Bridge Conditional Assessment

Bridge No. 04771 in Scotland, CT
Brook Road over Merrick Brook

Prepared for:

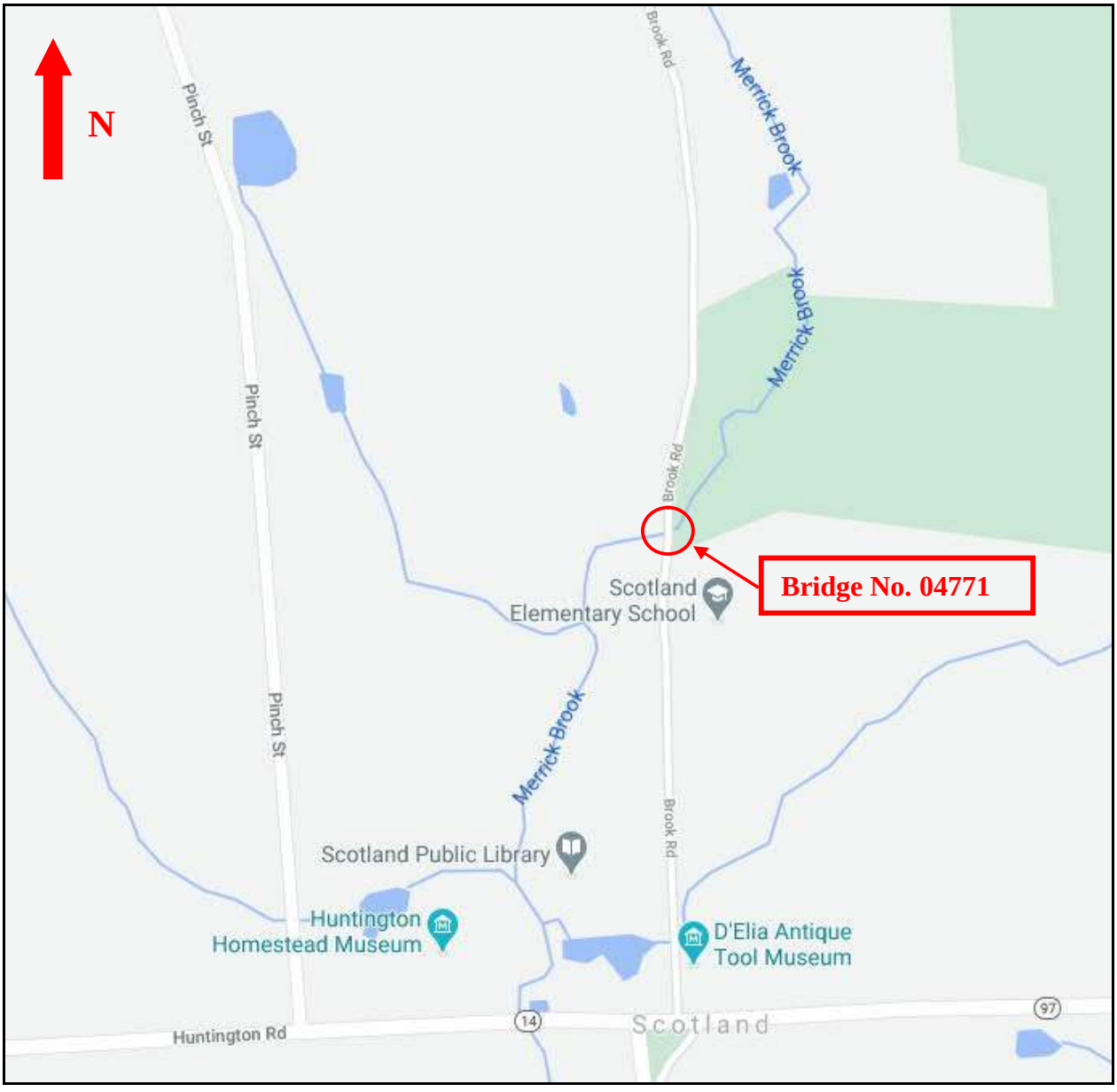
Town of Scotland
Scotland, Connecticut

Issued: January 29, 2021

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

Table of Contents

LOCATION MAP



Location map of Bridge No. 04771, Brook Rd #2 over Merrick Brook in Scotland, CT

INTRODUCTION

CHA Companies was retained by the town of Scotland, CT to visually inspect Bridge No. 04771 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 observed at the time of the inspection as well as conceptual level costs for planning purposes.

DESCRIPTION

General

Bridge No. 04771 is located on Brook Rd and spans over Merrick Brook in the Town of Scotland. This structure was built in 1970 and carries 2 lanes of bidirectional traffic over a 22'-7" roadway.

The structure consists of a 21'-6" span concrete slab superstructure, with an approximate 3" asphalt overlay, supported by reinforced concrete abutments and wingwalls on shallow spread footings. The bridge rail consists of steel posts capped by steel angles. The railing posts are attached to vertical face of the reinforced concrete superstructure and terminate at each end of the bridge with a blunt end bullnose (see photo 10). The approach embankments consist mostly of brush and vegetation.

Highway Geometrics

The immediate roadway section near the bridge is a tangent section without horizontal curvature. The bridge exists in an area near the point of intersection of a vertical sag curve. 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 22'-7" at the center of the span and at both approaches.

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 of bituminous concrete with no membrane is in good condition. The overlay does not extend to the deck edges (see photo 7). Minor transverse and longitudinal cracks are present. Transverse crack at north end of deck (up to ½" wide) approximately 10' long. Longitudinal cracking appears to run from the CL of south approach through the bridge and into the north approach.

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

Curbs – No curbs are present along either fascia. Previous curbs appear to have been removed at some point. The edge of the deck overlay ends approximately 10" from the railing, leaving a 3" drop off (see photo 8).

Railing – The railing is in good condition and consists of a single metal beam rail on H beam posts with angle iron caps. Northbound side has a newer galvanized rail, whereas the southbound side has primer exposed rail with light rust. The railing posts are attached to vertical face of the reinforced concrete superstructure and terminate at each end of the bridge with a blunt end bullnose (see photo 10). The railing does not properly transition off the bridge beyond the clear zone, creating a hazard due to blunt end fixed condition.

Curbs – There are no curbs present on the bridge deck.

Expansion Joints – There are no expansion joints.

Utilities – No utilities are present.

Superstructure

Deck – The reinforced concrete deck is in good condition. Moderate efflorescence and scaling exists for the full length of both outside faces of the fascias (see photos 11 & 12). At the north fascia, the efflorescence is heaviest at both the east and west edge of deck. Efflorescence note on northern portion of deck underside (see photo 13). Heavy efflorescence and cracking, up to full span length, is prevalent on the southern portion of the underside of deck (about ¼ of the deck width) (see photo 14).

Substructure

Overall substructure condition is rated to be in fair condition

Abutment (Stem) – The abutment stems are in fair condition. There are signs of leakage at most joints and efflorescence is evident at mid-height with vertical hairline cracking. There is an 8"x10" hollow area with diagonal crack and efflorescence at the east end of abutment #2.

Wingwalls (Stem)– The wingwalls are in fair condition (6). There is light scaling at the waterline. Wingwall 1A shows a surface spall (approximately 16"x6"x1.5" deep). The southeast wingwall shows signs of light scaling throughout the wall, with the heavier scaling at the outlet drain pipe. The northwest and northeast wingwalls have moderate mortar voids up to 8" penetration and hairline cracking (see photos 12 & 16).

Erosion and scour – Erosion and scour of the structure remains in poor condition. The overall substructure rating is driven by the erosion and undermining that is evident. The south abutment footing, including it's overpour, is exposed full length. The area of a concrete over pour at the south abutment is undermined for the full length of up to 16" penetration at the time of field inspection. Our observations match those of the recent inspection report suggesting that the conditions are serious but not rapidly progressing.

Channel and Channel Protection

Channel Scour – The channel enters the structure at a sharp angle with flow heading west and directed towards the southeast wingwall and south abutment. The misalignment of the flow has contributed to the erosion and scour issues previously noted.

Approaches

Approach Pavement – The approach pavement is in good condition. Minor longitudinal cracks extend from the bridge deck to the north approach. Additionally, minor transverse cracking up to ½" wide (approximately 15' length) at the North approach was observed.

Approach Guide Rail – No approach guiderail is present. There is no protection on the east side of the bridge approaches, with only abandoned wooden posts and no cables at the west side approaches. The bridge railing terminates at each end of the bridge with a blunt end bullnose (see photo 10). The railing does not properly transition off the bridge beyond the clear zone, creating a hazard due to the blunt end fixed condition and allows the ability of an errant vehicle to drive into the brook.

Approach Embankment – Approach embankments are in good condition with minor erosion. The channel centerline makes an abrupt turn as it approaches the structure with flow directed towards the southeast wingwall and the south abutment. This change to Merrick Brook's angle of the attack has led to embankment erosion and scouring of streambed material surrounding the nearby tree root wads (see photo 18). Undercutting upstream and downstream is exposing tree root systems. The approach embankments consist mostly of brush and vegetation.

RECOMMENDATIONS

Based on the findings from the field inspection, CHA is offering recommendations to preserve the structural integrity of the bridge as well as improve roadside safety at the site in the short term. It is apparent this bridge exhibits a high vulnerability to scour due to the geometry and the extreme turn the channel takes at the bridge. Action should be taken to prevent further scour to the south abutment and the southeast wingwall. The scour countermeasure should be designed to re-align the channel towards the center of the bridge span and be installed to protect the substructure from further scour which eventually will lead to undermining and ultimately structural instability. Measures should be taken to repair the northwest and northeast wingwalls mortar voids and deterioration, as well as addressing the fall hazard at the southeast wingwall by installing a fence. Additionally, a proper approach guiderail system should be installed at each corner of the bridge to provide safety to drivers by shielding them from a blunt end and redirecting vehicles to the roadway. Potential construction cost estimate: $100,000 (see Appendix B: Cost Estimate for the estimate breakdown).

APPENDICES

Appendix A – Photographs
Appendix B – Cost Estimate

Appendix A: Photographs

Photo 1: Elevation

Photo 2: North Approach

Photo 3: South Approach

Photo 4: Channel looking upstream from bridge

Photo 5: Channel looking downstream from bridge

Photo 6: Overlay cracking & sealing

Photo 7: Typical approach rail

Photo 8: Concrete buildout over NE WW

Photo 9: Approach rail with abandoned wooden posts

Photo 10: East rail

Photo 11: West rail

Photo 12: Wingwall 2A (NW)

Photo 13: Wingwall 2A (NW)

Photo 14: Abutment #2 (south) elevation

Photo 15: Leaking joints at abutments

Photo 16: Wingwall 2B (Northeast) w/ erosion at free end

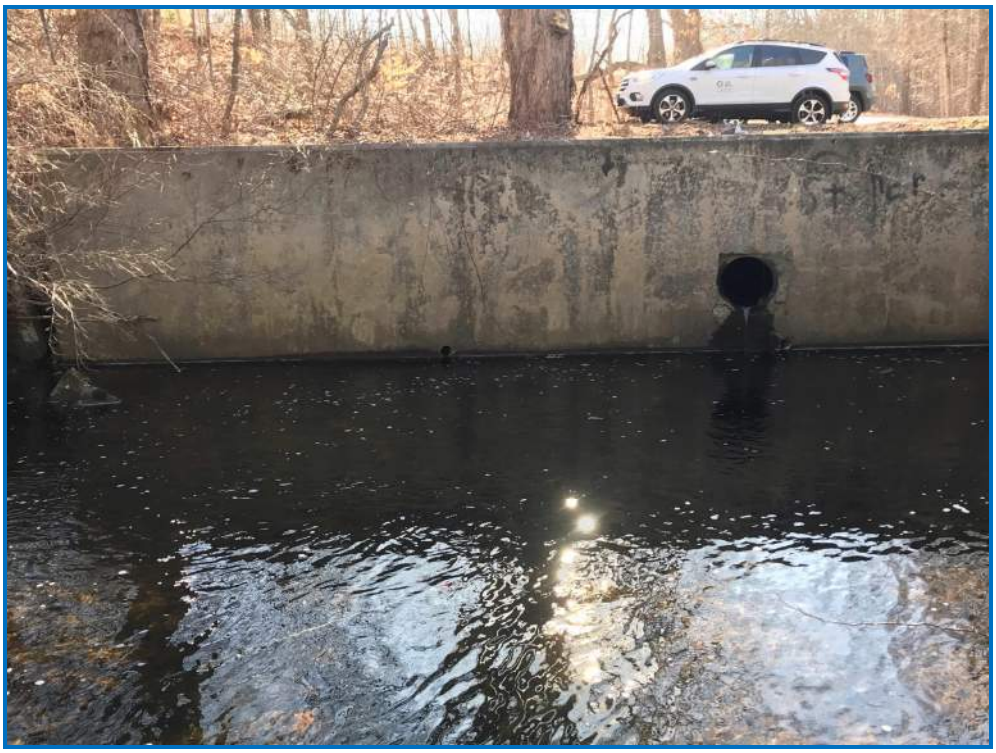


Photo 17: Wingwall 1B (SE) elevation

Photo 18: Embankment erosion beside WW 1B, undercut/exposed tree root systems

Photo 19: Efflorescence at WW 2B (Northeast)

Photo 20: Abutment #2 (north) elevation

Photo 21: Vertical hairline cracking at Abutment #2 (North).

Photo 22: Abutment #2 (north) leaking underside of deck at joint. Hairline cracking at abutment

Photo 23: Abutment #1 (South) Exposed footing and overpour

Bridge No. 04771
Location: Scotland, CT
January 29, 2021

Appendix B: Cost Estimate

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

Page: 1 OF 1

TOWN OF SCOTLAND

BRIDGE CONDITION ASSESSMENT

PROGRAMMING COST ESTIMATE

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

Bridge No. 04771 (Brook Rd over Merrick Brook) — City/Town: Scotland

	(Short Term) Item Description	Unit	Quantity	Unit Price	Amount
	Scour Countermeasure (fill, geotextile, riprap, etc.)	LS	1	$ 25,000.00	$ 25,000
	Water Handling	LS	1.0	$ 25,000.00	$ 25,000
	Approach Railing	LF	50	$ 175.00	$ 8,750
	Wingwall fencing	LF	75	$ 25.00	$ 1,875
	Substructure/Wingwall Concrete repairs	SF	75	$ 75.00	$ 5,625
				TOTAL ITEMS	$ 66,250

CONTRACT COST SUMMARY

TOTAL ITEMS		$ 66,250
CLEARING AND GRUBBING	2.0%	$ 1,325
MOBILIZATION	5.0%	$ 3,313
CONTINGENCY	15.0%	$ 9,938
MINOR ITEM ALLOWANCE	15.0%	$ 9,938
BASE ESTIMATE		$ 90,763

SAY : $ 100,000.00

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