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: 00001073 **Date Listed:** 09/29/00

Stevenson Dam Hydroelectric Plant	Fairfield	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.

for Beth L. Savage — Signature of the Keeper

9/29/00 — Date of Action

==

Amended Items in Nomination:

8. Statement of Significance: Criteria

Criterion A is justified and has been added for the property's significance under the area of significance "Politics/Government."

This information was confirmed with John Herzan, National Register Coordinator, CTSHPO staff, by telephone.

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

NPS Form 10-900
(Rev. 10-90)

OMB No. 1024-0018

1073

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 by marking "x" in the appropriate box or by entering the information requested. If any 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 Stevenson Dam Hydroelectric Plant

other names/site number N/A

2. Location

street & number Connecticut Route 34 not for publication _
city or town Monroe and Oxford vicinity Stevenson
state Connecticut code CT county Fairfield & New Haven code 001/009
zip code 06468, 06478

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1986, as amended, I hereby certify that this X 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 X meets ____ does not meet the National Register Criteria. I recommend that this property be considered significant ___ nationally X statewide __ locally. ___ (See continuation sheet for additional comments.)

[signature] August 8, 2000
Signature of certifying official Date
John W. Shannahan, Director, Connecticut Historical Commission

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 commenting or other official Date

State or Federal agency and bureau

4. National Park Service Certification

I, hereby certify that this 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): ____

for Beth L. Savage 9/29/00
Signature of Keeper Date of Action

5. Classification

Ownership of Property (Check as many boxes as apply)
- X private
- ___ public-local
- X public-State
- ___ public-Federal

Category of Property (Check only one box)
- ___ building(s)
- ___ district
- ___ site
- X structure
- ___ object

Number of Resources within Property

Contributing	Noncontributing	
___	___	buildings
___	___	sites
3	___	structures
___	___	objects
3	___	Total

Number of contributing resources previously listed in the National Register 0

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

6. Function or Use

Historic Functions (Enter categories from instructions)

Cat: Industry — Sub: energy facility
Transportation — road-related

Current Functions (Enter categories from instructions)

Cat: Industry — Sub: energy facility
Transportation — road-related

7. Description

Architectural Classification (Enter categories from instructions)

No Style
Neo-Classical Revival

Materials (Enter categories from instructions)

foundation Concrete
roof Built-up asphalt
walls Brick and Concrete
other Concrete

Narrative Description (See continuation sheets.)

8. Statement of Significance

Applicable National Register Criteria (Mark "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.

X 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 all the boxes that apply.)

____ A owned by a religious institution or used for religious purposes.

____ B removed from its original location.

____ C a birthplace or a grave.

____ D a cemetery.

____ E a reconstructed building, object, or 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
Politics and Government

Period of Significance 1917-1950

Significant Dates 1917
1919

Significant Person (Complete if Criterion B is marked above)
____

Cultural Affiliation ____________________

Architect/Builder Designers:Birkinbine Engineering Office, Charles T. Main Engineers, J.A.P. Crisfield Co., Contractors: J.A.P. Crisfield Co., C.W. Blakeslee Co.

Narrative Statement of Significance (see continuation sheets)

9. Major Bibliographical References

(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 Buildings Survey # ____
_X_ recorded by Historic American Engineering Record # CT-183

Primary Location of Additional Data
_X_ State Historic Preservation Office
__X Other State agency
___ Federal agency
___ Local government
___ University
__X Other
Name of repository: Connecticut State Archives, Town of Monroe Historical Society, Northeast Utilities Service, Co, Berlin, CT

10. Geographical Data

Acreage of Property 7.6

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

	Zone	Easting	Northing		Zone	Easting	Northing
1	18	~~652860~~	4582750	3			
2		652920	4582820	4			

Verbal Boundary Description (See continuation sheet.)

Boundary Justification (See continuation sheet.)

11. Form Prepared By

name/title Steven M. Bedford, Ph.D.

organization Fitzgerald & Halliday Inc. date January 21,2000

street & number 157 Oxford Street telephone 860-236-9369

city or town Hartford state CT zip code 06105

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.

Photographs
Representative black and white photographs of the property.

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

Property Owners

name Northeast Utilities

street & number 107 Selden Street telephone 800-286-5000

city or town Berlin state CT zip code 06037

name Connecticut Department of Transportation

street & number 2800 Berlin Turnpike(PO. Box 317546) telephone 800-286-5000

city or town Newington state CT zip code 06131

The Stevenson Dam Hydroelectric Plant is located 19.3 miles from the mouth of the Housatonic River and about six miles upstream from the confluence of the Housatonic and Naugatuck Rivers at Derby, Connecticut. The complex consists of three elements: a concrete gravity dam, a powerhouse, and a bridge carrying Connecticut Route 34 over the dam. Stevenson Dam itself is approximately 1,300' long, impounding Lake Zoar, which extends ten miles upriver to the base of Shepaug Dam. The lake has a shoreline of 27 miles and a surface area that varies between 967 and 1,063 acres, depending on whether or not the 3'-high dam flashboards are in place. Each element of the hydroelectric plant is described below.

Stevenson Dam

Stevenson Dam is approximately 1300' long, supporting a reinforced concrete highway bridge. Near the southern end of the dam is the powerhouse. Although comparatively straight, the dam arches slightly. The southern 500' are straight. The next 383' curve slightly to the east before straightening to reach the beginning of the original northern abutment. The dam then turns southeastward to accommodate the Taintor gates at the northern end of the dam. After a 100' breach for the approach channel to the Taintor gates, the approach channel retaining wall connects with the southern end of the original northern abutment, approximately 130' north of the face of the Taintor gates. The northern abutment continues northward another 100' at approximately 8' below the current ground level. In 1988-89, the entire dam was anchored to the bedrock using post-tensioned steel cables.[1]

All but the southern 60' of the dam rests on bedrock consisting of a hard gneiss free of water-bearing seams. Located at depths varying from 20' to 60' below the natural surface, the exposed rock was worn in sharp ridges crossing the valley diagonally from east to west, forming an ideal foundation for the dam. The aforementioned southern 60' are an 8' wide cutoff wall built to rest on solid ledge instead of bedrock. The rest of the 192'-long southern abutment is founded on bedrock. A sloping solid concrete wall, the southern abutment rises to a height of 120' above sea level, approximately 20' above the dam spillway, yet varies in width and depth below the ground surface. The southernmost 60' are 8' wide and 32' deep. The remaining 97' are battered, varying in width from 16' to 80', extending up to 44' below ground on the downstream side. An 18"x 18" drain box runs the length of the dam near its lowest point. This drain box discharges though 4" pipes to the toe of the dam to relieve uplift due to water pressure.

Adjoining the southern abutment is the 157'-long intake forebay section of the powerhouse. Projecting approximately 15' from the upstream face of the dam and sloping upstream, this area contains trash racks and log slots protecting the eight forebay openings. Each opening is 8'-6' x 15'-6" and is controlled by a motorized worm-gear-operated gate, installed c. 1995.

[1] Information on the description of the complex is derived from extant plans on file at the offices of Northeast Utilities Service Company, Berlin, Connecticut and MacWilliams, C. M. "Notes on Historical Data and Water Power Development on the Housatonic River in Connecticut." 1952: (not paginated) on file with the real estate division of Northeast Utilities Service Company.

The 630'-long spillway section of the dam, adjacent to the powerhouse, is divided into 21 bays by the supporting piers of the highway bridge, providing a clear opening of 26' in each bay for a clear spillway length of 546'. The spillway is topped by 3'-high flashboards. The ogee-curved spillway was designed for a discharge of 10' of water over its crest, equivalent to 70,000 cubic feet of water per second. This section of the dam has a maximum overall height of 122', rising from bedrock that is 22' below sea level to the crest of the spillway at 100' above sea level. The maximum base width is 81'. The first bay north of the powerhouse has a crest 5' lower than the rest of the spillway to assist in removing floating debris from the face of the dam and forebay. This bay is equipped with a motorized worm-gear-operated steel gate that was rebuilt c.1995. At about 10' from the heel of the dam, the aforementioned 18" x 18" drain box runs the length of the spillway, and discharges through 4" bleeder pipes to the toe of the dam.

There are five permanent hand-operated sluice gates, each 5' in diameter, located inside the dam at an elevation of approximately 50' above sea level. They are located in a 150'-long gallery that begins just north of the powerhouse. The shape of the sluice gates changes from a 5' diameter to a rectangular opening, 3'high and 8' wide, on the downstream side of the dam. The downstream sides of the gates are faced in gunite. The valve gallery is drained by 4" pipes.

Approximately 20' of the original northern abutment adjoin the spillway before the abutment is cut to allow for the approach channel to the two steel Taintor gates. Founded directly on bedrock, these curving gates rotate on a massive pivot arm. Each gate is 35' wide and 29' high and attached to 8'-thick reinforced concrete supports. They are powered by a 60-ton capacity hoist with a lifting speed of 0.5' per minute.

A retaining wall, approximately 8' thick, connects the northern wall of the Taintor gate westward to the remaining portion of the northern abutment. Buried approximately 8' below the surface, the surviving portion of the abutment is approximately 100' long and 25' tall. It varies in width from 8' to 12'.

Stevenson Dam Bridge

As currently configured, Stevenson Dam Bridge (Bridge No. 1843) carries Connecticut Route 34 over the Housatonic River between the towns of Monroe and Oxford, Connecticut. The bridge is located on the crest of Stevenson Dam and is an integral part of the structure of the dam. In 1959, the north end of the bridge was altered to accommodate the addition of two Taintor-type flood control gates to the dam. The deck structure was rehabilitated and widened in 1979.

The structure consists of 32 spans with a total length of 983,' curving approximately 15 degrees as it follows the curvature of the dam. Counting spans from the south to the north, Spans 1 through 30 measure 30' from centerline of pier to centerline of pier, while Spans 31 and 32 are each 43' long. The overall (out-to-out) deck width of the bridge is 27'-6," consisting of a 24' (measured curb to curb) roadway and two 1'-9"-wide sloped curb parapets mounted with traffic railing on each side of the roadway at Spans 1 through 26. A bridge railing consisting of steel posts with double rail elements is located along each side of the bridge at Spans 27 through 32.

The bridge consists of four distinct structural systems. Spans 1 through 8 are solid concrete integral with the gravity dam. Providing a minimum clearance of 10' 6" above the top of the spillway, the superstructure of Spans 9 through 26 consists of two reinforced concrete spandrel-arch fascia beams and one interior reinforced concrete T-beam, evenly spaced in the central 16' of the width of each span. Each beam is approximately 20" thick, while the central T-beam is approximately 3' deep. The fascia beams vary in depth from 8' at the springing to 30" at the top of the arch. The outside edges of the deck are cantilevered and are supported by 1'-wide reinforced concrete cantilever beams that extend approximately 4' from the fascia beams every 9'-4" along the length of the span. In certain areas the original reinforcing bar is visible. It consists of twisted steel, varying in diameter from 1/2" to 1."

Spans 27 through 30 have a superstructure consisting of two reinforced concrete T-beams along the western side of the bridge, and two W36x250 rolled wide-flange steel beams along the east side of the spans. These spans serve as a transition from the original dam alignment to the newer (1959) alignment over the Taintor gates. The superstructure of Spans 31 and 32, the final two spans at the northern end of the bridge, is made up of five W36x150 rolled wide-flange steel beams spaced at 6'-0."

The superstructure of Spans 1 through 27 supports a 1' thick reinforced concrete deck that was originally covered with 10" of gravel and 2" of a bituminous concrete material. The gravel and wearing surface were removed in 1979 and replaced with an 8" thick reinforced concrete slab placed over the original deck. Membrane waterproofing and a 3" bituminous concrete wearing surface protect the concrete deck. Spans 27-32 have a deck that consists of an 8"-thick reinforced concrete slab and a 3" bituminous wearing surface. At Span 30, the deck widens to accommodate a small control house. The only surviving pieces of the original parapet are in that location.

The substructure of Spans 9 through 32 consists of solid shaft, reinforced concrete piers constructed integrally with the dam. They are approximately 4' wide and 16' deep. The upstream sides of the piers have a cylindrical concrete nosing that projects approximately 2' from the upstream face of the dam. The nosing is faced with 1/4"-thick steel for additional protection against floating debris.

Stevenson Powerhouse

The Stevenson Powerhouse is located on the downstream side of Stevenson Dam, just south of the spillway. Its reinforced concrete foundations form an integral part of the turbine penstock and intake structure. The entire penstock and foundation mass is approximately 105' wide and 160' long and varies in depth from 65' at the level of the generator floor to 85' near the headgate. A short reinforced concrete penstock, one for each of the four turbines, takes the water from the forebay to the reinforced concrete scroll case, and thence to the turbine waterwheels. The penstock structure begins about 10' downstream from the face of the spillway, and 103'-6" from the center line of the turbines. Each penstock opening is 15'-6" high and 19'-10" wide. In the first 8' of its passage toward the turbines, each penstock opening is reduced to 14'-7" in height and 19'-6" in width. The opening continues to telescope down in size as it descends towards the turbine. At the entrance to the turbine scroll case (11' from the center line of each turbine), each opening is 11'-9" square with corners rounded to 2' radii. Below the turbines are flared, elbow-curved, discharge tubes that are 10' in diameter at the top and end at the tailrace in rectangular openings that are 26' high and 16' wide. A concrete wing wall extends along the river bank to prevent erosion from the tailwater.

The Stevenson Powerhouse itself is 160' long and 80' wide, and its greatest height, from foundation to roof, is 131,' with the westerly section rising approximately 10' higher than the easterly section. The eastern section of the roof houses an angled monitor skylight that has been covered over with asphaltic material. This bipartite division essentially expresses the function of the structure. The eastern section houses the generating equipment in a high-bay structure, while the western section houses the controls and switching facilities in a multi-level structure.

The concrete foundation is pierced above water by seven spaces for ventilators at the shaftway level. Rising above the concrete foundation, the majority of the structure is composed of structural steel with a brick veneer. It is seven bays wide (north-south) and four bays deep (east-west). The five-course American bond exterior brick walls rise from a concrete water table shaped like a large scotia molding. Each column is expressed on the exterior as a brick pilaster that terminates in a stylized corbelled capital. A corbelled string course unites the pilaster capitals, and they are topped by a coved reinforced concrete cornice. The intervening wall space, dominated by large tripartite steel casement windows with brick and concrete sills, is slightly recessed, corbelling out to meet the upper termination of the wall. Each window head is topped by a flat brick arch that is supported by a steel lintel.

The only entry to the structure is on the south facade. The large concrete-framed opening is decorated with stylized knee bracing in the upper corners. The opening is sealed by a set of three partially glazed rolling doors with a separate man-door opening in the central door.

The west facade, facing the bridge and dam, originally repeated the pattern of fenestration established on the other three walls. However, falling ice and snow from the bridge constantly broke windows. Consequently, all but the uppermost openings have been infilled with brick. The uppermost openings have been replaced with plexiglass.

The multi-level interior is reached from the entry on the generator floor level (elevation 65'). At this level four turbine/generator sets are laid out in a line stretching from north to south. The western section of this level of the powerhouse contains a series of small rooms that are used as storage and work spaces. The electrical leads from the generators travel westward through conduits in the concrete floor to the west wall of the building. Beneath the eastern section of the generator floor is a narrow gallery that permits access to the turbine shaftways and the tops of the turbines. The oil reservoirs for the generator thrust bearings are also at this level.

The structure surrounding the generator floor is supported by steel columns spaced 20' on centers. The columns also support a craneway for a 45-ton crane. The eastern portion of the roof is supported by built-up steel Pratt trusses that are cross-braced at the bottom chords. Steel king post trusses support the monitor roof. The roof itself has a gypsum slab deck covered by built-up felt and asphalt roofing.

One level (elevation 75') above the generator floor is the centrally located control room, which overlooks the generator floor. This level is reached by a central pair of stairs, as well as staircases on the north and south ends of the building.

To the north and south of the control room are long corridors with concrete cable trays. These trays formerly housed a variety of controls and connections to the generators. At the northern end of this floor is a small office and a toilet room. The easternmost portion of this level houses open 7,000-volt generator leads in concrete racks that are faced with wood doors.

Reached by the stairwell at the northern end of the building, the third level of the powerhouse (elevation 91') once housed transformer equipment, but now contains lubricating oil tanks and four large circuit breakers, one for each generator. An overhead cable tray conveys the connecting power cables out to a transformer yard and substation to the southeast of the powerhouse. Balcony projections from the third floor provide access to the operator's cab of the crane. At this level the northern stair also provides access to an open catwalk that in turn provides access to the dam forebay.

The fourth level, also reached by the northern stairwell, once housed the upper level of the powerhouse substation. Now empty, it provides access to the eastern roof. The roof of the western section of the building is supported in a similar manner to the roof on the eastern section except that it lacks a skylight.

The primary equipment in the powerhouse consist of the four turbine/generator sets. Manufactured by S. Morgan Smith Co., each turbine is a Francis-type inward flow vertical shaft, single runner, hydraulic turbine. With a 70' head, the first three units closest to the southern door (Units 1-3) produce 10,000 horsepower (HP) each from 82"-diameter runners weighing 21,000 lbs. each. Unit 4 has an 86"-diameter runner that weighs approximately 28,000 lbs., producing 11,000 HP under a 68.6' head. All units rotate at 150 rpm on Kingsbury-type vertical thrust bearings with loads of 140,000 lbs. for Units 1-3 and 160,000 lbs. for Unit 4.

When all four units are running, they consume 5, 200 cubic feet of water per second (cfs). Since the mean flow of the Housatonic at Stevenson is 2500 cfs, the plant operates on an alternating basis, with periods of generation interspersed with stillwater periods while the lake refills.

All four generators are synchronous type with exciters mounted on the head of each alternator. All were made by Westinghouse Corporation. Units 1-3 generate 8,333 kilo-volt-amperes (KVA), 7,500 kilowatts (KW) for each unit, while Unit 4 generates 10,000 KVA, 8,000 KW. It is supplied to the substation at 6,600 V, 3 phase, 60 cycles per second.

The Stevenson Dam complex is considered eligible under Criterion C due to its historic, architectural and engineering integrity as an early generating station with significance in the political and public utility history of Connecticut. The concrete dam, bridge and bulkhead, the concrete and brick powerhouse, and the operating characteristics of the powerhouse embody the typical and distinctive characteristics of the early twentieth-century hydroelectric generating station. Its pier-supported two-lane roadway is unusual among American dams east of the Mississippi River and it was the first powerstation to use vertical shaft turbines on the Housatonic River. The Stevenson complex also stands as an example of the political and business ingenuity of J. Henry Roraback. The complex was the key element in the realization Roraback's ideal electric utility, whereby power is economically produced at a remote location and then transmitted great distances to the customer. Without Roraback's political influence and shrewd business sense, the character of the public utility business in Connecticut would probably have been much less organized and less monolithic.

The early exploitation of the power potential of the Housatonic River began in earnest in 1845 when a power canal was built at Falls Village, utilizing the 90' drop in the river at Great Falls. The utilization of the river's power continued through the nineteenth century, focussing on areas where high heads could be created using relatively low dams.[1]

During most of the nineteenth century, power exploitation coupled machinery directly to water-driven turbines, requiring that mills and factories be created next to the water, where they were always in danger from flood damage. Once engineers developed electrical generators and wiring systems, power generated by turbines on the river could be sent to nearby users, located at a safe distance above floodwaters. To fully exploit a river such as the Housatonic, an economic means of transmitting electrical energy over relatively long distances needed to be created. In the last two decades of the nineteenth century many of the problems associated with long-distance electrical transmissions were solved.[2] These developments opened a new way for investors to exploit the Housatonic. They could use high-voltage transmission lines to bring power from the Housatonic valley, where there was little demand for electricity, to urban centers where people wanted electric power for lights and street railways.

The first hydroelectric development of the Housatonic began in 1884, when a power plant for electric lighting was built at Little Falls, in Canaan.[3] It was eventually followed by the Bulls Bridge system, in New Milford. When

[1] Roth, Matthew. *Connecticut: An Inventory of Historic Engineering and Industrial Sites*. (Washington, D.C.: Society for Industrial Archaeology, 1981): pp. 33, 128, 129. MacWilliams,C. M. "Hydro Development on the Housatonic River in Connecticut." 1953: p.4. Manuscript on file at Northeast Utilities Service Company, Berlin, Connecticut (hereafter MacWilliams, "Hydro," 1953). Freeman, John R. *Report on New York's Water Supply.* (New York: Martin Brown & Co, 1900): pp. 414-415; Raber, 1999: pp. 31-32.

[2] Hay, Duncan. *Hydroelectric Development in the United States 1880-1940.* (Washington D.C.: Edison Electric Institute. 1991): vol. I, pp. 13-41; Gordon and Malone. *The Texture of Industry*. (New York: Oxford University Press, 1994): pp. 105-108. MacWilliams, 1953: p. 5.

[3] MacWilliams, C.M., "Notes on Historical Data and Water Power Development on the Housatonic River in Connecticut," September 1952; not paginated. Manuscript on file at Northeast Utilities Service Company, Berlin, Connecticut (Hereafter, MacWilliams, "Notes,"1952).

completed in 1903, Bulls Bridge fed over 50 miles of transmission lines carrying 6 megawatts of power at 32 kilovolts, primarily to Waterbury and New Britain customers.[4] In terms of length of transmission and voltage, the plant represented a distinct advance in long-distance power transmission.

The exploitation of the power of the Housatonic continued through the first decade of the twentieth century. In 1904, J. Henry Roraback, a politically well-connected attorney, lobbyist, and entrepreneur with an interest in hydropower, organized the Berkshire Power Company to supply electric power for lighting North Canaan and the surrounding towns using a 600 kilowatt hydroelectric station on the Housatonic near the town.[5] By 1914, the Connecticut Power Company, a subsidiary of the Boston-based Stone & Webster Company, developed the hydropower at Falls Village, Connecticut.[6]

The Bulls Bridge and Falls Village plants used the only sites on the Housatonic where engineers could get high heads with low dams. The remaining fall of the Housatonic was more or less continuous, necessitating the use of high dams to create the water pressure needed to make power plants economically feasible.

The next Housatonic hydropower development, at Stevenson, was the first high dam on the river and the first project undertaken by the newly formed Connecticut Light and Power Company (CL&P). In 1905, J. Henry Roraback had organized the Rocky River Power Company to develop the potential of the Rocky River, which plunged down a steep gorge into the Housatonic at New Milford. In 1909, he arranged for the company charter to be amended to allow the Rocky River Power Company to develop the Housatonic itself, and to sell its product throughout the state. Based on his experience as a lobbyist for the New Milford Power Company, one of the first power companies in the East to deliver power via high-voltage transmission lines, Roraback envisioned the development of an electric utility that would produce power at a location remote from its load area and use high voltage lines to economically transmit power to its customers. In furtherance of his vision, several seemingly serendipitous events occurred. First, as a result of the 1912-1913 investigation of the New Haven Railroad's attempt to monopolize the trolley car system in Connecticut, the railroad was forced to divest itself of the Housatonic Power Company, its wholly owned subsidiary. The Housatonic Power Company owned a large steam plant in Waterbury, "three of four waterpowers on the Housatonic," and the

[4] The Bulls Bridge system was subsequently owned by the Housatonic Power Company, which was incorporated with other utilities into the Connecticut Light and Power Company in 1917. *Ibid.*; Raber, 1999: 32; Campbell, Charles L.*Progress and Change, A Brief History of Connecticut's Largest Electric and Gas Utility.* (New York: Newcomen Society in North America, 1950): pp. 11-13.

[5] Dahill, Edwin, M.,"Connecticut's J. Henry Roraback," Ph.D. Diss., Columbia University, 1971: pp. 24-25. Roraback also came into contact with United Gas Improvement Co., the parent company of the New Milford Power Company, for whom Roraback served as a lobbyist. Known to the public as U. G. I., this Philadelphia-based company was a leader in consolidating the many small tramway companies that had sprung up in Connecticut during the 1880s and 1890s.

[6] "Construction and Operation of a Connecticut Hydroelectric System," *Electrical World* 69, No. 9 (March, 1917): 404-407; MacWilliams, 1952; Campbell, op. cit.: pp 11-14; Raber, 1999: p. 32.

New Milford Power Company.[7] Roraback, who was also chairman of the state's Republican party, recognized that if the Housatonic Power Company could be merged with his Rocky River Power Company and if a large dam and power plant could be constructed, these conditions would establish the basis for the kind of utility company that he had previously envisioned.[8]

In order to purchase Housatonic Power, Roraback needed financial backing. This support came from Philadelphia-based United Gas Improvement Co. (U. G. I.), which, through its Connecticut Tramway subsidiary, had challenged the New Haven Railroad's attempts to monopolize the tramway business in the state. Consequently, early in 1917, the New Haven Railroad sold the Housatonic Power Company to U. G. I. On August 9, 1917, with U. G. I. as the principal financial backer, Roraback's Rocky River Power Company purchased all franchises and properties of the Housatonic Power Company, the United Electric Light and Water Company, and the Seymour Electric Light Company--virtually all the generating capacity on the Housatonic. On the same day, the name of these combined companies was changed to the Connecticut Light and Power Company (CL&P), with Roraback as a vice president, stockholder, and director. Work on Stevenson Dam began almost immediately.[9]

Constructing the Complex

The site, a 1,500'-wide gorge at the head of Lake Housatonic (the pool formed by the Derby Dam, also known as Derby Pool), offered a location at which engineers could design a high dam abutting exposed bedrock in the most economical manner. Since U.G.I. had financed Roraback's creation of CL&P, it is not surprising that the U.G.I. Contracting Company and another Philadelphia firm, the J. A. P. Crisfield Company, were primarily responsible for design and construction of the dam. Three other well-known engineering firms served as consultants. The firm of Charles T. Main designed the powerhouse, while John R. Freeman and the Birkinbine Engineering Office advised on the location of the dam. The local firm of C.W. Blakeslee of New Haven served as subcontractor. H.J. Hoard of Crisfield served as engineer in charge, with E.H. Burroughs as his assistant.[10]

In terms of construction of the complex, the project was divided into four parts: the powerhouse; the spillway section of the dam; the intake section of the dam immediately above the powerhouse; and the end abutments of the dam. The powerhouse was initially located on the north bank of the river, but subsequent subsurface investigation revealed that by constructing it on the south bank, considerable time could be saved and about 18,000 cubic yards of rock

[7] Quoted in Dahill, *op. cit.*: p. 105.

[8] Dahill, *op. cit.*: pp. 103-108; MacWilliams, 1952; Campbell, *op.cit.*: 12-16.

[9] *Ibid.* By 1920, U. G. I. would lend CL&P over 10 million dollars.

[10] *Ibid*; Dahill, *op .cit.*: pp 103-108; Raber, 1999: A-33.

excavation could be avoided.[11]

The complex was to be primarily founded on bedrock, which, in this area, is a hard gneiss, free of water-bearing seams. The exposed rock was worn in sharp ridges crossing the valley diagonally from east to west with a strike of 45 degrees to the general line of the dam, forming an ideal foundation. As a result, it was not considered necessary to anchor the dam to the bedrock.[12]

Work began in the summer of 1917. Building the dam complex required a vast infrastructure for housing workers, moving large quantities of men and materials, and creating a large lake. Six miles of railroad track were laid. Four carpenter's shops, and a machine shop, an electrical shop, and two Blacksmith's shops were built, along with two cement plants and three general warehouses. Two complete construction camps, housing up to 750 men total, were created. A separate boiler room and electric generators were then set up to supply power to the site. Up and down river, the dam's construction would also require additional works. including:

- building six miles of highway;
- building a new bridge over the Pomperaug River upstream;
- raising the steel bridge over the Housatonic upstream at Sandy Hook;
- clearing 1200 acres;
- relocating six miles of telephone and telegraph lines;
- removing and relocating one cemetery; and
- constructing one church and five operator's houses.[13]

A suspension bridge, Zoar Bridge, crossing the Housatonic approximately 0.75 miles north of the dam, required demolition since it was to be inundated. Its removal required placement of a bridge over the new dam.[14]

Work was begun on both sides of the river with a small temporary bridge connecting both work sites. A railway was used to transport materials to the site and remove overburden. At one time, 13 locomotives and 2 locomotive cranes were in use on the site. The entire overburden of the bedrock was removed, requiring excavations varying from 20' to 65'.[15] Almost 212,000 cubic yards of earth and rock were excavated for the creation of the Stevenson complex.[16]

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[11] MacWilliams, "Hydro," 1952; Hoard, H.J. "Stevenson Dam, Housatonic River, Conn," *Connecticut Society of Engineers, Papers and Transaction for 1919 and Proceedings of the Thirty-sixth Annual Meeting, 1920*: 37.

[12] *Ibid*; Hoard, *op. cit.*: 45.

[13] MacWilliams, 1952; Hoard: *passim*.

[14] *Ibid*.

[15] *Ibid.*

The concrete for the dam was made on site using aggregate obtained directly from the hill to the north of the site. The concrete was supplied to the dam via a system of two towers and a series of chutes. Up to 1,600 cubic yards of concrete were poured in one day. As the sections of the dam rose to completion, the bridge was cast as an integral portion of the dam. When completed, over 156,000 cubic yards of concrete were poured to create the dam and powerhouse.[17]

Handling the river during construction was achieved in an ingenious and economical manner. As the dam was being constructed on both sides of the natural river channel, a diversion channel was excavated on the southern bank of the river, without interfering with its flow, to an elevation 12' lower than the natural river level of the dam. Five openings were left through the constructed portion of the dam. When it came time to turn the river from its natural channel to the diversion channel, a coffer dam was placed across the natural channel, just below the entrance to the diversion channel, and the river was forced to flow through its new channel. A cofferdam below kept the river from entering the excavation from the downstream side. The openings in the dam were later converted to flood gates.[18]

The dam was a pet project for Henry Roraback. He was at the site two or three days a week, and his letters convey his excitement about the project, as well as his frustration in working in a wartime economy:

> We have between four and five hundred men working and are about two hundred short of what the work demands, but the labor situation is so very strenuous that we are unable to get this number. We have trouble with strikes of all sorts, higher wages and different things, and are obliged to readjust the situation continually to meet these demands.
>
> The work is very interesting. We have all sorts of machinery busy at the present time, seven steam shovels, an equal number of derricks, two over-head dragline cables and have built about five miles of railroad in connection with the work, and have several small cars hauling the stuff around.[19]

Roraback had hoped that the job would be completed by the end of 1918, but was stymied by the delay caused in large part by war-related labor shortages. At the end of the war the contractors were able employ 750 men, and on January 1, 1919, began operating two construction shifts. As a result, the first power from the plant was generated on

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[16] *Ibid.*

[17] *Ibid*; "Using 6-on. Bank Run Gravel Aggregate on Stevenson Dam," *Engineering News-Record* 85 No. 14 (September 30, 1920): 638-639.

[18] Hoard, *op. cit.*: 41.

[19] Roraback to Talbot O. Freeman, July 17, 1918, quoted in Dahill, *op. cit.*: p. 108.

November 24, 1919, via a high-voltage transmission line, to the Bunker HIll substation 25 miles away in Waterbury.[20]

When completed, Stevenson had an installed capacity of 19 megawatts (MW) from its three turbine and generator sets and a continuous capacity of about 4 MW based on the weekly river flow and 55 hours per week operation; a fourth turbine added in 1936 brought the plant capacity up to 31 MW.[21]

In 1951, the three older generators were rebuilt to increase their output to 7.5 MW. The dam has had a variety of modifications since its construction. Within 20 years of its completion, improved underdrainage was installed to address seepage through the dam's vertical construction joints, and the five flood gate openings in the lower face of the dam were lined with gunite. In 1958, modern Taintor gates were installed at the north end of the dam to release floodwaters that formerly went over the dam. This alteration required realignment and rebuilding of the northern section of the bridge. In 1988-89, to improve the dam's stability, CL&P installed tensioned steel cable anchors into the foundation bedrock. Circa 1995, CL&P rebuilt the penstock area of the dam.

Engineers and Contractors

Biographical information on the engineers who designed the dam and supervised its construction is quite uneven. No material has yet been found on the careers of E.H. McHenry, H.J. Hoard, J. A. P. Crisfield, or E. H. Burroughs. The Birkinbine Engineering Office was founded by John Birkinbine (1844-1915). Initially specializing in mining engineering, John Birkinbine was the first American to examine iron deposits in Mexico, and to suggest the practicability of making iron on the Great Lakes from coke made with Pennsylvania coal. As evidenced by his work on the Housatonic watershed, he was also extensively involved in hydrology projects. Birkinbine was the chief designer of the Bulls Bridge hydroelectric project. After John Birkinbine's death, the firm continued under his two sons, embarking on a slow decline, finally ceasing operations just before World War II. His firm's exact role in the design of the Stevenson complex is unclear. The firm records list involvement with a Rocky River Dam project of 1917-1920. This reference may mean that the Stevenson complex was initially designed for the Rocky River Power Company, because the Rocky River complex was not begun until 1926.[22]

John R. Freeman (1855-1932), led a distinguished career in hydrology. An 1872 graduate of the Massachusetts Institute of Technology, he initially was employed by the Essex Company in Lawrence, Massachusetts, rising to chief of the inspection department, while at the same time serving as water commissioner for the town of Winchester, Massachusetts. By 1895, he was consulting in waterpower and municipal water supplies, and became a member of the

[20] *Ibid.*

[21] MacWilliams, "Notes," 1952.

[22] This general biographical material was provided in the finding aid to the Birkinbine papers in the Special Collections division of the Lehigh University library.

Massachusetts Metropolitan Water Board. In 1896, he moved his practice to Providence, Rhode Island. In 1900, he was commissioned by New York City to examine new sources of water supply. His report included a scheme for tapping the upper Housatonic as a water supply for Manhattan. His subsequent career focused on water supply and waterpower projects across the country, including serving as consulting engineer on the Panama Canal (1906-07), and planning the Hetch-Hetchy water supply system for San Francisco (1912) and the Owens River aqueduct for Los Angeles (1907).[23]

Stevenson Powerhouse appears to be the design of the Boston-based firm of Charles T. Main, Engineers. An 1876 graduate of the Massachusetts Institute of Technology, Charles Thomas Main (1856-1943) began his career in the textile mills of Manchester, New Hampshire, and Lowell, Massachusetts, rising to be superintendent of the Lower Pacific Mills in Lowell in 1891. In 1893, Main formed a partnership in Boston with Francis Winthop Dean. In 1907, Main founded Charles T. Main, Engineers. His firm planned and built cotton mills and waterpower plants across the country, eventually designing over 80 hydroelectric plants, including the Conowingo dam across the Susquehanna in Maryland (1928), and the Keokuk, Iowa, dam across the Mississippi (1913).[24] In fact, the general layout of the generators at Stevenson Powerhouse resembles those at Keokuk.[25]

The local contracting firm, W. A. Blakeslee, still survives today. Since the Stevenson project, the firm has been involved in numerous large-scale construction projects throughout the state. Regrettably the firm has not retained any records specific to the Stevenson project.

When completed in 1919, the Stevenson Dam Hydroelectric Plant was illustrative of the mature vertical turbine design that has since become the standard for hydroelectric power production. It was the first high dam hydroelectric station built on the Housatonic, the first to form a large lake on the river, and one of few dams in the eastern United States that carries a roadway across its spillway. Architecturally, the massive pilasters and stylized capitals of the exterior of the powerhouse, coupled with the dramatic curving arcade of the bridge, combine to create an impressive ensemble. This architectural treatment is significant in that it is expressive of the high level of importance warranted by such a relatively novel facility during the first third of the twentieth century.

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[23] Griggs, Francis, ed. *A Biographical Dictionary of American Civil Engineers* II (New York; American Society of Civil Engineers, 1991): pp. 37-38.

[24] *Ibid.*, p. 71.

[25] Hay, *op. cit.*: p. 73.

Archival Material

Hundreds of original drawings, and microform copies of each drawing, of the Stevenson Dam complex are now located in the files of Northeast Utilities Service Company, 107 Selden Street, Berlin, Connecticut. One drawing of the complex, along with short, typed specifications, is located in the Connecticut State Archives, Hartford, Connecticut.

Historic views of Stevenson Dam complex can be found in the New Milford, Connecticut, office of Northeast Generation Services. Additional historic views are found in the collection of the Monroe Historical Society. These are currently housed in the records vault at the Monroe, Connecticut, town hall.

Roraback, J. Henry. Personal papers on file in the Connecticut State Archives, Hartford, Connecticut.

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Likely Sources Not Yet Investigated

The papers of the Birkinbine Engineering Office, on file at the Special Collections Division of the Lehigh University Library, Lehigh, Pennsylvania, may yield more information on the design of the complex.

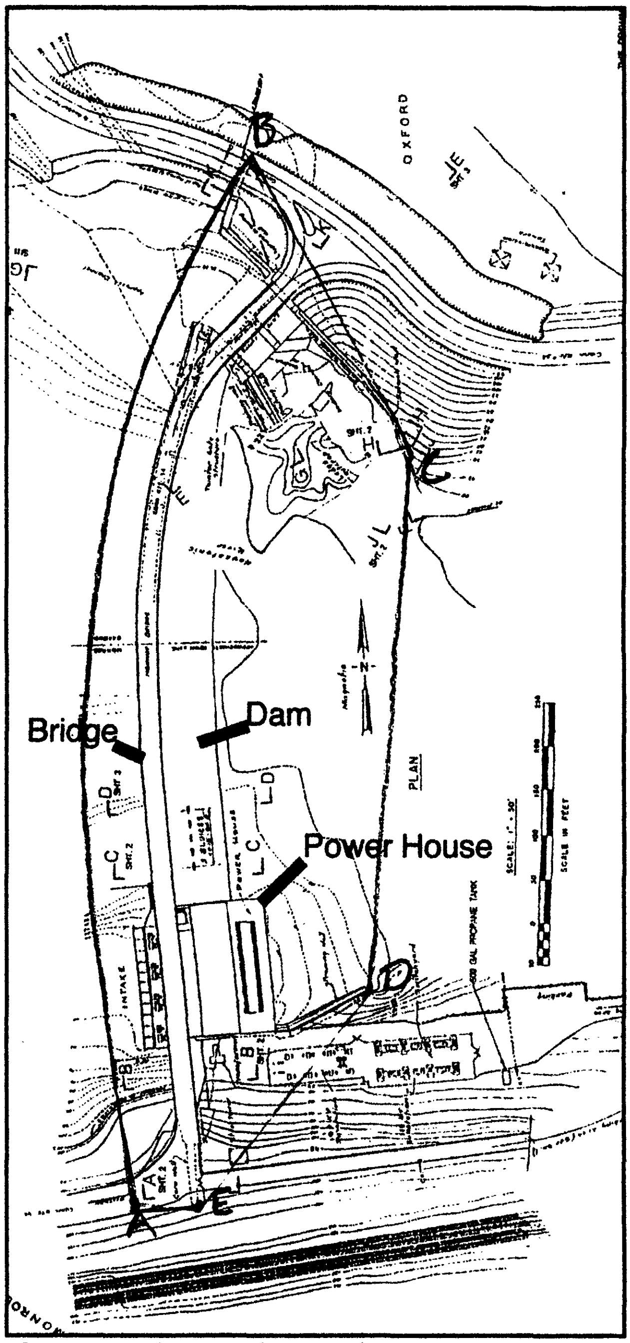
Verbal Boundary Description

Beginning at a point A, approximately 50' west of the southwest corner of the southern abutment, thence northerly in an arc, approximately 1,500' to point B at the northwest corner of the northern abutment, thence approximately 400' southeasterly to point C at the eastern end of the retaining wall adjacent to the Taintor gate spillway, thence southerly, approximately 700' to point D at the eastern end of the tailrace retaining wall, thence southwesterly, approximately 300' to point E, at the end of the southern abutment, thence westerly 50' to point A (see map. Page 10-2).

Boundary Justification

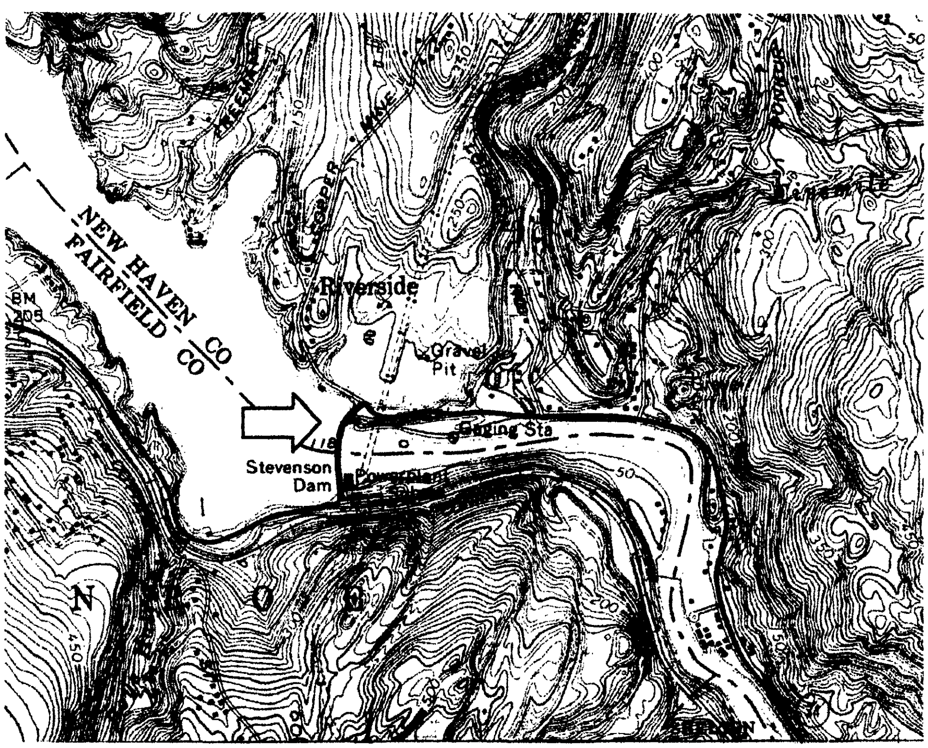
This boundary encloses all the physical elements historically associated with the Stevenson Dam Hydroelectric Plant.

STEVENSON DAM HYDROELECTRIC PLANT BOUNDARY MAP

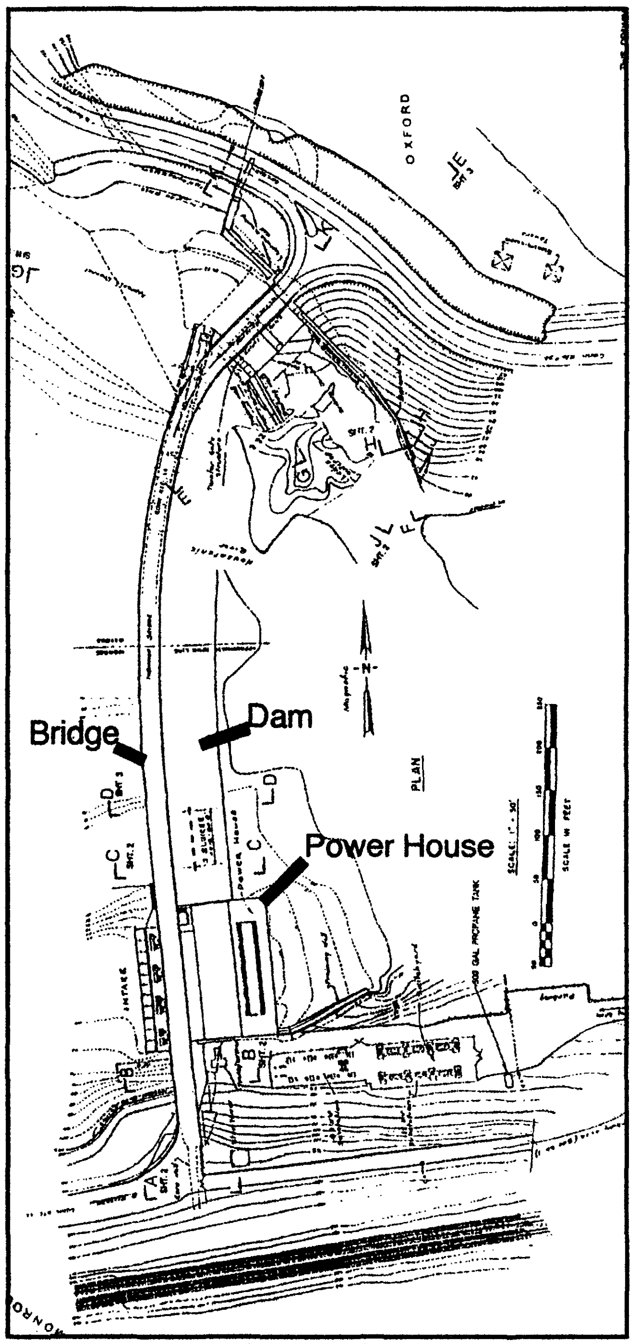


Source: Northeast Utilities Service Co.

Stevenson Dam Hydroelectric Plant
Section of USGS Map
Southbury Quadrangle
1:24.000



STEVENSON DAM HYDROELECTRIC PLANT SITE MAP



Source: Northeast Utilities Service Co.

PHOTO LIST

All photographs taken by Jonathan Wallen during September, 1999
All negatives are located in the Library of Congress, HAER Collection, CT-138.

Photo 1
View of downstream side of plant from southeast

Photo 2
View of upstream side of plant from northwest

Photo 3
North and east facades of powerhouse from northeast

Photo 4
East façade of powerhouse

Photo 5
Generator floor from northwest balcony of third floor.

Photo 6
Generator Unit 1, view from southwest.

Photo 7
Corridor adjacent to control room, view from north.

Photo 8
South bus room, view from north

Photo 9
Turbine, shaft, and generator, Unit 1.view from east.

Photo 10
Downstream side of Taintor gates, view from southeast