 | 67 | 66 |

Table 7-1 shows that the No Build Alternative noise levels are expected to increase by 2 decibels relative to the existing noise levels. For reference, humans can only perceive a change of +/- 3 dBA if they are concentrating on the noise itself. Otherwise, it generally takes a change of about +/- 5 dBA for someone to notice an appreciable change. A change of +/- 10 decibels is generally described as a doubling/halving in noise level.

Future noise levels associated with the Blue, Pink, or Green Route Alternatives are expected to be as much as 2 decibels quieter than the existing condition, and moreover, would be 4 decibels quieter than the No Build Alternative. Future noise levels associated with the Orange or Purple Route Alternatives are expected to increase by 2 decibels relative to the existing due to increased traffic volumes in general over time.

A screening was conducted to determine the potential impact and the need for environmental noise studies under NEPA. VTrans identified the areas and associated activities (i.e., land uses) that could be potentially affected by highway noise within a 500 foot study area on both sides of the proposed route alternatives. The number of sensitive receptors (e.g., residential, health clinics, places of worship, libraries, and K-12 schools) were identified within the 500 foot buffer for each of the proposed route alternatives, as shown on Figure 7-1 and Figure 7-2.

The Route Alternatives would shift a portion of heavy truck traffic from Route 22A in downtown Vergennes. Noise receptors along those remote routes experience relatively little existing traffic today. Future traffic noise levels along those routes would rise. There may be noticeable increases in heavy truck traffic noise levels for receptors located in quieter remote/rural areas along the bypass routes, but it is not expected that the future traffic noise levels would require consideration of noise control mitigation of any form.

Figure 7-1 Land Uses within 500 Feet of Blue, Pink, Orange and Green Route Alternatives

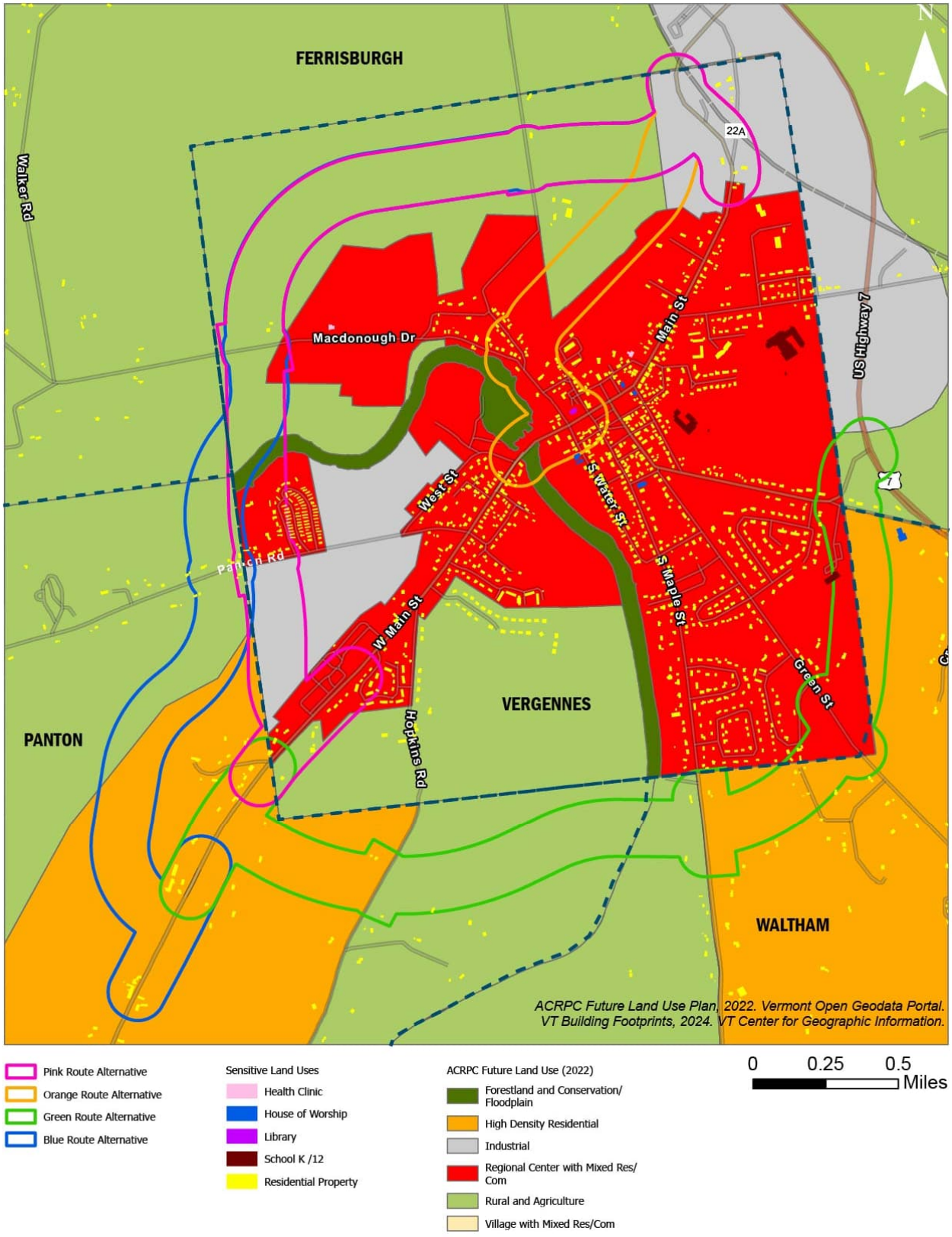
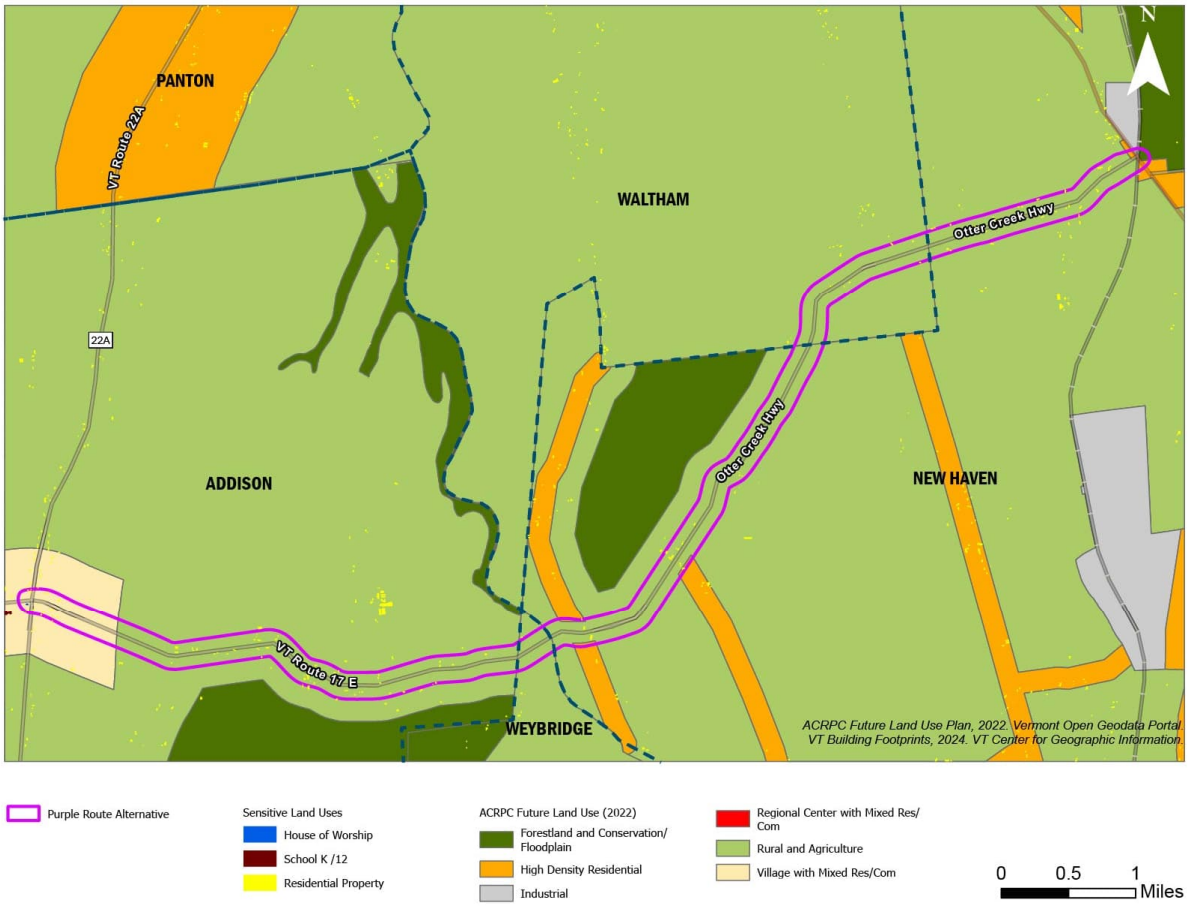


Figure 7-2 Land Uses within 500 feet of the Purple Route Alternative (Route 17 Section)




Criteria: Property Impacts – This measure considers the impacts to private properties and businesses. Full and partial takings were considered.

## 7.3 ECONOMIC AND LAND USE

Criteria: Property Tax Revenue – Property tax is a key revenue stream for towns in Vermont. This measure considers increases or decreases in property values in Vergennes and the surrounding towns which directly boosts the local tax base in the jurisdictions. A rise in property values would also indicate that businesses and residents perceive increased value in the area, contributing to long-term economic growth.

Criteria: Sales Tax Revenue – Although sales tax is a key metric for indicating economic activity, in Vermont, most sales tax revenue goes to the state, with limited local benefit. For Vergennes, which does not heavily rely on sales tax revenue alone, this metric will provide insight into commercial activity but may not reflect increased municipal revenue. The measure is the increases in sales tax for Vergennes and other municipalities and whether a route alternative would create preferential sales tax for one jurisdiction at the expense of another.

Criteria: Job Creation and Retention– This metric measures the route alternative's potential to open land for economic development use thus creating jobs through increased business opportunities, construction, and improved accessibility.

Criteria: Commercial Occupancy Rates – The measure for these criteria is higher commercial occupancy rates downtown reflect increased business activity and investment.

Criteria: Tourism Revenue: This measure would use geofencing to track increase in spending from people living over fifty miles away from Vergennes. Tourism is a major contributor to the local economy, particularly in Vergennes.

Criteria: Development Density Infill vs. Sprawl – This measure considers how each route alternative fosters infill development within Vergennes or contributes to sprawl. Infill supports sustainable growth, reduces infrastructure costs, and aligns with local goals.

Criteria: Zoning Changes, Comp Plan, and Land Reclassifications – This measure show what route alternative would require zoning and planning adjustments or land-use reclassifications. The fewer changes needed, the better the route alternative aligns with existing land-use policies.

## 7.4 ENVIRONMENTAL RESOURCES

Environmental resources criteria were measured quantitatively. Each measure was scored as low, medium, or high rating to determine the impacts given the implementation of a particular alternative. A score of zero (0) indicates that there is no tangible result/impact for that measure within that alternative. The definitions of low, medium, and high ratings for each criteria are provided in their appropriate sections below.

### 7.4.1 Wetlands

Criteria: Wetlands – These measures examine the potential impacts to mapped and inferred wetlands from a proposed route alternative.

> Measure: Acreage of impacted Class II wetlands – The total acreage of potential impacts to mapped and inferred state jurisdictional Class II wetlands, which are also regulated by the USACE if considered WOUS, were evaluated. Impacts >1 acre would require an Individual Permit with the USACE. Therefore, impacts <1 acre were scored as low, 1-5 acres as medium, and > 5 acres were scored as high.

### 7.4.2 Surface Waters

Criteria: Surface Waters – Surface waters include streams, rivers, lakes, and ponds. Aside from excavated farm/agricultural ponds, there are no natural lakes or ponds located within or

immediately adjacent to the route alternatives. Therefore, these measures examine the potential impacts to streams only from a proposed route alternative.

Measure: # of stream crossings – The number of stream crossings, including new crossings and the modification of existing crossings were evaluated. One stream crossing or modification of an existing crossing was scored as low, 2-3 as medium, and >3 as high.

### 7.4.3 Floodplains and River Corridors

Criteria: Floodplains & River Corridors – These measures examine the potential encroachment of floodplains (FEMA mapped flood hazard areas) and state regulated river corridors, including small stream 50-foot setbacks, from a proposed route alternative.

Measure: Acreage of floodplain encroachment – The total acreage of encroachment <1 acre was scored low, 1-3 acres as medium, and >3 acres received a high score.

Measure: Acreage of State River Corridors encroachment – The total acreage of encroachment of mapped river corridors <2 acres was scored low, 2-4 acres as medium, and >4 acres as high.

### 7.4.4 Vegetative Communities/Wildlife Habitat

Criteria: Vegetative Communities/Wildlife Habitat – These measures examine the encroachment into VT F&W mapped habitat blocks from a proposed route alternative.

Measure: # and acreage of habitat blocks impacted - The total acreage of encroachment of habitat blocks <5 acres was scored low, 5-10 acres as medium, and >10 acres as high. Ranking of habitat blocks were taken into account. For example, blue and pink route alternatives encroach into higher priority habitat blocks ranked 7 compared to the other route alternatives, which encroach habitat blocks ranked from 1-4. Therefore, the habitat block ranking was multiplied times the acreage (see numbers in parentheses in the evaluation matrix below). In addition, potential impacts to mapped wildlife road crossings, DWAs, and WMAs within and in the vicinity of the route alternative were taken into account. Based on this evaluation, the scoring was not adjusted.

### 7.4.5 Rare, Threatened, and Endangered Species

Criteria: Rare, Threatened, and Endangered Species – These measures examine the potential impacts to RTE and uncommon animal and plant species and VT significant natural communities from a proposed route alternative.

Measure: # of mapped RTE animal/plant species present within route – Scoring for the total number of potentially impacted species was adjusted based on the level of effort

associated with specific animal/plant species present and the likelihood of impacts from the proposed route alternative. For example, RTE mussel habitat potentially impacted by a route alternative would require a mussel survey and if present, a mussel relocation/mitigation plan and therefore was scored higher.

Measure: # of mapped uncommon animal/plant species present within route – Scoring for the total number of potentially impacted species was adjusted based on the level of effort associated with specific animal/plant species present and the likelihood of impacts from the proposed route alternative. For example, uncommon mussel habitat potentially impacted by a route alternative would require a mussel survey and if present, a mussel relocation/mitigation plan and therefore was scored higher.

Measure: Acreage of significant natural communities impacted – The total acreage of mapped significant natural communities potentially impacted by a route alternative <0.5 acre was scored as low, 0.5 – 1 acre as medium, and > 1 acre as high.

### 7.4.6 Farmland

Criteria: Farmland – These measures examine potential impacts to mapped primary agricultural soils from a proposed route alternative. The proposed route alternatives are located through soil map units classified as Prime Farmland and Farmland of Statewide Importance.

Measure: Acreage of primary agricultural soils impacted - The acreage of soil units classified as primary agricultural soils were evaluated. Whether the continuation of agricultural practices would be affected was taken into account. For example, if the route alternative potentially affected the border/edge verses the middle of an active agricultural field, it was scored lower. Less than 10 acres was scored as low, 10-20 acres as medium, and >20 acres as high.

### 7.4.7 Conserved Lands and Parkland and Recreation Areas

Criteria: Conserved Lands and Parkland and Recreation Areas – These measures examine the potential affect to conserved lands and parkland and recreation areas from a proposed route alternative.

Measure: # and acreage of parks and recreational areas – Potential impacts to areas less than 0.25 acre was scored as low, 0.25-0.5 acre as medium, and >0.5 acre as high. The size of the park and recreational parcel was taken into account. Subsequently, no scoring adjustments were made.

Measure: # and acreage of conserved lands - Less than 1 acres was scored as low, 1-4 acres as medium, and >4 acres as high. WMAs, the classification and acreage of a

conserved land, and geographical location of impact areas (i.e. along existing ROW) was taken into account and scoring was adjusted, if necessary.

## 7.5 PROJECT COSTS

Each route alternative was assessed for construction and development costs based on the following elements. These costs estimates are preliminary in nature and will be refined through future development of the route alternatives.

### Construction Costs

- Approximate cubic yards of excavation
- Approximate cubic yards of fill
- Approximate cubic yards of crushed stone subbase
- Approximate tons of asphalt
- Linear feet of guardrail and number of guardrail terminals
- Bridge order of magnitude cost based on the number of spans, the probably type of structure and location/height of the piers

### Development Costs

- Preliminary engineering
- Construction inspection
- Property acquisitions
- Archeological studies
- Wetland mitigation
- Agricultural mitigation

### 7.5.2 Anticipated Permits

Table 7-2 presents the anticipated permits for each of the route alternatives.

Table 7-2 Local, State, Federal Environmental Approval/Permitting Matrix

| | APPROVAL / PERMIT & AGENCY | ROUTE ALTERNATIVE | | | | |
|---|---|---|---|---|---|---|
| | | PURPLE | BLUE | PINK | GREEN | ORANGE |
| FEDERAL | Section 404 and / or Section 10 (USACE-New England District) | Y | Y | Y | Y | Y |
| | Section 404 and / or Section 10 (USACE- NY District) | N | Y | Y | N | N |
| | Section 408 (USACE) | N | Y | Y | N | N |
| | Bridge Permit (USCG) | N | Y | Y | N | N |
| | Rare, Threatened, and Endangered Species (USFWS) | Y / C | Y | Y | Y | Y / C |
| | NEPA (FHWA) | Y | Y | Y | Y | Y |
| | | | | | | |
| STATE | Flood Hazard Area & River Corridor (DEC) | Y | Y | Y | Y | Y |
| | Stream Alteration (DEC) | Y | Y | Y | Y | Y |
| | Wetlands[1] (DEC) | Y | Y | Y | Y | Y |
| | Shoreland Protection (DEC) | N | N | N | N | N |
| | Section 401 Water Quality Certification (DEC) | Y | Y | Y | Y | Y |
| | Section 106 (DHP) | Y | Y | Y | Y | Y |
| | Rare, Threatened, and Endangered Species (F&W) | Y / C | Y | Y | Y | Y / C |
| | Stormwater Construction Permit (DEC) | Y | Y | Y | Y | Y |
| | Stormwater Operational Permit (DEC) | Y | Y | Y | Y | Y |
| | Act 250 (NRB) | Y | Y | Y | Y | Y |
| | | | | | | |
| LOCAL | Floodplain | Y | Y | Y | Y | Y |

Y = Yes; N = No; Y/C = Yes but coordination only. Further review implies that the conceptual level plans and information gathered during site investigations do not provide sufficient information to determine the full extent of permit applicability. Agency Acronyms = VT Department of Environmental Conservation (DEC); VT Division of Historic Preservation (DHP); VT Fish & Wildlife (F&W); VT Natural Resources Board (NRB); US Army Corps of Engineers (USACE); US Coast Guard (USCG); US Fish & Wildlife Service (USFWS); and Federal Highway Administration (FHWA)

[1] All route alternatives would require compensatory wetland mitigation based on impact acreage.

## 7.6 EVALUATION MATRIX

Results and corresponding scoring of the various criteria are presented in Table 7-3, and the final scores are summarized in Table 7-4.

Table 7-3 Evaluation Matrix

| CATEGORY | CRITERIA | SPECIFIC MEASURE | ROUTE ALTERNATIVES | | | | |
|---|---|---|---|---|---|---|---|
| | | | PURPLE | BLUE | PINK | GREEN | ORANGE |
| TRANSPORTATION PERFORMANCE | | | | | | | |
| Transportation | Traffic Volume | Truck volumes on Route 22A in downtown Vergennes (AM/PM) | -85/-42 | -123/-77 | -123/-77 | -123/-77 | -123/-77 (north of Macdonough Drive) |
| | Traffic Operations | Change in overall network traffic operations | -- | + | + | - | -- |
| | Proposed Route Alternative | Travel times for freight vehicles | --- | + | + | - | + |
| | | Travel length in mileage | +5.2 | +0.4 | +0.4 | +0.9 | -0.1 |
| | Bicycle and Pedestrian | Potential for expansion of regional bicycle network | + | + | + | + | 0 |
| | | Potential improvement to pedestrian circulation | 0 | 0 | 0 | 0 | + |
| LOCAL AND REGIONAL ISSUES | | | | | | | |
| Quality of Life | Noise and Air Quality | Decibel change at receptors along Route 22A in downtown Vergennes | 1 dbA | 4 dBA | 4 dBA | 4 dBA | 0 |
| | | # of new sensitive receptors (residents, schools, churches, hospitals, historic buildings) within 500 feet of proposed route alternative | 174 | 13 | 42 | 34 | 40 |
| | Property Impacts | Partial and full acquisitions (acres) | 28 | 60 | 65 | 24 | 44 |
| | | # of estimated full parcel acquisition | 0 | 0 | 2 | 3 | 9 |
| | | # of estimated partial parcel acquisition | 71 | 13 | 10 | 14 | 11 |
| Economic Vitality | Property Tax Revenue | Potential to increase property tax revenue for Vergennes and Towns | ++ | +++ | +++ | + | ++ |
| | Sales Tax and Tourism Revenue | Potential to increase sales tax revenue for Vergennes and Towns and increase tourism visitation for Vergennes | + | ++ | ++ | + | + |

| CATEGORY | CRITERIA | SPECIFIC MEASURE | ROUTE ALTERNATIVES | | | | |
|---|---|---|---|---|---|---|---|
| | | | PURPLE | BLUE | PINK | GREEN | ORANGE |
| | Job Creation and Commercial Occupancy Rates | Potential to increase and retain jobs and increase commercial occupancy rates in downtown Vergennes and Towns | + | +++ | +++ | + | ++ |
| Land Use | Development Density Infill Versus Sprawl | Ability to foster infill development within Vergennes | + | +++ | +++ | + | ++ |
| | Zoning Changes, Comprehensive Plan, and Land Reclassification | Requires changes to zoning, comprehensive plans, or land classification | -- | -- | - | -- | -- |
| Equity | Environmental Justice | Potential for environmental justice populations within footprint of route alternative | - | -- | -- | - | -- |
| ENVIRONMENTAL RESOURCES | | | | | | | |
| Natural and Cultural Resources | Wetlands | Area of impacted Class II wetlands (acres) | 4.3 | 9.3 | 7.9 | 9.9 | 0.8 |
| | Surface Waters | # of new stream crossings | 0 | 3 | 1 | 7 | 3 |
| | Floodplains | Floodplain encroachment (acres) | 0.5 | 3.5 | 4.4 | 4.9 | 0.6 |
| | | State River Corridors encroachment (acres) | 3.3 | 4.0 | 4.9 | 5.4 | 1.1 |
| | Vegetative Communities / Wildlife Habitat | # and acreage of significant habitats impacted | 1 / 0.27 (1) | 1 / 1.89 (13) | 1 / 3.21 (22) | 3 / 7.80 (19) | 1 / 0.79 (2) |
| | Rare, Threatened, and Endangered (RTE) Species | # of mapped RTE animal / plant species present within route alternative | 3 / 0 | 15 / 0 | 15 / 0 | 7 / 0 | 4 / 1 |
| | | # of mapped uncommon animal / plant species present within route | 7 / 2 | 3 / 2 | 3 / 2 | 1 / 0 | 0 / 0 |
| | | Acreage of significant natural communities impacted | 0.6 | 0.6 | 1 | 0 | 0 |
| | Farmlands | Acreage of primary agricultural soils impacted | 29 | 22 | 26 | 22 | 6 |
| | Historic Resources | # of historic resources entirely intersecting with route alternatives | 9 | 1 | 0 | 0 | 2 |
| | | # of historic resources near (within 750 feet) route alternatives | 5 | 10 | 7 | 3 | 8 |
| | | # of known archeological resources near route alternative | 3 | 2 | 2 | 1 | 2 |

| CATEGORY | CRITERIA | SPECIFIC MEASURE | ROUTE ALTERNATIVES | | | | |
|---|---|---|---|---|---|---|---|
| | | | PURPLE | BLUE | PINK | GREEN | ORANGE |
| | Hazardous Materials | # of hazardous sites within 150 feet of proposed route alternative | 15 | 0 | 0 | 0 | 3 |
| COST | | | | | | | |
| Cost | Conceptual Cost Estimate | Construction cost | $54 M | $107 M | $132 M | $103 M | $19 M |
| | | Development cost | $21 M | $44 M | $54 M | $45 M | $12 M |

Table 7-4 Alternatives Evaluation Summary

| | PURPLE ROUTE ALTERNATIVE | BLUE ROUTE ALTERNATIVE | PINK ROUTE ALTERNATIVE | GREEN ROUTE ALTERNATIVE | ORANGE ROUTE ALTERNATIVE |
|---|---|---|---|---|---|
| Transportation Impacts | -6 | 5 | 5 | 1 | 3 |
| Local and Regional Issues | -3 | 5 | 4 | -2 | -5 |
| Environmental Resources | -17 | -21 | -18 | -16 | -11 |
| | -26 | -11 | -9 | -17 | -13 |

## 7.7 PROPOSED ALTERNATIVES TO ADVANCE INTO NEPA

Based on the results of the alternatives development and evaluation process, the following route alternatives are considered reasonable and could be adopted in or used to inform future project level NEPA reviews and documentation for projects within the Route 22A study corridor:

- Blue Route Alternative
- Pink Route Alternative

Considering the transportation impacts, the Purple Route Alternative does not provide a transportation benefit. In addition, the Purple Route Alternative does not support the quality of life needs identified in the Purpose and Need Statement. Similarly, the Green Route Alternative and Orange Route Alternative do not support the local and regional issue related to quality of life, economic vitality, land use, and equity. Based on the additional analysis presented in this technical memorandum, the Purple Route Alternative, Green Route Alternative, and Orange Route Alternative do not fully meet the Purpose and Need and should be dismissed for further study.

## 7.8 TECHNICAL COMMITTEE

The Technical Committee consists of subject matter experts that review and verify the scope of work, methods, and assumptions used by the consultants to carry out the study as well as any resulting recommendations. The Technical Committee's role is to ensure that the Policy Committee has reliable information on which to base its findings and decisions. Membership includes VTrans planning, highway safety and design, structures, bicycle and pedestrian, and environmental staff; ACRPC and municipal land use planners; FHWA staff; municipal public works and road supervisors; and economic development specialists.

In advance of future environmental reviews and to inform the NEPA process that may follow this study, an Agency Coordination Plan was developed to define the roles and guide coordination activities with state and federal agencies who may be cooperating and participating under NEPA

in future environmental reviews. State and federal agencies are invited to the Technical Committee meetings to review and provide input.

A joint Technical Committee and federal and state agency partner meeting was held on December 13, 2024 to review the alternatives evaluation. The Technical Committee were unanimously supportive of the recommendations to advance the Pink and Blue Route Alternatives.

## 7.9 POLICY COMMITTEE

The Policy Committee is charged with endorsing the findings in the PEL and making recommendations to VTrans on study planning decisions (e.g., purpose and need statement, initial short-list of concepts, and this design memorandum) that would be carried forward into a future environmental review. The Policy Committee functions as a body with wide knowledge that can speak on behalf of many communities impacted by this study and will consider recommendations from the Technical Committee in its decision-making process. It consists of representatives from the seven municipalities potentially affected by the PEL Study (Addison, Ferrisburgh, Panton, New Haven, Vergennes, Waltham, and Weybridge), VTrans, and other stakeholders representing the region, environment, and economy.

A Policy Committee meeting was held on January 6, 2025, to review the alternatives evaluation. A majority (ten out of twelve) of the Policy Committee members were supportive of the recommendations to advance the Pink and Blue Route Alternatives. The Policy Committee also voted to continue to study the Purple Route Alternative.