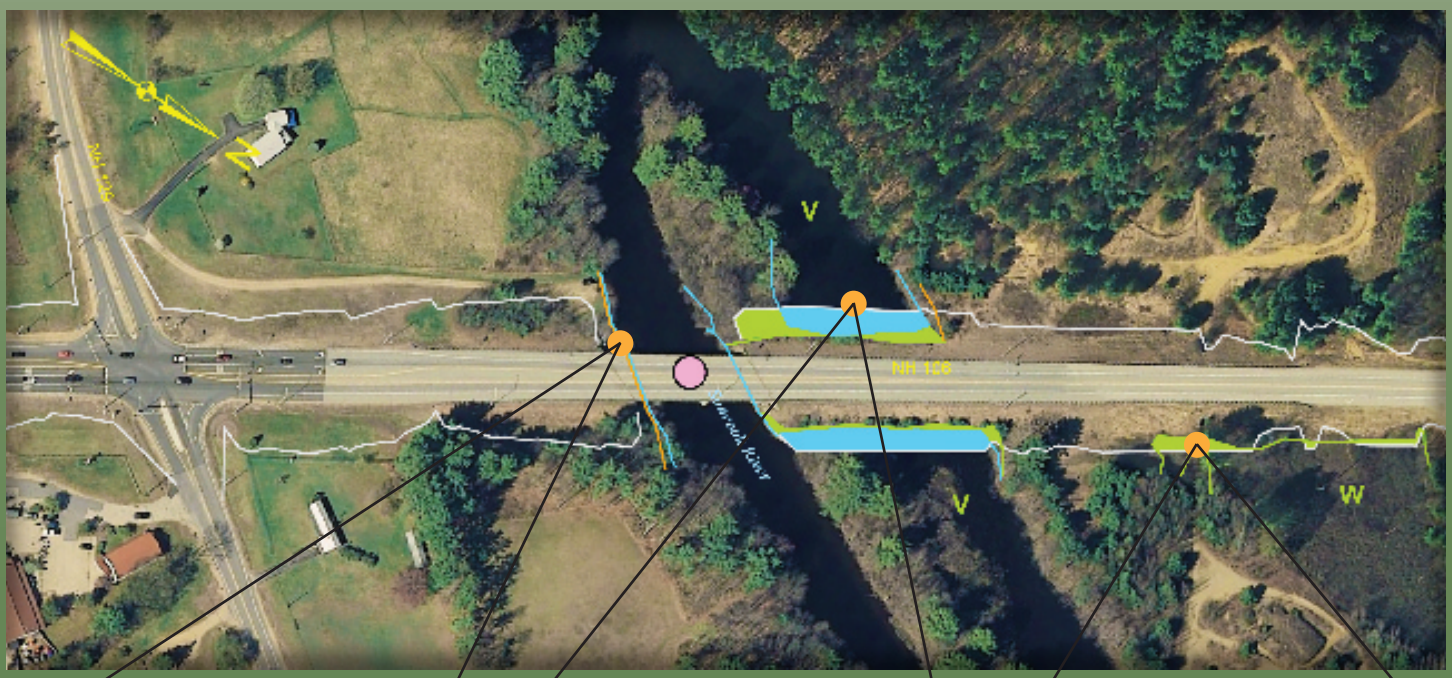
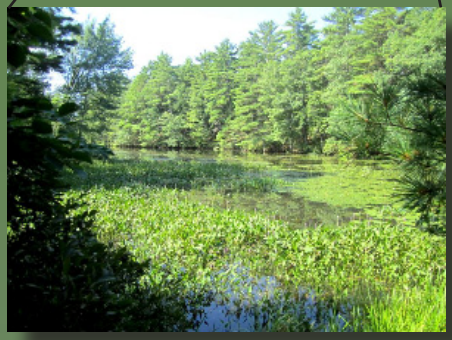
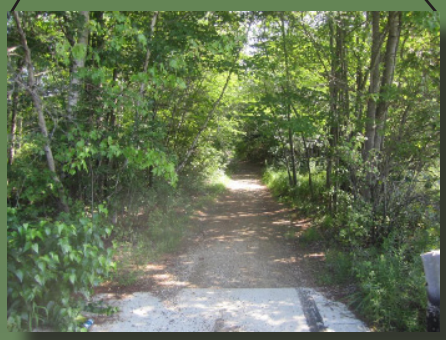
NH Route 106 Interim Corridor Study

Environmental Study

March 2012







New Hampshire DOT

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NHDOT 16188
NH Route 106 Interim Corridor Study

Environmental Study

March 2012

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Engineering Report

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1 Introduction

1.1 Scope of Report

The State of New Hampshire Department of Transportation (NHDOT) is evaluating the existing and future capacity and safety needs along a segment of NH Route 106 in Concord, Loudon, and Canterbury, NH. The project is a continuation of planning and design work done in the early 1990's which studied improvements to the entire corridor from Interstate-393 (I-393) in Concord and extending north approximately 21 miles to the US 3/NH 11 (Laconia Bypass) interchange. That project, which culminated in an Environmental Assessment (EA) produced in 1995, is referred to in this study as the "1995 EA project". The 1995 EA project proposed widening most of NH Route 106 from the current two lanes to four lanes, and identified smaller-scale "interim" improvements which might be made before the full build improvements were completed.

The project corridor is approximately 11 miles long beginning at I-393 in Concord and continuing north to a point approximately 0.25 miles north of Ames Road in Canterbury or 1.6 miles north of New Hampshire Motor Speedway (NHMS). (See Figure 1.1-1, Location Map.) The "study area" as referred to in this study is this 11-mile corridor and the land immediately adjacent. It is also referred to below as the "project corridor". The purpose of this study is to reinvestigate NH Route 106 within the study area to determine if the findings of the 1995 EA remain valid or require reconsideration.

This report documents existing natural, historical, and social resources within the project corridor, possible project impacts, and regulatory implications. The project does not currently have federal funding and therefore is not required to meet the provisions of the National Environmental Policy Act of 1969 (42 USC 4332(2)(c)) as implemented at 23 CFR 771.117(d)(3). However, the study addresses the principal elements of this Act, specifically the requirements of Categorical Exclusions, to facilitate project approval should federal funding become available in the future.

Section 1 describes the existing transportation system within the corridor, including roads, intersections, bridges, and other structures. Section 2 identifies the Purpose and Need for the project. Section 3 describes alternatives considered and how the Proposed Action was selected. Section 4 describes the Proposed Action in detail. Section 5 describes existing resources within the project corridor and possible project resource impacts. Section 6 details project coordination efforts with resource agencies, public officials, and the general public.

1.2 Existing Conditions

1.2.1 Roadway

NH Route 106 is a state highway that runs from Pembroke in the south to Laconia in the north, and intersects with Interstate 393 in Concord. The project corridor is approximately 11 miles long beginning at Autumn Drive in Concord and continuing north to a point approximately 0.25 miles north of Ames Road in Canterbury. (See Figure 1.1-1, Location Map.) The section of NH Route 106 between Loudon Road in Concord and Shaker Brook in Loudon was built on a new alignment in the early 1960's and mid 1970's, while the remainder of the project corridor has received shoulder widening along the original alignment over the last 25 years.

NH Route 106 has one general purpose travel lane in each direction throughout the project corridor, shoulders ranging from 4 to 12 feet wide, and exclusive turn lanes at certain intersections. This results in a pavement width that varies from 40 to 68 feet. The speed limit along NH Route 106 is posted at 55 miles per hour (mph) with a reduced speed limit of 40 mph at the signalized intersection of NH Route 106 and NH Route 129, and 45 mph at the signalized intersection of NH Route 106 and Shaker Road. The most recent Annual Average Daily Traffic (AADT) data from 2010 indicates that approximately 16,400 vehicles per day (vpd) travel along NH Route 106.

There are a number of interim roadway improvement projects along NH Route 106 that have been completed since the completion of the 1995 EA project, including:

- Loudon 10672A (1997) – Widening of NH Route 106 from Clough Hill Road north to Hollow Root Road
- Concord 12885 (1999) – Shoulder widening of NH Route 106 from Makris Lobster & Steak House in Concord north to Bridge #056/063 in Loudon just north of Wales Bridge Road
- Loudon 13207 (2001) – The relocation of Staniels Road opposite Josiah Bartlett Road and the widening of NH Route 106 to provide exclusive turn lanes at the new intersection
- A shoulder widening project by NHMS which extended from the NHMS main entrance to a point approximately 1,000 feet south of main entrance (completed in the early 1990's); and from the north track entrance north to Shaw Road in Canterbury (completed about 10 years later)

1.2.2 Bridges and Structures

Below is a description of each of the bridges and larger culverts that cross the alignment within the study area. A listing of all bridges and culverts over waterways may be found in Section 5.7 (Table 5.7-1). There are several other "dry" culverts found along the alignment as well.

NH Route 106 over cattle crossing in Concord (Sta. 1176+00) – This structure carries NH Route 106 over a cattle crossing connecting two agricultural fields on the Bartlett Farm property approximately 2,800 feet south of Staniels Road. This structure was constructed in 1961 as part of the NH Route 106 realignment. The structure is a concrete box arch structure with a height of 5'-5" and a width of 4'-0". The structure carries two lanes of traffic with a roadway width of 48'-0" and a structure length of approximately 68'-0". In general, the structure is in good condition.

NH Route 106 over Soucook River north of Wales Bridge Road in Loudon – Bridge # 056/063 (Sta. 1266+50) – Bridge No. 056/063 was constructed in 1977 and is a three-span continuous, steel girder beam with concrete deck bridge with a total length of 152 feet. The two lane bridge has a 46'-8" width deck with seven girders and no sidewalks. The roadway over the bridge has two 12' lanes and two 9'-3" shoulders. The substructure is composed of two abutments and two piers founded on steel H-piles. In general, the substructure is in good condition. The north and south abutments and one of the piers have shoe expansion bearings while the other pier is fixed. The bearings are in poor condition. The abutments have strip seal type expansion joints that have failed, are filled with roadway debris, and are leaking. Bridge 056/063 is not currently on the State's Red List[1], and has a sufficiency rating of 98.9%. This bridge is scheduled to be rehabilitated in 2012 by the Loudon 22027 project.

NH Route 106 over Soucook River north of NH Route 129 in Loudon – Bridge # 074/086 (Sta. 1339+50) – Bridge No. 074/086 was constructed in 1977 and is a two-span continuous, steel girder beam with concrete deck bridge with a total length of 182 feet. The two-lane bridge has a variable width deck with seven straight girders and two splayed girders and no sidewalks. The steel girders have cover plates at the pier which may limit the ability to rehabilitate the bridge due to fatigue concerns. The substructure is composed of two abutments and one pier founded on steel H-piles. The south abutment is in good condition, while the north abutment is in fair condition with minor spalling. In general, the wall pier is

[1] A list maintained by NHDOT of bridges requiring interim inspections due to known deficiencies, poor conditions, weight restrictions, or type of construction.

in good condition with minor spalling and cracking. The north and south abutments have shoe expansion bearings and strip seal type expansion joints. The expansion joints at both abutments have failed, are filled with roadway debris, and are leaking. Bridge 074/086 is not currently on the State's Red List, and has a sufficiency rating of 98.9%. This bridge is scheduled to be rehabilitated in 2012 by the Loudon 22027 project.

NH Route 106 over recreational trail north of NH Route 129 in Loudon – Bridge #074/087 (Sta. 1346+00) – Bridge No. 074/087 was constructed in 1998 and is a corrugated metal pipe arch structure with a height of 6'-1" and a width of 10'-0". The bridge carries two lanes of traffic with a roadway width of 45'-0". In general, the structure is in good condition. Bridge 074/087 is not currently on the State's Red List, and has a sufficiency rating of 100.0%.

NH Route 106 over Shaker Brook north of Clough Pond Road in Loudon – Bridge #100/114 (Sta. 1445+00) – Bridge No. 100/114 was constructed in 1951 and is a two–barrel, four-sided concrete box with a total length of 31'-3". The four-lane bridge has a width of 57'-6" and no sidewalks. The headwalls are comprised of splayed wingwalls founded on spread footings. This bridge was modified in 1996 by the NHDOT Bureau of Bridge Maintenance to accommodate the subsequent widening of NH Route 106 completed as part of project Loudon 10672A. Bridge 100/114 is not currently on the State's Red List, and has a sufficiency rating of 94.3%.

NH Route 106 southern crossing over Gues Meadow Brook (near the southern NHMS entrance) in Loudon – Bridge #137/132 (Sta. 1556+00) – Bridge No. 137/132 was constructed in 1960 and is comprised of two adjacent 72" reinforced concrete pipes with a total span of 14'-6". The two-lane bridge has a roadway width of 48'-0". The existing bridge has a recreational trail structure (walkway) built into the west headwall of the structure. The walkway was privately built for NHMS to accommodate pedestrian traffic during special events. This additional structure is in poor condition at best and should be replaced. Bridge 137/132 is not currently on the State's Red List, and has a sufficiency rating of 99.0%.

NH Route 106 middle crossing over Gues Meadow Brook (north of southern NHMS entrance) in Loudon (Sta. 1568+00) – This culvert is a sister structure to Bridge 137/132 and was most likely constructed in 1960. Similar to Bridge 137/132, the culvert is comprised of two adjacent 72" reinforced concrete pipes. The two-lane culvert has a roadway width of 48'-0". These two culverts do not qualify as a bridge structure based on NHDOT guidelines.

NH Route 106 northern crossing over Gues Meadow Brook at Loudon/Canterbury Town Line – Bridge #227/122 (Sta. 1625+50) – Bridge No. 227/122 was constructed in 1928 and rehabilitated and extended in 1992 to its current length of 84'-0". It is a single-span

concrete slab bridge with a total span of 10'-0". Bridge 227/122 is not currently on the State's Red List, and has a sufficiency rating of 93.3%.

There is one additional structure at the northern project terminus. This structure is Bridge #236/156, built in 1952, and carries the Rocky Pond outlet stream under NH Route 106. It will not be affected by the project.

2 Purpose and Need

2.1 Purpose of the project

The purpose of this project is to address known safety problems and potential capacity concerns for NH Route 106 and its intersections, from Autumn Drive in Concord to a point approximately 0.25 miles north of Ames Road in Canterbury.

2.2 Need for the project

NH Route 106 provides a regional transportation link between Concord and Laconia, as well as other areas to the north and south, while also providing access to several intersecting roadways along the corridor. In 2010 NH Route 106 carried approximately 16,400 vehicles per day, with 8.5% of that volume being truck traffic. The roadway is State-maintained and is classified as a Rural Minor Arterial. This project is identified in the State's current draft Ten Year Transportation Improvement Plan (2013-2022), although a funding source has not yet been identified.

The need for the project is due to the road's position as a vital north-south regional traffic corridor connecting the Capital Region and the Lakes Region, as well as providing an alternate route to Interstate 93. The study area also provides access to retail, commercial and industrial businesses, and residential developments.

A total of 211 crashes were reported for the eight-year period from 2002-2009. This total consisted of 4 fatal crashes, 83 personal-injury crashes, and 90 crashes involving property damage only. This results in an average of 27 accidents per year along the corridor. As the volume of traffic increases on NH Route 106 as currently configured, the number of crashes is likely to increase.

3 Alternatives to the Proposal

3.1 No-Build (Baseline) Alternative

The No-Build alternative assumes that the existing roadway system would be maintained in its current condition through the design year. Other than normal roadway maintenance by the NHDOT Maintenance District, the only improvements planned at this time are rehabilitation of bridge #056/063 and bridge #074/086 in 2012 by the Loudon 22027 project. The expected increase in traffic volumes on both NH Route 106 and many of the side roads would result in increased delays exiting the side streets. As motorists become more impatient with getting out of the side streets there is the potential for an increase in crash occurrences. In addition, the increase in the volume of left-turn movements into the side streets from NH Route 106 would increase the risk of crashes as drivers either fail to perceive and avoid the left-turning vehicles, resulting in rear end collisions, or attempt to go around them on the shoulders, resulting in side swipe type crashes. Therefore this alternative is not considered prudent, as it does not address the existing safety and capacity deficiencies at the intersections throughout the corridor.

3.2 Traffic Demand Management (TDM) Alternatives

The Traffic Demand Management alternatives include measures that are designed to reduce the volume of traffic on the roadway rather than increase overall capacity. These measures represent various actions that can be taken to reduce the amount of single occupancy vehicles on the roadway. TDM measures include a wide variety of measures designed to promote the use of alternative travel modes and thus decrease travel demand. The goal is to change driver behaviors to reduce travel demand through the use of TDM measures including, but not limited to, the following:

- Ride sharing
- Park and Ride facilities
- Work hour management (flextime, offset work hours, telecommuting)
- High occupancy vehicle (HOV) usage
- Transit usage (buses, trains)
- Commuter bicycle programs

A number of municipal and private organizations were contacted as part of the 1995 EA project to determine the level of existing and future TDM measures. These resources were reviewed as part of this study to determine if there had been any changes within the corridor that would affect travel demand. The results showed that there have been no apparent changes to the amount or types of TDM measures that are utilized along this corridor.

Therefore this alternative is not considered prudent on its own, as it does not provide enough reduction in traffic volumes along this corridor to alleviate the existing capacity or safety concerns. However, TDM measures along this corridor should continue to be investigated and improved upon as part of any long range transportation plan. Some measures that could be effective include:

- Additional Park and Ride facilities in the Town of Loudon.
- Expanded fixed-route bus routes that would provide more services to the commuting public.

3.3 Transportation System Management (TSM) Alternatives

Transportation System Management consists of localized improvements to the existing roadway system that do not involve major construction, are generally low cost solutions to existing capacity constraints and safety concerns, and can generally be completed by state maintenance personnel. These improvements tend to focus on intersection related improvements including signal timing and phasing upgrades, signal equipment upgrades, and consolidation of access points. These improvements can also include providing exclusive turn lanes or auxiliary lanes at an intersection without widening the roadway. This can be accomplished by reducing the existing shoulder width and restriping the roadway during normal pavement overlay programs.

Several examples of TSM improvements that have been made to the NH Route 106 corridor, some as a result of the 1995 EA project, are:

- Signal timing improvements at the intersection of Route 106 and NH Route 129.
- Shoulder widening along NH Route 106 (by NHDOT and NHMS).
- Restriping of NH Route 106 to provide for the installation of left-turn lanes at Chichester Road/South Village Road, Dunkin Donuts, and Clough Pond Road.

Several additional TSM measures that could be implemented along NH Route 106 that would improve safety and capacity are:

- Signal timing and phasing adjustments at the intersection of NH Route 106 and NH Route 129.
- Signal timing adjustments at the intersection of NH Route 106 and Shaker Road.
- Signal timing and phasing adjustments at the intersection of Route 106 and NH Route 140.
- Restriping of NH Route 106 to provide for the installation of left-turn lanes at a number of town road intersections.
- Improved/upgraded signing and pavement markings.

While the signal timing and phasing adjustments noted above can improve the overall operations of a signal, thus increasing capacity, the benefits are short lived. Some of the existing single lane approaches to the signalized intersections on NH Route 106 are nearing capacity, and as the volume of traffic continues to increase, the lane capacity will be exceeded and additional lanes will be needed.

Providing exclusive left-turn lanes improves traffic flow and safety by removing turning vehicles from the traffic stream. However, creating these lanes by reducing the usable shoulder on a high speed roadway such as NH Route 106 can reduce the capacity and safety of the intersection and possibly negate the positive effects of the exclusive turn lanes.

Therefore, this alternative on its own does not sufficiently improve existing traffic flow or alleviate safety concerns, nor does it address the needs of the corridor within the design year. However, TSM measures such as signal timing and phasing adjustments and improved signing and pavement markings should continue to be investigated and implemented as part of future planning and project development.

3.4 Alternatives Considered But Not Progressed

The installation of a roundabout at key intersections along the corridor was analyzed qualitatively. While either one- or two-lane roundabouts would be effective at handling peak hour traffic volumes, the management of traffic during special events held at NHMS would be more problematic. A review of the general operation of roundabouts during special events where larger than normal volumes are expected revealed that several states,

including Florida, have plans in place that utilize roundabouts during special events where a majority of the traffic entering the roundabout travels through the intersection from one direction and all other legs of the roundabout are essentially closed to traffic. This type of operation would require traffic to travel in both directions around the roundabout, making crossing maneuvers by emergency vehicles or local traffic difficult or impossible. In addition, this type of operation would require additional police control and signage to guide vehicles through the roundabout. Therefore this alternative is not considered prudent as it would result in poor operations during special events and could restrict access to NH Route 106 by emergency vehicles and local traffic.

A group of upgrade alternatives was developed during the 1995 EA project based on future traffic projections and analysis, resulting in a recommendation to upgrade approximately 15 miles of NH Route 106 to a four-lane cross section. Resource impacts of these upgrade alternatives were also assessed. As a result of this 1995 analysis, it was determined that a four-lane principal arterial for the entire 21-mile corridor was warranted. These improvements collectively came to be known as the "Ultimate Improvement" for NH Route 106 and would represent the longer-term layout of the corridor. This Ultimate Improvement would require the widening and reconstruction of the entire corridor with minor changes to both vertical and horizontal alignments.

The projected traffic volumes from the 1995 EA project indicated that the daily traffic volumes on the NH Route 106 corridor would reach nearly 23,000 vehicles by the Design Year (2013) at the Concord/Loudon town line. A review of the actual traffic volume increases along NH Route 106 since 1995 has shown a much smaller growth than was originally forecasted. The 2010 Annual Average Daily Traffic volume on NH Route 106 at the Concord/Loudon town line was found to be approximately 16,400 vehicles.

A field operational review and field speed study were undertaken to review the current level of service (LOS) of the corridor using a qualitative analysis approach. The conditions that were observed indicate that the free flow speed during both peak and non-peak hours is at or above the posted speed along the corridor. These observations were then compared to the descriptions of LOS indicators in the *Level of Service Characteristics by Highway Type* table from the NHDOT 1999 Highway Design Manual for an arterial roadway. Based on this review, the existing roadway would be considered to be operating at a LOS C during the peak hours and LOS A during non-peak hours for most of the corridor.

Therefore it was determined that the Ultimate Improvement to upgrade NH Route 106 to a four-lane cross section was not warranted at this time and that an Interim Typical Section

should be investigated that could address some of the intersection capacity and safety concerns along the corridor.

3.5 Interim Typical Section Alternative

Since a review of the traffic volumes and the operations along the corridor indicated that the Ultimate Improvement was not currently warranted, it became necessary to review the corridor to determine if there was an Interim Typical Section that would provide any measure of improvement in the safety and operations of the corridor through the Design Year.

The decision to install left-turn lanes at an intersection is normally predicated on meeting the recommended guidance as outlined in *A Policy on the Geometric Design of Highways and Streets*[2]. These volume thresholds indicate that a left-turn lane should generally be considered when at least 5% of the advancing volume is making a left turn at the intersection. Many of the side roads along NH Route 106 do not meet this volume threshold. The manual, however, also indicates that it is prudent to consider the installation of left-turn lanes on arterial roadways with higher operating speeds where improving safety and preserving overall capacity are an issue.

The crash data indicates that a common type of crash on NH Route 106 is rear-end crashes at unsignalized intersections and driveways which are indicative of the lack of a left-turn refuge. It should be noted that the crash data represents only reportable crashes and does not include either minor crashes where no police report was filed or the frequent "close calls" related during discussions with citizens, commuters, and the Loudon Police Chief. This indicates that there is a need to provide a safe refuge for vehicles waiting to make a left turn along NH Route 106. It has been found that crash rates can be reduced by 20 to 65 percent with the construction of a left-turn lane[3]. The "Highway Safety Manual (HSM)"[4] discusses the effects of different types of treatments intended to improve roadway and intersection safety. The effects of these treatments can be quantified using Crash Modification Factors (CMF), which are multiplicative factors applied to crashes at a particular intersection or along a specific segment of roadway, to determine the anticipated reduction in crash

[2] A Policy on the Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, Washington DC, 2011

[3] *Impacts of Access Management Techniques*, NHCRP Report 420, Transportation Research Board, Washington DC, 1999.

[4] Highway Safety Manual, American Association of State Highway and Transportation Officials, Washington, DC, 2010.

occurrences. Many agencies choose to describe crash reductions as a percentage of crashes reduced. The Crash Reduction Factors or percentage of crashes reduced can be related to the CMF through the following formula:

$$\text{Percentage of crash reduction} = (1\text{-CMF})*100$$

Where a specific Crash Reduction Factor listed in the Highway Safety Manual has a standard deviation value, these values should be applied to the CMF to provide a range of anticipated crash reduction percentages. Applying the formula for the CMF associated with constructing an exclusive left-turn lane at an intersection results in an anticipated reduction in crash occurrences of 40 to 56 percent. This reduction provides a measureable decrease in the anticipated crash occurrences associated with left-turn movements. Therefore it is recommended that left-turn refuges be provided at intersections and driveways where feasible. At intersections, the left-turn refuge would be provided by exclusive left-turn lanes, while in areas with frequent driveways, the left-turn refuge would consist of a two-way left-turn lane.

The Highway Safety Manual indicates that crash occurrences on rural highways with a driveway density of at least five access points per mile can be reduced with the implementation of a two-way left-turn lane. This corridor has a driveway density of approximately 10 driveways per mile, including unsignalized roadway access points, which results in a CMF of 0.94 for a two-way left-turn lane. This equates to an anticipated six percent reduction in overall crash occurrences resulting from driveway related left-turn crashes.

Therefore it is recommended that left-turn refuges be provided at intersections and driveways where feasible. At intersections the left-turn refuge would be provided by exclusive left-turn lanes, while those in areas with frequent driveways, the left-turn refuge would consist of a two-way left-turn lane.

The American Association of State Highway and Transportation Officials (AASHTO) states that shoulder width plays a key role in the operational capacity and safety of a roadway. Currently NH Route 106 has variable width shoulders ranging from 4 to 12 feet. Guidelines indicate that an arterial two-lane roadway should provide for a minimum 8-foot wide usable shoulder. Shoulders also function as deceleration and acceleration lanes for right turns at intersections and driveways, although this utility is limited when the shoulder width does not allow turning vehicles to fully depart the travel lane. Therefore it is recommended that uniform 12-foot wide shoulders be provided throughout the corridor to maximize their safety benefit and fully realize their utility as right-turn deceleration and acceleration lanes.

In addition, these wider shoulders would provide for enhanced accommodations for pedestrian and bicycle use along the corridor and would better accommodate traffic management for special events at NHMS.

The two-way left-turn lane and the wider shoulders have the added advantage of providing improved safety and maintenance of capacity for NH Route 106 at all driveways and intersections. A typical section showing this two-way left-turn lane is shown on Figure 3.5-1.

The installation of a two-way left-turn lane would result in the removal of all of the existing passing zones along NH Route 106 between I-393 and the northern project limit. The removal of the passing zones would result in a minor reduction in the capacity of the roadway segment since drivers would lose the ability to pass slower moving vehicles, resulting in a greater amount of time spent following other vehicles (delay) and traveling at slower speeds. Removing the passing zones may, however, increase the safety of the roadway as frustrated drivers will be discouraged from taking chances passing in less safe conditions. To alleviate potential platoons of slower-moving traffic (delay), reduce driver frustration, and return some of the capacity potentially lost with the removal of the passing zones, careful consideration was given to converting the two-way left-turn lane into a passing lane, as shown on the typical section in Figure 3.5-2. This could be employed in areas where there are few or no driveways or side roads. The Highway Capacity Manual (HCM) recommends a minimum passing lane length of approximately ¾ mile where traffic volumes are over 400 vehicles per hour. A review of the corridor shows that there are four areas that meet these criteria, two northbound and two southbound, where passing lanes could be utilized. These passing lanes, in conjunction with the proposed additional through lanes at some of the key intersections, would provide ample opportunities for drivers to pass slower moving vehicles resulting in improved roadway capacity, more even flow rate through the corridor, and improved safety.

Another consideration was the effect of any interim improvements on the operations of the corridor during special events held at NHMS. These events have unique operational concerns due to traffic volumes which are much higher than typical peak traffic volumes. The proposed Interim Typical Section would allow for five lanes of traffic flow (including the two through lanes, two shoulders and the center turning/passing lane) during those special events, which is one more lane than is currently provided. This additional lane could be utilized as a dedicated emergency vehicle lane throughout the corridor or to improve local access to NH Route 106 during these events. The proposed pavement markings can also be used during special events without modification by cones or other temporary markers.

4 Proposed Action

The Proposed Action would widen NH Route 106 from I-393 in Concord to approximately 0.25 miles north of Ames Road in Canterbury in order to address safety and capacity issues. The principal project components are a new center turn lane and passing lane, wider shoulders, and intersection improvements. Specifically, the project proposes to widen NH Route 106 to provide one 12-foot wide travel lane in each direction, a 16-foot wide center turn lane, and 12-foot wide shoulders. The proposed layout would provide increased safety for vehicles waiting to make a left-hand turn into driveways and roadways along the corridor by providing a refuge for decelerating and stopped vehicles. The proposed center turn lane will allow flexibility in the proposed lane use by providing an exclusive left-turn lane at intersections (12-foot lane with 4-foot painted median), a two-way left-turn lane at driveways (16-foot lane), and a passing lane at other locations (12-foot lane with 4-foot painted median). Providing opportunities for passing may improve safety by reducing driver frustration, which results in increased accident potential as drivers start to take chances passing the slower drivers, often in unsafe locations. In addition, the project includes minor work on the intersecting side roads, modifications to two of the existing signalized intersections, and the installation of traffic signals at two additional existing intersections. The project layout is shown on Figures 4.1-1 through 4.1-11.

4.1 Alignments

The project generally follows the existing NH Route 106 horizontal and vertical alignments and widens equally on both sides of the existing roadway. Below are locations where the preferred alignment departs from the existing alignment to minimize the overall impact of the project on natural, cultural, and social resources.

Wales Bridge Road area (Sta. 1240+28 to 1285+75) – In order to avoid impacts to the Soucook River and wetlands along the east side of NH Route 106, the proposed alignment was shifted approximately 12 feet to the west of the existing alignment to retain the existing easterly edge of pavement. This allows bridge #056/063 to be widened entirely to the west.

Shaker Brook and Lovering Mill area (Sta. 1436+79 to 1488+97) – The proposed alignment was shifted approximately 8 feet to the east to reduce impacts to the Shaker Brook, which parallels the western side of NH Route 106, and to avoid impacts to the historical Lovering Mill Site and an existing mobile home park south of Shaker Road. This shift in alignment retains the existing westerly edge of pavement and allows bridge #100/114 to be widened entirely to the east.

Clough Hill Road area (Sta. 1534+10 to 1547+67) – In order to reduce impacts to an unnamed pond along the east side of NH Route 106, the proposed alignment was shifted approximately 8.5 feet to the west of the existing alignment to retain the easterly edge of pavement.

4.2 Intersection Improvements

In order to reduce delay and improve levels of service at several of the intersections, additional improvements are proposed as described below:

NH Route 106 at Staniels Drive/Josiah Bartlett Road (Sta. 1204+00) – Install a fully actuated traffic control signal and widen the roadway to provide a 5-lane cross section consisting of two travel lanes in both the northbound and southbound directions and exclusive left-turn lanes.

NH Route 106 at Chichester Road/South Village Road (Sta. 1285+00) – Install a fully actuated traffic control signal and widen the roadway to provide a 5-lane cross section consisting of two travel lanes in both the northbound and southbound directions and exclusive left-turn lanes.

NH Route 106 at NH Route 129 (Sta. 1332+50) – Modify the existing signal timings and widen the roadway to provide a 5-lane cross section consisting of two travel lanes in both the northbound and southbound directions and exclusive left-turn lanes.

NH Route 106 at Shaker Road (Sta. 1477+50) – Modify the existing signal timings.

4.3 Bridges and Other Structures

There are several bridges and structures along the corridor that will need to be replaced or widened as part of the preferred alternative, including:

NH Route 106 over cattle crossing in Concord (Sta. 1176+00) – The existing cattle crossing located near the Bartlett Farm will need to be extended as part of the project. It is recommended that the existing structure be rehabilitated and widened to both sides.

NH Route 106 over Soucook River north of Wales Bridge Road in Loudon – Bridge # 056/063 *(Sta. 1266+50)* – The existing bridge will require widening in order to meet the proposed NH Route 106 roadway design width. As the existing bridge is generally in good condition, it could either be rehabilitated and widened, or completely replaced as part of this project. The widening could be completed by extending the abutments and pier, adding steel girders on one or both sides and splicing the deck into the existing structure. A replacement bridge

would likely consist of a three-span, slab-on-stringer bridge using either prestressed concrete or structural steel beams. The proposed bridge width would be based on final roadway design criteria. Due to the generally good condition of the existing bridge, site constraints, and environmental concerns, it is recommended that the existing structure be rehabilitated and widened to the west side.

NH Route 106 over Soucook River north of NH Route 129 in Loudon – Bridge # 074/086 (Sta. 1339+50) – The existing bridge will require widening in order to meet the proposed NH Route 106 roadway design width. As the existing bridge is generally in good condition, it could either be rehabilitated and widened, or completely replaced as part of this project. The widening could be completed by extending the abutments and pier, adding steel girders on one side or both sides, and splicing the deck into the existing structure. A replacement bridge would likely consist of a two-span, slab-on-stringer bridge using either prestressed concrete or structural steel beams. The proposed bridge width would be based on final roadway design criteria. Due to the generally good condition of the existing bridge, site constraints, and environmental concerns it is recommended that the existing structure be rehabilitated and widened to both sides.

NH Route 106 over recreational trail north of NH Route 129 in Loudon – Bridge #074/087 (Sta. 1346+00) – The existing pipe has an internal vertical clearance of approximately 6 feet which is substandard for recreational trail use. The recommended dimensions of a recreational trail underpass are 10 feet wide by 10 feet high to accommodate bicycles and snowmobile trail grooming equipment. It is recommended that the underpass meet at least the recommended minimum dimensions.

NH Route 106 over Shaker Brook north of Clough Pond Road in Loudon – Bridge #100/114 (Sta. 1445+00) – The existing four-sided concrete structure has moderate to severe spalls that will require rehabilitation. The existing bridge will require widening in order to meet the proposed NH Route 106 roadway design width. As the existing bridge is generally in good condition, it could either be rehabilitated and widened, or completely replaced as part of this project. The widening could be completed by constructing additional four-sided concrete structures on one or both sides and splicing them into the existing structure. A replacement bridge would likely consist of a single-span precast concrete rigid frame structure founded on stub abutments. The proposed bridge width would be based on final roadway design criteria. Due to the condition of the existing bridge (rated Satisfactory on bridge inspection forms), site constraints and environmental concerns, it is recommended that the existing structure be rehabilitated and widened to the east side.

NH Route 106 southern crossing over Gues Meadow Brook (near the southern NHMS entrance) in Loudon – Bridge #137/132 (Sta. 1556+00) – The existing bridge consists of two 72" culverts which have a walkway structure built in to the west headwall of the structure. This additional structure is in poor condition. Recent observations revealed numerous branches and other debris accumulated at the twin-culvert inlet. The existing bridge will require widening in order to meet the proposed NH Route 106 roadway design width. As the existing bridge is generally in good condition, it could either be rehabilitated and widened, or completely replaced as part of this project. The widening could be completed by constructing additional reinforced concrete pipe structures on one or both sides and splicing them into the existing structure. A replacement bridge would likely consist of a single-span precast concrete rigid frame structure founded on stub abutments. The proposed bridge width would be based on final roadway design criteria. Although the existing structures are in generally good condition, the recreational trail structure is in poor condition, debris builds up at the culvert inlet, the structures do not meet current NHDES stream crossing guidelines (such as spanning the bankfull width) and they may restrict aquatic organism passage. Therefore it is recommended that the existing structures be replaced with a new structure that better meets the intent of the stream crossing rules, accounts for aquatic organism passage and is wide enough to accommodate the adjacent pedestrian traffic.

Recreational Crossing Structure at Southern Gues Meadow Brook Crossing

NH Route 106 middle crossing over Gues Meadow Brook (north of southern NHMS entrance) in Loudon (Sta. 1568+00) – The NHDOT culvert carries NH Route 106 over the Gues Meadow Brook in Loudon, New Hampshire. As the culvert is a sister structure to Bridge 137/132 it was most likely constructed in 1960. Similar to Bridge 137/132 the culvert is comprised of two adjacent 72" reinforced concrete pipes. The roadway width over the culvert is 48'-0". The existing structure has a slight sag and there is at least 20 ft of fill over the pipes. The existing structure will require widening in order to meet the proposed NH Route 106 roadway design width. As the existing structure is generally in good condition, it could either be rehabilitated and widened, or completely replaced as part of this project. The widening could be completed by constructing additional reinforced concrete pipes structures on one or both sides and splicing them into the existing structure. A replacement bridge would likely consist of a single-span three sided arch structure founded on stub abutments. The proposed bridge width would be based on final roadway design criteria. Due to general

good condition of the structure, the site constraints, the large amounts of fill and environmental issues associated with replacement of the structure, it is recommended that the existing structure be rehabilitated by widening to both sides.

NH Route 106 northern crossing over Gues Meadow Brook at Loudon/Canterbury Town line – Bridge #227/122 (Sta. 1626+50) – The existing bridge will require widening in order to meet the proposed NH Route 106 roadway design width. As the existing bridge is generally in good condition, it could either be rehabilitated and widened, or completely replaced as part of this project. The widening could be completed by constructing additional concrete slab structures on one or both sides and splicing them into the existing structure. A replacement bridge would likely consist of a single-span three sided arch structure founded on stub abutments. The proposed bridge width would be based on final roadway design criteria.

4.4 Implementation and Cost

The Proposed Action including both roadway and bridge construction has been described above for the overall corridor. The next step is to look at the implementation of the Proposed Action and the associated cost. This project has been identified in the State's current draft Ten Year Transportation Improvement Plan (2013-2022), although a funding source has not yet been identified. The cost of the Proposed Action for the entire corridor is approximately $20 million, not including the cost of right of way acquisition. The implementation of a project of this extent will be challenging and therefore it may be more feasible to break the Proposed Action improvements into three distinct construction projects, as follows:

Phase 1 Northern Segment – Soucook Lane in Loudon to Ames Road in Canterbury

- 4.6 miles, approximately $7 million
- May require two new bridges over Gues Meadow Brook in Loudon
- Candidate for Public-Private Partnership

Phase 2 Southern Segment – I-393 in Concord to Staniels Road in Loudon

- 1.7 miles, approximately $4 million
- Includes installation of traffic signals and additional travel lanes at Staniels Road
- Possible candidate for Highway Safety Improvement Program funding

Phase 3 Middle Segment – Staniels Road in Loudon to Soucook Lane in Loudon

- 4.3 miles, approximately $9 million

- Includes installation of traffic signals and additional travel lanes at Chichester Road/ South Village Road
- May require two new bridges over Soucook River in Loudon

5 Environmental Effects

5.1 Land Use

5.1.1 Zoning

Figure 5.1-1 depicts current zoning and land use along the project corridor. As in the previous study, the majority of the land along the NH Route 106 corridor is zoned for commercial development. Details for each municipality are provided below.

Concord

Concord has a "Gateway Performance District" just south of the study area, south of I-393. North of I-393, within the study area, the corridor is zoned Medium Density Residential on the west side of NH Route 106, and Open Space Residential on the east side. The Open Space Residential (RO) District "is established to accommodate single-family dwellings at densities not exceeding one-half (½) of a dwelling unit per acre in cluster developments, as well as agricultural, forestry, and low impact outdoor recreational uses outside of the Urban Growth Boundary adjacent to environmentally sensitive areas and where municipal utilities are generally not present or anticipated." The Medium Density Residential (RM) District "is established to accommodate single- and two-family dwellings, cluster developments, and planned unit developments at densities of between one (1) and five (5) dwelling units per acre, and housing for the elderly at densities not exceeding fourteen (14) dwelling units per acre, in areas within the Urban Growth Boundary where municipal utilities are present or anticipated, with the lowest density corresponding to the absence of utilities and the greater densities corresponding to full municipal utility service." Concord does not have any commercial or industrial zoned land within the project corridor.

Loudon

The NH Route 106 corridor in Loudon is mostly zoned Commercial/Industrial. Commercial and industrial permitted uses include offices and laboratories, retail sales, shopping centers, motels, hotels and inns, and other uses. Additional uses such as automotive uses, recreational facilities, sand and gravel operations, and wireless telecommunication towers are permitted by Special Exception.

On the west side of NH Route 106 near Loudon Village, a portion of the corridor (4,700 linear feet) is zoned Village, in which the allowed uses include one and two family residences, churches, schools, libraries, and municipal buildings.

The area immediately surrounding the New Hampshire Motor Speedway (NHMS) and fronting on the east side of NH Route 106 (4,400 linear feet) is zoned Commercial/Recreational, which allows existing sports facilities (including motor sports parks), retail businesses, restaurants, camping facilities, offices and laboratories. Additional uses such as gasoline filling stations, sand and gravel operations and other uses may be allowed by Special Exception.

Canterbury

Most of the frontage along NH Route 106 in Canterbury is zoned Commercial. Allowed uses in this district include office establishments, commercial greenhouse operations, indoor recreational facilities, and hotels and motels. Other uses are allowed by Special Exception, such as sand and gravel operations, manufacturing, research and testing laboratories, restaurants, and automotive uses including filling stations. On the west side of NH Route 106, a 2,900-foot stretch that corresponds to Shaker State Forest land is zoned Natural Resource. Allowed uses within this district are limited to agriculture and forestry.

5.1.2 Current Land Use

The study area includes residential, commercial, agricultural, and undeveloped/open space land uses. Land use in each municipality's portion of the corridor is summarized below.

Concord

Just over a mile (6,600 linear feet) of the corridor lies within Concord. Within this corridor, there is one restaurant, the Makris Lobster & Steak House, at Station 1147. The Bartlett Farm is an operational dairy farm on Josiah Bartlett Road with pastures on both sides of NH Route 106. There are residences and residential neighborhoods along adjacent local roads but no residences with driveway access on NH Route 106. One residence on Haines Road is within 100 feet of the existing NH Route 106 centerline. The Taylor State Forest is within this segment, as well as other forested land along the corridor.

Loudon

Just over 8.2 miles of the corridor lies within the Town of Loudon. Within this stretch, either fronting on or adjacent to NH Route 106, there are a mixture of residential development, commercial and retail enterprises, lands with conservation easements, wetlands, and undeveloped upland. There are two retail shopping strips adjacent to NH Route 106 in Loudon, Fox Pond Plaza and Brookside Mall. There are 27 residences and an apartment complex with driveways fronting on NH Route 106, and 5 residences (all mobile homes)

within 100 feet of the existing or proposed centerline of NH Route 106. All of the residences are situated in land zoned for commercial development. There are also automotive repair facilities (J&D's, Lane's, and Loudon Automotive Repair), commercial enterprises (Penny Press building, Fillmore Industries, two storage unit businesses, and Sunnyside Maple, a commercial sugar house) and recreational facilities (Loudon Country Club and NHMS). There are also several service stations with convenience stores, a hotel, two churches, a Dunkin Donuts, a car dealership, fuel dealers, several sand and gravel operations, a campground, a mobile home park, and apartment houses.

Canterbury

Approximately 1.8 miles of the corridor lies in Canterbury. Within this corridor, NHMS lies partially within the Town of Canterbury, as do parking facilities owned by NHMS and others that are accessed from NH Route 106. The north entrance to NHMS lies within Canterbury. Shaker State Forest, land protected by conservation easements, and a commercial gravel pit also occur in this segment. There is one residence along NH Route 106 within the project corridor in Canterbury.

5.1.3 Future Land Uses

As proposed, the improvements to NH Route 106 would not involve full acquisition of any properties or residences along NH Route 106, but may require partial takes and slope and drainage easements. NHMS has plans to construct a museum just south of the track on track property. Discussions with the City of Concord and the Town of Loudon indicated that there are no other developments planned along the corridor. Future developments are discussed further in Section 5.16, Indirect Effects and Cumulative Impacts.

5.1.4 Consistency with Local and Regional Plans

Concord

Concord's Master Plan ("Master Plan 2030") addresses the entire length of NH Route 106 in Concord and does not distinguish between the portion north of I-393 (the current project corridor) and the rest of NH Route 106 in Concord. Concord's Master Plan calls for additional capacity along NH Route 106, and sees NH Route 106 as an important connector to the regional roadway system. The plan states "Route 106 should provide 4-lanes (2 lanes per direction) with additional turn lanes at major intersections throughout its length."

Loudon

Loudon's most recent Master Plan ("2001 Master Plan") identifies NH Route 106 as one of the three key transportation issues that the Town was facing in 2000. At that time, the Town commissioned a landscaping study of the NH Route 106 corridor to identify alternative landscaping scenarios that would be more aesthetically pleasing, help retain the rural character of the Town, discourage strip development and chain stores, and encourage nodal or clustered development. The study also proposed combined access locations. The study was completed in July of 2003, and focused primarily on two intersections, the intersection of NH Route 106 and NH Route 129, and the intersection of Chichester Road, South Village Road and NH Route 106. The study addressed development guidelines, site development, and landscaping. Many of the recommendations are directed at development guidelines and at zoning that will direct and guide future development. Specific to NH Route 106, the study recommended:

- Improvements to pedestrian crossings over, under and across NH Route 106, including a crosswalk at the NH Routes 129 and 106 intersection.
- Minimization of curb cuts along NH Route 106.
- Tree planting along the edge of the right of way to provide a tree-lined boulevard.

The Master Plan also identified pedestrian and bicycle safety as a concern, and recommended researching ways to move pedestrians and bicyclists across NH Route 106 in a safe and efficient manner. The Master Plan also notes that NHMS creates major traffic concerns on race days.

Canterbury

Canterbury's "Plan for Tomorrow" (2010) is largely silent on NH Route 106, but identifies NHMS as an economic force in the region and as a source of traffic on local roads during race weekends. The Plan recommends reviewing state agency planning documents and actions that might affect Canterbury.

Regional Transportation Plan

The "Central New Hampshire Regional Planning Commission Regional Transportation Plan" (2008) provides recommendations for transportation services and facilities in the central New Hampshire region. Concord, Loudon, and Canterbury are all considered in this plan. The plan provides nine major recommendations for improving transportation, as follows:

1. Towns in the region need to focus on Smart Growth and create town centers for public transportation hubs
2. A Transportation Management Association (TMA) is needed in the region
3. Park and Ride facilities are being utilized and should be expanded
4. Corridor studies are needed throughout the region to maintain connections
5. Efforts to establish passenger rail should be encouraged
6. Airports should develop long range plans to ensure smart growth
7. The public ought to be involved in transportation changes
8. Programs enabling children to walk or bike to school should be encouraged
9. Support the Coordinated Transit Study

Specifically, the plan states: "Measures should be made to improve the current roadway system in terms of safety and capacity without major reconstruction or road building. Some of the recommended improvements may include intelligent signalized traffic light systems, corridor monitoring, and adequate access management." The plan identifies the concept of connecting I-89 to NH Route 106, and recommends conducting a study to determine the feasibility of such a connection. Such a connection would be south of the project corridor for this project.

5.2 Social Environment

5.2.1 Neighborhoods

The 1995 EA concluded that the project "will not adversely affect any neighborhoods, as there are none along the NH Route 106 corridor". As with the previous study, there are many residences along NH Route 106 and there are neighborhoods adjacent to the roadway, but no clear neighborhoods that encompass NH Route 106 and none that would be directly affected by the proposed improvements. The Brookside Mobile Home Park, on the west side of NH Route 106 south of Shaker Road, is a residential community in which some of the residences are as close as 44 feet to the existing pavement. However, the alignment has been shifted in this section such that the pavement widening would occur on the east side of NH Route 106, allowing the west edge of pavement to remain in its current location. Therefore the proposed widening in this area would not affect these residences.

5.2.2 Travel Patterns and Accessibility

The proposed improvements along NH Route 106 would improve the accessibility to residences, businesses, and side roads with the construction of a two-way left-turn lane throughout the corridor. This two-way left-turn lane would provide a safe area for vehicles

to make left turns into and out of the numerous residences, businesses, and side roads within the corridor. There are no other changes proposed, such as new raised medians, which would substantially change existing travel patterns.

5.2.3 Local Facilities

Local facilities are shown on Figure 5.1-1.

Public Buildings

There are no schools along NH Route 106 within the study area. There is a combined Police, Fire, and Emergency rescue facility in Loudon that accesses NH Route 106 from the west along NH Route 129. A second fire station is located on Lower Ridge Road, on the east side of NH Route 106. There are no impacts anticipated to these emergency services facilities or their access to NH Route 106. Concord and Canterbury have no public buildings in or near the project corridor.

Places of Worship

There are two churches in the project corridor. The Faith Community Bible Church is on the west side of NH Route 106, north of the intersection with Currier Road, and is accessed from North Village Road. The Church of the Nazarene is on the east side of NH Route 106, and is accessed from Staniels Road. There are no impacts to the Faith Community Bible Church because all of the slope work would be contained within the existing right of way and the project would maintain the existing tree line that separates the church from the roadway. The ditch line along the east side of NH Route 106 north of Staniels Road would need to be shifted further east to accommodate the additional proposed lanes at the intersection. The existing embankment that separates the Church of the Nazarene from NH Route 106 will need to be re-graded to accommodate the change in the ditch line. This change, however, should not adversely affect the church as much of the embankment would remain.

5.2.4 Pedestrians and Bicyclists

Cyclists currently use NH Route 106, which has shoulders that vary between 4 to 12 feet wide along the project corridor. Pedestrians also travel on the roadway shoulder despite the high speed traffic. The proposed improvements to NH Route 106 would include 12-foot wide shoulders on both sides of the roadway, thus permitting bicycles and pedestrians to travel further from the vehicle travel path, except at several of the signalized intersections, where the shoulder width would narrow to 4 feet to accommodate the additional travel

lanes. Pedestrians and bicyclists would not be restricted from accessing the roadway. No curb-separated sidewalks are proposed.

5.3 Farmlands

5.3.1 Important Farmland Soils

Bartlett Farm Fields, East Side of NH Route 106

The US Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) administers the Farmland Protection Policy Act (FPPA), which provides guidelines to federal agencies involved in proposed projects that may convert farmland to non-agricultural uses. The purpose of the FPPA is "to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses..." The NRCS is responsible for making determinations, based on criteria established in the FPPA, as to whether proposed projects contain Important Farmland Soils, which includes soils designated as prime, unique, statewide, or locally important farmland soils.

Soils are defined as Prime Farmlands, Farmlands of Statewide Importance, Farmlands of Local Importance, and Unique Farmlands based on soil suitability criteria established by the NRCS, and defined in the Agricultural Handbook AH-436 titled "Soil Taxonomy", as well as land that is in production of specific high value crops. Land use within areas where the mapped soils fall into these classifications does not have to be in agricultural use for the classification to be valid, because land that is not irreversibly committed to another non-agricultural use could be used in the future for agriculture.

Important Farmland Soils and active farmlands are depicted on Figure 5.3-1.

Prime Farmland

Prime Farmland, as defined in the FPPA and federal regulations at 7 CFR 657.5, is “land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary.

Prime farmland includes land that possesses the above characteristics but is being used currently to produce live stock and timber. It does not include land already in or committed to urban development or water storage."

There are no Prime Farmland soils found directly within the project corridor.

Farmland of Statewide Importance

Farmland of Statewide Importance is defined at 7 CFR 657.5 as "land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are to be determined by the appropriate State agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable." There is one soil series designated as Farmland of Statewide Importance intercepted by the project corridor, as listed in Table 5.3-1.

Farmland of Local Importance

Farmland of Local Importance (per 7 CFR 657.5) may include other areas where there is local concern for "certain additional farmlands for the production of food, feed, fiber, forage, and oilseed crops, even though these lands are not identified as having national or statewide importance. Where appropriate, these lands are to be identified by the local agency or agencies concerned. In places, additional farmlands of local importance may include tracts of land that have been designated for agriculture by local ordinance." There are ten soil types designated as Farmlands of Local Importance that are incepted by the project corridor (see Table 5.3-1).

Unique Farmland

The FPPA defines another class of farmland soils, "Unique Farmland". This is defined at 7 CFR 657.5 as "farmland other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods." In order to qualify as Unique Farmland, a high-value food or fiber crop must be actively grown. In New Hampshire, Unique Farmland crops include, but are not necessarily limited to, maple syrup, apples, peaches, pears, plums, strawberries, raspberries, cranberries, blueberries, pumpkins, squash and tomatoes.

Table 5.3-1. Important Farmland Soils Intercepted by the NH Route 106 Project Corridor

Map Unit Symbol	Map Unit Name	Farmland Class
220B	Boscawen fine sandy loam, 3 to 8 % slopes	Local Importance
220C	Boscawen fine sandy loam, 8 to 15 % slopes	Local Importance
35A	Champlain loamy fine sand, 0 to 3 % slopes	Local Importance
35B	Champlain loamy fine sand, 3 to 8 % slopes	Local Importance
290C	Champlain-Woodstock complex, 8 to 15 % slopes	Local Importance
613A	Croghan fine sandy loam, 0 to 5 % slopes	Statewide Importance
12B	Hinckley gravelly fine sandy loam, 3 to 8 % slopes	Local Importance
12C	Hinckley gravelly fine sandy loam, 8 to 15 % slopes	Local Importance
459C	Metacomet fine sandy loam, 8 to 15 % slopes, very stony	Local Importance
480C	Millsite-Woodstock-Henniker complex, 8 to 15 % slopes, very stony	Local Importance
26B	Windsor loamy fine sand, 3 to 8 % slopes	Local Importance

In contrast with Prime Farmland and Farmland of Statewide and Local Importance, areas of Unique Farmland are not tied to specific soil map units, but are identified in consultation with NRCS. NRCS provided the limits of Unique Farmland soils within the project area, which are located across from NHMS at Sunnyside Maples, a maple sugar operation. Unique Farmland soils as defined by NRCS extend from the edge of the NH Route 106 right of way along the property of Sunnyside Maples, and are shown on Figure 5.3-1.

5.3.2 Farmland Impacts

Impacts to farmland soils of statewide and local importance as well as Unique Farmland soils were measured based on toe of slope impacts that extended past the existing right of way, according to guidance provided by the Merrimack County NRCS field office. Impacts total 10.79 acres of Farmlands of Local Importance, 0.41 acres of Farmlands of Statewide Importance, and 0.15 acres of Unique Farmland soils (Table 5.3-2).

Table 5.3-2. Farmland Soil Impacts

Farmland Soil Class	Square feet	Acres
Local Importance	470,049	10.79
Statewide Importance	17,951	0.41
Unique	6,691	0.15
Total	**494,691**	**11.36**

Under the FPPA, federal undertakings that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA), to nonagricultural uses must complete a "Farmland Conversion Impact Rating" analysis to determine the level of impacts proposed, whether alternatives should be considered, and if so, it compares proposed alternatives to determine which would have the lowest level of impact. Additional coordination with NRCS may be necessary to determine if this analysis will be necessary.

5.4 Air Quality

NEPA requires consideration of air quality impacts of projects. Under the Clean Air Act Air Amendments of 1990 and subsequent federal transportation legislation, transportation projects must demonstrate that they are consistent with federal air quality laws and regulations and will not violate the National Ambient Air Quality Standards (NAAQS). This is typically done both during long-range transportation planning and during preparation of NEPA documents for particular projects.

During long-range transportation planning, a regional emissions analysis is completed to determine whether a project proposed for the Statewide Transportation Improvement Program conforms to the state's plan to attain the NAAQS. (Specifically, it must conform to the Statewide Implementation Plan). The NH Route 106 project is on New Hampshire's *Statewide Transportation Improvement Program (STIP) 2009 to 2012* approved in 2009, and therefore has been determined to meet conformity requirements. Furthermore, the project is in an attainment area for all NAAQS pollutants and was not identified as a "Regionally Significant Project" (per 40 CFR 93.101), so no conformity determination is necessary.

To determine whether a project may result in any local exceedances of the NAAQS, a microscale analysis of pollutant concentrations may be prepared. This involves calculating the vehicle emissions and resulting concentrations in the air of carbon monoxide (CO), the constituent that most often exceeds air quality criteria. A microscale analysis is not proposed here for the following reasons:

Exceedances of the NAAQS are normally found only where there are high numbers of idling vehicles, such as intersections with high traffic volumes and poor levels of service. Most of the proposed improvements would improve the flow of traffic and the levels of service, for both through traffic and intersections. The 1995 EA project included a microscale analysis of two intersections within the current project corridor, the NH Route 129 and Shaker Road intersections. That study modeled 1993 baseline and 1999 and 2013 build and no-build conditions, and all predicted one-hour CO concentrations at these intersections were below 4 parts per million (ppm), compared to the one-hour NAAQS of 35 ppm. While modeling

methods have changed, the older model is considered reasonably accurate. Since the actual traffic volumes since the 1995 EA have been lower than predicted, CO concentrations are also expected to be lower than indicated by the previous modeling.

Two intersections that are not currently signalized, Staniels Road and Chichester Road/South Village Road, are proposed to be signalized (for safety reasons). This would result in more vehicle idling at these intersections and presumably higher CO concentrations. The 2011 and predicted 2035 traffic volumes at these intersections are lower than the corresponding volumes at the NH Route 129 intersections. Since the NH Route 129 intersection was found to have CO concentrations much less than the NAAQS in the 1995 microscale analysis, it is reasonable to assume that the two new signalized intersections would also be well below the NAAQS.

5.5 Noise

A noise impact assessment was completed in accordance with the federal noise regulations contained in *Procedures for Abatement of Highway Traffic and Construction Noise*, 23 CFR 772, and NHDOT noise assessment policy (*Policy and Procedural Guidelines for the Assessment and Abatement of Highway Traffic Noise for Type I Highway Projects*, 1996). Under the guidelines, Type I projects are defined as those involving the construction of new highways and/or the alteration of existing highways (e.g., realignment, addition of travel lanes). For purposes of this analysis, the alternative addressed in this report is considered Type 1. The purpose of the noise study was to determine the general likelihood of noise impacts along the major segments of the corridor, rather than quantifying noise impacts at specific receptors. This was accomplished by reviewing the 1995 EA noise study and conducting a new analysis using current methods, the FHWA Traffic Noise Model (TNM 2.5), and updated traffic data and geometry. The noise study report is included as Appendix A.

The noise analysis included the following steps, in accordance with Federal Highway Administration (FHWA) and NHDOT policy:

1. Identification of existing activities and developed lands along the proposed alignment that may be impacted by highway noise.
2. Determination of existing and future traffic noise levels at certain locations within the project area, based on the FHWA Traffic Noise Prediction Model (TNM 2.5).
3. Determination of existing and future traffic noise impacts at these locations. Impacts occur when traffic noise levels approach, within 1 decibel (dB), or exceed the FHWA Noise Abatement Criteria (67dB for residential land use), or when the predicted future traffic noise levels exceed the existing noise levels by 15dB or more.

4. Determination of approximate noise contours along the major segments of NH Route 106 by extrapolating from modeled noise levels.

Peak-hour traffic projections were developed for the 2015 Base Year and Design Year (2035) conditions, for both the No Build and Build Alternative, including vehicle-mix information. The year 2015 peak hour traffic volumes were then used, with the existing roadway configuration, to establish baseline noise levels. Year 2035 (Design Year) noise levels for the Build conditions were then predicted using the model. The predicted Year 2035 noise levels were compared to the Noise Abatement Criteria and the baseline noise levels to determine the noise impacts associated with the project.

Noise contours were generated to determine typical noise levels along major segments of the roadway, and therefore which areas and receptors may be impacted. The regulatory 66dB noise level was used for contour lines. Because of the variable topography of NH Route 106, it was not possible within the scope of this study to generate accurate noise contours at each receptor. Instead, noise levels were averaged over long segments of roadway in order to indicate broad areas of potential impact or lack of impact. To determine noise impacts (or evaluate abatement measures) at specific locations it will be necessary to model topography at each location. Areas warranting further noise study are identified in the results below.

The results are shown on Figures 5.5-1 through 5.5-10. The existing 2015 projected sound levels produced a 66dB contour approximately 95 feet from the project horizontal control line (HCL) from I-393 north to NH Route 129. (The HCL is an established survey line that more or less follows the centerline of the proposed highway plans.) From NH Route 129 north to the NHMS the 66dB contour is approximately 100 feet from the HCL.

The Proposed Action's 2035 projected sound levels produced a 66dB contour approximately 105 feet from the project horizontal control line (HCL) from I-393 north to NH Route 129. From NH Route 129 north to the NHMS the 66dB contour is approximately 110 feet from the HCL. In other words, the project would result in the 65dB level being reached approximately 10 feet further from the HCL than under the 2015 conditions.

There are relatively few receptors that fall within the 66dB contour due to topography and distance from the roadway. Most receptors along NH Route 106 have driveway access directly onto the roadway. This would make it very difficult to construct a barrier long enough to substantially reduce noise levels at impacted receptors. The low density of receptors within the project would also increase the costs of barriers, so that the maximum

$30,000 per benefited residence criterion would likely be exceeded. Therefore, it is unlikely that noise abatement would be feasible or reasonable for this project.

In order to conclusively determine which receptors are impacted by noise and whether noise abatement measures are feasible or reasonable, more detailed noise analysis will be necessary. Further analysis is recommended for the locations listed in Table 5.5-1.

Table 5.5-1. Recommended Future Noise Analysis Locations

Station	Description
1151+00 Left	Haines Road residence
1227+00 Left	NH Route 106 residence
1241+00 to 1256+00 Left	NH Route 106 residences
1414+00 to 1430+00 Left	North Village Road residences
1440+00 Left	Clough Pond Road residence
1447+00 to 1462+00 Right	NH Route 106 residences and business near Soucook Lane
1465+00 to 1480+00 Left and Right	Mobile home park, residences and businesses near Shaker Road
1525+00 to 1530+00 Left	NH Route 106 residences near Mudgett Hill Road
1535+00 Right	Apartment buildings on NH Route 106
1570+00 to 1586 Left and Right	Various buildings on NH Route 106
1606+00 Left	Residence on NH Route 106 across from main NHMS entrance
1694+50 Right	Residence on NH Route 106 near Shaw Road

5.6 Groundwater and Drinking Water

5.6.1 Aquifer Mapping

Aquifers within the project corridor have been mapped under a cooperative agreement between USGS and NHDES. Figure 5.6-1 depicts the transmissivity range of the contiguous aquifer that roughly follows the NH Route 106 corridor.

5.6.2 Groundwater Classification

Groundwater and drinking water are regulated principally under two New Hampshire laws. The Groundwater Protection Act (RSA 485-C) provides for groundwater classification according to groundwater quality and yields. The New Hampshire Safe Drinking Water Act (RSA 485) regulates water systems according to the type and size of population they serve.

RSA 485-C, the Groundwater Protection Act, authorizes municipalities and public water suppliers to develop local groundwater protection programs and establishes best management practices for regulated substances to help protect water quality. The law recognizes four classes of groundwater, as follows:

- GAA: Delineated Wellhead Protection Areas
- GA1: Groundwater of high value for present or future drinking water
- GA2: Potentially valuable stratified drift aquifers
- GB: All groundwater not assigned to a higher class

Areas classified as GAA are the most stringently regulated groundwater sources and are by definition within delineated wellhead protection areas (WHPAs). Class GA1 is “assigned to groundwater in a defined zone of high value for present or future drinking water supply” (RSA 485-C:5). Municipalities and public water suppliers can petition to reclassify their groundwater resources as GAA-delineated WHPAs or GA1 (high value stratified drift aquifers) under RSA 485-C. Reclassification to GAA or GA1 requires that the municipality or public water supplier adopt a local management program to prevent the release of harmful substances that may contaminate groundwater. There are no groundwater resources within the project corridor that have been reclassified to GAA or GA1, but there are delineated WHPAs that are eligible for this classification, as depicted on Figure 5.6-2. These GAA-eligible WHPAs have no regulatory bearing under 485-C because the municipalities have not

reclassified their groundwater resources as GAA. WHPA delineation and regulation are described further below.

Class GA2 is assigned to groundwater within aquifers identified as highly productive for potential use as a public water supply by the U.S. Geological Survey (USGS) regional groundwater studies, or other regional studies. Zones of stratified drift with a saturated thickness greater than 20 feet, and a transmissivity greater than 1,000 feet squared per day are designated as class GA2. Zones of bedrock with average well yields greater than 50 gallons per minute are also designated as class GA2. All other areas, by default, are classified as GB. Figure 5.6-1 depicts areas of sufficiently high transmissivity and sufficient depth within the project corridor to meet the criteria for Groundwater Classification GA2.

5.6.3 Wellhead Protection Areas

Under New Hampshire RSA 485-C, a *Wellhead Protection Area* "means the surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield." The wellhead protection program commits public water suppliers to regular inspections within the delineated WHPA to ensure that best management practices are being followed. The program benefits suppliers by allowing cost savings for chemical monitoring. Delineated WHPAs for community and non-transient non-community wells within the project corridor are depicted on Figure 5.6-2. The size of the WHPA is determined by the size of the population the well serves and the output of the well. Private domestic wells do not have delineated WHPAs. As described above, none of the towns within the study area have petitioned to reclassify any groundwater areas within the project corridor as class GAA.

5.6.4 Zoning Districts

The Towns of Loudon and Canterbury do not have any groundwater protection provisions in their zoning ordinances. Loudon includes a "Wetland Conservation District", the purpose of which is in part to protect groundwater, but does not designate any wellhead protection areas. Concord has an Aquifer Protection District that restricts land use within certain defined aquifers and surrounding all wells, including non-transient, transient, and domestic wells. The well at the Makris Lobster & Steak House in Concord has a 125-foot radius Aquifer Protection District, but the precise location of the well was not available in databases reviewed for this study. A 75-foot radius around domestic wells is also included in Concord's Aquifer Protection District, depicted on Figure 5.6-2. None of the domestic wells in Concord fall within 75 feet of the toe of slope of the proposed project.

5.6.5 Public Drinking Water Systems

Under RSA 485, the New Hampshire Safe Drinking Water Act, water systems are regulated according to the type and size of population they serve, as follows:

Public Water System means a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

Community Water System means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

Non-Community Water System means a public water system that is not a community water system, such as a restaurant or hotel. These are sometimes referred to as "Transient" water systems.

Non-Transient Non-Community Water System means a system which is not a community water system and which serves the same 25 people, or more, over 6 months per year (for example, a school or workplace).

Community systems have a Sanitary Protective Radius (SPR) that varies by well from 75 to 400 feet depending on the output of the well. Under the law, land use within this radius must be controlled by the supplier, either through ownership or easement. NHDES has provided recommendations with respect to community and non-transient non-community wells that address issues such as stormwater treatment, snow storage, and salt application.[5] Within the project corridor, the community well at Flintlock Apartments in Loudon has an SPR of 125 feet that appears to fall within the existing right of way of NH Route 106. As the project progresses, additional coordination with NHDES will occur regarding potential impacts to the sanitary protective radius of this well. If the right of way encroaches further on the SPR a waiver would be needed from Env-Ws 372.14, and Env-Dw 301.06. No other community wells are within 400 feet of the project corridor.

There are 14 public wells (Transient and Non-Transient Non-Community) that appear to fall within 400 feet of the project corridor. NHDES recommends that construction materials and equipment not be stored within 400 feet of public water systems.[6] Drinking water

5 *Recommendations for Implementing Groundwater Protection Measures When Siting or Improving Roadways* NHDES, 1995
6 NHDES Correspondence January 10, 2012

Administrative Rules Env-Ws 373.12 and 373.11(c) would not allow these water systems to have a roadway, parking lot, or even a right of way within 50 feet of their wells. If the project were to encroach on this setback, the system would have to obtain a waiver from the Drinking Water and Groundwater Bureau. If denied a waiver, the well would probably have to be replaced. Public water systems are depicted on Figure 5.6-2. All public well locations along NH Route 106 will have to be confirmed prior to construction. In particular, the location of the well at Makris Lobster & Steak House, a transient public well in Concord, will have to be determined.

Operators of public drinking water supply wells are required under Administrative Rule Env-Dw 700 to monitor and report levels of contaminants. Contaminant thresholds are detailed in Env-Dw 709 through Env-Dw 713. Water testing reports for the public drinking water supply wells listed above are available through the NHDES OneStop database.

5.6.6 Potential Impacts and Mitigation

Groundwater recharge occurs in part through infiltration of surface water. Impacts to groundwater within the project corridor could occur from increased stormwater runoff. Road salt usage would probably increase to cover the increased pavement area, which would result in higher sodium and chloride loads in runoff and in groundwater. However, there is no evidence that existing wells or groundwater have elevated levels of these constituents. The Secondary Maximum Contaminant Level (SMCL) for chloride is 250 milligrams per liter (mg/L). The SMCL represents contaminant levels that primarily affect aesthetic qualities (such as taste or color) of the water. According to the NHDES OneStop database, chloride levels in three wells with WHPAs overlapping the project footprint were 7.5 mg/L (2009), 19 mg/L (2011), and 70 mg/L (2011). Therefore, it appears to be highly unlikely the additional contribution from road runoff would elevate these concentrations to unsafe levels.

As discussed above, the corridor parallels a highly productive aquifer that provides water to public and domestic users. It also passes through WHPAs, SPRs, and one well with a designated Aquifer Protection District. Section 5.7.4 details stormwater treatment methods that would be employed in the project corridor, which would provide at least as much overall treatment of the stormwater runoff as provided under existing conditions. Additional measures, such as lined swales, closed drainage, or measures identified in *Recommendations for Implementing Groundwater Protection Measures when Siting or Improving Roadways"* (NHDES, 1995), could be considered within or near community or public wells or WHPAs. Potential impacts from construction would be addressed through appropriate construction best management practices (BMPs), detailed in Section 5.17.

NHDOT also has a Well Replacement Program to address future adverse impacts to public or private wells. Under the Program, NHDOT will investigate and replace any wells that have been found to be damaged or degraded as a result of NHDOT activities. Also, RSA 228:34 commits NHDOT to implement remedial measures for wells found to have been affected by state highway construction or maintenance activities.

5.7 Surface Waters

This section describes the existing surface waters within the study area, direct impacts to those waters (dredge and fill), stream crossing considerations, and potential water quality effects of the project.

5.7.1 Existing Surface Waters

Pond along NH Route 106 Embankment near Clough Hill Road

Surface waters, defined in the New Hampshire Administrative Rules as "Surface water body" or "surface waters" means those portions of waters of the state, as defined by RSA 482-A:4, which have standing or flowing water at or on the surface of the ground. This includes but is not limited to rivers, streams, lakes, ponds and tidal waters. Surface waters are regulated in New Hampshire under the federal Clean Water Act and the New Hampshire Dredge and Fill Law (NH RSA 482-A). Public Waters, which include all fourth order streams and water bodies larger than ten acres, are regulated under the Shoreland Water Quality Protection Act, SWQPA (formerly the Comprehensive Shoreland Protection Act, CSPA) which provides for protection standards within 250 feet of the shoreline. The Soucook River is a fourth order stream, so both crossings in the project corridor are subject to the SWQPA.

The study area is entirely within the Soucook River watershed, within a landscape formed by both glacial action and subsequent riverine processes. There are upland hills with glacial till soils, broad glacial outwash plains with sandy soils, and river floodplains with soils ranging from fine-grained silty deposits to coarse sandy materials. Surface waters in the hilly terrain

are mostly small streams, ponds, and swamps. In the broader river valleys and outwash plains, there are larger streams and rivers, ponds and wetlands in river meander scars, and kettle ponds. Within the project corridor, there are several waterways that cross under NH Route 106 via culverts and bridges, and ponds and waterways that lie close to the road embankment. All stream crossings locations are shown on Figures 5.7-1 (with watersheds) and 5.7-2 (on an aerial base). There are two crossings of the Soucook River, one crossing of Shaker Brook, three crossings of Gues Meadow Brook, and several other intermittent and perennial stream crossings. Stream crossings are discussed in more detail below and in Appendix B of this document.

5.7.2 Direct Surface Water Impacts and Mitigation

Direct surface water impacts, including dredge and fill, are quantified in Section 5.9 (Wetlands) and impact areas are shown on Figures 5.9-2 through 5.9-11. Below is a summary of the project's principal direct surface water impacts and a detailed description of Tier 1, 2 and 3 stream crossings.

Ponds

The total area of pond habitat that would be filled is 0.83 acres. The largest open water impact areas are across from the north NHMS entrance (identified as Wetland 22, 0.34 acres) and in the backwaters at the northern Soucook River crossing (Wetland V, 0.27 acres).

Vernal pools

Approximately 0.4 acres of vernal pool habitat would be filled for the road widening. Most of this impact (0.30 acres) is at Wetland 5, a forested wetland along the west side of NH Route 106 between Shaker Road and the Loudon Country Club. Impacts to most other vernal pools have been avoided.

Vernal Pool Impact Area South of NH Route 129 Intersection

Rivers and streams

Stream crossing locations are shown in Figure 5.7-1, which shows the watershed of each crossing, and Figure 5.7-2, which shows the tier classification of each crossing.

The photos on the following pages show the river and larger streams at their crossing areas and a typical smaller woodland stream. Most river and stream bridges and culverts will need to be lengthened for the project, resulting in filling of portions of stream channels and banks. These impacts have been avoided and minimized to the extent practicable by steepening banks, increasing the sizes of headwalls, or other measures. The total amount of river and stream channel that would be filled is 0.29 acres. The largest single impact (0.1 acre) is the middle Gues Meadow Brook crossing, at Station 1568+00.

Rivers and streams are regulated under both the Wetland Dredge and Fill law and regulations and Chapter 900 of the NH Administrative Rules, *Stream Crossings* (Env-Wt 900). These rules provide standards for new crossings as well as repair and replacement of existing crossings. During field investigations for the current project, all existing stream crossings that are subject to the stream crossing rules were identified. The wetland rules define a stream crossing as "a structure placed within a watercourse or on its associated upland or wetland approaches, or both, that is intended to provide human, animal, or vehicular passage over the watercourse." There are 14 such crossings within the project corridor, as well as other cross culverts that do not carry a stream channel. Because most of these crossings will need to be lengthened, the stream crossing rules must be addressed at each of these crossings.

The stream crossing rules refer to the *New Hampshire Stream Crossing Guidelines*[7], which require the collection of certain field data in order to design an appropriate crossing. The following information was collected for each of the fourteen stream crossings:

Stream Substrate – Stream substrate was documented using the following standards for particle size: Silt <0.06mm, Sand 0.6 mm-0.1", Gravel 0.1"-2.5", Cobble 2.5"-10", Boulders 10" – 7', and Bedrock.

Bankfull Width – Bankfull width is functionally the same as the ordinary high water mark. Features that determined bankfull width were adapted from *Stream Channel Reference Sites: An Illustrated Guide to Field Technique*[8] and include depositional features, changes in vegetation, undercuts in the bank, and stain lines or lower extent of lichens.

[7] *New Hampshire Stream Crossing Guidelines,* University of New Hampshire, 2009

[8] USDA Forest Service General Technical Report RM-245, 1994

Soucook River at Southern NH Route 106 Crossing, Near Wales Bridge Road

Soucook River at Northern NH Route 106 Crossing, Near NH Route 129

Shaker Brook Structure under NH Route 106, Upstream Side

Gues Meadow Brook Twin 72" Culverts at Downstream Side of Southern Crossing

Gues Meadow Brook Scour Pool and Channel Downstream of Southern Crossing

Typical Woodland Stream (Wetland D Area)

Gues Meadow Brook Downstream of Middle Crossing, West Side of NH Route 106

Bankfull Depth – Bankfull depth was measured as the average depth from the water elevation at bankfull to the channel substrate.

Flood Prone Area – The flood prone area is a linear measurement, and is the width of the channel or floodplain at twice the bankfull depth. The flood-prone area is used to calculate the entrenchment ratio, which is the ratio of the flood prone area to the surface width of the bankfull channel.

Channel Slope – In the absence of survey information for stream channels in the study area, channel slope was calculated using USGS topographical survey elevations.

Watershed Size – Watershed size for each channel was calculated using the StreamStats program developed by the USGS. Some watershed sizes were modified based on field observations of existing topography and drainage patterns.

Tier – The NH Stream Crossing Rules categorize streams as Tier 1, 2, or 3, based on the size of the watershed as well as other factors. Stream crossing tiers are discussed in greater detail in the Stream Crossing Summary Report attached to this document.

Rosgen – The Rosgen stream classification, based on all of the stream characteristics listed above, helps to assess the stability of the stream channel and its potential response to a new or replacement crossing structure.

Stream Order – The stream order describes the stream size based on the hierarchy of tributaries leading into it. Stream order data for the streams listed below were taken from the New Hampshire Hydrography GIS layer. Streams that do not appear in the data layer were assumed to be first order.

Impairment – Water Quality impairments as identified in the 2010 303(d) list (described in Section 5.7.3) were documented.

Table 5.7-1 summarizes the results of the stream crossing review, and provides the proposed square footage of wetland and surface water fill. A detailed discussion of the stream crossing rules, as well as descriptions and photographs of each crossing, are included in the Stream Crossing Summary Report attached to this document.

Table 5.7-1. Stream Crossing Summary

Name	ID	Station	Landmark	Water-shed Size (acres)	Tier	Substrate	Structure	Proposed Wetland/ Waterway Impacts (sq. feet)
Unnamed	1	1157	south of Bartlett Farm	65	1	cobble	18”RCP*	29
Unnamed	2	1160	south of Bartlett Farm	276	2	cobble - gravel	48" RCP	575
Unnamed	3	1193	Concord/Loudon town line	357	2	cobble	18" RCP	8,574
Soucook River (south)	4	1267	north of Wales Bridge Road intersection	38,578	3	sand	Bridge #056/063	407
Soucook River (north)	5	1339	just north of NH Route 129 intersection	36,150	3	gravel	Bridge #074/086	18,144 (includes backwater north of crossing
Unnamed	6	1396	south of Currier Road intersection	524	2	gravel	42" RCP	1,274
Shaker Brook	7	1445	just north of Clough Pond Road intersec.	9,720	3	cobble - gravel	Bridge #100/114	583
Unnamed	8	1506	north of country club entrance	25	1	boulders - cobble	12" RCP	3,475
Gues Meadow Brook (south)	9	1556	at south NHMS entrance	2,819	3	cobble	Bridge #137/132 (two 72"RCP)	14,271
Gues Meadow Brook (middle)	10	1568	north of south NHMS entrance	2,568	3	cobble	Two 72" RCP (no bridge no.)	7,394
Unnamed	11	1597	south of main NHMS entrance	311	2	gravel	18" RCP	1,965
Gues Meadow Brook (north)	12	1625	directly next to NHMS	1634	3	cobble	Bridge #227/122 (6' x 10' 3 sided box)	1,481
Unnamed	13	1687	north of north NHMS entrance	26	1	bedrock - cobble	24" RCP	274
Rocky Pond Outlet	14	1719	northern limit of project	5,106	3	bedrock - cobble	Bridge #236/156 (20’ wide slab)	0

** RCP = reinforced concrete pipe*

5.7.3 Existing Surface Water Quality

Surface Water Classifications and Impaired Waters

Surface waters in New Hampshire are classified as A or B, with Class B being the default classification. Class A waters are the highest quality and are considered usable for water supply after adequate treatment. Sewage discharges are prohibited in these water bodies. New Hampshire RSA 485-A:8, Water Pollution and Waste Disposal, and Administrative Rules Env-Wq 1700, provide thresholds for pollutants, dissolved oxygen, color, temperature, and other criteria that must be met for Class A and Class B waters.

The Federal Water Pollution Control Act (PL92-500, commonly called the Clean Water Act [CWA]), as last reauthorized by the Water Quality Act of 1987, requires each state to submit two surface water quality documents to the U.S. Environmental Protection Agency (EPA) every two years. Section 305(b) of the CWA requires submittal of a report (commonly called the "305(b) Report"), that describes the quality of its surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water. The second document is typically called the "303(d) list" which is so named because it is a requirement of Section 303(d) of the CWA. The 303(d) list includes surface waters that are:

a. Impaired or threatened by a pollutant or pollutant(s)

b. Not expected to meet water quality standards within a reasonable time even after application of best available technology standards for point sources or best management practices for nonpoint sources and

c. Require development and implementation of a comprehensive water quality study (called a Total Maximum Daily Load or TMDL study) that is designed to meet water quality standards.

New Hampshire's process for assessing surface waters is detailed in the "Consolidated Assessment and Listing Methodology" (CALM). The CALM interprets the NH surface water quality regulations (Env-Wq 1700) and identifies seven designated uses for New Hampshire surface waters, as shown in Table 5.7-2.

Table 5.7-2. New Hampshire Designated Uses of Surface Waters

Designated Use	DES Definition	Applicable Surface Waters
Aquatic Life	Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.	All surface waters
Fish Consumption	Waters that support fish free from contamination at levels that pose a human health risk to consumers.	All surface waters
Shellfish Consumption	Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.	All tidal surface waters
Drinking Water Supply After Adequate Treatment	Waters that with adequate treatment will be suitable for human intake and meet state/federal drinking water regulations.	All surface waters
Primary Contact Recreation	Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water.	All surface waters
Secondary Contact Recreation	Waters that support recreational uses that involve minor contact with the water.	All surface waters
Wildlife	Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.	All surface waters

For the 2010 303(d) list, all of the above designated uses except wildlife were assessed. The 2010 303(d) list identifies Shaker Brook and all three portions of Gues Meadow Brook as waterways that are impaired for one or more designated uses (Table 5.7-3 and Figure 5.7-3).

New Hampshire Water Quality regulations Env-Wq 1708 provides antidegradation standards to preserve and protect existing beneficial uses and minimize degradation of the state's surface waters. Antidegradation applies to:

- Any proposed new or increased activity, including point and nonpoint source discharges of pollutants that would lower water quality or affect the existing or designated uses;
- a proposed increase in loadings to a waterbody when the proposal is associated with existing activities;
- an increase in flow alteration over an existing alteration; and
- all hydrologic modifications, such as dam construction and water withdrawals.

Table 5.7-3. Impaired Surface Waters within the Project Corridor

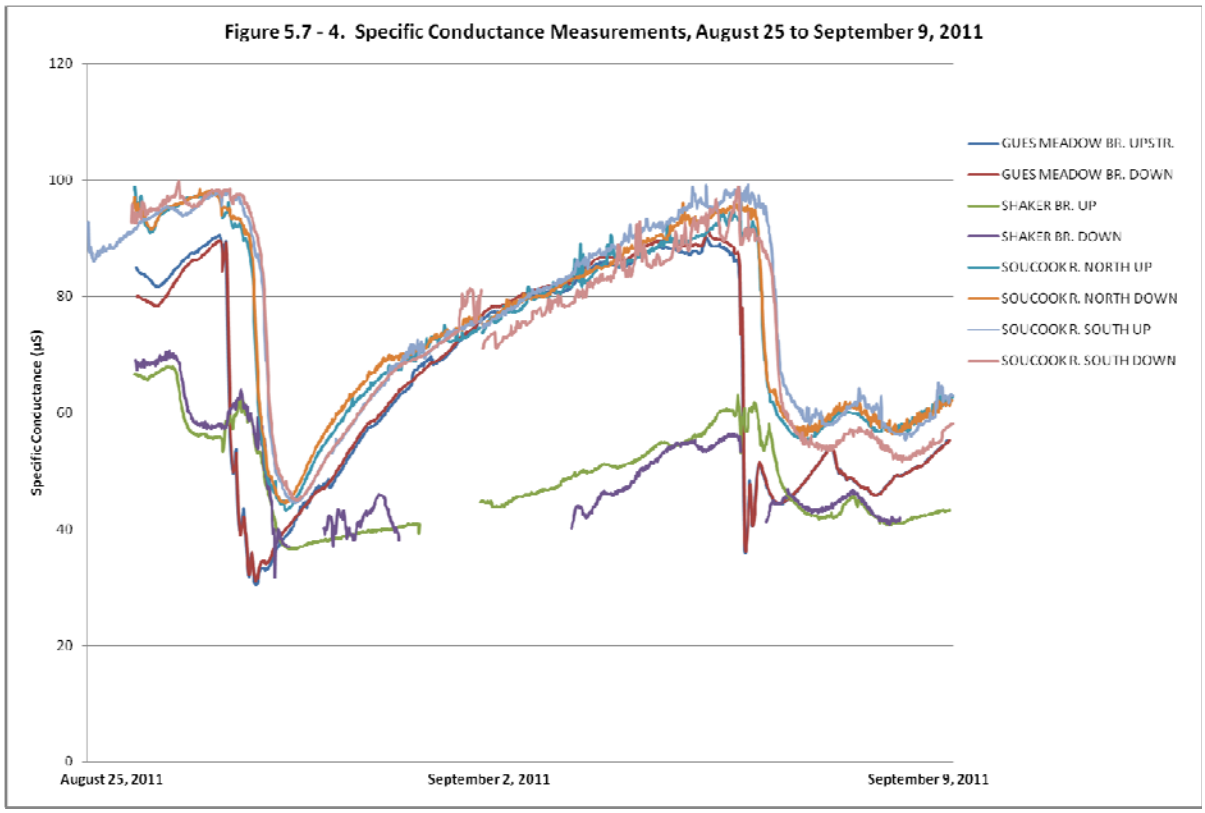
Assessment Unit ID	Waterway Name	Use Description	Impairment Name	TMDL Priority	TMDL Schedule
NHRIV700060202-09	**Shaker Brook**	Aquatic Life	Aluminum	Low	2019
			Benthic Macroinvertebrate Bioassessment (Streams)	Low	2017
			Habitat Assessment	Low	2017
			pH	Low	2017
		Primary Contact Recreation	E. coli	High	2010
NHRIV700060201-09	**Gues Meadow Brook**	Aquatic Life	Benthic Macroinvertebrate Bioassessment (Streams)	Low	2019
			pH	Low	2017
		Primary Contact Recreation	E. coli	High	2010
NHRIV700060201-10	**Gues Meadow Brook**	Aquatic Life	Benthic Macroinvertebrate Bioassessment (Streams)	Low	2019
NHRIV700060202-18	**Soucook River**	Aquatic Life	pH	LOW	2021
NHRIV700060201-07	**Rocky Pond outlet**	Aquatic Life	pH	LOW	2016

Existing Chloride Levels

Road runoff has been implicated in chloride concentrations found near interstate highways in southern New Hampshire, as described in the *Final Environmental Impact Statement, Interstate 93 Improvements Salem to Manchester* (2004). That study sampled chloride concentrations in 10 streams both upstream and downstream of I-93, and found higher concentrations in all 10 downstream segments, with some samples having concentrations approaching chronic water quality standards. Trowbridge et al.[9] determined chloride concentrations in southeastern New Hampshire streams and correlated the chloride concentrations at any given time with the likelihood the receiving water will exceed chloride water quality standards at some point during the year. They also developed a formula which converts specific conductance measurements to chloride concentrations in those streams. To determine the likelihood that the streams within the current project study area will exceed water quality criteria, existing specific conductance was measured and Trowbridge et al.'s formulas applied to obtain chloride concentrations and determine the likelihood of water quality criteria exceedances. While the Trowbridge et al. research was conducted in southeastern New Hampshire in streams with higher baseline chloride levels, the approach is applied to the current study area with the understanding that the correlations may be different but will yield a reasonable indicator of the range of actual chloride levels.

Aqua TROLL 100© monitoring devices manufactured by In-Situ, Inc. were deployed both upstream and downstream of NH Route 106 at four river crossings: both Soucook River crossings, the Shaker Brook crossing, and the southern-most Gues Meadow Brook crossing. Rugged Reader© data loggers were deployed with each device to record readings. The devices were deployed on August 25 and 26, 2011 in water 1 to 2.5 feet deep, and were removed on September 9, 2011. The first two days of monitoring were completed in optimal conditions, with water levels near the median annual low-water levels, which are normal for that time of year. After the first two days, however, Tropical Storm Irene passed over the state, resulting in heavy rainfall and much higher stream levels. Water levels receded a few days later, but rose again with a second large rain event a few days later. The resulting specific conductance data are shown in Figure 5.7-4 below.

[9] Trowbridge, P.R., J.S. Kahl, D.A. Sassan, D.L. Heath, and E.M. Walsh. 2010. Relating Road Salt to Exceedances of the Water Quality Standard for Chloride in New Hampshire Streams. Environmental Science and Technology 44: 4903-4909.



Specific conductance levels measured in microsiemens per centimeter (µS/cm) were converted to chloride concentrations in milligrams per liter (mg/L) by the Trowbridge et al. formula cited above. The formula is:

Chloride in mg/L = 0.307 * [Specific Conductance in µS/cm] – 22.00

The highest specific conductance recorded at each monitoring station during the two-week monitoring period was used in calculations in order to reflect the closest to the "worst case" (i.e., highest chloride concentration) scenario. The chloride concentrations were then derived using the above formula. The results are listed in Table 5.7-4. The highest calculated concentration is in the southern Soucook River crossing, at 8.6 mg/L.

Trowbridge et al. found that streams in southeastern New Hampshire with chloride concentrations (at any time during the year) below 102 mg/L were unlikely to experience water quality standards exceedances (at any time during the year). The four-day chronic water quality standard for chloride in New Hampshire is 230 mg/L, and the acute standard is 860 mg/L (Env-Wq 1700). It is apparent that the streams in the project study area are well below the 102 mg/L threshold and under current conditions are therefore very unlikely to exceed the standards.

The Proposed Action would add an additional lane to NH Route 106, which would presumably result in an increase in road salt applications and therefore chloride loading. This would be a maximum 50% increase in NH Route 106 lane mileage in the study area. If it is assumed all of the chloride in the receiving waters are from NH Route 106 (although other roads, NHMS, and other sources presumably contribute), it would require increases in lane mileage and road salting much greater than 50% to approach concentrations which could result in water quality exceedances.

Table 5.7-4. Maximum Specific Conductance and Corresponding Chloride Concentrations

Stream Crossing	Max. Specific Conductance (microsiemens/cm)	Derived Chloride Conc. (mg/L)
Soucook River (South) Upstream	99.3	8.5
Soucook River (South) Downstream	99.7	8.6
Soucook River (North) Upstream	98.9	8.4
Soucook River (North) Downstream	98.5	8.2
Shaker Brook Upstream	67.9	*
Shaker Brook Downstream	70.7	*
Gues Meadow Brook Upstream	90.6	5.8
Gues Meadow Brook Downstream	91.2	6.0

*Notes: * indicates the derived concentration would be less than zero.*

5.7.4 Stormwater Runoff Impacts and Treatment

Runoff from highways may contain elevated levels of metals, sodium and chloride, suspended solids, sediments, and phosphorus. These pollutants can degrade water quality and adversely affect aquatic life in streams, rivers, and ponds. Runoff can also infiltrate into groundwater. The project's potential effects on water quality derive principally from increased stormwater runoff. Measures to minimize those impacts to the extent practicable are addressed below.

Stormwater runoff from NH Route 106 and adjacent land currently drains to a variety of ditches, swales, and streams before ultimately reaching the Soucook River. These waterways, water bodies, and stormwater treatment facilities provide varying levels of water quality treatment of the runoff. The proposed project would add, on average, 20 feet

of new pavement width to NH Route 106, increasing roadway pavement in this corridor from the existing approximately 69.0 acres to 91.2 acres. Water quality treatment measures will be implemented that will treat runoff from both new and existing pavement, such that the pollutant load from the post-construction pavement will be less than the pollutant loading from the existing pavement. The intent is to achieve no net increase in the loading of most pollutants to the principal receiving waters (the Tier 3 rivers and streams). There are four principal drainage segments or subwatersheds within the eleven mile corridor: the Soucook River, Shaker Brook, Gues Meadow Brook, and the Rocky Pond outlet stream. In addition to implementing water quality treatment measures that will address the overall corridor, the project seeks to implement water quality treatment measures that will balance the treatment rates within these subwatersheds.

The existing swales, catch basins, and treatment swales along the corridor provide a measure of water quality treatment, but there are no formal water quality treatment measures. Because the project would involve a considerable change in impervious surface area (adding approximately 22.2 acres of new pavement along eleven miles of roadway), there would be a substantial increase in stormwater runoff and therefore in pollutant loading. Therefore, BMPs must be incorporated into the project design to improve stormwater treatment.

BMPs such as gravel wetlands and detention ponds can reduce the concentration and loading of pollutants in receiving waters. Typically detention ponds remove up to 70%-80% of metals and total suspended solids in runoff, 45%-68% of phosphorous, and 35%-55% of nitrogen. Gravel wetlands can remove up to 80%-90% of metals and total suspended solids in runoff, approximately 64% of phosphorous, and 85% of nitrogen[10]. As discussed above, the goal of the project is to achieve better water quality. Because BMPs do not capture 100% of the contaminant load, improving water quality will require treatment of more impervious area than the project proposes to create. Based on removal rates associated with gravel wetlands noted above, a ratio of treated impervious area to new impervious area of 1.2:1 would result in a net improvement in removal of most contaminants. In other words, for every acre of new pavement, at least 1.2 acres of pavement should be treated.

The principal stormwater treatment measures under consideration for this project are gravel wetlands. Additional water quality treatment will be provided in roadside swales using low impact designs along the entire corridor. However, since these areas would not meet all of

[10] *New Hampshire Stormwater Manual, Vol. 2*, New Hampshire Department of Environmental Services, 2008

the requirements of the New Hampshire Stormwater Manual, they have not been included in the total area treated. Since the existing corridor has little formal treatment, these areas would contribute to an improvement in water quality over existing conditions. Formal treatment measures currently under consideration are described in Table 5.7-5. These BMPs are in the concept stage and may be modified or relocated as project design proceeds.

Table 5.7-5. Proposed Stormwater Best Management Practices (Gravel Wetlands)

Drainage Segment or Subwatershed	Station Location	Segment and Side of Road Treated (by Station)	Total Pavement Area Treated (ac)
Soucook River	1154+00 Lt	1148+00 to 1155+00 both sides	1.06
Soucook River	1172+00 Rt	1160+00 to 1162+00 left side 1162+00 to 1167+75 both sides 1167+75 to 1171+00 left side	1.22
Soucook River	1198+00 Rt	1199+00 to 1217+00 both sides	2.89
Soucook River	1242+50 Rt	1240+50 to 1247+50 both sides 1247+50 to 1250+00 left side	1.37
Soucook River	1258+00 Rt	1250+00 to 1263+00 both sides	1.95
Soucook River	1285+00 Lt	1284+50 to 1295+50 both sides	1.75
Soucook River	1309+50 Lt	1303+75 to 1310+25 both sides	0.93
Soucook River	1326+00 Lt	1322+25 to 1329+00 both sides	1.05
Soucook River	1374+00 Lt	1373+50 to 1377+50 left side 1377+00 to 1396+25 both sides	3.07
Shaker Brook	1421+00 Lt	1406+00 to 1412+00 left side 1412+00 to 1421+00 both sides 1421+00 to 1424+00 left side	1.93
Shaker Brook	1436+50 Lt	1424+00 to 1438+00 both sides	2.07
Shaker Brook (90%) Soucook River (10%)	1464+00 Rt	1463+50 to 1482+75 both sides	2.27
Gues Meadow Brook	1536+00 Lt	1528+00 to 1543+00 both sides 1543+00 to 1549+00 left side	2.59
Gues Meadow Brook	1568+50 Lt	1568+25 to 1580+50 left side	0.90
Gues Meadow Brook	1587+50 Lt	1586+50 to 1597+00 both sides	1.57
Rocky Pond outlet	1658+50 Lt	1655+00 to 1663+25 left side	0.60
Rocky Pond outlet	1690+50 Rt	1689+00 to 1694+00 both sides	0.73
Totals			**27.95**

Table 5.7-6 summarizes treatment by roadway drainage segment or subwatershed. The table shows the acreage of existing and proposed new pavement, the acreage of pavement proposed to be treated, and the treatment ratio (treated pavement divided by new pavement). In the Soucook River, Shaker Brook and Gues Meadow Brook subwatersheds, the treatment ratio would meet the goal of a 1.2 or higher ratio. In the Rocky Pond outlet stream subwatershed, the treatment ratio is 0.6, since there were few places to locate treatment measures along this segment without disturbing important forest and wetland habitats. However, this segment also has extensive roadside ditches and swales, which contribute to the water quality treatment. For the entire project, the aggregate treatment ratio is 1.3:1. Therefore the project is expected to result in a net improvement in water quality in the principal receiving waters.

Sensitive resources will also be considered when siting drainage outfalls. For example, direct drainage of untreated runoff to ponds and vernal pools is undesirable.

Table 5.7-6. Acreage Treated by Proposed Stormwater Treatment Practices

Drainage Segment or Subwatershed	Existing Pavement Area (ac)	New Pavement Area (ac)	Pavement Area Treated (ac)	Treatment Ratio
Soucook River	39.59	12.77	15.52	1.3
Shaker Brook	9.11	2.94	6.04	2.1
Gues Meadow Brook	13.30	4.29	5.06	1.2
Rocky Pond outlet	6.98	2.25	1.33	0.6
Totals	**68.98**	**22.25**	**27.95**	**1.3**

5.8 Floodplains

5.8.1 Floodplain Regulations

Federal regulations (23 CFR 650, 44 CFR 9) and Executive Order 11988 provide that federal projects must address impacts to floodplains and floodways. For the purposes of federal regulations, the 100-year floodplain is the regulated floodplain or Base Flood. The Federal Emergency Regulatory Agency (FEMA) at 44 CFR 59.1 defines Base Flood as "the flood having a one percent chance of being equaled or exceeded in any given year." This term is used in the National Flood Insurance Program (NFIP) to indicate the minimum level of flooding to be used by a community in its floodplain management regulations.

The Regulatory Floodway is defined in FEMA's regulations (44 CFR 59.1) as "…the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height."

5.8.2 Floodplain Occurrence

Within the project corridor, floodplains have been mapped by FEMA for the National Flood Insurance program (NFIP) and by additional floodplain mapping commissioned by the City of Concord. Concord floodplain mapping includes a floodway that extends to the Loudon town line along the Soucook River, and 100-year and 500-year floodplains around the Soucook River. FEMA mapping identifies a 100-year floodplain around the Soucook River, Shaker Brook, portions of Gues Meadow Brook, and the Rocky Pond outlet stream (Figure 5.8-1).

5.8.3 Floodplain Impacts

There are no impacts proposed to mapped floodways within the project corridor.

There are no impacts proposed to 100-year floodplains in Concord. There are 2,518 square feet of impact to the 500-year floodplain (outside the limits of the 100-year floodplain) of the Soucook River. (The 500-year floodplain is not subject to regulation.) The project as proposed, involves a total of 3.77 acres of impact to FEMA mapped 100-year floodplains associated with the two Soucook River crossings, the Shaker Brook crossing, and one of the Gues Meadow Brook crossings, all in Loudon. Proposed volumes of floodplain fill at these locations are not yet available. Area impacts are summarized in Table 5.8-1, and a detailed discussion of impacts at each crossing follows. These impacts should not result in a substantial (i.e., more than one foot) increase in flood elevations of the river or streams

crossed by the project, and will not result in impacts to structures, nor pose a significant risk relative to property, life or hazard to life.

Table 5.8-1. Floodplain Impacts

IMPACT LOCATION	FLOODPLAIN IMPACT (ACRES)	FLOODPLAIN AREA UPSTREAM OF IMPACT (ACRES)	CLOSEST DOWNSTREAM STRUCTURE
Soucook Southern	0.96	1296.20	Staniels Road Bridge
Soucook Northern	1.98	991.55	Loudon Dam
Shaker Brook	0.64	545.50	Currier Road Bridge
Gues Meadow Brook North	0.19	17.10	Culvert under NHMS

Soucook River Crossing (Southern)

As described in Section 4.0, the Proposed Action would widen this bridge to the west (upstream) side of NH Route 106, keeping and extending the existing abutments and piers. There would be no changes to existing flow capacity due to the proposed widening. While there are 0.96 acres of floodplain fill proposed at this crossing, the available floodplain area upstream of this crossing is 1,293 acres.

The existing channel upstream of the bridge has a meandering path that causes the water flow to impact the existing slopes at acute angles. To reduce the erosion potential along the existing embankment, the channel was lined with large stones when the bridge was originally constructed. The proposed widening would impact the slopes along the west side of NH Route 106 adjacent to the river channel. The new roadway slopes should be stoned along the bottom to reduce erosion potential during high flow events, consistent with the original construction.

Soucook River Crossing (Northern)

As described in Section 4.0, the recommended design at this crossing is to rehabilitate and widen the existing crossing to both sides, keeping and extending the existing abutments and pier. As with the southern Soucook crossing, there are no changes proposed to the width of

the bridge opening or to the existing flow capacity at this bridge. While there are 1.98 acres of floodplain fill proposed at this crossing, the available floodplain area upstream of this crossing is 991 acres.

Shaker Brook Crossing

As described in Section 4.0, at this crossing the Proposed Action would rehabilitate and widen the existing crossing to the east (downstream) side of NH Route 106 in order to reduce impacts to the existing channel that parallels NH Route 106 upstream of the crossing. No changes to the existing flow capacity or width of the bridge opening are proposed. While there are 0.64 acres of floodplain fill proposed at this crossing, the available floodplain area upstream of this crossing is 546 acres.

It should be noted that the existing crossing is located at an approximate 90 degree angle to the existing flow direction of the stream, which results in a sharp turn just prior to crossing under NH Route 106. As a result, some signs of scour were observed along the outside bend in the brook as it nears the structure. In addition, a large volume of sediment was noted along the inside bend of the brook as it approaches the structure, within the northern chamber of the structure (which is approximately 50% filled with sediments), and approximately 50 feet downstream of the structure.

The proposed work should include additional erosion protection measures to help reduce scouring on the upstream side of the structure.

Gues Meadow Brook Crossing (Northern)

As described in Section 4.0, the Proposed Action would rehabilitate and widen the existing crossing to both sides of NH Route 106 at this crossing. No changes to the existing flow capacity or the width of the bridge opening are proposed at this location. While there is a small amount of floodplain fill (836 square feet) at this crossing, the available floodplain upstream of this crossing is 17 acres.

5.9 Wetlands

5.9.1 Regulatory Context

Wetlands are regulated by the federal government under the Clean Water Act (CWA). Section 404 of the CWA provides that discharges of dredged or fill materials into waters of the United States require a permit from the Army Corps of Engineers (ACOE). Waters of the United States include any non-isolated wetlands that meet the three parameters (hydrology, soils, and vegetation) as defined in the 1987 ACOE Wetlands Delineation Manual. The ACOE has issued a Programmatic General Permit (PGP) to the state that delegates permitting to the state for impacts up to three acres. Because the project proposes approximately five acres of impact, the project would not fall under the PGP, and an individual ACOE permit would be required.

Federal Executive Order 11990, issued in 1977, is intended to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands". The Order, which applies to federal activities and programs affecting land use, requires federal agencies to consider alternatives to wetland impacts and to limit potential damage if an activity affecting a wetland cannot be avoided.

Wetlands are regulated in New Hampshire under RSA 482-A, Fill and Dredge in Wetlands. The law defines a wetland as “an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal conditions does support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Under NH Administrative Rules, wetlands are delineated on the basis of the 1987 ACOE Manual. NH law also regulates surface waters and their banks. “Bank” is defined in the rules as “the transitional slope immediately adjacent to the edge of a surface water body, the upper limit of which is usually defined by a break in slope….” A permit is required if the applicant proposes dredge and fill in jurisdictional wetlands.

5.9.2 Wetland Functions

The NH Wetlands Law and the ACOE recognize several functions provided by wetlands. ACOE provides a method for identifying wetland functions in their *Highway Methodology Workbook* and the *Highway Methodology Workbook Supplement*[11]. Briefly, the functions recognized by ACOE, excerpted from the Highway Methodology Workbook Supplement, are

[11] The Highway Methodology Workbook, NAEEP-360-1-30a, 1999

listed below. Abbreviations following the function name are used below in Table 5.9-1, Wetland Impact Summary.

GROUNDWATER RECHARGE/DISCHARGE (GRD): This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area.

FLOODFLOW ALTERATION (Storage & Desynchronization) (FA): This function considers the effectiveness of the wetland in reducing flood damage by attenuation of floodwaters for prolonged periods following precipitation events.

FISH AND SHELLFISH HABITAT (FSH): This function considers the effectiveness of seasonal or permanent waterbodies associated with the wetland in question for fish and shellfish habitat.

SEDIMENT/TOXICANT/PATHOGEN RETENTION (STP): This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens.

NUTRIENT REMOVAL/RETENTION/TRANSFORMATION (NR): This function relates to the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface waters.

PRODUCTION EXPORT (Nutrient) (PE): This function relates to the effectiveness of the wetland to produce food or usable products for humans or other living organisms.

SEDIMENT/SHORELINE STABILIZATION (SS): This function relates to the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.

WILDLIFE HABITAT (WH): This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge.

RECREATION (Consumptive and Non-Consumptive) (R): This value considers the effectiveness of the wetland and associated watercourses to provide recreational opportunities such as canoeing, boating, fishing, hunting, and other active or passive recreational activities.

EDUCATIONAL/SCIENTIFIC VALUE (ESV): This value considers the effectiveness of the wetland as a site for an “outdoor classroom” or as a location for scientific study or research.

UNIQUENESS/HERITAGE (UH): This value relates to the effectiveness of the wetland or its associated waterbodies to produce certain special values.

VISUAL QUALITY/AESTHETICS (VQ): This value relates to the visual and aesthetic qualities of the wetland.

THREATENED or ENDANGERED SPECIES HABITAT (TE): This value relates to the effectiveness of the wetland or associated waterbodies to support threatened or endangered species.

5.9.3 Existing Wetlands

Winterberry in a scrub shrub wetland in the study area.

Nationwide wetland mapping, the National Wetlands Inventory (NWI), has been prepared by the U.S. Fish and Wildlife Service. This mapping depicts wetlands on a landscape scale and identifies types of wetlands using a number and lettering system developed by the U.S. Fish and Wildlife Service[12] Cowardin et al., the *Classification of Wetlands and Deepwater Habitats of the United States.* A summary sheet defining the codes that are used in the NWI is available at the NWI website (http://www.fws.gov/wetlands). Figure 5.9-1 depicts the NWI mapping for the project corridor and identifies each wetland by the three top level identifiers: wetland system (lacustrine, palustrine or riverine), vegetation structure (e.g., forested or scrub-shrub) and vegetation type (coniferous, deciduous, etc.). Palustrine wetlands are vegetated freshwater wetlands and unvegetated (open water) wetlands up to 20 acres. Lacustrine wetlands are

Roadside Wetland Ditches and Swales are Common in the Study Area and Have a Mixture of Scrub Shrub and Emergent Wetland (Wetland 21)

[12] Cowardin, V. Carter, F.C. Golet, E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

deepwater wetlands greater than 20 acres. Riverine wetlands are contained within a channel and characterized by periodically or continuously moving water. Figure 5.9-1 also displays streams and rivers as mapped in the New Hampshire hydrography GIS data layer. Not all wetlands are displayed in the NWI mapping data, as wetlands smaller than one acre are not captured in this data layer.

Scrub-Shrub Wetland South of Dump Road (Wetland 3)

NWI data does not constitute a wetland delineation, which is needed to calculate wetland impacts. Wetlands within 100 feet of the NH Route 106 centerline were delineated by McFarland Johnson using the ACOE manual in August-October, 2011. Wetlands were numbered to match the numbering system used in the 1995 EA, and are depicted on Figures 5.9-2 through 5.9-11. Wetlands along the project corridor include the following:

Forested Wetlands

The dominant wetland type along the project corridor was forested wetland. These wetlands are seasonally flooded and saturated, and support a variety of vegetation types. Most commonly, these wetlands feature red maple, white pine, hemlock, and other species such as American elm and black cherry. Understory species in these wetlands include sensitive fern, cinnamon fern, sedges, and sphagnum moss.

Scrub Shrub

Scrub shrub wetlands along the project corridor include wetlands dominated by speckled alder, highbush blueberry, winterberry, maleberry, and other broadleaved deciduous species; and areas dominated by leatherleaf, with meadowsweet, buttonbush, sheep laurel and other species. Scrub shrub wetlands in the project corridor generally are more frequently flooded than forested wetlands.

Emergent

Emergent wetlands in the project corridor include cattail marshes, roadside areas (some of which have been ditched) dominated by reed canary grass, goldenrod, sedges, and other herbaceous species; and margins of surface waters with floating leaved and emergent plants. Hydrologic regimes vary from seasonally saturated to permanently flooded.

Marshes in Soucook River Backwater, Northern Crossing (Wetland V)

Vernal Pools

Vernal Pools are seasonally flooded wetlands that provide breeding habitat for certain amphibians and invertebrates that are dependent on the temporary nature of these pools because of the absence of fish and other predators. A survey for vernal pools was conducted in the spring of 2011. Potential vernal pools were investigated for egg masses and juveniles of wood frogs and spotted salamanders, the two amphibian species in New Hampshire that are vernal pool dependent. The survey resulted in the identification of five wetlands that provide breeding habitat to vernal pool species.

Forested Vernal Pool, Wetland 5, North of Shaker Road

Surface Waters

Surface waters within the study area include intermittent and perennial streams, rivers, and ponds. Surface waters are described in detail in Section 5.7 of this document.

5.9.4 Wetland Impacts

Avoidance and Minimization

Under both New Hampshire law and federal permitting requirements, wetland impacts must first be avoided and minimized to the most practicable extent. Because of the nature of the project, widening an existing roadway with wetlands on both sides, it was impossible to avoid wetland impacts entirely. However, wetland impacts were minimized to the extent possible by slight alignment shifts and steepened side slopes to avoid wetland resources where possible. These impact minimization efforts will continue during final design. Specifically, the design was modified in the following areas, identified by station:

- Sta. 1240+48 to 1285+75: Alignment was shifted west in order to reduce impacts to Soucook River on the east side of NH Route 106.
- 1320+00 to 1322+50: Steeper slopes and guardrail were used on the east side of NH Route 106 to avoid impacts to wetland.
- 1340+25 to 1343+00: 1.5:1 slopes were used on both sides of roadway to reduce impacts to wetlands along the Soucook River.
- 1436+79 to 1488+87: Alignment was shifted east to avoid impacts to Shaker Brook along the west side of NH Route 106 and reduce impacts to wetlands (including a vernal pool) south of Beck Road.
- 1534+09 to 1547+67: Alignment shifted west to reduce impacts to unnamed pond on the east side of NH Route 106.

Impacts to wetlands would be further minimized by using appropriate BMPs during construction, including sediment and erosion controls, diversion and treatment of stormwater from construction areas, limiting the amount of exposed grounds at any given time, and other accepted practices. Construction BMPs are discussed further in Section 5.17, Construction Impacts.

Wetland Impact Summary

Wetland Impacts were calculated by measuring the areas where the proposed toe of slope overlaps with the delineated and surveyed wetland lines. Wetland impacts may differ slightly after final design is complete, when the toe of slope lines are further refined. Wetland impacts for the project as proposed total 4.95 acres (federal) or 5.10 acres (NH-regulated). Wetland impacts are summarized in Table 5.9-1 and Table 5.9-2. The largest

portion of proposed wetland impacts is to forested wetlands, 2.54 acres. There are 0.41 acres of impact proposed to vernal pools, most of which are forested, with one open water (PUB1H) wetland, Wetland U.

Table 5.9-1. Wetland Impact Summary

Wetland ID	Cowardin Type(s)	Station	Impact Area (Sq. Feet)	Impact Acreage	Wetland Type	Functions Potentially Affected
D	R4SB1 PFO1/4E	1148	1,892	0.04	intermittent stream	WH, FF, NR, STP
E	R3UB1 PFO1/4E	1160	575	0.01	intermittent stream	FSH, WH
F	PEM1E	1179	684	0.02	wet meadow	NR, STP
G	R3UB1 PFO1/4E	1191	8,574	0.20	perennial stream	FSH, WH
L	PFO1/4E	1236	953	0.02	forested wetland	STP, NR, WH
M	BANK	1265	407	0.01	Soucook River Bank	SS, R
N	PFO1/4E	1273	5,219	0.12	forested wetland	STP, NR, WH
Q	PFO1/4E PEM1Cd	1295	1,218	0.03	forested wetland marsh	STP, NR, WH
R	PUB3	1311	3,261	0.07	impounded forested wetland	WH
S	PSS1E	1316	1,411	0.03	scrub shrub swamp	STP, NR, WH, PE
T	PSS1E	1323	58	0.00	scrub shrub swamp	STP, NR, WH, PE
U	PUB1H	1322	1,811	0.04	vernal pool open water pond	WH
V	PUB1H PSS1E BANK	1341	18,144	0.42	Soucook River and adjacent backwater	FSH, WH, NR, STP, GR, FF, R, VQ
W	PFO1E	1360	2,621	0.06	vernal pool forested wetland	STP, NR, WH
W	PSS1/3E PFO1E PEM1C	1345	21,657	0.50	Forested wetland and emergent marsh	STP, NR, WH, GR, FF
1	R4SB3 PFO1/4E	1396	1,274	0.03	intermittent stream	WH
3	PFO1/4E	1422	375	0.01	vernal pool	WH
4	BANK, R2UB4, PFO1E, PSSIE	1438	6,308	0.07	Shaker Brook and associated wetlands	WH, FF, NR, STP, VQ, R
5	PFO1/4E	1482	10,219	0.23	forested wetland	STP, NR, WH
5	PFO1/4E	1487	12,925	0.30	vernal pool forested wetland	STP, NR, WH

Continued on next page

Table 5.9-1. Wetland Impact Summary, Continued

Wetland ID	Cowardin Type(s)	Station	Impact Area (Sq. Feet)	Impact Acreage	Wetland Type	Functions Potentially Affected
8	R4SB1 PEM1C PFO1E	1506	3,475	0.08	intermittent stream and associated wetlands	FSH, WH
10	PUB1H, BANK	1538	7,796	0.18	open water pond bank	SS, WH, VQ, FF
11	R3UB1 PFO1/4E PSS1E	1556	21,665	0.50	Gues Meadow Brook and associated wetlands	FSH, WH, NR, STP, GR, FF, VQ
12	R3UB1 PFO1/4E	1597	667	0.02	perennial stream and associated wetlands	FSH, WH, NR, STP, GR, FF
13	PFO1/4E R3UB1	1598	1,298	0.03	perennial stream and associated wetlands	FSH, WH, NR, STP, GR, FF
14	PFO1/4E PEM1Cd	1608	4,068	0.09	forested wetland and ditched emergent wetland	STP, NR, WH
16	R3UB1d PFO1/4E	1621	4,613	0.11	forested wetland and ditched emergent wetland	STP, NR, WH
17	PFO1/4E PEM1Cd	1629	8,385	0.19	forested wetland and ditched emergent wetland	STP, NR, WH
20	PFO1/4E	1641	16,762	0.38	forested wetland	STP, NR, WH
21	PFO1/4E	1664	6,498	0.15	forested wetland	STP, NR, WH
22	PUB4h	1670	14,968	0.34	impounded forested wetland	FF, WH, GR
23	PEM1Cd	1687	274	0.00	ditched emergent marsh	STP, NR, WH
24	PFO1/4E PEM1Cd	1687	8,616	0.20	forested wetland and ditched emergent marsh	STP, NR, WH
25	PEM1C	1698	12,614	0.29	emergent marsh	STP, NR, WH
30	PFO4E	1653	4,045	0.09	forested wetland	STP, NR, WH
31	PFO1/4E	1659	7,003	0.16	forested wetland	STP, NR, WH
32	PFO1/4E	1668	32	0.00	forested wetland	STP, NR, WH
Total Wetland Impacts (NH regulated)			**223,248**	**5.10**		
Total Wetland Impacts (ACOE Regulated)			**215,277**	**4.95**		

Table 5.9-2. Wetland Impact by Wetland Type

Wetland Type	Square Feet Impact	Impact Acreage	Linear feet
Bank	7,980	0.18	
Emergent	45,242	1.04	
Scrub Shrub	10,564	0.24	
Forested	110,768	2.54	
Open Water	36,012	0.83	
Streams and Rivers	12,691	0.29	767
Total Wetland Impacts (NH regulated)	**223,248**	**5.10**	
Total Wetland Impacts (ACOE Regulated)	**211,208**	**4.85**	

5.9.5 Mitigation

Both New Hampshire and federal law have requirements for providing compensatory mitigation for wetland impacts. New Hampshire requires mitigation for impacts over 10,000 square feet. The ACOE also has requirements for mitigation. Both state and federal law require that the applicant avoid and minimize wetland impacts before mitigation may be considered. Mitigation may be provided by restoring previously impacted wetlands, by construction or creation of wetlands in areas that were previously upland, or by preservation of upland areas by means of protective easements or other means that prohibit development. NHDES and the ACOE may also, after other options have been exhausted, accept a payment in lieu of mitigation.

Both NHDES and the ACOE have established ratios of mitigation acreage per impact acreage that would meet their regulatory requirements. The NHDES ratios are listed in Table 5.9-3 and the ACOE ratios in Table 5.9-4. Table 5.9-5 lists the mitigation acreage that would be required using the maximum ratio in the ACOE table (because the ACOE has higher ratios), using proposed impacts listed above in Table 5.9-1.

1995 Mitigation Site Review

Ten potential mitigation sites were evaluated in the 1995 EA. Sites were reviewed based on their proximity to an existing stream or lake to ensure hydrologic success, proximity to the project area, and opportunity for restoration of a disturbed area. Of the ten sites initially reviewed, four sites were carried forward for further review, as described below and shown on Figure 5.9-12.

Table 5.9-3. Minimum Compensatory Mitigation Wetland Mitigation Ratios (NH)

Resource Type	Creation	Restoration	Preservation of Upland Buffer
Bog	N/A	2:1	15:1
Tidal Wetlands	3:1	2:1	15:1
Forested	1.5:1	1.5:1	10:1
Undeveloped Tidal Buffer Zone	N/A	2:1	3:1
All Other Jurisdictional Areas	1.5:1	1:1	10:1

Table 5.9-4. Recommended Compensatory Wetland Mitigation Ratios (ACOE)

Mitigation: Impacts	Restoration (re- establishment)	Creation (establishment)	Enhancement (rehabilitation)	Preservation (protection/ management)
Emergent Wetlands	2:1	2:1 to 3:1	3:1 to 10:1	15:1
Scrub-shrub Wetlands (ac)	2:1	2:1 to 3:1	3:1 to 10:1	15:1
Forested Wetlands	2:1 to 3:1	3:1 to 4:1	5:1 to 10:1	15:1
Open Water	1:1	1:1	project specific	project specific
Submerged Aquatic Vegetation	5:1	project specific	project specific	N/A
Streams (linear feet)	2:1	N/A	3:1 to 5:1	10:1 to 15:1
Mudflat (ac)	2:1 to 3:1	2:1 to 3:1	project specific	project specific
Upland Preservation	>= 10:1	N/A	project specific	15:1

Table 5.9-5. Mitigation Required for Proposed Impacts Based on ACOE Ratios (Acres)

	Mitigation Type			
Impact Resource	**Restoration (re-establishment)**	**Creation (establishment)**	**Enhancement (rehabilitation)**	**Preservation (protection/ management)**
Emergent	2.08	3.12	10.4	15.60
Scrub-shrub Wetlands (ac)	0.48	0.72	2.4	3.60
Forested	7.62	10.16	25.4	38.10
Open Water	0.83	0.83	project specific	project specific
Submerged Aquatic Vegetation		project specific	project specific	N/A
Streams (linear feet)	1,534	N/A	42,185	11,505
Mudflat				
Upland Preservation		N/A	project specific	

Site 4: This site is north of the NH Route 106 / NH Route 129 intersection, on the east side of NH Route 106. This site is adjacent to the Soucook River, and had been previously disturbed for gravel excavation. However, the available area for wetland creation was only six acres, and tapping the available water source (the Soucook River) would have complicated the design, because a hydraulic analysis of potential channel impacts would have been necessary. Ultimately it was decided that the best mitigation for this area would be to restore vegetation and riparian habitat within a 100-foot buffer along the shoreline.

Site 8: This site was just north of the Canterbury/Loudon town line on the east side of NH Route 106 in Canterbury. The area was a former gravel pit near the Rocky Pond outlet stream, and provided opportunities for restoration and wetland creation. This site was ultimately purchased, modified for wetland mitigation, and protected with a conservation easement by the NHMS, as depicted on Figure 5.11-1.

Site 9: This site was just north of Rocky Pond in Gilmanton, where shoreline wetlands had been filled. NHDOT purchased this site and restored the wetlands as mitigation for wetland impacts from another project along NH Route 106.

Site 10: This site was and is an active gravel pit along NH Route 106 in Belmont with a brook just downstream of the site. The site was not pursued because the gravel pit was active and because it was determined that other suitable mitigation sites were available.

Current Project Mitigation Site Review

Potential mitigation sites for the current project were reviewed based on the following criteria:

- Location within the Soucook River watershed
- Previously disturbed wetlands and uplands with potential for restoration
- Source of hydrology
- Potential for land protection

Recent (2010) aerial photographs, USGS topographical maps, GIS conservation land data, and GIS hydrography data were used to identify potential sites. Local land trusts and conservation commissions were contacted for referral to potential sites. Mitigation concepts were also discussed with resource agencies (see correspondence in Appendix C).

Two sites showed some potential for restoration and/or preservation. A third site showed potential for land preservation. The site locations are shown on Figure 5.9-12, and individual sites are shown on Figures 5.9-13 and 5.9-14 and are discussed below.

Mitigation Site 1, Pembroke

This site is a former gravel pit that abuts the Soucook River in Pembroke. The size of the parcel or parcels is unknown but the area of interest is approximately 15 acres. A stream channel leads from a wetland area at the east end of the property and flows through a dilapidated crossing and into a stream channel at the south side of the parcel. A second stream has incised a deep channel through the hillside and has created a large gully. Sand and gravel have washed down the gully into the Soucook River and created a large gravel delta.

Because the site lies on a slope, dropping about 100 feet in 1300 feet, wetland creation at this site is not a constructible option. However, restoration of the existing eroded channel, and additional plantings near the Soucook River would provide an improved riparian buffer, would improve water quality downstream of the site, and would provide improved wildlife habitat. Portions of the upland around the gully are starting to revegetate, and provide early successional habitat, important for a number of wildlife species, including Eastern cottontails, ruffed grouse, and white throated sparrows.

Eroded Channel at Potential Mitigation Site 1 in Pembroke – View East

Mitigation Site 2, Pembroke

A second site, also in Pembroke, lies partly within the PSNH power line right of way. There are three existing agricultural fields lying in the floodplain of the Soucook River. Portions of the existing agricultural fields are currently wetland. The area could be used as mitigation either by excavating the existing wet meadow to create an emergent wetland or by allowing the area to grow back to floodplain forest. Possible future conflicts with a proposed connector between I-89 and NH Route 106 would have to be considered in evaluating and designing this site.

Potential Mitigation Site 2 Agricultural Field Adjacent to Soucook River

Mitigation Site 3, Canterbury

In discussion with the Five Rivers Conservation Trust, a potential site in Canterbury was identified. The parcel is 116 acres, has a mixture of early successional and mature upland

forest, wetlands, and stream channels, and lies within the Soucook River watershed just northwest of the northern terminus of the project. Given that the site is well vegetated and already has open water and forested wetlands, preservation of this site would probably be the most appropriate means of mitigation, rather than wetland creation. Discussions have not yet been initiated with the owner of the parcel, but the Five Rivers Trust indicates that he is open to the possibility of selling the parcel, or the development rights to the parcel.

In-Lieu Fee

NHDES has in place a means for providing mitigation through the Aquatic Resource Mitigation (ARM) fund program. This program allows applicants to pay into a conservation fund for wetland impacts (after avoidance and minimization of impacts) according to a formula set by the value of land in the municipality where the impacts are proposed, the type of wetlands proposed to be impacted, and an administrative fee. Through a Memorandum of Agreement with the ACOE, in-lieu fee payments fulfill federal requirements for wetland mitigation as well as state requirements. Using the formula provided by NHDES for 2011, an in-lieu fee for 5.10 acres of impact would total $713,947, as detailed in Table 5.9-6.

Table 5.9-6. In Lieu Fee Calculation

	Concord	Loudon	Canterbury	Total
Square feet of proposed impact by municipality	11,725	129,964	81,559	223,248
Equalized land value per acre	$28,002	$6,279	$4,010	
Total In-Lieu Fee Required	$47,006	$414,089	$252,852	**$713,947**

The final “mitigation package” could include an assortment of mitigation approaches, including preservation, restoration, or an in-lieu fee for a portion of the impact.

Next Steps

Further investigation of all three potential mitigation sites, as well as a continued search of potential mitigation sites near the study area will occur as the project progresses. While the Canterbury parcel provides a potential for addressing mitigation for the entire corridor, the opinions of resource agencies and all three conservation commissions (Concord, Loudon, and Canterbury) will be solicited.

5.10 Vegetation, Fisheries and Wildlife

5.10.1 Vegetation Communities

Vegetation in the vicinity of the project corridor is a mixture of forests, hay fields, marshes, and developed areas. Developed areas, including parking lots around the NHMS, may have lawns and landscaping, but are otherwise devoid of vegetation. Forests include upland, floodplain, and wetland areas.

Figure 5.10-1 depicts vegetation cover types identified in the 2005 *New Hampshire Wildlife Action Plan* (WAP) developed by the New Hampshire Fish and Game Department (NHFG). The WAP mapping provides a "broad brush" approach to vegetation types in the corridor, misidentifies some areas, and does not capture smaller-scale variations in vegetation types. However, it is useful as a general characterization of vegetation cover types in the study area. Vegetation types identified in the WAP are described further below.

Hemlock - Hardwood

Wooded areas along and near the project corridor are predominantly mixed hemlock - hardwood (red oak, white oak, American beech, red maple, Eastern hemlock and white pine). Some areas have sugar maple, black birch, and yellow birch. Understory species in these upland forested areas include witch hazel, ironwood, sarsaparilla, huckleberry, wintergreen, partridgeberry, and Canada mayflower.

Pine Barren

Areas identified as "pine barrens" on the vegetation map are not classic pine barrens that are dominated by pitch pine and scrub oak, but generally support white pine and red oak, with a minor component of red and pitch pine. These areas have sandy soils and support herbaceous species such as wintergreen, lowbush blueberry, and mosses. Historically, these areas experienced periodic fire that allowed regeneration of the species that grow there.

Oak-Pine

These areas are similar to areas identified as "Pine Barren", but generally have less pine and a broader component of oak, with some American beech, white oak, black birch, and ironwood. These areas have understory species include maple leafed viburnum, sweet fern, bracken, and lowbush blueberry. Oak-Pine areas have sandy or rocky well drained soils.

Grasslands

Not all areas identified as grasslands along the project corridor support grass or herbaceous vegetation – these areas include hayfields and lawns, but also gravel pits and parking lots.

Farm Fields at Bartlett Farm

Wet Meadow / Marsh

Wetland vegetation is discussed in Section 5.9, Wetlands. Wetland areas include herbaceous vegetation, shrubs, and forested wetlands. Wetland areas with emergent and shrub vegetation are identified on Figure 5.10-1 using National Wetland Inventory mapping and selecting those areas with emergent vegetation types.

Floodplain

Floodplain forests do not match FEMA mapped floodplains, and in many areas extend beyond the limits of the 100-year floodplain. Floodplain vegetation is found along the Soucook River, Shaker Brook, and Gues Meadow Brook. Red maple is the dominant tree species, with occasional American elm, green ash, and white pine. Some areas (along Gues Meadow Brook and Shaker Brook, in particular) have dense shrub layers with winterberry, highbush blueberry, viburnum, red twig dogwood, and other species. Herbaceous species include a thick fern layer with cinnamon fern, sensitive fern, royal fern, and interrupted fern.

Peatlands

Peatlands were identified on the plan with NWI vegetation type by matching wetland areas with broad leaved evergreen vegetation, which is generally confined to low nutrient wetland environment (bogs and fens). Peatlands support vegetation on a mat of sphagnum moss that, because of the highly acidic and low nutrient environment, does not decompose. Peatlands generally support needle-leaved tree species such as black spruce and tamarack, and broad leaved evergreen shrubs and subshrubs such as bog laurel, bog rosemary, Labrador tea, sheep laurel, and leatherleaf. The mapping does not identify two peatland areas that lie along the corridor, both near the northern Soucook River crossing, that are dominated by leatherleaf (a broad leaved-evergreen species) with steeplebush, sheep laurel, grasses, and sedges. No other peatland areas were noted during field investigations.

Impacts and Mitigation

The amounts of each vegetation cover type that would be impacted have not been quantified. The impacts are considered negligible compared to the amounts of these vegetation types in the general area. Vegetation communities that are rare or subject to special protection are addressed below in Section 5.10.3 and in Section 5.9 (Wetlands). No mitigation is proposed for impacts to vegetation cover types.

5.10.2 Wildlife and Fisheries

To assess wildlife and fisheries habitat within the study area, the following sources of information were reviewed: the 1995 EA; the *NH Route 106/Soucook River Wildlife Corridor Study* prepared by Turtle Pond Enterprises for NHMS in 2002; the *New Hampshire Wildlife Action Plan* prepared by NH Fish and Game Department (NHFG) and approved in 2006; and the NH Natural Heritage Bureau (NHB) and NHFG regarding rare species, which are addressed in Section 5.10.3 below. Observations made during fieldwork for this project are also included here.

Existing Wildlife Resources

1995 EA Wildlife Assessment

The 1995 EA noted that the Soucook River adds to wildlife habitat diversity along the project corridor and serves as a migratory travel corridor for wildlife in the area. Some of the species that would be common in the river corridors include white-tailed deer, raccoon, mink, beaver, otter, muskrats, red fox, gray fox, snowshoe hare, bobcat, cottontails and possibly black bear. The birds which are often sighted along the river corridors include wood ducks, black ducks, green and great blue heron, red-shouldered hawks, black-capped chickadees, bluejays, kingfishers and catbirds. A number of other wildlife species which may occur within the project corridor but are not associated with rivers were also listed. Deer wintering areas were not known to occur within the project corridor. The 1995 EA further noted that the majority of fish found within the study area are associated with the Soucook River, and include eastern brook trout, rainbow trout, brown trout, small-mouthed bass, horned pout, perch, pickerel and shiners.

2002 Wildlife Corridor Study

The 2002 Wildlife Corridor Study examined the wildlife corridor value of the land within one-half mile east of NH Route 106 and 100 feet west of NH Route 106, from I-393 north to Rocky Pond. (Rocky Pond is about one mile north of the northern terminus of the current

NH Route 106 study.) This study first used existing sources of information to list species found within seven broad habitat types along seven different road segments. All bird, mammal, reptile, and amphibian species found within the general area were included in the listing. Species totals ranged from 9 species in forests with adjacent wetlands to 42 species in "wetlands and/or open water" and 46 species in "open areas and/or near water". While these species occurrences were not confirmed, they indicate the potential for a wide range of species to occur in the area.

Through field investigation, the Wildlife Corridor Study also identified areas of active wildlife trails and "significant and critical wildlife habitat" within the corridor. The wildlife trails were generally in or along recreational trails, gravel pits, NHMS parking areas, agricultural fields, habitat edges, logging roads, power lines, floodplain areas, exposed river bottoms and river banks. Maps showed locations of wildlife trails and directions of movement. Significant and critical wildlife habitat elements, such as floodplains, large wetlands, vernal pool and shrubland, occurred in various places within all segments investigated. Areas outside of the project area to prioritize for habitat linkages included Broken Ground (Concord), Oak Hill (Loudon), Clough Hill (Loudon), Ridge Road (Loudon), and Shaker Road (Canterbury).

The Wildlife Corridor Study also cited NHDOT personnel as stating that there are no clear patterns of road-killed small animals, but there were two areas consistently having large animal (whitetail deer and moose) road-kill. These are the vicinity of the cattle underpass at the Bartlett Farm and north of the NH Route 129 intersection near a snowmobile underpass.

Wildlife Action Plan

The New Hampshire Wildlife Action Plan (WAP) habitat mapping was reviewed for the study area, and is shown in Figure 5.10-2. The figure shows Tier 1 ("highest ranked habitat in NH"), Tier 2 ("highest ranked in biological region"), and Tier 3 habitat ("supporting landscapes"). The figure also shows conservation lands and waterways. The WAP mapping shows areas of mostly Tier 2 habitat along stretches of NH Route 106 from the southern Soucook River crossing to the Shaker Brook crossing, and mixed Tier 1, 2 and 3 habitat north of the NHMS to the Rocky Pond outlet stream.

Wildlife Connectivity

Areas important for wildlife habitat connectivity were reviewed for the current project and are also shown on Figure 5.10-2. Factors considered included WAP mapping, waterways, wetlands, conservation lands, and current land use and zoning. Five areas of moderate value for habitat connectivity were identified, and four areas of high value were identified. Three of the high-value areas already have bridges with sufficient span to allow most wildlife to

cross: the two Soucook River crossings and the Shaker Brook crossing. The fourth high-value area is the road segment north of the NHMS to the Rocky Pond outlet stream.

Existing Fisheries Resources

The Soucook River is a common fishing destination and is fished for brook trout, brown trout, rainbow trout and other species. Larger tributaries such as Shaker Brook and Gues Meadow Brook may also support recreational fishing, and brook trout were observed during this study in smaller, Tier 2 streams. NHFG has conducted sampling in the Soucook River watershed and Gues Meadow Brook subwatershed, and data through 2008 is published on the GRANIT website (http://www.granit.unh.edu/data/datacat/pages/fish_huc12.pdf) and listed Table 5.10-1. The website notes that other species may also be present within these watersheds. It is apparent that both of these watersheds support a wide variety of game and non-game species.

Wildlife and Fisheries Impacts

The Proposed Action would affect wildlife and fisheries in several ways.

Direct habitat loss

A fringe of habitat along the existing roadway would be consumed for the project. The areas of fisheries habitat have been quantified and are reported in the wetlands section as impacts to rivers and streams (R4SB1, R3UB1, R3UB3) and ponds (PUB3, PUB1H, PUB4h). The impact acreages of other habitat types have not been quantified. The impact acreage is a small fraction of the amount of available habitat in the general project area. The most notable habitat impacts are to wetlands, vernal pools, and waterways, which are addressed in Section 5.9 of this study.

Wildlife and fisheries habitat connectivity

Existing NH Route 106 is a partially permeable barrier to many terrestrial wildlife species. Some species may be reluctant to cross due to habitat considerations, some may get killed trying to cross, and others may be preyed upon by other wildlife while attempting to cross. Some burrowing animals are unable to cross the roadway. Certain groups of species are affected disproportionately. Most birds can cross the roadway safely at will. Reptiles and amphibians, on the other hand, are more often killed on roads, because they move slowly, often stop moving when they encounter vehicles, and are often unseen by motorists. Areas where there are large wetlands immediately adjacent to NH Route 106 are likely to have high wildlife mortality on the roadway.

Table 5.10-1. Fish Species Found in Two Study Area Stream Watersheds

Note: P = Present

	Gues Meadow Brook	Soucook River
American eel	P	P
brown bullhead	P	P
blacknose dace	P	P
bridle shiner	P	P
brown trout	P	P
creek chub		P
creek chub sucker		P
common shiner	P	P
pumpkinseed	P	P
common white sucker	P	P
brook trout	P	P
brook trout historic occurrence		P
chain pickerel	P	P
fallfish	P	P
golden shiner	P	P
lake chub	P	
largemouth bass	P	P
longnose dace	P	P
margined madtom		P
redfin pickerel		P
rainbow trout		P
spottail shiner	P	P
tesselated darter		P
yellow bullhead	P	P

Aquatic organisms (fish, amphibians, aquatic mammals, and other species) can cross NH Route 106 in many of the rivers and streams, but culverts that carry smaller streams may prevent their passage. Road widening requires most river and stream crossings to be extended. The larger river and stream crossings, including the two Soucook River, Shaker Brook, and three Gues Meadow Brook structures, have existing spans sufficient to allow most aquatic organisms to cross without difficulty. Two of the Gues Meadow Brook crossings have twin 72-inch culverts which may inhibit medium to large mammals such as raccoons and moose from crossing. These are proposed to be replaced with larger structures which would improve aquatic and terrestrial wildlife habitat connectivity.

Northern Soucook River Crossing Showing the Potential for Both Terrestrial and Aquatic Habitat Access

Southern Gues Meadow Brook Crossing, Showing Limited Potential for Fish and Wildlife Passage

The smaller stream crossings (classified in the NH stream rules as Tier 1 and 2 streams) are concrete pipes with small openings relative to their lengths, which makes them narrow, dark, and sometimes shallow or with perched outlets, and therefore difficult for most aquatic species to pass through. Extending these culverts would make them more difficult to cross through. Proposed treatments for each culvert and bridge are listed in Section 5.7, Surface Waters.

Mitigation for Wildlife and Fisheries Impacts

No mitigation is proposed for impacts to specific habitat types, other than that described previously for wetlands, vernal pools, and water bodies.

Impacts to habitat connectivity are incremental compared to the impacts of the historical road layout and construction impacts, so no major mitigation measures are proposed.

Nevertheless, opportunities to improve existing habitat connectivity across the roadway have been examined and should continue to be considered as the project moves forward. Considering the scale of this project, modest improvements, such as upgrading existing stream crossings, are appropriate. Specifically, certain stream crossings at locations identified as moderate or high value habitat connectivity areas on Figure 5.10-2 could be targeted for upgrades to accommodate a broader range of wildlife species. These could include the following:

- A Tier 2 stream crossing with an existing 42-inch diameter culvert approximately one-quarter mile south of the Currier Road intersection. This area includes highly ranked habitat on both sides of the road and conservation land and the Soucook River on the east side of the road.
- The southern two Gues Meadow Brook crossings. These both have twin 72-inch corrugated metal culverts, are on an existing stream corridor, and have high-quality habitat and conservation lands nearly adjacent to the east and one-half mile away to the west.
- A Tier 1 stream crossing with a 24-inch culvert approximately 1,500 feet north of the north NHMS entrance. This area includes highly ranked habitat and conservation land on both sides of the road.

Larger scale connectivity improvements could be considered in the future when the project ultimate improvements (widening to four lanes) are considered.

5.10.3 Threatened and Endangered Species

Existing Rare Species Records and Observations

Rare species are protected in New Hampshire under the Native Plant Protection Act of 1987 (RSA 217-A), for plants, and the Endangered Species Conservation Act (RSA 212-A), for animals. Species that are endangered at the federal level are protected under the Endangered Species Act of 1973. The New Hampshire Natural Heritage Bureau maintains records of rare species (plants and animals) occurrence and provides guidance on protection issues from potential project impacts to rare plants. New Hampshire Fish and Game provides guidance on protection issues to rare animals. The U.S. Fish and Wildlife department provides guidance on potential impacts to federally endangered plants and animals.

The New Hampshire Natural Heritage Bureau (NHB) was consulted on the presence of rare species and exemplary natural communities within the study area. NHB reported records of the following species.

The state-endangered brook floater mussel (*Alasmidonta varicosa*) was found from 1992 to 1995 in several locations in the Soucook River. The records appear to be in the southern half of the project corridor, which includes the two NH Route 106 crossings over the river. Brook floater habitat and populations could occur at either or both of these crossings and at other locations within the Soucook River along the project corridor.

The state-endangered Blanding's turtle (*Emydoidea blandingii*) was found in 2006, 2008 and 2009 within or near the southern portion of the study area. The 2008 sighting was a turtle attempting to cross NH Route 106 just north of NH Route 129. Soucook River backwater channels and ponds are on both sides of the road in this area. Several other ponds within the study area could provide suitable Blanding's turtle habitat. Blanding's turtles are also known to frequent vernal pools. These ponds and vernal pools are shown on Figure 5.9-2 through 5.9-11. Roadsides and gravel pits are often used for nesting.

Wood turtles (*Glyptemys insculpta*) are listed as a Special Concern species and were found in 2008, 2009 and 2010 within or near the southern portion of the study area. Two sightings were about one mile east of NH Route 106 near Chichester Road and Giddis Brook; two sightings were along NH Route 106 south of the southern Soucook River crossing; and one was south of I-393 and west of NH Route 106. One observation was a nesting turtle. The Soucook River through the project corridor appears to be appropriate year-round habitat for wood turtles, and larger tributaries may be used for active season dispersal and foraging. Ponds, vernal pools, marshes, and shrub swamps may be used for foraging as well. Roadsides and gravel pits are often used for nesting.

NHB also reported that there was an exemplary natural community, a red maple floodplain forest, associated with the Soucook River, east of the project area. The floodplain forest is described as a "good example of a high terrace floodplain forest of sandy soils. *Acer rubrum* (red maple), *Pinus strobus* (white pine), and *Prunus serotina* (black cherry) are dominant in the canopy, with *Viburnum dentatum var. lucidum* (northern arrow-wood), *Viburnum nudum var. cassinoides* (witherod), and *Alnus incana var. americana* (speckled alder) common in the sub-canopy layer. *Onoclea sensibilis* (sensitive fern), *Solidago rugosa* (rough goldenrod) and various graminoids are common in the diverse herb layer." This area is approximately a quarter mile east of the study area, and no impacts are anticipated to the red maple floodplain forest.

During field investigations, a single small whorled pogonia (*Isotria medeoloides*) plant was discovered just outside the road right of way. Small whorled pogonia is a state endangered and federally threatened orchid, protected under both state and federal law. The area surrounding the single specimen was searched by a team from US Fish and Wildlife Service, McFarland Johnson, and NHDOT, and no additional plants were found. Habitat surrounding the single plant is primarily wetland habitat, but the plant is an upland plant, so suitable habitat is limited.

State-endangered and Federally Threatened Small Whorled Pogonia

Rare Species Impacts and Mitigation

The Proposed Action would affect habitats where state-listed rare species are known or suspected to occur. At the Soucook River and its larger tributaries, there may be minor areas of fill to extend piers or abutments and widen bridges. The impact area is likely to be very small compared to the amount of habitat available, so it is anticipated that no formal mitigation will be necessary. However, pre-construction surveys should take place to identify potentially affected populations of the rare mussels or turtles. When the exact footprint is known, consultation will take place with NHFG to determine what measures should be taken.

At the Soucook River crossing north of NH Route 129, approximately one-quarter acre of open water habitat would be filled by the project. This area is suitable habitat for Blanding's turtles and possibly wood turtles. Efforts to further minimize these impacts should be explored during future design phases. If impacts cannot be avoided, appropriate mitigation would be explored in consultation with NHFG.

Vernal pools would be impacted at a few locations. Because of their importance to Blanding's and wood turtles, their location relative to known turtle habitat should be considered and mitigation developed if appropriate in consultation with NHFG.

For the small whorled pogonia, the Natural Heritage Bureau has requested that nearby suitable habitat be surveyed during the next growing season for additional plants. It is anticipated that any direct impacts would be avoided as it is located outside the right of way

in an area where the proposed impacts would be within the existing right of way. There will continue to be coordination with NHNHB and USFWS.

5.11 Parks, Recreation and Conservation Lands

5.11.1 Parks and Recreation Lands

Parks

Public parks and recreation areas are among the resources protected under Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 USC 303(c)). There are several areas used for public and private recreation along the project corridor, but no public parks with facilities such as restrooms, maintained trails, or parking. The nearest public parks are a Town recreational field area in Loudon Center, west of the project corridor, and a Town recreational field area on Staniels Road, east of the project corridor. Neither of these parks would be affected by the project, so there is no use of Section 4(f) resources in regard to parks.

Snowmobile Trails

The New Hampshire Snowmobile Association, in cooperation with the Department of Resources and Economic Development, publishes a State Corridor map depicting the location of statewide snowmobile trails. Trails within or near the project corridor are shown on Figure 5.11-1. A network of local trails and the New Hampshire Corridor Trail crosses private land, public land, and road rights of way by permission of landowners. A local organization, the NH Sno-Shakers Snowmobile Club, maintains trails along and near the project corridor. Snowmobile trails maintained by this organization occur within or near the entire project corridor. A trail closely parallels NH Route 106 from Asby Road (Concord) to the Bartlett Farm, where it passes under the cattle crossing; and from Bridge #056/063 over the Soucook River, where there is another crossing

Recreational Trail at NH Route 106 Trail Underpass North of NH Route 129 Intersection

under the road, north all the way to the south entrance of NHMS. . State Corridor Trail #15 also crosses NH Route 106 just north of NH Route 129 and in the vicinity of the NHMS, near the Big Apple store. There is also a crossing near the northern project terminus.

Recreational and Cattle Underpass at Bartlett Farm

The continuity and integrity of these trails and connectors should be considered in future planning and design stages. Most of these trails are on private property and none qualify for Section 4(f) consideration. The NHDOT intends to work with the NH Snowmobile Association, the local snowmobile clubs and DRED - Parks and Recreation to help maintain trail continuity.

Bicycles

The NHDOT Bicycle Route Maps for Merrimack Valley and the Lakes Region do not identify NH Route 106 as a preferred bicycle route. However, cyclists regularly use NH Route 106, probably because it has wide shoulders. The NH Cycling Club hosts race events at NHMS, and many racers travel to and from the races by bicycle on NH Route 106.

Pedestrians

Although there are no sidewalks along NH Route 106, pedestrians use the shoulders and right of way for walking, particularly in the vicinity of the NHMS on race weekends. There are no designated or maintained trails along the NH Route 106 corridor.

River Access

The Soucook River is used for canoeing, kayaking and fishing, and probably for swimming. The GRANIT database identifies three public access points within or near the project corridor: a remote access point on the Soucook River Conservation Easement in Canterbury, a walk-in access on the Smith Tract in Loudon, and a fishing access off of South Village Road (near the intersection with NH Route 129) in Loudon. None of these access points provide boat ramps or access. Another access within the NH Route 106 right of way next to the northern Soucook River crossing, just north of NH Route 129, is regularly used for recreational access, but is not listed as a public access point in the GRANIT database.

Private Recreational Facilities

Private recreational facilities along the project corridor include the NHMS, at the north end of the project corridor, and the Loudon Country Club, on the west side of NH Route 106 north of Beck Road.

5.11.2 Conservation Lands

Conserved lands were identified from publicly available GRANIT data and are shown on Figure 5.11-1. Conserved lands within the vicinity of the project corridor include property protected by state agencies (NHDES, NH Fish and Game, and NH Department of Resources and Economic Development), private conservation agencies (Five Rivers Conservation Trust), municipalities (Town of Loudon, City of Concord) and private landowners. Conserved lands that lie directly along the corridor, and proposed impacts to those lands, are summarized in Table 5.11-1.

Impacts to conservation parcels were calculated by measuring the area of overlap where the proposed toe of slope extends past the existing right of way. (Parcel lines for conserved parcels are not necessarily surveyed lot lines, and impacts may vary from those calculated here.)

Table 5.11-1. Conservation Lands

Name	Acreage	Impact Acreage	Land Protection Type	Land Protection Agency	ACCESS
Taylor State Forest	10.5	0.03	Fee Ownership	NH Dept. of Resources & Economic Dev. (DRED)	Access Allowed
Bronnenberg Easement	74.3	NO IMPACTS	Conservation Easement	Five Rivers Conservation Trust	Unknown
Soucook River Conservation Easement (Smith Tract)	40.8	0.42	Conservation Easement	NH Fish & Game	Access Allowed
Prescott	117.0	0.06	Conservation Easement	NH Dept. of Environmental Services (DES)	Restricted Access
Shaker State Forest	233.4	0.18	Fee Ownership	NH Dept. of Resources & Economic Dev. (DRED)	Access Allowed
Soucook River Conservation Easement	79.8	0.48	Conservation Easement	NH Fish & Game	Access Allowed

5.12 Historic and Archeological Resources

Historic and archeological resources were identified in the early 1990's within the 1995 EA project study area extending from I-393 to Laconia. As part of the current project, an architectural historian was retained to update the findings of the original report. No additional archeological work was performed for this phase of the current project. Historic and archeological findings are described below and shown on Figure 5.12-1.

5.12.1 Historic Resources

Existing Resources

The 1995 EA project historic resource study included historical research, a windshield survey, and constraints mapping, which resulted in the identification of individual historic properties and potential historic districts. As part of this project an architectural historian reviewed the previous findings and conducted additional field reviews and historical research to determine whether properties that were previously determined to be eligible for the National Register of Historic Places (NR) are still eligible, and whether any other properties are now eligible. The findings were documented in NH Division of Historical Resources (NHDHR) Individual Inventory Forms, which are available for review. Inventory Forms were reviewed by NHDOT cultural resources specialists and NHDHR staff. NHDHR subsequently made Determinations of Eligibility for these properties.

NHDHR determined that certain properties which had been identified as NR-eligible in the 1995 EA are no longer NR-eligible. These properties include:

Loudon Road Agricultural Historic District, MLT-LRA: The NHDHR determination states:

> The area was re-evaluated to document the significant change that has occurred over the past two decades by subdivision and new residential construction. While some of the individual properties in the district remain intact, the agricultural character that was conveyed through continued dairy farming on the Bartlett Farm, and by semi-open fields along both sides of Loudon Road has been lost to suburban residential infill. The historic farmhouses on the road are no longer united physically with many new intrusions and the relationship between the buildings and the land is no longer evident. The Loudon Road Agricultural Historic District does not meet eligibility under Criterion A, B, or C and is not eligible for listing in the National Register of Historic Places.

Daniel Hill/Winthrop Hill House, 662 NH Route 106, LOU0235: The NHDHR determination notes that this house has been removed, and although there may be "deeply buried features", there are "no other archaeological concerns, no eligibility".

NHDHR determined that the following properties within the current study area are NR-eligible.

Bartlett Farm, 471 & 467 Josiah Bartlett Road, CON0244: The NHDHR determination states:

> The Bartlett Farm began circa 1840 as a mixed agriculture farm under the Messer family. By the 1920s, it was reforested and was purchased by Concord Lumber as a wood lot. When the timber was removed, the Concord Lumber agent who had purchased it, Charles Bartlett, bought the farm for himself and started dairy farming on the land. It is still in use as a dairy farm. In 1927, the main house was substantially altered to its current two-story form. It is individually eligible for the state and National registers as an excellent and rare example of a surviving dairy farm, showing the appropriate improvements as technologies and agricultural products standards have changed.

Jones House, 7012 Josiah Bartlett Road, LOU0004: The NHDHR determination states: "The DOE committee agreed that the building was eligible for the NR as an example of a connected farm building. Despite the reforested property, the immediate domestic setting does retain integrity as a farmyard."

Wales Bridge, Wales Bridge Road, LOU0402: This bridge was determined to be eligible for the NR during the 1995 EA project, and the NHDHR determination states that the structure retains its eligibility on the basis of NR Criteria A and C. The boundary of the eligible structure is the footprint of the bridge along with the abutments and approach.

Brown Farm, 18 Hemlock Hill Drive, LOU0017: The NHDHR determination states:

> The Brown Farm is a well preserved and intact farmstead that retains most of its outbuildings. Recent subdivision has reduced what was once 102 acres down to 17.32 acres. The farm is eligible for the NR under C for architecture and A as a 20th century summer home and possibly for agriculture. While the loss of acreage is concerning, other farms have been found eligible for the National Register for agriculture with less surviving acreage. More

information on the effects of the subdivision of land to the landscape of the farm is needed to determine potential agricultural significance at this time.

An amended Individual Inventory Form was completed for the Brown Farm, which redefined the NR-eligible boundary. The current NR-eligible area includes properties from three parcels and encompasses 36.62 acres.

Impacts

The proposed improvements to NH Route 106 would require land acquisition or easements from NR-eligible Josiah Bartlett Farm, as detailed below. Based on a review of the project footprint, boundaries of the NR-eligible portions of the properties, and consultation with NHDHR, it does not appear the project would affect the Brown Farm, Jones House, or Wales Bridge, nor would it affect any of the characteristics that make these resources NR-eligible. Formal determinations of effect based on Section 106 of the National Historic Preservation Act have not yet been made. Determinations will be made in consultation with NHDHR.

One of the NR-eligible properties, the Josiah Bartlett Farm, will be directly impacted by the project. The existing house is located on Josiah Bartlett Road to the west of NH Route 106 in Concord, while a portion of the property extends from Josiah Bartlett Road east across NH Route 106 to the Soucook River. The NR-eligible property boundary includes portions of both Josiah Bartlett Road and NH Route 106, as shown on Figure 5.12-1. As part of the Proposed Action, NH Route 106 would be widened equally about the existing centerline with no changes to the existing vertical alignment of the roadway. The traffic along this section of roadway would move approximately 8 feet closer to the house, which is located approximately 800 feet from NH Route 106.

The intent of the Proposed Action would be to mimic the existing slopes along both the east and west sides of NH Route 106 outside of the proposed widening in order to reduce the slope impacts to the property. Existing slopes along the west side of the road vary from 3:1 to 4:1, and along the east side vary from 2:1 to 3:1, and proposed slopes would be similar. As such, there would be minimal changes to the length or location of existing guardrail along the property. The existing cattle crossing under NH Route 106 that connects the two parts of the property would be extended to match into the proposed slope using new headwall structures.

The Proposed Action also includes a proposed water quality BMP that would be located outside of the existing right of way at the toe of slope along the east side of NH Route 106 (see Figure 4.1-1). The proposed water quality BMP would not be visible from the existing farm house, therefore minimizing the overall visual impacts of the BMP. The specific

footprint, form, vegetation, and drainage structures of the BMP have not yet been determined, so the effects on the property and its NR eligibility cannot yet be determined.

The acreage of land affected by the proposed slope work and BMP are 0.16 acres along the west side of the road and 0.44 acres on the east side, or 0.60 acres total. The total property is 195.6 acres. Overall there would be limited impacts to the existing farm land, little change in the visual appearance looking at the existing property from the surrounding areas or looking at the surrounding area from the existing property, and traffic would move 8 feet closer to a house that sits approximately 800 feet from the roadway. A formal determination of effect would be made in consultation with NHDHR. Property impacts may trigger the need for a Section 4(f) evaluation.

Mitigation

Mitigation measures will be determined in consultation with NHDHR. It is expected mitigation measures will be limited in nature and will not substantially affect project design.

5.12.2 Archeological Resources

Existing Resources

Historic and prehistoric archeological resources were identified for the 1995 EA project. At that time, documentary research indicated that the general project area was attractive for occupation throughout the prehistoric and historic periods. Visual inspection and walkover surveys were completed to identify topographical features favorable for prehistoric sites and locations of historic resource sensitivity. Nine areas were found to be sensitive for prehistoric resources, and subsequent subsurface sampling identified prehistoric resources at two of these locations, the Lindquist site in Loudon and the Jewett site in Laconia. Neither of these sites is within the potential impact area of the current project.

Eight sites were found to be sensitive for historic resources. It was later determined that three of those did not retain value for archeological research. Only one of the remaining sites, Lovering Mill, is within the current project's study area.

Impacts

The Lovering Mill site is located on the west side of NH Route 106 adjacent to Shaker Brook in Loudon. In the area of the existing mill site, the proposed roadway alignment of NH Route 106 would be shifted approximately 8 feet to the east so that the proposed edge of pavement along the westerly side of NH Route 106 would align with the existing edge of pavement. This will minimize the amount of slope work to be constructed along the west

side of NH Route 106 adjacent to the mill site. Work in this area will consist of replacing existing guardrail and placing fill on the upper portion of the existing fill slope. It is not anticipated that the existing toe of slope along the east side of the brook or the mill site would be affected as a result of the Proposed Action. In a meeting on March 8, 2012, NHDHR concurred with this conclusion. Therefore it is assumed no further archeological study is needed and there would be no effect on resources at this site or elsewhere within the project corridor. If the project footprint changes, these conclusions may need to be reconsidered.

Mitigation

Since the project would not affect Lovering Mill or other sensitive archeological areas, it is assumed no mitigation will be needed.

5.13 Hazardous Materials

5.13.1 Regulatory Context

Hazardous waste sites are regulated by both the federal Resource Conservation and Recovery Act of 1980 (RCRA) (40 CFR Part 261 C) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1986 (CERCLA). The New Hampshire Department of Environmental Services regulations incorporate by reference 40 CFR 260-270 (hazardous waste). The regulations include procedures for identifying hazardous waste, requirements for generators and transporters of hazardous waste, requirements for treatment, storage and disposal (TSD) facilities, and other provisions.

5.13.2 1995 EA Project Investigations

For the 1995 EA project, hazardous materials sites were initially identified along the project corridor from Concord to Laconia, extending out one mile to either side of NH Route 106. More focused follow-up investigations were carried out on those areas within 250 feet of the existing centerline of NH Route 106. In addition, the project area included investigations on side roads extending 600 feet from their intersection with NH Route 106 and 150 feet from their centerline. These areas are referred to below as the “hazmat study area”. The assessment consisted of both Initial Site Assessments (ISA) and Preliminary Site Investigations (PSI) of selected sites within the hazmat study area. The ISAs resulted in 63 sites within the hazmat study area that warranted further investigation. Sites were reviewed with both FHWA and NHDOT to determine the likelihood of contamination at each site and the potential for impacts due to construction activities. Based on that review, PSIs were conducted in a total of 12 of the identified sites. The 12 sites consisted of three former gas

stations, three car dealerships, four automotive repair facilities, one miscellaneous debris dump, and one construction yard. Four additional sites were currently, formerly, or previously under investigation by NHDES. Because of their "regulatory and investigative histories", no PSIs were conducted on those four sites.

Results of the soil and groundwater samples taken during the PSIs at the 12 sites showed no detectable environmental contaminants at 8 of the 12 sites. Of the four remaining sites, apparent gasoline-related volatile organic compounds (xylenes and/or MTBE) were detected at three sites: a car dealership, a former gas station, and an automotive repair facility. The detected concentration of xylenes and MTBE were below the NHDES Ambient Groundwater Quality Standards so no further action by NHDES was anticipated. The last site consisted of a construction yard facility where concentrations of petroleum hydrocarbons and total xylenes were in excess of NHDES Policy.

Based on the information that was gathered for the 1995 EA project, it was determined that the contamination would not affect the overall design of the project.

5.13.2 Current Project Database Review

As part of the current project, research was conducted to identify potential hazardous materials sites near the project corridor. The review area for this research included the NH Route 106 corridor from I-393 in Concord to Canterbury, including all areas within one mile of the project corridor. The objective of this survey was to provide a preliminary assessment of the potential for the presence of oil and/or hazardous materials that could affect the proposed project.

FirstSearch Database Review

Possible sites were first identified based on a regulatory database search conducted by FirstSearch Technology Corporation (FSTC) of Norwood, Massachusetts. The report compiled by FSTC dated December 12, 2011 lists all known contaminated sites, hazardous waste generators, registered underground storage tanks (UST), and other indicators of the presence of hazardous materials within the current study area and within one mile of the study area boundary.

The research identified two categories of sites: leaking underground storage tanks (LUST) and spill sites. Sites identified in the FirstSearch report are shown on Figure 5.13-1. Database sources for FirstSearch data are described below. Note that there is some duplication between FirstSearch results and the NHDES data described later in this section.

RCRA GEN: EPA RESOURCE CONSERVATION AND RECOVERY INFORMATION SYSTEM GENERATORS - Database of hazardous waste information contained in the Resource Conservation and Recovery Act Information (RCRAInfo), a national program management and inventory system about hazardous waste handlers. In general, all generators, transporters, treaters, storers, and disposers of hazardous waste are required to provide information about their activities to state environmental agencies. These agencies in turn pass on the information to regional and national EPA offices. This regulation is governed by RCRA, as amended by the Hazardous and Solid Waste Amendments of 1984. This database includes facilities that generate or transport hazardous waste or meet other RCRA requirements, including:

- LGN - Large Quantity Generators;
- SGN - Small Quantity Generators;
- VGN – Conditionally Exempt Generators; and
- RAATS (RCRA Administrative Action Tracking System) and CMEL (Compliance Monitoring & Enforcement List) facilities.

SPILLS: NHDOS/ NHDES HAZARDOUS MATERIAL SPILLS LISTING - Database of spills reported to the New Hampshire Department of Safety (DOS). The data includes information regarding spill date, chemical spilled, amount spilled, and hazard type for spill sites.

LUST: NHDES LEAKING UNDERGROUND STORAGE TANKS DATABASE - Database of leaking underground storage tanks reported to NHDES. The data includes information regarding risk level, project type, and project manager.

UST/AST: NHDES UNDERGROUND AND ABOVEGROUND STORAGE TANKS DATABASE - Database of underground and aboveground storage tanks registered with NHDES. The data includes information regarding owner name and address, tracking number, and physical tank descriptions.

STATE: State/Tribal Sites: NHDES GROUNDWATER HAZARDOUS WASTE INVENTORY SITES – Database of hazardous waste sites. The data includes project manager and type of hazardous waste. The list is abbreviated as “GW HAZ INV”.

NHDES Database Review

NHDES maintains a “OneStop” database (des.nh.gov/onestop) of site remediation and groundwater hazard inventory sites. The NHDES OneStop database was reviewed to follow up and confirm the locations and status of sites identified in the FirstSearch report. Site types in the OneStop database are listed in Table 5.13-1.

Table 5.13-1 NHDES Site Remediation and Groundwater Hazard Inventory Site Types

Site Types Found Within a Half Mile of Project Corridor Selected for Review	
ETHER	Ether contamination from an unknown source
LUST	Leaking underground storage tank project.
OPUF	Leaking residential or commercial heating oil tanks.
SPILL/RLS	Oil spill or release.
Site Types Found Within a Half Mile of Project Corridor Not Selected for Review	
GWRELDET	Site which has a groundwater release detection permit and no other defined project type.
H2O SAMPLE	Isolated groundwater sample with contaminant detection. Site has not been tied to a known contaminant source.
HOLDTANK	Non-hazardous, non-sanitary holding tank registration.
Land/UNLN	Existing landfill or landfill closure.
STUMP/DEMO	Municipal or commercial stump or demo dump.
SEPTIC	Subsurface wastewater disposal system receiving > 20,000 gallons/day.
UIC	Underground injection control: discharges of benign wastewaters not requiring a groundwater discharge permit or request to cease a discharge (i.e. floor drain closure requests).
Site Types Not Shown in Project Corridor	
CERCLA	Superfund Site
GWRELDET	Site which has a groundwater release detection permit and no other defined project type.
H2O SAMPLE	Isolated groundwater sample with contaminant detection. Site has not been tied to a known contaminant source.
HAZWASTE	Site has non-petroleum related contamination (i.e. chlorinated solvents). This type does not indicate severity of contamination, it is only an identifier of the type of contamination.
HOLDTANK	Non-hazardous, non-sanitary holding tank registration.
IRSPILL	Initial spill response.
LAND/LN	Lined landfill.

Continued on next page

Table 5.13-1 NHDES Site Remediation and Groundwater Hazard Inventory Site Types, continued

Site Types Not Shown in Project Corridor, Continued	
LWW/LAG	Lined wastewater lagoon.
MOST	Leaking motor oil storage tank.
OLD DUMP	Old open dump site (non-landfill).
RAPIDINF	Rapid infiltration basin.
SEPT/LAG	Septage lagoon.
SITEEVAL	Unsolicited site assessment (i.e. the site assessment was not requested by the State). Often these evolve due to a real estate transaction of commercial property.
SITEEVALHW	Unsolicited site assessment (like SITEEVAL) reviewed by the Waste Management Division, Hazardous Waste Remediation Bureau at NHDES.
SLUD/LAG	Sludge lagoon.
SLUDGAP	Sludge application project.
SPRAYIRR	Spray irrigation project.
TRANS_STA	Solid waste transfer station.
UWW/LAG	Unlined wastewater lagoon

The research identified sites that could be potentially harmful if disturbed by the proposed project: leaking underground storage tanks (LUST), leaking residential or commercial oil tank sites, sites with ether contamination, and oil spill or sites. Sites shown in yellow (all other sites) on Figure 5.13-1 were further away, had been cleaned up, or the cases had been closed.

Thirteen sites were selected for further review, as described below and listed in Table 5.13-2. Sites identified in the FirstSearch report and the NHDES OneStop database are shown on Figure 5.13-1.

Table 5.13-2. Hazmat Remediation Sites within the Project Corridor

Type	Name	Address	Town	Status	ID
LUST	Lot No. 236	NH Route 106	Loudon	Closed	16473
LUST	Crowley Land Clearing Inc.	846 NH Route 106	Loudon	Closed	12013
LUST	Huckleberry Heating Oils	30 Chichester Rd.	Loudon	Closed	10276
LUST	106 Beanstalk	577 NH Route 106	Loudon	Closed	10249
LUST	Speedway Convenience Store	905 NH Route 106	Loudon	Closed	17944
OPUF/ETHER	Lazy Pines Mobile Home Park	3 Lazy Pines Drive	Loudon	Closed	16765
OPUF/ETHER	Scotch Pines Mobile Home Park	Route 106 / Shaker Road	Loudon	Closed	15051
ETHER	Freedom Hill Cooperative	Pine Ridge Road	Loudon	Closed	17202
SPILL/RLS	Auto Accident	Route 106	Loudon	Closed	16840
SPILL/RLS	Domestic Fuel Oil Spill 1	Clough Pond Road	Loudon	Closed	16507
OPUF	Domestic Fuel Oil Spill 2	Storrs Road	Loudon	Closed	16842
- -	Domestic Spill 3*	N. Village Road	Loudon		- - -
- -	Domestic AST Line Leak**	Hardy Road	Loudon	Closed	- - -

**This site was included in the FirstSearch Report, but was not found in the NHDES data or in the NHDES Onestop database.*

***This site was not included in the NHDES HazMat GIS data layer, but was included in the FirstSearch report and is in the NHDES OneStop database.*

Leaking Underground Storage Tanks

Lot No. 236: This site, just north of the project corridor, was a gas station in the 1930s and 1940s. The site had three LUSTs, and a site investigation was conducted by NHDOT. This site was identified in the 1995 EA. A bedrock water supply well at the site had MtBE levels that exceeded the Ambient Groundwater Quality Standard (AGQS), and test borings and monitoring wells were installed. The water supply well was abandoned, and after additional monitoring it was determined that the site met the criteria for Site Closure. A Certificate of No Further Action was issued in January, 2002.

Crowley Land Clearing: This site had an underground storage tank that was out of compliance because of substandard construction, as it was single walled. The site is located on the east side of NH Route 106, north of Lower Ridge Road, at Station 1546+00. The tank was removed in 1994, and NHDES determined that no discharge of petroleum that would impact surface water or groundwater had occurred. The file was closed in 2000.

Huckleberry Heating Oils: This site, a heating oil supply facility just south of Chichester Road on the east side of NH Route 106 at Station 1278+00 had a LUST in 1989 with subsequent enforcement action by NHDES. Ongoing water quality sampling in monitoring wells took place until 2005, when a certificate of no further action was issued, based on the fact that the AGQS was met.

106 Beanstalk: This site is a gas station in Loudon on the west side of NH Route 106, north of Shaker Road, at Station 1480+00. The site had a LUST in 1989. Enforcement action was taken and groundwater monitoring occurred until 2003, when the file was closed. The site was identified in the 1995 EA.

Speedway Convenience Store: This site is a gas station on the west side of NH Route 106, across from the NH Motor Speedway at Station 1561+00. A LUST was discovered here in 2003. Subsequently, groundwater monitoring took place at the site and a certificate of no further action was issued in September, 2006, based on the fact that all AGQS criteria had been met.

Leaking Residential or Commercial Heating Oil Tanks, Ether Contamination

Lazy Pines Mobile Home Park: This site, about a quarter mile west of Route 106 near North Village Road in Loudon, is listed under OPUF and ETHER. NHDES file review indicates that the site, which has a community water system, was referred to the Oil Remediation and Compliance Bureau (ORCB) by the Water Supply Engineering bureau (WSEB) based on detection of MtBE in the water system, however, subsequent testing showed that the levels were either below accepted levels or were no longer detected. No further information about the fuel oil spill is provided. The file was closed in 2004.

Scotch Pines Mobile Home Park: This site is just southeast of the intersection of NH Route 106 and Shaker Road in Loudon. There are two NHDES sites located here, an OPUF and an ETHER site. This Mobile Home Park has a community public water supply system that had MtBE detected in its drinking water, and was referred to the Oil Remediation and Compliance Bureau by the Drinking Water Bureau at NHDES in 2000. Subsequent water testing revealed that the MtBE levels were below the Maximum Contaminant Levels allowed under the state rules and the file was closed.

Ether Contamination from an Unknown Source

Freedom Hill Cooperative: This site, about a quarter mile west of NH Route 106, off of Pine Ridge Road in Loudon, has a community well that had MtBE detected in its drinking water system (detection date uncertain). There was no known source of contamination, and the file was closed in 2004, presumably because contaminant levels did not reach thresholds for which further action would be required. No additional information is available.

Oil Spill or Release.

In addition to the leaking underground storage tanks listed above, there were five sites listed as spills in the FirstSearch and/or NHDES Hazmat database lists that were located within 0.5 miles of the project corridor. These sites are described below.

Auto Accident: The NHDES database documents an automobile accident on NH Route 106, where ten gallons of diesel fuel were released, on November 7, 2002. The fuel was cleaned up and the file was closed.

Domestic Fuel Oil Spill 1: A domestic fuel oil spill was reported on Clough Pond Road on October 19, 2001. The file was closed on October 22, 2001. No further information is provided for this site.

Domestic Fuel Oil Spill 2: A second domestic fuel oil spill occurred on Storrs Drive. The NHDES online database has no information about the date of the incident, and no further information is available.

Domestic Spill 3: FirstSearch identified a residential spill on North Village Road. However, no information is provided in the NHDES database.

Domestic AST Line Leak: This residence had a kerosene leak of 25 gallons in 2008. The spill was cleaned up and the file was closed in 2009.

5.13.3 Recommendations

Based on the findings of the FirstSearch database review and a review of NHDES files, there are no ongoing enforcement actions for hazardous material remediation within the immediate project corridor. Additional review to ensure no involvement with hazardous materials should occur as design and right of way acquisition proceed.

5.14 Visual Environment

The visual environment along the NH Route 106 corridor is dominated by the roadway itself and immediately adjacent forests, fields, waterways, wetlands, and developed areas. The roadway is relatively level and straight with wide shoulders. The surrounding terrain ranges from level to low rolling hills, and there are few viewpoints along the corridor with broad views of the terrain or aesthetically pleasing landforms. However, the forested areas provide a characteristic rural setting and feeling, and there are scattered views of large wetlands, ponds, and streams. Residents along Josiah Bartlett Road, in Concord, currently look at NH Route 106 across the open fields of the National Register-eligible Bartlett Farm, down to the Soucook River Valley. Changes in the visual setting of the farm may have implications for Section 106, as described in Section 5.12. During meetings early in the 1990's study process, City of Concord officials expressed concerns that the rural, natural views of the NH Route 106 approach to Concord be maintained.

View of Soucook River from NH Route 106

Motorists' View of Existing NH Route 106

Under the Proposed Action, the existing NH Route 106 will be widened by 16 to 20 feet for a total width of 64 feet. This would not substantially or dramatically alter the view either from the roadway or of the roadway from surrounding areas. Direct impacts to visually attractive features like rivers, ponds, and fields would be minimal.

View of Bartlett Farm Fields from NH Route 106

5.15 Environmental Justice

Executive Order 12898 directs Federal agencies to avoid, minimize, or mitigate disproportionately high and adverse effects on minority and low-income populations. An analysis was completed to identify the proportions of minority and low-income populations within the general project area and surrounding areas.

The letter report is attached as Appendix D. Year 2000 U.S. census data were used in the analysis, as the 2010 data were not fully available at the time of the analysis. The study area for purposes of this analysis was the project limits and the area in the immediate vicinity that most closely corresponds to the boundaries of Census Tracts and Block Groups. The surrounding area in this analysis is all census tracts and block groups outside of, and immediately adjacent to, the study area.

Table 5.15-1 shows the presence of protected groups that might be impacted by the project. The percentage of the population that is elderly was slightly higher than that found in the surrounding area. The percentages of the population that make up the other protected groups were all below the percentages found in the surrounding area. Therefore, it is concluded that the project would not have a disproportionate effect on minority or low-income populations and complies with Executive Order 12898. However, the percentage of the population which is elderly is 10.88%, and as such, additional outreach efforts will be made to incorporate inputs from these groups. As appropriate during final design, participation from these groups will be encouraged.

Special consideration should be given to any project features that affect pedestrian accessibility. The project constitutes an alteration in accordance with Title II of the Americans with Disabilities Act (ADA). As such, minimum ADA Accessibility Guidelines apply, unless deemed technically infeasible.

Table 5.15-1. Environmental Justice Population Analysis Results

	Avg. % Elderly Popn.	Avg. % Minority Popn.	Avg. % Low-income Popn.	Avg. % Disabled Popn. (Sensory)	Avg. % Disabled Popn. (Physical)	Avg. % LEP* Popn.
Study Area: Merrimack County US Census Tracts: 32 (Block Group 1) 328 (Block Group 1) 370 (Block Group 1) 360 (Block Groups 1, 2 and 3)	10.88%	1.62%	3.86%	3.15%	6.82%	0.28%
Surrounding Area: Merrimack County US Census Tracts: 32 (Block Groups 2 and 3) 328 (Block Group 2) 330 (Block Group 1 and 2) 329 (Block Group 2 and 3) 350 (Block Group 1) 440 (Block Group 2) Belknap County US Census Tracts: 9656 (Block Group 1) 9658 (Block Group 3)	10.30%	2.30%	5.52%	3.41%	6.85%	0.53%

*Notes: * LEP (Limited English Proficiency) definition: Where there is a population of people who speak English as a second language less than "well" (i.e., "not well" or "not at all").*

5.16 Indirect Effects and Cumulative Impacts

The requirement to assess indirect effects and cumulative impacts of proposed federal actions was established in the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA).

5.16.1 Indirect Effects

Indirect effects are effects that are caused by the Proposed Action but are later in time or farther removed in distance, but still reasonably foreseeable. Indirect effects may include the effects of land use change induced by a project or effects on water quality, wildlife, air quality, or other social, natural and cultural resources.

The Proposed Action's direct impacts to most resources would be minimal. Water quality treatment would result in equal or lower pollutant loading than currently exists for most pollutants associated with roadways. Chloride inputs would increase, but the low chloride concentrations in existing water bodies indicates the direct impact would be minimal, and therefore the indirect impacts, further downstream or later in time, should be minimal. Wetland impacts would be limited to the immediate vicinity of the roadway, and the impact is not expected to extend farther away in the wetlands or downstream. Because the project would not increase capacity of NH Route 106, it is not expected to alter travel or growth patterns in the area or induce growth or changes in land use. For these reasons, indirect effects are expected to be minimal.

5.16.2 Cumulative Impacts

Cumulative impacts are the combined effects of the direct and indirect impacts of a project when added to other past, present, and reasonably foreseeable future actions. The geographic area of concern for cumulative impacts is the highway corridor and immediately adjacent uplands, wetlands, and waterways. The overall land use pattern of the corridor was established many decades ago when the road network and village centers were developed. Therefore the relevant time frame for this project is the past few decades, during which there have been incremental changes to NH Route 106 and its intersections, scattered development along the roadway, and substantial increases in the footprint of the NHMS. The foreseeable future time frame is the next 10 to 20 years, when incremental development, likely including continued improvements of the NHMS are likely to take place.

Most direct impacts of the current project are minimal, and as described above all indirect effects are expected to be minimal. The most substantial direct impacts are to wetlands and water bodies. There would also be incremental effects on wildlife habitat and water quality. It is likely that road improvements and land development along the road in the recent past have filled wetlands, consumed wildlife habitat, and had incremental effects on water quality. Natural resource impacts and associated mitigation measures at the NHMS are well documented. In the foreseeable future, the interim road improvements will be completed, and the potential "ultimate improvements" may be implemented. NHMS plans to construct a racing museum, although most work is likely to be in previously disturbed areas. There will presumably be continued incremental land development along the roadway and continued growth in traffic volumes.

The combined past, current and foreseeable future impacts to wetlands are likely to result in substantial losses in wetland acreage and functions. However, this project's impacts have been minimized by alignment shifts, slope steepening and other measures, and future

mitigation may offset some of the impacts. There are still extensive wetlands along the corridor that are in good condition and provide a range of wetland functions and values.

The combined impacts to wildlife habitat are more difficult to determine. The effects of habitat loss and loss of connectivity between habitats has been and continues to be incremental. There is no irreplaceable habitat being affected by this project, and the amount of habitat lost compared to the surrounding area's intact habitat is negligible. However, the roadway is a partial barrier for some species, particularly aquatic species such as fish. This project will consider measures to improve connectivity across the road by upgrading structures carrying rivers and streams under the roadway. This could be considered when any future widening work is implemented as well, especially in areas that are important to habitat connectivity.

The cumulative impacts to water quality are uncertain. At this time, water quality in the corridor's receiving waters is generally good, except for a few impairments unrelated to road impacts. If best management practices are employed for future development projects, the incremental road improvements and development in the foreseeable future are unlikely to result in water quality impairments. If chloride levels are found to approach water quality criteria in the future, NHDOT would comply with any TMDL measures developed in consultation with NHDES. NHDOT has a Well Replacement Program for the investigation and replacement of private water supplies contaminated with chloride. NHDOT investigates suspected contaminated wells, takes water samples, and determines contaminants and possible sources of contamination. If chloride levels due to road maintenance are sustained above 250 mg/L, NHDOT may pay damages or provide a replacement well.

5.17 Construction Impacts

The majority of the proposed improvements along NH Route 106 would be constructed utilizing lane shifts which would maintain a minimum of one travel lane in each direction at all times. It may be necessary during certain construction operations to utilize alternating one-way traffic control with flaggers or police officers. These temporary lane closures would occur during non-peak hours and would be returned to two-way flow at the end of each work day. Work is likely to be performed during weekday daylight hours. However, some night work could be required including, but not limited to, culvert or bridge construction, to minimize disturbances to the motoring public. In those rare cases, the contractor will be required to obtain permission from the NHDOT and input from the local communities would be considered prior to initiating work.

Access to local roads and driveways along NH Route 106 would be maintained during construction. Traffic on side roads, however, may experience some delays during the construction.

Temporary increases in noise and dust emissions may occur during construction, from construction operations. Standard measures would be employed to minimize construction noise and dust levels to the extent practicable. Precautions would be taken to minimize inconveniences, particularly for abutting property owners.

As part of the rehabilitation of the existing bridge structures, work may include concrete repair and painting of the structures over open water. Mitigation measures would include enclosures and containment systems on the structures to prevent debris from entering the rivers and streams during construction. Erosion and sedimentation controls would be installed prior to any work adjacent to streams, wetlands, ponds and rivers within the corridor to protect the water quality of the watersheds. A Storm Water Pollution Prevention Plan (SWPPP) will be in place throughout the construction of the project including monitoring the SWPPP and the erosion control measures effectiveness by qualified personnel.

If dewatering is required during construction, provisions would be made that the water quality of the discharges comply with applicable provisions under the National Pollution Discharge Elimination System (NPDES) permit program and NHDES Water Quality Certificate conditions.

6 Coordination and Public Participation

The NHDOT is the lead agency on this project and will be responsible for the implementation of the project and obtaining funding as required.

From 1990 through 1995, during preparation of the 1995 EA, a series of meetings were held with resource agencies, public officials, and the general public. These included 9 meetings with resource/regulatory agencies; 15 meetings with local officials, boards and commissions; and one public hearing. Dates and participating organizations are detailed in Section 4.19 of the 1995 EA.

The meetings and discussions held with various state and federal agencies and public officials for the current project are listed below. Correspondence and available meeting minutes are included in Appendix C. Agency and public coordination meetings were held on the following dates:

Date	Topic
October 3, 2011	GACIT Hearing (Governor's Advisory Committee on Intermodal Transportation) – Project presented to hearing committee
November 8, 2011	Public officials meeting – Concord, Loudon, and Canterbury
November 11, 2011	Cultural resource agency meeting – Project overview
December 21, 2011	Natural resource agency meeting – Project overview and preliminary impacts
March 8, 2012	Cultural resource agency meeting – Discussion of proposed potential impacts

As the project moves forward, additional meetings will be held between NHDOT, resource/regulatory agencies, and the public to gather feedback on the proposed design.