

CREEK ROAD ALTERNATIVE ANALYSIS

Town of Middlebury Vermont

INTRODUCTION

The Town of Middlebury's Creek Road, which parallels Otter Creek, has experienced damage as a result of erosion and subsidence in areas adjacent to the Creek resulting in costly repairs and road closure. The road extends from Court Street to Three Mile Bridge Road, a distance of 2.6 miles. The northern portion is paved and serves numerous single family homes, businesses, the Town Gymnasium, Addison County Transit Resources, and the VTrans Highway Garage. The southern 2.3 miles are gravel and serve two residences and agricultural fields. The southernmost mile of the roadway has been closed to traffic since 2015 and only vehicle accessible to property owners. A large percentage of the property abutting Creek Road is conserved farmland, wetlands, and located in the 100 year flood plain.

The Town has made significant repairs to the roadway/stream bank over the years, most recently in 2008, 2012, and 2015. In cooperation with the Town, Addison County Regional Planning Commission contracted with Pathways Consulting, LLC for an evaluation of the cause and possible solutions to the stream bank instability that continues to impact Creek Road. This study considered varying methods of bank stabilization, road relocations, and closures. Given the high capital costs of the proposed solutions, the Select Board questioned the potential cost benefits of a more phased approach or the possibility of more cost efficient solutions.

The following analysis was commissioned by the Select Board with the goal of clarifying the alternative approaches available and presenting them in a format that considers both short and long term costs.

APPROACH

Based upon review of the various options considered under the former study, discussions with town officials, and consideration of environmental and regulatory factors, it was evident that three fundamental alternatives were available:

- Keep the entire roadway open in its current location and make either comprehensive or phased repairs over time,
- Keep the road open to the Perrin residence and repair only the northern portion,
- Maintain the road to the Bingham residence and provide alternative access to Perrin's.

Relocation of the roadway to create a buffer to the stream bank was considered, however, the feasibility of complying with wetlands and floodplain regulations, and securing the necessary easements/land acquisitions makes this approach impractical.

When evaluating the cost associated with any option, it is critical that consideration be given not only to upfront capital cost but also the annual cost of repairs and maintenance. This is particularly important when an "as-needed" repair approach is under consideration. To equitably compare a phased approach with more comprehensive repairs, the Present Worth of future repair and maintenance costs must be calculated and added to initial capital expenses.

ASSUMPTIONS

1. Cost

- a. **Construction** – The Pathways Study provides detailed analysis of anticipated construction costs of the alternatives considered. This analysis reviewed the estimated unit costs and quantities and found them to be reasonable. The primary area of variance from the Pathways Study is in the estimated cost associated with stream bank stabilization. Pathways estimated a unit costs of \$150 per linear foot. Five bids received

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from the Town for comparable bank repairs to Shard Villa Road ranged from \$424 to \$883 per linear foot. This analysis utilizes an average unit costs of \$480/lf (excluding the high bid). The Pathways Study also does not include the necessary replacement of a box culvert at the current northern road closure or guardrails in areas where the road is in direct vicinity to the Creek. Both costs have been added to this analysis at the request of the Middlebury Public Works.

- b. **Maintenance** – The Town of Middlebury typically expends an estimated \$12,000 per mile for the annual maintenance of gravel roads. This value was used over the period of analysis in each alternative for the respective portion of gravel road proposed to remain open.
2. **Present Worth Parameters** – A Present Worth Analysis estimates the current value of future expenditures based on estimated rate of return and period of analysis. Municipal capital planning projects often utilize rates which approximate historical inflationary trends. This analysis is based on a 3% rate over a 10 year period.
3. **“As Needed” Repairs** – Based upon the Pathways Study, their subconsultant’s, Headwaters Hydrology PLLC, geomorphic assessment, and continued deterioration of the road, this analysis conservatively assumes that all areas of roadway within 25 feet of Otter Creek will ultimately require repairs at some point over the period of the analysis.

OPTIONS CONSIDERED

The following alternative approaches were analyzed.

1. **Alternative A1 – Road open from Route 7 to 3 Mile Bridge (Comprehensive Improvements):** This alternative is based on a proactive approach which completes stream bank stabilization measures to all areas within 25 feet of Otter Creek and associated roadway improvements including Pathway’s recommendations, guardrails, and box culvert replacement.
2. **Alternative A2 – Road open from Route 7 to 3 Mile Bridge (Phased Repairs):** This alternative includes stream bank stabilization for all segments currently failing and associated roadway repairs as recommended by Pathways, guardrails and box culvert replacement. Projected cost include future stream bank stabilization for all remaining road segments within 25 feet of the Creek prorated over the 10 year analysis period and regular road maintenance.
3. **Alternative B – Road open from Route 7 to Perrin’s (Phased Repairs):** This alternative includes stream bank stabilization for all segments north of the road closing that are currently failing and associated roadway repairs as recommended by Pathways and guardrails. Projected cost include future stream bank stabilization for all open road segments within 25 feet of the Creek prorated over the 10 year analysis period and regular road maintenance. The road would remain closed from Perrin’s to 3 Mile Bridge with no capital improvements and restricted access.
4. **Alternative C – Road open from Route 7 to Bingham’s (Phased Repairs):** This alternative is based upon the same criterion as Alternative B less improvements from Bingham to Perrin. In order to provide access to the Perrin’s residence, a new drive is constructed through the South Ridge development to the Perrin residence. The road would be closed from Bingham’s to 3 Mile Bridge with no capital improvements and restricted access.

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SUMMARY TABLE AND ALTERNATIVE COST DETAIL

The following Tables summarizes the capital and present worth analysis of the alternative's considered and provide detailed cost analysis for each alternative which serve as the basis for the information included in the Summary Table. Each table is broken into anticipated upfront Capital Costs and Annual Costs converted to Present Worth. The sum of these two components is the Present Value of each alternative.

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4/18/2019

| SUMMARY TABLE | | | | | |
|----------------------|--|----------------------|---------------------|----------------------|----------------------|
| Alternative | Description | Cost Analysis | | | |
| | | Capital Costs | Annual Costs | Present Worth | Present Value |
| A1 | Complete Road Improvements - Route 7 to 3 Mile Bridge (w/Annual Repairs) | \$ 4,666,049 | \$ 28,182 | \$ 240,397 | \$ 4,906,446 |
| A2 | Initial Road Improvements - Route 7 to 3 Mile Bridge (w/Annual Repairs) | \$ 1,506,725 | \$ 363,457 | \$ 3,100,362 | \$ 4,607,087 |
| B | Upgrade Road to Perrin (w/Annual Repairs) | \$ 944,819 | \$ 218,678 | \$ 1,865,369 | \$ 2,810,188 |
| C | Upgrade Road to Bingham and private Drive to Perrin | \$ 494,396 | \$ 20,769 | \$ 177,168 | \$ 671,563 |

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Alternative "A1"

Description: Road Open for entire length. Stabilize all High and Moderate Risk Streambanks. Repair existing Road, Replace Box Culvert and Present Worth of annual upkeep.

| Item Num. | Item Description | Quant. | Unit | Unit Cost | Total Cost |
|----------------------|--|--------|------|-----------|---------------------|
| CAPITAL COSTS | | | | | |
| 1.0 | Bank Stabilization | 6,950 | LF | \$ 480 | \$ 3,336,000 |
| 2.0 | Resurface Existing Roadway | 6,200 | LF | \$ 13 | \$ 80,600 |
| 3.0 | Filter Fabric | 800 | LF | \$ 10 | \$ 8,000 |
| 4.0 | Drainage Culverts | 12 | EA | \$ 8,000 | \$ 96,000 |
| 5.0 | Roadside Ditching | 2,385 | LF | \$ 18 | \$ 42,930 |
| 6.0 | Box Culvert | 1 | LS | \$150,000 | \$ 150,000 |
| 7.0 | Guard Rails | 1,240 | LF | \$ 55 | \$ 68,200 |
| 8.0 | Solar Drive Upgrade | - | LF | \$ 40 | \$ - |
| 9.0 | Private Gravel Drive (with fabric) | - | LF | \$ 60 | \$ - |
| 10.0 | Road Closure Gate | - | EA | \$ 5,000 | \$ - |
| 11.0 | ROW Purchase Costs | - | LS | \$ - | \$ - |
| 12.0 | Mobilization/Demobilization (5% of Const Cost) | | | 5% | \$ 189,087 |
| 13.0 | Misc. Work and Clean-up (2.5% of Const Cost) | | | 2.5% | \$ 94,543 |
| 14.0 | Design and Permitting (7.5% of Const. Cost) | | | 7.5% | \$ 33,430 |
| 15.0 | Contingency (15% of Const Cost) | | | 15% | \$ 567,260 |
| | SUBTOTAL | | | | \$ 4,666,049 |
| ANNUAL COSTS | | | | | |
| 1.0 | Bank Stabilization | - | LF | \$ 480 | \$ - |
| 2.0 | Mobilization/Demobilization (5% of Const Cost) | 1 | LS | 5% | \$ - |
| 3.0 | Misc. Work and Clean-up (2.5% of Const Cost) | 1 | LS | 2.5% | \$ - |
| 4.0 | Design and Permitting (7.7% of Const Cost) | 1 | LS | 7.5% | \$ - |
| 5.0 | Contingency (15%of Const Cost) | 1 | LS | 15% | \$ - |
| 6.0 | Road Maintenance (\$12,000/mile) | 12,400 | LF | \$ 2.27 | \$ 28,182 |
| | SUBTOTAL | | | | \$ 28,182 |
| | PRESENT WORTH of Annual Expenses | 10 | YR | 3% | \$240,397 |
| PRESENT VALUE | | | | | \$ 4,906,446 |

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4/18/2019

Alternative "A2"

Description: Road Open for entire length. Repair existing erosion and Road, Replace Box Culvert and Present Worth of annual repairs and upkeep.

| Item Num. | Item Description | Quant. | Unit | Unit Cost | Total Cost |
|----------------------|--|--------|------|-----------|--------------------|
| CAPITAL COSTS | | | | | |
| 1.0 | Bank Stabilization | 1,577 | LF | \$ 480 | \$ 756,960 |
| 2.0 | Resurface Existing Roadway | 6,200 | LF | \$ 13 | \$ 80,600 |
| 3.0 | Filter Fabric | 800 | LF | \$ 10 | \$ 8,000 |
| 4.0 | Drainage Culverts | 12 | EA | \$ 8,000 | \$ 96,000 |
| 5.0 | Roadside Ditching | 2,385 | LF | \$ 18 | \$ 42,930 |
| 6.0 | Box Culvert | 1 | LS | \$150,000 | \$ 150,000 |
| 7.0 | Guard Rails | 1,240 | LF | \$ 55 | \$ 68,200 |
| 8.0 | Solar Drive Upgrade | - | LF | \$ 40 | \$ - |
| 9.0 | Private Gravel Drive (with fabric) | - | LF | \$ 60 | \$ - |
| 10.0 | Road Closure Gate | - | EA | \$ 5,000 | \$ - |
| 11.0 | ROW Purchase Costs | - | LS | \$ - | \$ - |
| 12.0 | Mobilization/Demobilization (5% of Const Cost) | | | 5% | \$ 60,135 |
| 13.0 | Misc. Work and Clean-up (2.5% of Const Cost) | | | 2.5% | \$ 30,067 |
| 14.0 | Design and Permitting (7.5% of Const. Cost) | | | 7.5% | \$ 33,430 |
| 15.0 | Contingency (15% of Const Cost) | | | 15% | \$ 180,404 |
| | SUBTOTAL | | | | \$1,506,725 |
| ANNUAL COSTS | | | | | |
| 1.0 | Bank Stabilization | 537 | LF | \$ 480 | \$ 257,904 |
| 2.0 | Mobilization/Demobilization (5% of Const Cost) | 1 | LS | 5% | \$ 12,895 |
| 3.0 | Misc. Work and Clean-up (2.5% of Const Cost) | 1 | LS | 2.5% | \$ 6,448 |
| 4.0 | Design and Permitting (7.7% of Const Cost) | 1 | LS | 7.5% | \$ 19,343 |
| 5.0 | Contingency (15% of Const Cost) | 1 | LS | 15% | \$ 38,686 |
| 6.0 | Road Maintenance (\$12,000/mile) | 12,400 | LF | \$ 2.27 | \$ 28,182 |
| | SUBTOTAL | | | | \$ 363,457 |
| | PRESENT WORTH of Annual Expenses | 10 | YR | 3% | \$3,100,362 |
| PRESENT VALUE | | | | | \$4,607,087 |

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Alternative "B"

Description: Road Open from North End to Perrin's. Repair existing erosion and Road. Present Worth of annual repairs and upkeep. Roadway Closed South of Perrin's.

| Item Num. | Item Description | Quant. | Unit | Unit Cost | Total Cost |
|---|--|--------|------|-----------|---------------------|
| CAPITAL COSTS | | | | | |
| 1.0 | Bank Stabilization | 1,325 | LF | \$ 480 | \$ 636,000 |
| 2.0 | Resurface Existing Roadway | 3,150 | LF | \$ 13 | \$ 40,950 |
| 3.0 | Filter Fabric | 406 | LF | \$ 10 | \$ 4,060 |
| 4.0 | Drainage Culverts | 2 | EA | \$ 8,000 | \$ 16,000 |
| 5.0 | Roadside Ditching | 1,212 | LF | \$ 18 | \$ 21,816 |
| 6.0 | Box Culvert | - | LS | \$ - | \$ - |
| 7.0 | Guard Rails | 630 | LF | \$ 55 | \$ 34,650 |
| 8.0 | Solar Drive Upgrade | - | LF | \$ 40 | \$ - |
| 9.0 | Private Gravel Drive (with fabric) | - | LF | \$ 60 | \$ - |
| 10.0 | Road Closure Gate | 2 | EA | \$ 5,000 | \$ 10,000 |
| 11.0 | Land Purchase Costs | - | LS | \$ - | \$ - |
| 12.0 | Mobilization/Demobilization (5% of Const Cost) | | | 5% | \$ 38,174 |
| 13.0 | Misc. Work and Clean-up (2.5% of Const Cost) | | | 2.5% | \$ 19,087 |
| 14.0 | Design and Permitting (7.5% of Const. Cost) | | | 7.5% | \$ 9,561 |
| 15.0 | Contingency (15% of Const Cost) | | | 15% | \$ 114,521 |
| SUBTOTAL | | | | | \$ 944,819 |
| ANNUAL COSTS | | | | | |
| 1.0 | Bank Stabilization | 328 | LF | \$ 480 | \$ 157,200 |
| 2.0 | Mobilization/Demobilization (5% of Const Cost) | 1 | LS | 5% | \$ 7,860 |
| 3.0 | Misc. Work and Clean-up (2.5% of Const Cost) | 1 | LS | 2.5% | \$ 3,930 |
| 4.0 | Design and Permitting (7.7% of Const Cost) | 1 | LS | 7.5% | \$ 11,790 |
| 5.0 | Contingency (15% of Const Cost) | 1 | LS | 15% | \$ 23,580 |
| 6.0 | Road Maintenance (\$12,000/mile) | 6,300 | LF | \$ 2.27 | \$ 14,318 |
| SUBTOTAL | | | | | \$ 218,678 |
| PRESENT WORTH of Annual Expenses | | 10 | YR | 3% | \$1,865,369 |
| PRESENT VALUE | | | | | \$ 2,810,188 |

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4/18/2019

Alternative "C"

Description: Road Open from North End to Bingham's. Private Drive to Perrin's. Repair existing erosion and Road. Present Worth of annual repairs and upkeep. Roadway Closed South of Bingham's.

| Item Num. | Item Description | Quant. | Unit | Unit Cost | Total Cost |
|----------------------|--|--------|------|-----------|-------------------|
| CAPITAL COSTS | | | | | |
| 1.0 | Bank Stabilization | 240 | LF | \$ 480 | \$ 115,200 |
| 2.0 | Resurface Existing Roadway | 1,500 | LF | \$ 13 | \$ 19,500 |
| 3.0 | Filter Fabric | 155 | LF | \$ 10 | \$ 1,550 |
| 4.0 | Drainage Culverts | 6 | EA | \$ 8,000 | \$ 48,000 |
| 5.0 | Roadside Ditching | 462 | LF | \$ 18 | \$ 8,316 |
| 6.0 | Box Culvert | - | LS | \$ - | \$ - |
| 7.0 | Guard Rails | 300 | LF | \$ 55 | \$ 16,500 |
| 8.0 | Solar Drive Upgrade | 1,000 | LF | \$ 40 | \$ 40,000 |
| 9.0 | Private Gravel Drive (with fabric) | 2,000 | LF | \$ 60 | \$ 120,000 |
| 10.0 | Road Closure Gate | 2 | EA | \$ 5,000 | \$ 10,000 |
| 11.0 | ROW Purchase Costs | 1 | LS | \$10,000 | \$ 10,000 |
| 12.0 | Mobilization/Demobilization (5% of Const Cost) | | | 5% | \$ 18,953 |
| 13.0 | Misc. Work and Clean-up (2.5% of Const Cost) | | | 2.5% | \$ 9,727 |
| 14.0 | Design and Permitting (7.5% of Const. Cost) | | | 7.5% | \$ 19,790 |
| 15.0 | Contingency (15% of Const Cost) | | | 15% | \$ 56,860 |
| | SUBTOTAL | | | | \$ 494,396 |
| ANNUAL COSTS | | | | | |
| 1.0 | Bank Stabilization | 26 | LF | \$ 480 | \$ 12,480 |
| 2.0 | Mobilization/Demobilization (5% of Const Cost) | 1 | LS | 5% | \$ 624 |
| 3.0 | Misc. Work and Clean-up (2.5% of Const Cost) | 1 | LS | 2.5% | \$ 312 |
| 4.0 | Design and Permitting (7.7% of Const Cost) | 1 | LS | 7.5% | \$ 936 |
| 5.0 | Contingency (15% of Const Cost) | 1 | LS | 15% | \$ 1,872 |
| 6.0 | Drive Maintenance (\$8,000/mile) | 3,000 | LF | \$ 1.52 | \$ 4,545 |
| | SUBTOTAL | | | | \$ 20,769 |
| | PRESENT WORTH of Annual Expenses | 10 | YR | 3% | \$177,168 |
| PRESENT VALUE | | | | | \$ 671,563 |