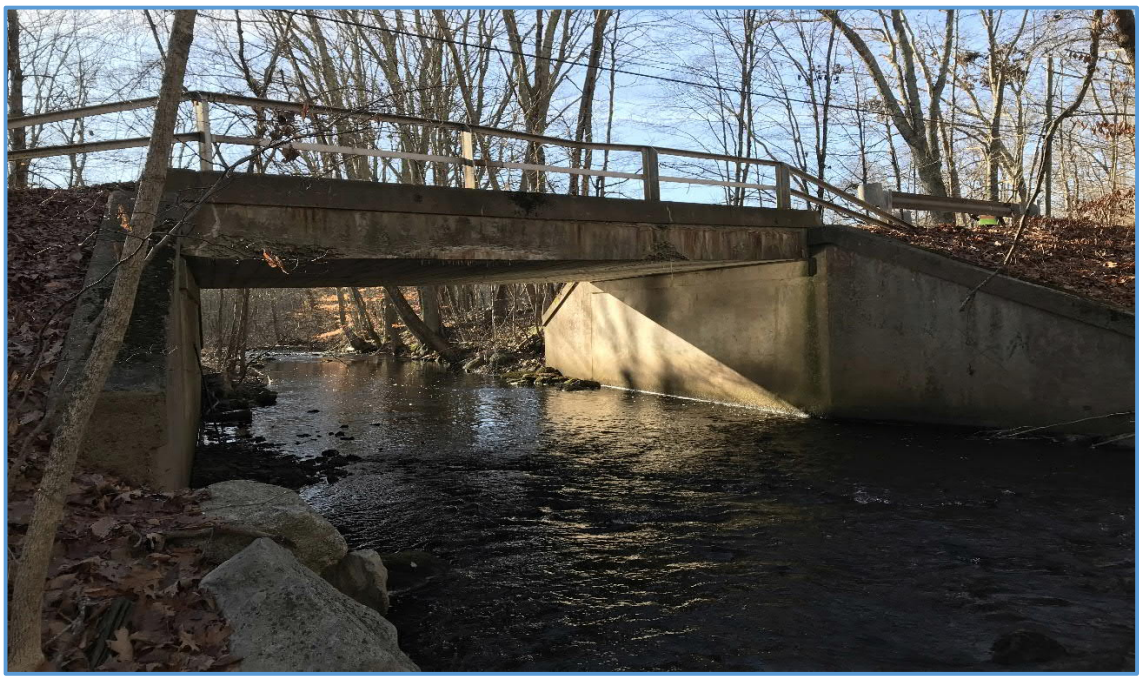
Bridge Conditional Assessment

Bridge No. 04769 in Scotland, CT
Brooklyn Turnpike over Merrick Brook



Prepared for:

Town of Scotland
Scotland, Connecticut

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860.290.4100
www.chacompanies.com
101 East River Drive, 1st Floor, East Hartford, CT 06108

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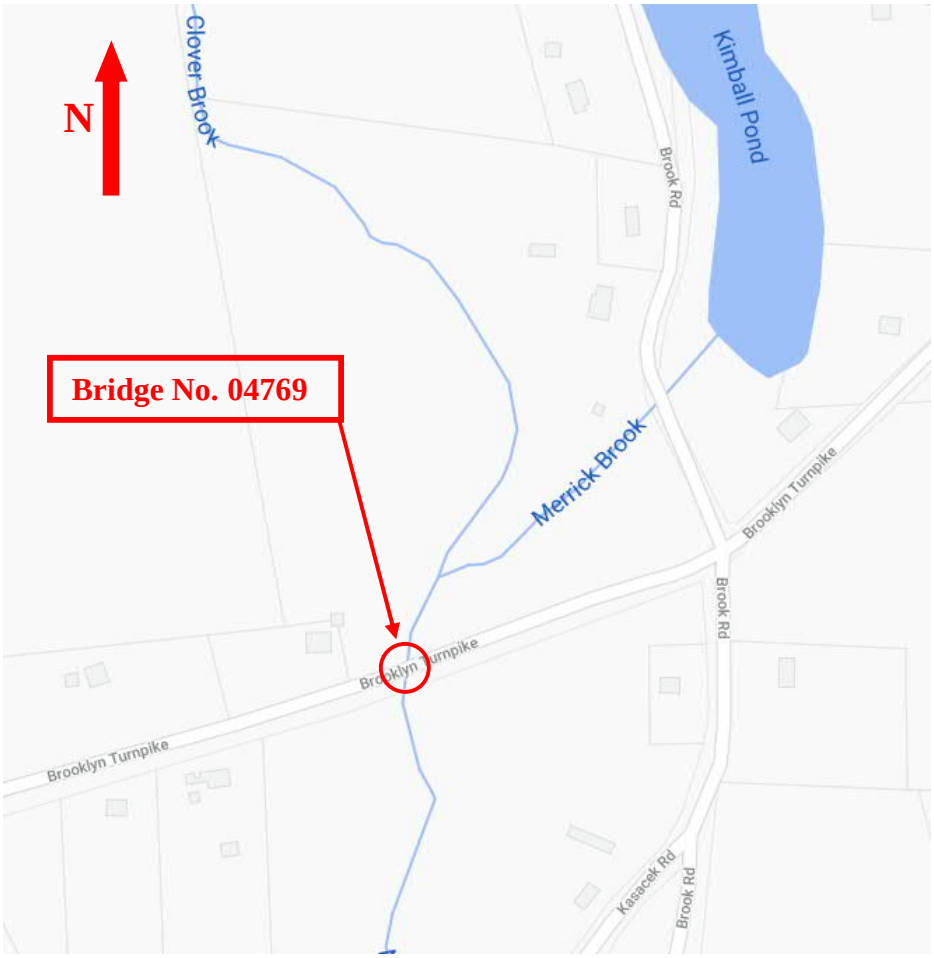
LOCATION MAP



Location map of Bridge No. 04769 Brooklyn Turnpike over Merrick Brook in Scotland, CT

INTRODUCTION

CHA Companies was retained by the town of Scotland, CT to visually inspect Bridge No. 04769 and to assess the current condition of the bridge. CHA conducted the field inspection on December 15, 2020. This report describes the findings of the inspection as well as provides recommendations for addressing the areas of deteriorations identified during the inspection, as well as provide conceptual level costs for planning purposes.

DESCRIPTION

General

Bridge No. 04769 is located on Brooklyn Turnpike and spans over Merrick Brook in the Town of Scotland. This structure was constructed in 1940 and carries 2 lanes of bidirectional traffic over a 20'-0" roadway. Currently the structure is posted for 36 tons.

The structure consists of a 26'-0" span concrete slab superstructure, with a macadamized wearing surface overlay, supported by reinforced concrete abutments and splayed wingwalls on shallow spread footings. The bridge rail consists of steel posts capped by steel angles. The railing posts are attached to the concrete curbs and connect to metal beam rail on steel posts at the approaches. The approach embankments consist mostly of brush and vegetation.

Highway Geometrics

The limits of the bridge and the immediate approach roadway is a tangent section. The roadway profile was raised for the limits of the ACROW bridge to feather into the existing vertical sag. No catch basins are located within the vicinity of the bridge, indicating that surface run-off drains via overland sheetflow. The curb-to-curb roadway width of the bridge is 20'-0" at the center of the span and at both approaches.

Based on the Federal Highway Administration (FHWA) Coding Manual, Based on the Federal Highway Administration (FHWA) Coding Manual, the minimum curb-to-curb roadway width for 2 lanes of 2-way traffic to avoid functional obsolescence assuming an ADT between 401 and 1000 vehicles per day is 22'. Therefore, the bridge is considered to be functionally obsolete.

See photos 1-6 of Appendix A for general site photos.

FIELD OBSERVATIONS

The ratings indicated below are in accordance with the industry standard Federal Highway Administration (FHWA) & National Bridge Inspection Standards (NBIS) guidelines.

Deck

Overlay – The overlay is in fair condition due to deterioration and delamination. Transverse cracking for the full width of the roadway exists at each edge of deck. Delamination along railbases full length x 30" wide. Heavy sediment accumulation and vegetation was present at each gutterline (see photo 12).

Deck – The concrete deck is assessed as part of the concrete slab superstructure.

Curbs – The curbs are in fair condition. There is moderate scaling and cracking of the concrete rail base/curbing observed (see photo 17). North side curb reveal is 7", and the south side is 9". Heavy sediment accumulation and vegetation was present at each gutterline (see photo 12).

Railing – The railing is in fair condition. The painted angle steel railing and angle steel posts exhibit light surface rust throughout. The north side top rail is bent approximately 3 inches down near midspan. There is a bridge rail transition at the approaches on the north side, but no railing transition on the south.

Expansion Joints – There are no expansion joints.

Utilities – No utilities are present.

Superstructure

Deck – The reinforced concrete deck remains in fair condition. Hairline cracking and longitudinal cracks with efflorescence exist in random locations on the underside of deck towards the inlet side end face of deck. At the end face of deck, there are areas of severe spalling approximately 4'-0" long x 1'-0" high x 3" deep (see photo 17). The surrounding concrete is also hollow. There is another location on the same face of deck with hairline longitudinal and diagonal cracking with heavy efflorescence and hollow concrete (see photo 17). Spalling up to 2'-0" and 4" deep exists on the same north face and underside of deck, however there is no exposed rebar (see photo 18). The south face of deck (outlet end) shows a 4'-0" x 2'-6" approximate area of hairline map cracking and efflorescence (see photo 21).

Substructure

The substructure is overall in good condition

Abutments (Stem) – The reinforced concrete abutments are in good condition with only minor vertical hairline cracking and light scaling at the waterline.

Wingwalls (Stem) – The reinforced concrete wingwalls are in good condition with only fine hairline map cracking and light scale at the waterline.

Erosion and scour – The footings in regards to erosion and scour remain in fair condition. The west abutment and northwest footings are exposed full length (see photo 23). The vertical face is exposed up to 12", but no undermining was noted at the time of inspection. There is gravel build up on the east abutment. There is evidence of bedrock upstream and downstream of the bridge. The structure may be founded on bedrock.

Channel and Channel Protection

Channel Scour – The channel has a straight alignment from the inlet to the outlet favoring the west side of the structure. The channel base consists of mostly rounded stones (4"-12"). There is evidence of bedrock upstream and downstream of the bridge.

Approaches

Approach pavement – The approach pavement is in poor condition. There are transverse and longitudinal cracking up to ¼" wide that exists in random locations. There is evidence of previous crack sealing that has failed. Minor wheel rutting exists, as well as settlement up to 1" at the approaches immediately before and after the bridge.

Approach guiderail – The approach guiderail appears to be in fair condition. There is metal beam rail on steel posts on all approaches. There are minor scrapes and dents evident at the guiderails, as well as leaning posts (see photo 8). There is a bridge rail transition at the approaches on the north side, but no railing transition on the south.

Approach embankment – The approach embankments appear to be eroding. The channel flow is favoring the west side where embankment undercutting exists both upstream and downstream causing exposed root systems and leaning trees (see photo 6). The approach embankments consist mostly of brush and vegetation.

RECOMMENDATIONS FOR REPAIR

Based on the findings from the field inspection, several recommendations can be made in order to preserve the structural integrity of the bridge in the short term. It is recommended to remove and replace the existing pavement on the bridge. A membrane should be added to the top of the deck to limit the amount of deleterious de-icing salts that can penetrate the concrete. Cleaning and painting of the existing railing and the addition of frencing on the wingwalls should be included. Action should also be taken to prevent further scour to the west abutment and the west wingwalls. The scour countermeasure should be designed to re-align the channel towards the center of the bridge span, and be installed to protect the existing substructure from further scour which eventually will lead to undermining and ultimately structural instability. Potential construction cost estimate: $100,000 (see Appendix B: Cost Estimate for the estimate breakdown).

While the recommendations above will help to preserve the bridge within the short term, the Town should plan and budget to perform a major rehabilitation of the structure within the next 10 years. The rehabilitation project will involve a superstructure (deck) replacement with substructure repairs and scour countermeasures. Potential construction cost estimate: $550,000 (see Appendix B: Cost Estimate for the estimate breakdown).

Appendix A: Photographs

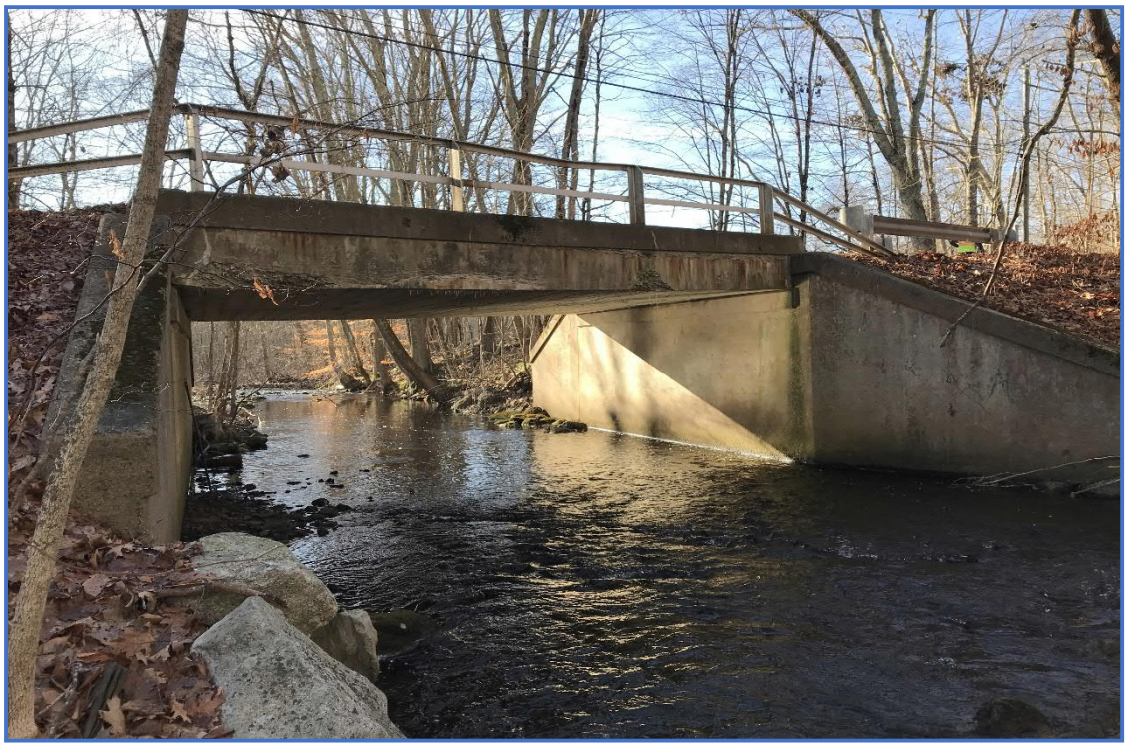


Photo 1: North Elevation

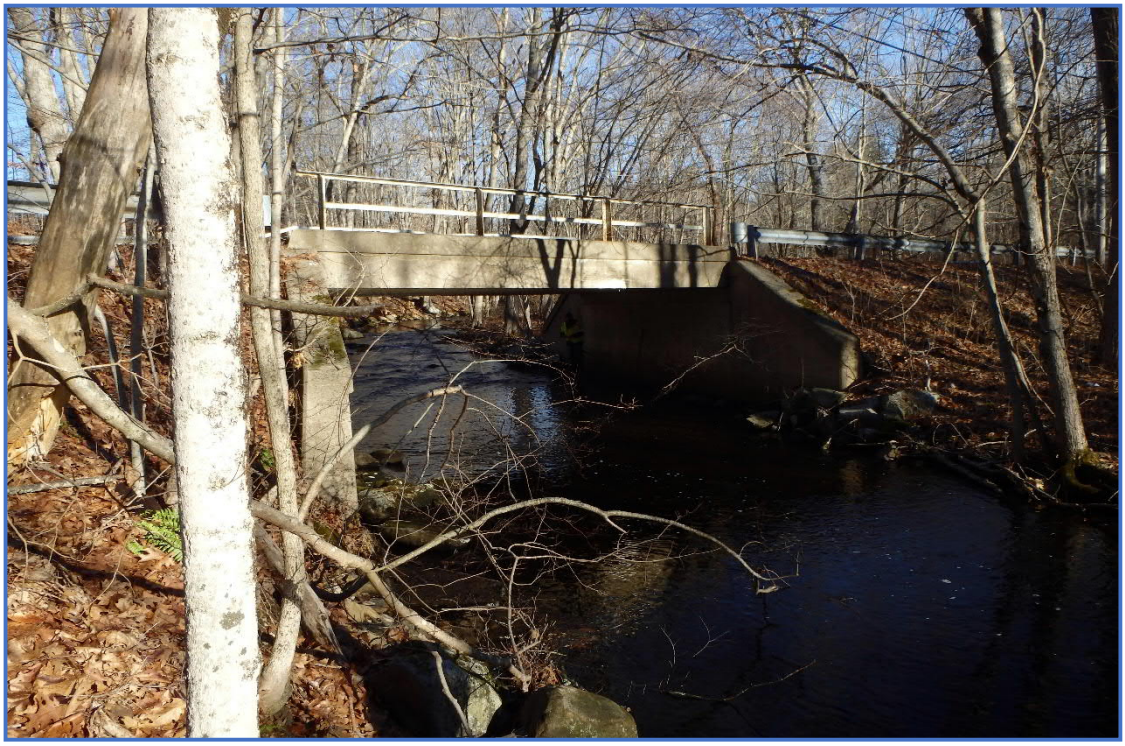


Photo 2: South Elevation

Photo 3: Bridge from West Approach (Looking East)

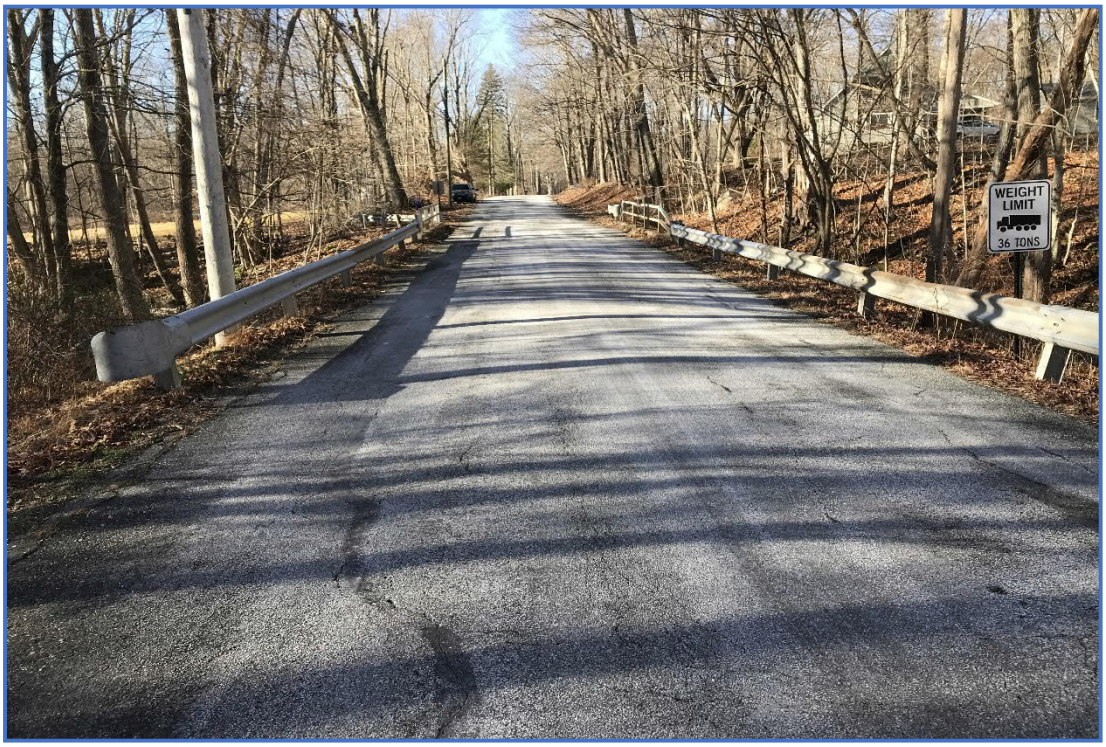


Photo 4: Bridge from East Approach (Looking West)

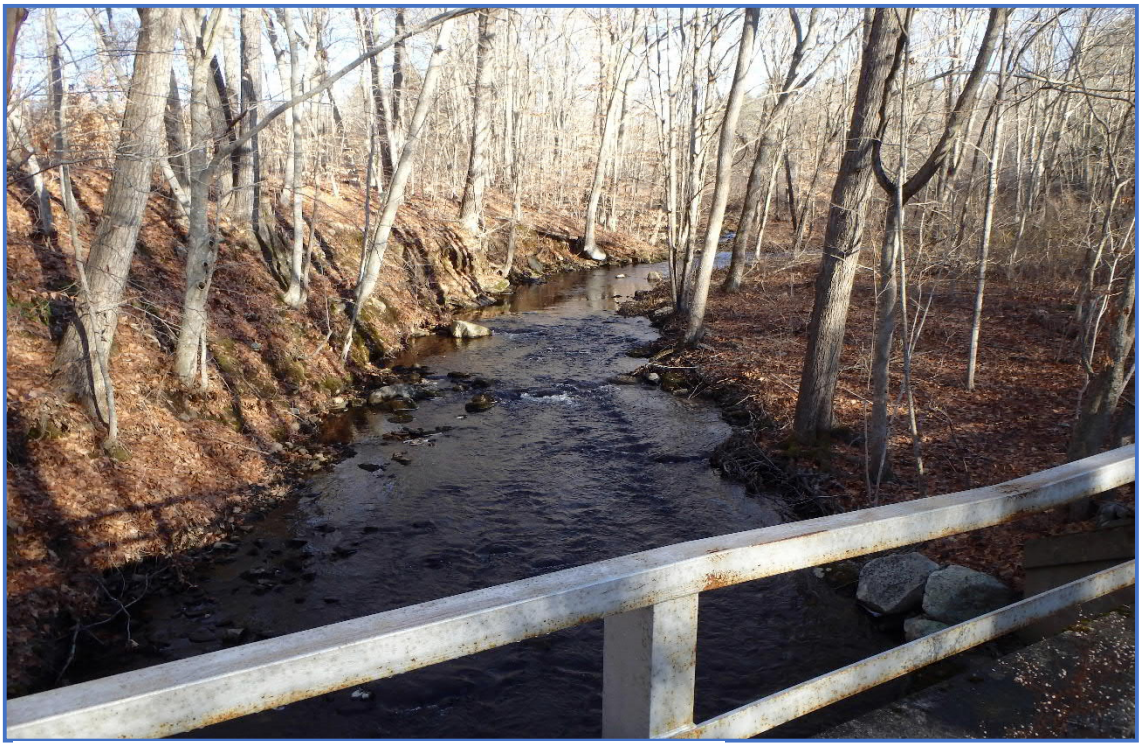


Photo 5: Channel looking upstream (North) from bridge

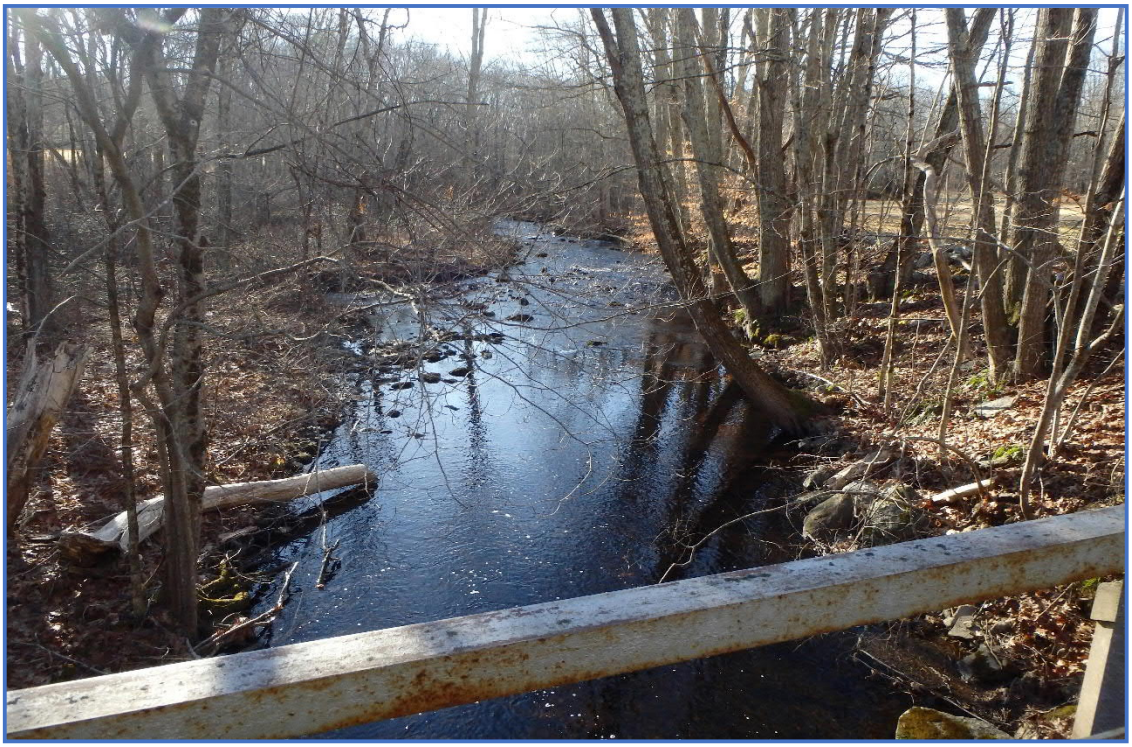


Photo 6: Channel looking downstream (South) from bridge

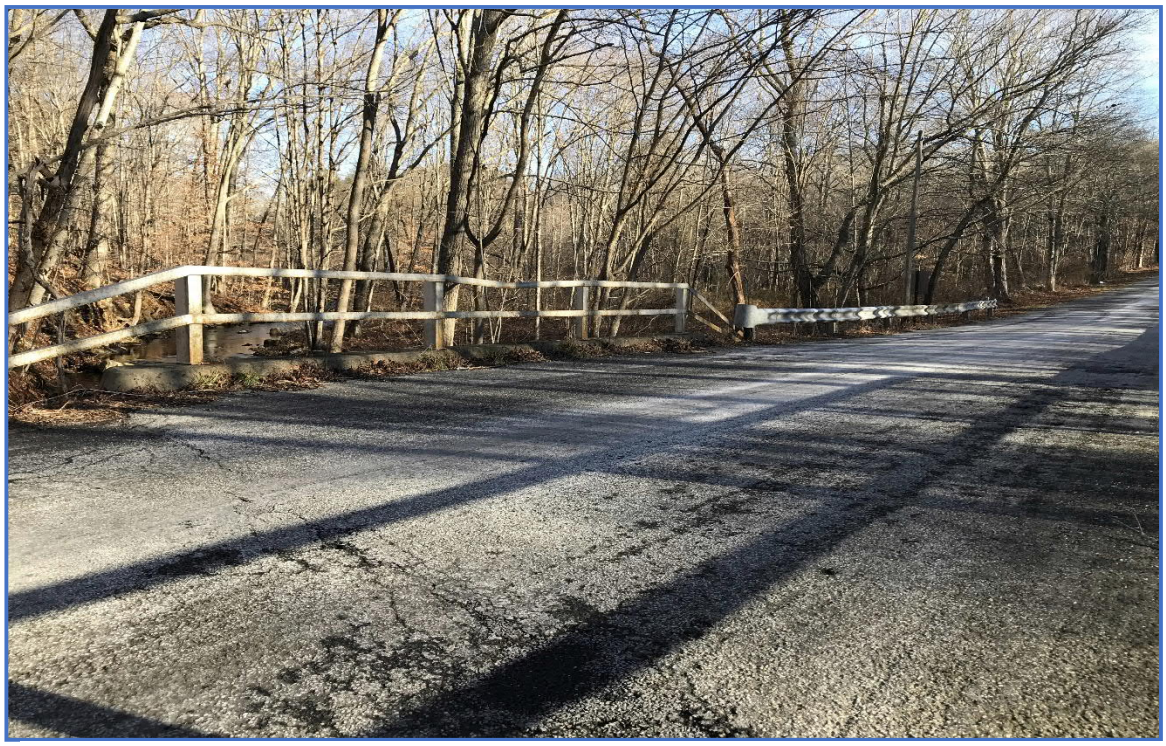


Photo 7: Typical wearing surface overlay. Note full width transverse cracking at deck ends.

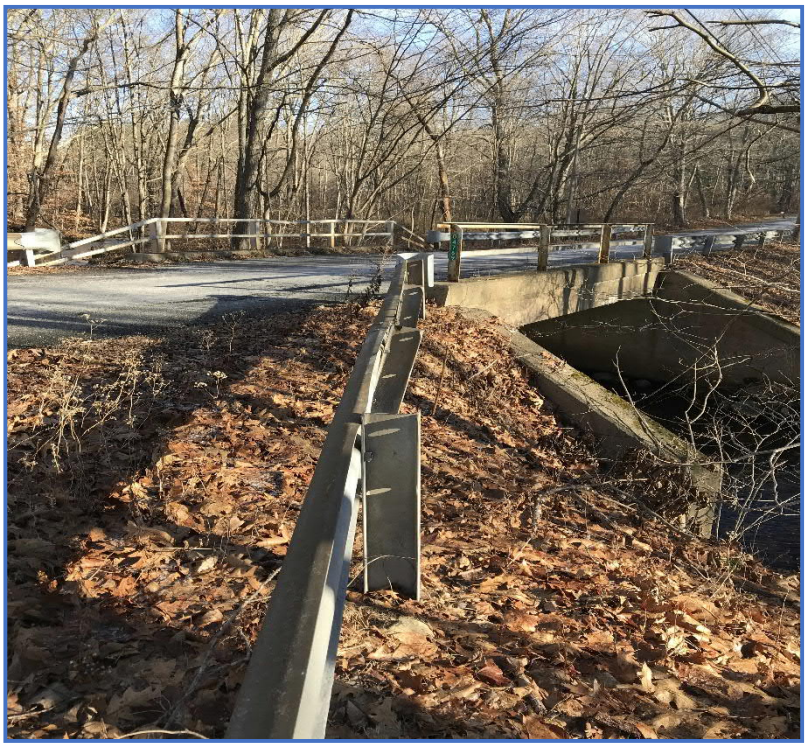


Photo 8: Southwest approach corner and bridge rail, leaning posts

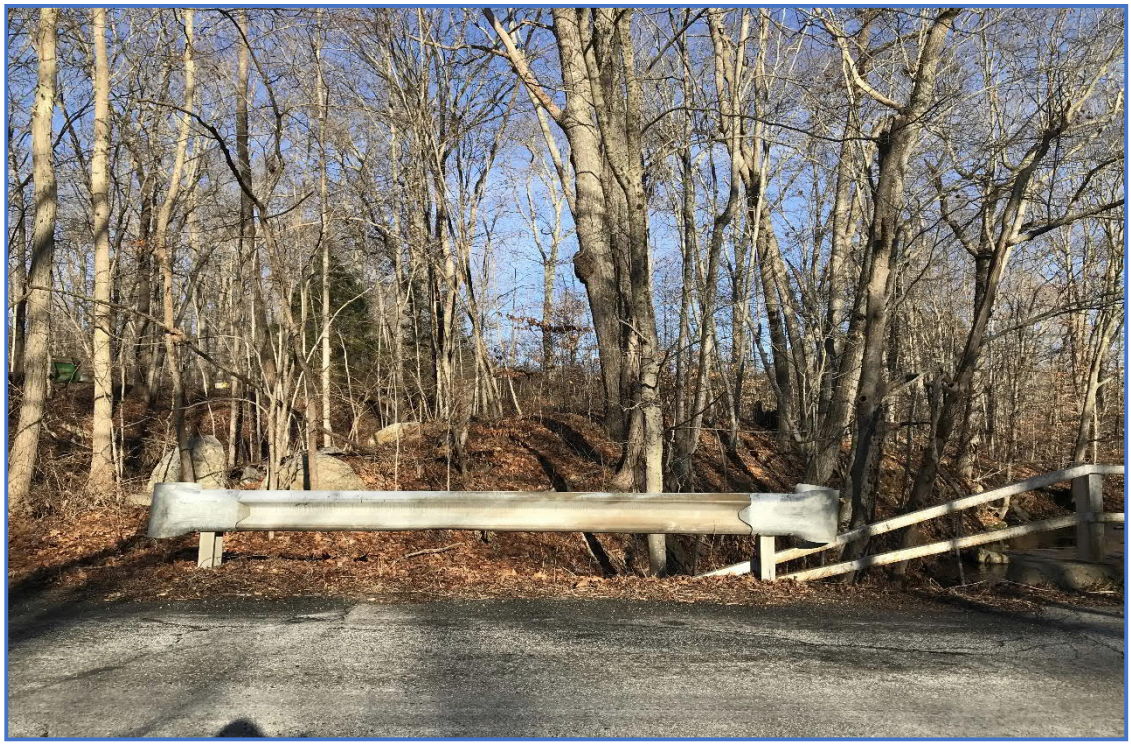


Photo 9: Northwest approach corner and bridge rail

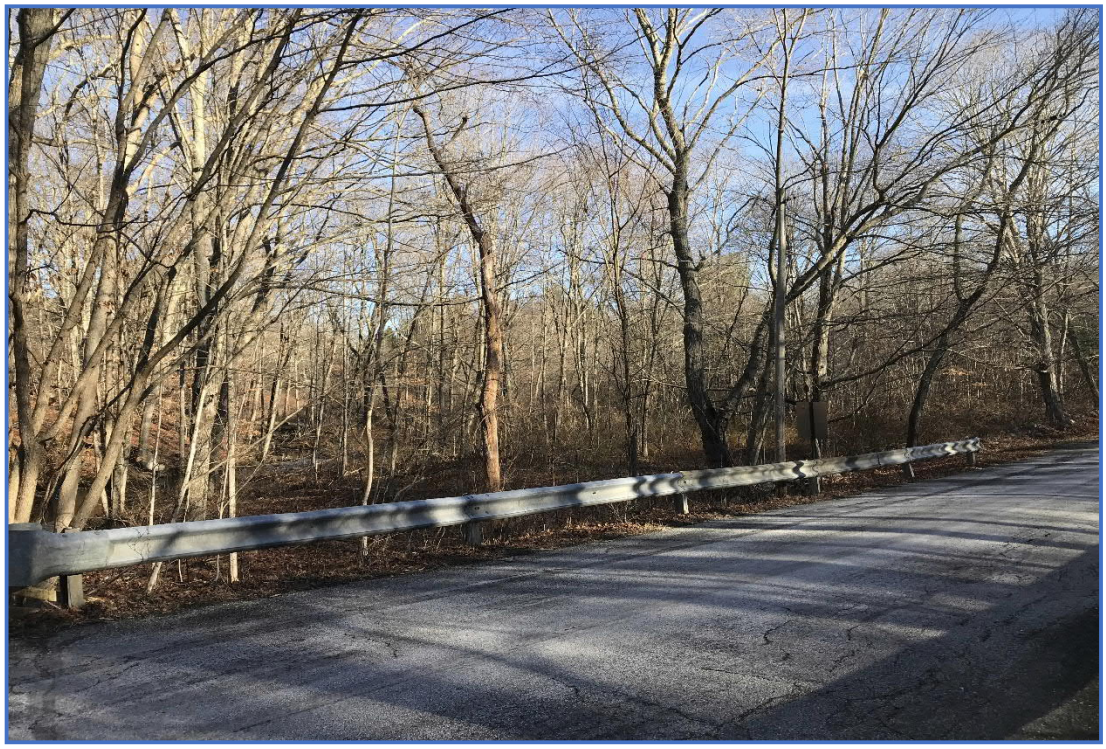


Photo 10: Northeast approach corner guardrail

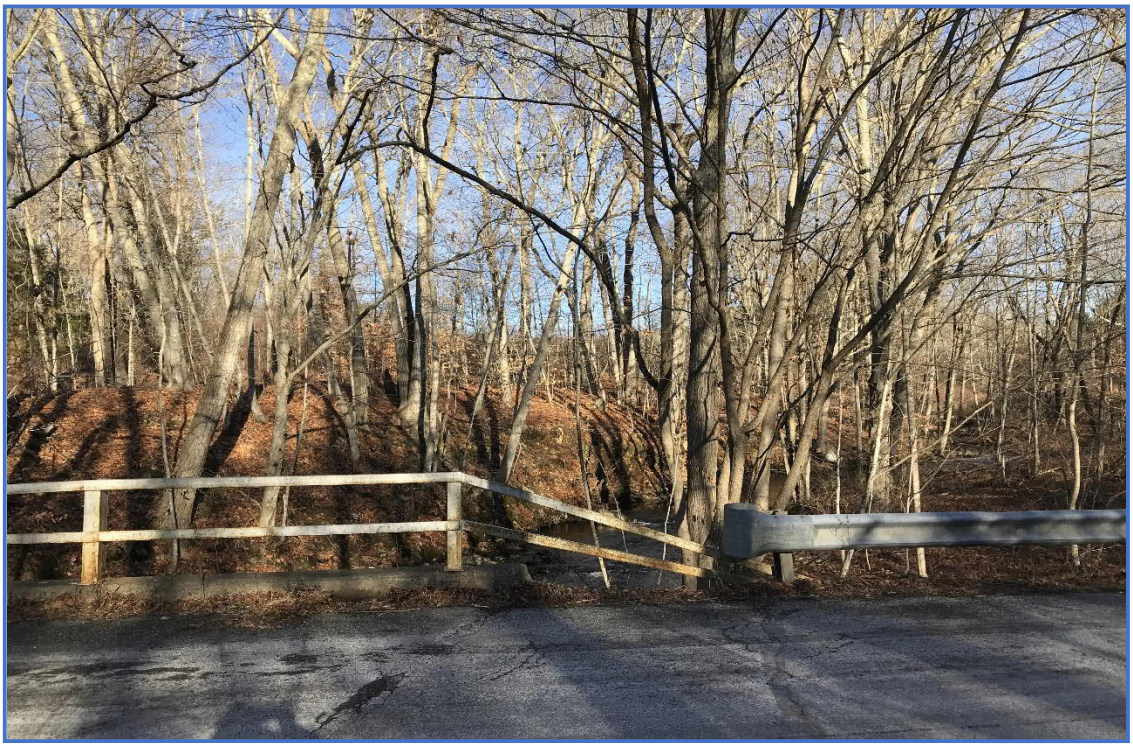


Photo 11: Northeast approach corner and bridge rail

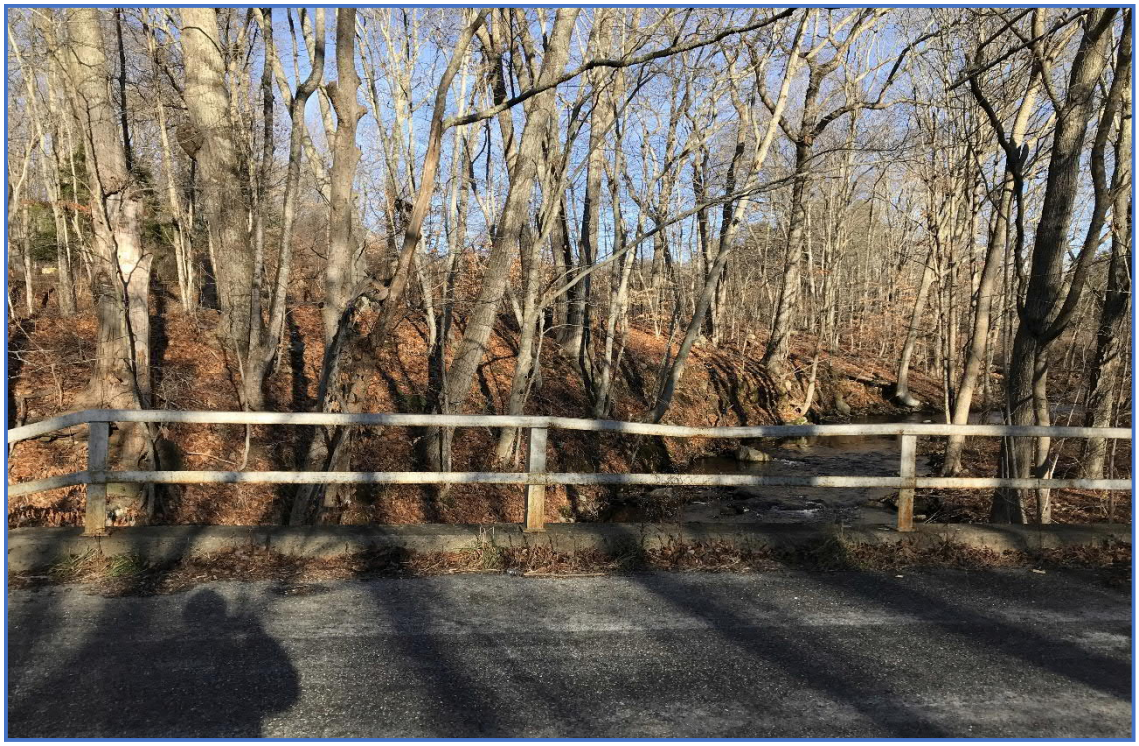


Photo 12: Bent rail north side of bridge (note typical surface rust)

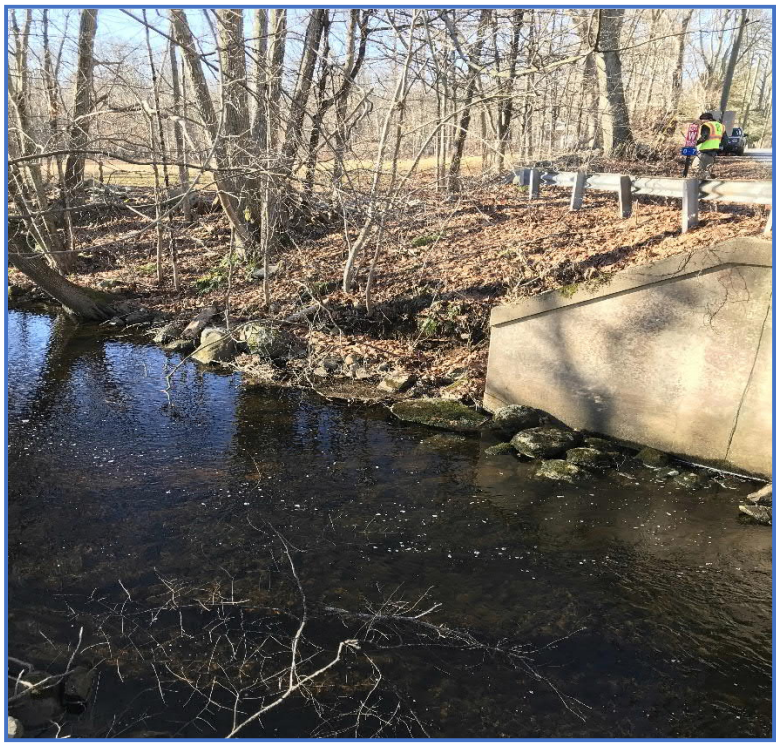


Photo 13: Southwest corner wingwall and splayed approach guardrail

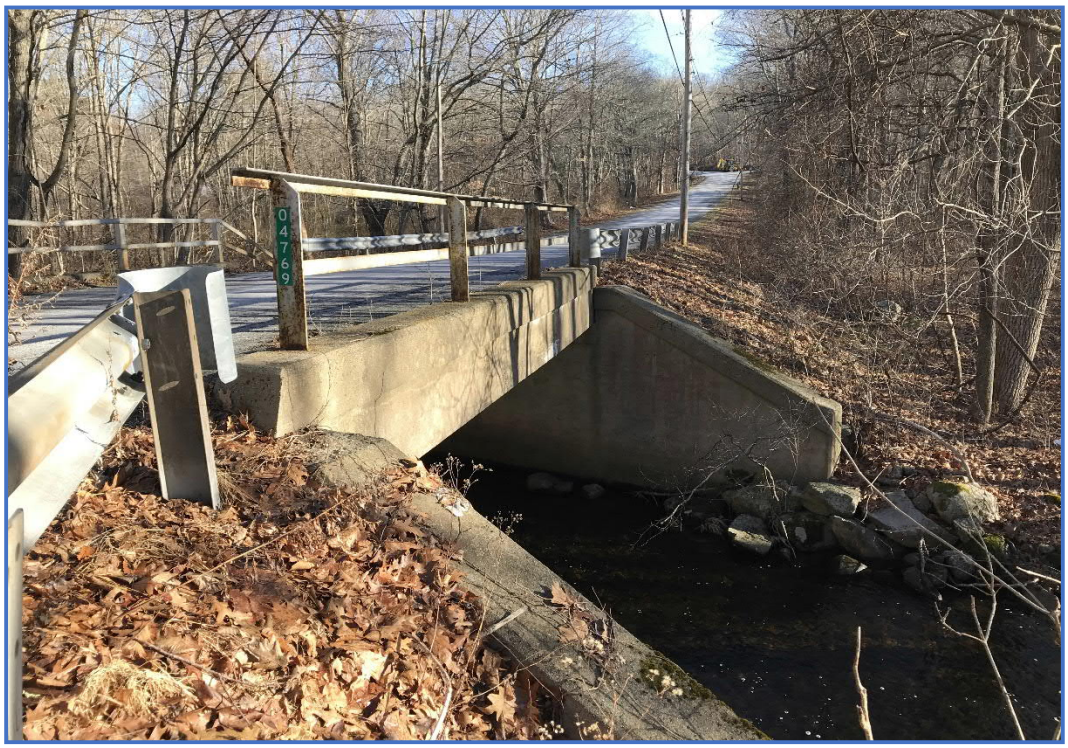


Photo 14: Southeast corner wingwall, rip rap at outlet side

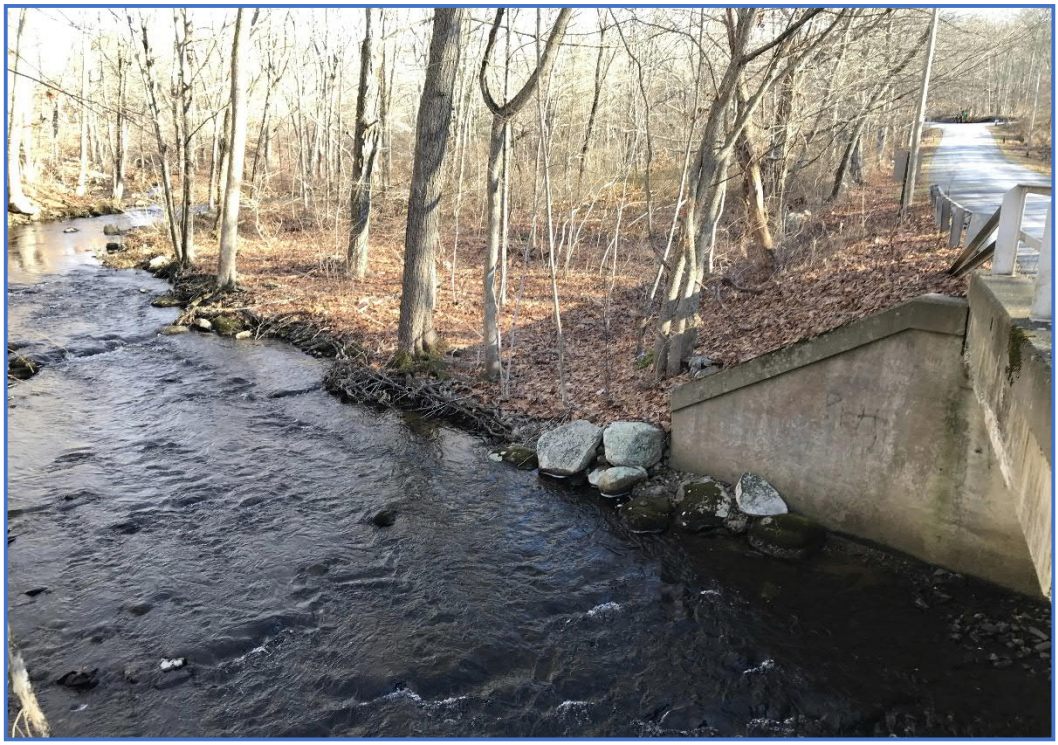


Photo 15: Northeast corner wingwall and rip rap. Inlet side.

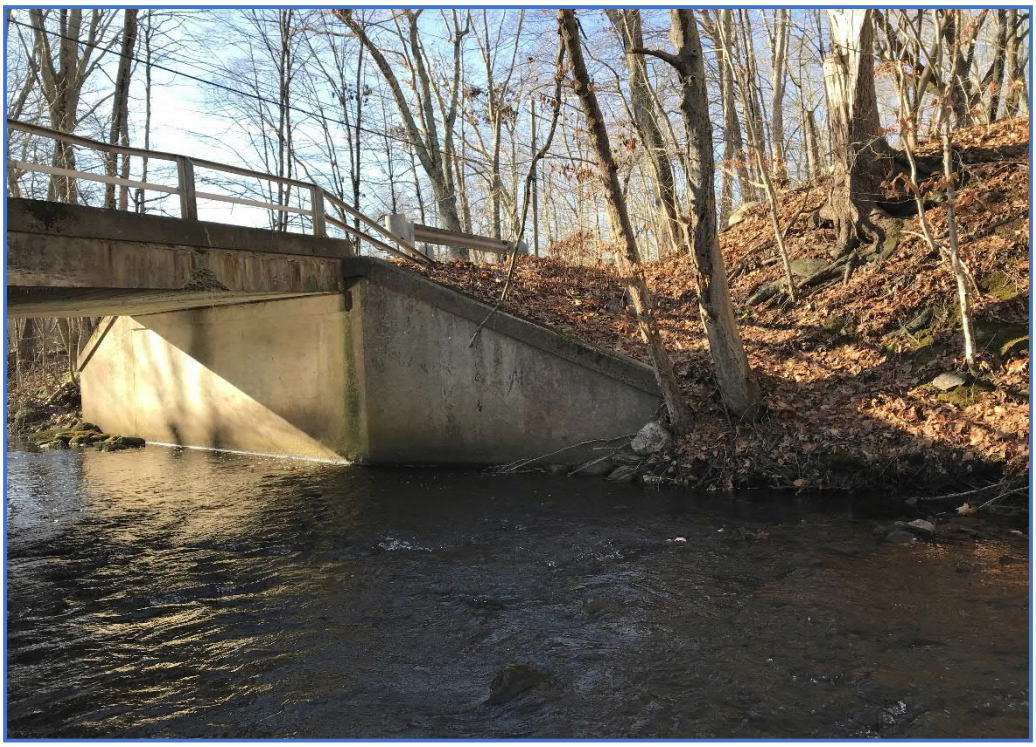


Photo 16: Northwest corner wingwall. Inlet side

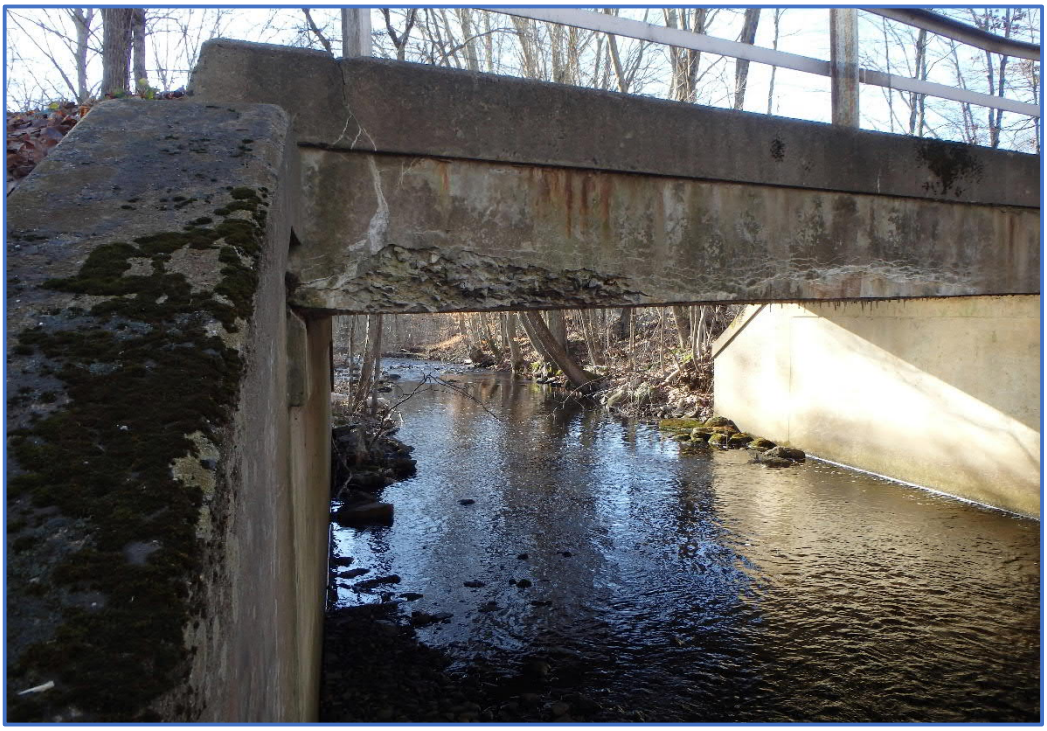


Photo 17: North side of deck, severe spalling and longitudinal hairline cracks with efflorescence. (Inlet end)

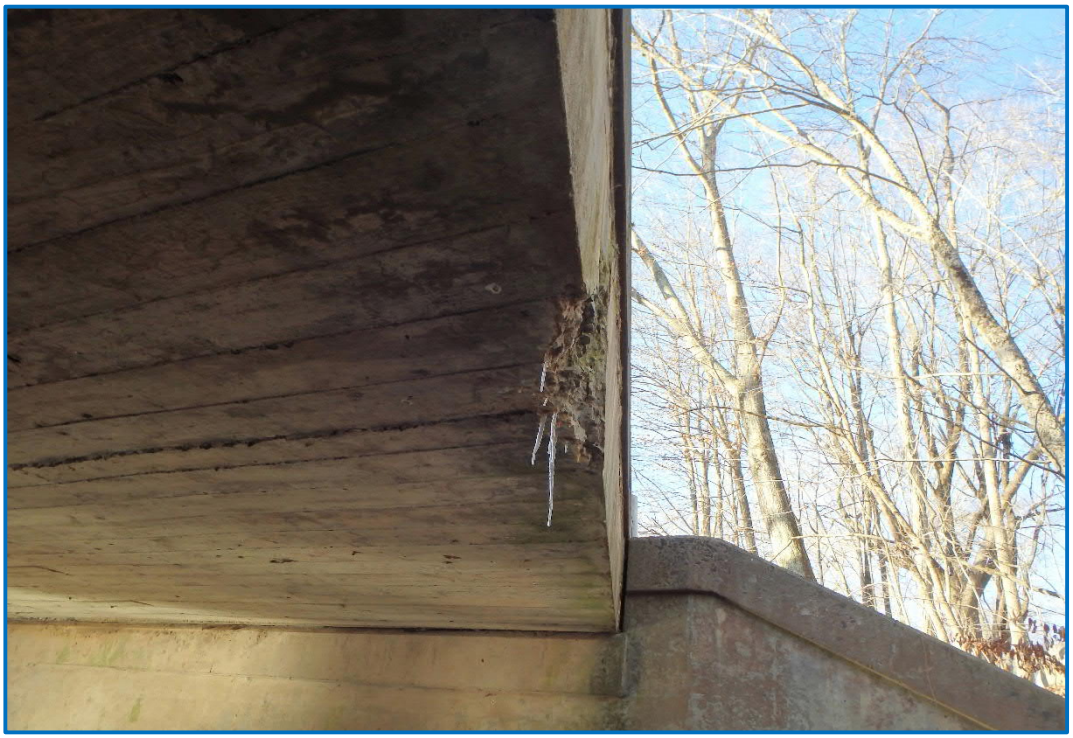


Photo 18: Typical underside and north side of deck severe spalling. (Inlet end)

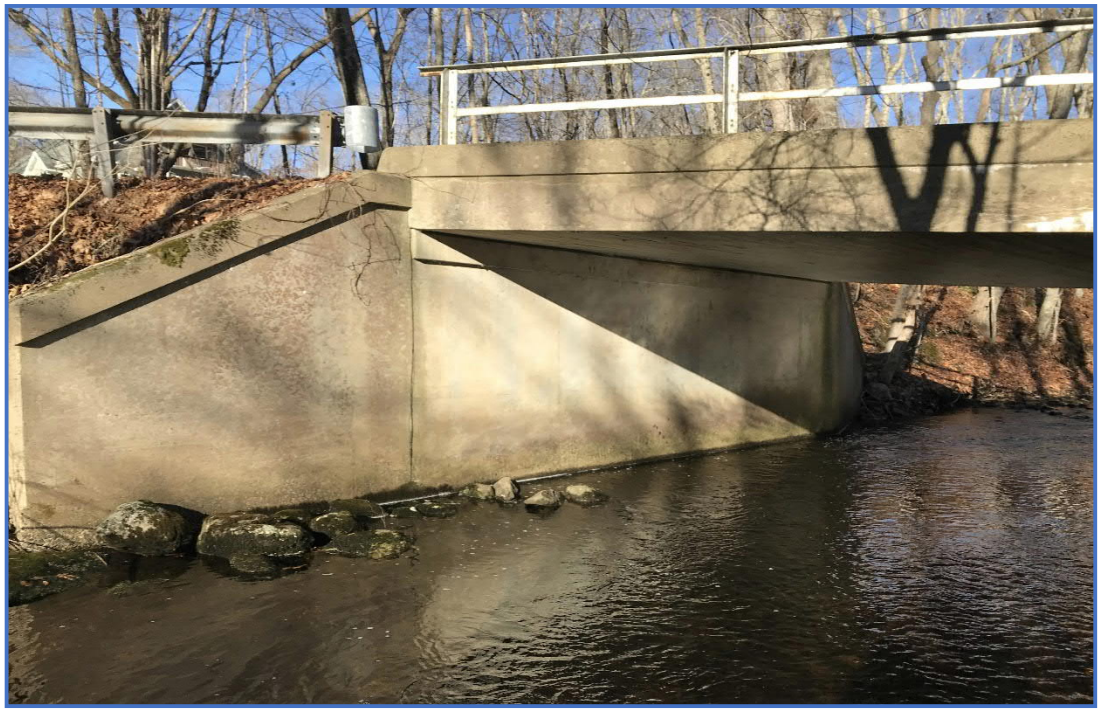


Photo 19: West abutment and southwest wingwall

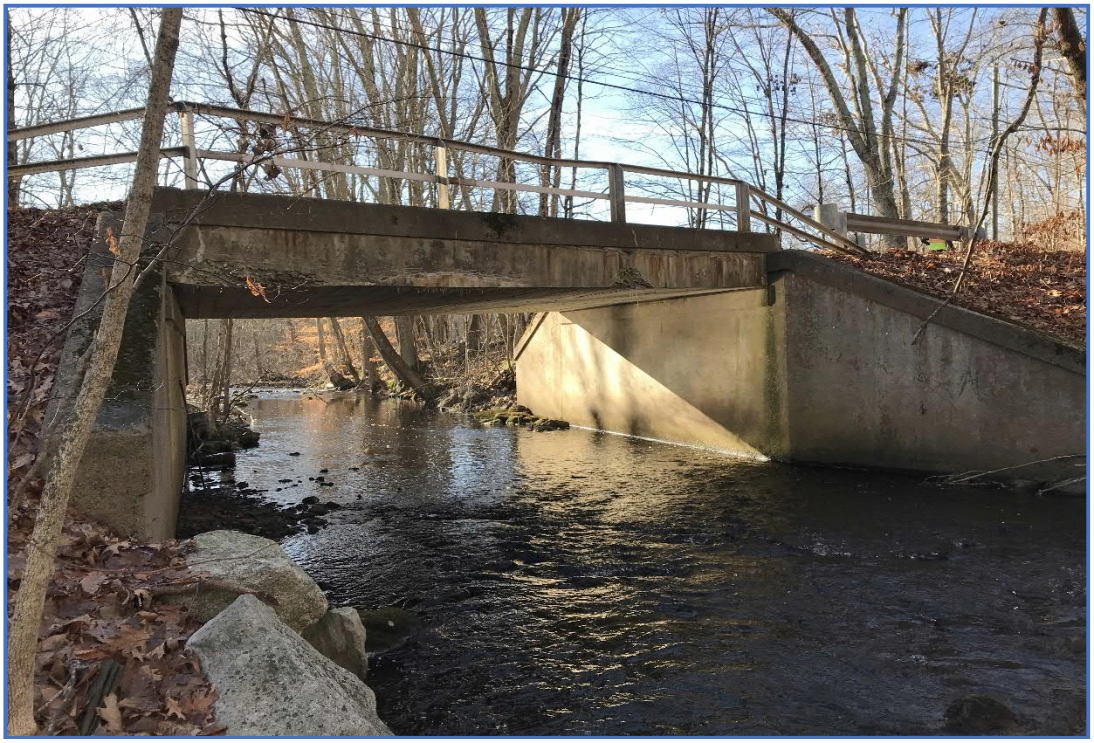


Photo 20: North side of deck, North side of deck, severe scaling and longitudinal hairline cracks with efflorescence. (Inlet end)

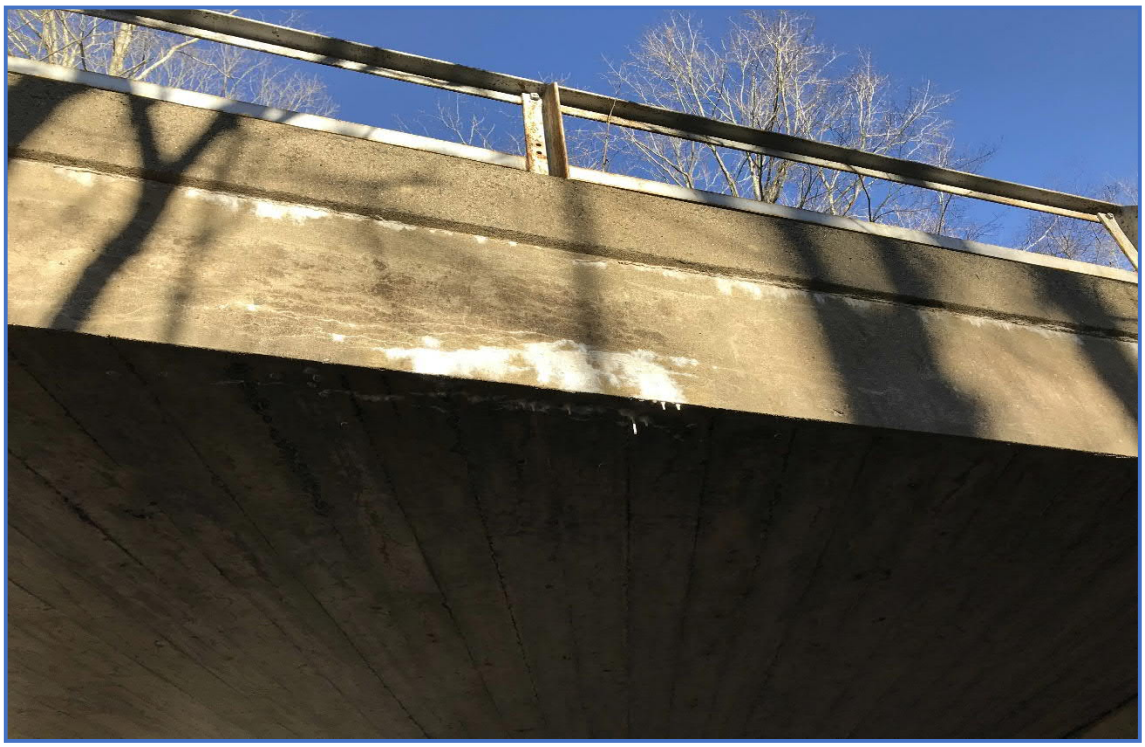


Photo 21: South side deck, longitudinal cracks with efflorescence (outlet side)

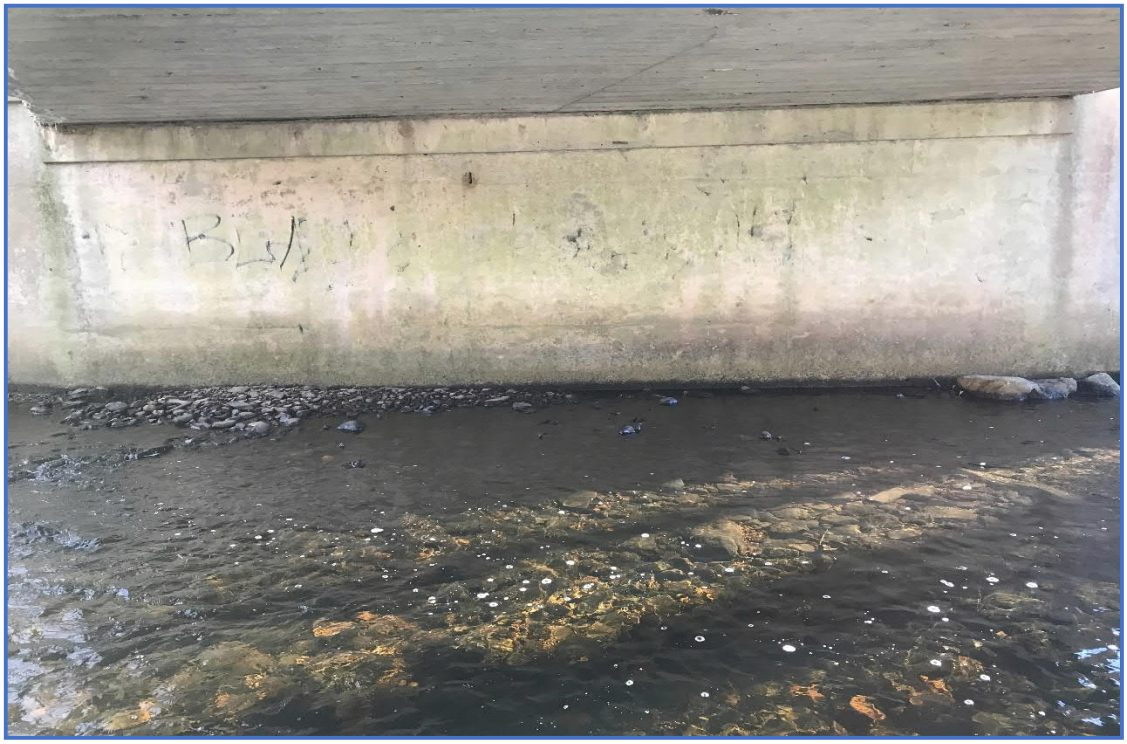


Photo 22: East abutment

Photo 23: West abutment, exposed footing

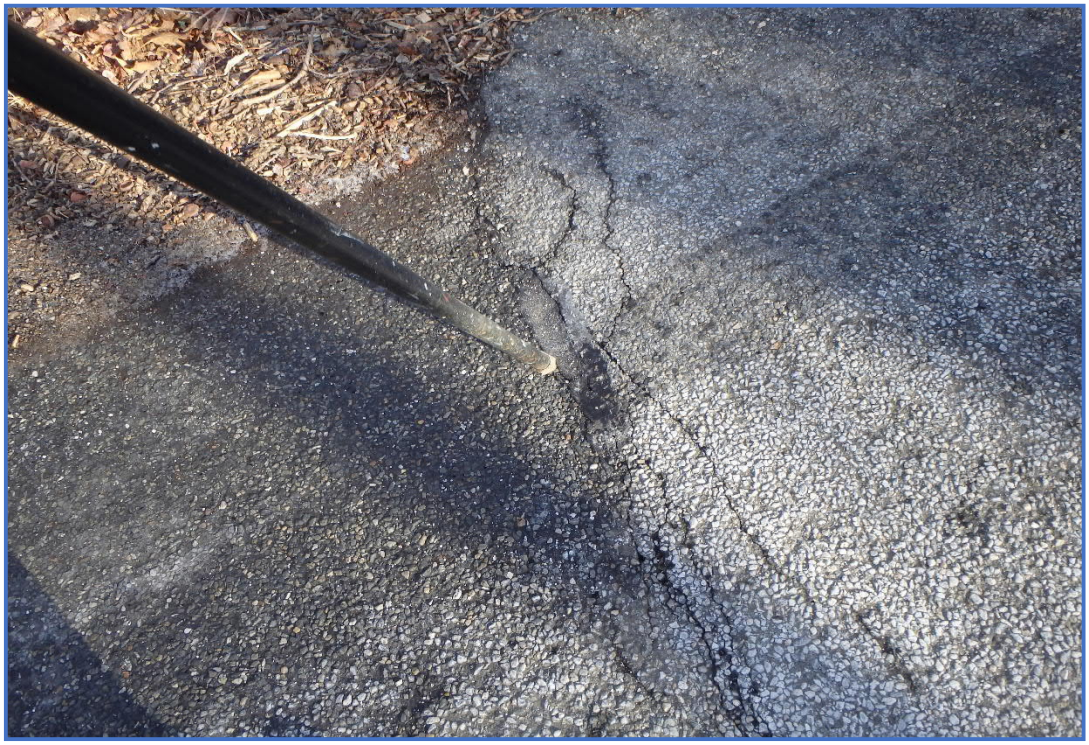


Photo 24: Settlement and transverse cracking at approach west side

Appendix B: Cost Estimate

CHA Project No. : 67404 **Date :** 01/29/21

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TOWN OF SCOTLAND

BRIDGE CONDITION ASSESSMENT

PROGRAMMING COST ESTIMATE

Project Title: Programming Cost Estimate — F.A.P. No.: T.B.D.

Bridge No. 04769 (Brooklyn Turnpike over Merrick Brook) — City/Town: Scotland

	(Short Term) Item Description	Unit	Quantity	Unit Price	Amount
	Fine Milling	S.Y.	250	$ 10.00	$ 2,500
	HMA S0.5	TON	3.5	$ 200.00	$ 700
	Asphaltic Plug Joints	LF	40	$ 150.00	$ 6,000
	Waterproofing Membrane	SF	58	$ 60.00	$ 3,467
	Cleaning and Field Painting Bridge Railing	SF	156	$ 50.00	$ 7,800
	Scour Countermeasure (fill, geotextile, riprap, etc.)	L.S.	1	$ 10,000.00	$ 10,000
	Water Handling	L.S.	1	$ 30,000.00	$ 30,000
	Protective Fencing (Bridge)	LF	120	$ 15.00	$ 1,800
				TOTAL ITEMS	$ 62,267

CONTRACT COST SUMMARY

		TOTAL ITEMS	$ 62,267
	CLEARING AND GRUBBING	2.0%	$ 1,245
	MOBILIZATION	5.0%	$ 3,113
	CONTINGENCY	15.0%	$ 9,340
	MINOR ITEM ALLOWANCE	15.0%	$ 9,340
		BASE ESTIMATE	$ 85,305

SAY : $ 100,000.00

Note: ROW and Engineering costs are not included in this estimate

CHA Project No. : 67404 **Date :** 01/29/21

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TOWN OF SCOTLAND

BRIDGE CONDITION ASSESSMENT

PROGRAMMING COST ESTIMATE

Project Title: Programming Cost Estimate — F.A.P. No.: T.B.D.

Bridge No. 04769 (Brooklyn Turnpike over Merrick Brook) — City/Town: Scotland

	(Long Term Superstructure Replacement) Item Description	Unit	Quantity	Unit Price	Amount
	Precast Deck Panels	SF	520	$ 400.00	$ 208,000
	Concrete Topping Slab	CY	10	$ 1,000.00	$ 10,000
	CIP brush curbs	LF	52	$ 150.00	$ 7,800
	Metal Bridge Railing	LF	52	$ 250.00	$ 13,000
	Traffic Approach Railing	LF	80	$ 75.00	$ 6,000
	Fine Milling	S.Y.	150	$ 10.00	$ 1,500
	HMA S0.5	TON	3.5	$ 200.00	$ 700
	Asphaltic Plug Joints	LF	40	$ 150.00	$ 6,000
	Waterproofing Membrane	SF	58	$ 60.00	$ 3,467
	Scour Countermeasure (fill, geotextile, riprap, etc.)	L.S.	1	$ 10,000.00	$ 10,000
	Water Handling	L.S.	1	$ 30,000.00	$ 30,000
	Superstructure Demolition (existing)	SY	58	$ 360.00	$ 20,800
				TOTAL ITEMS	$ 317,267

CONTRACT COST SUMMARY

TOTAL ITEMS		$ 317,267
CLEARING AND GRUBBING	2.0%	$ 6,345
MOBILIZATION	5.0%	$ 15,863
CONTINGENCY	30.0%	$ 95,180
MINOR ITEM ALLOWANCE	30.0%	$ 95,180
BASE ESTIMATE		$ 529,835

SAY : $ 550,000.00

Note: ROW and Engineering costs are not included in this estimate