OMB Approval No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Continuation Sheet

Section number _____ Page _____

SUPPLEMENTARY LISTING RECORD

NRIS Reference Number: 04001091 **Date Listed:** 9/29/04

Bridge No.1132	Middlesex	CT
Property Name	**County**	**State**

N/A
Multiple Name

This property is listed in the National Register of Historic Places in accordance with the attached nomination documentation subject to the following exceptions, exclusions, or amendments, notwithstanding the National Park Service certification included in the nomination documentation.

Entered in the National Register — 9-24-04

Signature of the Keeper **Date of Action**

==========

Amended Items in Nomination:

8. Statement of Significance: Period of Significance:

The period of significance for this property's historical and engineering significance under criteria A and C is 1934.

This was confirmed with CTSHPO staff by telephone.

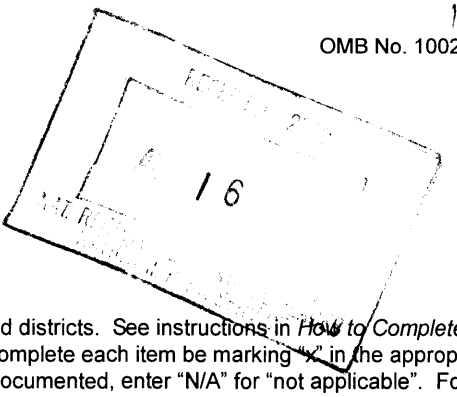
DISTRIBUTION:
National Register property file
Nominating Authority (without attachment)

NPS Form 10-900
(Oct. 1990)

OMB No. 10024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form



This form is for use in nominating or requesting determinations for individual properties and districts. See instructions in *How to Complete the National Register of Historic Places Registration Form* (National Register Bulletin 16A). Complete each item be marking "X" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable". For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer to complete all items.

1. Name of Property

historic name **BRIDGE NO. 1132**

other names/site number N/A

2. Location

street & number Route 80 at Hammonasset River ☐ not for publication

city or town Killingworth - Madison ☐ vicinity

state Connecticut code CT county Middlesex - New Haven code 007-009 zip code 06419,06443

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this ☒ nomination ☐ request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property ☒ meets ☐ does not meet the National Register criteria. I recommend that this property be considered significant ☐ nationally ☒ statewide ☐ locally. (☐ See continuation sheet for additional comments.)

X 08/10/04

Signature of certifying official/Title Date

J. Paul Loether, Division Director, Connecticut Commission on Culture & Tourism
Deputy State Historic Preservation Officer

State or Federal agency and bureau

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. (☐ See continuation sheet for additional comments.)

Signature of certifying official/Title Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that the property is:

☑ entered in the National Register.
☐ See continuation sheet.
☐ determined eligible for the National Register.
☐ See continuation sheet.
☐ determined not eligible for the National Register.
☐ removed from the National Register.
☐ other, (explain): _____

Signature of the Keeper — Entered in the National Register

Date of Action 9-29-04

5. Classification

Ownership of Property
(Check as many boxes as apply)

- ☐ private
- ☐ public-local
- ■ public-State
- ☐ public-Federal

Category of Property
(Check only one box)

- ☐ building(s)
- ☐ district
- ☐ site
- ■ structure
- ☐ object

Number of Resources within Property
(Do not include previously listed resources in the count)

Contributing	Noncontributing	
		buildings
		sites
1		structures
		objects
1	0	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

0

6. Function or Use

Historic Functions
(Enter categories from instructions)

TRANSPORTATION: road-related

Current Functions
(Enter categories from instructions)

TRANSPORTATION: road-related

7. Description

Architectural Classification
(Enter categories from instructions)

Other: open-spandrel concrete arch

Materials
(Enter categories from instructions)

foundation N/A
walls N/A
roof N/A
other N/A

Narrative Description
(Describe the historic and current condition of the property on one or more continuation sheets.)

8. Statement of Significance

Applicable National Register Criteria
(Mark an "x" in one or more boxes for the criteria qualifying the property for National Register listing.)

- ■ **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.
- ☐ **B** Property is associated with the lives of persons significant in our past.
- ■ **C** Property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.
- ☐ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" in a ll the boxes that apply.)

Property is:

- ☐ **A** owned by a religious institution or used for religious purposes.
- ☐ **B** removed from its original location.
- ☐ **C** a birthplace or grave.
- ☐ **D** a cemetery.
- ☐ **E** a reconstructed building, object, structure
- ☐ **F** a commemorative property.
- ☐ **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

ENGINEERING
TRANSPORTATION

Period of Significance
1915-1935

Significant Dates
1934

Significant Person
(Complete if Criterion B is marked above.)
N/A

Cultural Affiliation

Architect/Builder
Connecticut Highway Department, engineers
Osborn-Barnes Construction Co., contractor

Narrative Statement of Significance
(Explain the significance of the property on one or more continuation sheets.)

9. Major Bibliographic References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

- ☐ preliminary determination of individual listing (36 CFR 67) has been requested
- ☐ previously listed in the National Register
- ☐ previously determined eligible by the National Register
- ☐ designated a National Historic Landmark
- ☐ recorded by Historic American Building Survey # _____
- ■ recorded by Historic American Engineering Record # CT-162

Primary location of additional data:

- ■ State Historic Preservation Office
- ☐ Other State agency
- ☐ Federal agency
- ☐ Local government
- ☐ University
- ☐ Other

Name of repository:

Connecticut Historical Commission,
59 South Prospect Street, Hartford, CT 06106

Bridge No. 1132 — Middlesex - New Haven Counties, CT
Name of Property — County and State

10. Geographical Data

Acreage of Property less than one

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing
1	18	690660	4580930
2			
3			
4			

☐ See continuation sheet

Verbal Boundary Description
(Describe the boundaries of the property on a continuation sheet.)

Boundary Justification
(Explain why the boundaries were selected on a continuation sheet.)

11. Form Prepared By

name/title Bruce Clouette, Historian

organization Public Archaeology Survey Team, Inc. date March 31, 2003

street & number P.O. Box 209 telephone 860-429-1723

city or town Storrs state CT zip code 06268

Additional Documentation

Submit the following items with the completed form:

Continuation Sheets

Maps

A **USGS map** (7.5 or 15 minute series) indicating the property's location.
A **Sketch map** for historic districts and properties having large acreage or numerous resources.

Photographs

Representative **black and white photographs** of the property.

Additional Items
(Check with SHPO or FPO for any additional items.)

Property Owner

(Complete this item at the request of SHPO or FPO.)

name Connecticut Department of Transportation

street & number 2800 Berlin Turnpike telephone 860-594-3000

city or town Newington state CT zip code 06141-7546

Description:

Bridge No. 1132 is a 100-foot-long open-spandrel concrete arch that carries Route 80, known locally as North Branford Road, across the Hammonasset River's deep ravine (Photographs 1-3). The arch itself has a rise of 26 feet, with the distance from the river bed to the roadway measuring about 45 feet. In addition to the main arch, the bridge has three 15-foot-long concrete-girder approach spans at each end, giving an overall length of 231 feet. The two-lane roadway is 30 feet wide and rises at a grade of 4% going west to east. The bridge's setting is a densely wooded nature area, with hiking trails along the bank and, just upstream, the dam for the Lake Hammonasset Reservoir; a modern steel footbridge crosses the river just to the north of the highway bridge. Originally, the area was known as Ninevah Falls. The bridge was designed by the engineering staff of the Connecticut Highway Department, the predecessor agency to today's Department of Transportation. The contractor for the project, which was completed in 1934, was the Osborn-Barnes Construction Company of Danbury, Connecticut, a medium-sized firm that specialized in road construction.

The two parallel arch ribs, five feet wide and tapering in depth from three feet at the ends to two feet at the crown, spring from footings set into the rock ledge on either side of the river. The ribs are centered 20 feet apart and are joined by four 18-inch-square transverse struts (Photograph 4). Eight pairs of columns, 18 inches by 36 inches in section, rise from the arch ribs to support transverse floor beams for the concrete-slab roadway. Because the roadway is wider than the arch, the beams, which are tapered and rounded at the ends, extend beyond the plane of the columns to support the overhang. Large square piers rise from the footing at either end of the arch; the outside surface of each pier is finished as a single recessed panel. The end abutments consist of simple reinforced-concrete retaining walls. The piers and abutments have engaged half columns to be consistent with the structural columns atop the arch ribs.

The side elevations of the bridge give the appearance of a series of arches. The openings between the columns are given a round-arched shape by fascia beams, with simple capitals on the columns augmenting the arcade effect. The arches are ten feet wide above the main arch and fifteen feet wide on the approaches. The bridge's railings are three feet high and consist of 10-foot sections of square chamfered balusters between piers, with larger piers at the ends of the arch and at the extreme ends of the bridge (Photograph 5). Two of the end piers are incised with the date "1934" (Photograph 6).

The bridge has undergone several episodes of repair and improvement since it was constructed, but it retains intact much of its historic appearance. Cracked and spalled concrete has been replaced in such a way that the original form of the bridge remains unchanged, even though the color match is not perfect and occasional plywood form-marks contrast with the board marks evident from the original work. Modern "W-rail" guardrails have been installed on either side of the roadway, a circumstance that obscures somewhat the original railings, but by assuming their function this modification allows the historic railings to remain in place.

Next page: General layout of bridge, January 30, 1934, Connecticut Department of Transportation Drawing File 71-02.

Statement of Significance:

Summary

Bridge No. 1132 is significant as a well-preserved example of open-spandrel concrete-arch engineering (Criterion C) and as a project that exemplified early 20th-century attempts to improve the state's highway system (Criterion A). Open-spandrel arches were generally used only for very long spans (usually 100 feet or more) and were especially well suited for crossing deep ravines and valleys. For that reason, they often were among the largest and most expensive highway bridge projects of the period. The appearance of the open-spandrel arch was also considered aesthetically pleasing. The state engineers were particularly proud of the way this bridge complemented its scenic surroundings. It was called out for special mention in the Highway Department's 40th-anniversary history, published in 1935, and was one of only nine bridge projects (four of them open-spandrel arches) mentioned by name.

Technological Significance

The character-defining feature of the open-spandrel arch is the system of columns and floor beams, usually resting on two or more arch ribs, that carries the roadway. In contrast to the filled or solid-spandrel type of arch, in which the roadway was supported on fill contained between the spandrel walls, the open-spandrel design minimized the dead load of the structure and thus was feasible for much longer spans. Open-spandrel arches were more complex to design than the filled-spandrel type, and they required a great deal more carpentry labor to build the forms for the ribs, columns, and cross beams, but they offered substantial savings because the arch itself could be lighter and the footings less massive. The design also resulted in a bridge with considerable aesthetic appeal, with the soaring arch ribs and slender columns creating a graceful appearance that was appropriate for a variety of settings. Although a restrained Neo-Classicism was often evident in the articulation of the spaces between columns as round-arched openings (as in Bridge No 1132), what the state engineers called the "artistic merit" of these bridges derived primarily from the form itself, which directly reflected the design's economy of material.

Reinforced concrete was a relatively new material when the Connecticut Highway Department began planning its Trunk Line bridges. Specifications for mixtures and the amount and type of reinforcement were not standardized until around 1915, but the concrete arch was extensively discussed in the engineering periodicals and textbooks of the period and quickly became a favorite of highway officials around the country. The Department completed its first open-spandrel arch in 1918, with five others to follow in the 1920s and 1930s. Concrete was an exceptionally strong bridge material since, when properly reinforced with steel rods, it resisted both compressive and tensile forces. It was also an inexpensive material, the chief cost being the reinforcement steel; the concrete itself was just sand, gravel, and Portland cement. The fact that concrete bridges were labor-intensive to build was not seen as a drawback. Instead, it meant that most of the cost of the bridge would end up in the pockets of local workers rather than enriching some distant bridge company. Engineers in that period also hoped that concrete would be a nearly maintenance-free material.

In addition to epitomizing the open-spandrel form, Bridge No. 1132 is notable for retaining its Neo-Classical balustrade railing, an indicator of its period of origin, and for the rather steep roadway grade, which required that each set of columns and archways be slightly different.

Transportation History Significance

The Route 80 bridge over the Hammonasset River was part of an early 20th-century effort by the Connecticut Highway Department to provide the state with a network of modern roads. The Department was the operating arm of the Connecticut Highway Commission, which had been established in 1895 to advise local highway officials and provide some state assistance in upgrading local roads. Within two years, the Commission was empowered to build roads on the state's behalf. In 1907, fourteen highways were designated as Trunk Lines, highways that crossed town boundaries and served as major cross-state routes. Rising motor vehicle traffic and the demands of agricultural interests, who viewed good roads as essential for the marketing of produce, encouraged direct state investment in rebuilding the Trunk Line highways, and in 1915 bridges on the Trunk Lines were added to the Department's responsibilities. Prior to this, bridges had been built and maintained by the towns or, in a few cases, by specially constituted state bridge commissions. The Department's engineers immediately went to work on what was regarded as the state's top priority, the replacement of bridges along the east-west shoreline route that is known today as Route 1. The material shortages of World War One prevented the completion of the Route 1 bridges until the early 1920s, at which time the Department turned its attention to the replacement of inland bridges.

Bridge No. 1132 was built as part of a major reconstruction of local roads into the Trunk Line known as Route 80. Extending from New Haven to the Connecticut River, Route 80 ran through what was then an almost entirely agricultural area. The first east-west route north of the shore line, it connected with several north-south Trunk Lines and thus was undoubtedly very useful in improving farmers' access to markets. As part of the same effort, numerous smaller streams were crossed by new concrete beam and slab bridges, many of which had the same square-baluster railings. However, Bridge No. 1132, spanning the route's largest river, was the lynchpin of the project. It replaced an earlier bridge on the site that crossed the river at a much lower level, thereby eliminating the steep hills at either end. It cost more than $480,000, a sizeable sum for the times.

Bibliography:

Clouette, Bruce, and Matthew Roth. Connecticut Historic Bridge Inventory. Connecticut Department of Transportation, 1990.

_____. *Connecticut's Historic Highway Bridges*. Newington, Conn.: Connecticut Department of Transportation, 1991.

Condit, Carl W. *American Building: Materials and Techniques from the First Colonial Settlements to the Present*. Chicago: University of Chicago Press, 1968.

Connecticut Department of Transportation. Drawing File 71-02.

Connecticut Highway Commission. *Biennial Report, 1935-1936*.

Connecticut State Highway Department. *Forty Years of Highway Development in Connecticut, 1895-1935*. New Haven: Connecticut Tercentenary Commission, Publication No. 46, 1935.

Hool, George A., and W. S. Kinne. *Reinforced Concrete and Masonry Structures*. New York: McGraw-Hill Book Company, 1924.

Legat, Arthur W. *Design and Construction of Reinforced Concrete Bridges*. London: Concrete Publications, 1948.

McCullough, Conde B. *Economics of Highway Bridge Types*. Chicago: Gillette Publishing Co., 1929.

Urquhart, Leonard C., and Charles-Edward O'Rourke. *Design of Concrete Structures*. New York: McGraw-Hill Book Company, 1926.

Waddell, J. A. L. *Economics of Bridgework*. New York: John Wiley and Sons, 1921.

Verbal Boundary Description:

The nominated property includes the bridge, abutments, and piers.

Boundary Justification:

The nominated property embraces the entire historic structure.

National Register of Historic Places
Continuation Sheet

All Photographs:

1. Bridge No. 1132
2. Killingworth-Madison, Middlesex-New Haven Counties, CT
3. PAST, Inc. Photo
4. March 2003
5. Negative filed with PAST, Inc., Storrs, CT

Captions:

South side of bridge, camera facing northeast
Photograph 1 of 6

North side of bridge, modern pedestrian bridge in foreground, camera facing south
Photograph 2 of 6

Roadway level from west end, camera facing east
Photograph 3 of 6

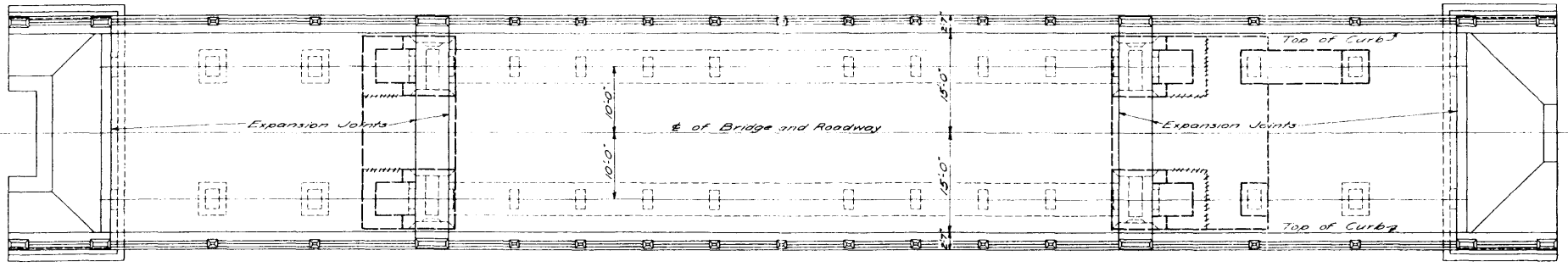
Detail of underside of bridge from east end, camera facing west
Photograph 4 of 6

Detail of railing, north side of bridge, camera facing northeast
Photograph 5 of 6

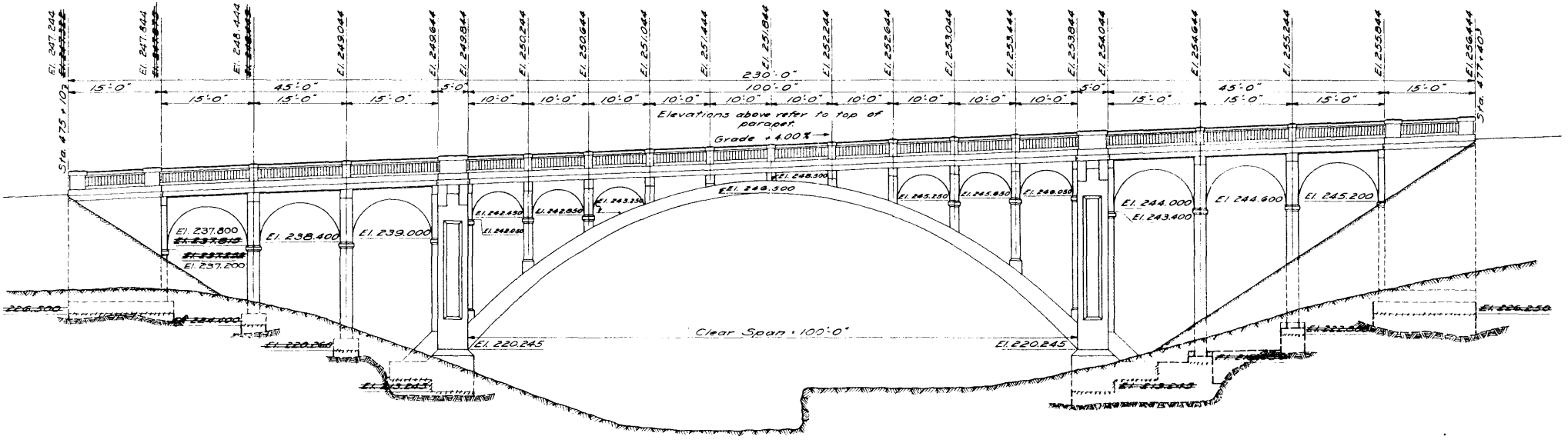
Detail of date incised in end pier of north railing, camera facing northwest
Photograph 6 of 6

FED. ROAD DIST. NO.	STATE	TOWNS	FED. AID PROJ. NO.	FISCAL YEAR	ROUTE NO.	SHEET NO.	SHEETS
9	CONN.	Madison & Killingworth	590	1933	90	3	

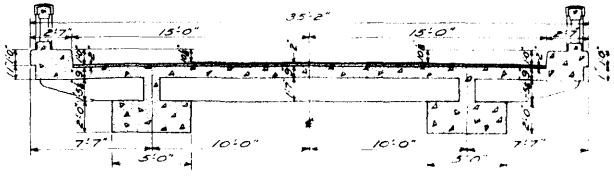
Revisions in Red show Bridge as constructed.



PLAN



SOUTH ELEVATION



CROWN SECTION

CONNECTICUT
STATE HIGHWAY DEPARTMENT
TOWNS OF
MADISON & KILLINGWOR.
PROPOSED BRIDGE /
NINEVEH FALLS
OVER HAMMONASSET RIV
GENERAL LAYOUT

SCALES	1"=10', 1"=10'		PROJE NUM 98
MADE BY	L.O.W.	DATE 1-30-34	
CHECKED BY	J.W.C.	DATE 2-6-34	SHEET 3. 01
APPROVED	J.F. Willis	DATE 2-8-34	