

Township of Huron-Kinloss Bridge Needs Assessment 2021

PRESENTATION TO
COUNCIL ON :
April 4, 2022
By: Ken Logtenberg, P.Eng.



Scope of Presentation

- Scope of the Assessment
- Explain inspection method
- Summary of observations
- Description of improvement types
 - Maintenance improvements
 - Capital improvements
- Illustrate specific examples
- Concluding comments
- Questions

Scope of Assessment

1. Assemble maps of structure locations and review information from previous bridge inspection reports
 - Reviewed 99 structures, 54 culverts and 45 bridges.
2. Visually inspected all the structures, assemble notes on OSIM forms as per the guidelines
3. Analysed the data
 - Develop list of general observations, prioritize the lists of needs, assign timelines and calculate probable costs to complete repairs.
4. Prepared a report and presented results

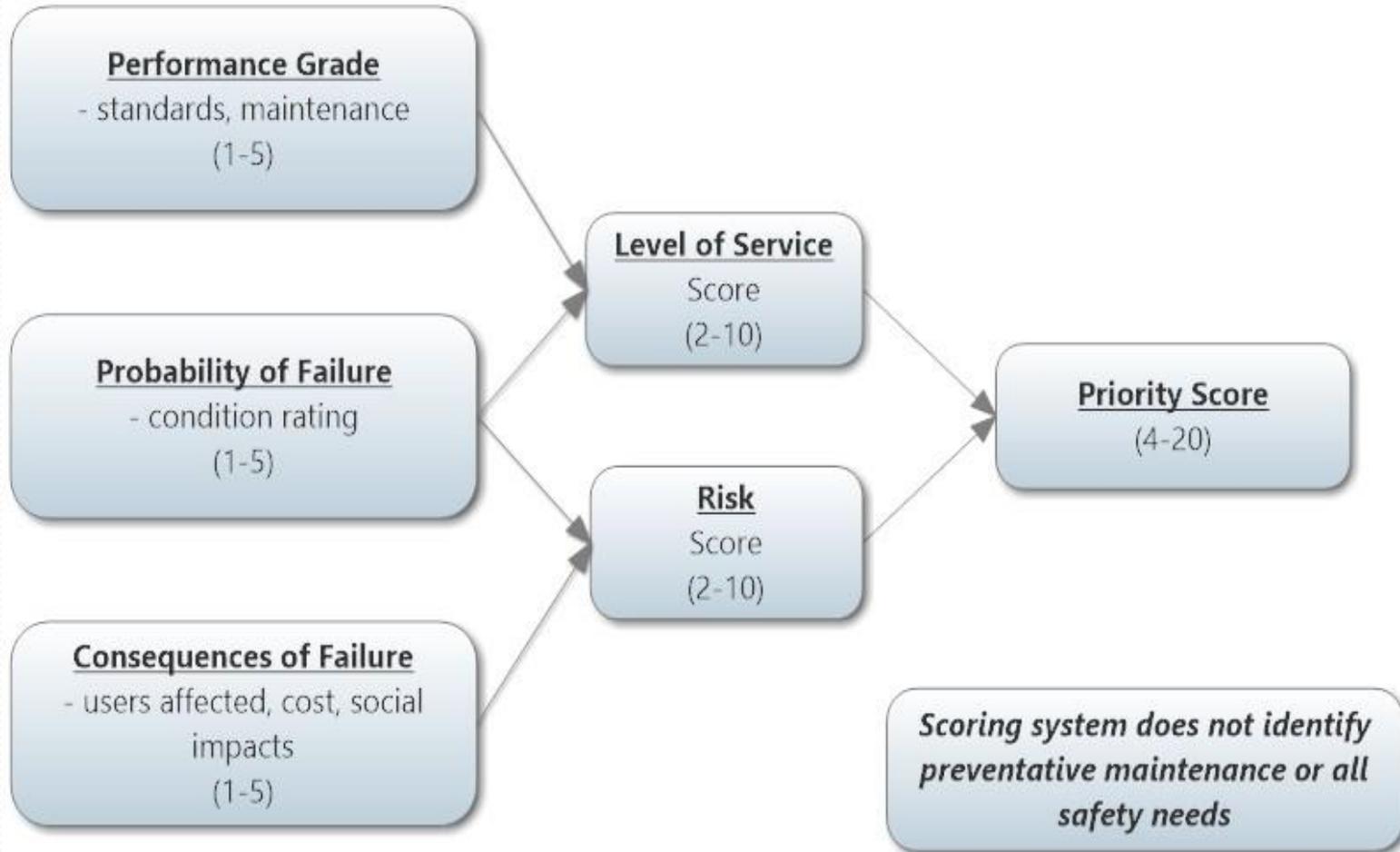
Legislative Requirements

- Ontario Regulation 104/97, *Amended to O. Reg. 160/02* requires that all bridges be inspected under the supervision of a Professional Engineer every 2 years.
- These inspections are to be carried out in general accordance with the Ontario Structure Inspection Manual.
- In Ontario the definition of a bridge is any structure with a span of 3.0 m or greater.

Bridge Assessments Method

- Bridge inspection as per OSIM (Ontario Structure Inspection Manual developed by the MTO)
 - Recorded measurements and take photos of bridge major components and identified defects.
 - Assign condition ratings to components, based on visual observations and non-destructive testing
 - Calculate a Bridge Condition Index scores (BCI)
 - Timeline for repairs are based on the opinion of the Engineer, grouped in urgent, < 1 year, 1 - 5 and 6 – 10
 - May identify needs for additional investigation work
 - Calculate probable costs to address the needs
 - Prioritized needs using scoring system and Engineer's opinion

Simplified Priority Scoring System



Scoring System Ranking

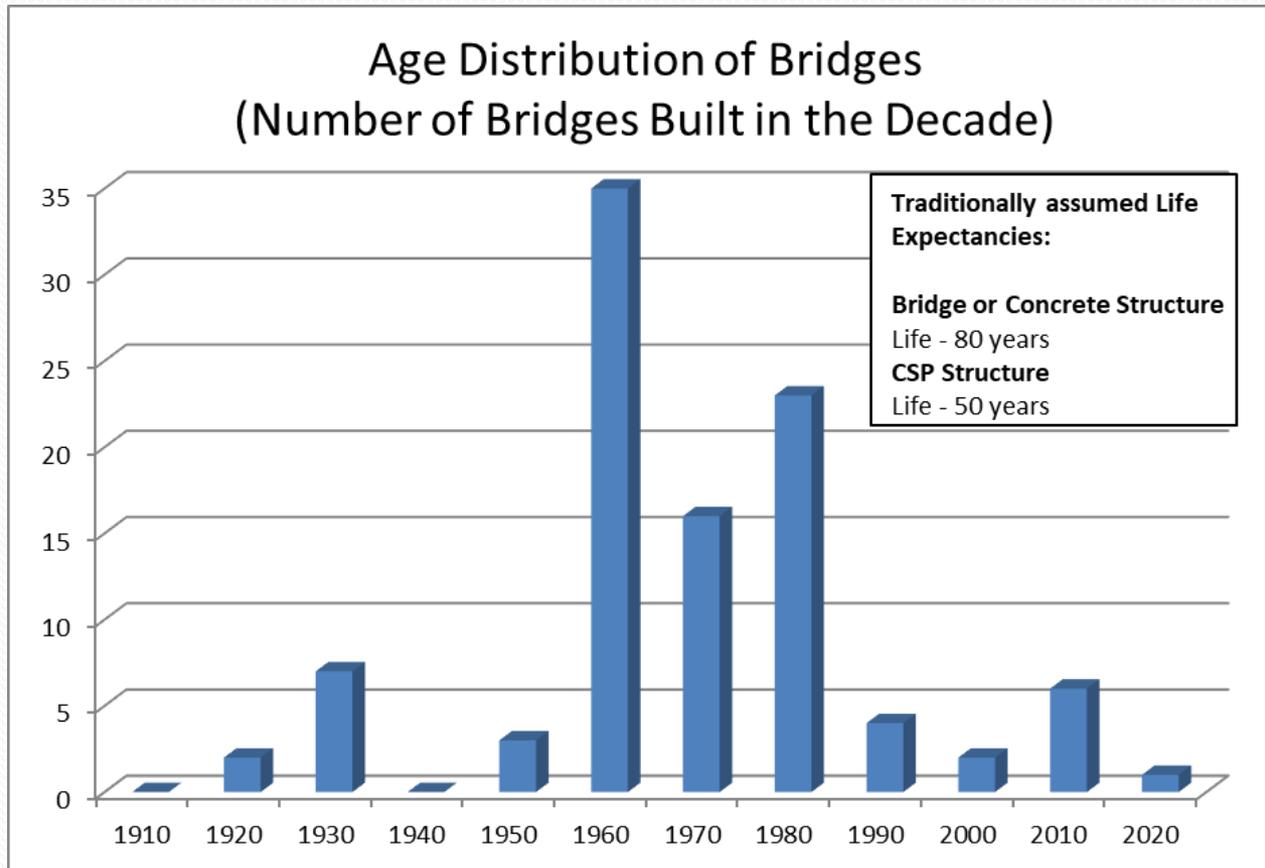
Consequence of Failure:		Priority Score Calculation Factors for Bridges				Probability of Failure:																																																	
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		Risk = Consequence of Failure + Probability of Failure Priority Score = Risk + Level of Service Level of Service = Performance Grade + Probability of Failure																																																					

- Simple scoring system to help prioritize the needs and develop a Risk Score and a Level of Service score that could be used for Asset Management and with other asset types
- The theoretical score should only be used as a guide. Other factors, preventative maintenance, cost savings strategies, other infrastructure needs and overwhelming safety needs should be considered when prioritizing.

Bridge Capacity Restraints

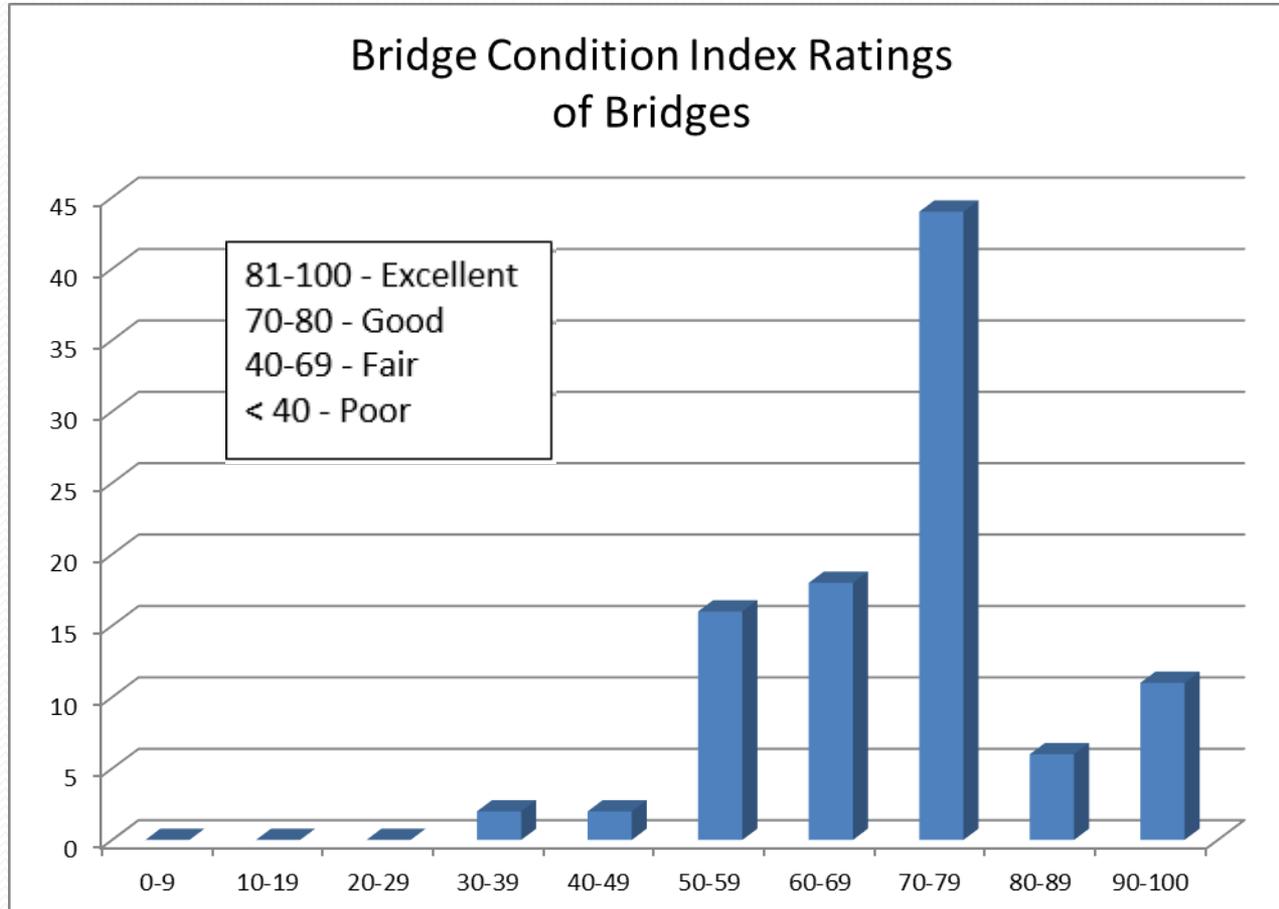
- Bridge with load limits
 - H26 – 11 tonnes (Sideroad 30)
 - H28 – 12 tonnes, proposing reduction to 8 tones (Sideroad 20)
 - H30 – 16 tonnes (Sideroad 5)
 - H35 – 8 tonnes (Baseline)
 - K3 – Concern about the condition but have not propose a load limit at this time
- Narrow Structures
 - 7 narrow structure identified, the 4 with load limits, plus
 - H39, 5.5m road width, Victoria Road in Point Clark
 - H41, 5.3m road width, South Base Line
 - H44, 7.4m road width, Concession 4, Recommend Widening and add railings or Replacement

Bridge Assessment



- 45 bridges and 54 culverts reviewed
- 9 structures > 80 years old, 9 structures < 25 years old
- Average age is 49 years

Bridge Assessment



- 2 structures with BCI scores ≤ 40
- 61 structures with BCI scores >70
- Average BCI Score of 71

Bridge Assessment

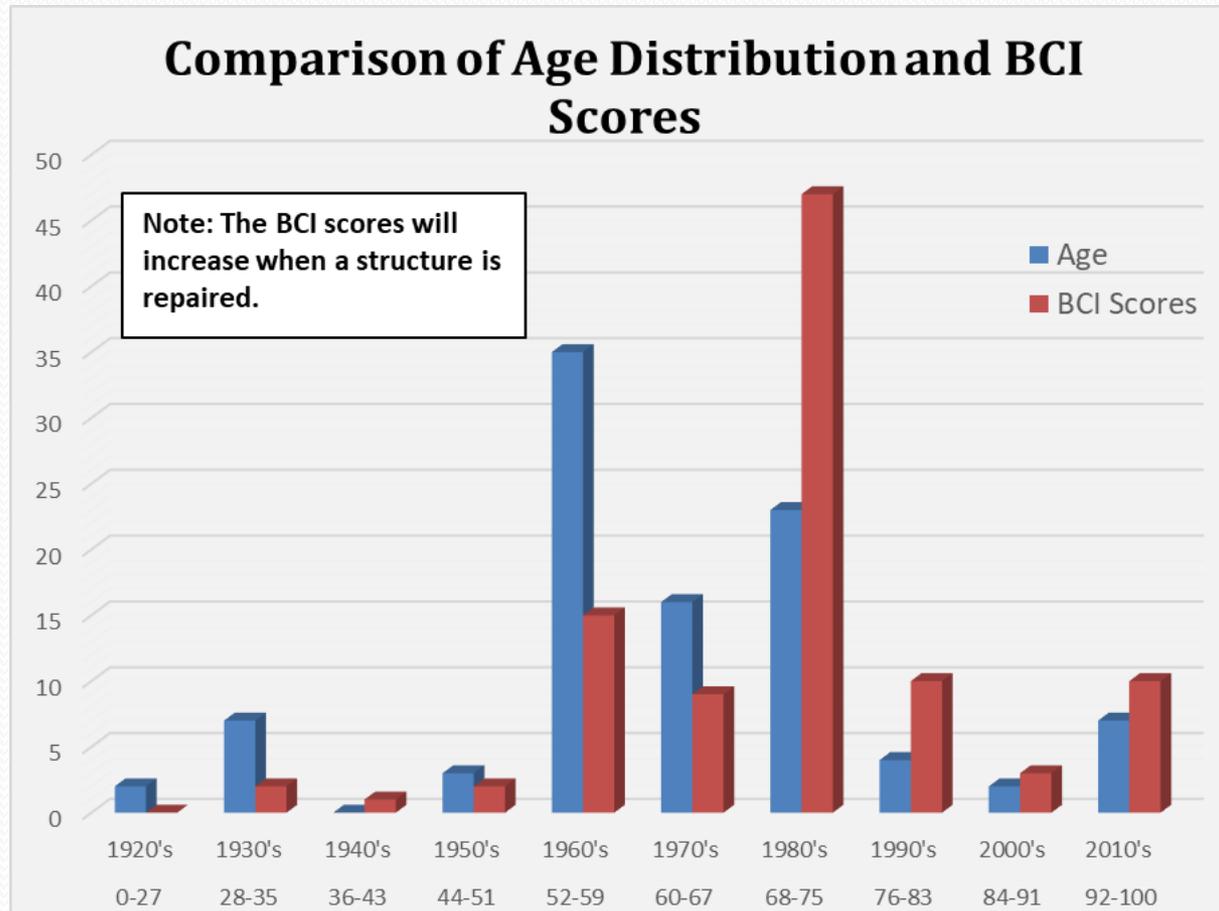


Figure was created to see if the BCI scores for the bridges deteriorated linearly from 100 to 40 over; over 80 years as suggested.

Figure shows it does not and also suggests the BCI score is higher than they should be for the age of the structures.

Suggested Long Term Capital Budget

To predict a long term budget we reviewed the condition of each structure and calculated a probable cost for the next major repair or replacement in 2021 dollars.

- With bridges, maximum life 120 years, major rehabilitation extends life about 40 year and costs 40% of the replacement costs, sometimes repaired twice over its life time
- With concrete culverts maximum life about 120 years, rehabilitation extends life by about 50 years and costs about 20% of replacement costs.
- With steel culverts, maximum life expectancy 80 years, no rehabilitation options.
- The estimated replacement cost of all the structures is \$54.5 million in 2021 dollars and average annual costs of \$700,000 or about 1.3% of the replacement costs.

Routine Maintenance Tasks

- Clean bearing seats to let water drain away from girders
- Pressure wash expansion joint seal and check for leaks
- Clean gravel off the curbs and deck
- Re-seal joints in walls with caulking
- Remove brush and logs blocking stream flow through
- Restore eroded stream banks, place rip rap at toe
- Grade shoulders to shed water off uniformly to minimize potential for washouts

List of Maintenance Needs

Site Number	Location	Repair Description	BCI
H1	Concession 2	Replace caulking, remove debris, clear drains	75
H2	Sideroad 30	Replace caulking, remove debris, clear drains	76
H3	Sideroad 25	Remove tree	90
H5	Concession 2	Remove vegetation at south end	64
H6	Concession 2	Place riprap, remove trees and clear drains	74
H7	Sideroad 20	Replace caulking, clear drains	75
H8	Concession 2	Clear deck drains	75
H9	Concession 2	Replace caulking, replace rail endcaps, clear drains	75
H10	Sideroad 20	Remove gate from stream	88
H11	Sideroad 10	Replace caulking	74
H12	Concession 2	Place riprap	75
H13	Concession 4	Place riprap	75
H15	Sideroad 5	Remove trees	75
H16	Sideroad 10	Replace caulking, clear deck drains	75
H21	Concession 6	Place riprap, clear debris	75
H30	Sideroad 5	Replace damaged offset blocks	77
H31	Sideroad 20	Clear gravel from deck	77
H33	Sideroad 25	Clear deck drains	75
H34	Concession 10	Remove built up silt	74
H36	Concession 6 West	Clear deck drains	74
H37	Concession 6	Replace caulking, clear gravel from deck	75

List of Maintenance Needs- cont.

Site Number	Location	Repair Description	BCI
H39	Victoria Road	Place riprap	74
H40	Lake Range Drive	Place riprap	74
H41	South Baseline	Clear of deck top	57
H45	Sideroad 20	Remove tree	57
H47	Huron-Kinloss Boundary	Place riprap	68
H53	South Baseline	Remove debris	68
H54	Sideroad 25	Remove debris	54
H60	Sideroad 20	Place riprap	75
H61	Huron-Kinloss Boundary	Remove gate in stream	87
H69	Concession 4	Place riprap	64
L6	Canning Street	Replace caulking	69
P2	East of County Road 1	Remove debris	57

- Costs have not been included for these tasks because it is assumed that most of the work can be completed by Township staff and it would be accommodate over time in the maintenance budget

General Comments

- Recommending repairs to some bridges to help extend the life of those structures and minimize the rehabilitation costs.
- When bridges have leaking expansion joints at deck ends, recommend repairs to prevent deterioration of the girders at the abutments bearing seats, sometimes recommend a change the design (remove expansion joints).
- When doing repairs, often include features to extend the life of the structures, cathodic protection, corrosion inhibitors or waterproof concrete and coating systems.

Major Repairs or Replacement Needs

- Prioritized based on Engineering judgement and scoring system concepts.
- Needs to address structural safety concerns and preventative maintenance work, prioritized.
- Sometimes other options are chosen; temporary repairs to delay replacement, or doing nothing and eventually close or replace the bridge
- Probable costs for assumed repair method calculated based on 2021 costs, inflated as required

Priority List of Repair and Replacement Needs 1 – 5 year period

Site Number	Location	Repair Description	Probable Cost	BCI	Priority
H66	Concession 8	Patch repair abutment, wingwall, soffit and deck top. Install guiderail, place riprap, waterproof and pave	\$341,000	64	8
L1	Ludgard Street	Replace barriers, curbs and deck drains. Scarify and overlay deck, waterproof and pave	\$203,000	69	8
L2	Gough Street	Replace barriers, curbs and deck drains. Scarify and overlay deck, waterproof and pave	\$203,000	70	6
L3	Wheeler Street	Replace barriers, curbs and deck drains, Patch deck, waterproof and pave	\$191,000	69	8
H38	Lake Range Drive	Convert to semi integral abutment, patch beams, jack and replace bearings. Patch deck top, waterproof and pave, install guiderail	\$630,000	73	10
K3	Langside Street	Replace structure	\$590,000	50	11
H28	Sideroad 20	Replace structure	\$720,000	30	14
P1	West side of Sideroad 10	Cast concrete at base of piers, repair railings, install retaining wall, replace sleeper with concrete, reinforce galvanized channels	\$218,000	44	11
H51	Sideroad 10	Grout ends of culvert, install riprap	\$40,000	80	6
L6	Canning Street	Patch repair deck and curb, waterproof and pave	\$81,000	69	8
L7	Havelock Street	Waterproof and pave	\$56,000	76	7
H71	Sideroad 20	Reset culvert, install erosion protection	\$90,000	57	8
H32	Concession 12	Replace drains, patch repair curbs	\$40,000	74	8
H27	Concession 6	Install guiderail	\$40,000	74	8
H35	Baseline	Install guiderail	\$45,000	59	11
H46	Concession 2	Install guiderail	\$40,000	57	9
H55	Sideroad 25	Install guiderail	\$40,000	54	10
				Total	\$3,568,000
				Average (5 Year)	\$713,600

List of Repair and Replacement Needs 6 to 10 year period

Site Number	Location	Repair Description	Probable Cost	BCI	Priority
H7	Sideroad 20	Patch repair curbs and parapet walls	\$47,000	75	6
H11	Sideroad 10	Replace barriers	\$85,000	74	6
H29	Concession 10	Replace sidewalk, barriers and deck drains. Patch deck top, waterproof and pave, install guiderail	\$259,000	72	6
H44	Concession 4	Replace curbs, install guiderail on approaches and over structure	\$472,000	63	11
H45	Sideroad 20	Replace structure	\$342,000	57	8
H56	Huron-Kinloss Boundary	Replace Structure	\$352,000	66	9
K8	Kairshea Ave	Replace Structure	\$497,000	57	9
K19	Kincardine-Kinloss Road	Replace Structure	\$490,000	31	13
				Total	\$2,544,000
				Average (5 Year)	\$508,800

H66 – Pine River Road West

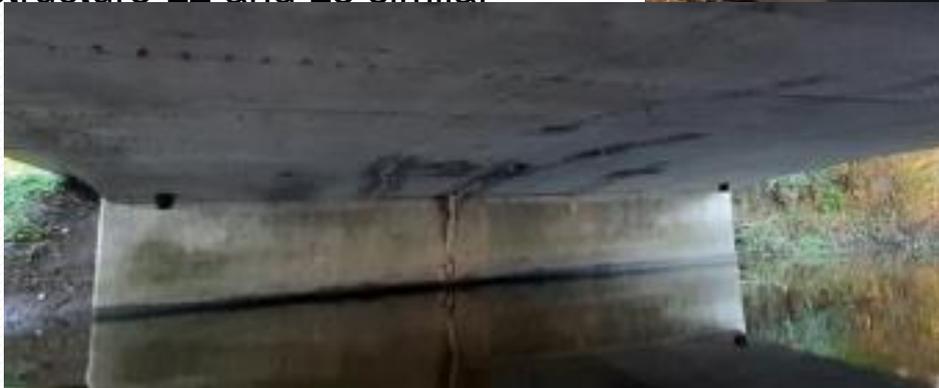


- Repairs to edge of deck
- Remove asphalt, patch deck top and curbs
- Rip rap in-front of abutments
- Waterproof and pave deck top



L1 – Ludgard Street

- Scarify deck top, replace curbs, barrier walls and barrier walls
- Deck soffit repairs or through deck repairs
- Replace deck drains
- Water proof and pave over deck once repaired
- Structure L2 and L3 similar



H38 – Bell Bridge



- Deck repairs, link the deck of the piers, and convert to semi-integral abutments
- Jack up deck end, patch girders, replace bearing pads
- Install guide railing on approaches
- Not replacing railing and curbs at this time

K-3 Langside Street



- Recommending replacement vs repairing because it is a very old structure with a somewhat narrow deck surface at 7.2m between barrier walls
- Structure has 7.7m span but structure downstream is smaller, may be able to replace with a concrete culvert for less than the \$590,000, budgetted.
- Structure had some repairs completed to it in 1994

H-28 – Sideroad 20



- Recommending replacement vs. repairing, load limit reduction proposed now and decision to close or repair within 5 years
- Structure has 10.7m span but structure downstream has 6.1m span, therefore, may be oversize. If able to replace with a concrete culvert or single lane bridge, we may determine that the budget price of \$720,000 is excessive.

P1 – Rail Trail of Sideroad 10



- Repairs or replacement of some wood bent piles required within next few years.
- Need to replace some floor beams and provide a supplemental retaining wall in-front or reinforce the existing abutment walls

Concluding Summary

- When reviewing near term capital needs identified on OSIM reports, a probable annual cost of \$611,000 per year was calculate for the next 10 years
- When reviewing the projecting long term capital needs, a probable annual cost of about \$700,000 per year was calculated
- A significant list of maintenance work tasks were identified
- Follow-up inspections required every 2 years.
- Priorities for future work may change especially if the work is delayed.

Questions