Sherburne Brook Bridge Project

Town of Northwood, New Hampshire

Benefit-Cost Analysis (BCA) Summary

 The Town of Northwood’s bridge project will generate significant benefit to the Town of Northwood, the surrounding communities, the state of New Hampshire and the nation by delivering an innovative and partnership focused project that will deliver a safe, efficient, accessible and convenient transportation infrastructure system that will enhance quality of life and increase ladders of opportunity now and 100 years into the future in line with [USDOT’s mission](https://www.transportation.gov/mission/about-us).

The BCA for Northwood’s project uses a 25 year forecasting period and takes an extremely conservative approach to estimating the benefits of the project. Where the known benefits were not readily quantifiable, a qualitative description is offered. The valuation of benefits uses a number of assumptions that are required to produce monetized values for non-pecuniary benefits. The different components of time, for instance, are monetized by using a “value of time” that is assumed to be equivalent to the user’s willingness to pay for “time savings” in transit. Specifically, the BCA expresses benefits and costs monetarily in “present value” (PV) capturing benefits and costs over the project time horizon. Project costs and benefits are discounted at both 3% and 7% in line with federal practice.

The Benefit Cost Analysis calculates a Benefit Cost Ratio (BCR) for the project. The BCR is expressed as the ratio of benefits of a project relative to its costs, expressed in present-value terms and over a period of 25 years. A BCR above 1.0 suggests that benefits exceed costs, in which case the project creates a positive return on investment.

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| **Funding Sources** | **Amount** | **Percentage of the project** |
| TIGER VII Request | $1,021,706  | 91% |
| Town of Northwood | $100,000  | 8% |
| Coe-Brown academy | $1,000  | 1% |
| **TOTAL** | **$1,122,706** | **100%** |

**Benefit/Cost Analysis Quantitative Summary**

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| --- | --- | --- | --- |
|  | **Total Project Benefits & Costs** | **3% Discount Rate** | **7% Discount Rate** |
| Benefits |  $51,455,448.00  | $29,360,246.43  | $21,107,573.67  |
| Costs |  $1,122,706.00  |  $1,067,512.31  |  $986,959.57  |
| **BCR** | **45.8** | **27.5** | **21.4** |

The Benefit Cost Ratio for the Sherburne project has an initial benefit of more than a 46 to 1 ratio, signifying that the value of the project significantly outweighs the costs of the project. Over a 25 year period those benefits accumulate from year to year. At a 3% discount rate the BCR over 25 years shows more than a 27 to 1 ratio for benefiting the region.

Project Matrix

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| BaselineProblem to be addressed  | Change to BaselineAlternatives | Types of Impacts | Affected Population | Economic Benefit | Results Summary | Page/TabReference |
| 1.The 78 year old bridge over Sherburne Brook has been placed on the Red List by NHDOT and is on the verge of failing  | Replace the bridge per NHDOT specs New bridge enhances safety, bike traffic, and pedestrian trafficNew Bridge will protect the fragile Northwood environment from being harmed by a dangerous detour  | Economic: Trucks will safely use the bridge to deliver goods and services againEnvironmental Enhanced environmental sustainabilitySafety: First responders will have a faster route to emergency calls  | Residents of Northwoodand StraffordPublic and private school studentsBusinesses in the Route 4 commerce corridorThe Loons | Monetized value of reduced travel timeMonetized value of a reduction of vehicle accidentsQualitative analysis of economic growth and improvement in relation to the TIGER grant.  | State of Good Repair (Qualitative) Economic Competitiveness (Quantitative & Qualitative) Quality of Life (Quantitative & Qualitative)EnvironmentalSustainability (Quantitative & Qualitative) Public Safety (Qualitative)  | Narrative Page 12Narrative Page 14Narrative Page 14Tab 3 BCANarrative Page 17Narrative Page 18 |
| 2. Poor road conditions and flooding on the road leading to both ends of Sherburne Brook Bridge | Road will be repaved with additional drainage placed in west of Sherburne Brook and near Mary Waldron Beach.Environmental protection to the beach, surrounding wetlands and to locations on the detour route  | Environmental: Enhanced environmental sustainabilityImproved state of good road condition by preventing road flooding  | residentsof Northwoodand StraffordPublic and private school studentsBusinesses in the Route 4 commerce corridorThe Loons | Monetized value of reduction in Accidents on Bow Lake Rd. Qualitative analysis on the economics of the region  | State of Good Repair (Qualitative)EnvironmentalSustainability (Qualitative) | Narrative Page 12Narrative Page 17 |

**Infrastructure Baseline**

One 78 year old bridge in Northwestern Northwood; .7 miles of deteriorated road from the Strafford line to the bridge; and 1.2 miles of deteriorated from the bridge to Coe-Brown Academy that is currently owned by the Town. All right of ways are owned by the Town of Northwood

The bridge is currently in a poor state of repair and deterioration, necessitating weight restrictions that adversely impact public safety, commerce, economic development, traffic congestion, tourism, and transportation efficiency in the Town to a significant degree. School buses, fire trucks, and commercial vehicles are prohibited from legally crossing this bridge and therefore must use cumbersome and circuitous alternate routes.

Detailed alternative analysis was considered as part of the assessment completed for this project in early 2016. As a result, the BCA values the project costs and benefits based on the most cost-effective approach informed by sound judgement. The baseline project assumption is that once the project is approved, a phased construction effort would be planned for FY2017.

***Project Costs***

The total estimated project cost is $1,122,706 including $93,790 for final design, permitting, and construction. $13,000 for preventive maintenance are quantified in the BCA on Tab 2 and are recommended best practice from [NHDOT](http://des.nh.gov/organization/divisions/water/wetlands/documents/roadway_bmp.pdf), however, these dollars are not requested as part of this application.

**Project Benefits**

The requested TIGER VIII funding will enable the Town and its local and regional partners to complete a transformative transportation project that will completely transform the Town of Northwood, the Coe-Brown Academy and the surrounding towns. The project will facilitate a safer a more reliable transportation system that will provide economic, educational and social ladders of opportunity to destinations within the Town and beyond.

The proposed project will improve travel conditions to a state of good repair and provide safer, transportation for the thousands of daily commuters and hundreds of high school students. In partnership with ongoing transportation and economic development initiatives in the project area, it is expected that this project will greatly assist with the future development of the Route 4 Commerce Corridor, promote development in Northwood, as well as offering significant benefit to the towns of Strafford and Epsom which rely on Bow Lake Road to get their kids to school.

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| --- | --- | --- | --- | --- | --- |
| **year** | **calendar year**  | **affected drivers** | **undiscounted benefits**  |  **7% discounted rate**  | **Present worth @7%** |
| **1** | **2017** | **2213** |  **$1,863,133.04**  | **0.873439** |  **$ 1,627,333.06**  |
| **2** | **2018** | **2280** |  **$ 1,919,027.03**  | **0.816298** |  **$ 1,566,497.92**  |
| **3** | **2019** | **2348** |  **$ 1,976,597.84**  | **0.762895** |  **$ 1,507,936.61**  |
| **4** | **2020** | **2419** |  **$ 2,035,895.77**  | **0.712986** |  **$ 1,451,565.18**  |
| **5** | **2021** | **2491** |  **$ 2,096,972.65**  | **0.666342** |  **$ 137,300.95**  |
| **6** | **2022** | **2566** |  **$ 2,159,881.83**  | **0.62275** |  **$ 1,345,066.41**  |
| **7** | **2023** | **2643** |  **$ 2,224,678.28**  | **0.582009** |  **$ 1,294,782.78**  |
| **8** | **2024** | **2722** |  **$ 2,291,418.63**  | **0.543934** |  **$ 1,246,380.50**  |
| **9** | **2025** | **2804** |  **$ 2,360,161.19**  | **0.508349** |  **$ 1,199,785.58**  |
| **10** | **2026** | **2888** |  **$ 2,430,966.02**  | **0.475093** |  **$ 1,154,934.94**  |
| **11** | **2027** | **2975** |  **$ 2,503,895.00**  | **0.444012** |  **$ 1,111,759.43**  |
| **12** | **2028** | **3064** |  **$ 2,579,011.85**  | **0.414964** |  **$ 1,070,197.07**  |
| **13** | **2029** | **3156** |  **$ 2,656,382.21**  | **0.387817** |  **$ 1,030,190.18**  |
| **14** | **2030** | **3251** |  **$ 2,736,073.68**  | **0.362446** |  **$ 991,678.96**  |
| **15** | **2031** | **3348** |  **$ 2,818,155.89**  | **0.338735** |  **$ 954,608.03**  |
| **16** | **2032** | **3449** |  **$ 2,902,700.56**  | **0.316574** |  **$ 918,919.53**  |
| **17** | **2033** | **3552** |  **$ 2,989,781.58**  | **0.295864** |  **$ 884,568.74**  |
| **18** | **2034** | **3659** |  **$ 3,079,475.03**  | **0.276508** |  **$ 851,499.48**  |
| **19** | **2035** | **3768** |  **$ 3,171,859.28**  | **0.258419** |  **$ 819,668.70**  |
| **20** | **2036** | **3881** |  **$ 3,267,015.06**  | **0.241513** |  **$ 789,026.61**  |

**The Benefit Cost analysis has both a 3% and 7% discount rate for this project**

**State of Good Repair**

If left unimproved, the poor condition of the bridge and road will continue to threaten current and future transportation infrastructure efficiency, mobility of goods or accessibility and mobility of people, or economic growth. Following best practice from FHWA, and working in partnership with NHDOT, the Town will employ cost effective strategies and actions to maximize the life of the bridge and get another 78 years from the new bridge. This asset management methodology will take a balanced approach to replacement and guarantee maximum return for the TIGER dollars invested.

**Economic Competitiveness**

The project focuses on improvements specifically targeted to increasing the economic competitiveness of the community, region, and the nation. In addition to the qualitative benefits outlined in relation to the State of Good Repair, detailed analyses quantified benefits in terms of travel time savings and savings in operating cost. Specific attention was paid to ensure that no transfer benefits were included e.g. fuel savings and vehicle maintenance costs that are incorporated into cost per mile. As a result of this project, more direct routes for the students at coe-Brown, the fire department, and the police department will be possible. There will also be associated improvements to Bow lake Road and intersection operations that will reduce delay, congestion and optimize traffic operations. The net present value (2015) of the project’s travel time savings over a 25-year period is **$51,455,448.00.**

Operational and maintenance costs for the Northwood Highway will also be modestly impacted by this project. The Town will see an annual maintenance savings of **$2,571** with a total savings of **$13,000** combined net present value for savings 25 years. The BCA workbook also highlights accidents on or near the bridge that would be potentially eliminated by this project, providing a savings of **$9,521,640** over a 25 year period.

The impact of the Sherburne Brook Bridge replacement on the economic competitiveness of the Town should not be underestimated. The Town is a tourist destination for all of Southern New Hampshire, Northern Massachusetts, and Boston with the Town’s population swelling to almost double during the summer months to 8,000 people. Northwood is a small rural town and it is difficult to accurately quantify tourism dollars entering the Town it is estimated that tourism accounts for **$1,868,652** to local businesses during the summer months. The condition of the Sherburne Brook Bridge and the dilapidated Bow Lake Rd. has impacted tourism in the past and is certain to do so in the future if left unaddressed. The Town is currently addressing the legacy of a poorly constructed Bow Lake Rd. that has contributed to the beach erosion and the closure of the only town boat ramp on Bow Lake. Along with the demonstrated impact on public safety, Bridge, which is such a vital component of the Town’s transportation network, is an eyesore and has a detrimental effect on the visitor experience to picturesque Northwood.

**Quality of Life**

The principles of [Northwood’s Masterplan](http://www.northwoodnh.org/assets/municipal/10/nwoodnh_2004_master_plan_1369921106.pdf) (Page 13) and its economic development strategy are both consistent with the Livability Principles of the Partnership for Sustainable Communities. Northwood has seen substantial growth in new home starts and new business starting up in Northwood along the RFCC. The successful development of the Town relies on the ability of these new homes, and those who live in them, to be connected to the employment opportunities of the RFCC. The Town’s successful growth and expanding economy over the last 2 years is threated by the deteriorating conditions of the bridge and severely undermines the transportation network of the region.

**Sustainability**

Because it is proud of its rural character Northwood encourages land owners to put their large 10-acre lots into conservation, meaning that nothing can ever be built on that particular 10-acre plot. In addition the Town allows private owners to keep land in a current use status. This gives a tax break to land owners that keep their land in a natural state and allow others to use the land for passive recreation like biking, hiking and walking. Promoting more sustainable traffic patterns protects Northwood’s most at-risk environmental resources like the conserved 10-acre lots and yields environmental and public health benefits. These benefits include reduced traffic crashes, reduced emissions from long detours, improved physical and mental health, and a higher standard of living for those commuting to and from Coe-Brown, Northwood Town Hall, and the other jobs on the RFCC. The Town anticipates **$1,746,492** (tab 2 BCA) in a reduction in vehicle miles travelled in 2018 after the project is completed.

If left unaddressed the current conditions of Bow Lake Road and the bridge over Sherburne Brook will be major road blocks to sustainably meeting the transportation needs of the growing community and damage the water bodies, forests and at-risk wildlife that thrives in this unique region of New Hampshire. If left unattended the disrepair of the bridge and road will reduce the quality of life for the 2,100 people that use it on a daily basis for commuting; the residents that live on the detour routes will see an increase in heavy truck traffic; and the economy of the region will be negatively impacted as tourism and retail services decline due to road closures.

The Benefit-Cost Analysis (BCA) highlights the savings from repairing the bridge and Bow Lake Road. The benefits are results of a reduction in miles travelled due to the weight restrictions on the bridge and a possible closure if traffic needs to access the 12-mile detour. The cost benefit from the ride share program that relies on the Sherburne Brook Bridge was not taken into account in the BCA to avoid specious inflation. However, if the bridge remains in its current condition and is allowed to deteriorate the Town will be unable to implement sustainable transportation solutions.

**Public Safety**

While developing the application for TIGER funding, the emergency service providers and primary providers of public safety were consulted to get a complete understanding of the importance of the Sherburne Brook Bridge. *In an emergency* s*econds count, and a delay could be the difference between life and death. “If the bridge over Sherburne Brook continues to deteriorate the result will be further weight restrictions and ultimately the closure of the bridge. This will have a catastrophic effect on public safety to not only the people of Northwood but also the residents of Strafford who rely on Northwood for mutual aid with Fire, ambulance, and police coverage.*

The proposed project, if funded through TIGER, will increase vehicular, pedestrian and bicycle safety and reduce the potential for accidents. Replacing and rehabilitating the existing outdated bridge with the NHDOT recommendations will reduce injury and accidents, improve emergency vehicle access, and promote healthy, attractive alternatives to driving across the bridge through the addition of new bicycle and pedestrian amenities.

Accident data was reviewed by the Northwood Police Department as part of the analysis for this TIGER application. As is typical of short-span bridges of this nature, few accidents took place on the bridge spans themselves. However, existing and future weight restrictions and closures on the Bridge will divert traffic, particularly heavy vehicle traffic to already congested and dangerous rural intersections. On Bow Lake Road itself the Town sees 3 reported accidents per year with a third of these occurring near the bridge. This is a high accident zone because of the width of the existing bridge structure, causing drivers to veer to close to and hit the decaying guard rails over the brook. After monetizing the cost of 3 accidents per year the Town will see a benefit of **$396,735** (tab 2 BCA) per year after the bridge and road are complete