

HISTORIC AMERICAN ENGINEERING RECORD

OHIO AND ERIE CANAL, BRECKSVILLE DIVERSION DAM

HAER No. OH-59-G

Location: South of Route 82, Sagamore Hills vicinity, Summit County, Ohio

The Brecksville Diversion Dam is located in both Summit and Cuyahoga Counties. Its midpoint is at latitude: 41.320993, longitude: -81.587397. The coordinates were obtained on February 11, 2021 using Google Earth. There is no restriction on their release to the public.

Present Owner: Ohio Department of Natural Resources

Present Use: Diversion dam

Significance: The Brecksville Diversion Dam, constructed in 1951, is an integral component of the feeder complex that has supplied water to the section of the Ohio and Erie Canal between Lock No. 36 and the canal's northern terminus at Cleveland from 1827 to the present day. Built 38 years after the end of canal navigation in 1913, its function is related to water supply rather than navigation. Although it post-dates the canal's period of significance (1825-1913) this fixed-crest concrete weir replaced an earlier timber-crib dam at approximately the same location and illustrates the evolution of low-head dam technology in the twentieth century.

Historian: Scott D. Heberling, Heberling Associates, Inc., 2021

Project Information: This documentation was undertaken in June 2020 as mitigation for the removal of the Brecksville Diversion Dam, part of a larger project to restore the free flow of the Cuyahoga River. The Cuyahoga River Ecosystem Restoration Canal Diversion Dam Project is a partnership among Cuyahoga Valley National Park; Friends of the Crooked River; Ohio Environmental Protection Agency; Ohio Department of Natural Resources; U.S. Army Corps of Engineers; and Northeast Ohio Regional Sewer District. The field team consisted of Scott D. Heberling, Project Historian, Heberling Associates, Inc.; and Andrew Baugnet, Photographer.

For additional information, see:

Ohio and Erie Canal
Ohio and Erie Canal, Pinery Feeder Dam
Ohio and Erie Canal, Head Gates
Ohio and Erie Canal, Feeder Channel

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Part I. Historical Information

A. Physical History:

1. **Date(s) of construction:** 1951-1952
2. **Engineer:** State of Ohio, Department of Public Works
3. **Builder/Contractor/Supplier:** Not known

4. **Original Plans and construction:**

The original plans for the Brecksville Diversion Dam are dated March 2, April 21, April 23, and April 24, 1951 and were developed by the State of Ohio, Department of Public Works, S.O. Linzell, Director. Copies of the *Construction Plans of Brecksville Diversion Dam, Cuyahoga and Summit Counties, Ohio* are currently in the possession of Cuyahoga Valley National Park. They include two site plans showing the existing timber-crib dam and the proposed new concrete dam as well as a cover sheet and three sheets containing section and plan views of the concrete weir, apron, and abutment walls.¹

The dam was designed as a fixed-crest reinforced concrete weir across the Cuyahoga River which would divert water into the Ohio and Erie Canal via an existing set of three head gates and a feeder channel. The head gates recently had been replaced by the American Steel and Wire Company (AS&W), which leased the water from the State of Ohio for use at its Cuyahoga Works.² The feeder channel was constructed in 1827, soon after the canal opened to navigation.

According to the plans, the dam was 160'-0" long, 11'-0" wide at the base, 3'-0" wide at the crest, and 9'-6-½" high measured from the base of the structure. The crest of the dam was 5'-0" to 7'-0" above the shelf of shale bedrock at the bottom of the river channel which occurred at variable depth. On the downstream side was a 9'-0" wide x 1'-6" deep concrete apron to provide erosion protection. The top of the apron was level with the surface of the shale bedrock. The dam was designed to have a nearly vertical face on the upstream side and a curved profile on the downstream side. As a gravity dam it relied on its own mass and internal strength to resist the force of the water behind it so the concrete of the main structure penetrated 2'-6" to 4'-6" into the bedrock stream bed and a 2'-6" wide footer extended another 2'-0" deeper into the bedrock at the upstream face. Steel reinforcement consisted of 6" x 6" no. 4 welded mesh embedded in the concrete 4" beneath all surfaces. Poured concrete abutment walls, 1'-9" wide on 9'-0" wide footers, extended 45'-0" north from the dam on the east bank and 30'-0" on the west bank. Each wall was about 8'-6" high, measured from the top of the weir, and was stepped at the north (downstream) end. Based on field examination

¹ Ohio Department of Public Works, "Construction Plans of Brecksville Diversion Dam, Cuyahoga and Summit Counties, Drawings, 6 Sheets, July 16, 1951."

² American Steel and Wire Company, "Map Showing Replacement of Ohio Canal Inlet Gates," Sheet 7238-1, Drawing, February 7, 1949.

and spot measurements, the dam appears to have been built exactly as designed. Construction was completed in 1952.³

5. Alterations and Additions:

There is no documentary or physical evidence to suggest that any alterations were made to the original design of the dam and abutments subsequent to their construction. The stone rip-rap placed on the west bank to the north of the abutment wall, shown on the 1951 plans, later was partly replaced by poured concrete to better protect the river bank and a pier of the Brecksville-Northfield High Level Bridge.

B. Historical Context:

The Ohio and Erie Canal, a 308-mile inland waterway, was constructed to link Lake Erie at Cleveland with the Ohio River at Portsmouth. It was one of the most important of America's nineteenth century canals, operating as a navigation system from 1827 to 1913. It was conceived as an extension of New York State's Erie Canal, part of a system that connected New York City and the eastern seaboard with the western and southern states via Lake Erie and the Hudson, Ohio, and Mississippi Rivers. The Ohio and Erie connected a formerly poor and remote frontier region to distant cities and markets, establishing the foundation for Ohio's industrial, commercial, and political development. It was a key link in the transportation network of northeastern Ohio and served as the major route of travel and communication through the Cuyahoga Valley for several decades.⁴

The Cuyahoga Valley reached the apex of its importance as a transportation corridor between 1827 and 1840. Interregional competition from the proliferation of new canal routes during the 1840s and the construction of Ohio's railroad system in the 1850s ultimately led to the canal's demise. The canal system experienced a long period of decline prior to the devastating flood event of March 1913 that ended Ohio's canal era once and for all. The Ohio and Erie Canal from Akron north to Brecksville was totally destroyed by the 1913 flood. However the 17-mile long segment from Brecksville north to Cleveland was considered salvageable and, although abandoned as a transportation route, was retained as an industrial water supply.⁵

During the original construction of the Ohio and Erie Canal, dams and feeders were built to ensure an adequate supply of water for the canal, particularly along higher sections of the line. By the early 1830s there were twelve feeders along its length, including one built in 1827 at the head of the Pinery Narrows near Brecksville. The original Pinery feeder complex consisted of a V-shaped timber-crib weir in the river; head gates to regulate the flow of water from the river

³ Roy Hampton and Heather Kenney, "National Register Assessment of the Brecksville Diversion Dam (SUM-3253-1), Cuyahoga Valley National Park, Summit and Cuyahoga Counties, Ohio" (Columbus, OH: Hardlines Design Company, 2006), 1.

⁴ Harry N. Scheiber, *Ohio Canal Era: A Case Study of Government and the Economy: 1820-1861* (Athens: Ohio University Press, 1968), 191; Sam Tamburro, "The History of the Ohio & Erie Canal," in *Canal Fever: The Ohio & Erie Canal from Waterway to Canalway*, ed. Lynn Metzger and Peg Bobel (Kent, OH: Kent State University Press, 2009), 3-4.

⁵ Tamburro, "The History of the Ohio and Erie Canal," 12-16; Terry K. Woods, *Ohio's Grand Canal: A Brief History of the Ohio and Erie Canal* (Kent, OH: Kent State University Press, 2008), 70-71.

into the feeder; the feeder channel itself; and a waste weir to return excess water to the river. The structures were rebuilt or repaired many times between 1844 and 1906.⁶

After the catastrophic 1913 flood the Pinery Feeder and the canal section between Brecksville and Cleveland were repaired and continued to operate since they supplied cooling water to the American Steel and Wire Company's Cuyahoga Works. Since at least 1899 that company had utilized water from the canal for its industrial operations, first at the Newburgh Steel Works, then at the Cuyahoga Works in Cuyahoga Heights. The first known lease to AS&W was executed in 1922 and was renewed in October 1943 and periodically thereafter through 1995, even after the state transferred its canal lands within Cuyahoga Valley National Park to the federal government in 1988. The company, owned by U.S. Steel in the twentieth century, performed routine maintenance on canal structures along the leased section of canal. In 1986 a new steel fabricating company acquired the Cuyahoga Works together with the rights to the American Steel and Wire Company name and assumed responsibility for maintaining the canal north of Brecksville including the feeder complex.⁷

In 1949 AS&W replaced the 1905 feeder head gates with a new concrete head gate structure. Two years later it replaced the old timber-crib dam with a new fixed-crest concrete weir located about 120' downriver. In 1951 the lease was amended to include construction of a new concrete dam and abutments at a cost of \$95,000. The work was funded by AS&W but designed and supervised by the Ohio Department of Public Works. The old dam was left in place but was breached in the center to allow the water to flow through. The crest of the new dam was about 1'-0" higher than the top of the crib dam which was now submerged beneath the surface of the pool. The 1951 structure is known as the Brecksville Diversion Dam. It is typical of low-head fixed-crest concrete weir dams built throughout Ohio and other states during the 1910s to 1950s to impound water for industrial processes.⁸

The American Steel and Wire Company continued to maintain the Brecksville Diversion Dam and the associated feeder channel and head gates until the late 1980s. In 1988 the National Park Service acquired the Ohio and Erie Canal Lands within Cuyahoga Valley National Park and assumed responsibility for maintenance of the feeder complex although the hydraulic lease continued for a few more years. The State of Ohio continued to own individual structures including the Brecksville Diversion Dam, head gates, feeder channel, and Pinery Dam remnant.⁹

⁶ Ohio Board of Public Works, Records of the Board of Public Works, "Map of the Ohio Canal, Summit County, Ohio, surveyed by D.C. Kennon (1892)," State Archives Series 1353.

⁷ Carol Poh Miller, "Ohio and Erie Canal," HAER No. OH-59, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 1987, 8; Board of Public Works, Records of the Board of Public Works, Record of Leases, 1928-1973, State Archives Series 2597, BV4667 and 4668, lease between the State of Ohio and American Steel & Wire dated December 22, 1931. This lease covers the period 1932-1947 and refers to the original lease beginning January 17, 1922. Also of interest are lease extensions the State of Ohio and U.S. Steel Corporation dated November 1957, December 8, 1970, July 24, 1985 and October 26, 1990.

⁸ Sam Tamburo, "History of the Brecksville Dam," (Brecksville, OH: National Park Service, 2003), 7.

⁹ Tamburo, "History of the Brecksville Dam," 7; Hampton and Kenney, "National Register Assessment of the Brecksville Diversion Dam," 10-11; Ohio Environmental Protection Agency, National Park Service-Cuyahoga Valley National Park, Ohio Department of Natural Resources, and U.S. Army Corps of Engineers, *Cuyahoga River*

Part II. Structural/Design Information

A. General Statement:

1. Character:

The Brecksville Diversion Dam is a typical low-head concrete weir representing standard civil engineering practices of its era. The design conformed to the topography and hydraulics of the site but the design, materials, and construction are completely typical of small dams constructed throughout Ohio and the United States in the first half of the twentieth century, especially those constructed for the purpose of industrial or municipal water supply. A low-head weir was appropriate for the site since its function was to divert water into the canal rather than to store water.

2. Condition of fabric:

The dam is structurally sound and continues to function as designed and built.

B. Description:

The dam is a fixed-crest reinforced concrete weir across the Cuyahoga River which diverts water into the Ohio and Erie Canal via a set of three head gates and a feeder channel. It has no spillway. The dam is 160'-0" long, 11'-0" wide at the base, and 9'-6-1/2" high measured from the base of the structure. The crest of the dam has a designed hydraulic height of 5'-0" to 7'-0" above the shale bedrock at the bottom of the river channel which occurs at variable depth. On the downstream side is a 9'-0" wide x 1'-6" deep concrete apron which provides erosion protection. The weir has a nearly-vertical face on the upstream side and a curved profile on the downstream side. The concrete of the main structure extends 2'-6" to 4'-6" below the variable surface of the bedrock stream bed and a 2'-6" wide footer extends another 2'-0" into the bedrock at the upstream face, providing a solid anchor for the weir. Poured concrete abutment walls, 1'-9" wide on 9'-0" wide footers, extend 45'-0" north from the weir on the east bank and 30'-0" on the west bank. Each wall is about 8'-6" high, measured from the top of the weir, and is stepped at the north (downstream) end.

C. Mechanicals/Operation:

The Brecksville Diversion Dam impounds water and diverts it into the Ohio and Erie Canal. Only a portion of the normal flow of the Cuyahoga River is diverted into the feeder channel and canal, so as a fixed-crest weir, water continually overtops the dam. It has no mechanical systems or machinery. The head gates that control the flow of water into the canal feeder channel are located 120' south of the dam, adjacent to the submerged and abandoned Pinery Dam.

D. Site Information:

The Brecksville Diversion Dam spans the Cuyahoga River at the head of the gorge known as the Pinery Narrows. The center of the river marks the boundary between Summit and Cuyahoga

counties. The river bed consists of a shelf of shale bedrock which provides a solid foundation for the dam. The submerged remains of the older timber-crib Pinery Dam are located 120' upstream from the Brecksville Diversion Dam. Water in the pool behind the Brecksville Diversion Dam is diverted into the Ohio and Erie Canal via a set of head gates constructed in 1949 and a feeder channel which dates to the original 1827 construction of the canal. The terrain on the east side of the river is fairly level and about 12' above the river channel. The terrain on the west side is very steep except for the grade of the Cuyahoga Valley Scenic Railway (the former Valley Railway) which runs parallel to the river, approximately 14' above the channel. The massive Route 82 Brecksville-Northfield High Level Bridge, built in 1931, spans the river, canal, and feeder with piers located 90' feet downstream from the dam.

Part III. Sources of Information

A. Primary Sources:

American Steel and Wire Company. "Map Showing Replacement of Ohio Canal Inlet Gates." Sheet 7238-1. February 7, 1949. Available at Cuyahoga Valley National Park, Resource Management Division files, Peninsula, OH. This map and related plans may be subject to copyright so were not reproduced here.

Ohio Board of Public Works. *Map of the Ohio Canal, Summit County, Ohio*. Records of the Board of Public Works, Canal Plat Maps, 1892-1912. Surveyed by D.C. Kennon. State Archives Series 1353. Available at Ohio History Center, Columbus, OH.

Ohio Board of Public Works. Records of the Board of Public Works. Record of Leases, 1928-1973. State Archives Series 2597. Lease between the State of Ohio and American Steel & Wire dated December 22, 1931 and extensions dated October 1943, November 1957, December 1970. Available at Ohio History Center, Columbus, OH.

Ohio Department of Public Works. "Construction Plans of Brecksville Diversion Dam, Cuyahoga and Summit Counties." 1951. Available at Cuyahoga Valley National Park, Resource Management Division files, Peninsula, OH.

Ohio Environmental Protection Agency, National Park Service-Cuyahoga Valley National Park, Ohio Department of Natural Resources, and US Army Corps of Engineers. *Cuyahoga River Ecosystem Restoration, Canal Diversion Dam Project, Environmental Assessment*. Brecksville, OH: Cuyahoga Valley National Park, 2016. Available at Cuyahoga Valley National Park, Resource Management Division, Peninsula, OH.

State of Ohio and U.S. Steel Corporation. Lease dated December 8, 1970 and lease extensions dated July 24, 1985 and October 26, 1990. Tract File 101-33, Hawkins Library, Cuyahoga Valley National Park.

B. Secondary Sources:

Bobel, Peg and Lynn Metzger. "The Ditch and the Path in the Backyard." In *Canal Fever: The*

Ohio and Erie Canal from Waterway to Canalway, edited by Lynn Metzger and Peg Bobel, 231-249. Kent, OH: Kent State University Press, 2009.

Hampton, Roy and Heather Kenny. "National Register Assessment of the Brecksville Diversion Dam (SUM-3253-1) Cuyahoga Valley National Park, Summit and Cuyahoga Counties, Ohio." Report submitted to The Friends of the Crooked River. Columbus, OH: Hardlines Design Company, 2006. Available at Cuyahoga Valley National Park, Resource Management Division, Peninsula, OH.

Metzger, Lynn and Peg Bobel, eds. *Canal Fever: The Ohio and Erie Canal from Waterway to Canalway*. Kent, OH: Kent State University Press, 2009.

Poh-Miller, Carol. "Ohio and Erie Canal," HAER No. OH-59, Historic American Engineering Record (HAER), National Park Service, U.S. Department of the Interior, 1979.

Scheiber, Harry N. *Ohio Canal Era: A Case Study of Government and the Economy, 1820-1861*. Athens, OH: Ohio University Press, 1968.

Tamburro, Sam. "History of the Brecksville Dam." Brecksville, OH: National Park Service, 2003. Available at Cuyahoga Valley National Park, Resource Management Division, Peninsula, OH.

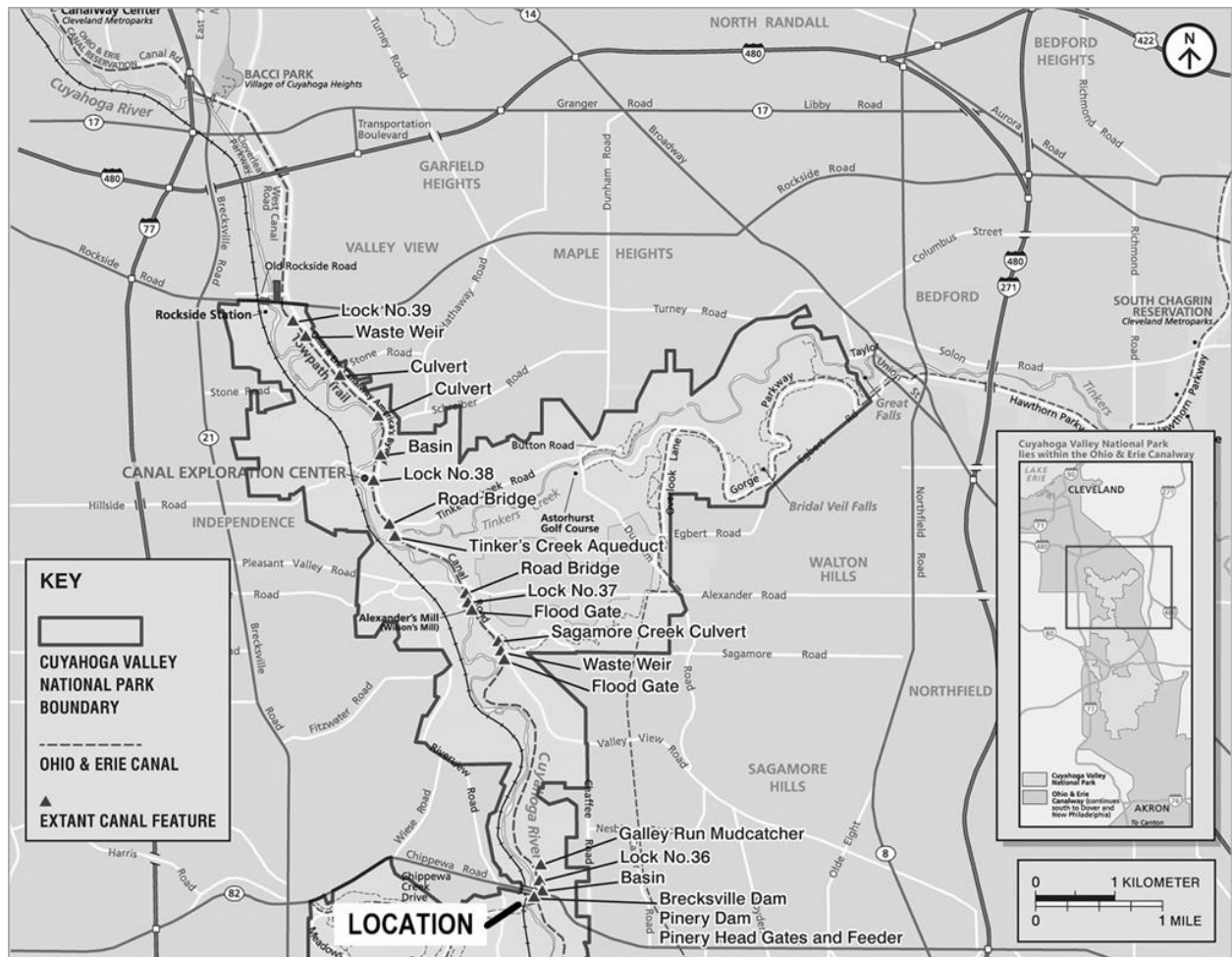
Tamburro, Sam. "The History of the Ohio & Erie Canal," In *Canal Fever: The Ohio & Erie Canal from Waterway to Canalway*, edited by Lynn Metzger and Peg Bobel, 3-18. Kent, OH: Kent State University Press, 2009.

Woods, Terry K.. *Ohio's Grand Canal: A Brief History of the Ohio and Erie Canal*. Kent, OH: Kent State University Press, 2008.

C. Likely Sources Not Yet Investigated:

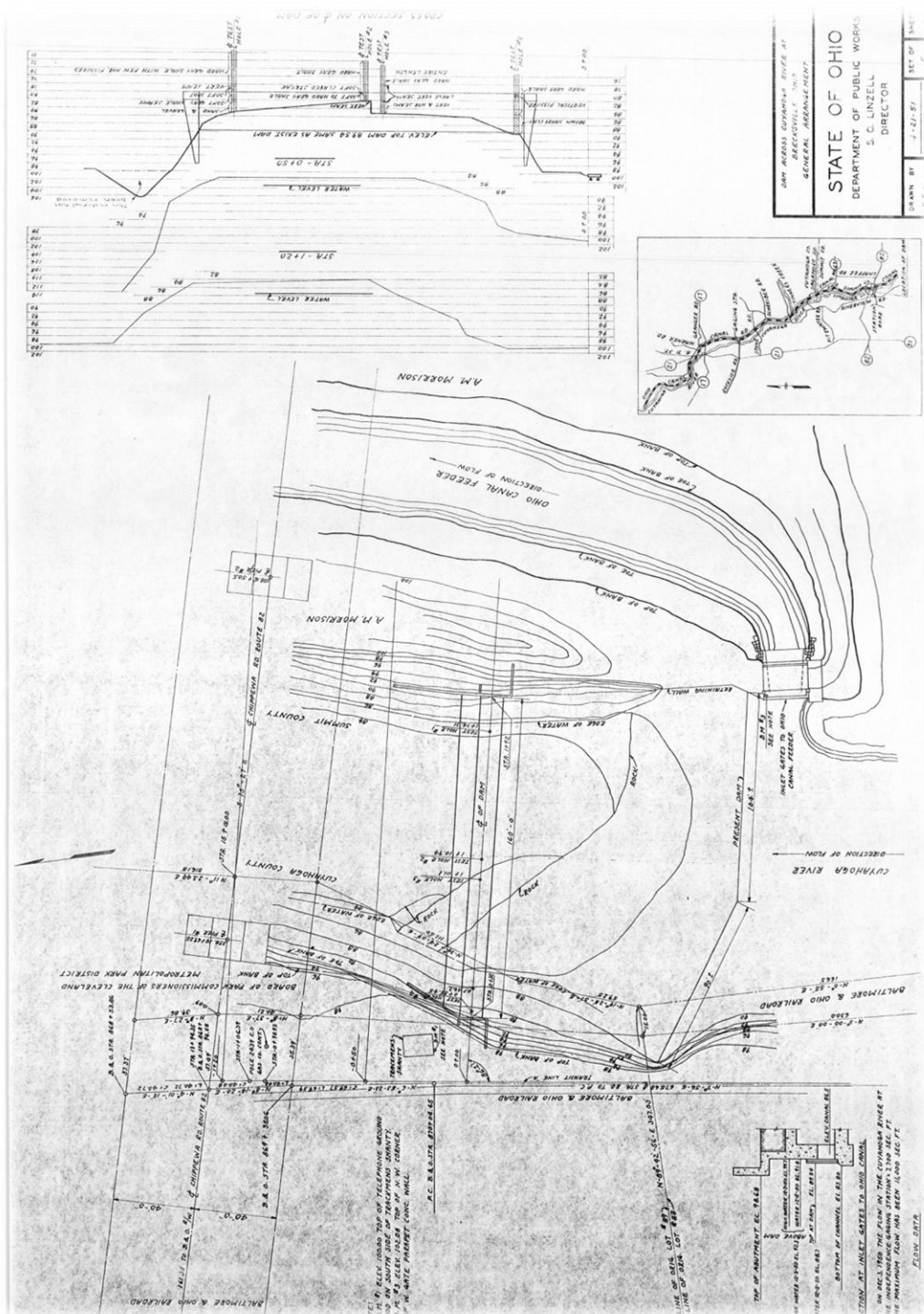
The American Steel and Wire Company constructed the Brecksville Diversion Dam and head gates in 1949-1952 and subsequently was responsible for routine repairs and maintenance of these structures. Company records relating to these activities may survive but due to changes in company ownership and the closure of the Cuyahoga Works in 1984, the existence and location of company records are unknown.

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Location Map (Base Map: Cuyahoga Valley National Park; adapted by Heberling Associates, Inc.)

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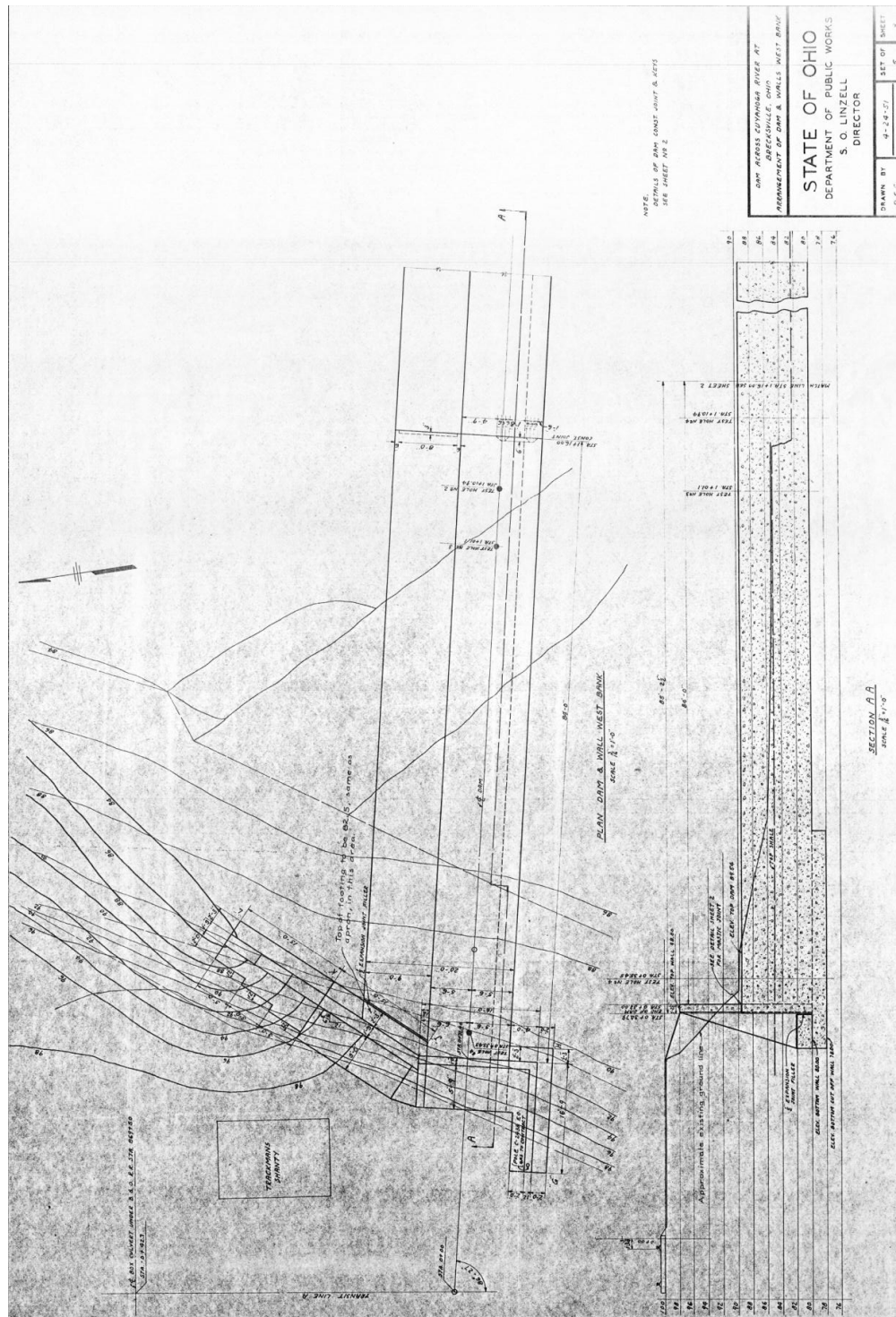


Ohio Department of Public Works, "Dam Across Cuyahoga River at Brecksville, Ohio: General Arrangement," April 21, 1951, Sheet 1 of 5, "Construction Plans of Brecksville Diversion Dam, Cuyahoga and Summit Counties," Drawings, 5 Sheets, July 16, 1951.

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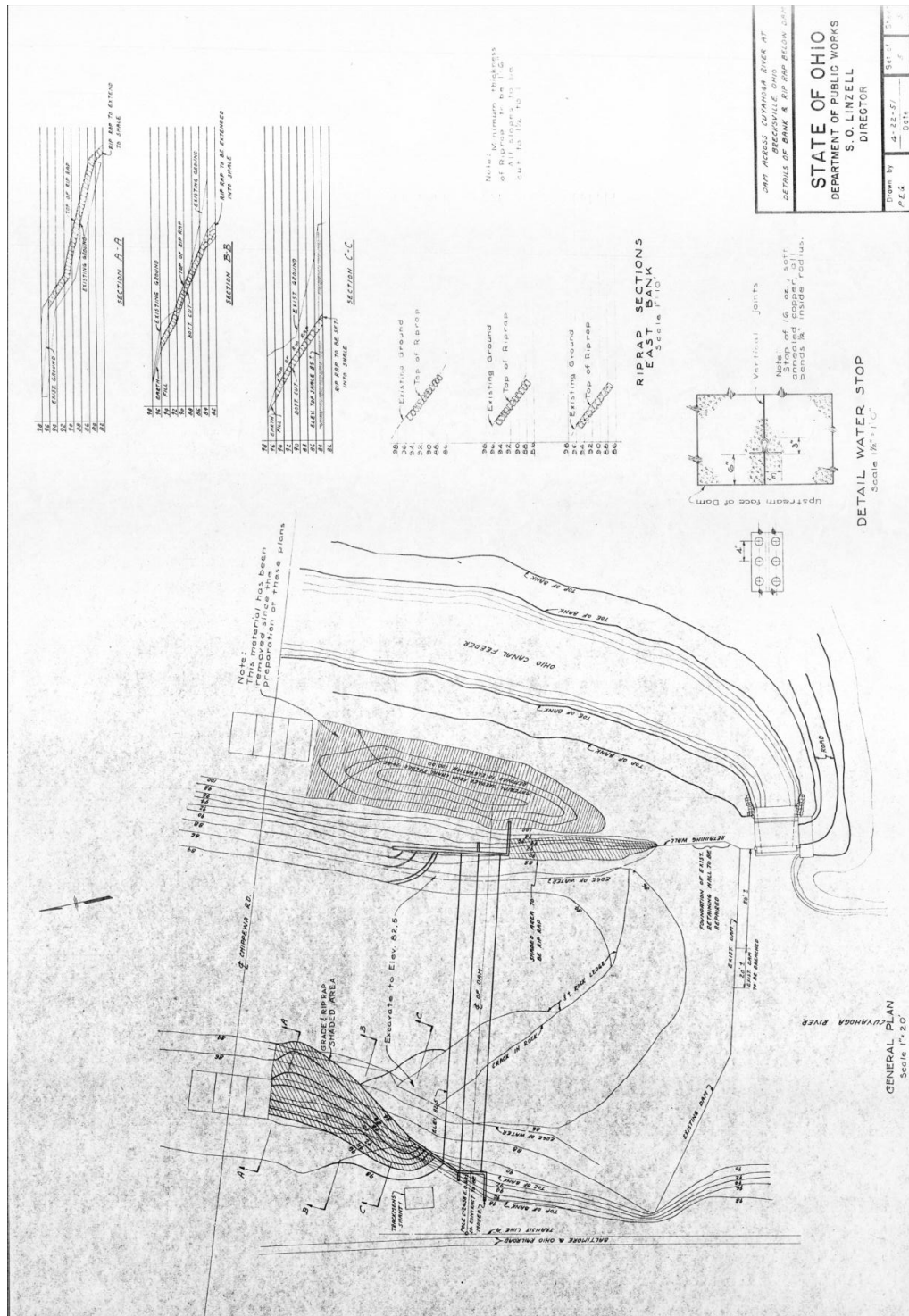
Ohio Department of Public Works, "Dam Across Cuyahoga River at Brecksville, Ohio: Arrangement of Dam and Wall East Bank," March 2, 1951, Sheet 2 of 5, "Construction Plans of Brecksville Diversion Dam, Cuyahoga and Summit Counties," Drawings, 5 Sheets, July 16, 1951.

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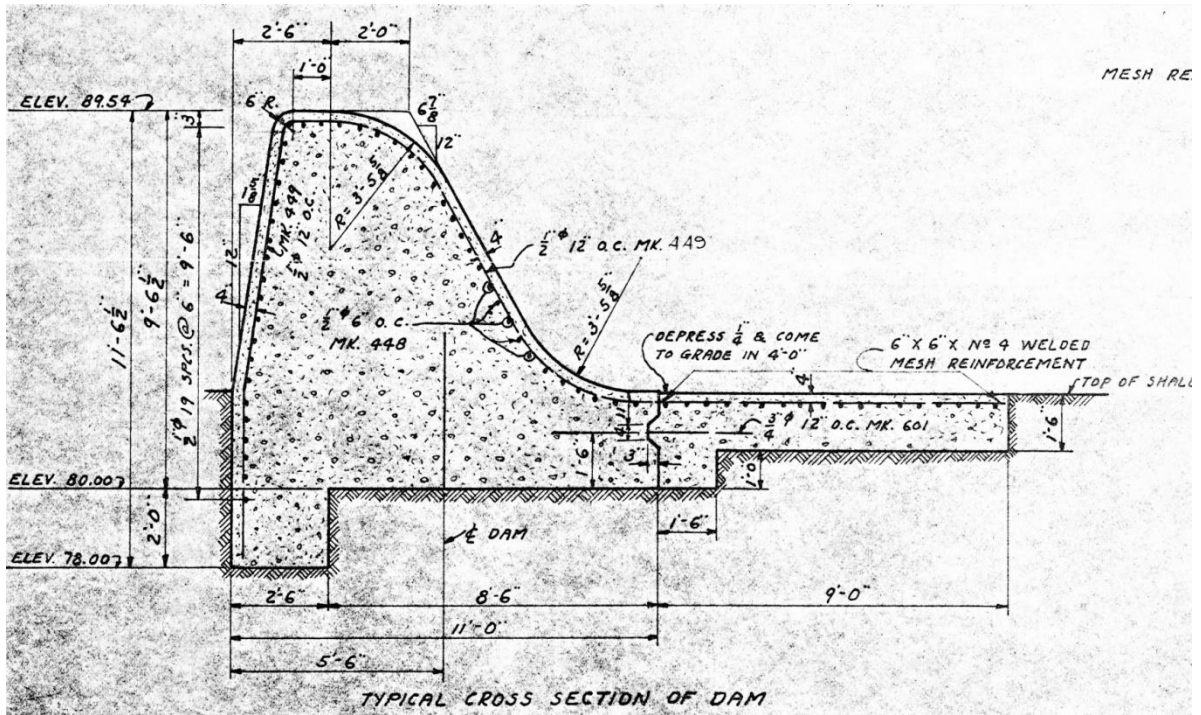


Ohio Department of Public Works, "Dam Across Cuyahoga River at Brecksville, Ohio: Arrangement of Dam and Walls West Bank," April 24, 1951, Sheet 3 of 5, "Construction Plans of Brecksville Diversion Dam, Cuyahoga and Summit Counties," Drawings, 5 Sheets, July 16, 1951.

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Ohio Department of Public Works, "Dam Across Cuyahoga River at Brecksville, Ohio: Details of Bank and Riprap Below Dam," April 22, 1951, Sheet 5 of 5, "Construction Plans of Brecksville Diversion Dam, Cuyahoga and Summit Counties," Drawings, 5 Sheets, July 16, 1951.



Detail, section view: Ohio Department of Public Works, "Dam Across Cuyahoga River at Brecksville, Ohio: Arrangement of Dam and Wall East Bank," March 2, 1951, Sheet 2 of 5, "Construction Plans of Brecksville Diversion Dam, Cuyahoga and Summit Counties," Drawings, 5 Sheets, July 16, 1951.