Wilmington BF 010-1(58) Scoping Report

Bridge No. 31 (VT Route 9) over the Deerfield River

PREPARED FOR

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I. Site Information

Bridge No. 31 is a state-owned bridge located on Vermont Route 9 (VT-9) and spans the North Branch of the Deerfield River in the Town of Wilmington, Vermont. The bridge serves as the main vehicular and pedestrian connector of the Historic Downtown Village of Wilmington. It lies between the intersections of Vermont Route 100 (VT-100) and VT-9 to the east and the intersection of Ray Hill Road (TH-8) and VT-9 to the west. There are historic buildings directly adjacent to the bridge on the north side of the bridge. On the south side, there is the town-owned Riverbank Park, and a small park that is part of the Crafts Inn property. The existing conditions were gathered from a combination of site visits, the bridge inspection report, and the existing survey.

General Bridge Information

Roadway Classification	Rural Principal Arterial (State Highway on the NHS)
Bridge Type	Concrete T-beam Bridge
Bridge Length	59 feet
Year Built	1934
Ownership	State of Vermont

Need

The following is a list of deficiencies of Bridge No. 31 and VT-9 at this location:

Bridge

1. The deck and superstructure of the bridge are in poor condition. In the past few years, multiple steel plates have been installed on top of the deck in response to the discovery of holes in the deck. The superstructure continues to deteriorate due to active leakage through the deck. The reinforced concrete t-beams exhibit cracking, delamination, and spalling with exposed reinforcing steel.

2. The bridge does not meet hydraulic standards, and there is a history of flooding and debris accumulation at the bridge location.

3. The existing bridge sidewalk width is substandard.

4. The bridge width is narrow for the village setting and proximity to the intersection with VT-100. While it meets minimum standards for both lane and shoulder widths, the existing bridge width does not meet current standards for bicycle accommodations. Given the large number of oversize vehicles that travel VT-9, the limited width impacts bicyclist and pedestrian comfortability on the bridge. Additionally, the curb-to-curb width is inadequate to efficiently perform winter maintenance activities.

Roadway

1. The existing intersection geometry and the proximity of parking spaces to the VT-9/VT100 intersection restrict intersection capacity and turning movements, especially for large trucks.

2. The intersection is in a High Crash Location, with 23 crashes from 2020-2024.

3. The traffic control infrastructure is outdated according to the Vermont Agency of Transportation (VTrans) standards and guidance.

Traffic

Bridge No. 31 is adjacent to the intersection of VT-9 and VT-100. VT-9 is a major link for the region and one of only a few west to east truck routes in the state carrying high passenger car and truck volumes. There are typically several oversize loads per day crossing the bridge. A traffic study of this site was performed by the Vermont Agency of Transportation (VTrans). The following traffic volumes were projected for the Years 2028 and 2048.

TRAFFIC DATA	2028	2048
AADT	4,224	4,635
DHV	619	679
ADTT	490	730
%T	4.9	6.7
%D	54	54

Traffic volumes have been stable in this area, and a growth rate of less than 0.5% per year is expected. Freight traffic is expected to grow faster than passenger car traffic. VT-9 is not a significant commuter corridor, so eastbound and westbound volumes are generally balanced throughout the day.

There is a signalized intersection at the east end of the bridge at the intersection of VT-9 and VT-100. In addition, traffic is also stopped by an advance signal controlling VT-9 eastbound at the west end of the bridge, just west of the intersection of VT-100 and Ray Hill Rd (TH 8) to allow movement out of Ray Hill Road onto VT-9. The intersection of VT-9 and VT-100 has pedestrian faces on all four legs. The existing traffic signal equipment is dated and should be replaced with the bridge.

Traffic is seasonal, with the highest volumes in winter. During the peak hour of an average winter day, the intersection operates at a Level of Service (LOS) D. The average delay is 40 seconds per vehicle. The southbound approach is the most congested, with a LOS E and an average delay per vehicle of 64 seconds. A LOS F (80 seconds of delay) is considered unacceptable.

During the busiest hours on ski weekends, congestion is worse than an average day. Based on counts from President's Day weekend in 2023, the peak congestion occurred on Sunday afternoons with a southbound delay of 200 seconds. Queues were over 1000 feet on Route 9 and over 700 feet on Route 100 southbound. Although this is meaningful congestion, it is not unusual around ski areas for the busiest days and hours of the year.

Design Criteria

The design standards for this bridge project are the Vermont State Standards (VSS), dated October 22, 1997, AASHTO's Policy on Geometric Design of Highways and Streets, 7th Edition (AASHTO Green Book), and the VTrans Structures Design Manual (SDM) dated 2010. The minimum standards referenced in the following table are for a Principal Arterial based on an ADT of 1500 - 6000, a DHV of over 400, and a design speed of 25 mph.

Design Criteria	Source	Existing Condition	Minimum Standard	Comment
Approach Lane and Shoulder Widths	VSS Section 3.5 AASHTO Green Book Section 7.2.3.1	11'/4' (15')	10'/ 4' (14')	
Bridge Lane and Shoulder Widths	VSS Section 3.7	11'/4' (15')	10′/4′ (14′)	
Clear Zone Distance	VSS Table 3.4	Obstructions exist within the Clear Zone	12' (Cut) / 14' (Fill)	Substandard
Banking	VSS Section 3.13	NC over Bridge	NC	
Speed		25 mph (Posted)	25 mph (design)	
Horizontal Alignment	AASHTO Green Book Table 3-13	R = ∞	R_{min} = 198 @ NC	
Vertical Grade	VSS Table 3.6	0.8%	9% (max, village) for level terrain	
K Values for Vertical Curves	VSS Table 3.1	K = 88 (Crest) K = 24 (Sag)	K = 20 (Crest) K = 30 (Sag)	
Vertical Clearance	VSS Section 3.8	N/A	N/A	
Stopping Sight Distance	VSS Table 3.1	575'	150'	
Bicycle/Pedestrian Criteria	VSS Table 3.8	1' Shoulder	3' Shoulder (VSS) 5' Sidewalk (PROWAG)	
Bridge Railing	Structures Design Manual (SDM) Section 13	Historic Concrete railing	TL-3	Substandard
Hydraulics	VSS Section 3.8	0.10' of freeboard at the Q_{50} storm event	Pass Q_{50} storm event with 1.0' of freeboard	Substandard
Structural Capacity	SDM, Ch. 3.4.1	Deck and superstructure are in poor condition, with three repairs in the last 12 months (one from critical finding, two emergency)	Design Live Load: HL-93	Substandard

Inspection Report Summary

VTrans conducts Bridge Safety Inspections in accordance with the National Bridge Inspection Standards (NBIS). Bridges are typically on a 24-month inspection interval, however due to the condition of this bridge the inspection cycle has been reduced to a 12-month inspection interval. The ratings below are from the most recent inspection, performed on April 10, 2025.

Deck Rating	4 Poor
Superstructure Rating	4 Poor
Substructure Rating	5 Fair
Channel Rating	8 Very Good

The structural conditions of the bridge were reported as follows:

Structure continues to deteriorate in an advanced state with the deck becoming in severely poor condition which has led to the tops of the beams showing further distress. The deck has multiple areas of highly probably full depth holes that continue to deteriorate with another steel plate installed over bay #4 at midspan since the April inspection in 2024 that also measures 8'-0" by 20'-0" by ~1" thick that is abutted to preexisting steel plate (same size) that is installed along the abutment #1 side of structure over bay #4. Newly installed steel plate over bay #4 at midspan has loosened with the deck / top of beams #4 and #5 having heavily deteriorated concrete and with each traffic impact more concrete is lost allowing the steel plate to have more movement. District is tightening steel plate up at time of inspection however possible concrete repairs should be completed over the top of the beams to stabilize steel plate over bay #4 at midspan. Bay #3 near the abutment #2 end of deck has large area of delamination along the deck soffit that is highly saturated with large area of depression cracking over the length of that section of the deck which follows the delaminated deck. A steel plate needs to be installed over bay #3 near abutment #2. Bay #4 has heavy spalling along the abutment #2 end of deck in the third section of the deck and is highly saturated and also should have a steel plate installed over the deck or be repaired. Bay #5 has heavily saturated concrete and spalling and loose concrete at the abutment #2 end of deck near the curtain wall with as much as ~4" of penetration into concrete deck soffit. Bay #5 will also need to be repaired or have steel plate installed to prevent full depth hole. Soffit has large full bay width spalling in bay #4 with a previous full depth patch present near midspan that has distress along the top surface and is highly saturated with heavily deteriorated concrete along the underside. Bay #4 at the abutment #1 end had a full depth hole open up near the end of March of 2025 just past the first steel plate installed and has temporary shoring installed with small steel plate and asphalt patch (concrete is crumbling around this area and with each traffic impact more concrete falls into channel). Bay #3 at abutment #1 end (near curtain wall) has highly saturated area that is delaminated and also has high probability for a full depth failure in deck and should receive concrete repairs to deck or a steel plate installed over the top.

Superstructure has spalling along the lower portions in beams #2, #4 and #6 from continuous leakage from above. Beams #2 and #6 deteriorated areas correlate to the pre-existing curb slots along the edge of deck. The heaviest deterioration being present in beam #6 at midspan exposing bottom three (3) tiers of longitudinal steel reinforcing rods exposed with thinning and active rust

scaling and two (2) rusted through stirrups. The bottom tier of steel reinforcing measures ~1-9/64" in thickness while the second tier up has as much thinning as ~1-7/64" along beam #6 at midspan below pre-existing deck curb drain. Beam #4 also has heavy spalling at midspan with bottom three (3) tiers of longitudinal steel reinforcing rods exposed with rust scaling and thinning with five (5) stirrups rusted through. Beam #2 spalling ~10-0" away from abutment #2 that has exposed the bottom tier of steel reinforcing has some rust scaling along the steel reinforcing and ten (10) severed stirrups consecutively. Beam #3 has cracking and small delaminations forming near midspan and over abutment #2. Beam #5 has delamination present at first set of cross bracing along the upstream side.

Structure is in need of deck / super replacement and substructure rehabilitation project or full replacement.

In summary, the structure overall is in poor condition, controlled by the extensive deteriorations present in the deck and superstructure. The April 2024 inspection resulted in a critical finding of a full depth hole in the deck at Bay 4 near midspan. As a result, a steel plate was installed on top of the deck. At least one prior repair had been made to the bridge to address additional deck deteriorations. In March of 2025, an emergency repair was made to the deck for an additional hole in the deck located adjacent to an existing steel repair plate. The April 2025 inspection resulted in a critical finding relating to a deck hole, and a maintenance finding recommending a superstructure replacement. After the April 2025 inspection, another repair was required in June of 2025 after a hole was noticed during Memorial Day weekend festivities. Currently, there is growing concern among the residents of Wilmington about the condition of the bridge.

Hydraulics

The structure does not meet current standards of the VTrans Hydraulic Manual and does not meet state stream equilibrium requirements for bankfull width. The standard is to pass a Q_{50} design storm with 1 foot of freeboard. The existing structure provides approximately 0.1 feet of freeboard at the 2% AEP (Q_{50}), far below the acceptable threshold. There is no freeboard at the 1% AEP (Q_{100}).

The Agency of Natural Resources (ANR) reported a bankfull width of approximately 81 feet for this section of the North Branch of the Deerfield River. The approximate hydraulic clear span of the bridge is 54 feet, which significantly restricts the channel. However, the channel width is restricted in this reach not only by Bridge No. 31, but also by the foundations of adjacent historic buildings and stone masonry channel walls. According to the bridge inspection report, the conditions of the channel armoring are very good. The existing structure appears to be founded on ledge, though this needs to be verified by geotechnical investigation to determine scour risk at the site.

The project is within the FEMA Special Flood Hazard Area with Base Flood Elevations and a delineated floodway (Zone AE). Therefore, a replacement or rehabilitation project will require close coordination with the VTrans Hydraulics Group and the Regional Floodplain Manager. A Flood Hazard Area & River Corridor Rule (FHARC) General Permit or other permits may be needed.

Utilities

The existing utilities are shown on the Existing Utility Layout Sheet, and are as follows:

Municipal Utilities

- Water – There are water mains along VT-9, VT-100, South Main Street, and Ray Hill Road, each with numerous service lines. Bridge No. 31 carries the VT-9 water main via a 12" ductile iron pipe in Bay 6.
- Stormwater – There are two stormwater pipes that discharge through the bridge abutments, one originating from Ray Hill Road and the other from VT-100N, and one that discharges just south of the west abutment, coming from VT-100S/VT-9E.
- Sewer – There are sewer lines in the vicinity of the bridge along Ray Hill Road and VT-100 that continue onto South Main Street, but none of them go across the bridge.

Public Utilities (Aerial)

There are many aerial utility lines within the project area. There are utility poles with overhead lines that run along the eastbound travel lane of VT-9, including a pole on either side of Bridge No. 31. There are also aerial facilities at the intersection of VT-9 and Ray Hill Rd, and the intersection of VT-9 and VT-100. These aerial utilities are owned by Green Mountain Power, First Light Fiber, Consolidated Communications, and Duncan Telecommunications.

Public Utilities (Underground)

- Consolidated Communications – There are underground conduits that run from the northeast corner of the VT-9/VT-100 intersection and are carried across the south fascia of the bridge.

Right-Of-Way

There are approximately 3-rod State Rights-of-Way centered on VT-9 and VT-100. Given the need to relocate utilities and the proximity to other properties within all four quadrants of the bridge, it is anticipated that any construction associated with this project will require temporary easements and additional permanent Right-of-Way acquisitions.

The existing Right-of-Way is plotted on the Existing Conditions Layout Sheet which can be found in the appendix.

Resources

The environmental resources present at this project site are shown on the Existing Conditions Layout Sheet and are as follows.

Biological:

Wetlands / Watercourses

There are no wetlands within the project area. The banks on each quadrant consist of rock and sand dominated by Japanese knotweed, an invasive species.

The North Branch of the Deerfield River is a perennial stream and is regulated by ANR and the US Army Corps of Engineers. There is a potential for time-of-year restrictions for work in the waterway to reduce impact on aquatic organisms.

Species / Habitats of Special Concern

There are no critical habitats within the project area. The U.S. Fish and Wildlife Service IPac mapping database lists the following rare, threatened, or endangered species present:

- Myotis septentrionalis, Northern Long-eared Bat (E)
- Danaus plexippus, Monarch Butterfly (candidate species for listing)

Also listed are the following vulnerable or Birds of Conservation Concern species that may be present during the summer:

- Haliaeetus leucocephalus, Bald Eagle (breeds May 24 – July 13)
- Coccyzus erythropthalmus, Black-billed Cuckoo (breeds June 14 – July 13)
- Hylocichla mustelina, Wood Thrush (breeds May 31 to August 24)
- Cardellina canadensis, Canada Warbler (breeds June 14 – July 27)
- Chaetura pelagica, Chimney Swift (breeds May 31 – July 13)

Bridge No. 31 has been determined to be fully passable by the AOP Coarse Screen. In the existing condition, it is unlikely to allow for terrestrial passage given the lack of above-water sediment bars. Any new structure or changes to the existing structure should maintain aquatic organism passage. Passage of terrestrial wildlife should be considered in design and should not be worsened.

Agricultural Soils

There are statewide agricultural soils in the area, including Colton gravely sandy loam, 3 to 8 percent slopes on the east side of the bridge, and Adams loamy sand, 3 to 8 percent slopes on the west side of the bridge.

Hazardous Materials:

There is a hazardous waste site (Hazardous Waste Site 20033074) located within the project area at 17 West Main Street (VT-9). There may be impacts to this site depending on the scope of utilities and roadway work. There is continued monitoring at this site and coordination with the Project Contamination Engineer will be needed during construction.

The project is located within a mapped Urban Background Soils area. Disturbed soils within the project are expected to be kept on site or follow Notice to Bidders' guidance.

Soil sampling in the proximity of the bridge is recommended to determine if lead paint or other contaminants are present and whether abatement of contaminated soils is needed during construction.

Historic:

The Project is subject to review under Section 106 of the National Historic Preservation Act of 1966 ("Section 106"). Section 106 requires federal agencies to consider the effects on historic properties of projects they carry out, assist, fund, permit, license, or approve.

Bridge No. 31 is located within the Wilmington Village Historic District, which is listed in the National Register of Historic Places. Three of the four quadrants have contributing historic structures, including: currently Cask & Kiln at 4 North Main St (VT-100), Dot's Restaurant at 3 West Main St (VT-9), and Crafts Inn at 10 West Main St (VT-9). At the southeast quadrant at 2 West Main St (VT-9) is a small parcel that currently serves as a pocket park but formerly held a contributing historic structure. This structure burned in 2007, and the Town subsequently purchased the parcel and established a small pocket park, known as Bank Park or Riverbank Park, that contains landscaping, a trellis, and seating area. The park is not a historic resource, though it is located within the historic district.

The National Register nomination dates to 1980, and at that time, Bridge No. 31 was not yet 50 years old; thus, it was not yet old enough to be included in the historic district at that time. An updated nomination would include Bridge No. 31 as a contributing resource. Additionally, Bridge No. 31 itself is a historic resource; it meets the Criterion C registration requirements outlined in the Multiple Property Documentation Form *Metal Truss, Masonry and Concrete Bridges of Vermont, 1820-1978 (2018 revised)*. It is eligible under Criterion C as a well-preserved example and as a rare surviving type [Type 104 – concrete tee beam]. It retains its character defining features, including a decorative concrete railing with concrete hexagonal balustrades.

Precaution during construction activities will be needed due to the proximity to the historic properties mentioned above. Specifically, vibration monitoring of the historic properties will likely be a stipulation of a Section 106 Memorandum of Agreement (MOA). If the bridge is closed during construction, the Section 106 review should address the effects of its closure including economic factors and traffic changes in the historic district.

The removal of the existing bridge would result in an Adverse Effect under Section 106. Required mitigation would likely include the following:

- Historic Resource Documentation Package ("HRDP") of the existing bridge; and,

- The proposed bridge design would need a bridge railing compatible with the historic district.

In addition to Section 106, the Project will be subject to review under Section 4(f) of the Department of Transportation Act of 1966 ("Section 4(f)"). Section 4(f) protects significant publicly owned public parks, recreation areas, and wildlife and waterfowl refuges as well as significant historic sites, whether they are publicly or privately owned. Section 4(f) is codified as 49 U.S.C. 303 and 23 U.S.C. 138. Section 4(f) and applies to all agencies within the United States Department of Transportation, including FHWA. FHWA regulations 23 C.F.R 774 implement the law.

A Section 4(f) evaluation will be required for any adverse effects to (or "use" of) historic sites for any easements/acquisitions of historic sites. A Section 4(f) de minimis determination may be used for historic sites or parks when the "use" of the resource will not cause an adverse effect to the resource. Use of a historic resource that adversely affects the historic resource (other than the bridge itself – see below) will require an individual Section 4(f) evaluation.

Additionally, a Section 4(f) evaluation will be required for use (easements/acquisitions) to park resources. There is one park resource – Bank Park or Riverbank Park at the southwest quadrant at 2 West Main Street (VT-9). The park was constructed in 2008-2009 following a fire that left the prior building in ruins. The park has been identified by the Town as significant; therefore, it is a Section 4(f) resource. Minor use of the park that does not adversely impact the park's use will require a Section 4(f) parks de minimis determination. Use of the park that adversely impacts the park's use will require an individual Section 4(f) evaluation.

Removal of the existing bridge will require a Section 4(f) Bridge Programmatic evaluation, which will require the following alternatives be evaluated:

- No Action;
- Rehabilitation of the Existing Bridge;
- Replacement off-alignment with rehabilitation of the existing bridge to a pedestrian bridge; and,
- Replacement on-alignment with removal of the existing bridge.

Landscape:

This project is located in a village setting; therefore, the streetscape elements of the design should be consistent with that context. Accommodations for bicyclists and pedestrians should be retained or improved in the project design, in alignment with the village setting and the priorities outlined in the 2018 Wilmington Town Plan. Adjacent to the bridge, Riverbank Park and the Craft's Inn property provide spaces to gather and include landscaping features that should be protected during construction or restored after construction as appropriate.

This project may include disturbance in the riparian buffer, in which case a riparian planting plan will be needed. It is recommended to minimize tree clearing and utilize tree protection fencing for trees that will be retained through construction.

Archaeological:

No archaeologically sensitive areas have been located within the project area. Another review will be completed once project Preliminary Plans are available.

Stormwater:

The roadway and sidewalk drainage over the bridge are collected in a closed drainage system with one outfall that extends through each of the bridge's abutments and one that outfalls just downstream of the bridge through the east channel wall. The outfall locations are expected to remain in the same or similar locations as they are today.

The area and type of disturbance will be evaluated to determine if an Operational Stormwater Permit is required for the project.

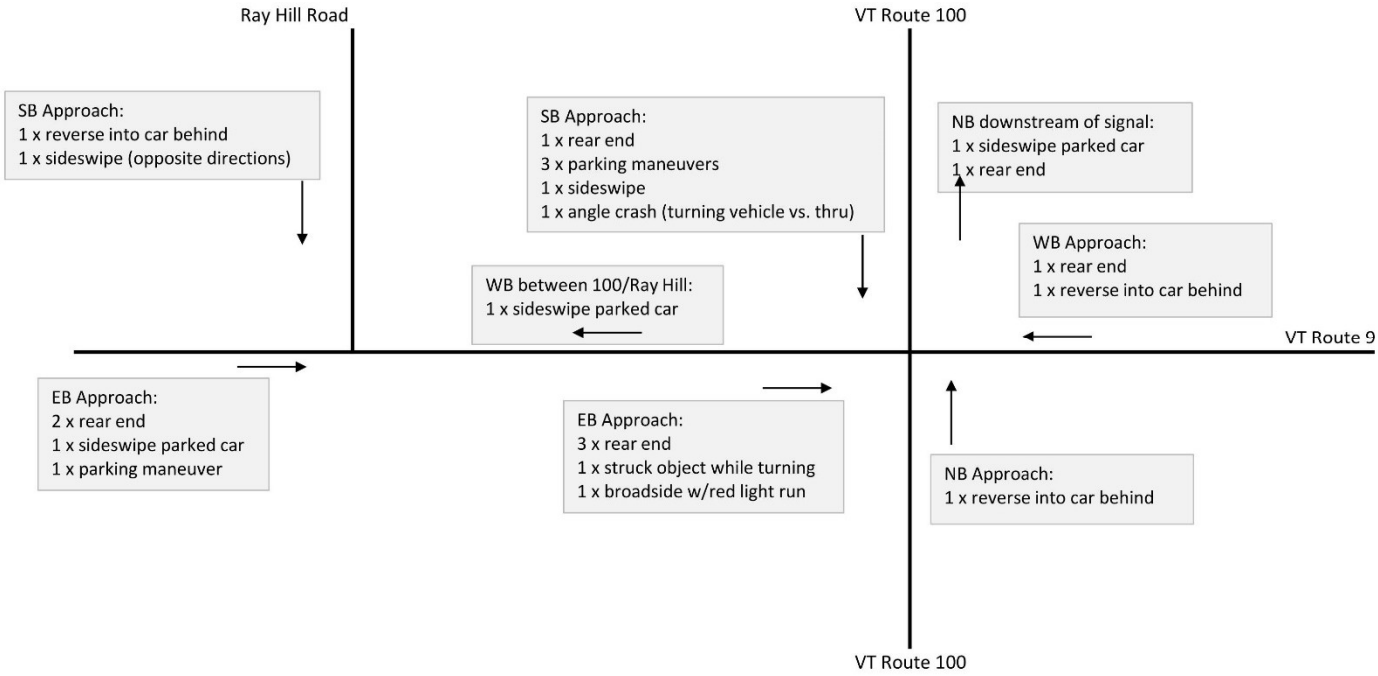
Community Input

Given the location of the project within the downtown historic village, the Town of Wilmington, its residents, and property owners in the area have a vested interest in this project. As a result, extensive community outreach has been completed throughout this scoping effort. The following are key considerations from this outreach:

- The Town is accepting of the need to fix the bridge and appreciative to be a part of the conversation during the scoping process.
- The Town would prefer that any proposed construction be as short a duration as possible.
- If an Accelerated Bridge Construction alternative is proposed, the Town prefers one longer closure period outside of their winter, summer, and fall tourist seasons. Multiple shorter duration closure periods would be unfavorable given the perceived difficulty of communicating the multiple closures to tourists.
- The Town prefers to keep as much pedestrian and vehicular traffic on VT-9 as possible.
- If pedestrian or vehicular detours are proposed, the preference of the Town is to keep those detours as close to the downtown businesses as possible.
- Pedestrian mobility and business access is very important to the Town of Wilmington and its downtown businesses. They prefer that a temporary or permanent pedestrian bridge located close to the existing structure is considered to address their mobility concerns.
- Residents are concerned about access to Ray Hill Road throughout construction. They also suggested that Ray Hill Road could be used for locals to bypass the project area.
- The Town is concerned with the deteriorating condition of the bridge.

II. Safety

Five years of crash data was reviewed for the scoping area, including the Ray Hill Road and the VT-9 and VT-100 intersections. Between 2020-2024, there were 23 crashes. At this level of traffic, the rate of 4.6 crashes/year is not unusually high for Vermont. None of these crashes resulted in death or serious injury, and none involved a pedestrian or cyclist. A diagram describing crash locations and circumstances is shown below.



Crashes between conflicting directions have been rare, representing only three of the total crashes. Most crashes are between same-direction vehicles. A history of minor rear-end crashes is typical for congested areas. However, the frequency of parking-related crashes (either maneuvering in/out of street parking or striking a parked car) is relatively high at 30% of all crashes. It is also notable that two crashes were caused by a driver backing into the car behind them while trying to make room for a truck to turn.

These observations indicate that street parking may currently be allowed too close to the intersection. Additionally, while the geometric design is adequate for truck turns, it depends on cars respecting the stop bars, which are further back than would feel natural to most drivers.

Overall, the crash history does not show significant safety risks in the project area. Even so, there are changes that could reduce the frequency of minor property damage crashes. One mitigation measure is to set street parking further back from the intersections (eliminating only the closest parking space to the intersection may be sufficient). Another possible improvement is to reinforce the design stop location at the signal by maintaining the stop bar paint and adding an R10-6 (“Stop Here on Red”) sign.

III. Maintenance of Traffic

The Vermont Agency of Transportation reviews each new project to determine suitability for the Accelerated Bridge Program, which focuses on faster delivery of construction plans, permitting, and Right of Way, as well as faster construction of projects in the field. One practice that will help in this endeavor is closing bridges for portions of the construction period, rather than providing temporary bridges. In addition to saving money, the intention is to minimize the closure period with faster construction techniques and incentives for contractors to complete projects sooner. The Agency considers the closure option on all projects where rapid reconstruction or rehabilitation is feasible. The use of prefabricated elements in new bridges will also expedite construction schedules. This can apply to decks, superstructures, and substructures. Accelerated Construction provides enhanced safety for the workers and the travelling public while maintaining project quality.

The maintenance of traffic options presented below assume that the contractor will have sufficient space to construct the bridge while maintaining traffic flow through the VT-9/VT-100 intersection. It is possible that there would be traffic impacts to the intersection, such as alternating one-way traffic or temporary closures of the intersection, during which a larger regional detour would be utilized.

The following options have been considered to maintain traffic during construction:

Option 1: Off-Site Detour

This option would close the bridge and reroute traffic onto an offsite detour during an accelerated construction period. VT-9 is a State Highway on the National Highway System, therefore it would be the responsibility of the State of Vermont to choose the preferred detour route, and to sign it according to the most recent MUTCD.

The best option for an official signed detour utilizes state Routes 100 and 8 through Whitingham and Readsboro. This detour is the shortest route available that would be appropriate for truck traffic and oversized loads. It has an end-to-end distance of 30.5 miles and adds approximately 14.9 miles to the travel distance. The route (described for the eastbound direction) is as follows:

- VT-9, VT-8, VT-100, back to VT-9.

There are shorter bypass routes available that would likely be utilized by passenger cars during the bridge closure. One possible route is presented not as an option for the signed detour, as it uses town highways, but to consider the travel impacts on passenger cars and locals during a bridge closure. This route has an end-to-end distance of 8.4 miles and adds approximately 6.2 miles to the travel distance. It consists of Class 2 Town Highways and State Highways. The route (described for the eastbound direction) is as follows:

- VT-9, Haystack Road (TH-5), Ray Hill Road (TH-5), Mann Road (TH-5), Coldbrook Road (TH-1), VT Route 100, back to VT-9.

Maps of the Signed Detour and potential passenger car bypass route can be found in the Appendix.

Additional considerations with this option:

- Emergency services response time.
- Maintaining pedestrian and cyclist access at the site during construction. All vehicular detours are too long for pedestrians. Pedestrian detour options are discussed in more depth below.
- Significant advance coordination with the Vermont DMV needed for messaging and the issuance of permit loads during closure.

Advantages: This option would eliminate the need for a temporary bridge and detour, which would save costs, decrease construction duration, and minimize right-of-way and environmental impacts. Additionally, since the impacts are less extensive, this alternative is not anticipated to require an Operational Stormwater Permit.

Disadvantages: Traffic flow would not be maintained through the project site during the closure period(s).

Option 2: Temporary Bridge

This option would involve constructing a temporary bridge and roadway detour within the project area. Bridge No. 31 is adjacent to historic buildings and features on all four corners, so it is not feasible to construct a temporary roadway bridge directly upstream or downstream of the bridge.

A temporary bridge could be located downstream of Bridge No. 31, spanning the North Branch of the Deerfield River between South Main Street (TH-33) across from the Pettee Memorial Library and an existing parking area behind several businesses on VT-9. Traffic on VT-9 would be routed down South Main Street, across the temporary bridge, through the parking area and connect back to VT-9 via an existing driveway. To construct this detour, the parking area would need to be significantly reconstructed. There is a difference in grade between South Main Street and the parking area of +/- 15 feet. A 75-foot +/- temporary retaining wall would be constructed to support the roadway, and a paved, two-way roadway would be built. The temporary bridge would be approximately 110 feet long and have a maximum slope of 5%, which is steeper than preferred, though not unacceptable for temporary bridge installation and ADA accessibility. Pedestrians would be detoured on this route as well. This route would impact existing features including approximately 50 parking spots, potential underground utility features, trees, overhead electrical, fencing, sidewalk, and curb. Temporary Right-of-Way easements would be required for this detour.

Another possible detour route utilizing a temporary bridge that would connect VT-9 to Class 3 TH-59, near the Southeast Vermont Transit facility, was considered but ultimately ruled out, as the

longer detour would not realize the benefits to local businesses of maintaining traffic close to downtown.

Additional considerations with this option:

- Emergency services response time.
- Maintaining pedestrian and cyclist access at the site during construction. All detours considered above are too long for pedestrians. Pedestrian detour options are discussed more in depth below.
- A two-lane temporary bridge and roadway would be required to handle traffic volumes.
- The temporary route would not be appropriate for trucks due to geometric constraints. Truck traffic would need to be routed via the regional detour as described in the previous section, Off-Site Detour.
- Significant advance coordination with the Vermont DMV needed for messaging and the issuance of permit loads during construction.

Advantages: This option would keep both pedestrian and vehicular traffic closer to the downtown businesses while still providing adequate space for construction to occur.

Disadvantages: Traffic flow would not be maintained through the project site during construction, which is a concern for local business owners on the VT-9 corridor. Additionally, this option would include more extensive impacts, including numerous temporary ROW easements, the loss of town parking spaces during construction, and increased environmental impacts. The reconstruction of the town-owned parking area used for the temporary roadway would likely trigger the need to obtain an Operational Stormwater Permit. Additionally, the construction of the temporary roadway and bridge would be expensive, and the duration of construction would be significantly longer than an Accelerated Bridge Construction option.

Option 3: Phased Construction

Phased construction would involve maintaining a single lane of traffic on part of the existing bridge, or part of a new bridge, while reconstructing or rehabilitating the other half of the bridge. This option is not feasible at this site for multiple reasons. First, traffic would be maintained using alternating one-way traffic during construction, which is not viable given the traffic volumes and closely spaced intersections at this location. Additionally, due to the site constraints with historic properties in close proximity in 3 of the 4 quadrants, there is not sufficient width upstream or downstream of the bridge to construct half of a new structure. Finally, the existing bridge deck and superstructure are in poor condition and therefore it would not be advisable to demolish a portion of the bridge while maintaining traffic on the remaining deck. For these reasons, phased construction will not be considered further.

Option 4: Maintain Traffic on Existing Bridge and Construct New Bridge Off-Alignment

Construction of a new bridge off-alignment would allow traffic to be maintained on the existing bridge during the construction of the new bridge, eliminating the need for a temporary bridge or closure. As mentioned above, the site is tightly constrained by historic properties, and due to the proximity to the nearby intersections of VT-9/VT-100 and VT-9/TH-8, it would not be feasible to realign the geometry of VT-9 by constructing a bridge off-alignment. Therefore, constructing a new bridge off-alignment will not be considered further.

Maintenance of Pedestrian Traffic

The Town of Wilmington relies heavily on tourism and hosts many events throughout the year to highlight local businesses and the recreational opportunities the region has to offer. Pedestrian access to the shops, restaurants, and other facilities downtown is essential to maintaining the vitality of the village, and maintaining this access during construction will be a key component of this project.

The following options have been considered to maintain pedestrian access during construction:

Temporary Pedestrian Bridge

If Bridge No. 31 is closed during construction and traffic is detoured, pedestrian traffic could be maintained on a temporary pedestrian bridge downstream of the existing bridge, connecting the green space next to Craft's Inn and Riverbank Park located at 2 West Main Street.

Advantages: Pedestrians would not have to traverse a lengthy detour to cross the river during construction. A temporary pedestrian bridge could also be used to temporarily support the watermain and other utilities currently supported by Bridge No. 31.

Disadvantages: There would be temporary impacts to Riverbank Park during construction. Additionally, this option could be costly, incurring the expense not only of installing and removing the temporary bridge and utilities, but also the costs of removing and resetting the park plantings, stonework, and trellis once construction is complete. Temporary construction easements would need to be obtained from the Craft's Inn property.

Permanent Pedestrian Bridge

This option is similar to the Temporary Pedestrian Bridge option, but the feature would be permanent. The pedestrian bridge could serve as a pedestrian detour during construction and turn into a permanent feature of downtown Wilmington after construction. The on-bridge utilities could be permanently supported by the new pedestrian bridge.

Advantages: Pedestrians would not have to traverse a lengthy detour to cross the river during construction. The utilities on the bridge would only have to be relocated once, saving time and money. Since Bridge No. 31 has two sidewalks in the existing condition, similar accommodations need to be provided on the new bridge. However, if a permanent pedestrian bridge is constructed, that would allow one sidewalk to be removed from the bridge, providing more space for vehicular traffic on the bridge without significantly widening the structure. With the roadway bridge only having one sidewalk, the shoulders on the bridge could be wider or an additional turning lane could be added, providing more clearance for oversized loads navigating the corridor.

Disadvantages: This option would result in permanent impacts to the pocket park as well as permanent impacts to the Craft's Inn property. The permanent impacts would require a historic 4(f) de minimis for the Craft's Inn property and at least a parks 4(f) de minimis for Riverbank Park. If the permanent impacts to the park were deemed adverse, the park's use would require an individual Section 4(f) evaluation Additionally, permanent right-of-way would need to be obtained from Craft's Inn. This would require additional design discussions and coordination with property owners which could lead to schedule delays. The Town would need to enter into a maintenance agreement with VTrans to maintain the pedestrian bridge after the completion of the project, which would result in additional recurring costs.

Pedestrian Detour

Detour on Temporary Bridge

If roadway traffic is maintained on a temporary bridge, as discussed in Maintenance of Traffic Option 2 above, pedestrians could also utilize the temporary bridge via an attached sidewalk. If pedestrians followed the roadway detour, it would have an end-to-end distance of 0.34 miles, though pedestrians would likely return to VT-9 via one of several business' driveways that connect to the West Main Street Parking area, which would be a less lengthy detour.

Advantages: This option would be a relatively short detour, keeping pedestrians within close proximity to downtown businesses.

Disadvantages: Detouring pedestrians on a temporary bridge in this location would mean there would be a longer route than the current condition, and this detour may be less accessible than the current condition or a pedestrian bridge adjacent to Bridge No. 31. Additionally, while this option keeps pedestrians close to downtown businesses, the Town of Wilmington is still concerned about the potential loss of business and tourists with this option as they will not be directly on VT-9.

Detour on Existing Pedestrian Bridge

Another option to detour pedestrians during construction would be to utilize the existing Reardon pedestrian bridge and part of the Hoot, Toot, and Whistle Trail on the Town of Wilmington's trail

system. The Reardon crossing is located approximately 0.2 miles West from Bridge No. 31 along VT-9. The end-to-end distance of this detour is 0.65 miles. This detour route is as follows:

- VT-9, South Main Street, Shafter Street, Mill Street, TH-59 (Class 3 Town Highway), Hoot, Toot & Whistle Trail, Reardon Bridge, VT-9.

This route is the longest option for detouring pedestrians, and the length of the detour may act as a deterrent for pedestrians to visit the opposite side of the river. In its current state, the Reardon Bridge is not ADA accessible and would require the construction of a temporary ramp on the side closest to VT-9. The proposed ramp would likely impact VT-9 and adjacent businesses. Primarily due to its length and the volume of pedestrian traffic in the vicinity of the project, this detour is not recommended or considered further.

IV. Utility Relocation

Overhead utilities run along the south side of VT-9, crossing the bridge and crossing VT-9 at the two adjacent intersections. These utilities must be relocated in advance of bridge construction to accommodate cranes and other construction equipment at the bridge. Utility relocation is expected to take one construction season before bridge construction begins. The recommended solution is to move the overhead utilities to existing utility poles that run along the parking area behind Craft's Inn and several other businesses. The utility lines would then cross the river and tie into the existing overhead network on South Main Street across from the Pettee Memorial Library. This approach is efficient and is estimated to require minimal adjustments to the existing system, such as adding span guy anchors and a push brace. Layouts showing the existing utilities and the proposed utility relocation are included in the Appendix.

V. Alternatives Discussion

Alternative 1: No Action

This alternative would leave the bridge in its current condition. The bridge deck and superstructure are in poor to critical condition, with three deck repairs needed within the past 12 months. It is clear that the bridge is nearing the end of its service life. In addition to the bridge's structural issues, there are issues of function in the bridge's current condition. The bridge does not meet the minimum hydraulic requirements, which is of concern considering the history of flooding at this location. Additionally, the widths are substandard and residents report that the current lane and shoulder widths are narrow for the current frequent passage of oversize loads. Overall, this alternative does not meet the needs of this project and therefore is not recommended.

Alternative 2: Bridge Rehabilitation

This alternative would rehabilitate components of the existing bridge. Given that the deck and superstructure are in poor condition and have needed multiple critical or emergency repairs within

the past year, it is not advisable to try to rehabilitate these components. A bridge rehabilitation alternative would include a full superstructure replacement, likely with a prefabricated superstructure such as NEXT beams or prefabricated bridge units. The substructure is in fair condition, with heavy spalling and cracking noted. A substructure rehabilitation would involve removing the deteriorated concrete and installing a new concrete facing.

Though these measures would address the structural deficiency of the bridge, they would not entirely address the hydraulic deficiency. A shallower superstructure could be installed, which would increase the hydraulic opening, but perhaps a greater issue with the existing bridge is the alignment of the East Abutment. The East Abutment is not in line with the adjacent channel walls, and it extends into the channel. This constriction poses a flooding hazard, not only with restricted ability to pass high flows, but also restricted ability to pass large woody debris. Therefore, this alternative does not sufficiently meet the need of this project to provide a resilient structure that increases the hydraulic capacity of this crossing, and this alternative is not recommended or considered further.

Alternative 3: Bridge Replacement On-Alignment

Bridge No. 31 is located in a dense downtown center, constrained on all four quadrants by historic properties or features and a section 4(f) park. It is also constrained by the VT-9/VT-100 intersection on the east side, and the VT-9/TH-8 intersection on the west side. Due to these constraints, it is not feasible to construct a new bridge off-alignment without extensive impacts to the historic district and the adjacent intersections. Therefore, the existing bridge horizontal and vertical alignment will be considered for a bridge replacement. This alternative involves constructing a new substructure and superstructure, and must consider various options for bridge width, length, skew, superstructure and substructure type, and construction methods.

a. Bridge Width and Configuration

The existing bridge is approximately 42 feet wide, with 11-foot lanes, 4-foot shoulders, 5-foot sidewalks including the curb, and 1-foot barriers. The lane and shoulder widths meet Vermont standards for a village principal arterial, though feedback from the community has indicated that the shoulder width is narrow, especially considering the volume of oversize loads navigating this corridor. The existing sidewalks are a substandard width, as the standard is 5 feet wide excluding the curb width.

The bridge widths considered are 43 feet and 46 feet. For each width, two different lane, shoulder, and sidewalk configurations were evaluated.

- 43-foot width
    - Two sidewalks on bridge: This option would maintain the existing 11-foot lane and 4-foot shoulder widths and increase the sidewalk and curb width to 5.5 feet to meet minimum standards.

        - *Advantages*: this configuration would have minimal impacts on the adjacent properties and intersections, limiting potential ROW and historic concerns. Standard lane, shoulder, and sidewalk widths would be provided.
        - *Disadvantages*: this configuration would maintain the existing 4-foot shoulders, which feels narrow based on current traffic conditions, and does not serve to enhance mobility through the project area.
        - This configuration was not considered further as it does not address the need to enhance mobility for pedestrians and bicyclists through the project site. As described below, minimally increasing the bridge width will better address the needs of the project.
    - One sidewalk on bridge with permanent pedestrian bridge: This option would remove the downstream sidewalk from the bridge, as pedestrian traffic on that side of the road would be carried by a permanent pedestrian bridge. This option features 11-foot lanes, 5-foot shoulders, and a widened 9-foot sidewalk and curb on the upstream side of the bridge.
        - *Advantages*: The wider shoulders would provide more space for oversize loads and cyclists across the bridge. The addition of the pedestrian bridge and widened sidewalk would provide much more space for pedestrians not only to walk but also to pause, which would enhance downtown events.
        - *Disadvantages*: The addition of the permanent pedestrian bridge would have additional impacts to adjacent properties, including the historic Craft's Inn property and the section 4(f) Riverbank Park, and would require maintenance by the Town. The wider sidewalk on the upstream side of the bridge along with the roadway alignment shifted south would impact the turning movements of large eastbound and southbound right turning trucks.
        - This configuration was not considered further as the addition of the permanent pedestrian bridge adds significant cost and 4(f) impacts to the project without the added benefit of an additional turn lane on the bridge that would improve mobility through the intersection with VT 100.
- 46-foot width
    - Two sidewalks on bridge: This option features 11-foot travel lanes, 5-foot shoulders, and 6-foot sidewalks including the curb width.
        - *Advantages:* this configuration would increase the shoulder and sidewalk widths with minimal impacts to the adjacent properties and intersections as the proposed bridge superstructure could be built entirely within the existing ROW. The wider shoulders and sidewalks would enhance mobility by providing more space for oversize loads, pedestrians, and cyclists across the bridge.
        - *Disadvantages:* the increased width of this alternative would add minimal costs compared to the 43-foot width option.
    - One sidewalk on bridge with permanent pedestrian bridge: This option would remove the downstream sidewalk from the bridge, as pedestrian traffic on that side of the road would be carried by a permanent pedestrian bridge. This option would

have two 11-foot travel lanes, one central 10-foot left turning lane, a 2-foot and 4-foot wide shoulder, and a 6-foot wide sidewalk including curb on the upstream side of the bridge.

- *Advantages:* this configuration would add additional capacity to the intersection of VT-9/VT-100 by providing space for left turning movements to queue while allowing eastbound traffic to pass. It would provide more space for pedestrians, both on the upstream sidewalk and on the downstream permanent pedestrian bridge.
- *Disadvantages:* this configuration has the most impacts to adjacent historic/4(f) properties of the options considered. The pedestrian bridge would require maintenance by the Town. While the addition of the turning lane adds additional capacity to the intersection of VT-9/VT-100, it does not significantly improve LOS of the intersection during average traffic volumes. The benefit of any new capacity would be mostly felt during a few hours a day on 10-15 weekends per year.

b. Construction Method

The construction method is a significant consideration for this project, as it is related to many of the other alternatives discussed.

- Conventional Construction
  - A conventional construction method would utilize a temporary bridge for passenger cars during the construction of the permanent bridge on the existing alignment, as discussed under Maintenance of Traffic Option 2. Truck traffic and oversize loads would be redirected to the signed detour discussed under Maintenance of Traffic Option 1. Pedestrian and cyclist traffic would be detoured on the temporary bridge, as discussed under Maintenance of Pedestrian Traffic. The first construction season would include relocation of aerial utilities and the utilities on the bridge. The temporary bridge and roadway could potentially be constructed throughout the winter or the following construction season. After the temporary bridge and roadway are completed, traffic would be detoured to the temporary bridge and the existing bridge would be closed for reconstruction. The construction of the permanent bridge would likely take one construction season, after which traffic could be switched onto the new bridge and the temporary bridge and roadway could be removed and the original ground could be restored. The duration of this construction method would likely take two to four years.
  - *Advantages:* Traffic flow would be maintained through downtown Wilmington via a temporary roadway through the West Main Street parking lot. This would allow visitors to access local businesses on both sides of the river during construction.
  - *Disadvantages:* Several disadvantages of this alternative are related to its longer duration compared to accelerated construction. Bridge No. 31 is a central point in downtown culturally and economically, so the construction and temporary

bridge detour being in place for an extended amount of time would likely have impacts to town events and downtown businesses. The temporary roadway would impact much of the existing parking in the West Main Street parking lot, though there may be an opportunity to add additional parking temporarily on the portion of VT-9 that would be closed to through traffic. Another disadvantage of this option is the scale of its impacts. The restoration of the parking area after construction was finished would likely trigger the need for an Operational Stormwater Permit. There would be significant Right-of-Way impacts to the businesses that share ownership of the West Main Street parking lot. Additionally, there may be hydraulic impacts or concerns associated with installing a temporary bridge that would need to be mitigated. Finally, the construction of the temporary roadway and bridge would be a significant cost to the project.

- Accelerated Construction
    - An accelerated construction method would involve constructing a new bridge during a closure period, during which traffic would be detoured onto local and regional detours as discussed under Maintenance of Traffic Option 1. Pedestrian and cyclist traffic would be detoured via a permanent or temporary pedestrian bridge, or via the existing Reardon Bridge, as discussed under Maintenance of Pedestrian Traffic. The bridge construction could be completed in one continuous closure or in multiple long weekend closures. Altogether, it is anticipated that the bridge could be constructed in as little as 28 days of closure in total. During the closure period(s), construction would occur 24 hours per day. Like the Conventional Construction option, this method would involve an initial construction season of utility relocation. During the following construction season, the contractor would complete construction activities in advance of the closure period, which could include night work or traffic interruptions with lane closures. This work could include constructing the proposed abutments in advance of the full closure. The abutments would likely consist of precast concrete caps with micropiles socketed into bedrock. This type of abutment may be the most appropriate for an accelerated construction period given the site constraints. The contractor would then construct the new bridge during the bridge closure and traffic detour. After the bridge closure, traffic would be allowed back on the new bridge. The contractor would remain on site after the closure to complete remaining tasks, so there may be traffic interruptions or other construction impacts during the remainder of the construction season. The overall duration of this construction method would likely be two years in total.
    - *Advantages*: The primary advantage of this option is that traffic could return to VT-9 after the bridge closure period. Based on input from the Local Concerns meeting, a primary concern of residents and business owners is reducing the duration of traffic interruptions downtown. There may be an opportunity to schedule the closure around local and regional events to limit the construction

impact during those times. Another advantage is that there would be less Right-of-Way, hydraulic, and parking impacts than if a temporary bridge were constructed.

- *Disadvantages:* Traffic would be detoured around downtown during the bridge closure, which may have adverse impacts to businesses in the area. There would also be adverse impacts to local residents, as there would be 24-hour construction noise during the closure. It is possible that occasional night work would be needed in advance of the closure as well. Additionally, accelerated bridge construction techniques are typically more costly than those employed for conventional construction.

c. Bridge Length and Skew

The existing bridge is approximately 59 feet long with a skew of five degrees. The west abutment is in line with the face of the existing channel walls, while the east abutment juts into the channel by a maximum of approximately 13 feet on the south side. It would be beneficial to the hydraulic performance of the bridge to increase the bridge span length by positioning the abutments in line with the channel walls at a minimum. From a construction standpoint, it would be advantageous to construct the new abutments behind the existing abutments, so the existing abutments could be used to retain material during construction. This would place the west abutment slightly behind the channel walls, and the east abutment in line with the channel walls. This results in a bridge span length of 70 feet. The existing skew of 5 degrees is so minor that it would not be necessary for the new bridge to be skewed relative to the roadway alignment.

d. Superstructure Type

Regardless of whether conventional or accelerated construction is used, it will be advantageous to use a precast or prefabricated superstructure for ease and speed of construction. At this span length, a precast concrete NEXT-D beam or Prefabricated Bridge Unit with steel beams and a concrete deck are reasonable options. The superstructure can impact the hydraulic performance of the structure due to its bottom surface roughness and its overall depth. The shape of the NEXT-D beam is better suited to prevent debris entrapment than the I-shaped beams used in the PBUs, since the NEXT-D beams don't have a bottom flange. The depth of the superstructure impacts the overall hydraulic opening of the bridge, and the bottom surface roughness relates to the risk of large woody debris getting caught under the bridge. At this span length, the depth of a NEXT-D beam would likely be 39-43 inches, including three inches of pavement. The depth of a prefabricated bridge unit could be in a similar range of 40 inches – 48 inches. The existing bridge is approximately 51 inches deep based on the surveyed geometry. Therefore, both superstructures would be an improvement in superstructure depth. Additionally, the superstructure depths could potentially be reduced for both NEXT-D beams and PBUs with the use of Ultra High Performance Concrete (UHPC). Reducing the proposed superstructure depths will only enhance the hydraulic performance of the bridge. The use of UHPC should be investigated further during the design phase of the project.

e. Substructure Type

The existing bridge abutments are founded on spread footings, though the geometry of the abutments is unknown. A geotechnical investigation is needed to determine the exact constituency of the subgrade, and it is recommended to include testing of the abutments to determine their thickness. Bedrock is visible in the stream adjacent to the abutments, so it is likely the footings rest on bedrock. The abutment construction will be a critical and complex element of construction due to the challenging site constraints. There will need to be elements to support and dewater the excavation. One option may be to use the existing abutments as support of excavation and cofferdams by constructing the new abutments behind the existing abutments. This method could work well with precast concrete abutments on micropiles socketed into bedrock. After the new abutments are installed, the existing abutments could be removed incrementally, with the contractor installing a permanent wall or decorative facing in front of the new abutment as the existing abutments are removed. A geotechnical investigation is needed to determine the feasibility of this or other potential substructure options.

Alternative 4: Bridge Replacement Off-Alignment

As discussed in Maintenance of Traffic Option 4, the site is tightly constrained by adjacent historic properties and the proximity to the nearby intersections of VT-9/VT-100 and VT-9/TH-8. It would not be feasible to realign the geometry of VT-9 by constructing a bridge off-alignment. Therefore, this option is not considered further.

VI. Alternatives Summary and Evaluation Matrix

Based on the existing site conditions, condition of the bridge, local concerns, purpose and need for the project, recommendations from hydraulics, and maintenance of traffic discussed herein, there are three viable alternatives:

Alternative 3a: Bridge Replacement, On Alignment utilizing Accelerated Bridge Construction Techniques with a Full Closure and Pedestrian Traffic Maintained on a Temporary Pedestrian Bridge

Alternative 3b: Bridge Replacement, On Alignment utilizing Accelerated Bridge Construction Techniques with a Full Closure and Pedestrian Traffic Maintained on a Permanent Pedestrian Bridge

Alternative 3c: Bridge Replacement, On Alignment utilizing Conventional Construction with Traffic Maintained on a Temporary Bridge

Following is an evaluation matrix summarizing the costs and key evaluation criteria.

VII. Cost Evaluation Matrix[1]

Wilmington BF-010-1(58)		Alternative 1:	Alternative 2:	Alternative 3: Bridge Replacement, On Alignment			Alternative 4:
				Accelerated Bridge Construction		Conventional Bridge Construction	
		No Action	Bridge Rehabilitation	a. Full Closure with Temporary Pedestrian Bridge	b. Full Closure with Permantent Pedestrian Bridge	c. Traffic Maintained on a Temporary Bridge	Bridge Replacement, Off Alignment
COST[1]	Bridge Cost	$0	N/A	$ 1,600,000.00	$ 1,600,000.00	$ 1,600,000.00	N/A
	Removal of Structure	$0	N/A	$ 200,000.00	$ 200,000.00	$ 150,000.00	N/A
	Roadway	$0	N/A	$ 80,000.00	$ 80,000.00	$ 80,000.00	N/A
	Maintenance of Traffic	$0	N/A	$ 500,000.00	$ 1,050,000.00	$ 1,800,000.00	N/A
	Construction Cost	$0	N/A	$ 2,380,000.00	$ 2,930,000.00	$ 3,630,000.00	N/A
	Construction Engineering & Contigencies	$0	N/A	$ 1,547,000.00	$ 1,904,500.00	$ 1,089,000.00	N/A
	Total Construction Costs	$0	N/A	**$ 3,927,000.00**	**$ 4,834,500.00**	**$ 4,719,000.00**	
	Preliminary Engineering[2]	$0	N/A	$ 589,050.00	$ 725,175.00	$ 707,850.00	N/A
	Right-of-Way	$0	N/A	$ 75,000.00	$ 100,000.00	$ 160,000.00	N/A
	Total Project Costs	$0	N/A	**$ 4,591,050.00**	**$ 5,659,675.00**	**$ 5,586,850.00**	N/A
	Annualized Costs	$0	N/A	$ 45,910.50	$ 56,596.75	$ 55,868.50	N/A
TOWN SHARE[3]		$0		$ 200,000.00	$ 100,000.00	$ 250,000.00	N/A
SCHEDULING	Project Development[4]	N/A	3 Years	3 Years	3 Years	3 Years	3 Years
	Construction Duration	N/A	2 Years	2 Years	2 Years	2-4 Years	2-3 Years
	Closure Duration	N/A	To be determined	28 Days	28 Days	N/A	N/A
ENGINEERING	Typical Section - Roadway (feet)	22'-0"	22'-0"	22'-0"	32'-0"	22'-0"	22'-0"
	Typical Section - Bridge (feet)	42'-0" 1'-5'-4'-11'-11'-4'-5'-1'	42'-0" 1'-5'-4'-11'-11'-4'-5'-1'	46'-0" 1'-6'-5'-11'-11'-5'-6'-1'	46'-0" 1'-6'-2'-11'-10'-11'-4'-1'	46'-0" 1'-6'-5'-11'-11'-5'-6'-1'	N/A
	Geometric Design Criteria - Sidewalk Width	Substandard Width	Substandard Width	Meet Standard width	Meet Standard Width	Meet Standard Width	N/A
	Intersection Capacity	No Change	No Change	No Change	Improved	No Change	N/A
	Traffic Safety	No Change	No Change	Improved	Improved	Improved	N/A
	Alignment Change	No	No	No	No	No	Yes
	Pedestrian Access	No Change	No Change	Improved	Improved	Improved	N/A
	Bicycle Access	No	No	Improved	Improved	Improved	N/A
	Utilities	No Change	Aerial/Underground Relocation	Aerial/ Underground Relocation	Aerial/ Underground Relocation	Aerial/ Underground Relocation	Aerial/Underground Relocation
MAINTENANCE OF TRAFFIC	Regional Detour	N/A	Yes	Yes	Yes	Yes	N/A
	Road Closure	N/A	N/A	Yes	Yes	No	No
	Temporary Pedestrian Bridge	N/A	N/A	Yes	No	No	N/A
	Permanent Pedestrian Bridge	N/A	N/A	No	Yes	No	N/A
	Temporary Bridge	N/A	N/A	No	No	Yes	N/A
RESILIENCE	Hydraulic Capacity	No Change	No Change	Improved	Improved	Improved	N/A
	Design Life	<10 Years	50 Years	100 Years	100 Years	100 Years	100 Years
	Maintenance Required	Yes	Slightly Improved	Improved	Improved	Improved	N/A
	Safety	No Change	Slightly Improved	Improved	Improved	Improved	N/A
IMPACTS	Archeological	N/A	N/A	N/A	N/A	N/A	N/A
	Section 106 Historic Preservation	N/A	No Adverse Effect	Adverse Effect	Adverse Effect	Adverse Effect	Adverse Effect
	Section 4(f) Historic Preservation	N/A	No	Bridge Programmatic	Bridge Programmatic	Bridge Programmatic	Bridge Programmatic
	ROW Acquisition	No	No	Yes	Yes	Yes	Yes
LOCAL & REGIONAL	Satisfies Purpose & Need	No	No	Mostly	Yes	Yes	Mostly

[1] Costs are estimates only, used for comparison purposes.

[2] Preliminary Engineering costs are estimated starting from the end of the Project Definition Phase.

[3] The town is responsible to cover the costs associated with utility relocation

[4] Project Development durations are starting from the end of the Project Definition Phase.

VIII. Conclusions and Recommendations

Based on the alternatives evaluation, VHB recommends Alternative 3a - Bridge Replacement, On Alignment utilizing Accelerated Bridge Construction Techniques with a Full Closure and Pedestrian Traffic Maintained on a Temporary Pedestrian Bridge.

This recommendation is based on the following:

- Alternative 3a will address the condition and structural deficiencies of the current bridge by fully replacing it.
- The temporary pedestrian bridge will maintain pedestrian traffic through the village, which will be the least impactful to local businesses and the Town of Wilmington.
- The temporary pedestrian bridge can be used to facilitate the replacement of the existing utilities on the bridge.
- The temporary pedestrian bridge will be removed and the Craft's Inn property and River Bank Park can be fully restored. This will limit impacts to adjacent historic/4(f) resources as temporary easements/impacts do not rise to the level of a 4(f) as long as the easement is required for less than the duration of construction.
- Alternative 3a is the least expensive of the alternatives considered.
- Alternative 3a has the shortest construction duration of the alternatives considered.
- Utilizing accelerated bridge construction with a maximum 28-day closure is the preferred alternative for the Town of Wilmington, specifically the local business owners. This will be the least impactful to their business as it will minimize the overall duration that both pedestrian and vehicular traffic is impacted by construction.
- The proposed 46-foot bridge width will increase the sidewalk and shoulder widths on both sides of the bridge, enhancing mobility for pedestrians and bicyclists. The wider bridge will also facilitate more efficient winter maintenance activities and will provide more room for oversize vehicles to cross the bridge.

Given the proximity of the intersections on either side of Bridge No. 31, VHB also recommends the following improvements be considered as part of the bridge project:

- Both traffic signals should be replaced with newer equipment matching current VTrans specifications.
- The Ray Hill Road signal is unconventional, with one free-flowing approach, one signalized approach, and one stop-controlled approach. One option to satisfy current standards is to signalize all legs of the intersection. In this case, Ray Hill Road should be coordinated with the signal at VT-100. The green phase for Ray Hill Road should overlap with the northbound phase at VT-100 but be much shorter due to low volumes. Additionally, the southbound approach should be actuated with no recall. Another option to improve the intersection would be to remove the signal at Ray Hill Road and paint "Do Not Block" intersection markings on VT-9 to allow cars turning from Ray Hill Road to

turn onto VT-9 during congestion. These options should be considered further during the design phase.

- The bridge project should also refresh and enhance pavement markings at each intersection, including crosswalks and stop bars. Stop lines are recommended at stop signs.

Finally, while an eastbound left turn lane would reduce overall delay by 6 seconds, incrementally improving the intersection's LOS from a D to a C, adding left turn lanes to other approaches would offer less benefit. Only an eastbound turn lane was considered for this project. The benefit of this additional lane is modest and is not recommended for this project as it would require adding a permanent pedestrian bridge that significantly increases both project costs and impacts to historic/4(f) resources.

IX. Appendices

1. Site Photographs
2. Town Map
3. Bridge Inspection Report
4. Preliminary Hydraulics Memo
5. Preliminary Geotechnical Information
6. Natural Resource Identification Memo
7. Archeological Resource Identification Memo
8. Historic Resource Identification Memo
9. Stormwater Resource Identification Memo
10. Landscape Resource Identification Memo
11. Environmental Specialist Resource Identification Memo
12. Floodplains Rivers Map
13. Hazardous Waste and Urban Soils Map
14. Other Resources Map
15. Operations Survey Questionnaire
16. Community Questionnaire
17. Plans
    a. Existing Conditions Layout Sheet
    b. Existing Utility and Utility Relocation Layout Sheets
    c. Alternative Typical Sections and Layouts
    d. Conceptual Temporary Bridge and Roadway Layout
    e. Conceptual Regional Detour and Local Bypass Maps
    f. Pedestrian Detour Alternatives