POND EDDY BRIDGE PROJECT
S.R. 1011, SECTION 470
SHOHOLA TOWNSHIP, PIKE COUNTY, PENNSYLVANIA, AND
TOWN OF LUMBERLAND, SULLIVAN COUNTY, NEW YORK

FINAL SECTION 4(f) EVALUATION

PREPARED BY

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 4-0

IN CONSULTATION WITH

NEW YORK STATE DEPARTMENT OF TRANSPORTATION
REGION 9
AND
FEDERAL HIGHWAY ADMINISTRATION
PENNSYLVANIA DIVISION

JANUARY 2012
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I. INTRODUCTION/DESCRIPTION OF THE PROPOSED ACTION
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The Pennsylvania Department of Transportation (PennDOT), Engineering District 4-0, working in cooperation with the New York State Department of Transportation (NYSDOT) Region 9 (Southern Tier) and the Pennsylvania Division of the Federal Highway Administration (FHWA), proposes to address the structural and functional deficiencies of the existing Pond Eddy Bridge through the implementation of a bridge improvement project. Constructed between 1904 and 1905, the existing Pond Eddy Bridge (known locally as the All Veterans Memorial Bridge) carries State Route (S.R.) 1011 over the Delaware River between Shohola Township, Pike County, Pennsylvania, and the Town of Lumberland, Sullivan County, New York (Figure 1), via a two-span, pin-connected, Pennsylvania (Petit) through truss. The Pond Eddy Bridge Project involves providing a safe, structurally sound means for crossing the Delaware River to access the isolated community of Pond Eddy, Pennsylvania.

The Pond Eddy Bridge was listed on the National Register of Historic Places on November 14, 1988, as a representative example of a multiple span Pennsylvania (Petit) truss bridge (Appendix A). As such, the Pond Eddy Bridge qualifies as a Section 4(f)-protected resource. Additionally, there are several other Section 4(f)-protected resources located within the general project area, including:

- the Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail,
- State Game Land No. 209, and
- a portion of the Delaware State Forest (Figure 1).

The Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail are under the administrative jurisdiction of the National Park Service (NPS) and the Pennsylvania Fish and Boat Commission (PFBC), respectively. Similarly, State Game Land No. 209 is subject to the administrative jurisdiction of the Pennsylvania Game Commission (PGC), and the Delaware State Forest falls under the jurisdiction of the Pennsylvania Department of Conservation and Natural Resources (DCNR). Section 4(f) was enacted as Section 4(f) of the U.S. Department of

“The Administration may not approve the use of land from a significant publicly owned public park, recreation area, or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that:

• there is no feasible and prudent alternative to the use of land from the property; and

• the action includes all possible planning to minimize harm to the property resulting from such use.”

The advancement of the Pond Eddy Bridge Project may result in some capacity in a use of the National Register-listed Pond Eddy Bridge. Similarly, the proposed project may result in a use of the Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail. Off-line/alternate access alternatives for the Pond Eddy Bridge Project have the potential to result in a use of property from State Game Land No. 209 and the Delaware State Forest. As such, the proposed project may have unavoidable Section 4(f) implications, thereby necessitating the preparation of this Section 4(f) Evaluation. For the purposes of this project, the FHWA has determined that an Individual Section 4(f) Evaluation is the appropriate level of Section 4(f) documentation. This Individual Section 4(f) Evaluation includes descriptions of the project's:

II. Purpose and Need,
III. Identification and Description of Section 4(f) Resources (Pond Eddy Bridge, Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail, State Game Land No. 209, and Delaware State Forest),
IV. Alternatives Analysis and Assessment of Least Harm, and
V. Coordination with Agencies Having Jurisdiction over Subject Section 4(f) Resources.

Technical appendices are included, as deemed appropriate, to serve as documentation of or to provide more information about particular aspects of the project. Similarly, other project documents or studies have been referenced as appropriate.
II. PROJECT PURPOSE AND NEED
II. PROJECT PURPOSE AND NEED

The Pond Eddy Bridge serves as the only access over the Delaware River to the community of Pond Eddy, Pennsylvania. The bridge provides access from NY State Route 97 across the Upper Delaware River. The project area is characterized as a rural mountainous river valley with steep river banks and a mature forested landscape along the valley outslopes. The Upper Delaware River is approximately 500 feet wide and is contained within deep river banks, extending approximately 20 to 25 feet in elevation. The rural mountainous terrain coupled with the breadth of the Delaware River contributes to the isolated nature of Pond Eddy, Pennsylvania. The mountainous terrain extends approximately 500 feet above the river. Residents of Pond Eddy, Pennsylvania, must use the bridge to access their properties. The bridge also provides access to State Game Lands 209 and the Delaware State Forest.

Bridge inspections conducted since the early 1990s revealed that the Pond Eddy Bridge has major structural and functional deficiencies which present potential safety concerns and serve to limit vehicular access to Pond Eddy.

The purpose of the Pond Eddy Bridge Project is to provide a structurally sound bridge to carry S.R. 1011 over the Delaware River. The need for the project is based on the existing structural and functional deficiencies that currently prevent or limit adequate access over the Delaware River for the community of Pond Eddy, Pennsylvania.

A. CONDITION OF POND EDDY BRIDGE

Built in 1904-1905, the Pond Eddy Bridge is a two-span, pin connected, Pennsylvania (Petit) through truss structure. PennDOT’s engineering evaluations indicate that the bridge could carry a maximum load of 15 to 18 tons in a non-deteriorated condition. An 18-ton weight limit may have been acceptable in the early years to allow homeowners to receive basic services including the delivery of fuel oil, coal, and firewood as well as local emergency response services (i.e., police, fire, and ambulance). Over the past 100 years of service, the physical condition of the Pond Eddy Bridge has slowly deteriorated to the point that it can no longer safely carry its original 18-ton load limit. Currently, emergency repairs are planned to reestablish the maximum vehicle loading to seven tons, which is less than half of its original load carrying capacity. In addition, vehicle loads have increased substantially since 1904. For comparison, current emergency and basic vehicles have loading rates in excess of 20 tons. For example, the Shohola fire trucks range from 20 to 26 tons. This divergence of what the Pond Eddy Bridge is physically capable of carrying versus the increased load ratings of modern
vehicles has resulted in a bridge structure that does not serve the function for which it was originally constructed.

In October 2006, PennDOT completed Safe Load Capacity and Load Rating Analyses on the bridge. The outcome of those analyses resulted in PennDOT downposting the bridge’s weight restriction limit from eight to three tons due to the advanced state of structural deterioration. These structural deficiencies presented potential safety concerns and further reduction of access to Pond Eddy by almost any vehicle larger than a typical passenger car. This weight restriction resulted in PennDOT issuing an emergency contract to replace ten severely deteriorated floor beams beneath the bridge deck as well as several wooden deck planks. This partial rehabilitation was completed in December 2006 and resulted in the bridge’s posted weight capacity being reassigned to seven tons. In December 2010, the existing bridge was downposted to a three-ton capacity. Substantial maintenance efforts were completed in 2011 that included the replacement of 64 steel stringers at a cost of $500,000. The 2011 stringer replacement efforts were intended to restore the existing structure to a seven-ton weight capacity. Even with the substantial maintenance efforts, emergency response vehicles and most trucks (fuel, propane, and coal) still cannot legally use the bridge.

Based on the advanced state of structural deterioration, the existing Pond Eddy Bridge has been classified as “structurally deficient.” The term structural deficiency refers to the physical integrity of the various components of a bridge in relation to the load-carrying capacity for which it was designed or engineered. By definition, a structurally deficient bridge is safe but is in need of significant repairs or replacement to bring it to current standards. In regard to the Pond Eddy Bridge, the three major bridge components that factor into the structural deficiency determination are the deck, substructure, and superstructure. PennDOT’s bridge rating system, as outlined in Publication 100A, rates bridge conditions over a scale of 0 to 9 with a rating of 9 for excellent condition and 0 for failed condition. All three of these bridge components have a condition rating of 3, which is indicative of advanced deterioration. Additionally, FHWA’s bridge sufficiency rating formula provides a percentage rating scale with 100% representing an entirely sufficient bridge and 0% representing an entirely insufficient or deficient bridge. As a whole, the Pond Eddy Bridge has an overall sufficiency rating of 20%, which automatically qualifies it for replacement or repair. This low sufficiency rating provides further justification for the bridge being classified as structurally deficient.

Additionally, the existing bridge is classified as “functionally obsolete” due to a posted height restriction limitation and a substandard single-lane deck width. Specifically, the bridge is a through truss structure with limited vertical clearance of 13’6” and a single-lane deck width of
These existing bridge features are considered substandard by National Bridge Inspection Standards. The substandard deck width (single-lane crossing) forces vehicles to yield to oncoming traffic to avoid the potential risk of a head-on collision. While the rural nature of the project area and low average daily traffic (ADT) may limit the overall severity of these bridge deficiencies, they are, and will remain, conditions that present potential safety and access concerns for the traveling public until corrective actions are implemented.

B. ACCESS OVER THE RIVER TO THE VILLAGE OF POND EDDY

The Village of Pond Eddy consists of approximately 24 residences encompassing 2 municipalities - Shohola and Westfall Townships. The Pond Eddy Bridge is the lone access across the Delaware River to the community. The Pond Eddy residents use this bridge to travel to school, work, and stores. Representatives from the community have repeatedly expressed the need to have the bridge repaired or replaced so that basic access and essential services can get across the river to Pond Eddy. This has been demonstrated in numerous public meetings, meeting responses, and in personal telephone calls from local residents. The residents of Pond Eddy have stated that their needs include access for emergency service, fuel supply, concrete, septic maintenance, road maintenance, and other basic service delivery vehicles. The Shohola Township fire truck vehicles range from 20 to 26 tons. Through the many coordination efforts with the local constituency, PennDOT has evaluated weights for vehicles that typically provide emergency and basic services.

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C. SUMMARY OF PURPOSE AND NEED

Structural and functional deficiencies exist with the Pond Eddy Bridge, and these deficiencies present potential safety and access concerns for the traveling public to cross the Delaware River. Without improvements, the existing bridge will continue to deteriorate and will eventually require more stringent weight restriction limitations to the point that the bridge would be closed to vehicular traffic. The dependability of the structure would become questionable, and safety and access for the traveling public would be compromised. This concept is inconsistent with PennDOT’s mandate under PA Act 120 to provide adequate, safe, and efficient transportation facilities for the overall benefit of and use by the residents of the Commonwealth. As such, the purpose of the Pond Eddy Bridge Project is to provide a structurally sound bridge to carry S.R. 1011 over the Delaware River. The need for the project is based on the existing structural and functional deficiencies that currently prevent or limit adequate access over the Delaware River for the community of Pond Eddy.

In addition to the project needs and due to the unique circumstances of the project area, FHWA and PennDOT identified the following “project objectives” to be achieved with the bridge improvement project.

- Maintain access at all times for emergency services, school buses, and other goods and services to the isolated community of Pond Eddy
- Maintain access to the Upper Delaware Scenic and Recreational River
- Maintain access to the active Norfolk Southern rail line
- Maintain access to State Game Land 209 and the Delaware State Forest
- Design a solution in harmony with the characteristics of the general surroundings
- Design a solution respectful of the National Park Service’s Management Plan for the Upper Delaware River and its scenic and recreational values
- Design a solution that is financially achievable within the project’s current budget
III. IDENTIFICATION AND DESCRIPTION OF THE SECTION 4(f) RESOURCES
III. IDENTIFICATION AND DESCRIPTION OF THE SECTION 4(f) RESOURCES

The area in and around the Pond Eddy Bridge crossing contains several Section 4(f) resources, including:

A. Pond Eddy Bridge - Listed on National Register of Historic Resources,
B. Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail,
C. State Game Land No. 209, and
D. Delaware State Forest.

Detailed descriptions of these four Section 4(f) resources are provided below for reference purposes.

It is important to note that the project’s Determination of Eligibility Report identified a portion of the Delaware & Hudson (D&H) Canal within the project’s APE along the eastern (New York) side of the Delaware River. The report states that two segments of the D&H Canal had been previously determined to be National Historic Landmarks (NHL), one segment within Lackawaxen Township, Pike County, and a second segment in the vicinity of Honesdale, Wayne County (see Appendix B, D&H Canal NHL Nomination Form). However, the portion of the D&H Canal within the project APE was significantly altered when NY State Route 97 was constructed over the formal canal in the 1930s. Further coordination with the National Park Service (NPS) and a review of the NHL nomination form revealed that this portion of the D&H Canal is not part of the NHL. No significant portions of the canal were identified within the project APE; however, while the canal has not been visually confirmed within the APE, potential archaeological remains associated with the canal may still exist. As part of the Section 106 commitments, PennDOT and the NYSHPO agreed (January 17, 2007) to have an archaeological monitor on-site if any construction is undertaken in the area of the existing NY State Route 97 roadbed. The portion of the D&H Canal that passes through the project study area is not part of a National Historic Landmark segment. The portion of the D&H Canal that passes through the project study area is not identified as a Section 4(f) resource.

A. POND EDDY BRIDGE

1. Structure

The Pond Eddy Bridge is a two-span, pin-connected, Pennsylvania (Petit) through truss with cut stone mortared masonry abutments and a central pier. The superstructure consists of
two identical simple spans, each 252 feet center to center of bearings. Each truss has 12 equal panel lengths of 21 feet and exhibits varying elevations along the upper chord giving the “camel-back” appearance. The top chords of the trusses are made up of two channel sections connected together with a plate across the top flanges and with the bottom flanges laced together with flat bars. The bottom chords of the trusses are made up from multiple eyebar links. The truss diagonals act as pure tension members, and all diagonal bracing members to the upper chords are tension tie rods. All compression members in the upper chord bracing and the main truss verticals are made up of laced angle sections. The truss members are connected together using shear pins at all the truss nodes, resulting in a pure statically determinate structure. The deck is comprised of timber flooring supported on longitudinal rolled steel stringers, which are supported on steel built up riveted floor beams. The floor beams are suspended from the shear pins at the bottom chord nodes using pin plates.

Constructed in 1904-1905, the Pond Eddy Bridge was listed on the National Register of Historic Places on November 14, 1988, as a representative example of a multiple span Pennsylvania (Petit) truss bridge of moderate length. The original bridge to cross the Delaware River at this location was a Roebling-type, wooden suspension toll bridge constructed in 1871 by local resident John Decker. This original bridge sustained severe damage as a result of the famous “Pumpkin Flood,” which occurred on October 8-9, 1903. As a result of these damages, the Town of Lumberland hired the Owego Bridge Company from Owego, New York, which submitted the low bid of $28,900 to replace the severely damaged 1871 bridge with the current truss bridge.

The fabrication of the Pond Eddy bridge members took place during the summer of 1904 in the shops of the Owego Bridge Company, which were situated on the New York and Erie Railroad so that direct transport to Pond Eddy was possible. The abutments and center pier were constructed at Pond Eddy; however, it appears that at least a portion of the existing support structures may have been reused, including part of the northern abutment. The bridge was originally designed for two lanes, with a center dividing rail, but the center dividing rail was removed for deck repairs in 1911 and never replaced.

2. History of Bridge Maintenance

The history of the bridge repairs is descried below; however, it should be noted that the records are not detailed; therefore, specific details regarding each repair event are limited. Records indicate that repairs to the bridge were frequent, especially to the central pier, which
was often damaged by the “elements,” including the flow of ice and debris every year. In 1908 the bridge was painted, planking was replaced, and the central pier was repaired. Subsequent repairs were conducted in one form or another in 1911, 1914, 1916, 1918, 1919, and 1923. In 1927, the Town of Lumberland sold the Pond Eddy Bridge to the Interstate Bridge Commission for $3.00 because it needed extensive repairs.

Additional maintenance repairs were performed in 1969. In 1985, PennDOT conducted its first official bridge inspection of the Pond Eddy Bridge. As a result of this detailed bridge inspection, the deck superstructure and substructure all received condition ratings of 5 and a weight restriction posting for 8-tons. Then in 1987 the superstructure was given a condition rating of 4, thus rendering the bridge to be considered as “structurally deficient.” In 1999, emergency funds were used to place three new beams between deteriorated stingers. There are no records of bridge repairs conducted between 1969 and 1999.

In 2006, the wooden deck was repaired. Later that year and as a result of another detailed bridge inspection, PennDOT lowered the posted bridge restriction from eight tons to three tons. In 2007, emergency funding was secured and 14 steel stringers were repaired at a cost of $70,000. Following these emergency repairs, the bridge was reposted to a seven-ton load limit. In 2010 substantial repair efforts were completed for the pier nose and footing underpinning at a cost of $250,000. In December 2010, the existing bridge was downposted to a three-ton capacity. Substantial maintenance efforts were completed in 2011 including the replacement of 64 steel stringers at a cost of $500,000. The 2011 stringer replacement efforts were intended to restore the existing structure to a seven-ton weight capacity. From 2007 to 2011, $820,000 have been invested into the maintenance of the existing structure. Even with the substantial maintenance efforts, emergency response vehicles and most trucks (fuel, propane, and coal) still cannot legally use the bridge. Within the next five years, additional maintenance would likely be required to maintain the existing seven-ton weight capacity.

B. UPPER DELAWARE SCENIC AND RECREATIONAL RIVER/ PENNSYLVANIA WATER TRAIL

The Upper Delaware Scenic and Recreational River consists of 73.4 miles of free-flowing river beginning at the confluence of the East and West Branches at Hancock, New York, and extending downstream to Railroad Bridge No. 2 in the vicinity of Mill Rift, Pennsylvania. A component of the National Wild and Scenic Rivers System since November 10, 1978, the Upper Delaware Scenic and Recreational River is under the administrative jurisdiction of the NPS but is managed in cooperation with a number of partnering agencies, including the Upper Delaware
Council. The Upper Delaware River is the only major river along the entire North Atlantic coast that remains undammed along its main stem and is one of only a few river segments in the northeastern United States to have been designated as a component of the National Wild and Scenic Rivers System. To receive such recognition, a river and its surrounding environment must possess resources of outstanding quality, including scenic, recreational, geologic, fish and wildlife, and/or historic and cultural resources.

Recognized for its scenic quality and abundant recreational opportunities, the Upper Delaware Scenic and Recreational River consists of riverfront villages set among a backdrop of forested hills ranging in elevation from 500 to 2,000 feet. Major recreational opportunities in the river corridor include sightseeing, boating, camping, hunting, fishing, hiking, and bird watching. The river corridor is especially noted for its resident Bald Eagle population and Roebling's Delaware Aqueduct at Lackawaxen, Pennsylvania. Recreational opportunities within the immediate vicinity of the Pond Eddy Bridge consist predominantly of boating (i.e., canoeing, kayaking, rafting, tubing, etc.) and fishing for traditional warmwater river species (i.e., smallmouth bass, walleye, sucker, etc.).

With respect to the recreational boating opportunities associated with the Upper Delaware Scenic and Recreational River, it is important to note that this section of the Delaware River has also been designated as a Pennsylvania Water Trail by the PFBC. Water trails are boat routes suitable for canoes, kayaks, and small motorized watercraft. Like conventional trails, water trails are recreational corridors between specific locations. Water trails are comprised of access points, boat launches, day use sites, and, in some cases, overnight camping areas. Each water trail is unique, a reflection of Pennsylvania’s diverse geology, ecology, and communities. The official trail sponsor for the Delaware River Water Trail is the Delaware River Greenway Partnership. Within Pennsylvania, the FHWA has determined that officially designated water trails qualify as Section 4(f) resources as a result of their primary recreational component.

C. STATE GAME LAND NO. 209

Located in northeastern Pike County in Shohola and Westfall Townships, State Game Land No. 209 (Figure 1) is approximately 4,329 acres in size; is owned, managed, and maintained by the PGC; and is considered to be a public hunting area open to the general public for the lawful pursuit of game and other permitted recreational uses. Land cover in State Game Land No. 209 consists predominantly of wooded terrain interspersed with ponds,
swamps, and Pond Eddy Creek. The most prevalent game species are deer, bear, turkey, and grouse. As such, the peak use of this game land coincides with Pennsylvania’s traditional fall hunting seasons (October through December) as well as the spring turkey hunting season in April and May. Within Pennsylvania, State Game Lands are specifically protected under Section 2002 of PA Act 120 and are regarded as Section 4(f) resources.

D. DELAWARE STATE FOREST

The Delaware State Forest (Figure 1) is a sprawling public land encompassing more than 80,000 acres in 14 separate tracts and contained in portions of Pike, Monroe, Northampton, and Carbon Counties. While this is a sparsely populated part of the state, it is within a two-hour drive of New York City and Philadelphia; therefore, the Delaware State Forest is heavily used. Recreational opportunities include hunting, fishing, hiking, bird watching, snowmobiling, cross country skiing, mountain biking, and many other active and passive recreational activities. The Delaware State Forest is under the administrative jurisdiction of the Pennsylvania DCNR.
IV. ALTERNATIVES ANALYSIS
IV. ALTERNATIVES ANALYSIS

In an effort to address the purpose and need of the project, an analysis of alternatives was developed for the project. Understanding the sensitive nature of the different Section 4(f)-protected resources within the project area, several alternatives were evaluated as part of the Alternatives Analysis for the project. The alternatives identified for consideration were developed not only as part of the engineering feasibility studies but also the Section 106 consulting party and public meeting forums. The scope of the alternatives analysis included an evaluation of the following groups of alternatives.

A. Alternatives Considered and Dismissed from Detailed Alternatives Analysis

1. Pond Eddy Buyout
2. State Game Lands Alternate Access
3. Southern Access Road from Mill Rift, Pennsylvania
4. Parker’s Glen Alternate Access

B. Alternatives Considered in Detail

1. Total Section 4(f) Resource Avoidance Alternatives
   i. No Build
   ii. Rehabilitation

2. Other Alternatives Considered in Detail
   i. Bridge Replacement
   ii. Dual Bridge
   iii. Rehabilitation with Strengthening and/or Widening

All of these alternatives and their various scenarios are presented below in their appropriate category for analysis purposes.

A. ALTERNATIVES CONSIDERED AND DISMISSED FROM DETAILED ALTERNATIVES ANALYSIS

1. Pond Eddy Buyout Alternative

   The Pond Eddy Buyout Alternative proposes the acquisition of all private properties located on the Pond Eddy, Pennsylvania, side of the Delaware River thereby eliminating the need for a safe, reliable bridge crossing at this location. Under this alternative, all residences and other private properties located along Rosa and Flagstone Roads would be acquired via an Eminent Domain take and the existing Pond Eddy Bridge would be closed to vehicular traffic.
Once taken out of service, PennDOT would look to transfer ownership to another party in accordance with the project’s marketing plan. PennDOT would market the reuse of the bridge as part of their commitment to the Section 106 consultation process. PennDOT will work with interested parties identified during the marketing process or other groups who present themselves to relocate or reuse all or portions of the bridge. The development and implementation of a Marketing Plan would be associated with an approved Memorandum of Agreement (MOA) with the State Historic Preservation Officer as part of the Section 106 coordination process.

If a new owner could not be identified, the existing Pond Eddy Bridge would be considered for removal. If removed, this alternative would limit public access to State Game Land No. 209, the Delaware State Forest, and the active Norfolk Southern rail line located on the Pennsylvania side of the Delaware River. As part of the public meeting coordination efforts for the project, PennDOT has received feedback from the local officials and residents of Pond Eddy that they oppose the Pond Eddy Buyout Alternative. The local residents and public officials signed a petition and submitted it to PennDOT documenting their opposition to the Buyout Alternative. A copy of the signed petition is provided in Appendix C. The estimated cost for the Buyout Alternative is $9.5 million. Given the inability to meet the project purpose and need and impact to the local community, the Pond Eddy Buyout Alternative was dismissed from further consideration.

2. State Game Land Alternate Access Alternative

This alternative would construct a new two-lane roadway through Pennsylvania State Game Land 209 (SGL 209). The roadway would originate at State Route 6 in Milford Township, Pennsylvania, and travel in a northerly direction for a distance of 4.8 miles toward the community of Pond Eddy. Approximately two miles of the existing Fire Tower Road through the Delaware State Forest would need to be upgraded from an improved dirt road to meet current PennDOT design criteria. Additionally, Fire Tower Road would need to be extended approximately 2.8 miles through primarily SGL 209 from the Buckhorn Ridge Fire Tower in the Delaware State Forest to the northern terminus of the existing S.R. 1011 roadway in Pond Eddy (Figure 2). This alternative may avoid any use of the National Register-listed Pond Eddy Bridge and Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail by providing an alternate public access to the community of Pond Eddy, Pennsylvania.
While this alternative would avoid the existing Pond Eddy Bridge and Upper Delaware River, it would require the construction of approximately 4.8 miles of roadway including 2.8 miles through SGL 209. This new roadway construction would require traversing the rolling terrain of the SGL 209 and Pond Eddy Creek watershed. Water uses in the Pond Eddy Creek watershed are protected for High Quality Cold Water Fishes, and the PFBC identifies the stream as a wild trout stream and a Class A trout waters. Wetlands located in and along the floodplain of Pond Eddy Creek and its tributaries are protected as Exceptional Value in accordance with Pennsylvania Department of Environmental Protection (PA DEP) Chapter 105 regulations. The proposed SGL 209 Alternate Access Alternative would impact wildlife habitat, an unknown number of jurisdictional wetlands, including potential EV wetlands, Pond Eddy Creek tributaries, and would permanently alter recreational opportunities within the State Game Land. Additionally, this alternative would substantially change the point of access to Pond Eddy, Pennsylvania, resulting in disruption of the community’s existing travel patterns. Rather than the existing point of access from Route 97 directly across the Delaware River in New York, this new roadway would be accessed off Route 6 just outside Milford. The costs for the State Game Lands 209 Alternate Access Alternative are estimated at $43.7 million ($6.5 million per mile plus design 30%, inspection 10% of construction cost).

With the construction of the State Game Lands Alternate Access, there would no longer be a need for a safe, reliable bridge crossing over the Delaware River at this location. Therefore, the Pond Eddy Bridge would be taken out of service and PennDOT would look to transfer ownership to another party in accordance with the project’s marketing plan. PennDOT would market the use or reuse of the bridge as part of their commitment to the Section 106 consultation process. PennDOT would work with interested parties identified during the marketing process or other groups who present themselves to use or reuse all or portions of the bridge. The development and implementation of a Marketing Plan would be associated with an approved MOA with the State Historic Preservation Officer as part of the Section 106 coordination process. If a new owner could not be identified, the existing Pond Eddy Bridge would be considered for removal.

This alternate would not meet the project purpose for providing a structurally sound crossing of S.R. 1011 over the Delaware River. This alternative would require use of Section 4(f) property, upgrade or construct a new at-grade road crossing of the Norfolk Southern Railroad, and a new permanent right-of-way for roadway template and stormwater conveyance features. Agency correspondence (Appendix D) indicates that alternate access through the State Game Land would not be favored by the PGC. Given the inability to meet the project
purpose and need, impacts to the State Game Land and natural resources, the impacts to the community’s existing travel patterns, and substantial required costs, the State Game Lands Alternate Access Alternative was dismissed from further consideration.


This alternative considers alternative access to the Village of Pond Eddy along the Norfolk Southern Railroad from Mill Rift, Pennsylvania, to the south. This alternative would construct a new two-lane roadway through Delaware State Forest land (including the Buckhorn Natural Area and the Stairway Wild Area) and the Norfolk Southern Railroad (Figure 3). The roadway would originate in the vicinity of Mill Rift, Pennsylvania, and travel in a northwesterly direction for a minimum of 4.5 miles toward the community of Pond Eddy. The new roadway construction would require similar costs and have similar constraints that were identified with the State Game Land Alternate Access Alternative. Additionally, this alternative would substantially change the point of access to Pond Eddy, Pennsylvania, resulting in disruption of the community’s existing travel patterns. It is estimated that the construction cost for this alternate would be $41 million ($6.5 million per mile plus design 30%, inspection 10% of construction cost).

With the construction of the Southern Access from Mill Rift, there would no longer be a need for a safe, reliable bridge crossing over the Delaware River at this location. Therefore, the Pond Eddy Bridge would be taken out of service and PennDOT would look to transfer ownership to another party in accordance with the project’s marketing plan. PennDOT would market the use or reuse of the bridge as part of their commitment to the Section 106 consultation process. PennDOT would work with interested parties identified during the marketing process or other groups who present themselves to use or reuse all or portions of the bridge. The development and implementation of a Marketing Plan would be associated with an approved MOA with the State Historic Preservation Officer as part of the Section 106 coordination process. If a new owner could not be identified, the existing Pond Eddy Bridge would be considered for removal.

Correspondence from the Pennsylvania DCNR indicates that alternate access through the state forest would not be favored by the agency (see Appendix D). This alternative would not meet the project purpose for providing a structurally sound crossing of S.R. 1011 over the
Figure 3
Job No: R09-0107.006
Scale: 1" = 2000'

State Game Land No. 209
Delaware State Forest

Legend
- Alternative Access
- Pennsylvania State Game Land
- Pennsylvania State Forest

Source: U.S.G.S. 7.5’ Quadrangle - Pond Eddy, New York and Milford, Pennsylvania

Westfall and Shohola Townships
Pike County, Pennsylvania and Town of Lumberland
Sullivan County, New York

Pond Eddy Bridge Project
S.R. 1011, Section 470
Mill Rift Alternate Access Alternative
Delaware River. Based on the inability to meet the project purpose and need, substantial costs, impacts to the community’s existing travel patterns, and impacts to the state forest and natural resources, the Mill Rift Alternate Access Alternative was dismissed from further consideration.

4. Parker’s Glen Alternate Access Alternative

The Parker’s Glen Alternate Access Alternative considers extending Parker’s Glen Road (T-446) approximately 2.5 miles alongside and within the right-of-way of the existing Norfolk Southern rail line from Parker’s Glen to the northern terminus of the existing S.R. 1011 roadway in Pond Eddy (Figure 4). This alternative may avoid any use of the National Register-listed Pond Eddy Bridge and Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail by providing an alternate public access to the community of Pond Eddy, Pennsylvania.

While this alternative would avoid the existing Pond Eddy Bridge, it would require the construction of approximately 2.5 miles of new roadway alongside and within the right-of-way of the existing Norfolk Southern rail line that extends from Pond Eddy to Parker’s Glen and beyond. This public roadway construction within existing railroad right-of-way would create safety concerns associated with train-vehicle conflicts. Use of railroad right-of-way would require coordination and permission from Norfolk Southern.

In addition to the 2.5 miles of new roadway construction alongside the Norfolk Southern rail line, approximately 2.5 miles of the existing Parker’s Glen Road (T-446) from Parker’s Glen to the Walker Lake/Twin Lakes area would have to be upgraded from an improved narrow dirt road to meet current PennDOT design criteria. This 2.5-mile section of existing Parker’s Glen Road consists of a narrow dirt road in a steeply sloping mountainous area. Due to the sloping nature of the terrain, any planned roadway design would need to address slope stability for the proposed road. As such, the total length of roadway improvements would be approximately 5.0 miles for the Parker’s Glen Alternate Access Alternative. This alternative would substantially change the point of access to Pond Eddy, Pennsylvania, resulting in disruption of the community’s existing travel patterns. Rather than the existing point of access from Route 97 directly across the Delaware River in New York, this new roadway would be accessed off Twin Lakes Road (S.R. 1005) from the Shohola, Pennsylvania-Barryville, New York, area.
It is estimated that the construction cost alone for this alternative would be $6.5 million per mile, or $32.5 million plus $13 million for design and construction inspection costs (design 30%, inspection 10% of construction cost). The sum total for the Parker's Glen Alternate Access Alternative is estimated to be in excess of $45.5 million. Due to the undeveloped, mountainous nature of the forested hillside, this alternative would result in impact to the natural environment in the area.

With the construction of the Parker’s Glen Alternative, there would no longer be a need for a safe, reliable bridge crossing over the Delaware River at this location. Therefore, the Pond Eddy Bridge would be taken out of service and PennDOT would look to transfer ownership to another party in accordance with the project’s marketing plan. PennDOT would market the reuse of the bridge as part of their commitment to the Section 106 consultation process. PennDOT would work with interested parties identified during the marketing process or other groups who present themselves to relocate or reuse all or portions of the bridge. The development and implementation of a Marketing Plan would be associated with an approved MOA with the State Historic Preservation Officer as part of the Section 106 coordination process. If a new owner could not be identified, the existing Pond Eddy Bridge would be considered for removal.

This alternative would not meet the project purpose for providing a structurally sound crossing of S.R. 1011 over the Delaware River. Based on the inability to meet the project purpose and need, environmental impacts, impacts to the community’s existing travel patterns, and substantial costs, the Parker’s Glen Alternate Access Alternative was dismissed from further consideration.

B. ALTERNATIVES CONSIDERED IN DETAIL

1. Total Section 4(f) Resource Avoidance Alternatives

i. No Build

The No Build (or Do-Nothing) Alternative involves taking no action (other than routine maintenance activities) and allowing the existing Pond Eddy Bridge to remain in place as is. No rehabilitative or any other significant structural improvements would be completed under this alternative. The nature of the deterioration of this structure is such that maintenance efforts cannot address it successfully. As such, this alternative would fail to correct the identified structural deficiencies and the associated weight restriction limitation of the existing bridge.
structure. This is supported by the maintenance performed over the last several years, as documented in the “History of Bridge Maintenance” section of this report.

Without improvements, the existing bridge would continue to deteriorate, and the posted weight limit would eventually be lowered. The dependability of the structure would become questionable, and safety for motorists and pedestrians would be compromised. The bridge would eventually have to be closed because it would not be able to carry any loads safely. Closure of the bridge would result in a complete loss of the crossing of the Delaware River at this location; which would force the residents of Pond Eddy, Pennsylvania, to abandon their homes and property. Bridge closure would also limit public access to the State Game Land No. 209, the Delaware State Forest, and the active Norfolk Southern rail line.

The No Build Alternative does not meet the project purpose and need; therefore, it is not a prudent or feasible project alternative. The No Build Alternative is considered as a baseline for the comparative analysis of the alternatives for the project.

ii. Bridge Rehabilitation Alternative

The Bridge Rehabilitation Alternative considers rehabilitating the existing Pond Eddy Bridge to its original capacity to carry S.R. 1011 over the Delaware River. The Pond Eddy Bridge was constructed in 1904; as such, the existing structure has weakened over the years as evinced by its downposting to a seven-ton weight limit and at times the emergency posting down to a three-ton limit. To adequately assess the condition of the bridge and evaluate the rehabilitation options, PennDOT commissioned the following engineering evaluations (Appendix E).

- Hatch Mott MacDonald (HMM) Engineering Feasibility Study (February 2003) with the incorporation of the in-depth bridge inspection reports prepared by McFarland-Johnson Engineers, Inc. and HNTB Corporation
- PennDOT Bridge Quality Assurance Division - Hal Rodgers Report (November 2006)
- Michael Baker, Jr., Inc. - Second Opinion Report (March 2009)

These evaluations were used to evaluate the structural condition of various components of the existing bridge in order to determine the necessary work efforts that would be required as part of the Bridge Rehabilitation Alternative. The evaluation of a Bridge Rehabilitation Alternative is described below.
Rehabilitation Option 1 (Restore Bridge to Original As-Built Condition)

This option evaluated rehabilitative efforts to restore the existing bridge to its original as-built condition. The extent of the deterioration includes many aspects of the bridge structure and thus would require repair or replacement of individual bridge components including stringers, floor beams, and truss members. To repair the bridge to get it back to the original condition, the following repairs would be required.

1. Replacement of the deck with a new timber deck
2. Replacement of many of the stringers and floor beams
3. Repairs to the truss members
4. Extensive reconstruction of the substructure
5. Replacement of several deteriorated pins

Implementation of these efforts would allow for a maximum weight bridge posting of 15 to 18 tons with a life expectancy of 10 to 20 years before another major bridge rehabilitation would be necessary. The rehabilitated structure will remain a single-lane bridge with a 14'10" curb-to-curb width. To repair the structure, a temporary support system would need to be erected to conduct the necessary rehabilitation efforts, specifically for the replacement of deteriorated pins. Additionally, traffic could not be maintained on the existing bridge during construction. A temporary bridge would need to be constructed to maintain access across the Delaware River for Pond Eddy, Pennsylvania. Construction of the temporary support system and the temporary river crossing bridge would require additional access and impacts to the Delaware River. The temporary support system would be required through one to two construction seasons. The implementation of these short-lived rehabilitative efforts would be costly and require substantial access within the Delaware River.

It is noted that the proposed pin replacement is problematic since a temporary support system is needed to conduct the necessary rehabilitation efforts. The rehabilitation of the deck, stringers, floor beams, and truss members alone would not increase the load-carrying capacity of the bridge, as the pins are the bridge component that control the load rating. If the existing pins were to be left in place in their deteriorated condition, the bridge would be posted for only 13 tons and the life expectancy of the rehabilitation would be reduced to 5 to 10 years.
Summary of Rehabilitation Option 1

Due to the advanced deterioration of the bridge, the rehabilitation would require substantial costs associated with a temporary support system, river access, and a temporary access bridge. Replacement of the pins would be difficult and costly. The rehabilitation would require the installation of causeways in the river so that a temporary support system could be erected to complete the bridge repairs. Additionally, because the existing bridge would require significant repair, traffic could not be maintained on the existing bridge during construction. Therefore, a temporary bridge would need to be constructed to maintain access to Pond Eddy, Pennsylvania. PennDOT and Erdman Anthony (PennDOT’s bridge engineer) have determined that the cost to complete the rehabilitation of the existing bridge, Option 1, is estimated at $15.3 million and would require substantial access within the Delaware River. The life expectancy for the rehabilitation options would be expected to be 10 to 20 years and involve annual maintenance costs estimated at $18,000. Pursuance of the rehabilitation (Option 1) would involve a substantial investment for a limited life expectancy. In New York State, the standard life expectancy for bridges is 50 years.

Implementation of Option 1 of the rehabilitation alternatives would result in a bridge structure with a posted weight restriction limitation between 15 and 18 tons and a limited life expectancy of 10 to 20 years. There are design exceptions under PennDOT’s Design Manual Standards or with the Smart Transportation Policy to allow a downposting to accommodate lower load ratings (MS-13.5 ≈23 tons) for bridge crossings in certain applicable circumstances. In the case of a sole crossing across the Delaware River, this would not be an applicable site. Local residents have stated their need to have effective and safe crossing over the Delaware River for not only their personal transportation but also for basic and emergency services, as documented under the Purpose and Need Section. Therefore, Option 1 only partially satisfies the project’s purpose and need.

The evaluation of rehabilitation options was completed by PennDOT and HMM. Michael Baker, Jr. Inc. completed an independent review of the engineering evaluations and agreed with the findings of the previous evaluations and agreed that the rehabilitation (Option 1) would not adequately provide a structurally sound bridge to carry S.R. 1011 over the Delaware River. Rehabilitation of the bridge is feasible; however, due to the engineering complexity leading to excessive cost, substantial access within the Delaware River, limited life expectancy, and its ability to only partially meet the project purpose and need for the project, Rehabilitation Option 1 is not considered a prudent alternative.
2. Other Alternatives Considered in Detail

i. Bridge Replacement Alternative

The Bridge Replacement Alternative would involve the construction of a new bridge structure immediately upstream of the existing Pond Eddy Bridge. HMM considered bridge replacement options as part of their 2003 Engineering Feasibility Study. The HMM study specifically identified four bridge design options for consideration for the Bridge Replacement Alternative.

- Three-span continuous steel multi girder bridge (Option A-1)
- Four-span prestressed concrete I-beam bridge (Option A-2)
- Two-span simply supported steel through truss bridge (Option A-3)
- Two-span continuous welded steel plate girder bridge (Option A-4)

The two-span continuous welded steel plate girder bridge (Option A-4) was initially determined to pose potential backwater and flooding concerns associated with required beam depths; therefore, it was not further considered. Cost estimates were developed for comparison of the replacement options.

### TABLE 2
COST SUMMARY FOR BRIDGE REPLACEMENT OPTIONS

<table>
<thead>
<tr>
<th>BRIDGE REPLACEMENT OPTIONS¹</th>
<th>ESTIMATED CONSTRUCTION COST²,³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-span continuous steel multi-girder bridge (A-1)</td>
<td>$9,400,000</td>
</tr>
<tr>
<td>Four-span prestressed concrete I-beam bridge (A-2)</td>
<td>$9,600,000</td>
</tr>
<tr>
<td>Two-span simply supported steel through truss bridge (A-3)</td>
<td>$10,360,000</td>
</tr>
</tbody>
</table>

1: Estimated lifespan is approximately 100 years
2: Costs are referenced from the 2010 Erdman Anthony Cost updates and include an estimated amount of $825,000 for disassembly of the existing Pond Eddy Bridge
3: Annual maintenance costs are estimated at $10,000 for the replacement options

As part of the Section 106 coordination process, consulting party members questioned whether a replacement alternative would create backwater flooding concerns for upstream properties. To address these concerns, PennDOT commissioned NTM Engineering to complete a hydraulic and hydrologic study to evaluate the backwater flooding potential for the replacement alternative. The four-span pre-stressed concrete I-beam bridge (Option A-2) was
evaluated in these analyses because the four-span three-pier design was considered to represent the “worst-case scenario” from a potential flooding encroachment perspective. The results of the NTM study determined that the proposed replacement alternative would not create a backwater flooding problem for the upstream properties. The replacement alternative would adequately pass the 100-year flow through the crossing location without impacts to the surrounding environment.

Advancement of the replacement alternative would involve the construction of a new bridge structure immediately upstream of the existing Pond Eddy Bridge (with use of a temporary causeway), so that the existing bridge can be used to maintain traffic during project construction. Following project construction, the existing Pond Eddy Bridge would be removed and marketed for reuse at another location. The replacement alternative would be designed to meet current PennDOT design criteria for safety and load carrying capacity. This alternative meets the project purpose and need by providing a structurally sound bridge to carry S.R. 1011 over the Delaware River.

This alternative, however, would result in an obvious use of the National Register-listed Pond Eddy Bridge and the Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail on both a temporary and permanent basis. The permanent impacts to these resources are the removal of the historic bridge and construction of the new bridge with the placement of piers at potentially new locations in the water trail. The replacement option includes a balanced consideration of impacts (minimizing flooding and direct encroachment within the Delaware River) with economic costs while meeting the purpose and need of the project. The replacement alternative has been hydraulically modeled and shown to avoid backwater flooding impacts. Advancement of this alternative would involve further consideration of avoidance and minimization measures for the Delaware River and coordination with the NPS, PFBC, and permitting agencies through the Final Design and Permitting phase of the project. The Replacement Alternative is carried forward into the Assessment of Least Harm with the Other Alternatives Considered in Detail.

ii. Dual Bridge Alternative

The Dual Bridge Alternative would consist of constructing a new bridge structure immediately upstream of the existing Pond Eddy Bridge and the existing Pond Eddy Bridge would remain in place but would be closed to vehicular traffic. The existing bridge would remain in place, assuming that a new owner could be identified through the marketing plan, as a means
of preserving the National Register-listed bridge structure. In effect, this alternative would result in two side-by-side bridge crossings of the Delaware River at Pond Eddy.

This alternative was developed in response to comments issued by the Section 106 Consulting Parties related to the preservation of the existing Pond Eddy Bridge. The Dual Bridge Alternative would meet the project purpose and need by providing a safe, structurally sound means for crossing of S.R. 1011 over the Delaware River. The NPS notified PennDOT that a dual bridge alternative would be in conflict with the NPS’s ten-bridge limit management policy for the implementation of Section 7 of the National Wild and Scenic Rivers Act for the Upper Delaware River (Appendix F). The NPS also expressed concern regarding the aesthetic tunneling effect of passing under two adjacent bridges and the associated impact that this alternative could have on the recreational experience of local boat traffic. Additionally, the Dual Bridge Alternative would result in an increase in the number of piers within the river, including potentially three piers for the proposed structure and the lone center pier for the existing bridge. The increased number of new piers combined with leaving the existing large center pier in place would result in an increase in the 100-year flood elevation and raise backwater flooding concerns. The Dual Bridge Alternative is carried forward into the Assessment of Least Harm with the Other Alternatives Considered in Detail.

iii. Rehabilitation with Strengthening and Widening

Rehabilitation Option 2 (Rehabilitate and Strengthen Bridge to HS-20 Capacity)

This option considered rehabilitative efforts to strengthen the existing structure to meet the HS-20 (36 Ton) vehicle load capacity. The HMM study of the existing bridge determined that the deck, stringers, floor beams, 45% of the truss members, and several of the truss pins did not satisfy the HS-20 vehicle rating criteria. The HMM study evaluated the components of the existing bridge, in their original non-deteriorated condition, and characterized them to have the following inventory and operating rating capacities. In accordance with the AASHTO Manual for Condition Evaluation of Bridges, inventory rating refers to the load that can safely utilize the bridge for an indefinite period of time. Operating load is the maximum permissible live load that can be placed on the bridge. Unlimited usage at the operating rating level will reduce the life of the bridge.
The existing interior stringers supporting the 4"x8" timber deck were rated for flexure and shear resulting in an inventory rating of 17 tons and operating rating of 24 tons.

The existing floor beams were checked for flexure and shear resulting in an inventory rating of 13 tons and operating rating of 20 tons.

The existing hanger plates are deteriorated (as determined by McFarland-Johnson Engineers inspection) and thus checked for tension, shear, block shear, and bearing resulting in an inventory rating of 37 tons and an operating rating of 42 tons.

The rating of the pins was evaluated as part of the HNTB inspection (January 1970) and the pins were checked for shear, bearing, and bending, resulting in several pins failing in bending. The controlling pins were determined to be U1 and U7 with an inventory rating of 11 tons and an operating rating of 18 tons.

Significant deterioration is present in many of the bridge components, including the stringers, floor beams, bridge deck, pins, and masonry pier. This deterioration has necessitated that the bridge have a posted weight limit ranging from eight tons to three tons depending on the state of deterioration and level of emergency repairs.

Based on the strength of existing members and the condition of the structure, the following repairs and rehabilitation were recommended in the HMM study in order to increase the load carrying capacity of the bridge for HS-20 loading.

- The existing timber deck would be replaced with an open steel grid deck.
- The existing stringers would be replaced with 4 steel stringers, W18x50, M270 Grade 36. The new stringers would be coped at the ends at the top flange to avoid interference with the existing floor beams. The stringers would be bolted to the web of the existing floor beams using connection angles and high strength bolts.
- The existing floor beams would be strengthened by adding 2⅛" steel plates, M270 Grade 36, to the top and bottom flanges. Significantly deteriorated floor beams would be replaced with new beams sized to accommodate intended higher load rating capacity.
- The existing top chord members would be strengthened by using a 5/16"x16" plate at the bottom face of the member. The existing lacing bars would be removed in stages as the new plate is being installed. The existing truss diagonals, verticals, and bottom chord tension members would be strengthened with cables or adjustable bars that are connected to the truss pins and placed directly over the existing members.
- Based on the condition rating, a minimum of eight pins of the upper truss chord do not meet the loading criteria and would need to be replaced. However, this type of truss bridge requires all members to be connected by a single pin at each of the panel points. Removing the truss pins would require disconnecting and temporarily supporting all the truss members framing into that panel, including the span itself.
If existing members are severely deteriorated, new steel members would be installed. As with the replacement of truss pins, truss member replacement would require temporary support of the bridge while existing truss members are removed and new members installed. In addition to strengthening of the bridge superstructure, the existing piers and abutments require masonry repairs. The foundation of the existing pier, located in the center of the river, should also be underpinned to alleviate ongoing scour issues.

Implementation of these efforts would allow for a maximum weight bridge posting at 36 tons with a life expectancy of 10 to 20 years before another major bridge rehabilitation would be necessary. The existing structure, in its original non-deteriorated condition, is sized to carry a 15- to 18-ton load capacity. In order to increase the load capacity, as well as to repair significant areas of deterioration, numerous bridge components, including the deck, floor beams, stringers, and various truss members, would have to be replaced or significantly modified. The extent of the repairs could include using beams and members that are larger in size, replacing lacing bars on the upper chords with steel plates, adding cables adjacent to designated truss members to increase the load-carrying capacity, and replacing pins. The utilization of bigger beams and member strengthening with cables along with the appropriate pin replacement will accommodate the desired increased load capacity. The changes, however, would compromise character-defining features of the truss and impact the bridge’s materials, workmanship, feeling, and association. Changes to the bridge fabric to allow for a maximum weight bridge posting at 36 tons would affect its historic integrity. In particular, replacing existing beams and members with larger ones will alter the fabric. The addition of cables and adjustable bars would not only alter the fabric but would also add visual components inconsistent with the original design and construction. Changes to the substructure such as the steel open grid deck, replaced stringers, and strengthened floor beams may not be visible alterations; however, the addition of larger beams and members and the addition of cables and adjustable bars would be. The additive nature of the necessary changes would alter the characteristics of the Pond Eddy Bridge that made it eligible for inclusion in the National Register. This level of bridge strengthening would diminish the historic integrity of the original bridge design.

The rehabilitated structure will remain a single-lane bridge with a 14’10” curb-to-curb width. Additionally, traffic could not be maintained on the existing bridge during construction. A temporary bridge would need to be constructed to maintain access across the Delaware River for Pond Eddy, Pennsylvania. Construction of the temporary support system and the temporary
river crossing bridge would require additional access and impacts to the Delaware River. The implementation of these rehabilitative efforts would be costly, require substantial access within the Delaware River, and diminish the historic integrity of the original bridge design.

Rehabilitation Option 3 (HS-20 Loading with Deck Widening)

This option considered rehabilitating the structure to meet the HS-20 (36-ton) load capacity along with widening the existing structure to maintain two lanes of traffic. To do so, the existing structure would need to be dismantled to rehabilitate the truss members and the entire floor system (deck, stringers, and floor beams) would need to be replaced. A new lateral bracing system for the truss would also have to be constructed to accommodate the wider structure. This option would also require the in-stream pier and abutments to be widened to accommodate a two-lane bridge crossing.

In order to increase the load capacity as well as to repair significant areas of deterioration, numerous bridge components, including the deck, floor beams, stringers, and various truss members, would have to be replaced or significantly modified. The extent of the repairs could include using beams and members that are larger in size, replacing lacing bars on the upper chords with steel plates, adding cables adjacent to designated truss members to increase the load-carrying capacity, and replacing pins. The utilization of bigger beams and member strengthening with cables along with the appropriate pin replacement will accommodate the desired increased load capacity. The changes, however, would compromise character-defining features of the truss and impact the bridge’s materials, workmanship, feeling, and association. Changes to the bridge fabric to allow for a maximum weight bridge posting at 36 tons would affect its historic integrity. In particular, replacing existing beams and members with larger ones will alter the fabric. The addition of cables and adjustable bars would not only alter the fabric but would also add visual components inconsistent with the original design and construction. Changes to the substructure such as the steel open grid deck, replaced stringers, and strengthened floor beams may not be the visual alterations; however, the addition of larger beams and members and the addition of cables and adjustable bars would be. The additive nature of the necessary changes would alter the characteristics of the Pond Eddy Bridge that made it eligible for inclusion in the National Register. The bridge strengthening and widening efforts would diminish the historic integrity of the original bridge design.

Construction of the temporary support system and the temporary river access would also require additional access and impacts to the Delaware River. The implementation of these
rehabilitative efforts would be costly, require substantial access within the Delaware River, and diminish the historic integrity of the original bridge design.

Summary of the Rehabilitation Options 2 and 3

Due to the advanced deterioration of the bridge, rehabilitation would require substantial costs associated with a temporary support system, river access, and a temporary access bridge. Replacement of the pins and/or widening the structure would be difficult and costly. The rehabilitation would require the installation of causeways in the river so that a temporary support system could be erected to complete the bridge repairs. Additionally, because the existing bridge would require significant repair, traffic could not be maintained on the existing bridge during construction. Therefore, a temporary bridge would need to be constructed to maintain access to Pond Eddy, Pennsylvania. PennDOT and Erdman Anthony (PennDOT’s bridge engineer) have determined that the minimum rehabilitation costs for Option 2 (with strengthening) and Option 3 (strengthening with widening) are estimated at $16.3 million and $18.5 million, respectively. Depending on the extent of deterioration and strengthening needs, additional costs may be required for Options 2 and 3. Life expectancy would be approximately 10 to 20 years. Pursuance of these rehabilitation options would involve a substantial investment for a limited life expectancy. In New York State, the standard life expectancy for bridges is 50 years.

There are design exceptions under PennDOT’s Design Manual Standards or with the Smart Transportation Policy to allow a downposting to accommodate lower load ratings (MS-13.5 ≈ 23tons) for bridge crossings in certain applicable circumstances. In the case of a sole crossing across the Delaware River, this would not be an applicable site. Local residents have stated their need to have effective and safe crossing over the Delaware River for not only their personal transportation but also for basic and emergency services, as documented under the Purpose and Need section. Therefore, consideration of rehabilitation with strengthening to a lower load rating is not considered to be prudent based on the access needs for the community of Pond Eddy, Pennsylvania. Rehabilitation of the bridge with strengthening and/or widening may be feasible; however, there are engineering complexities leading to excessive cost, substantial access within the Delaware River, limited life expectancy, and impacts to the bridge’s historic integrity. Rehabilitation - Options 2 and 3 are carried forward into the Assessment of Least Harm with the Other Alternatives Considered in Detail.
C. SUMMARY OF ALTERNATIVES

Table 3 is provided to summarize each alternative for the project. The table outlines the estimated costs and summarizes each alternative with respect to meeting the project purpose and need, project objectives, construction access, life expectancy, and project impacts, including 4(f) resources (historic integrity of bridge, SGL, State Forest, and Delaware River).

**TABLE 3**
**POND EDDY BRIDGE PROJECT - ALTERNATIVES COMPARISON TABLE**

<table>
<thead>
<tr>
<th>PROJECT ALTERNATIVE</th>
<th>COST 1</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pond Eddy Buyout</td>
<td>$9.4 million</td>
<td>As part of the public meeting coordination efforts for the project, PennDOT has received feedback from the local officials and residents of Pond Eddy that they oppose the Pond Eddy Buyout Alternative. The local residents and public officials signed a petition and submitted it to PennDOT documenting their opposition to the Buyout Alternative. The Buyout alternative may be feasible, but given the impacts to the local community, this alternative is not a practical or prudent project alternative; therefore, this alternative was dismissed from further consideration.</td>
</tr>
<tr>
<td>SGL Alternate Access</td>
<td>$43.7 million</td>
<td>SGL Alternate Access would require use of the State Game Lands 209 and involve construction of 4.8 miles of new roadway with impacts to the surrounding environment and require substantial costs. Given the inability to meet the project purpose and need, impacts to the SGLs and other natural resources, community impacts due to changes in the existing travel patterns, and substantial required costs, the State Game Lands Alternate Access Alternative was dismissed from further consideration.</td>
</tr>
<tr>
<td>Mill Rift Alternate Access</td>
<td>$41 million</td>
<td>The Mill Rift Alternate Access would require use of the Delaware State Forest and involve construction of 4.5 miles of new roadway with impacts to the surrounding environment and require substantial costs. Given the inability to meet the project purpose and need, impacts to the state forest and other natural resources, community impacts due to changes in the existing travel patterns, and substantial required costs, the Mill Rift Alternate Access Alternative was dismissed from further consideration.</td>
</tr>
<tr>
<td>Parkers Glen Alternate Access</td>
<td>$45 million</td>
<td>The Parker’s Glen Alternate Access would require use of existing local roadway and lands adjacent to the existing Norfolk Southern Railroad. This alternative would involve construction of 5 miles of new roadway with impacts to the surrounding environment and substantial required costs. Given the inability to meet the project purpose and need, impact to the surrounding environment, community impacts due to changes in the existing travel patterns, and substantial required costs, the Parkers Glen Alternate Access Alternative was dismissed from further consideration.</td>
</tr>
<tr>
<td>PROJECT ALTERNATIVE</td>
<td>COST(^1)</td>
<td>REMARKS</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td>No Build</td>
<td>$150,000 - $200,000 annual maintenance(^2)</td>
<td>No rehabilitative or any other significant structural improvements would be completed under this alternative. The existing bridge would continue to deteriorate and compromise any safe access to Pond Eddy, PA. The No Build Alternative does not meet the project purpose and need for the project, but serves as the basis of comparison for the project alternatives.</td>
</tr>
<tr>
<td>Rehabilitation (Option 1)</td>
<td>$15.3 million</td>
<td>Bridge Rehabilitation Alternative would result in a bridge structure with a posted weight restriction limitation between 15 and 18 tons with a life expectancy of 10 to 20 years. The local residents and public officials have expressed a need to have safe efficient access for basic and emergency services. Substantial costs and access within the Delaware River are required for temporary bridge support and access for the rehabilitative efforts. Rehabilitation of the bridge may be feasible; however, advancement of this alternative is not prudent due to the engineering complexity leading to excessive cost, substantial access within the Delaware River, limited life expectancy, and its ability to only partially meet the project’s purpose and need.</td>
</tr>
<tr>
<td>Replacement</td>
<td>$9.6 million</td>
<td>The Replacement Alternative could be constructed immediately upstream of existing bridge and provide the safe, efficient access of S.R. 1011 over the Delaware River with a life expectancy of approximately 100 years. This alternative is carried forward into the Assessment of Least Harm.</td>
</tr>
<tr>
<td>Dual Bridge</td>
<td>$8.8 million</td>
<td>This alternative violates the NPS’s 10-bridge limit management policy for the implementation of Section 7 of the National Wild and Scenic Rivers Act for the Upper Delaware Scenic and Recreational River, negatively impacts recreational boating, increases backwater flooding, and involves finding a new owner to maintain the existing bridge in place. This alternative is carried forward into the Assessment of Least Harm.</td>
</tr>
<tr>
<td>Rehabilitation with Strengthening and or Widening (Options 2 and 3)</td>
<td>$16.3 million – 18.5 million</td>
<td>Bridge Rehabilitation (Options 2 and 3) would result in a bridge structure with a posted weight capacity of 36 tons with a life expectancy of 10 to 20 years. Substantial costs and access within the Delaware River are required for temporary bridge support and access for the rehabilitation efforts. Rehabilitation may be feasible; however, advancement of this alternative involves engineering complexities leading to excessive cost, substantial access within the Delaware River, limited life expectancy, and impacts to the historic integrity of the bridge. This alternative is carried forward into the Assessment of Least Harm.</td>
</tr>
</tbody>
</table>

\(^1\) 2009-2010 cost estimates  
\(^2\) Average annual maintenance costs from 2007-2011
D. ASSESSMENT OF LEAST HARM

1. Least Overall Harm Analysis

This section describes the project alternatives that were carried forward for further consideration as part of the Least Overall Harm Analysis. The following factors are to be considered when conducting the least harm analysis in accordance with § 774.3(c)(1).

1. The ability to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property)
2. The relative severity of remaining harm, after mitigation, to the protected activities, attributes, or; features that qualifies each property for Section 4(f) protection
3. The relative significance of each Section 4(f) property
4. The views of the officials with jurisdiction over each Section 4(f) property
5. The degree to which each alternative meets the project purpose and need
6. After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f)
7. Substantial differences in costs among the alternatives

Each alternative is described in detail in the “Other Alternatives Considered in Detail” Section of this report and the Analysis of Least Harm is summarized as follows.

2. Alternatives Considered

A. The Replacement Alternative could be constructed immediately upstream of existing bridge and provide the safe, efficient access of S.R. 1011 over the Delaware River with a life expectancy of approximately 100 years. Existing access to Pond Eddy would be maintained during construction via the existing Pond Eddy Bridge, thereby avoiding and minimizing impacts to the river by eliminating the need for a temporary access bridge and additional construction causeways. The Replacement Alternative best meets the purpose and need of the project, is supported by the NPS and is cost effective; therefore, it would result in the Least Overall Harm.

B. The Dual Bridge Alternative violates the NPS's 10-bridge limit management policy for the implementation of Section 7 of the National Wild and Scenic Rivers Act for the Upper Delaware Scenic and Recreational River, negatively impacts recreational boating, increases backwater flooding, and involves finding a new owner to maintain the existing bridge in place. The Dual Bridge Alternative would not result in the Least Overall Harm given the impacts to the Delaware River and opposition by the NPS.

C. Rehabilitation with Strengthening and or Widening - Bridge Rehabilitation (Options 2 and 3) would result in a bridge structure with a posted weight capacity of 36 tons with a life expectancy of 10 to 20 years. Substantial costs and access within the Delaware River are required for temporary bridge support, temporary access bridge during construction, and river access for the rehabilitation efforts. Substantial costs and river access would be incurred for a limited service life and additional river access and costs would be
required for future maintenance efforts. Rehabilitation options 2 and 3 would not result in the least overall harm due to the engineering complexity leading to a substantial cost difference, substantial access within the Delaware River, limited life expectancy, and impacts to the bridge’s historic integrity.

TABLE 4
EVALUATION OF LEAST HARM ALTERNATIVE

<table>
<thead>
<tr>
<th>EVALUATION OF LEAST HARM</th>
<th>REPLACEMENT</th>
<th>DUAL BRIDGE</th>
<th>REHABILITATION WITH STRENGTHENING AND WIDENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The ability to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property)</td>
<td>Adverse effects to the Historic bridge would be mitigated through implementation of the Section 106 MOA. Avoidance and minimization efforts with respect to pier placement, span length and river access would be further coordinated through the implementation of the Design Advisory Committee and permitting coordination with the NPS.</td>
<td>Historic bridge would remain in place if a new owner would take responsibility for the structure. Installation of a second bridge would create additional river impacts.</td>
<td>Adverse effects to the Historic bridge would be mitigated through implementation of the Section 106 MOA. Temporary bridge would be installed to maintain access during construction, thereby requiring additional river access. Short life span would require additional construction access to river for maintenance activities.</td>
</tr>
<tr>
<td>2. The relative severity of remaining harm, after mitigation, to the protected activities, attributes, or; features that qualify each property for Section 4(f) protection</td>
<td>Removal of Historic Bridge would be mitigated through MOA. Replacement would minimize impacts to river. Access during construction would be maintained on existing bridge; thereby eliminating additional need for temporary bridge crossing and additional river construction causeway access.</td>
<td>Historic Bridge would remain, if new owner would be identified. Two bridges would constitute additional impacts to the free-flowing condition of the river.</td>
<td>Altering of the historic integrity of the bridge would be mitigated through MOA. Temporary bridge would be required to maintain access to Pond Eddy during construction; thereby requiring additional river impacts in addition to the temporary supports and construction causeways needed to complete the rehabilitation efforts. Short life span of rehabilitation would result in additional river access to complete maintenance activities.</td>
</tr>
<tr>
<td>3. The relative significance of each Section 4(f) property;</td>
<td>Same for all Alternatives</td>
<td>Same for all Alternatives</td>
<td>Same for all Alternatives</td>
</tr>
</tbody>
</table>
### EVALUATION OF LEAST HARM

<table>
<thead>
<tr>
<th>4. The views of the officials with jurisdiction over each Section 4(f) property;</th>
<th>REPLACEMENT</th>
<th>DUAL BRIDGE</th>
<th>REHABILITATION WITH STRENGTHENING AND WIDENING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement would result in adverse effect to Historic Bridge. Adverse Effect would be mitigated through implementation of MOA. NPS are in support of Replacement and require avoidance and minimization measures to maintain free-flowing condition of river</td>
<td>Preservation of the existing historic bridge would be supported by SHPO’s; however, the NPS would not permit a Dual Bridge Alternative due to impact to the Delaware River.</td>
<td>Significant Rehabilitation efforts to increase the bridge strength would affect the historic integrity of the bridge. Adverse Effect would be mitigated through implementation of MOA. NPS support Replacement and require avoidance and minimization measures to maintain the free-flowing condition of the river.</td>
<td></td>
</tr>
</tbody>
</table>

| 5. The degree to which each alternative meets the project purpose and need; | Meets the Project Purpose and Need | The NPS would not permit this alternative; therefore, it is not considered to meet the purpose and need | Does not fully meet the project purpose and need due to the limited service life of the rehabilitated structure. |

| 6. After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f) | Replacement would not adversely impact non-4(f) protected resources | Dual bridge could adversely affect the flooding conditions of the upstream Mill Brook Tributary. | Rehabilitation with Strengthening and or widening would not adversely impact non-4(f) protected resources |

| 7. Substantial differences in costs among the alternatives | Replacement costs are estimated at 9.6 million | Dual Bridge is estimated at 8.8 million, but would not be permitted by the NPS | Rehabilitation with Strengthening and or Widening is estimated at 16.3 (Option 2) and 18.5 (Option 3). This alternative would cost substantially more than the replacement and dual bridge alternatives. |

### 3. Conclusion of Assessment of Least Harm

Based on consideration and balancing of the seven factors above, FHWA concludes that the Replacement Alternative would result in the least overall harm in light of the statute’s preservation purpose.
E. MEASURES TO MINIMIZE HARM TO THE SECTION 4(f) RESOURCES

Measures to minimize harm to the Section 4(f) resources have been developed in consultation with the various officials having jurisdiction over the subject Section 4(f) resources. With regard to the National Register-listed Pond Eddy Bridge, project implementation would constitute an "Adverse Effect" under Section 106 of the National Historic Preservation Act (see Appendix A). As such, PennDOT and NYSDOT have developed measures to mitigate the project’s Adverse Effect. The mitigation measures were coordinated and approved through the state historic preservation offices (Pennsylvania Historical and Museum Commission [PHMC] and New York State Historic Preservation Officer [NY SHPO]) and the Advisory Council for Historic Preservation (ACHP) through the development of a Section 106 MOA. The fully executed MOA is included in Appendix G. Measures to minimize impacts to the Upper Delaware River are also to be implemented as part of the project. The proposed mitigation measures include the following.

- **Marketing the Reuse of Bridge:** PennDOT will work with interested parties identified during the marketing process to relocate or reuse all or portions of the bridge. Should a group come forward to assume ownership of the bridge, PennDOT will require a preservation covenant which states that the buyer shall be responsible for rehabilitating and/or maintaining the bridge upon its removal and relocation in accordance with the recommended approaches in the Secretary of the Interior’s Standards for Rehabilitation (NPS, 1992).

- **Recordation:** The Pond Eddy Bridge will be documented to the standards of the Historic American Engineering Record (HAER), or appropriate state-level recordation. This recordation will document through description and photography the characteristics and history of the bridge including the setting, context, and its local significance. This documentation will be submitted to the PA SHPO and NY SHPO and made available for an appropriate local repository to be designated by the PA SHPO and NY SHPO.

- **Pond Eddy Bridge Design Advisory Committee:** A Design Advisory Committee (DAC) will be formed for the project. PennDOT will organize the formation of the DAC by inviting a representative member from the interested local municipalities, counties, consulting parties, local emergency service providers, and the local public to take part in workshops to discuss the aesthetic design of the new bridge. Once the DAC has been established, a series of three workshops will be held so that PennDOT can solicit input from the committee members regarding the aesthetics, engineering elements, cost, and constructability of the structure. With the formation of the DAC, PennDOT, NYSDOT, and FHWA are committed to investigate and consider bridge design concepts,
approaches, and appurtenances that would result in the construction of an aesthetically appealing design to fit the context of the river setting and comply with PennDOT’s design manual. Concepts to be investigated could include, but are not limited to, an oversized single-lane bridge, a pedestrian promenade, a faux truss, use of local materials, and other design measures to be considered for a context sensitive bridge. The design of the new bridge shall be consistent with PennDOT Design Manual, Part 2, Highway Design (Publication 13M), as supplemented by the AASHTO Green Book (2001); FHWA Flexibility in Highway Design; PennDOT Strike-Off Letter 432-08-03 “Project Right-Sizing Policy,” and the PennDOT Smart Transportation Manual.

With regard to the Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail, a design modification in the form of increased span lengths (resulting in fewer piers being placed in the river) has the potential to minimize the Bridge Replacement Alternative’s use. PennDOT has demonstrated that a 4 span three pier arrangement design could work from a flooding perspective; thereby establishing a maximum pier arrangement of 3; however, PennDOT is committed to investigate alternate span lengths and pier arrangements as part of the Final Design process and include coordination with the NPS, PFBC, and permitting agencies. PennDOT will work with the NPS and PFBC to develop an Aids-to-Navigation (ATON) and Boating Safety Plan to address potential boat safety issues associated with the temporary use of the river via implementation of a causeway during project construction.
V. COORDINATION WITH THE AGENCIES HAVING JURISDICTION OVER THE SUBJECT SECTION 4(f) RESOURCES
V. COORDINATION WITH THE AGENCIES HAVING JURISDICTION OVER THE SUBJECT SECTION 4(f) RESOURCES

Coordination with the Section 4(f) jurisdictional officials (i.e., the PA SHPO, NY SHPO, ACHP, NPS, and PFBC) has been ongoing throughout the development of the Pond Eddy Bridge Project. Coordination with the PA SHPO and NY SHPO (Appendix A) and the ACHP (Appendix A) has been conducted in accordance with the requirements set forth pursuant to Section 106 of the National Historic Preservation Act. In this capacity, PennDOT developed, in coordination with the SHPOs and the ACHP, a Determination of Eligibility Report, a Determination of Effect Report, and a Phase I Archaeology Report. PennDOT also developed and coordinated with the SHPOs and ACHP, a Project Development Report (PDR) to document the history and complexity of the Pond Eddy Bridge Project development process. PennDOT, NYSDOT and FHWA coordinated the development and execution of the Memorandum of Agreement with the SHPOs and ACHP to address the project’s Section 106 Adverse Effect finding.

In addition to these formalized coordination efforts, PennDOT has been holding monthly to bimonthly conference calls with the SHPOs over the past three years to coordinate the ongoing project development activities. The NPS, in their capacity as the official with jurisdiction over the Upper Delaware Scenic and Recreational River, has also been party to these monthly/bimonthly conference calls. PennDOT has also conducted three separate Consulting Party meetings for the project (June 29, 2005, August 23, 2007, and April 7, 2009), of which the SHPOs, ACHP, and NPS have been party to. Subsequent to the April 7, 2009, Consulting Party Meeting, PennDOT and FHWA conducted a project-specific coordination meeting with the ACHP on May 5, 2009, to discuss unresolved issues related to the Section 106 process. Additionally, a project-specific coordination meeting was held with the NPS on April 24, 2007 and July 25, 2011, to discuss issues related to the Bridge Replacement’s use of the Upper Delaware Scenic and Recreational River (Appendix F).

As previously noted, coordination will continue with these various agencies as the project moves into the Final Design phase. Specifically, the SHPOs and NPS will be invited to participate in the project’s DAC. Coordination will also continue with the NPS and PFBC with respect to the Bridge Replacement Alternative’s use of the Upper Delaware Scenic and Recreational River/Pennsylvania Water Trail and the project’s need for an ATON and Boating Safety plan.
VI. CONCLUSION
VI. CONCLUSION

This Section 4(f) Evaluation demonstrates that a number of alternatives have been evaluated for the Pond Eddy Bridge Project, including several Total Section 4(f) Resource Avoidance Alternatives. Based on the analysis of these alternatives, a feasible and prudent Total Section 4(f) Resource Avoidance Alternative does not exist for this project. Of the alternatives studied in detail, the Bridge Replacement Alternative is the feasible and prudent project alternative that results in the least overall harm to Section 4(f) resources.