DUCK BROOK BRIDGE
Acadia National Park Roads & Bridges
Spanning Duck Brook on Paradise Hill Road
Bar Harbor Vicinity
Hancock County
Maine

HAER NO. ME-30

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

PHOTOGRAPHS

MEASURED AND INTERPRETIVE DRAWINGS

XEROGRAPHIC COPIES OF COLOR TRANSPARENCIES

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Department of the INterior
P.O. Box 37127
Washington, D.C. 20013-7127

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HISTORIC AMERICAN ENGINEERING RECORD

DUCK BROOK BRIDGE

HAER No. ME-30

I. LOCATION: Spanning Duck Brook on Paradise Hill Road, 1 mile SE of Hulls Cove Visitor Center, Acadia National Park, Bar Harbor vicinity, Mount Desert Island, Hancock County, Maine.

Quad: Bar Harbor, Maine
UTM: 19/561150/4916300

DATE OF CONSTRUCTION: 1950-53

DESIGN: Public Roads Administration, Sterling, VA.

ENGINEERS: T. W. Harris, Wayne Franham, George O'Neil, Bureau of Public Roads

CONTRACTOR: M&M Construction Company

STRUCTURE TYPE: Three-span stone-faced reinforced concrete continuous arch deck bridge

FHwA STRUCTURE NO.: 1700-001P

SIGNIFICANCE: The last of the major bridges constructed in Acadia National Park, Duck Brook Bridge is also the largest road-related structure in the park, and the largest continuous concrete arch deck bridge in the eastern United States. Construction of the $366,000 structure was the final project in the completion of the Paradise Hill Road, which provided a new entrance to the park bypassing the crowded streets of Bar Harbor.

PROJECT INFORMATION: Documentation of Duck Brook Bridge is part of the Acadia National Park Roads and Bridges Recording Project, conducted in 1994-95 by the Historic American Engineering Record. This is one in a series of project reports. HAER No. ME-11, ACADIA NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads. In addition, HAER No. ME-56, PARADISE HILL ROAD, contains more specific information on the road on which the structure is located.

Richard H. Quin, Historian, 1994

HISTORY

The last of the major bridges constructed in Acadia National Park, the Duck Brook Bridge is also the park's largest road-related structure. The massive stone-faced reinforced concrete bridge spans a deep ravine over Duck Brook on three semi-elliptical arches.

The bridge was necessitated by the construction of the Paradise Hill Road, which provided a connection between the Park Loop Road and Hulls Cove, west of Bar Harbor. This road had been discussed by John D. Rockefeller and his engineer, Paul D. Simpson, as early as 1934. In 1936, Rockefeller informed Secretary of the Interior Harold Ickes that he would be willing to donate the necessary land to construct this link, which would allow motorists to enter the park without having to pass through downtown Bar Harbor. The government subsequently appropriated $209,945 for construction, which began under supervision of the Public Roads Administration in December 1940. The road was completed eight months later; however, funds for the Duck Brook Bridge and smaller spans over the present Maine Route 233 (Eagle Lake Road) and the New Eagle Lake Road were not available, and the construction of the structures was delayed by World War II and subsequent funding shortages.[1]

An early consideration was whether to cross the creek above the present site, which would have necessitated construction of a second span across a side creek, or whether to build a large bridge at the present site. In October 1939, National Park Service Director Arno B. Cammerer notified Rockefeller that a tentative decision had been made to employ the single span structure at the lower site.[2]

Mr. Rockefeller, who purchased the land through which the road passed and donated it to the park, concerned himself with the myriad details of the road's construction. He felt a single span

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[1]H. Eliot Foulds, Landscape Architect, and Lauren H. Meier, Historical Landscape Architect, Olmsted Center for Landscape Preservation, National Park Service, *Compliance Documentation for the Historic Motor Roads, Acadia National Park, Federal Highways Project #PRA-ACAD-4A10* (Boston, MA: National Park Service, North Atlantic Regional Office, September 1993), 50.

[2]Arno B. Cammerer, Director, National Park Service, to John D. Rockefeller, Jr., 26 October 1939. Rockefeller Archives Center, Offices of the Messrs Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 72.

below the branch stream was preferable, and urged Public Roads Administration Assistant Highway Engineer Leo Grossman to plan for the lower crossing. He wanted a stone-faced bridge constructed, consistent with the design of earlier park motor road and carriage road bridges.[3]

Although the Paradise Hill Road was completed in 1940, funds for the bridges had not been released. Rockefeller realized that the impending world war might cause a delay in the work, and tried to have the National Park Service release funds for the construction. The two small bridges were subsequently designed, but plans for the Duck Brook Bridge remained incomplete. In June 1941, Rockefeller wrote his friend Horace M. Albright, former director of the National Park Service, thanking him for "so persistently keeping at the matter of the completion of the plans for the bridge, adding that without his support, he feared there would "be little prospect of their ever having been finished." He was hoping the plans would be complete in time for the bridge to be advertised that summer.[4]

The outbreak of World War II, however, severely delayed the project. Wartime shortages of steel were one factor, but few road projects of any sort were carried out in the parks over the duration. Much equipment was transferred to military use; park and federal road-building personnel went into the services; and tourist travel declined sharply due to gasoline and tire rationing. Even with the conclusion of hostilities, the project could not be started for half a decade because the Park Service was operating on a severely restricted budget.

Work finally got underway in August 1950. The M&M Construction Company, comprised of W. Robinson Martin of Manchester, Vermont and Harold MacQuinn of Hulls Cove, was the low bidder on the project. The Bureau of Public Roads classified the work as Acadia National Park Project 10A4. Three BPR engineers served on the project: T. W. Harris began the work, and was followed by

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[3]"Acadia's Stone Bridges Link Past and Future" *Bar Harbor [ME] Times*, 23 April 1987, 24; John D. Rockefeller, Jr. to Leo Grossman, Assistant Highway Engineer, Bureau of Public Roads, 20 November 1939. Rockefeller Archives Center, Offices of the Messrs Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 72.

[4]JDR, Jr. to Horace M. Albright, 20 June 1941. Rockefeller Archives Center, Offices of the Messrs Rockefeller, Record Group 2, Homes (Seal Harbor), Box 117 Folder 1.

Wayne Franham then George O'Neil. The project office was located in the ravine below the bridge's northeast side.[5]

Photographs taken during construction give some indication of the order of the work. The piers and abutments were constructed first, then the arch voussoirs and barrels were erected on timber formwork. The concrete for the arches was poured next, and then the stone-facing was brought up to grade level.

To support the arches, the Timber Structure Company of New York shipped 42 knocked-down prefabricated wooden trusses from Portland, Oregon. The trusses were erected at the site on a boom and crane. The trusses were placed in pairs without the use of a traditional "centering stick." Due to the massive size of the arches, the wooden formwork had to support up to 800 tons.[6]

A construction railway, called the "M&M Railroad," was employed to carry 16-cubic foot hoppers which carried the concrete to the arch barrels. The pink granite face stone was obtained from Hall Quarry, 3 miles south of Somesville. The stone was cut from templates at the site and placed on the structure as indicated on the architectural plans.[7]

The project entailed some 92,000 hours of worker's time, and as many as 75 men were on the job at one time. Total cost of the structure was $366,000, making it the most expensive road-related structure in the park at the time of its completion.[8]

On 8 October 1952, the last 600 pound block of granite was lifted into place. Final work on the structure included placement of the 3' sidewalks on each side, repairs of damage caused by heavy construction equipment, and surfacing. Following completion of the bridge the Paradise Hill Road opened in July 1953.[9]

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[5]"Acadia's Stone Bridges," 24; Duck Brook Bridge construction photo, ca. 1952, Brown's Studio, Bar Harbor, ME.

[6]Gladys O'Neil, "The Story of Duck Brook Bridge," in Tammis E. Coffin, ed. *The Rusticator's Journal: A Collection of Articles From the Journal of the Friends of Acadia* (Bar Harbor, ME: Friends of Acadia, 1993), 74.

[7]"Acadia's Stone Bridges," 36.

[8]O'Neil, 74.

[9]"Acadia's Stone Bridges," 36.

The bridge remains in active use and has been little altered. A 1990 inspection of the structure by the Federal Highway Administration determined the bridge "deficient or functionally obsolete" but did not suggest closing or posting the structure. The bridge safety inspection report recommended an expenditure of $8,500 for rehabilitation work, including the repointing of stone masonry as required, removal of vegetation from the roadway deck, sealing of cracks in the asphalt roadway surface, and repair of erosion on abutment wingwalls and breastwalls. Both abutments had settled slightly, causing moderate transverse cracks. Drainage pipes at drop inlets had failed and required replacement, and new scupper caps were needed at the tops of the drains. Original construction ladders inside the piers had rotted and were a safety hazard. Bridge end delineators were needed at both approaches. Moderate spalling and efflorescence was also noted, as were minor cracks over the expansion joints.[10] Other than the replacement of the inspection ladders, the other recommended work does not appear to have been carried out.

The bridge is the largest continuous concrete arch bridge east of the Mississippi River.

Description

The 402' bridge is supported by three semi-elliptical arches set on piers. The center arch has a clear span of 95', and the two side arches each span 89'. Approaches add another 65' in length to each side. Some 4,000 pounds of concrete, 2,000 tons of reinforcing steel, and 1,100 cubic yards of stone went into the bridge.[11]

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[10]U.S. Department of Transportation, Federal Highway Administration, "Bridge Safety Inspection Report, Paradise Hill Road over Duck Brook, Acadia National Park, Str. No. 1700-001P" (Sterling, VA: Federal Highway Administration, Eastern Direct Federal Division, 27 June 1990), 2, 8-9.

[11]O'Neil, 74.

III. BIBLIOGRAPHY

I. PRIMARY SOURCE DOCUMENTS

National Park Service Reports

Foulds, H. Eliot, Landscape Architect, and Lauren H. Meier, Historical Landscape Architect, Olmsted Center for Landscape Preservation, National Park Service, *Compliance Documentation for the Historic Motor Roads, Acadia National Park, Federal Highways Project #PRA-ACAD-4A10.* Boston, MA: National Park Service, North Atlantic Regional Office, September 1993.

Bureau of Public Roads/Public Roads Administration/Federal Highway Administration Reports

U.S. Department of Transportation, Federal Highway Administration. "Bridge Safety Inspection Report, Paradise Hill Road over Duck Brook, Acadia National Park, Str. No. 1700-001P." Sterling, VA: Federal Highway Administration, Eastern Direct Federal Division, 27 June 1990.

Correspondence

Cammerer, Arno B., Director, National Park Service, to John D. Rockefeller, Jr., 26 October 1939. Rockefeller Archives Center, Offices of the Messrs Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 72.

Rockefeller, John D., Jr., to Horace M. Albright, 20 June 1941. Rockefeller Archives Center, Offices of the Messrs Rockefeller, Record Group 2, Homes (Seal Harbor), Box 117 Folder 1.

--to Leo Grossman, Assistant Highway Engineer, Bureau of Public Roads, 20 November 1939. Rockefeller Archives Center, Offices of the Messrs Rockefeller, Record Group 2, Homes (Seal Harbor), Box 122 Folder 72.

Construction Drawings

U.S. Department of the Interior, National Park Service, Division of Architecture, North Atlantic Region. Bridge over Duck Brook, Paradise Hill Road, Acadia National Park. Construction drawing NP-ACA-2. Boston, MA: National Park Service, North Atlantic Regional Office, 7 April 1940.

II. SECONDARY SOURCE DOCUMENTS

Journal Articles

O'Neil, Gladys. "The Story of Duck Brook Bridge," in Tammis E. Coffin, ed. *The Rusticator's Journal: A Collection of Articles From the Journal of the Friends of Acadia*. Bar Harbor, ME: Friends of Acadia, 1993.

Newspaper Articles

"Acadia's Stone Bridges Link Past and Future," *Bar Harbor* [ME] *Times*, 23 April 1987.

Historic Photographs

Duck Brook Bridge construction photo, ca. 1952. Brown's Studio, Bar Harbor, ME.

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INDEX TO BLACK AND WHITE PHOTOGRAPHS

JET LOWE, PHOTOGRAPHER, MAY 1995

ME-30-1	DUCK BROOK BRIDGE IN ELEVATION FACING SOUTHWEST BY 250 DEGREES.
ME-30-2	PERSPECTIVE VIEW FACING SOUTH BY 180 DEGREES.
ME-30-3	INTERIOR ARCH DETAIL FACING NW BY 250 DEGREES.
ME-30-4	GENERAL VIEW OF INTERIOR CONCRETE FORM WORK FACING NW.

INDEX TO COLOR TRANSPARENCIES

All color xerographic copies were made from a duplicate color transparency.

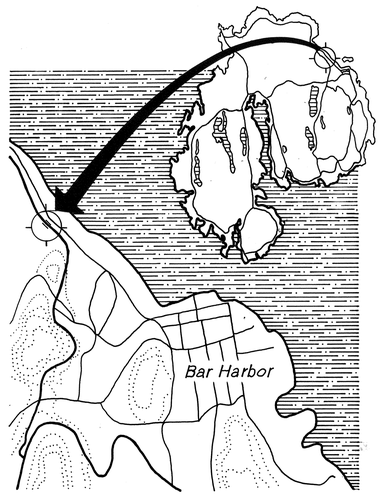
Jet Lowe, Photographer, May 1995

ME-30-5 (CT)	DUCK BROOK BRIDGE IN ELEVATION FACING SOUTHWEST BY 250 DEGREES.

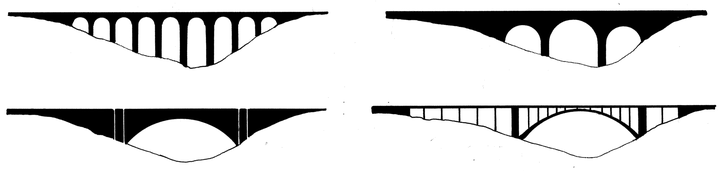
DUCK BROOK MOTOR ROAD BRIDGE 1953

The last major bridge constructed in Acadia National Park, Duck Brook Bridge is the largest road-related structure in the park and the largest stone-faced concrete arch bridge east of the Mississippi. The structure was planned in the early 1940s as part of the Paradise Hill Road, which would provide a scenic connecting link to the Park Loop Road from Hulls Cove west of Bar Harbor. However, construction was delayed because of World War II, and the bridge work did not begin until 1950. The contractor was the "M&M Construction Company," comprised of W. Robinson Martin of Manchester, Vermont and Harold MacQuinn of Hulls Cove. The project was under construction supervision by the Bureau of Public Roads, U.S. Department of Commerce.

The bridge spans Duck Brook's deep ravine on three massive semicircular arches. An internal concrete frame stiffens the arches and supports the concrete deck. To support the arches during construction, the Timber Structure Company of New York shipped 42 knocked-down prefabricated wooden trusses to the project. The trusses were erected in pairs by a crane without the use of traditional centering. Due to the size of the arches, the trusses had to support weights of up to 800 tons. A construction railway, called the "M&M Railroad," was employed to convey hopper cars carrying concrete to the site. The pink granite face stone was obtained from the famed Halls Quarry near Someville. Some 4,000 tons of concrete, 2,000 tons of reinforcing steel, and 1,100 cubic yards of stone was used to build the bridge. The bridge was completed in 1953. At a cost of $336,000, it was the park's most expensive road-related structure.



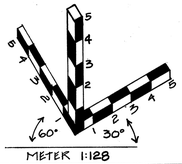
PROPOSED ALTERNATE BRIDGE DESIGNS



NOTE: This drawing is a conjectural interpretation based on construction drawings and field measurements.

KEY TO PARTS

- A Concrete footings
- B Reinforced concrete deck supports
- C Rock
- D Access Ladder
- E Reinforced concrete framework
- F Reinforced concrete spandrel wall
- G Reinforced concrete arch
- H Bituminous waterproofing
- I Reinforced concrete deck with expansion joints
- J Asphalt roadway surface
- K Pedestrian sidewalk
- L Granite facing stone
- M Reinforced concrete pier



DELINEATED BY: J. SHANNON BARKAS, 1994

NATIONAL PARK SERVICE
ACADIA ROADS & BRIDGES RECORDING PROGRAM
NATIONAL PARK SERVICE
UNITED STATES DEPARTMENT OF THE INTERIOR

DUCK BROOK BRIDGE - 1953
PARADISE HILL ROAD SPANNING DUCK BROOK
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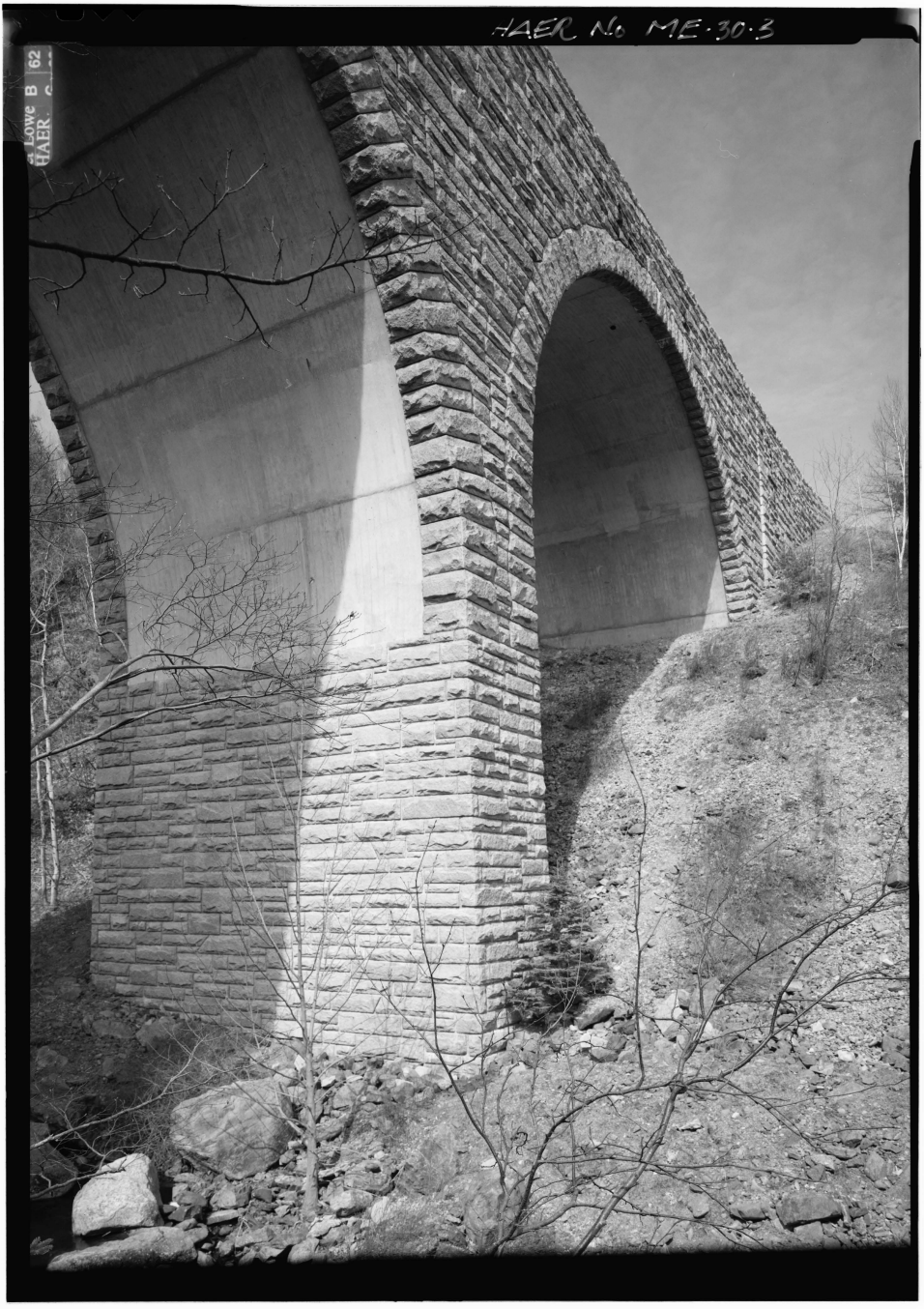
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