NPS Form 10-900
(Rev. 8-86)

OMB No. 1024-0018

United States Department of the Interior
National Park Service

National Register of Historic Places Registration Form

FEB 01 1991

NATIONAL REGISTER

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines for Completing National Register Forms* (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name Lake Zumbro Hydroelectric Generating Plant

other names/site number N/A

2. Location

street & number Off Co. Hwy. 21 N/A ☐ not for publication

city, town Mazeppa Twp. Mazeppa ☒ vicinity

state Minnesota code MN county Wabasha code 157 zip code 55956

3. Classification

Ownership of Property	Category of Property	Number of Resources within Property		
		Contributing	Noncontributing	
☐ private	☐ building(s)	1	0	buildings
☒ public-local	☐ district	0	0	sites
☐ public-State	☐ site	1	0	structures
☐ public-Federal	☒ structure	0	0	objects
	☐ object	2	0	Total

Name of related multiple property listing:
Hydroelectric Generating Facilities in Minnesota, 1881-1928

Number of contributing resources previously listed in the National Register 0

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, 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. ☐ See continuation sheet.

Signature of certifying official Ian R. Stewart Date 1/22/91

Deputy State Historic Preservation Officer

State or Federal agency and bureau Minnesota Historical Society

In my opinion, the property ☐ meets ☐ does not meet the National Register criteria. ☐ See continuation sheet.

Signature of commenting or other official Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

☑ entered in the National Register. ☐ See continuation sheet. — Beth Boland — 3/14/91

☐ 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 Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)	Current Functions (enter categories from instructions)
INDUSTRY/PROCESSING/EXTRACTION:	INDUSTRY/PROCESSING/EXTRACTION:
Energy Facility	Energy Facility

7. Description

Architectural Classification (enter categories from instructions)	Materials (enter categories from instructions)
Classical Revival	foundation Concrete walls Concrete roof Concrete other Concrete

Describe present and historic physical appearance.

See Continuation Sheet

[X] See continuation sheet

DESCRIPTION

The Lake Zumbro Hydroelectric Plant belongs to the general property type of "hydroelectric generating plant," as defined in "Section F" of the multiple property listing, "Hydroelectric Generating Facilities in Minnesota, 1881-1928." Straddling the Zumbro River in rural Wabasha County, the 900-foot-long structure supplies electricity to its original owner and builder, the City of Rochester, located about 15 miles upstream (south) in Olmsted County. When completed in 1919, the generating plant comprised a straight-crested gravity dam of mostly concrete construction, with an "integral," or attached, concrete powerhouse containing two hydroelectric generating units. Over the years, the dam and powerhouse have experienced minor repairs and modifications that have not significantly affected the structure's original design,materials, and workmanship. The generating plant once was part of a larger complex containing three operators 'residences, situated on the west shore about one-quarter mile upstream (south) from the powerhouse. In the late 1960s, these residences and their associated buildings were removed from the site.[1] Since the residences were adjunct features, deriving any significance they themselves might have possessed from their association with the dam and powerhouse, their removal did not significantly affect the hydroelectric generating plant.

In its original configuration, the Lake Zumbro Hydroelectric Generating Plant displayed the following six major sections, as seen looking upstream (south) from right to left (west to east): (1) a non-overflow, concrete, gravity dam section approximately 120 feet in length with a maximum height of 60 feet; (2) a flat-roofed, rectangular-plan, concrete powerhouse about 100 feet in length; (3) a 14-foot-long trash-and-ice sluiceway with a 10-foot-wide opening serviced by a hand-cranked, vertical, wooden gate; (4) a 426-long, uncontrolled, overflow concrete spillway with an ogee downstream face, ranging in height from about 43 feet to 66 feet; (5) a 75-foot-long, non-overflow concrete, gravity dam section with a maximum height of about 60 feet; (6) a 169-foot-long earth-fill dam section with a concrete core wall. The concrete sections of the dam have a vertical upstream face. The spillway section is about seven feet thick at the crest and about 70 feet thick at the base, with a thin concrete apron extending an additional 30 feet. All sections of the dam are founded on sandstone bedrock. In 1929, 1935, 1957, and 1961, various sections of the concrete dam were resurfaced with new concrete or gunite. To facilitate the 1961 work, which focused on the rehabilitation of the upstream face, a dewatering tunnel was constructed through the body of the spillway. None of these repairs noticeably altered the structure's original design, workmanship, or materials.[2] In 1983, the trash-and-ice sluiceway, which had been inoperable for many years, was removed and the site infilled with concrete, thereby "reforming the area to the geometry of the spillway."[3] Although this alteration visibly changed the dam's original design, it eliminated a minor feature representing only about one percent of the downstream surface.

In terms of architectural style, the Lake Zumbro Generating Plant makes a modest overture to the early twentieth-century, Classical Revival, as evidenced by the tall arched windows of the powerhouse, set in recessed panels articulated by pilaster strips. Technologically, the powerhouse is solidly within its period of construction, employing standard, vertical generating units, which characterized virtually every Minnesota hydroelectric plant built after World War I. Although the Lake Zumbro Plant was originally engineered to accommodate three generating units, only two were installed, leaving the turbine pit at the west end of the building unoccupied. Designed to operate under about 55 feet of head, each unit consisted of a 1,350-horsepower, Francis-type turbine directed-connected to a three-phase, 60-cycle, 2,300-volt generator with a rated capacity of 920 Kilowatts. The turbines were manufactured by the Pelton Water Wheel Company; the generators by the General Electric Company.[4] As was customary in power-plant construction of the period, the interior of the Lake Zumbro powerhouse embodied an open interior plan, designed so that an overhead traveling crane would have unobstructed access to the generating units for purposes of maintenance and repair.

Architecturally and technologically, the powerhouse has experienced relatively little alteration. The original design included roof-top transformers that stepped up the current to 33,000 volts for transmission to Rochester. At an undetermined date, this equipment was replaced by an open-air substation to the west of the building. Also at an undetermined date, the arched window openings were partially in-filled with opaque material. During the mid 1960s, on-site operators were replaced by remote-control equipment, permitting the plant to be monitored and operated from Rochester. Finally, in the 1980s, the generating units were rebuilt, and new penstock gates installed.[5] None of these modifications significantly affected the plant's integrity.

1. The operators' residences are noted under "improvements" in Annual Report of the Public Utility Board of the City of Rochester, Minnesota . . . 1921 (Rochester, 1921); see also Nicholas Kroska, Serving the Community (Rochester Public Utilities, 1988), p. 75. For the original locations of the buildings, see "Property Map Hydro Plant & Vicinity," Drawing No. 3414, unpublished, 1959, in Rochester Public Utilities Building. Their removal was verified by the author in December 1989, by means of field survey and interview with Fred King, current leaseholder of the site.

2. This discussion of original construction and subsequent modification relies on Harza Engineering Company, "Lake Zumbro Dam, Phase II Investigations," unpublished report prepared for Rochester Public Utilities, 1981. The Harza study based its description on engineering drawings and construction photographs in possession of Rochester Public Utilities.

3. Harza Engineering Company, "Construction Report for the Rehabilitation of Lake Zumbro Dam," unpublished report prepared for Rochester Public utilities, 1983, p. 1.

4. The original equipment is listed in Annual Report of the Public Utility Board, The City of Rochester, Minn. (Rochester: Schmict Printing Co., 1924), p. 19.

5. On the remote-control program, see Kroska, p. 75. Information concerning 1980s modifications was obtained during author's guided tour of the plant in October 1989, conducted by Tom Williamson, Senior Mechanical Engineer, Rochester Public Utilities.

8. Statement of Significance

Certifying official has considered the significance of this property in relation to other properties:

☐ nationally ☒ statewide ☐ locally

Applicable National Register Criteria ☐ A ☐ B ☒ C ☐ D

Criteria Considerations (Exceptions) ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F ☐ G

Areas of Significance (enter categories from instructions)	Period of Significance	Significant Dates
Engineering	1919	1919

Cultural Affiliation
NA

Significant Person
NA

Architect/Builder
Engineer: Hugh Lincoln Cooper
Builder: Omaha Structural Steel Bridge Company

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

See Continuation Sheets.

☒ See continuation sheet

SIGNIFICANCE

The Lake Zumbro Hydroelectric Generating Plant is historically and technologically significant, under Criterion C in the area of engineering, for its design by Hugh Lincoln Cooper (1865-1937), one of the nation's foremost hydroelectric engineers of the early twentieth century.

Hugh Lincoln Cooper was born in 1865 in the rural community of Sheldon, Minnesota, situated in Houston County in the southeastern corner of the state. His formal education ended in 1883, with the receipt of a high school diploma from the nearby village of Rushford, where his father operated a flour mill. Despite his father's urging that he become a millwright, young Cooper had his heart set on bridge engineering, a subject that had first captured his imagination as a 17-year-old, when he had helped a farmer build a 40-foot wooden span over a creek. After a brief stint as an axman and rodman with a railroad bridge-building party in Wisconsin, Cooper in 1885 began an apprenticeship with bridge engineer Horace E. Horton of Rochester, Minnesota. His first major project was supervising the erection of the cantilever spans of the Wabasha Street Bridge in St. Paul, a Mississippi River crossing listed in the National Register for its engineering significance. Upon completion of this work in 1889, Cooper relocated to Chicago as superintendent and chief engineer of Horton's Chicago Bridge and Iron Works.[1]

In the mid-1890s, Cooper became interested in hydroelectric engineering, believing that the new field, barely a decade old, offered greater opportunities than bridge building. As a means of gaining experience, he took an unpaid position with Stilwell-Bierce & Smith-Vaile Company of Dayton, Ohio, a prominent manufacturer of water turbines that also built and equipped small hydroelectric plants. Within a few months, Cooper was on the company payroll; within a few years, he was assistant chief engineer of the entire operation. In 1898, Cooper went to work for the first of several consulting engineering firms, building hydroelectric dams in Brazil, Canada, and Mexico. Finally, in 1905, he set up his own engineering company, of which he remained president until his death in 1937.

As Donald C. Jackson has noted in Great American Bridges and Dams, Cooper quickly achieved an "international reputation" for his pioneering work in low-head hydroelectric design and construction. In engineering parlance, "head" is the distance water falls in powering a turbine. Since the amount of hydroelectric power generated at a site is a combined function of head and stream flow, "low head" sites are generally not considered to be promising candidates for development unless they have access to heavy stream flow. Cooper was among the first hydroelectric engineers to successfully exploit relatively small drops in major rivers, which, because of their great width, flowage, and susceptibility to flooding posed enormous engineering challenges. Cooper's hallmark was the extended, straight-crested, concrete gravity dam with wide, overflow spillway and integral powerhouse. He first employed this design on a large scale in the 59-foot-high, 2,392-foot-long Holtwood (McCall Ferry) Dam across the Susquehanna River on the Pennsylvania-Maryland border. Designed and built during 1906-1910, this project was among "the largest hydroelectric generating facilities in the United States" at the time of its completion, and it paved the way for Cooper's next major undertaking: the design and construction of the 53-foot-high, 4,696-foot-long Keokuk Hydroelectric Dam across the Mississippi River, completed between 1910 and 1913. Keokuk was "the largest hydroelectric power plant in the world," until Cooper surpassed it with the federally-sponsored, 4,800-foot-long Wilson ("Muscle Shoals") Dam on the Tennessee River in Alabama, completed in the mid-1920s. Even this project, however, was eventually dwarfed by his work for the Soviet government on the Dnieper River hydroelectric facility in the Ukraine, which, upon its completion in 1932, contained a 750,000-hp power plant, roughly three times the original capacity of Muscle

Shoals.[2]

Although Cooper moved away from Minnesota while still a young man, he maintained strong ties with the City of Rochester, the scene of his first apprenticeship, as well as the home of his wife's parents. The local citizenry, on their part, kept track of Cooper's increasing fame, and it is therefore not surprising that the city turned to Cooper to design its municipal hydroelectric plant.[3] Owner and operator of a steam-powered, electric utility system since 1894, the City of Rochester first considered the hydroelectric development of the Zumbro River in 1904, rejecting the proposal at that time on the grounds that local consumption would be unable to absorb the additional power. But as demand for electricity increased over the next decade, the project attracted greater support, prompting city voters to approve an initial bond issue for hydroelectric plant construction in January 1916. In the summer of that same year, the City Council hired Cooper to survey the proposed damsite, located about 15 miles north of Rochester. On the basis of Cooper's designs and specifications, the city awarded a construction contract in April 1917 to Omaha Structural Steel Bridge Company. The contractor commenced work in June, with H. H. Dimow and John Hall serving as resident engineers under Cooper's supervision. In November 1919, the 60-foot-high, 900-foot-long Lake Zumbro Hydroelectric Generating Plant went on line, transmitting 33,000-volt current to the city's steam-powered generating plant on North Broadway in Rochester, where it was "stepped down" for local distribution. Originally, the city utilities board had planned for the hydroelectric plant to replace the municipal steam facility as the area's main source of electrical power, but local demand increased so quickly that the output of both plants was almost immediately required. Although the municipal steam plant of the 1920s has long since been demolished, the Lake Zumbro Plant is still in operation after more than 70 years of service.[4]

Although Cooper is best known for his "monster" hydroelectric developments, the Lake Zumbro Plant demonstrates that he was equally adept at modestly scaled projects. Technologically speaking, the facility is vintage Cooper engineering, produced at the height of his career, shortly after the completion of the Keokuk Dam and shortly before his preliminary work on the Muscle Shoals development. Like these two larger projects, Lake Zumbro embodies Cooper's signature, low-head design of a straight-crested, concrete gravity dam with an integral powerhouse and overflow spillway. Its regional significance is enhanced by the fact that it is Cooper's only hydroelectric commission in Minnesota.

1. Unless otherwise other noted, this biographical sketch of Cooper relies on the following sources: "Builder of Muscles Shoals Began by Making Minnesota Log Bridge," St. Paul Pioneer Press, sec. 1, October 11, 1925, 10:2; "Memoir of Hugh Lincoln Cooper," American Society of Civil Engineers Transactions, 103 (1938), 1772-1777 (also printed in American Society of Mechanical Engineers Transactions of the same year); "Cooper, Hugh Lincoln," The National Cyclopaedia of American Biography, vol. 33 (New York: James T. White and Company, 1947), pp. 173-174; James K. Finch, "Cooper, Hugh Lincoln," Dictionary of American Biography, Supplement 2, ed. Robert Livingston Schuyler (New York: Charles Scribner's Sons, 1958), pp. 118-119.

2. On these major hydroelectric projects, see Donald C. Jackson, Great American Bridges and Dams (Washington, D.C.: 1988), pp. 144-145; 162-164, 204; Elisha N. Fales, "The Mississippi River Dam at Keokuk, Iowa, U.S.A.," Engineering, 96 (November 21, 1913), 675-678; "Building Wilson Dam at Muscle Shoals on the Tennessee -- I," Engineering News-Record, 94 (April 23, 1925), 676-683; Harold Dorn, "Hugh Lincoln Cooper and the First Detente," Technology and Culture, 20 (April 1979), 322-347.

3. Local accounts of the area's "notable sons" invariably mentioned Cooper in the same breath as Frank B. Kellogg, a Rochester lawyer who became Secretary of State in the Coolidge Administration; see, for example, "Olmsted County Once Home of Seven Notables," newspaper clipping no. 129, in Gopher Trails Scrapbook, Minnesota Historical Society Reference Library; Flora McGhee, ed., Know Rochester Better (St. Paul: Bruce Publishing Company, 1940). pp. 28-29.

4. On the hydroelectric plant's planning, construction, and operation, see Nicholas Kroska, Serving the Community: The History of Rochester Public Utilities (Rochester Public Utilities, 1988), pp. 27-30; Annual Report of the Public Utility Board [of] the City of Rochester, Minn. . . . 1923 (Rochester: Hack & Goetting, Printers, 1923), pp. 15-16. Between 1920 and 1936, the hydroelectric plant supplied about one third of the total kilowatts generated by the city, recording an annual high of about 55% in 1929 and an annual low of about 15% in 1934; see chart captioned "Growth of Electric Load," in Annual Report . . . 1935 (Rochester, 1935), n.p.

9. Major Bibliographical References

See Continuation Sheet

[x] See continuation sheet

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 # _____
- [ ] recorded by Historic American Engineering Record # _____

Primary location of additional data:

- [x] State historic preservation office
- [ ] Other State agency
- [ ] Federal agency
- [ ] Local government
- [ ] University
- [ ] Other

Specify repository: _____

10. Geographical Data

Acreage of property 2 acres

UTM References

	Zone	Easting	Northing
A	15	541590	4895460
B	15	541810	4895410
C			
D			

[ ] See continuation sheet

Verbal Boundary Description

See Continuation Sheet

[x] See continuation sheet

Boundary Justification

See Continuation Sheet

[x] See continuation sheet

11. Form Prepared By

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BIBLIOGRAPHY

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"Olmsted County Once Home of Seven Notables." Newspaper clipping No. 129, in Gopher Trails Scrapbook. Minnesota Historical Society Reference Library.

VERBAL BOUNDARY DESCRIPTION

The property is bounded by a rectangular beginning at a point 1,515 feet west and 1,654 feet north of a point formed by the corners of Sections 25,27, 34, and 35 in Township 109 North, Range 14 West, thence progressing in a northwesterly direction in a straight line parallel to the upstream face of the Lake Zumbro Dam for a distance of 900 feet, thence progressing at a right angle in northeasterly direction for a distance of 100 feet, thence progressing at a right angle in a southeasterly direction for a distance of 900 feet, thence progressing at a right angle in a southwesterly direction to the point of origin.

BOUNDARY JUSTIFICATION

The boundaries contain the substructure and superstructure of the Lake Zumbro Dam and Powerhouse, which comprise the property known as the Lake Zumbro Hydroelectric Generating Plant.