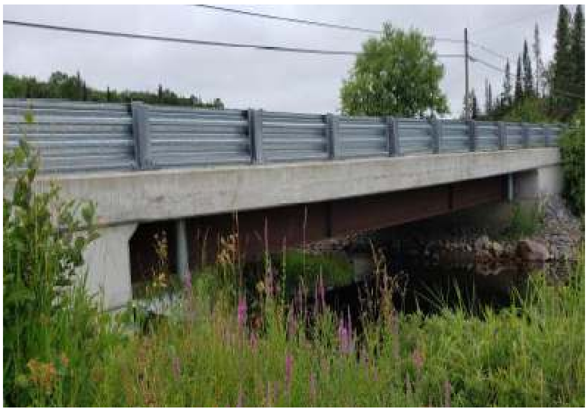
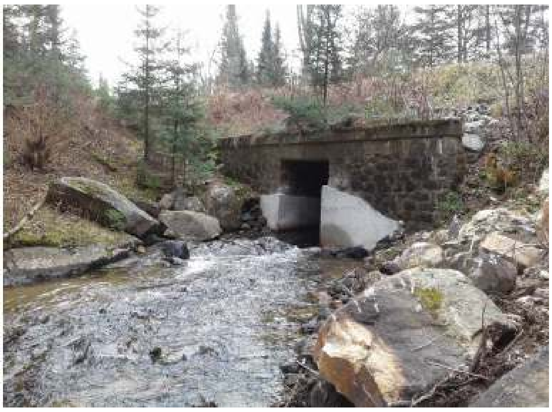
**THE TOWNSHIP OF STRONG**





**BRIDGE MANAGEMENT STUDY REPORT (FINAL)**

**7 BRIDGES / 3 CULVERTS**

**DECEMBER 2020**

***Report Submitted By:***


***HP Engineering Inc.***

***400-2039 Robertson Road, Ottawa, Ontario, K2H 8R2***

***Office: 613-695-3737 ~ Fax: 613-680-3636***

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***Appendices***




*HP Engineering Inc.*
*Suite 400, 2039 Robertson Road, Ottawa, Ontario, K2H 8R2*
*Phone: 613-695-3737 ~ Fax: 613-680-3636*

## 1.0 INTRODUCTION

The Township of Strong (the Township) has retained HP Engineering to perform inspections and develop a bridge management study for 10 structures owned and maintained by the Township.

Each structure in the Township's inventory was visually inspected using the Ministry of Transportation of Ontario's (MTO) Structure Inspection Manual. HP Engineering has entered the data from the inspections into individual inspection forms. The data for each structure present visual observations, suggested rehabilitation, further required investigation and budget cost information. Refer to the appendices for individual inspection sheets for bridges and culverts.

The following report summarizes the suggested rehabilitation / replacement costs, engineering investigation costs and replacement values for each structure based on benchmark budget costs.

Appendix A presents summary tables for all structures. The structures are listed in numerical order of structure number, and the rehabilitation / replacement costs (determined from benchmark budget costs) for each structure.

## 2.0 STRUCTURE INSPECTIONS

A total of 10 structures owned and maintained by the Township were visually inspected in accordance with the MTO Structure Inspection Manual. The inspections were performed during the summer of 2020.

For each structure, components were screened for visual signs of deterioration. The components were then given a rating (on the inspection forms) using the MTO extent and severity method, whereby the components are proportioned (in units of $m^2$, %, m, etc.) based on their observed conditions (excellent, good, fair, poor). This provides quantitative data as to the extent of the observed deterioration for each component. Explanatory statements accompany each of the components' ratings where deemed applicable by the inspector.

The inspection forms also provide information regarding suggested engineering investigation and repairs and associated budgetary estimates of expected costs. Suggested engineering investigations are subdivided based on time of need. Repairs and associated budgetary estimates are subdivided based on time of need. The basis of selection for budget costs is further discussed in Section 3.0 of this report.

Photographs of each inspected structure are included with the inspection sheets including a minimum of 2 photographs for each structure (approach and elevation). Additional photographs depicting the details of the structure, observed defects or deterioration have also been included.

Individual inspection forms for the structures are included as an attachment where the structures are separated into alphabetical order.

## 3.0 DETERMINATION OF COSTS

### 3.1 Repair, Rehabilitation and Replacement

Given the cursory information obtained during the visual inspections and without the benefit of detailed design information, it is impractical to develop detailed cost estimates for each structure. For these reasons, benchmark budget costs were developed for categories of repair, rehabilitation and replacement. Traditionally, benchmark costs do not necessarily provide accurate costs for individual repairs /

replacement, but have proven to provide sufficient accuracy for global budgeting purposes when dealing with a large number of structures.

For the purpose of this study, benchmark costs for the rehabilitation and replacement of structures are based on maintaining the existing width, length and alignment of each structure. However, the costs to replace the existing structures with structures meeting current geometric standards are included for comparison. For this purpose, an overall roadway width of 10 metres was used for both bridges and culverts. More accurate costs for each structure would be provided upon further engineering study and design based on exact repair, rehabilitation and replacement needs (including change in geometry). The following benchmark costs have been established for this study following the requirements of the inspection forms.

Bridge and Culvert Replacement Costs

Budget costs for the replacement of bridges are usually based on the deck surface area of individual structures ($m^2$). Therefore, benchmark replacement costs for this study were determined using the following unit costs including approaches, administration and design costs, based on the spans of individual bridges and taking into account approach roadway costs (which do not vary with bridge span). In addition, the varying widths of bridges were taken into account to provide more realistic unit costs and to avoid large discrepancies in the replacement cost between bridges of different lengths, but similar surface areas.

| Total Bridge Replacement Unit Costs | | |
|---|---|---|
| **Bridge Length (m)** | **Width (m)** | **Unit Replacement Cost ($/m²)** |
| 3-10 | <10 m | $8,000.00 |
| | ≥10 m | $7,500.00 |
| 10-20 | <10 m | $7,500.00 |
| | ≥10 m | $6,500.00 |
| 20-30 | <10 m | $6,500.00 |
| | ≥10 m | $5,500.00 |
| >30 | <10 m | $5,500.00 |
| | ≥10 m | $4,500.00 |

In the case of culverts, the plan area (or deck surface area) used in the calculation was (‘length of spans’ + 1 m) x (‘width of roadway’ + 1 m). The purpose of using the Total Bridge Replacement Unit Costs table for culverts is to normalize the replacement cost figures. Although culverts are generally less expensive to construct than bridges, it is generally accepted that the expected life span is approximately 50% of a bridge. It is valid therefore, on a life cycle cost basis, to utilize the Total Bridge Replacement Unit Costs table for all structures, whether they are bridge type or culvert type.

Bridge Repair / Rehabilitation Costs

For budgeting purposes, costs for the rehabilitation of bridges are typically expressed as a percentage of the total replacement costs. Rehabilitation costs for this study are separated into four categories as presented in the table below (including administration and design costs).

| Bridge Rehabilitation Costs | | |
|---|---|---|
| Category | | % of Replacement Cost |
| 1. | Major Bridge Rehabilitation | 50-60 |
| 2. | Minor Bridge Rehabilitation | 25-50 |
| 3. | Major Item Repair | 5-25 |
| 4. | Minor Item Repair | 5 or less |

Culvert Repair / Rehabilitation Costs

It is generally not practical to undertake major rehabilitation work to culvert crossings where significant deterioration or deficiencies exist in the metal liner (barrel). Culvert replacement is normally planned in these circumstances. Repair work identified generally included repairs to the inlet and outlet structures such as headwalls, cut-off walls, retaining walls, restoration of backfill, slope protection at the culvert ends and installation / upgrading of guiderail. In the case of concrete barrels, some repair work to the barrels may be included if the opening is large enough to permit construction access.

Approach Roadway Repair / Rehabilitation Costs

For this study, approaches are considered to be 30m of roadway from the centre of each individual culvert (60 m total per culvert) and 6m of roadway from the end of the deck for each individual bridge (12m total per bridge). Repair / rehabilitation costs for approach roadways have been separated into three categories as presented in the table below (including administration and design costs).

Separate costs for Approach Roadway Repair / Rehabilitation have been included for Bridge Rehabilitation. For structure replacement costs and repairs, the approach roadway repair / rehabilitation costs have been included in the recommended work costs if applicable.

| Approach Roadway Repair/Rehabilitation Costs | | |
|---|---|---|
| Category | | Cost |
| 1. | Capital Projects (Partial / Complete Paving, Guiderail) | $40,000.00 |
| 2. | Minor Repairs / Maintenance (Crack Sealing, Surface Sealing, Guiderail Repairs) | $14,000.00 |
| 3. | Crack Sealing Only | $7,000.00 |


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Construction Detour Costs

Several alternatives exist to maintain the flow of traffic when a bridge or culvert undergoes major rehabilitation or replacement. These include the construction of a detour structure adjacent to the existing structure, a detour route around (avoiding) the structure, and the staging of the construction to allow traffic on the structure during construction. The construction of a detour structure is the most costly option and is usually recommended only when the other options are not possible. The detour route is the least expensive option, but is often not practical due to the length of the detour route and the inconvenience to residents near the structure. The most frequently recommended option is the staging of rehabilitation work to allow the passage of traffic.

Since most bridge projects would consist of rehabilitation and not replacement, the staging of work would be the most frequently used option to maintain traffic during construction. Therefore, the benchmark costs for detours are based on staging of the work as per the following. These costs are based on additional costs incurred from staging of the work during construction (extra effort, time). Traffic control costs would be separate from detour costs and are presented later in this section.

| Detour During Construction Costs | | |
|---|---|---|
| Category | | Cost |
| 1. | Detour - Minor Rehabilitation / Major Rehabilitation of Bridges Less than 10m Long / Culvert Replacement | $30,000.00 |
| 2. | Detour - Major Rehabilitation / Bridge Replacement | $100,000.00 |

Traffic Control Costs

In addition to performing the work in stages to accommodate traffic, the safety of traffic passing on the bridge or over the culvert during construction must also be ensured. The costs of traffic control during staged projects would be as follows:

| Traffic Control Costs | | |
|---|---|---|
| Category | | Cost |
| 1. | Traffic Control- Minor Rehabilitation | $30,000.00 |
| 2. | Traffic Control - Major Rehabilitation | $50,000.00 |

Utilities / Right of Way Costs

Most bridge or culvert rehabilitation / replacement projects do not require substantial expenses for the installation or modification of existing utilities. Similarly, most of these projects do not require an increase in right of way. Therefore, specific benchmark budget costs for these items were not developed.

Environmental Study Costs

Since bridge or culvert replacements / rehabilitations typically do not involve a change in alignment or a reduction in clearances under the structure, these projects usually fall under the Schedule A or A+ Environmental Assessment for Ontario Highways. This type of environmental assessment does not require detailed environmental and mitigation plans, but typically requires written application with, and permission from, the appropriate environmental agencies (Ontario Ministry of Natural Resources, Ontario Ministry of the Environment, Local Conservation Authorities (Permit To Take Water)). Therefore, the benchmark budget cost for environmental study would be as follows (based on the requirement of Schedule A or A+ Environmental Assessment):

| Environmental Study Costs | | |
|---|---|---|
| Category | | Cost |
| 1. | Bridge / Culvert Replacement, Minor and Major Rehabilitation | $9,500.00 |

Other Costs

Any other costs not specified in the above (site specific requirements) are deemed to be covered in the total benchmark costs. Therefore, no specific amount for other work is specified in this report.

Contingency Costs

The benchmark costs used for budgeting purposes are based only on information obtained from visual inspections. Because of this, contingency allowances are already built into the benchmark costs. Therefore, specific amounts for contingencies will not be included in this report.

Recommended Replacement Costs

For the purposes of this report, when a structure (bridge or culvert) replacement has been recommended, all associated costs (approaches, detours, traffic control, utilities, right of way, environmental studies and contingency) have been included in the replacement cost provided in the 'Repair and Rehabilitation Required' table on the inspection forms.

## 3.2 Engineering Investigation

Further engineering investigation is recommended for several of the bridges and culverts as indicated on individual inspection forms. Benchmark budget costs for engineering investigation work are presented in the table below:

| Engineering Investigation | | | |
|---|---|---|---|
| **Category** | | **Type of Structure** | **Cost** |
| 1. | Detailed Inspection / Rehabilitation Study - Full Bridge | Truss | $27,500.00 |
| | | Others | $22,000.00 |
| | | Traffic Barrier Only * | $5,500.00 |
| 2. | Detailed Deck Condition Survey | Exposed Deck | $5,500.00 |
| | | Asphalt Paved Deck | $8,800.00 |
| | | Concrete Culvert with Height of Fill Less than 500 mm ** | $5,500.00 |
| 3. | Structure Evaluation | Truss | $16,500.00 |
| | | Others | $11,000.00 |
| 4. | Underwater Investigation | All Bridges | $11,000.00 |

* Requirements for traffic barriers on bridges and culverts were determined using the Canadian Highway Bridge Design Code, MTO Standards and good engineering practice. The evaluation of existing traffic barriers was based on assumed values of AADT and good engineering practice. For structures with existing approach guiderail, a review of the required approach / leaving end length of guiderail and end treatments (as per the MTO's Roadside Safety Manual) was not carried out.

** Deck condition survey on concrete culvert includes cores with no corrosion potential survey. Deck condition surveys on concrete culverts with a height of fill greater than 500 mm are not practical.

The benchmark budget costs for a Structure Evaluation and Detailed Deck Condition Survey would be reduced to 50% of that shown in the table above when any one these are performed simultaneously with a Detailed Inspection / Rehabilitation Study.

Other investigations such as fatigue and seismic investigations would be included with the Detailed Inspection and Structure Evaluation (respectively), if deemed necessary by the engineer. Detailed coating condition surveys are typically only required where a failure of coating systems have occurred other than normal deterioration. A DART (Deck Assessment by Radar Technology) survey is not a commonly used investigation method. Detailed deck condition surveys are the most commonly used method of deck inspection. Therefore, individual costs for the various types of investigation described above are not provided.

## 4.0 BRIDGE CONDITION INDICES (BCI)

Bridge Condition Index (BCI) values were derived using MTO's standard methods as outlined in their document entitled '*Bridge Condition Index, an Overall Measure of Bridge Condition*' (July 2009). Based on this document, we utilize an excel spreadsheet (developed based on the parameters outlined in the document) that, after inputting the inspection data for each element (condition ratings), automatically calculates the BCI value.

With the calculated BCI values for each structure, an *overall* picture of the general condition of the Municipality's structures inventory as a whole can then be presented by summarizing BCI ranges (good, fair, poor) and counting the overall percentage of structures in each category. This is the methodology that the MTO currently utilizes and it is generally an effective tool to determine where the Township stands in terms of the overall condition and maintenance needs for their structure inventory. This information can be used to compare the overall condition of various structures, to assist in prioritizing structures for future rehabilitation and assist in the funding application process.

The BCI ranges that are normally included in this summary table are as follows:

- Good (BCI Range 70-100); for this range, maintenance is not usually required with the next five years.
- Fair (BCI Range 60-70); for this range, maintenance work is usually required / scheduled within the next five years. Carrying out work within this timeframe (next five years) is typically considered the ideal time to get the most out of bridge spending.
- Poor (BCI Less than 60); for this range, maintenance work is usually required / schedule with the next year.

For the Township's inventory (10 structures total), the current summary of BCI ranges is presented as follows (individual structure BCI values are presented in the tables in ***Appendix A***):

| ***BCI Range*** | ***Number of Structures in Range*** | ***Percent of Structures in Range*** |
|---|---|---|
| 70-100 | 9 | 90 |
| 60-70 | 1 | 10 |
| Less than 60 | 0 | 0 |

## 5.0 ROUTINE MAINTENANCE

As part of the Township's overall bridge management program, a program of routine maintenance should be implemented and up-kept for all structures. Maintaining this program will assist in minimizing the potential for premature deterioration of structural elements; and, when combined with a program of bridge rehabilitation, will assist in maximizing the useful service life of the Township's structure inventory.

Overall routine maintenance needs will vary depending on the type of structure, location, traffic volumes, winter maintenance procedures (sanding vs. salting, etc.), size of the structure, vintage and previous maintenance / rehabilitation carried out on the structure in the past. The following presents a general summary of routine maintenance operations that are considered applicable for the structures present within the Township's inventory:

- Periodic bridge cleaning; this would include power-washing of all components exposed to roadway traffic and areas where debris accumulation is prevalent. This would include asphalt wearing surfaces, expansion joint gaps, edges of roadway, bearing seats, truss bottom chords, etc. Typically this operation would be carried out on an annual basis, most likely each spring after winter sanding / salting operations have ceased; however, in some cases (i.e. gravel approach roadways, etc.), an increase in the number of cleanings per year may be required.

- Concrete spot repairs; this would generally include localized patching of small concrete spalls and delaminations located in areas within the roadway splash zones (top of deck, curbs, expansion joint block-outs, etc.). Completing these repairs will assist in preventing accelerated deterioration of concrete in these areas by reducing the ingress of chlorides, etc. There is no specific timing for these types of repairs and they are generally performed on an as-needed basis.

- Steel spot repairs / spot coating; this would generally include localized touch-ups to steel coatings located in areas within the roadway splash zones (truss bottom chords, exterior floor beams / stringers, etc.) as well as localized spot repairs in areas of appreciable section loss / corrosion. There is no specific timing for these types of repairs and they are generally performed on an as-needed basis.

- Clearing of debris in waterway; this would include clearing of trapped debris in the vicinity of the structure (upstream / downstream). This operation would typically be carried out on an annual basis, after the spring run-off period.

- Asphalt surface repairs / rout and seal; this would include cold patch asphalt repairs, routing and sealing of wide cracks in asphalt. This operation would typically be carried out an annual basis, after winter clearing operations have ceased.

- Re-grading of approach roadways (gravel roadway surfaces); this would include placing and grading fresh granular material on roadway surfaces. The timing of this work would depend on the overall volume and type of traffic typically traversing the roadway (truck haul route, summer cottage traffic route, etc.). Typically this work would be carried out on an annual or bi-annual basis.

- Bridge deck drainage; this would include maintaining existing deck drains free of debris and maintaining them in an un-plugged condition. This operation would typically be carried out an annual basis, after winter clearing operations have ceased.

- Clearing of debris / vegetation from approach guiderail; this would involve removing debris and vegetation from in front of approach guiderail. Although this is mainly a safety measure (to ensure proper performance of the guiderail), it also assists in prolonging the lifespan of the guiderail (accumulation of debris can accelerate rot on wooden posts, corrosion on steel guiderail, etc.).

- Surface sealing of exposed concrete surfaces; this would include cleaning and applying a concrete sealer on concrete surfaces exposed within the splash zone (exposed concrete decks, curbs, sidewalks and barrier walls); this operation is not typically required on an annual basis and would typically be completed in 3-5 year intervals. Sealing concrete surfaces periodically assists in minimizing the migration of chlorides into the concrete.

## 6.0 ASSET MANAGEMENT INFORMATION

As previously mentioned, all structures were visited and inspected in conformance with the requirements of the Ontario Structure Inspection Manual (2008 Revision). Based on the results of the inspections, repair / rehabilitation needs and budgetary costs for these were identified. In addition, additional engineering inspections and studies were also recommended.

Although OSIM inspections (generally performed every 2 years) are a useful screening tool to identify upcoming bridge maintenance needs and costs, these inspections solely rely on visual evidence of deterioration and do not take into account the age (life cycles) of individual structures, nor do they take into account the potential for hidden deterioration (which could be revealed with further investigations such as detailed bridge condition surveys, rehabilitation studies, etc.).

In order to provide the Township with a more useful planning tool for structure maintenance, rehabilitation and replacement, all of the information gathered from the OSIM inspections was summarized in an Asset Information Summary table.

***Asset Management Summary***

This set of tables presents basic asset information for the structures such as structure name, type of structure and basic geometry. The replacement value for each structure (based on current and widened geometry, in the case where the width of the existing structures are deficient) is also provided. These values are presented in 2020 dollars. The BCI calculated for each structure is also provided.

The BCI values were calculated using the method established by the Ministry of Transportation of Ontario. This method takes into account the quantities for poor, fair, good and excellent for each of the elements and determines the cost of the rehabilitation needs. The BCI is determined by dividing the remaining value of the bridge (value of the bridge less cost of the rehabilitation needs) by its initial value (in new condition).

## 7.0 DISCUSSION

This Bridge Management Asset Study was developed to provide the Township of Strong with the necessary information required to project budgets and set priorities for future bridge and culvert rehabilitation / replacement programs. The attached inspection sheets should be updated accordingly as repairs and rehabilitations are carried out.

Replacement, rehabilitation and engineering investigation budget costs were provided for 10 of the Township's structure based on visual biennial inspections performed by HP Engineering (during the summer of 2020).

The costs for individual structures are presented on inspection forms and were based on benchmark costs developed for this study. These should be used for budgeting purposes only. More accurate cost estimates for each structure's needs would be provided based on more detailed scopes of work developed during the design engineering stages.

The estimated replacement value of the Township's bridge and culvert inventory (based on 10 structures in the inventory) is approximately ***5.69*** million dollars. The estimated value of all the bridges and culverts (based on 10 structures in the inventory) if reconstructed to current geometric standards would be approximately ***7.44*** million dollars.

Immediate repair / rehabilitation costs for the 10 structures inspected are estimated to be a total of approximately ***144*** thousand dollars broken down as ***48*** and ***96*** thousand dollars for bridges and culverts respectively. Similarly, the longer term repair / rehabilitation costs (1-5 years) for the 10 structures inspected are estimated to be a total of approximately ***268*** thousand dollars broken down as ***130*** and ***138*** thousand dollars for bridges and culverts respectively. The 6-10 year repair / rehabilitation costs for the 10 structures inspected are estimated to be a total of approximately ***0*** dollars.

The costs associated with recommended further Engineering Investigations for the 10 structures inspected was estimated to be a total of approximately ***25*** thousand dollars broken down as ***10*** and ***15*** thousand dollars for bridges and culverts respectively. It is noted that the majority of the costs associated with these recommended further Engineering Investigations are related to deficient and / or non-existing barriers over the structures and on the approaches to the structures.

Respectfully Submitted,

December 11, 2020

**HP ENGINEERINC INC.**

LICENSED PROFESSIONAL ENGINEER
11/12/2020
V.K.T. DWIVEDI
100073709
PROVINCE OF ONTARIO

Tashi Dwivedi, P.Eng.
Principal

# APPENDIX A

# ASSET MANAGEMENT SUMMARY

# APPENDIX A-1

## BRIDGES
## (7 STRUCTURES)

# Appendix A : Asset Information Summary - Bridges



| Site No | Bridge Name | Bridge Type | Year Built (Age) | Year of Last Rehab | Number of Spans | Total Length (Parallel to Roadway) (m) | Width (Perpendicular to roadway) (m) | Roadway Width (m) | Existing Surface Area ($m^2$) | Replacement Cost - Existing Geometry ($000) | Replacement Cost - Current Geometric Standards ($000) | BCI | Benchmark Budget Costs | | | | Prioritization of Major / Minor Capital Work | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | Rehabilitation Costs ($000) | | | Engineering Investigation Costs ($000) | Prioritize Year of Need - Major/Minor Capital Works | Estimated Major / Minor Capital Work Expenditure per Year ($000) | | | | | |
| | | | | | | | | | | | | | < 1 year | 1-5 Years | 6-10 Years | Normal | | 2021 | 2022 | 2023 | 2024 | 2025 | Total ($000) |
| | | | | | | | | | | | | | | | | | | | | | | | |
| BR1 | Adams Road Bridge | Concrete Rigid Frame | Unkonwn | - | 1 | 7.00 | 5.60 | 4.60 | 39 | 314 | 578 | 75 | 0.0 | 6.0 | 0.0 | 0.0 | 5 | | | | | 6.0 | |
| BR3 | Brookside Road Bridge | Concrete Rigid Frame | Unknown | - | 1 | 12.30 | 5.70 | 5.10 | 70 | 526 | 847 | 73 | 48.0 | 0.0 | 0.0 | 5.0 | 2 | | | 53.0 | | | |
| BR4 | Robins Road Bridge | Concrete Girder | Unknown | - | 1 | 21.80 | 11.50 | 10.00 | 251 | 1,379 | 1,379 | 75 | 0.0 | 0.0 | 0.0 | 0.0 | N/A | | | | | | |
| BR5 | Muskoka Road Bridge | Steel Girder | 2014 | - | 1 | 16.00 | 8.10 | 7.00 | 130 | 972 | 1,154 | 75 | 0.0 | 0.0 | 0.0 | 0.0 | N/A | | | | | | |
| BR6 | Stirling Creek Bridge | Bailey Panel | Unkonwn | - | 1 | 12.2 | 6.37 | 5.05 | 78 | 583 | 898 | 72 | 0.0 | 64.0 | 0.0 | 0.0 | 1 | | 64.0 | | | | |
| BR7 | Pevency Road Bridge | Steel Girder | Unknown | - | 1 | 15.05 | 6.05 | 5.45 | 91 | 683 | 1,037 | 74 | 0.0 | 12.0 | 0.0 | 0.0 | 4 | | | | | 12.0 | |
| BR12 | Rodeo Road Bridge | Concrete Rigid Frame | Unknown | 2020 | 1 | 1.8 | 16.00 | 6.00 | 29 | 216 | 270 | 70 | 0.0 | 48.0 | 0.0 | 5.0 | 3 | | | | 53.0 | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| TOTALS | | | | | | | | | | 4,672 | 6,163 | | 48 | 130 | 0 | 10 | | 0 | 64 | 53 | 53 | 18 | 188 |

**NOTES:**

1. BCI as calculated by HP Engineering.

## APPENDIX A-2

## CULVERTS
## (3 STRUCTURES)

# Appendix A : Asset Information Summary - Culverts



| Site No | Culvert Name | Culvert Type | Number of Spans | Total Length (Parallel to Roadway) (m) | Width (Perpendicular to roadway) (m) | Roadway Width (m) | Existing Surface Area ($m^2$) | Replacement Cost - Existing Geometry ($000) | Replacement Cost - Current Geometric Standards ($000) | BCI | Benchmark Budget Costs: Rehabilitation Costs ($000) | | | Engineering Investigation Costs ($000) | Prioritization of Major / Minor Capital Work: Prioritize Year of Need - Major/Minor Capital Works | Estimated Major / Minor Capital Work Expenditure per Year ($000) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | < 1 year | 1-5 Years | 6-10 Years | Normal | | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | Total ($000) |
| | | | | | | | | | | | | | | | | | | | | | | | |
| BR2 | Forest Lake Road Culvert | Concrete Rigid Frame | 1 | 3.0 | 12.4 | 6.8 | 31 | 250 | 330 | 66 | 0 | 138 | 0 | 5.0 | 1 | 143.0 | | | | | | | |
| BR8 | Black Creek Road Culvert | Rectangular Culvert | 1 | 6.2 | 42.1 | 7.5 | 61 | 490 | 594 | 75 | 48 | 0 | 0 | 5.0 | 3 | | | 53.0 | | | | | |
| BR11 | Rodeo Road Culvert | CSP Arch | 1 | 3.3 | 22.0 | 7.0 | 34 | 275 | 355 | 75 | 48 | 0 | 0 | 5.0 | 2 | | 53.0 | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| **TOTALS** | | | | | | | | **1,014** | **1,279** | | **96** | **138** | **0** | **15** | | **143** | **53** | **53** | **0** | **0** | **0** | **0** | **249** |

**NOTES:**

1. BCI as calculated by HP Engineering.