



ELLIS
Engineering Inc.

ELLIS Engineering Inc.
Consulting Engineers
214 Martindale Road, Suite 201
St. Catharines, ON L2S 0B2

Tel: (905) 934-9049
Web: www.ellis.on.ca

December 14, 2022

Town of Pelham

Pelham Municipal Building
20 Pelham Town Square
Fonthill, ON
L0S 1E0

Attention: Mr. Derek Young, Manager of Engineering

Reference: 2022 Bridge and Culvert Inspection Program, Rehabilitation/Replacement Needs
ELLIS File No.: 1070

We are pleased to submit one (1) copy of the 2022 Pelham Bridge and Culvert Inspection Program, Rehabilitation/ Replacement Needs ring binder, which contains inspection reports for twenty-three (23) of the Town of Pelham's bridges and culverts.

A universal serial bus (USB) flash drive has been included, which contains all files relating to the Town's Bridge and Culvert structures, including the corresponding Bridge Management Database (*Town of Pelham Bridge Inspections 2022.mdb*), a Microsoft Streets and Trips map file (*Inspections Map 2022.est*) containing the location of all the Town's structures, PDF files of each individual bridge and culvert assessment report, as well as all original inspection photographs. The Town will require the use of Microsoft Access to use the database and Microsoft Streets and Trips to view the location maps.

All of the inspections were completed by Robert Ellis and Jordan Marcella of ELLIS Engineering Inc. Arih Struger-Kalkman, P.Eng., and Duane VanGeest, P.Eng. reviewed the reports, including recommendations and cost estimates based on the deficiencies at each structure.

Classification:

All structures have been classified as either "Bridge" or "Culvert" type structures according to the criteria contained in the Municipal Bridge and Culvert Appraisal Manuals. The definition is as follows:

"In general, bridges transfer all live loads through a superstructure to a substructure and foundations, and culverts transfer all live loads through fill. Box or Open type structures with a span of 3m or greater, and have less than 600mm of cover shall be appraised as a bridge, and those with more than 600mm of cover shall be appraised as a culvert".

Corrugated Steel Pipe (CSP), High Density Polyethylene Pipe (HDPE), and Soil Steel Multi Plate (SSMP) type structures are always classified as culverts, regardless of fill.

The technical classification of each structure as either a “Bridge” or a “Culvert” has been indicated within the Bridge Management Database. Each structure has a unique ID number. Also, Bridge and Culvert structures have been classified as either “Municipal” or “Structure”. Bridges or culverts with a span less than 3.0m are classified as “Municipal” structures and do not require inspection every two years as required by Ontario Regulations 104/97. Structures with a span greater than 3.0m are classified as “Structure” and must be inspected once every two years, by Ontario law.

The Biennial inspection for ‘Structures’ may be increased to four years, according to the Ontario Structure Inspection Manual (OSIM), if the following criterion is met:

“For culverts with 3m to 6m spans and retaining walls, the inspection interval can be increased to four years if the culvert or retaining wall is in good condition and the engineer believes that the culvert or retaining wall condition will not change significantly before the next inspection.”

Priority Ranking and Bridge Condition Index (BCI):

Each structure has been given a priority ranking. The priority ranking summary spreadsheets of the Rehabilitation/Replacement Needs have been prioritized according to the following categories:

- NOW,
- 1-5 Years,
- 6-10 Years,
- Adequate.

In addition to the priority rankings, the structures are classified with a General Overall Condition Rating and a corresponding Bridge Condition Index (BCI) value. The categories summarized in Table 1, below, were used to classify the structures.

Table 1: Structure Condition Classification and Corresponding BCI Values

Condition	BCI Range	Description
Very Good	80 – 100	Overall the components of the structure are in very good condition. Generally the structure has been constructed within the last 10 years and does not require any work within the next 10 years.
Good	70 – 79	Overall the components of the structure are in good condition. Generally the structure is adequate or requires only minor maintenance within the next 10 years.
Fair	60 – 69	Overall the components of the structure are in fair condition. Generally the structure requires major rehab or replacement within the next 10 years, or requires Condition Survey (C/S), Load Capacity Evaluation (LCE) or Rehabilitation/Replacement Analysis (RRA).
Poor	0 – 59	Overall the components of the structure are in poor condition. Generally the structure requires replacement within the next 5 years.

Structure Type:

Each of the structures inspected has been classified by structure type. Structure types include Rigid Frame (RF), Rigid Frame Box (RB), High Density Polyethylene Pipe (HDPE), Corrugated Steel Pipe (CSP), and Soil Steel Multi Plate (SSMP).

Figure 1, below, shows the percentage of structures classified under each type.

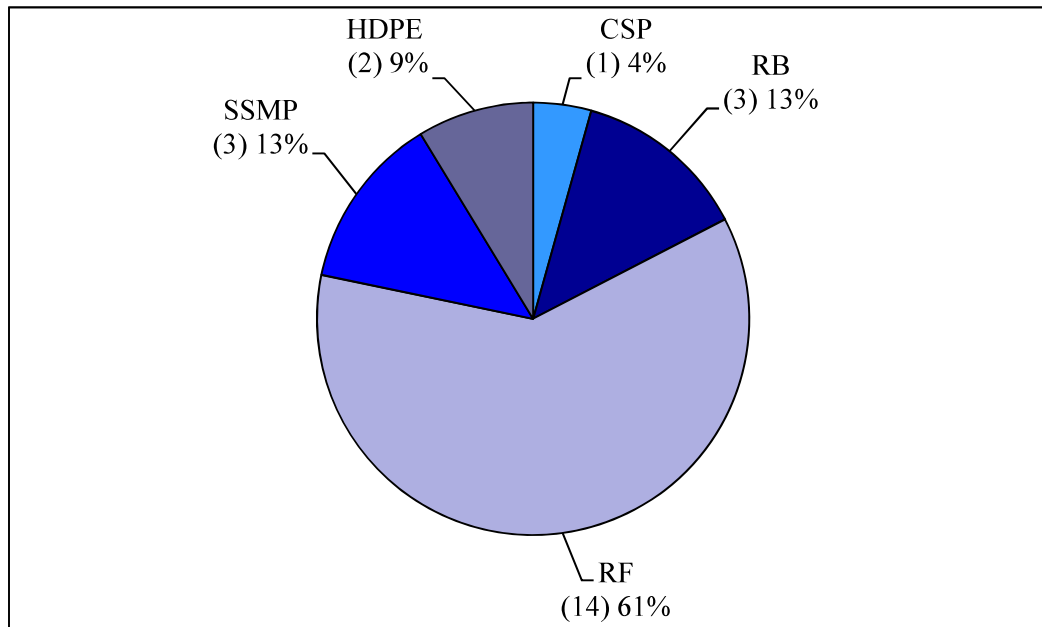


Figure 1: Structures Classified by Structure Type

Bridge Management Database:

All structure inspection information has been entered into a Bridge Management Database. Inspection reports and photographs can be sorted and viewed electronically and any additional hard copies can be printed directly from the database.

All Rehabilitation/Replacement Needs reports contained in the ring binder are sorted by structure ID Number. The various printed spreadsheets list the structures by structure number, within their respective priority rating categories (NOW, 1-5 Years, 6-10 Years, and Adequate).

Changes and Updates to the Database:

No structures were added, removed, renamed, or reclassified since the 2020 inspections.

Next Inspection:

In the 2022 assessment, 23 of the Town's structures were inspected. The next inspection for all 23 structures is 2024.

Estimated Costs for Repair:

The estimated rehabilitation/replacement construction costs have been calculated based on preliminary engineering assumptions. The accuracy of the cost estimates are in an approximate range of plus or minus 20%, with no allowance for contingencies.

In some cases, the installation of steel-beam guide rails has been included as a recommended rehabilitation. Generally road works have not been recommended unless directly related to the rehabilitation of the structure.

Roadside Safety Barriers:

We identified five (5) of the Town's structures that have recommendations related to Roadside Safety Barriers. We recommend that the Town review the structures listed in Table 3, below, along with the Geometric Design Guide for Canadian Roads and the Town of Pelham's Roadside Safety Policy to determine if upgrades, repairs, and/or new roadside safety barriers are required.

Table 3: List of Structures to Review for Roadside Safety Barriers

ID Number	Structure Name	Priority Rating	Cost
05	Luffman Drive	NOW	\$69,000
09	Roland Road	NOW	\$15,000
11	Centre Street	6-10 Years	\$69,000
18	Maple Street	NOW	\$69,000
21	Effingham Street	NOW	\$1,500
Total Cost:			\$223,500

Note: Cost includes estimates for engineering.

Summary of Structure Conditions:

Figure 2, below, shows the percentage of structures inspected in 2022 in each General Overall Condition category.

Figure 2: Structures Classified by General Overall Condition

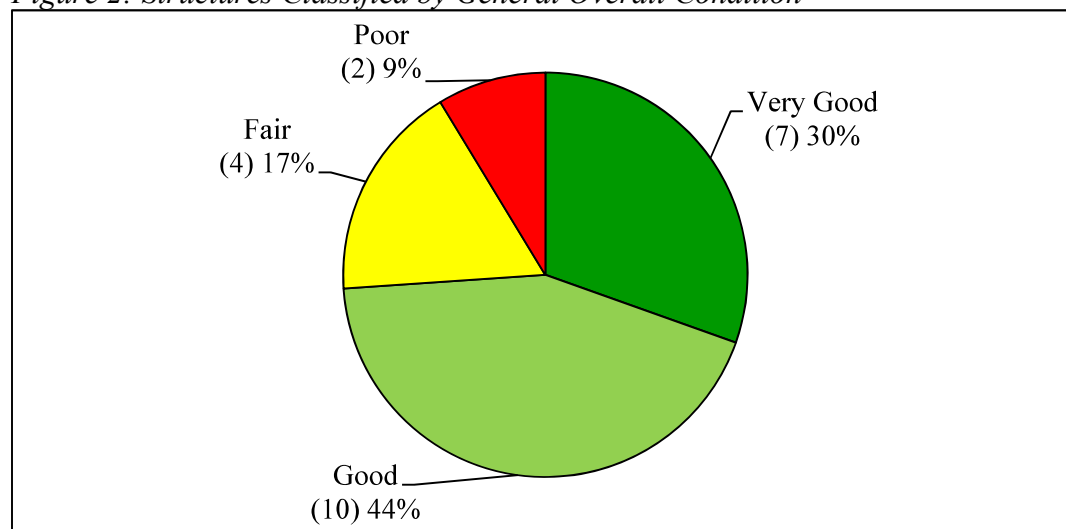


Table 4 and Figure 3, below, summarize the relationship between the general overall condition and priority rating of the structures inspected.

Table 4: Summary of General Overall Condition

		General Overall Condition									
		Very Good		Good		Fair		Poor		Total	
Priority Rating	Adequate	6	26%	2	9%	2	9%	0	0%	10	43%
	6–10 Years	0	0%	1	4%	1	4%	0	0%	2	9%
	1–5 Years	1	4%	0	0%	0	0%	1	4%	2	9%
	NOW	0	0%	7	30%	1	4%	1	4%	9	39%
	Total	7	30%	10	43%	4	17%	2	9%	23	100%

Note: Percentages (%) are rounded to the nearest percent.

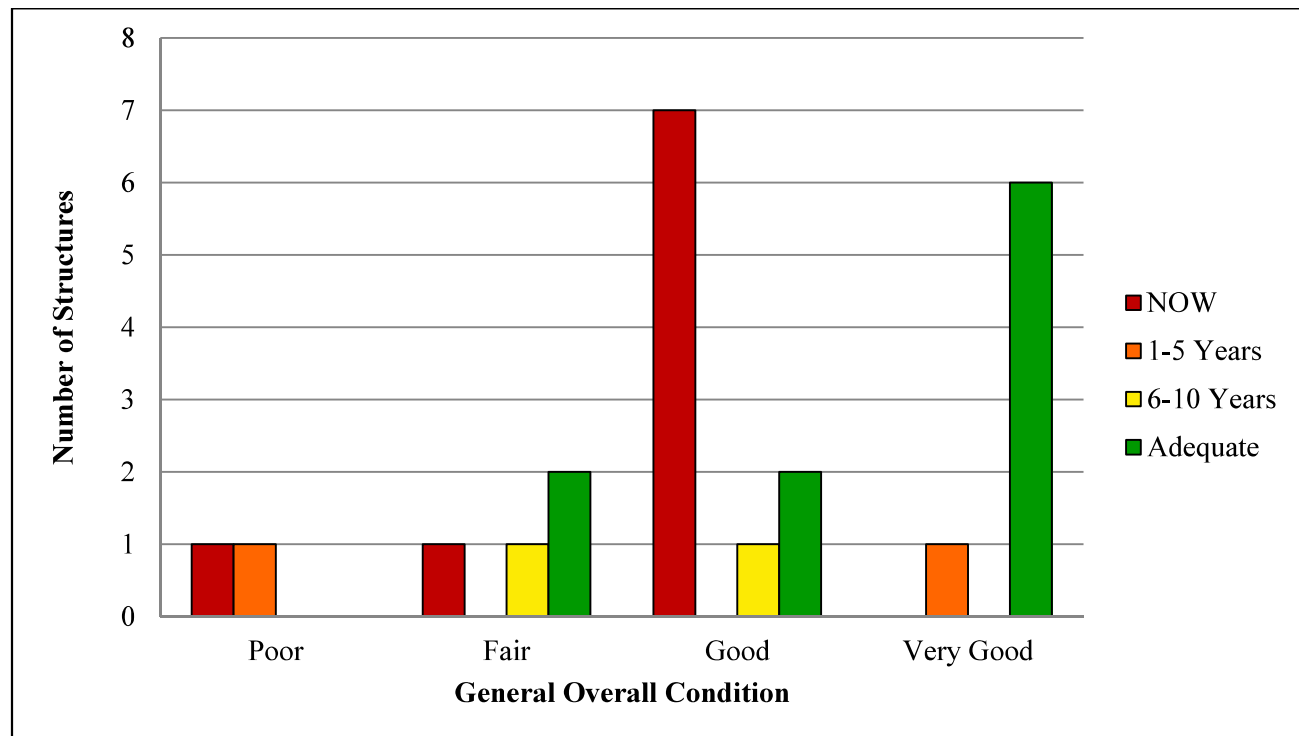


Figure 3: Number of Structures for Each General Overall Condition Category by Priority Rating

Table 5 and Figure 4, below, summarize the relationship between the priority ratings of the structures inspected in 2022 relative to the estimated cost range for the rehabilitation/replacement needs.

Table 5: Summary of Priority Rating and Cost

Priority Rating	Total	% of Total	2022 Estimated Cost	Number of Structures in the Cost Range		
				\$0 - \$49,999	\$50,000 - \$499,999	\$500,000 +
Adequate	10	43%	\$0	-	-	-
6–10 Years	2	9%	\$139,000	0	2	0
1–5 Years	2	9%	\$1,058,000	1	0	1
NOW	9	39%	\$1,511,000	6	2	1
Total	23	100%	\$2,708,000	7	4	2

Notes: Costs include estimates for engineering.

Percentages (%) are rounded to the nearest percent.

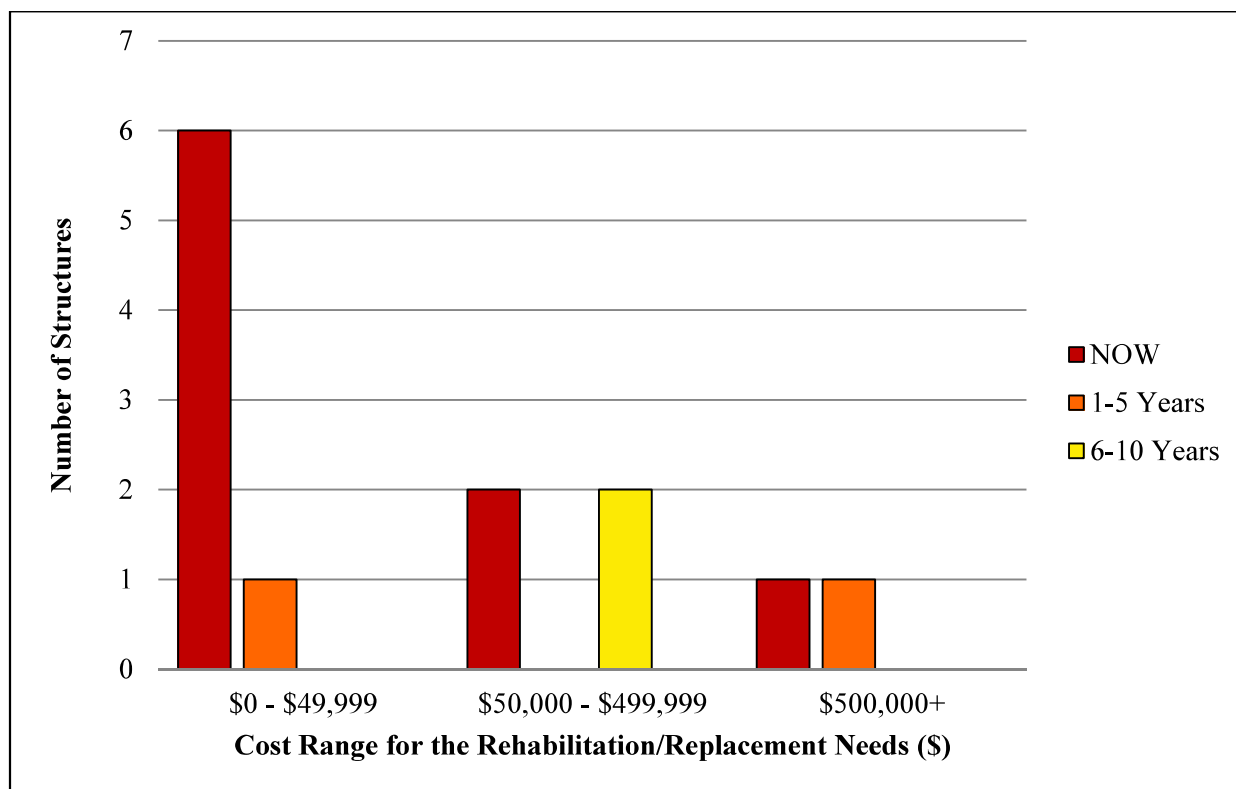


Figure 4: Number of Structures in the Rehabilitation/Replacement Cost Range by Priority Rating

Table 6, below, summarizes the change in cost from the 2020 Bridge and Culvert Assessment to the 2022 Bridge and Culvert Assessment for structures in each Priority Rating.

Table 6: Summary of the Change in Cost from the 2020 Assessment to the 2022 Assessment

Priority Rating	2020 Total Cost	2022 Total Cost	Summary of Major Changes and Comments
Adequate	\$0	\$0	No Change.
6-10 Years	\$977,500	\$139,000	+ New RIR recommendation for Structure No. 11. + New rehabilitation recommendation for Structure No. 02. - Structure No. 13 moved to 1-5 Years.
1-5 Years	\$21,000	\$1,058,000	+ Increases in construction costs. + Structure No. 13 moved from 6-10 Years.
NOW	\$3,149,500	\$1,511,000	+ Increases in construction costs. - Structure No. 22 replaced in 2021. - Structure No. 14 replaced in 2022.
Total	\$4,148,000	\$2,708,000	\$1,440,000 decrease (Approximate 35% decrease)

Note: Costs include estimates for engineering.

- Indicates reduction in cost from 2020.

+ Indicates increase in cost from 2020.

The overall costs decreased approximately 35% from 2020 to 2022 due to the replacements of Sixteen Road Culvert (Structure No. 22) and Balfour Street Culvert (Structure No. 14). Minor increases in cost for individual structure rehabilitation/replacement needs reflect an increase in the cost of construction.

Closing:

We thank you for giving us the opportunity to provide our services for this very interesting project. Should you have any questions concerning the report, please contact the undersigned.

Yours truly,

ELLIS Engineering Inc.



Arih Struger-Kalkman, M.Eng., P. Eng.
Project Manager



Robert Ellis
Project Assistant

cc: Jason Marr, Director of Public Works