Nettle Creek Aqueduct
NE1/4, NE1/4, NW1/4 of Section 9
Township 33 North, Range 7 East of the 3rd P.M.
Morris
Grundy County
Illinois

IL HAER No. GR-2014-1

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Illinois Historic American Engineering Record
Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, Illinois 62701

ILLINOIS HISTORIC AMERICAN ENGINEERING RECORD
NETTLE CREEK AQUEDUCT

IL HAER No. GR-2014-1

Location: NE1/4, NE1/4, NW1/4 of Section 9
Township 33 North, Range 7 East of the 3rd P.M.
Morris
Grundy County
Illinois

Present Owner: State of Illinois

Present Occupant: Illinois Department of Natural Resources (IDNR), with the Illinois and Michigan State Trail serving as the local management unit.

Present Use: The structure historically was used as an aqueduct carrying the Illinois and Michigan Canal over Nettle Creek. However, it collapsed during an extreme flood event in April 2013. Plans call for it to be replaced with a newly built aqueduct.

Statement of Significance:

The Nettle Creek Aqueduct was one of five aqueducts that carried the Illinois and Michigan Canal and associated feeder canals across major waterways along its route. The Illinois and Michigan Canal played a key role in the settlement and economic development of northern Illinois and helped secure Chicago's position as a regional transportation/industrial hub. Smaller streams intersected by the canal typically were directed through culverts running beneath it. Larger streams and rivers, however, needed to be bridged by aqueducts. The aqueducts were an essential part of the canal's operation but also one of the more complex engineering problems faced by its designers and subsequent caretakers. Aqueducts would pose a recurring maintenance problem for the canal's engineers, requiring frequent repairs and reconstruction. The Nettle Creek Aqueduct experienced at least seven major rebuilding episodes between 1847 and 1938. The current aqueduct span was constructed by the Civilian Conservation Corps (CCC) in 1938, using the pre-existing abutments with some modifications. The existing aqueduct, while functional in design, reflects the post-1933 transition of the Illinois and Michigan Canal from commercial to recreational use and is emblematic of CCC-era construction methods—particularly in respect to stonework and reinforced concrete. The Nettle Creek Aqueduct is cited as a contributing resource in the documentation supporting the nomination of the Illinois and Michigan Canal as a National Historic Landmark and to the National Register of Historic Places.[1]

[1] The Illinois and Michigan Canal was listed as a National Historic Landmark in January 1964, and subsequently listed on the National Register of Historic Places in 1976 (Blanche Schoerer, Grant Peterson, and S. Sydney Bradford,

Part I. HISTORICAL INFORMATION

A. Physical History:

1. Date(s) of Erection:

The existing aqueduct was built in 1938-1939, but an aqueduct has stood at this location since 1848.

2. Architect:

The existing aqueduct was constructed as a cooperative project between the National Park Service (specifically its Branch of Recreational Planning and State Cooperation) and the Illinois Department of Public Works and Buildings. However, it is not entirely clear what architect or engineer(s), or even which agency, ultimately was responsible for the final design of the existing aqueduct due to the failure to find the original construction drawings for the structure. Initial conceptual drawings and construction notes were prepared in 1935-1936 by G. Jeppesu and William Scott. While certain aspects of this early design would be followed with the as-built structure, one key feature—a double-arched span—was not.

All plans prepared for the aqueduct and an associated waste gate structure ultimately required the approval of Carter Jenkins, chief engineer with the Illinois Department of Public Works and Building's Division of Waterways, and V. D. Ehringer, General Superintendent of the Illinois and Michigan Canal. Correspondence to/from both men related to the construction of the aqueduct can be found in the Illinois and Michigan Canal records on file at the Will County Historical Society.

3. Original and Subsequent Owners:

United States of America	to 1829
State of Illinois	1829 to Present

4. Builders, Contractors, Suppliers:

A search of canal records failed to find the construction contract for the original Nettle Creek Aqueduct. Engineer's reports, however, do indicate that "Perce and

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National Register of Historic Places Inventory Nomination Form: Illinois and Michigan Canal. Washington, D.C.: National Park Service, 1976). The canal was listed as the nation's first National Heritage Corridor in 1984.

Armstrong" (referring to William L. Perce and William A. Armstrong) were the contractors responsible for the construction of the original structure. Contractors and suppliers involved in subsequent rebuilding episodes prior to 1937, if known, are identified in Part I.B.2 below.

Civilian Conservation Corps personnel constructed the trunk of the existing aqueduct and also refaced the pre-existing abutments with cut stone. A. H. Boberg served as senior project superintendent and G. N. Lamb as associate engineer initially. Multiple suppliers were involved with the project, including: the Barrett Hardware Company of Morris (wire and nails), the Beatty Lumber Company of Morris (cement and hydrated lime), Chicago Gravel Company (sand and gravel), Joliet Material Company (re-bar), Lincoln Crushed Stone Company of Joliet (rubble stone), Thomas F. Ryan Company of Lockport (molding plaster and hemp fiber casting), and the Standard Oil Company (grease).

5. Original Plans:

Although a search of the Illinois State Archives uncovered several conceptual sketches and material estimates for the existing aqueduct, no final, approved plans for the structure were found. However, three large-scale drawings of an adjacent spillway and waste gates were found at the Will County Historical Society in Lockport, Illinois. The spillway and waste gates were designed in conjuncture with the 1938-1939 rebuilding of the Nettle Creek Aqueduct, and they do provide several important details on the rebuilding work on that structure. Plans for later repairs and modifications to the aqueduct—dating from 1947, 1954, and 1997—do exist. Copies of all original plans that were located have been incorporated into the supplemental materials for the IL HAER documentation package.

6. Alterations and Additions:

The Nettle Creek Aqueduct required significant rebuilding multiple times during its history. Such rebuilding episodes are known to have occurred in 1850, 1859, 1868, 1877, 1889, and 1910. The existing aqueduct, built in 1938-1939, has stood much longer than any of its predecessors, though it too has experienced a number of modifications. In 1954, a footbridge was constructed over the west end of the aqueduct in order to connect the north and south towpaths. Also, the deck for the vehicle bridge on the south side of the aqueduct was removed at some point prior to 1974. In 1989, a new bridge deck was installed, using pre-cast, pre-stressed concrete beams. In 1997, shotcrete[2] was applied to the interior and underside of the aqueduct's trunk, as well as to selective areas of the abutments, where the stone had deteriorated.

[2] Shotcrete is a concrete mixture conveyed through a hose and pneumatically projected at high velocity onto a surface.

B. Historical Context:

Stretching approximately 97 miles in length, the Illinois and Michigan Canal was a complex hydrological system that measured 60-feet wide at its top, 30 feet at its base, and required seventeen locks, numerous aqueducts, water weirs, culverts, and multiple feeder canals to operate. One of the main obstacles of the system was the 13-foot dividing ridge spur separating the South Branch of the Chicago River from the Des Plaines River. Initially, a "deep cut" was planned at this location, but the deep-cut plan was abandoned and two summit locks were constructed to lift boats over the dividing ridge. The remaining 141-foot descent from Lockport to La Salle was negotiated by 15 locks (numbered 1 through 15 from east to west). Water was supplied to the canal from a variety of sources, including a pumping station drawing water from the Chicago River at Bridgeport, and feeder canals located at the Little Calumet, Du Page, Kankakee, and Fox Rivers. Rivers and streams intersected by the canal were crossed by a number of methods. The Des Plaines and Du Page Rivers were crossed by building low-water dams that were designed to back up the rivers to the same level of the canal. Through Joliet, the canal actually co-opted and followed the channel of the Des Plaines. Aux Sable Creek, Nettle Creek, the Fox River, Pecumsaugam Creek, and the Little Vermilion River were all crossed by means of aqueducts. Smaller streams were diverted beneath the canal though culverts. The water level in the canal was regulated by means of waste weirs. The waste weirs were equipped with control gates that allowed water to be discharge from the canal when the level rose too high.

Much has already been written regarding the history and significance of the Illinois and Michigan Canal, and it is not the purpose of this document to re-digest this contextual history, but to supplement what has already been done by earlier researchers. As such, we present below a brief overview of aqueducts on the Illinois and Michigan Canal, as well as a site-specific history of the Nettle Creek Aqueduct.[3]

1. Aqueducts on the Illinois and Michigan Canal:

Webster defines an aqueduct as "a conductor or conduit of water, by means of pipes, or a canal or tunnel, or other channel, supported by some structure. More particularly applied to the ancient structures, raised on one or more series of arches, and sustaining one or more channels, conducted on a slightly descending plane… This term is also applied to a structure, similar to the ancient aqueducts, for conveying a canal over a river or hollow; more properly called an *aqueduct-bridge*."[4] Aqueducts generally are composed of a "trunk" section, which carries

[3] Christopher Stratton and Floyd Mansberger, *An Archaeological Resource Management Plan for the Illinois and Michigan Canal State Trail* (Springfield: Fever River Research, 2001).

[4] Noah Webster, *An American Dictionary of the English Language* (Springfield, Massachusetts: George and Charles Merriam, 1854), p. 64.

the canal across an intersecting stream, supported by abutments at each end. Depending on the length of the structure, intervening piers may be present to carry the trunk across the underlying stream. Additionally, a bridge is generally constructed along one side of the trunk for use as a towpath—an integral part of the canal structure used by mules or vehicle traffic.

There were a total of six aqueducts built in association with the Illinois and Michigan Canal, five of which were located along the main line of the canal. Moving from west to east, the aqueducts crossed the Little Vermilion River, Pecumsaugan Creek, Fox River, Nettle Creek, and Aux Sable Creek. The sixth aqueduct crossed the Des Plaines River and serviced the feeder canal running between the Kankakee River and the main canal (referred to as the Kankakee Feeder). The Nettle Creek Aqueduct had not been included in the original engineering plans for the canal but was a late "add-on" in the construction process, as will be discussed further below. Although essentially identical in respect to the basic components (i.e. abutments, piers, trunk, and towpath bridge), the aqueducts varied considerably in respect to length. That over the Fox River was the largest and represented the greatest engineering challenge. Being approximately 464' in length and having 8 spans; it was begun in 1838 and completed by the 1848 opening of the Canal.[5] The Des Plaines Aqueduct also was substantial, with five spans each of 50'. The aqueduct over the Little Vermilion River had five spans, while the one at Aux Sable had three spans (each 40' in length, or approximately 120' total). The Pecumsaugan Aqueduct was described in 1846 as "consisting of a trunk, composed of timber and plank, 106 feet long and 28 feet wide, in connection with a dam."[6] The Nettle Creek Aqueduct was the shortest of those on the canal, having a single span only 35' in length.

Many of the aqueducts built on other canals in the East were fully of stone construction (New York's Erie Canal being a notable example). On the Illinois and Michigan Canal, however, the trunks of the aqueducts all were of frame construction. Time and cost concerns, and a shortage of skilled labor, all may have played a factor in the decision to use wooden trunks. All of the trunks built along the Illinois and Michigan Canal followed the same framing system, specifically William Howe's renowned bridge truss.

Born in Spencer Massachusetts in 1802, William Howe took up bridge building around 1838. In 1840, he received two patents on an improved truss design he

[5] Constructions drawings for the Fox River Aqueduct are on file at the Illinois State Archives (Record Group 491.106).

[6] William Gooding, "Report of the Chief Engineer of the Illinois and Michigan Canal," 30 November 1846, Reports of the Commissioners and Trustees to the Governor 1845-1848, Record Group [RG] 491.010, Illinois State Archives [ISA], Springfield, p. 110).

had conceived. The principal feature of the Howe Truss was its use of diagonal timber compression members and vertical iron rod tension members running between upper and lower chords. In 1842, he obtained a patent on an improved version of his truss, which incorporated a curved timber running from each buttress to the center of the truss. The Howe Truss proved so successful that it became the most popular bridge design in the latter half of the nineteenth century, being used extensively for covered bridges.[7] The design of the Howe Truss was readily adapted for canal use by simply lining the interior of the frame with planking. In choosing the Howe Truss for the trunks of their aqueducts, the Illinois and Michigan Canal engineers were thus adopting what was considered to be the best design available for this type of frame structure. They went one step further in assuring the quality of construction by awarding William Howe the contracts to built most of the trunks along the canal (the one exception being Nettle Creek). He also received contracts to build multiple bridges along the route.[8] Howe supervised much of this work himself, which means he presumably resided in northern Illinois for an extended period (circa 1846-1848). He eventually later returned to Massachusetts, where he died in 1852, only a few years after the Illinois and Michigan Canal was completed.

In his 1846 annual report, Chief Engineer William Gooding expounded on the utility of the Howe Truss.

> Howe's patent plan of superstructures has been adopted for the bridges and aqueducts upon the main line of the canal, and for the aqueduct across the Des Plaines river and Kankakee Feeder. This plan combines strength and durability in a degree superior to any other with which I am acquainted, and the facility with which repairs can be made and new materials substituted for the old are strong reasons for the preference it has obtained.[9]

Construction of the substructures (i.e. abutments, wing walls, and piers) was left to other contractors, rather than to Howe. Chief Engineer Gooding considered much of the substructure work completed by 1846 to be of generally poor quality,

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[7] http://www.britannica.com/Ebchecked/topic273529/William-Howe.

[8] A December 1846 statement of work completed, and to be done, on the Illinois and Michigan Canal indicates that William Howe had the contracts for the construction of bridge superstructures in Sections 122, 125, 128, 135, 148, 1515, 154, 166, 168, 176, 186, and 195. He was to be paid $624 a piece for these structures. The statement also indicates money due him for work on the aqueducts over the Fox River ($9,786), Little Vermilion ($3,885), and Aux Sable ($2,240.39) ("Statement of the Condition of the Work Upon the Illinois and Michigan Canal, December 1st, 1846," Reports of the Commissioners and Trustees to the Governor 1845-1848, RG 491.010, ISA, Springfield, pp 159-160).

[9] Gooding, "Report of the Chief Engineer (1846), pp. 109-110.

a situation he attributed to a number of factors, including a lack of attention to the work, low prices on the contracts awarded (resulting in incompletion), and sickness among the workforce.[10] The workmanship on the substructures appears to have improved in the years following. The abutments and piers had a deep recess in their center, to accommodate the trunk, and their sidewalls rose to the same height as those of the trunk.

Despite the proven strength of the Howe Truss for bridges, the trunks of the aqueducts were subjected to extraordinary strain once the canal was filled with water and opened for navigation, and some of them required repairs after the first season of navigation. The use of unseasoned wood in the construction of the trunks (a practice deemed suitable during the push to complete the canal) contributed to the problems. Edward B. Talcott, who succeeded Gooding as chief engineer, discussed several of the difficulties that had arisen with aqueduct trunks in his report for 1848:

> There are upon the main line four[11] aqueducts with wooden trunks and one on the Kankakee Feeder constructed upon the plan of Howe's patent for Bridges. Three of those on the main line were built by the patentee and the one on the feeder under the direction of Mr. Day, his principal workman. Notwithstanding these structures have required considerable expense of repairs in their first seasons use. I consider the plan a good one, so far as I can judge the defect is in the want of sufficient bearings at the several points where the strain is concentrated.[12]

Talcott reported that the Des Plaines Aqueduct (for the Kankakee Feeder) settled soon after being filled with water and had to be adjusted. Several bearings were then crushed. These were replaced, and the aqueduct was refilled again. Even so, the aqueduct still had to be given "additional support by a set of braces under each span." Cast iron bearing plates also were inserted.[13] Talcott noted that this aqueduct had 50' spans, which when filled with 6' of water weighed 190 tons. The spans had thirty-six suspension rods, sixteen of which were 1-½" diameter

[10] Ibid, p. 109.

[11] It's not clear why Talcott mentions only "four" aqueducts on the main line, when documentary research clearly establishes that there were five aqueducts present at this time (i.e. Little Vermilion, Pecumsaugan Creek, Fox River, Nettle Creek, and Aux Sable Creek). This inconsistency regarding the number of aqueducts also is repeated by Howe (1956), though the Pecumsaugan Aqueduct may have been removed by the time of his writing.

[12] Edward B. Talcott, "Report of the Chief Engineer of the Illinois and Michigan Canal," 30 November 1848, Reports of the Commissioners and Trustees to the Governor 1845-1848, RG 491.010, ISA, pp. 414-415.

[13] Ibid, p. 415.

and twenty of 1-3/8" diameter. At each end of the rods was a 6" round washer. Once filled with water, there was 200 lbs of pressure per square inch upon these points. According to the engineer:

> This would be perfectly safe if the timber was well seasoned and of equal quantity, but in so many bearings it is almost impossible to obtain timber of equal density, or resistance to crushing. This produces an unequal pressure upon the points of bearing, and consequently a greater sink into of the truss. Much of this timber was necessarily used before it was seasoned. Hence all of these structures have settled more or less below their true line, in proportion to the length of span and weight sustained…."[14]

The trunk of the Fox River Aqueduct had settled so much by August 1848 that it had to be repaired in a similar manner as that done for the Des Plaines Aqueduct. Talcott commented that, "The several aqueducts will be thoroughly repaired during the winter by removing all defective timbers, and increasing the bearings at the points of greatest pressure, when I believe they will require very [few] further repairs for several years."[15] These were but the first of a long series of repairs that would be made to the aqueducts.

Talcott's estimate of a "few years" was not far off, for in 1853 he relayed "the renewal of several floor timbers" in the Aux Sable, Fox River, and Little Vermilion aqueducts, and stated that the "aqueduct trunks will require removal at the end of two or three years."[16] The following year, William Gooding, who was then serving as acting Superintendent, referenced Talcott's previous report and stated that, "It has, however, been found upon a more particular examination of the aqueduct trunks that the timbers were much more decayed and the structures yielding to the great pressure upon them at more points than was apprehended at the time of his [Talcott's] report was made." He regarded the aqueduct over the Des Plaines River for the Kankakee Feeder as being in particular danger of failure. Gooding stated that Howe's patent truss would continue to be employed for all proposed aqueduct (and bridge) reconstruction work along the canal. However, he indicated that the design would be improved "in certain particulars, such as the introduction of cast iron bearings instead of wood, increased height of truss, etc. etc." [17]

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[14] Ibid.

[15] Ibid.

[16] Edward B. Talcott, "General Superintendent's Report, 1853," Reports of the Commissioners and Trustees to the Governor 1849-1854, RG 491.010, ISA, pp. 395-396.

[17] William B. Gooding, "General Superintendent's Report," 12 December 1854, Reports of the Commissioners and Trustees to the Governor 1849-1854, RG 491.010, ISA, p. 457-458. One additional item of note in Gooding's

Further repair and rebuilding work on aqueducts is commonly noted in later annual reports, a selective few of which will be presented here. The General Superintendent's report for 1856 states that, "After a thorough examination of the Aux Sable, Nettle Creek, Fox River & Little Vermilion aqueducts it was determined that it was necessary to rebuild Aux Sable & Little Vermilion the present winter…."[18] In July 1859, the Fox River Aqueduct suffered some damage when "one rod and washer on three rods that support the middle of the floor timbers… broke which caused ten (10) floor timbers in one span to give way and break near the chords." The General Superintendent had found it necessary to add additional rods to support the floor timbers, and he proposed placing a heavy beam under the floor timbers through the center of the aqueduct to prevent a recurrence of this type of failure.[19]

In 1878, Chief Engineer Daniel C. Jenne reported that:

> The superstructures of the aqueducts have all been in use for 10 or 11 years, except the Kankakee, which was rebuilt last winter, and all the other will require rebuilding in the two years. Nettle Creek, at Morris, requires rebuilding before the opening of navigation next spring; the others can be made to stand another year, but probably all will have to be rebuilt before the opening of navigation in 1879. The timber for all should be contracted this year, to be delivered in the early part of the season of 1878, which gives the benefit of the winter to cut the timber, and thus reduce the price very materially; but no expense is incurred until the timber is delivered.[20]

In 1882, the Little Vermilion Aqueduct needed to be raised up and leveled, as the west end had settled 18". Regarding this event, Superintendent William Thomas

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report, is his statement that: "After the present winter scarcely any of the long timber required in rebuilding either the aqueducts or bridges can be found along or near the line of Canal, and in fact but little is now to be obtained here. The most of it must be procured from the country bordering on Lake Michigan" (p. 458). The canal engineers may have been increasingly reliant on white pine timber for aqueducts from this point onwards, as opposed to the local hardwoods used during the initial construction phase.

[18] John B. Preston, "General Superintendent's Report, 1855," Reports of the Commissioners and Trustees to the Governor 1855-1868, RG 491.010, ISA, p. 45.

[19] John B. Preston, "General Superintendent's Report, 1859," Reports of the Commissioners and Trustees to the Governor 1855-1868, RG 491.010, ISA, p. 270.

[20] Canal Commissioners, "Report of the Canal Commissioners," in *Reports to the General Assembly of Illinois, 1877* (Springfield, 1877), p. 53.

commented that, "It would seem, at first thought, strange that after standing firmly in place over thirty years it should now settle, but such was the fact."[21]

In their 1887 report, the Canal Commissioners noted that repairs had been made to the Des Plaines Aqueduct (for the Kankakee Feeder) during the winter months and further work was expected in the winter to come. These were merely stopgaps, however; the Commissioners warned that the "time is rapidly approaching when this aqueduct will have to be rebuilt, which will require a large outlay in its construction." The Commissioners also reported that the aqueduct across the Fox River was going to be rebuilt during the ensuing winter. The cost for the project was estimated at $25,000, which was eight times as much as the recent replacement of the Nettle Creek Aqueduct.[22] The Fox River Aqueduct was rebuilt during the off season and was ready for use by the opening of navigation in the spring of 1890. Late in 1890, work commenced on replacing the aqueducts spanning Aux Sable Creek and the Little Vermilion River. Both were reported as being "unsafe."[23]

The reliance on wood-frame trunks along the canal continued into the early years of the twentieth century. This tradition continued until 1910, when a steel-frame trunk was installed on the Nettle Creek Aqueduct. In time, steel-frame trunks would be incorporated into the other aqueducts as well. Another material that saw increasing use for aqueduct repairs during this period was poured concrete, which was used to repair or augment existing stone abutments and piers, or for building new ones.

In their 1914 report, the Canal Commissioners states that, "The aqueducts at Ottawa and LaSalle must receive extensive repairs, almost to the point of rebuilding, as they cannot be expected to hold out the next season in their present condition."[24] The Commissioners estimated the cost of repairing the Fox River Aqueduct at Ottawa at $22,000, that over the Little Vermilion River at LaSalle at $10,000, and repairs to the smaller aqueducts at $5,000. This was part of a wider proposal directed toward the rejuvenation and repair of the canal, which the Commissioners estimated would cost $166,750. A recent rise in commercial traffic on the canal had encouraged this improvement package, with General Superintendent R. F. Burt noting that, "The season just closed has demonstrated to use beyond any reasonable doubt that the canal 'is returning to its own' in

[21] Canal Commissioners, *Report of the Canal Commissioners of the State of Illinois, 1882* (Springfield, 1882), p. 41.

[22] Canal Commissioners, *Report of the Canal Commissioners of the State of Illinois* (Springfield, 1887), pp. 3-4.

[23] Canal Commissioners, *Report of the Canal Commissioners of the State of Illinois* (Springfield, 1890), p. 3.

[24] Canal Commissioners, *Report of the Canal Commissioners of the State of Illinois* (Springfield, 1914), p. 7.

popularity and usefulness…." Burt acknowledged the limitations and outdated character of the I&M but was still optimistic that shippers recognized its usefulness as a "barge canal" and could derive some benefits from it. [25]

Repairs were made to the Aux Sable, Fox, and Little Vermilion aqueducts in 1916.[26] These repairs may have included the removal of old timber trunks and their replacements with steel ones. The final evolution of aqueduct design on the canal occurred in 1938-1939, when a reinforced-concrete trunk was put in place across Nettle Creek.

Viewing the long history of aqueduct repairs on the Illinois and Michigan Canal, William Howe wrote in 1956, "It can be readily seen that the maintenance of these aqueducts has been a continuous and constant drain on the canal resources. The aqueduct piers and abutments have been rebuilt repeatedly, and in efforts to conserve and lengthen the life of the aqueducts, the old wooden troughs have been replaced with steel and concrete troughs."[27] Howe's observation was accurate, and especially so in the case of the Nettle Creek Aqueduct, which has faced severe challenges almost from the date of its construction, as will be discussed in detail below.

2. Nettle Creek Aqueduct:

The Nettle Creek Aqueduct is located on that portion of the Illinois and Michigan Canal that was designated as "Section 126" during the construction phase of the canal. Section 126 began from a point a short distance east of Nettle Creek and extended one-half mile to the west. Jacob Claypool initially took out the contract to build the section, but the work was stopped before it barely had begun due to collapse of the State Bank in 1842.[28] The contract was re-let and work resumed in 1845.[29] William L. Perce and William A. Armstrong were awarded the new contract for Section 126, in partnership with Claypool.[30] Armstrong was a

[25] Ibid, p. 8.

[26] Canal Commissioners, *Report of the Canal Commissioners of the State of Illinois* (Springfield, 1916), p. 8.

[27] Walter A. Howe, *Documentary History of the Illinois and Michigan* Canal (Springfield: Division of Waterways, 1956), p. 159.

[28] The Canal Commissioners advertised for proposals for bids to construct forty-six sections of the Illinois and Michigan Canal in late summer of 1841 (cf. "Notice to Canal Contractors," *Illinois Weekly State Journal*, Springfield, August 13, 1841; p. 2).

[29] O. L. Baskin and Company, *History of Grundy County* (Chicago: O. L. Baskin and Company, 1882), p. 157.

[30] Canal records primary reference this group as "Perce & Armstrong" and "Perce & Co.," though "Perce, Armstrong, and Claypool" also is referenced.

prominent local figure who is considered the founder of Morris. He also was involved in the construction of Section 125 of the canal, which ran through Morris itself, but had a different partner for that contract.[31] William Perce was a newcomer to the area, having only arrived in 1845. In addition to his own family, Perce was accompanied by two men who later would assist him in the construction of the Nettle Creek Aqueduct; these were Charles H. Goold, who served as his bookkeeper, and Alexander Morrison, who served as foreman on the project.[32]

Initial engineering plans called for Nettle Creek to be channeled beneath the canal by means of a large stone culvert. As contractors for Section 126, Perce and Armstrong assumed the responsibility for building this culvert in addition to construction of the canal prism to either side of it. The canal prism was a very labor-intensive project, requiring an initial grubbing and clearing of vegetation, followed by excavation, the raising of earthen embankments, and the lining of the canal's interior with clay (a job referred to as "puddling" in canal records). The embankments on the approach to Nettle Creek were exceptionally high due to the depth of the stream valley. Itemization of work done on the canal, compiled at several points in 1846 and early 1847 include headings for the "Stone Culvert on Sec. 126." These reports suggest that the contractors had made considerable headway on the construction of the structure.[33]

The stone culvert for Nettle Creek, however, ultimately was abandoned in favor of an aqueduct. Chief Engineer William Gooding reported on this change in a report submitted November 30, 1846.

> The plan of crossing Nettle Creek by culvert has been changed, and aqueduct substituted. The contract required that the stone for building the culverts should be obtained at the Du Page quarries, but this material having proved to be much less durable than was

[31] William A. Armstrong also was instrumental in the creation of Grundy County, separating it from La Salle County. He was elected as the first Sheriff for Grundy County and served for several terms afterwards. On his arrival to Morris in 1841, he occupied the former Chapin log cabin, which was located a short distance east of Nettle Creek. Armstrong partnered with James Hart in the construction of Section 125 of the Canal. Hart reportedly was one of the first to use teams and scrapers in excavating the canal. He and Armstrong completed their contracts with the state, though "at heavy financial loss" (Baskin, pp. 196-198).

[32] Ibid, p. 202.

[33] John A. Preston, "Report of Estimates," 1 January 1846 and 1 June 1846, Illinois and Michigan Canal Records [IMCR], Will County Historical Society [WCHS], Lockport, Illinois; "Abstract of the Amount of Work performed Upon the Western Division of the Illinois and Michigan Canal from December 1st 1846 to February 1st 1847, 1 February 1847, IMCR, WCHS.; "Statement of the Condition of the Work Upon the Illinois and Michigan Canal, December 1st, 1846", Reports of the Commissioners and Trustees to the Governor 1845-1848, RG 491.010, ISA, p. 145.

> supposed when the contract was made, and no better being obtainable, it was thought advisable to change the plan of the structure. It is now proposed to build an aqueduct of 35 feet span between the abutments which will be composed of sand stone of pretty fair quality, as good a kind be found along the line of the canal. The stone will be obtained at less expense than from the Du Page, and for the abutments are preferable. The foundation of the whole work which is upon piles, is already laid, the masonry of both abutments commenced, and considerable quantity of stone delivered. The work, so far, has been very well executed. All the stone for this work may be delivered during the winter should the weather prove favorable."[34]

Gooding failed to elaborate on the rationale for the change of plans in his report, but it is conceivable that the engineer had come to realize that a culvert simply would not suffice for Nettle Creek during periods of heavy rainfall. The culvert could pose a serious bottleneck, causing the waters to back up behind it which, in turn, could undermine the canal embankment itself and result in a catastrophic failure. The fact that the East Fork of Nettle Creek entered the main branch a short distance above the canal crossing (thereby augmenting the volume of water that had to be discharged through the culvert) increased the likelihood of such an event occurring. One wonders if a significant flood event had occurred after work on the culvert was well begun, opening the eyes of all involved to the potential threat.

Survey and field notes from 1847 contain a prospective sketch and material estimates for the Nettle Creek aqueduct. The sketch suggest that the aqueduct was envisioned to have three spans of 40' (120' total) carried by stone abutments and two intervening piers. This design was similar to that used for the aqueduct crossing Aux Sable Creek, six miles to the east. The proposed length also was appropriate to the natural width of the stream valley at the canal's crossing point, particularly since the stream was "braided" here as well (with three distinctive channels present on early maps). In the end, however, a much shorter span, only 35' in length, was approved for the aqueduct (see Supplemental Materials GR-2014-1-S1 through S4). The reduction in span length ultimately proved disastrous, as later events would show.[35]

Unlike the other aqueduct along the canal, the trunk was built under the direction of the contractors completing the canal section (i.e. Perce & Armstrong) rather than William Howe, or his assistant Mr. Day. However, Howe's patented truss

[34] Gooding, "Report of the Chief Engineer (1846), pp. 108-109.

[35] One wonders whether time and cost concerns played into this decision. Perhaps the abutments for the shortened aqueduct were able to utilize some of the pilings that had already been driven in preparation for the culvert.

design was still employed for the aqueduct. The full length of the aqueduct's superstructure is stated as 45'. This length included the open span over the creek (35') and overlap onto the two abutments. The final cost estimate for the aqueduct, submitted by Perce and Armstrong on October 1, 1847, was $19,320.81. This figure was higher than other aqueducts along the canal, even though the span over Nettle Creek was shorter. A large percentage of the total cost related to masonry ($11,495.70). William Howe was paid $45 in patent fees for the application of his truss on the aqueduct.[36] On November 30, 1847, Chief Engineer Gooding was able to report that the aqueduct across Nettle Creek was "entirely finished."[37]

Several published histories suggest that the original aqueduct across Nettle Creek had a short life span due to problems with the stonework used for the abutments. An 1882 county history, for instance, stated that, "The stone for this aqueduct was quarried some seven miles below Morris, near the river bank and hauled by teams. It was a reddish sandstone of inferior quality and disintegrated so that the aqueduct had to be rebuilt."[38]

Canal records, however, indicate that natural forces, more than poor stone, were responsible for the rebuilding of the abutments. The aqueduct was severely damaged multiple times during its early years. One such instance occurred on August 20, 1850 after 12 inches of rainfall had flooded the canal and swollen Nettle Creek. The extensive rainfall caused two severe breaks in the canal around Morris, one of which was through the towpath to the west of the Nettle Creek Aqueduct and the other at the aqueduct itself. General Superintendent Edward B. Talcott provided a full description of this event in his annual report of that year, which merits full quotation both for its explanation of the failure (eerily similar to later ones) and the repair efforts undertaken immediately afterward:

> The second and by far the most expensive break occurred at the Nettle Creek Aqueduct. This structure is a span of thirty five feet, with walls sixteen feet high under the trunk built on a pile foundation. Immediately after the break occurred through the tow path, a dam was thrown across the west end of this aqueduct, which retained about four feet of water on the level below, extending to Marseilles. I examined this dam and the aqueduct about 9 o'clock in the evening previous, when all was apparently

[36] William B. Gooding, "Statement of Work Performed in Construction of the Illinois and Michigan Canal from July 1845 to December 1848", Reports of the Commissioners and Trustees to the Governor 1845-1848, RG 491.010, ISA, p. 450.

[37] Gooding, "Report of the Chief Engineer (1847)," p. 273.

[38] Baskin, p. 202.

safe. The creek was passing freely with a strong current about 8 feet deep. Not apprehending any danger at this point, I did not examine it again until notified of the break about 7 o'clock in the evening of the 20th. A dam was made across the canal about one mile below the aqueduct, which was completed the next morning at day light. Upon an examination after the water had somewhat subsided, it appeared that the break had been caused by the undermining of the upper end of the west abutment, extending considerable beyond the foundation, which left a section of the berm bank and bottom unsupported; when this fell, or broke through, the force of the water from the canal above, and the current from the creek below, soon swept away the earth leaving a free passage for the waster of the canal under the foundation. A Canal Boat which was moored within one hundred feet of the aqueduct was drawn into the breach, striking the masonry at the top of the wall with such force as to overthrow the entire wing—Eighteen feet in length of abutment—and force forward from the foundation another section sixteen feet in length.

The east abutment was undermined its entire length, and about three hundred cubic yards of Embankment behind it carried out through the foundation. For a space of sixty feet in length of canal from the west abutment, the bank had been washed out below the foundation of the masonry to a depth of 20 feet for the full breadth of the canal, and as the water subsided, this space had been filled with a deposit of rubbish and soft mud to a depth of six feet.

The entire space between the abutments had been washed out to the depth of five or six feet below the foundation, and for the distance of eighteen feet in length, the piles which supported the masonry had been carried out. The foundation of the wing is supposed to be in place.

The repairs were made by filling the space between the abutments with heavy gravel to 5 feet above the foundation of masonry—care being taken to force the gravel under the walls as far as possible. For a distance of sixty feet from the broken abutment a foundation was prepared by covering the surface with 2-½ inch plank upon which was placed a tressle [sic] work of the necessary height for the trunk, which extended one hundred and twelve feet, where it is connected with the embankment which remained unbroken.

In putting down this foundation, it was deemed important to place it as low as possible, in order to facilitate the rebuilding of the

> masonry before the close of navigation. The necessary excavation for putting down the timbers at a level three feet above the original foundation was completed on the evening of the 30th of August. The rain which fell during that night and the next day raised the creek to five feet above that level at which it remained stationary for three days. It then became necessary to fill the space previously excavated and put the foundations down at six feet above the original bank.[39]

Aside from the uncooperative weather, Talcott also cited the height of the embankments by the aqueduct ("upwards of twenty feet high") as a hindrance in moving materials for repairing the breach, "making from two to five removals necessary before they could be put in place." Despite these challenges, the repairs were completed and water let into the canal on September 15. Shallow-draft boats, drawing only 3', were allowed through the aqueduct the following day. Efforts were made to salvage the stones that had been dislocated from the abutments but very few of these were recovered due to the high water in the creek. Superintendent Talcott stated that, "It is contemplated to renew the foundation if practicable and to take down and relay that portion of the abutment which has been moved on the foundation, as this in part supports the trunk and cannot be done during the season of navigation." He estimated the cost of restoring the aqueduct at $2,500.[40]

Before repairs could be made, however, the aqueduct was severely damaged once again in a storm in April 1851.[41] In his annual report of that year, Superintendent Talcott reported:

> That part of the west abutment of Nettle Creek Aqueduct which remained after the break in August 1850, and the entire east abutment were undermined and destroyed. The wings of the east abutment were left standing in a shattered condition. The trestle work put in last year remained perfect, except about 10 feet in length, which was undermined. A foundation was prepared by filling with stone to the depth of twelve feet, upon which a tressle [sic] work was placed for supporting the trunk.

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[39] Edward B. Talcott, "General Superintendent's Report," 10 December 1850, Reports of the Commissioners and Trustees to the Governor 1849-1854, RG 491.010, ISA, pp. 162-164.

[40] Ibid.

[41] On April 30, 1851, the *Daily Illinois State Register* (p. 2) carried a short note entitled "The Canal Repaired," which simply stated "The Chicago Journal of Saturday, says: 'A dispatch this morning from the break at Nettle creek, announces that boats drawing three feet of water can pass. Otherwise, the navigation is uninterrupted.'"

> The present length of this structure including the wings is 246 feet, with a clear waterway of 78 feet. The original structure was a single span of 35 feet.[42]

In his annual report for 1855, General Superintendent John B. Preston stated that, "It is believed that the Nettle Creek and Fox River aqueducts will stand another season."[43] He made a similar assessment the following year, noting: "The Nettle Creek Aqueduct still appears to be substantial and will probably answer for one or two years more if the season is favorable, it may be best to put in the abutments next summer as much of them as can be done without interfering with the present structure."[44]

Nature soon forced the issue of repairing the aqueduct. As stated by General Superintendent Preston in his 1858 annual report, "The freshet in March undermined some of the tressels [sic] of the Nettle Creek aqueduct. One tressel [sic] settled about one foot. The structure was so much decayed that [it] was considered unsafe to depend upon [it] longer than this season." Men employed by Preston himself were tasked with putting in the foundation for the new abutments, while the contract for constructing the trunk awarded to S. B. Boomer. The trunk was "to be built in all respects like the other aqueducts built along the canal with truss 12 feet high for $35 per lineal foot."[45]

Much of the material necessary for the rebuilding of the aqueduct already was on hand by the time Preston prepared his 1858 annual report, and work was underway by December:

> As soon as the water was drawn off from the Nettle Creek aqueduct (1st December) we commenced to remove the old structure in order to finish the masonry and to put on the new trunk and to make heavy embankments at each end of the new work. The new aqueduct and embankments were finished in February [1859]. The paving between and below the abutments to prevent washing the bed of the stream under the structure and near the foundations was not completed until summer, owing to back water

[42] Edward B. Talcott, "General Superintendent's Report," 10 December 1851, Reports of the Commissioners and Trustees to the Governor 1855-1868, RG 491.010, ISA, p. 148.

[43] Preston, "General Superintendent's Report (1855)," p. 45.

[44] John B. Preston, "General Superintendent's Report (1856)," Reports of the Commissioners and Trustees to the Governor 1855-1868, RG 491.010, ISA, p. 155.

[45] John B. Preston, "General Superintendent's Report (1858)," Reports of the Commissioners and Trustees to the Governor 1855-1868, RG 491.010, ISA, p. 212.

> from the Illinois river during the winter and spring. There has been expended in removing the old aqueduct, completing masonry and new trunk, also making embankments connections and paving $5,584.69.[46]

It appears that this trunk lasted for only a decade before it too needed to be replaced. Under the heading "STATE NEWS," the *Daily Illinois State Journal* stated that "The canal company are engaged in erecting the frame work for the new acqueduct [sic] over Nettle creek in the town of Morris."[47]

By 1877, the Nettle Creek Aqueduct required rebuilding once again. The 1877 General Superintendent's Report's stated that, "The trunk of the Nettle Creek aqueduct [sic] at the city of Morris has so far failed as to require rebuilding, and the material was provided, framed, and delivered on the ground before the close of navigation, and is now being raised."[48] In their report of that year, the Canal Commissioners stated:

> "The timber for Nettle Creek Acqueduct [sic], at Morris, has been procured, framed and delivered on the ground, and will be completed the coming winter. The cost to date is $694.04. Next year three new acqueducts [sic] will have to be built, viz: Aux Sable, Fox River and Vermilion, the timber for which a contract has been closed with Messrs. McArthur, Smith & Co., of Chicago, the same to be delivered on their dock before August 1, 1878. The approximate cost of the three is $32,000.00."[49] (p. 4)

Even after the 1877 rebuilding, additional repairs and rebuilding would be necessary in the years that followed. In 1886, the General Superintendent reported that, "The slope walls of the Nettle Creek aqueduct being in bad condition, were rebuilt."[50] The General Superintendent's Report of 1898 noted that, "The old aqueduct over Nettle Creek, below Morris, was taken out and [an] entirely new structure put in its place." This work was commenced after the close of navigation in 1888 and completed by the February following.[51] This work also

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[46] Preston, "General Superintendent's Report (1859)," p. 269.

[47] *Daily Illinois State Journal*, 21 January 1868, p. 2.

[48] Cited in Howe, p. 156.

[49] Canal Commissioners, "Report of the Canal Commissioners (1877)," p. 4.

[50] Cited in Howe, p. 156.

[51] Howe, p. 159.

was noted by the Canal Commissioners in their 1889 report: "The Nettle creek aqueduct, at Morris, has been rebuilt at an expense of about $3,000." The itemized list of maintenance and repair expenses for the fiscal year includes a payment of $629.24 for "castings and rods for Nettle creek aqueduct" made by Wells & French Company in December 1888. This is followed by a payment of $1,005.77 to Marsh and Bingham for "timber and plank." Although the latter expense does not specifically reference Nettle Creek, there is a good chance that the timber and plank purchased were intended for the aqueduct there.[52]

Two late-nineteenth-century photographs of the Nettle Creek Aqueduct are attached in the Supplemental Materials (see GR-2014-1-S6). These images capture the essence of the aqueduct's appearance during its first sixty years of use. The structure's Howe Truss system is well illustrated in these images.

In the spring of 1910, a new steel aqueduct was installed at Nettle Creek. The aqueduct was constructed by the Joliet Bridge and Iron Company at the cost of $7,820.[53] This effort may have been undertaken following a break in the canal behind the west abutment—an event that is illustrated in several period photographs (see Supplemental Materials GR-2014-1-S7 and S8). The steel-frame aqueduct had a vehicle bridge on its south side, just as the earlier timber-frame aqueduct had. Poured concrete appears to have been added to the face of the existing stone abutments to help support the new trunk. Historic photographs of the steel-frame aqueduct are attached in the supplemental figures (see GR-2014-1-S9 and S10).

In 1937, plans were begun for the construction of a new reinforced concrete aqueduct over Nettle Creek. Material orders for the new structure were placed in July 1937.[54] Before construction could actually begin, however, the pre-existing steel-frame aqueduct needed to be removed. The work began in late August, with the salvageable material being offered for sale as scrap iron.[55] A temporary (frame?) aqueduct was then constructed, which remained in place until the reinforced concrete one could be completed. Manpower for the project was supplied by Civilian Conservation Corps personnel based at Camp Brandon-Morris, in Channahon, Illinois, and A. H. Boberg served as project superintendent.

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[52] Canal Commissioners, *Report of the Canal Commissioners of the State of Illinois* (Springfield, 1889), pp. 3, 12. Wells & French Company was founded in Chicago in the late 1860s. The company began as a bridge building concern but later expanded into the construction of railroad cars (http://www.midcontinent.org/rollingstock/builders/Wells-French.htm).

[53] Canal Commissioners, *Report of the Canal Commissioners of the State of Illinois* (Springfield, 1910), p. 13.

[54] V. D. Ehringer to Gordon Hart, 7 July 1937, File No. 703, IMCR, WCHS.

[55] V. D. Ehringer to Newtson Iron & Metal Co., 20 August 1937, File No. 703, IMCR, WCHS.

The new aqueduct was to have a reinforced concrete trunk that was supported on either end by the pre-existing stone abutments, which were to be augmented, where necessary, by concrete and faced with a new stone veneer. The plan also called for two bridges to flank the aqueduct: one on the south able to accommodate vehicles and a narrower one on the north meant for pedestrians. The bridge decks were supported on the inside by the trunk and on their outer side by reinforced concrete arches springing from the abutments. Stonework matching that applied as a veneer to the abutments was to be used for the sidewalls of the bridges in order to harmonize the whole.

Construction of the aqueduct occurred over the course of 1938 and continued into 1939. Correspondence related to the project suggests that some delays occurred due to material shortages, including lumber for form work, coarse aggregate (for concrete), and building stone.[56] Inadequate construction estimates also played a role. In respect to the concrete aggregate, A. H. Boberg, pointed out that original estimates had made "no provision… for the foundations for the abutment wing walls or for the additional cavities of concrete necessitated in the abutment walls, where large cavities had to be filled, due to the deteriorated condition of the old stone abutments."[57]

In a letter dated October 17, 1938 Project Superintendent A. H. Boberg relayed to Superintendent V. D. Ehringer that, "We have now reached the point on the Aqueduct Job where we have completely exhausted our form lumber supply, and will, in short time need the lumber…." Attached to the letter was an itemization of all of the lumber that would be required. Recent material purchases had nearly exhausted all of the project's remaining funds, making it "necessary for the Park Authorities to furnish this form lumber, if we should be able to continue the construction." Boberg further noted that, "we are also short some of the timber which project superintendent Rex brown at New Salem was supposed to furnish for the Flum[e] False work. I have written him at several occasions but have to date not received the material. I have included those timbers on attached list."[58]

The August 1939 edition of *Towpath Topics*, a CCC newsletter, carried a brief article related to the work on the Nettle Creek Aqueduct. The article indicates that stonework on the structure was still in progress and was being carried out by the 630th Company of the CCC:

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[56] A. H. Boberg to V. D. Ehringer, 17 October 1938; V. D. Ehringer to Carter Jenkins, 19 October 1938; A. H. Boberg to V. D. Ehringer, 27 October 1938; File No. 703, IMCR, WCHS.

[57] Boberg to Ehringer, 27 October 1938.

[58] Boberg to Ehringer, 17 October 1938. Boberg refers to the aqueduct project as "Job No. 34.

> Mr. V. M. King and his mighty and stalwart cohorts "Dog" Lehner and Jay Bowler are moving right along with the stone work of the project. The men on this job are getting some very good experience in all types of stone work, from quarrying and cutting to placing and fitting of the most technical nature. It is rumored that there is a potential G. Borglum[59] in the gang, but we have no definite word.[60]

Another aspect of the project was the construction of waste gates and a concrete spillway immediately west of the aqueduct. Plans for the waste gates and the spillway were finalized in September 1938, and project correspondence indicates that these features were in place by October of the following year.[61] The waste gates were inserted into a concrete retaining wall that ran along the south side of the canal aqueduct (see Supplemental Materials GR-2014-1-S14 through S20). In 1939, new plans were drawn up for the spillway to be extended down to grade (as opposed to terminating at the edge of the abutment wing wall, as originally built) and for a cut-stone veneer to be added on the exterior of the structure (see Supplemental Materials GR-2014-1-S21 through S23). A letter from Departmental Inspector R. N. Johnson on October 3, 1939 stated that the extended spillway was to be "fitted into the existing stone wall" and suggested that the stone veneer "harmonize with the existing stone work of the aqueduct."[62] One presumes that the spillway modifications and extension were completed, but this is not entirely clear from the evidence at hand.

Subsequent correspondence on the Nettle Creek Aqueduct post 1939 is limited and primarily concerns requests and specifications for the completion of stonework on the aqueduct. Unfortunately, the correspondence does not specify where the stonework was to be applied on the structure, though the sizes requested suggest that it was related to veneer work. In July 1941, maintenance engineer Rex G. Brown made a request for, "Approximately 200 Tons sound, solid limestone slab blocks from 8" to 18" in thickness which are dressed from 12" to 3'-0" on one edge and not less than 4" dressed at right angles to first described edge."[63] In response to this request, A. H. Stone, a design engineer, drew up a list

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[59] This refers to Gutzon Borlund (1867-1941), the noted American sculptor responsible for the massive carvings at Stone Mountain, Georgia and Mount Rushmore.

[60] "Morris Aqueduct", *Tow Path Topics* (August 1939), p. 3.

[61] V. D. Ehringer, "Nettle Creek Waste Gates," 3 October 1939, File No. 703, IMCR, WCHS.

[62] R. N. Johnson to Rex G. Brown, 13 November 1939, File No. 703, IMCR, WCHS.

[63] Rex G. Brown, "Stone for the Completion of the I&M Canal Aqueduct over Nettle Creek," 15 July 1941, File No. 703, IMCR, WCHS.

of specifications and bill of materials for contractors, in which he stated that the stone supplied "shall be sound, solid, standard stock, buff limestone slab blocks, sawed finish to sizes" approximately 12"to 36" in length, 8" to 18" in height, and not less than 4" in thickness.[64] Rex Brown subsequently expressed concern over Stone's specification that sawn stone be supplied:

> We are of the opinion that it is not practical to purchase this material sawed to sizes as it would not match the material already in place, and that the cost would be greatly increased by requiring that finish….
>
> As you know the greater percentage of the work has been completed on this structure, and ruble [sic] stone has been used entirely to date. It has a very rustic appearance, and we believe that the use of perfectly dimensioned stone would be entirely too formal for the remainder of the structure. We are advised that approximately 20% increase could be expected over prices bid on the same materials last fall. Otherwise, the specifications and bill and material appears to be entirely satisfactory.[65]

Discussions on completing the stonework on the aqueduct continued through the remainder of the year, though there was little sign of progress. In a December 3, 1941 letter, Stone informed Brown that it "might [be] impossible for the CCC camp in that locality to complete this project in the very near future" and proposed that the delivery of the stone be delayed until the quarries' slack periods as a cost saving measure.[66] The final piece of correspondence found related to this topic is dated December 6, 1941—one day before the attack on Pearl Harbor.[67] One can only guess how America's entry into the Second World War further delayed completion of the project. Perhaps it never was completed in full.[68]

The Division of Waterways Report for 1947 states that:

> On April 4, 1947, extensive flooding was caused by heavy rains throughout areas served by the Canal which required constant attention to prevent damage to the Canal and its structures.

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[64] A. H. Stone, "Specifications and Bill of Materials," 11 September 1941, File No. 703, IMCR, WCHS.
[65] Rex G. Brown, "Limestone Blocks—Nettle Creek Aqueduct," 26 September 1941, File No. 703, IMCR, WCHS.

[66] A. H. Stone to Rex G. Brown, 3 December 1941, File No. 703, IMCR, WCHS.

[67] Rex G. Brown to A. H. Boberg, 6 December 1941, File No. 703, IMCR, WCHS.

[68] This might explain why the south wing wall of the west abutment has no CCC-era stone veneer on it.

> However, in spite of all efforts several large breaks and numerous smaller ones developed which washed away the canal banks and in several cases even the towpath; the most serious damage being done when the west wing wall and waste gate structure of the Nettle Creek Aqueduct collapsed.[69]

The report's reference to the "west wing wall" is rather confusing, since it is open to interpretation as to whether it refers to the west abutment (which has north and south wing walls but no western one) or to the concrete retaining wall that is known to have been installed along the south bank of the canal between the waste gate structure and aqueduct. The latter scenario appears more likely as the west abutment shows no evidence of having been washed out during this period. Repair plans prepared in August 1947 also make it clear that the retaining wall needed to be replaced. Two alternatives were considered: building a poured concrete wall 12" thick, similar to that which had presumably washed out; or the addition of steel sheet piling here and on the opposite side of the canal. The latter option ultimately was adopted. The eastern end of the sheet piling was joined to the walls of the aqueduct's trunk by means of short, concrete connectors. The new waste gates and spillway were similar to those built in 1939. One change, however, is that the spillway was fully enclosed only on its northern end rather than along its full length as the earlier structure had been. Also, the spillway was not extended down the face of the abutment wing wall as previously, instead being terminated at the edge of the wall (see Supplemental Materials GR-2014-1-S26 through S28).

In 1954, a pedestrian bridge was added at the west end of the Nettle Creek Aqueduct. The bridge was constructed of wood frame and 4'-6" wide (see Supplemental Materials GR-2014-1-S30). The aqueduct and footbridge were reported as being in "good condition" in 1956.[70]

At some point the deck of the original vehicle bridge was removed, as was the stonework forming its outer sidewall. The concrete arch that had supported the bridge was left in place however. The date at which this modification occurred is not known, but a 1974 photograph of the aqueduct establishes that it had taken place by that time (see Supplemental Materials GR-2014-1-S31). In 1989, a new vehicle bridge was installed, using pre-cast, pre-stressed concrete beams that did not require any support from the concrete arch.

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[69] As cited in Howe, p. 159. See also *Rockford Morning Star* (6 April 6 1947) which carried a story on the effects of a large storm the hit the upper Midwest. The newspaper account stated that "Hundreds of acres of farm land in Grundy county were flooded by water pouring through a break in the wall of an aqueduct which takes the Illinois-Michigan canal over Nettle Creek."

[70] Howe, p. 165.

In 1997, extensive repairs were made to the aqueduct and stone abutments. Shotcrete was applied to areas where the concrete or stone had deteriorated, with the underside of the trunk being a particular point of concern. The entire interior of the trunk also was lined with approximately 6"of shotcrete (see Supplemental Materials GR-2014-S32 through S36).

Part II. ARCHITECTURAL INFORMATION

A. General Statement: Like all structures of its kind, the Nettle Creek Aqueduct was intended to carry a waterway across a natural obstacle, which in this case involved the Illinois and Michigan Canal traversing Nettle Creek. The principal component of the structure is its trunk, through which the waters of the canal and any boats thereon were carried. The trunk of the aqueduct is built of reinforced concrete and consists of a single span supported by abutments (principally built of stone, with some concrete additions) at either end. Running parallel to the trunk, on its south side, is a vehicle bridge. Earlier versions of the aqueduct also had a bridge at this location to accommodate traffic along the towpath. A pedestrian walkway is present along the north side of the trunk. The latter feature was absent from the earlier aqueducts here, but was added as part of the 1938-1939 aqueduct in order to facilitate foot traffic on the north side of the canal. The inclusion of the walkway in the design reflects the recreational use of the Illinois and Michigan Canal at the time the existing aqueduct was constructed.

1. Architectural Character: In essence, the aqueduct was very functional in design and was intended to carry boat, foot, and vehicle traffic moving along the Illinois and Michigan Canal over Nettle Creek. The use of reinforced concrete for the aqueduct represented a break from previous versions of the structure and was in tune with modern building techniques (particularly bridge construction). The primary aesthetic feature integrated into the aqueduct's design was the stonework that was applied over the face of the pre-existing abutments and also was used for the sidewalls of the pedestrian walkway and the vehicle bridge. The stonework is ashlar (square cut) but has been given a rock-faced treatment and laid in irregular courses, which is in sync with the "rustic" aesthetic promoted by the National Park Service during the 1930s. This esthetic is in contrast to the larger, uniform-sized, rock-faced blocks laid in regular coursework during the earlier periods of construction. The 1930s stonework is easily discernable from the earlier stonework present on the abutments.

2. Condition of Fabric: The structure is partially collapsed due to an extreme flood event in the spring of 2013. The flood undercut the central portion of the east abutment, causing the trunk of the aqueduct to drop. The collapse resulted in the destruction of the eastern portion of the pedestrian walkway. Most of the stone

veneer added to the south wing wall of the east abutment by the CCC also was washed away in the flood. Even with this damage, the aqueduct still largely retains its historic integrity.

B. Structural Description: The aqueduct is comprised of three primary components: trunk, vehicle bridge, and pedestrian walkway. The trunk of the aqueduct is constructed in a manner similar to a through-girder, reinforced-concrete bridge but is distinguished by its exceptionally high sidewalls, which provides the channel through which the waters of the canal can flow. As built, the main span of the trunk measured 18' wide on the interior and 65' long. The sidewalls were 1'-9" thick and 6' high. The application of shotcrete on the interior of the trunk in 1997 reduced the width of the trunk to 17 and also increased the thickness of the sidewalls. The floor of the aqueduct is 7-½" thick and is supported below by 1'x1'-4" concrete beams running between the through girders. The beams are placed 3'-9" on center. Construction documents indicate that the re-bar used on the construction of the trunk included both round and square stock, and was ½", 5/8", ¾", and 1" in thickness/diameter. On the east, the trunk of the aqueduct continues for an additional 32' past the main span (creating a total length of 97'), and the sidewalls here flare out to an eventual width of 30'-6" in order to align to the canal prism. This section of the aqueduct is integral to the overall structure, but it lacks the underlying beams found on the main span, since it was built upon the canal bed.

The 1938 design of the aqueduct called for the pedestrian walkway and vehicle bridge to be supported on their interior side by the through girders forming the aqueduct's trunk and on their outer side by paired arches built of reinforced concrete. The arches had a single span but were doubled up for both bridges. The arches spring from the base of the abutments and are inserted into notches in the abutments. At their apex, the arches measure 1'x1' square and are connected to the trunk at this point by a similarly sized beam. Stonework was inserted into the space above the arches resting on the exposed concrete arches and also formed the outer sidewalls for the pedestrian and vehicle bridges. The pedestrian walkway measures 5' wide (on the interior) and has a 3"-thick, concrete deck, which rests on a concrete lip on the south and stonework on the north. The outer (north) sidewall of the walkway is capped with concrete coping.

The original vehicle bridge on the south side of the aqueduct measured at least 10' wide (possibly 10'-6") and had a concrete deck (approx. 8" thick) that was supported by concrete beams extending off the aqueduct's trunk. Its outer (south) sidewall was formed up with stone like that used for the pedestrian walkway. At some point prior to 1974, the vehicle bridge deck was removed, along with the stonework associated with the outer sidewall. In 1989, the vehicle bridge was rebuilt using pre-cast, pressed concrete beams that did not have to rely on the support of either the pre-existing aqueduct trunk or concrete arch. Four beams, measuring 1'-9"x3'-0", were installed, which rested on concrete footings poured on top of the abutments. This created a road deck 12' wide. A frame rail was put in place on both sides of the new deck.

The span of the aqueduct trunk and its associated bridges rests on abutments, which are principally built of limestone but do include some poured-concrete additions—particularly on the east abutment. As built, the abutments had regularly coursed ashlar stonework (large uniform sized blocks) on their outer face. The stone was rock-faced with a neatly tooled corner. The contemporary stonework used on the interior of the abutment is more characteristic of rubble masonry, though an exposed portion of the backside of the east abutment shows that the stonework here was large quarried blocks, un-tooled and irregularly coursed (using variably sized blocks).

There is a distinct difference between the east and west abutment, in respect to the angle of their wing walls. The wing walls of the east abutment have an angle of 15 degrees, and each runs for 33' to 34'. By contrast, the wing walls of the west abutment have a 45-degree angle and extend for 43' to 45'. This difference in angles between the wing walls may reflect hard experience, considering that several of the major washouts at the aqueduct prior to 1910 occurred behind the west abutment. Experience, coupled with multiple rebuilding episodes, might also explain why there is such a variation in respect to the widths of the abutments and their respective wing walls. The east abutment is about 10' thick at its center and is flanked by wing walls that are 6' wide on the north and 8'-6" on the south. The west abutment is nearly 10'-6" wide in its center and has wings walls that are 7' thick on the north and only 4' thick on the south. These measurements reflect the 1938-1939 modifications, when the CCC applied 1-6" of stone veneer over the pre-existing stone abutments, one exception being the south wing wall of the west abutment, which shows no evidence of a 1930s-era veneer having been applied even though construction plans suggest otherwise.[71] The wing walls of the abutments have a stepped profile and have been capped with poured concrete. The northern wing walls have parapet walls, while those on the south do not.

The exposed canal bed adjacent to the east side of the east abutment indicates the presence of a concrete apron that transitions from the clay canal bed to the canal trunk. Although the west end of this apron was supported by a foundation wall placed adjacent to the abutment, the upper end of the apron, at its intersection with the clay puddling, did not. It may have been at this location that the flood waters undercut the apron and subsequently the east abutment, which lead to the failure of the east end of the aqueduct. Correspondence written during the 1930s-era rebuilding of the canal cautions against puncturing the clay puddling during the installation of sheeting piling for temporary dams and emphasizes the need to reseal the canal bed in event it is punctured. In December 1937, Assistant Engineer M. V. Ahlvin warned: "The old sheet pile cofferdams should be removed before the new ones are and the Canal bottom sealed with clay after the wooden piling is removed or we will always have this seepage to contend with, and the possibility of failure of the abutments of the aqueduct. My understanding was that the new

[71] It's possible that veneer was washed away during the April 1947 flood event, as Howe (1956:159) mentions the "west wing wall" as having collapsed at this time.

cofferdams will be earth ones and nothing incorporated that will penetrate the bottom seal of the canal."[72] This warning likely is valid now as it was then.

D. Site:

1. General Setting and Orientation: The Nettle Creek Aqueduct is located along the Illinois and Michigan Canal within the limits of Gebhardt Woods State Park on the western edge of Morris. The aqueduct is orientated roughly east-west, in alignment with the canal. The area surrounding the structure is largely wooded, with the exception of that to the southeast, which presently is occupied by the City of Morris' water treatment plant. The embankments of the canal on approach to either side of the aqueduct are particularly high due to the valley through which Nettle Creek flows. Nettle Creek enters the Illinois River approximately one-quarter of a mile south of the aqueduct. The East Fork of Nettle Creek enters the main branch a short distance north of the aqueduct.

2. Historic Landscape Design: The aqueduct presents a narrowing point of the canal prism, and it has several structural features running off of it that are intended to stabilize the embankments and funnel boat traffic into the aqueduct. Steel sheet piling extends off the west end of the aqueduct's trunk for a distance of about 75'. Construction plans suggests that the sheet piling has been in place since at least 1947. On the eastern end of the aqueduct, there is a poured concrete retaining wall that runs along the north bank of the canal for a distance of 12'-6". The angle of this retaining wall mirrors the flared eastern end of the aqueduct.

   Graveled pathways run along the top of the embankments on both sides of the canal. The southern of these follows the historic towpath and is aligned to the vehicle bridge on the aqueduct. Traffic along the northern path is accommodated by the aqueduct's pedestrian walkway.

3. Outbuildings: The aqueduct has no outbuildings associated with it. However, it does have a spillway and waste gates located directly downstream, or west, of it, which were constructed in 1947, as replacement of those built in 1938-1939. These features may be impacted by the proposed demolition of the aqueduct. The spillway is located approximately 60' downstream (west) of the aqueduct. Its purpose is to allow the discharge water during periods of excessive rainfall, thereby preventing overflows on the canal. The spillway extends off the south side of the canal and runs for a distance of 40', where it discharges over the southern wing wall of the west abutment. The route of the spillway is slightly

[72] M. V. Ahlvin to V. D. Ehringer, 16 December 1937, File No. 703, IMCR, WCHS.

curved so that either end is aligned squarely to both the canal and the abutment. The spillway is constructed of poured concrete[73] and essentially represents a large box drain. On the interior, it measures 3'-8" tall and 6'-0" wide. The walls are 8" to 9" thick. The northern end of the spillway has a concrete cap in order to allow traffic to cross it. Originally, the cap was only 9' wide, but it later was extended an additional 6'.[74] A pair of waste gates is positioned on the northern end of the spillway. The waste gates are wood frame and are operated by hand using with ratchet gears. Although the existing gates likely do not date from the 1930s, they are identical to the ones depicted in the original design plans, copies of which are included in the supplemental materials.

Part III. SOURCES OF INFORMATION

A. Original Architectural Drawings: Three sheets of original architectural drawings related to the 1938-1939 rebuilding of the aqueduct were found on file with the Will County Historical Society. However, these sheets are specific to the waste gates and spillway located adjacent to the aqueduct, as opposed to the aqueduct itself (see Supplemental Materials GR-2014-1-S13 through S23). Architectural drawings for later modifications to the aqueduct—dating from 1947, 1954, and 1997—exist as well (see Supplemental Materials GR-2014-1-S24 through 30 and S32 through S36).

B. Early Views: No early photographs of the existing, reinforced concrete aqueduct were located during the course of the IL HAER documentation. However, the documentary research did find historic photographs of previous incarnations of the structure (both wood truss and steel frame) dating from the late nineteenth and early twentieth centuries. Copies of these images are attached in the Supplemental Materials (see GR-2014-1-S5 through S9)

C. Interviews: No interviews were conducted.

D. Bibliography:

1. Primary and Unpublished Sources:

Canal Commissioners. "Report of the Canal Commissioners," in *Reports to the General Assembly of Illinois, 1877.* Springfield: State of Illinois, 1877.

[73] The spillway was formed up using 5-¼"-wide planking. Several large knot holes were present in this planking, which were covered with circular patches of metal, presumed to be the bottoms of "tin" cans.

[74] The extension of the concrete cap was formed up with sheets of plywood, in contrast to the narrower planking used in the original construction.

_____. *Report of the Canal Commissioners of the State of Illinois*. Springfield: Canal Commissioners. 1882-1916.

Daily Illinois State Journal. Springfield, Illinois. 21 January 1868.

Daily Illinois State Register. Springfield, Illinois. 30 April 1851.

Federal Emergency Management Agency (FEMA). "Nettle Creek Aqueduct Demolition and Reconstruction, DR-4116-IL, PW 1265, Morris, Grundy County, Illinois." 16 April 2014.

Frauenhoffer & Associates. *I & M Canal Rehabilitations, Nettle Creek Aqueduct*. Prepared for Illinois Capital Development Board. 1997.

Illinois and Michigan Canal Records (IMCR)

1841 "Flagged Survey—Dresden to Pinney's Station. Record Group 491.106. Illinois State Archives (ISA), Springfield.

[1848] Plat of the Illinois and Michigan Canal. Three volumes. Record Group 491.106. Illinois State Archives, Springfield.

Reports of the Commissioners and Trustees to the Governor 1845-1848. Record Group 491.010, Illinois State Archives, Springfield.

Reports of the Commissioners and Trustees to the Governor 1849-1854. Record Group 491.010, Illinois State Archives, Springfield.

Reports of the Commissioners and Trustees to the Governor 1855-1868. Record Group 491.010, Illinois State Archives, Springfield.

Survey and Field Notes. Record Group 4191.108. Illinois State Archives.

File No. 703 (Aqueducts). Will County Historical Society, (WCHS), Lockport, Illinois.

Illinois Department of Public Works and Buildings and National Park Service. *Nettle Creek I & M Canal Spillway*. 1939. [Copy on file at Will County Historical Society, Lockport, Illinois].

Illinois Department of Public Works and Buildings, Division of Waterways. *Footbridge Across the I & M Canal Aqueduct at Nettle Creek.* 1954. [Copy on file at Illinois State Archives, Springfield].

_____. *Repairs to the I & M Aqueduct Over Nettle Creek.* 1947 [Copy on file at Illinois State Archives, Springfield].

National Park Service and Illinois Department of Public Works and Buildings. *Waste Gates at Nettle Creek Aqueduct*. 1938. [Copy on file at Will County Historical Society, Lockport, Illinois.]

Rockford Morning Star. Rockford, Illinois. 6 April 1947.

Tow Path Topics. August 1939.

2. Secondary and Published Sources:

Baskin, O. L. Baskin and Company. *History of Grundy County*. Chicago: O. L. Baskin and Company, 1882.

Howe, Walter A. *Documentary History of the Illinois and Michigan* Canal Springfield: Division of Waterways, 1956.

Schoerer, Blanche, Grant Peterson, and S. Sydney Bradford. *National Register of Historic Places Inventory Nomination Form: Illinois and Michigan Canal.* Washington, D.C.: National Park Service, 1976.

Sereno, Ken and Deborah Steffes. *Morris: A Nostalgic Portrait*. St. Louis: G. Bradley Publishing Company, 2007.

Stratton, Christopher and Floyd Mansberger. *An Archaeological Resource Management Plan for the Illinois and Michigan Canal State Trail.* Springfield: Fever River Research, 2001.

United States Geological Survey (USGS). *Morris, Illinois Quadrangle*. 7.5 minute series. Washington, D. C.: United States Geological Survey, 1993.

Webster, Noah. *An American Dictionary of the English Language.* Springfield, Massachusetts: George and Charles Merriam, 1854.

E. Likely Sources Not Yet Investigated: The Illinois and Michigan Canal records at the Illinois State Archives and Will County Historical Society are extensive but only partially indexed, and time did allow for these records to be thoroughly explored for all references

to the Nettle Creek Aqueduct. Additional information related to the aqueduct, beyond that presented in the IL HAER documentation, no doubt could be found in these collections (particularly in respect to the earlier generations of aqueducts over Nettle Creek).

Another potential source of information not investigated is CCC project reports, which are inventoried as Record Group 79 at the National Archive's College Park (Maryland) facility. CCC project superintendents routinely submitted narrative reports to Washington, D. C. describing the character of the work being undertaken by their respective commands, and it is very likely that the construction of the Nettle Creek Aqueduct is discussed in the reports for the company(s) involved. Photographs, showing work-in-progress and before-and-after views, often were attached to the narrative reports or were incorporated into a project album. Some of the CCC project photographs for the Illinois and Michigan Canal are on file with the Howard and Louis Adelman Regional History Collection at Lewis University (Romeoville, Illinois). The latter collection also contains many other photographs and images of the canal, some of which may be of the Nettle Creek Aqueduct.

Newspapers represent another source of information on the aqueduct. The limited newspaper research done for the project suggests that major repair and reconstruction work on the aqueduct (and the oft-related breaks in the canal) received attention from newspapers as far away as Rockford and Springfield. Morris and Chicago-area newspapers have not been researched, but these publications likely contain a wealth of additional information on the aqueduct over time. Relevant newspaper articles might help identify the different contractors and suppliers who were involved with the different construction episodes, as well providing other details on the structure.

Part IV. METHODOLOGY OF RESEARCH

A. Research Strategy: The research strategy involved two basic components: a field investigation of the aqueduct, and documentary research. The field investigation would entail a physical documentation of the aqueduct through digital photographs and scaled line drawings intended to compliment any pre-existing architectural/engineering drawings that might exist for the structure. Major goals of the documentary research included locating historic images of the aqueduct (including maps, photographs, and original construction plans), identifying key construction episodes, and determining the evolution of the structure through time. It was expected that much of the documentary research would be conducted at the Illinois State Archives and Will County Historical Society, as these two institutions are the principal repositories for official Illinois and Michigan Canal records.

B. Actual Research Process: The actual research process essentially followed the proposed research strategy. An initial field visit to the aqueduct was made in early May 2014 in

order to take digital photographs of the structure and surrounding site before the vegetation had fully leafed out. A more extensive field investigation was made in September 2014, at which time additional digital photographs were taken and scaled line drawings were prepared. The Will County Historical Society was visited in conjuncture with the September field investigations, and this yielded considerable information related to the 1938-1939 rebuilding of the aqueduct. Additional research later was conducted at the Illinois State Archives and Illinois State Library in Springfield.

C. Archives and Repositories Used: A number of archives and repositories were utilized as part of this project. In Springfield, these included the Illinois State Archives, which holds primary documents related to the construction and operation of the Illinois and Michigan Canal, and the Illinois State Library in Springfield, which has published copies of the annual reports submitted by the Canal Commissioners to the Governor. The State Archives yielded a wealth of information on the early history of the Nettle Creek Aqueduct, which was found to have a troubled history (at least in respect to maintenance) almost from the date of its construction. The Will County Historical Society in Lockport, Illinois also was used. The latter institution occupies the old headquarters building for the Illinois and Michigan Canal, and, as stated previously, it too has an extensive collection of primary canal records. Much of the information concerning the construction of the existing 1930s-era aqueduct that is included in the IL HAER outline was obtained from this repository. Sandy Vasko, current president of the Will County Historical Society, was very generous in making these materials so accessible and is owed our thanks.

D. Research Staff:

1. Primary Preparer: The written IL-HAER outline presented here primarily was prepared by Christopher Stratton of Fever River Research. All aspects of this project were coordinated by, and under the direct supervision of Floyd Mansberger, principal investigator, Fever River Research, Inc., P.O. Box 5234, Springfield, Illinois, 62705.

2. Photographer: Floyd Mansberger, Fever River Research, was responsible for all of the photographs taken for this project. Capital Blueprint (Springfield, Illinois) printed the digital images attached to the documentation package.

3. Delineator: Drawings of the aqueduct attached as Figures 2 and 3 were prepared from measurements and notes taken in the field by Mansberger and Stratton. The drawings were digitized by Stratton using AutoCad software.

4. Additional Staff: All Fever River Research personnel involved in the preparation of this IL-HAER report have been mentioned in the preceding sections. Dr. Harold Hassen, Cultural Resources Coordinator with the IDNR, provided copies of several sets of plans related to the Nettle Creek Aqueduct, which were obtained

from the Illinois State Archives and have been integrated into the Supplemental Materials for the IL HAER documentation package.

Part V. PROJECT INFORMATION

During a period between April 16 and May 5, 2013, north-central Illinois experienced severe storms that caused widespread flooding in the region. Flood waters within the Illinois and Michigan Canal and in Nettle Creek ultimately weakened the east abutment of the Nettle Creek Aqueduct and undercut it, thereby causing the trunk of the aqueduct to collapse. Hydrological studies determined that the narrow span of the aqueduct had contributed to repeated flooding in Morris (by restricting the flow of Nettle Creek), and this concern was now compounded by the ruinous state of the structure. The aqueduct's collapse had also interrupted the flow of water in the canal. The Illinois Department of Natural Resources (IDNR) subsequently proposed to demolish the ruined aqueduct and replace it with a new one whose span would be approximately twice as long. It was further proposed that stonework and other historic materials be salvaged from the old aqueduct and incorporated into the new one, or at least be emulated in the latter's design.

The proposed demolition and reconstruction of the Nettle Creek Aqueduct is to be funded in part by the Federal Emergency Management Agency (FEMA). A cultural resources evaluation conducted by FEMA noted that the aqueduct was included as a contributing resource in the documentation supporting the Illinois and Michigan Canal's designation as a National Historic Landmark in 1964 and its subsequent listing on the National Register of Historic Places in 1966. The study determined that the aqueduct, despite its damaged condition, still retained sufficient historic integrity for it to remain eligible to the National Register of Historic Places as a contributing feature of the Illinois and Michigan Canal. As such, the proposed demolition project would represent an adverse effect on a historic property. The State Historic Preservation Office (SHPO) and NPS later concurred with this determination.[75]

After consultation with FEMA, the Illinois Emergency Management Agency (IEMA), the IDNR, and the Midwest Regional Office of the NPS, the Illinois Historic Preservation Agency (IHPA) drafted a Memorandum of Agreement (MOA) regarding the proposed demolition of the Nettle Creek Aqueduct. This MOA stipulated that a Level III Illinois Historic American Engineering Record (IL HAER) documentation package be prepared for the Nettle Creek Aqueduct to mitigate the adverse effect of the proposed demolition. The MOA was signed by all consulting parties, and Fever River Research received notice to proceed in late August 2014.

This Illinois Historic American Engineering Record documentation project was undertaken to fulfill requirements stipulated in the subject MOA. The MOA was

[75] Federal Emergency Management Agency (FEMA), "Nettle Creek Aqueduct Demolition and Reconstruction, DR-4116-IL, PW 1265, Morris, Grundy County, Illinois" (16 April 2014).

executed and its terms carried out in order to ensure compliance by the participating state and federal agencies with the Illinois State Agency Historic Resources Preservation Act (20 ILCS 3420). The project was conducted by Fever River Research under contract with the IDNR.

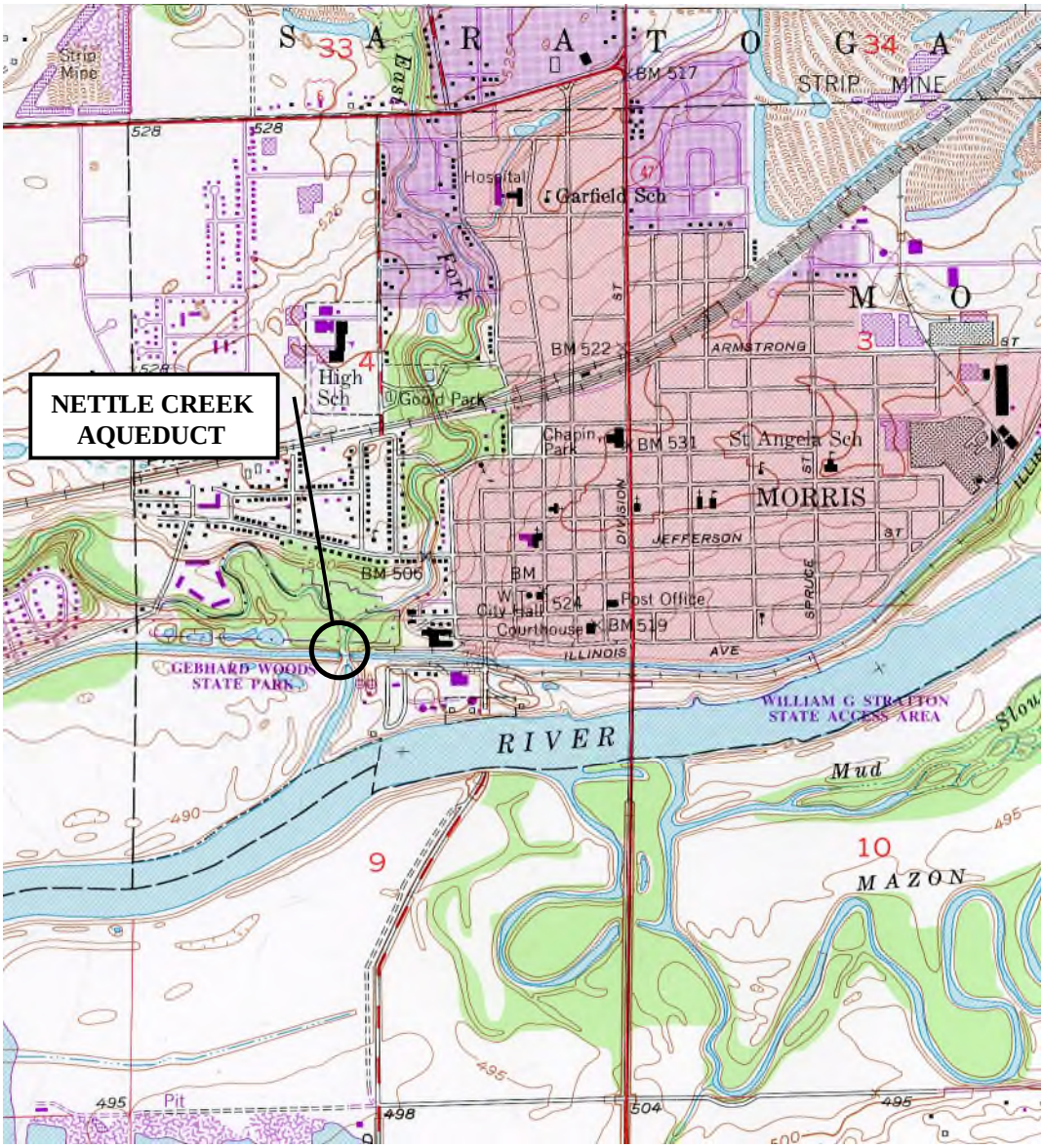

Figure 1. United States Geological Survey (USGS) 7.5 minute topographical map showing the location of the Nettle Creek Aqueduct (Morris, IL Quadrangle 1993).

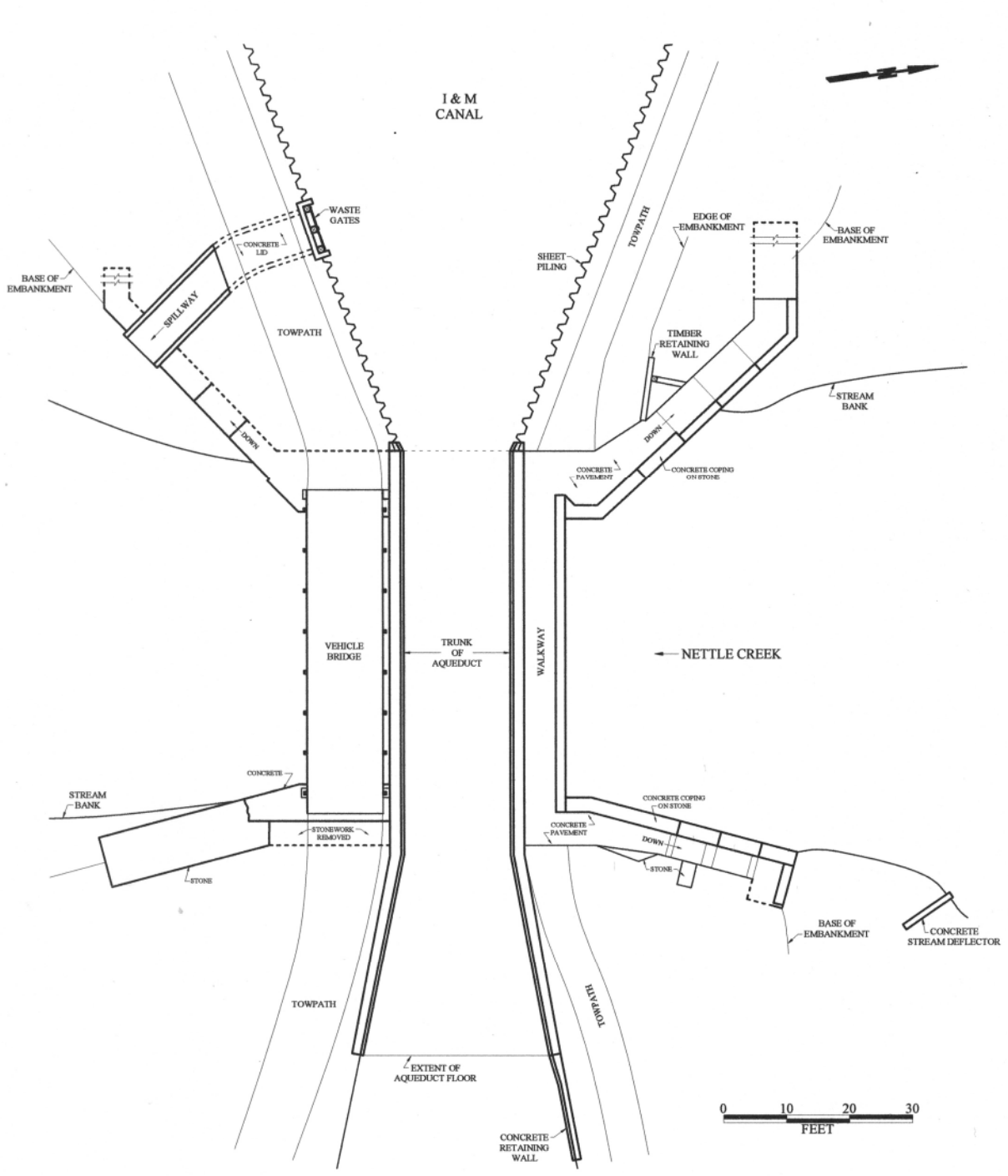

Figure 2. Plan of the Nettle Creek Aqueduct and associated features.

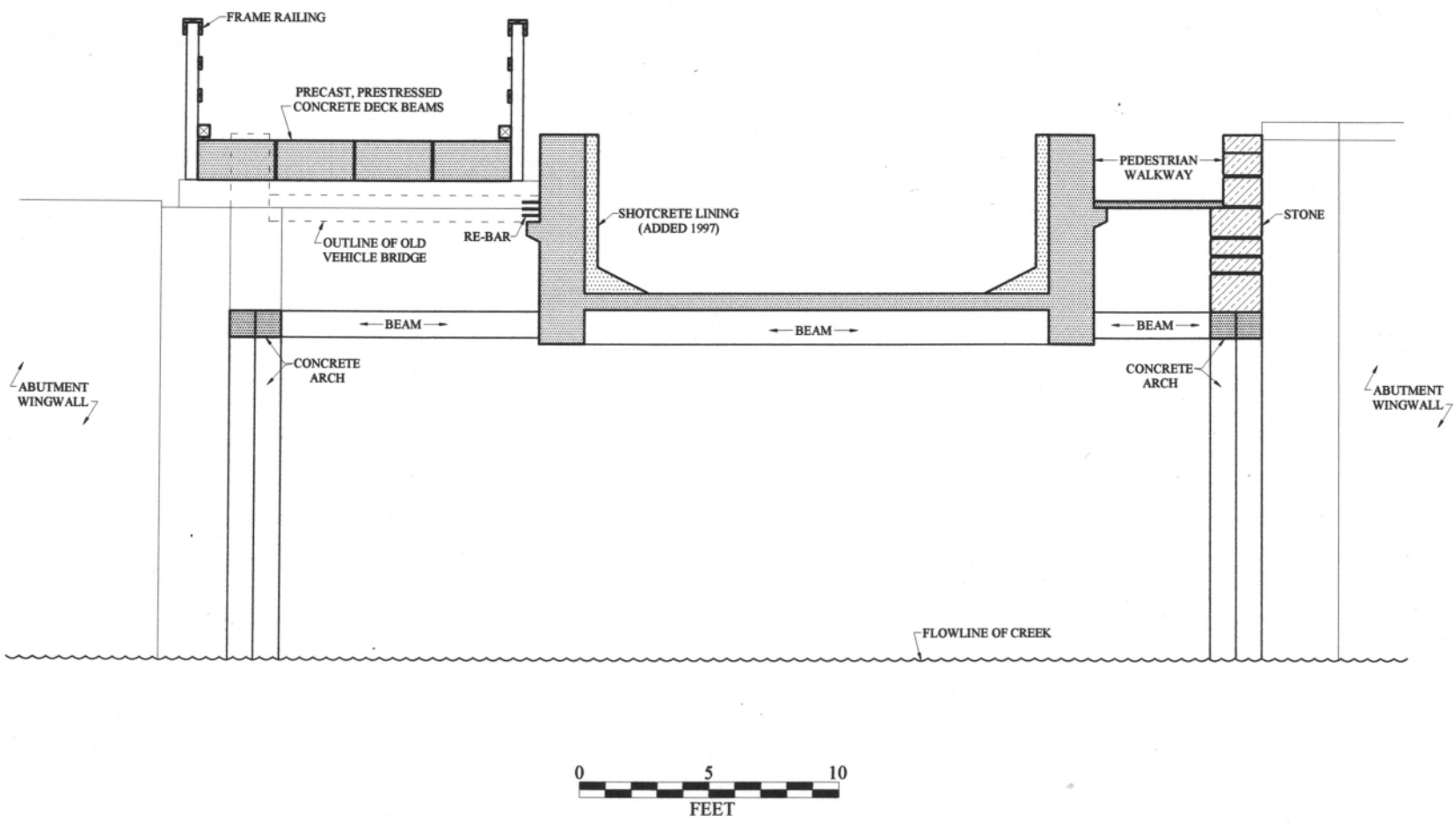

Figure 3. Sectional through the Nettle Creek Aqueduct, looking west. The abutment wingwalls are not shown in their entirety.

INDEX TO SUPPLEMENTAL MATERIALS

Nettle Creek Aqueduct — IL HAER No. GR-2014-1
Illinois and Michigan Canal State Trail
Morris
Grundy County
Illinois

GR-2014-1-S1 Detail of an 1841 map illustrating the surveyed route of the Illinois and Michigan Canal adjacent to Nettle Creek. The numbered flags on the map refer to the sections of the canal for which individual construction contracts were let. The map pre-dates the construction of the Nettle Creek Aqueduct. However, the structure's future location has been circled in red. This map provides a good depiction of settlement-era conditions immediately prior to the founding of Morris. The house labeled as "Armstrong's" to the east of the Nettle Creek, may have belonged to William E. Armstrong, who was awarded the contract for Section 125 and also participated in the construction of Section 126, as well that of the original aqueduct over Nettle Creek.[1]

GR-2014-1-S2 Sketch plan of the Nettle Creek Aqueduct and material estimates for the structure's "docking" (its wood lining), prepared in 1847. The plan shows the aqueduct as being much longer than ultimately it built, with two intermediate piers between the abutments. As built, the aqueduct had no piers.[2]

GR-2014-1-S3 Plan and elevation views prepared in 1847 for the abutments and piers on the Aux Sable Aqueduct (located six miles east of Nettle Creek). These plan are identical to that initially proposed for the Nettle Creek (and illustrated in the previous figure), but in this case actually were followed through on in respect to the piers. The elevation view at left provides the best evidence we have of what the abutments for the Nettle Creek Aqueduct may have looked like originally.[3]

GR-2014-1-S4 Plan and material estimates for an unnamed aqueduct, which is suspected to be that over Nettle Creek (1847). The plan calls for a shorter span with no piers, and this reflects what ultimately was built at Nettle Creek.[4]

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[1] Illinois and Michigan Canal Records, "Flagged" Survey—Dresden to Pinney's Station. Record Group 491.106, Illinois State Archives, Springfield.
[2] Survey and Field Notes, Book A-50 (1847), Record Group 491.108, Illinois State Archives, Springfield.
[3] Ibid.
[4] Ibid.

GR-2014-1-S5 Detail of a circa-1848 plat of the Illinois and Michigan Canal showing the Nettle Creek Aqueduct and immediate vicinity. Note the two tracts of land to the east (right) of the aqueduct that are labeled "Reserved for Hydraulic Purposes" and "Dry Dock"; both front a wider section of the canal (called a "widewater") in Morris.[5]

GR-2014-1-S6 Two historic photographs of the Nettle Creek Aqueduct (looking south), likely dating from the late nineteenth century. These images capture the essence of the aqueduct's early design, with a frame trunk carried by a Howe Truss between two stone abutments. However, the structure actually had been rebuilt several times over by this point due to a series of devastating flood episodes and general decay. Note the ashlar stonework and regular coursing used for the abutments.[6]

GR-2014-1-S7 Two postcard views of the Nettle Creek Aqueduct taken after a break in the canal on its west end in the spring of 1910.[7]

GR-2014-1-S8 Another view of the Nettle Creek Aqueduct after the break in the canal in the spring of 1910. This image provides a good illustration of the manner in which the abutment wing walls were constructed.[8].

GR-2014-1-S9 Two views of the Nettle Creek Aqueduct showing the steel-frame structure that was installed in 1910. These photographs are undated but possibly were taken in the 1920s or early 1930s (based on the drastic leaks in the aqueduct's trunk). Both views show the north side of the aqueduct and look southeast. Note the addition of poured concrete along the lower part of the east abutment.[9]

GR-2014-1-S10 Two other photographs of the steel-frame aqueduct over Nettle Creek, possibly taken in the 1920s or early 1930s. Both views show the south side of the aqueduct and illustrate the vehicle bridge here. The downstream side of the bridge deck was carried by a Pratt Pony Truss.[10]

GR-2014-1-S11 Conceptual sketch for the proposed rebuilding of the Nettle Creek Aqueduct, produced in 1935 and showing the north elevation of the

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[5] Plat of the Illinois and Michigan Canal, Book 2 [1848], Record Group 491.106, Illinois State Archives, Springfield.
[6] Howard and Louis Adelman Regional History Collection, Lewis University, Romeoville, Illinois.
[7] Fever River Research, Springfield, Illinois.
[8] Grundy County Historical Society Collection. Published in: Ken Sereno and Deborah Steffes, *Morris: A Nostalgic Portrait* (St. Louis: S. Bradley publishing Company), p. 12.
[9] (TOP) Photo received from Dr. Harold Hassen (IDNR), as copied from Illinois State Archives (Record Group 244?); (BOTTOM) Fever River Research, Springfield, Illinois.
[10] Photos received from Dr. Harold Hassen, as copied from Illinois State Archives (Record Group 244?).

structure. The dual arches shown here were not adopted for the final design; a single arch was employed instead.[11]

GR-2014-1-S12 Sectional view for the proposed rebuilding of the Nettle Creek Aqueduct, drawn in 1935. This view looks west and shows a pedestrian walkway at right, canal trunk in center, and vehicle bridge at right. This drawing provides a rough approximation of the aqueduct's final design, though there were some deviations from it.[12]

GR-2014-1-S13 Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 1* (1938), showing the southwest corner of the Nettle Creek Aqueduct. This view provides a good, though partial, illustration of how the south side of the rebuilt aqueduct initially appeared. Note the irregularly coursed stonework employed by the CCC. The discharge tube for the waste gates appears on top of wing wall at left.[13]

GR-2014-1-S14 Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 1* (1938), showing plan of waste gates and discharge tube at the west end of the aqueduct. Note the proposed addition of an 18" stone veneer over the existing wing wall.[14]

GR-2014-1-S15 Details of *Waste Gates at Nettle Creek Aqueduct, Sheet 1* (1938). (LEFT) Sectional view through a proposed concrete retaining wall adjacent to the waste gates (see Section "C-C" on previous figure). (RIGHT) Detail of the drip key at end of the waste discharge tube. This drawing also indicates the veneer to be added to the existing wing wall.[15]

GR-2014-1-S16 Details of *Waste Gates at Nettle Creek Aqueduct, Sheet 1* (1938), showing sectionals through the discharge tube associated with the waste gates.[16]

GR-2014-1-S17 Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 2* (1938), showing upstream (canal side) of the waste gates.[17]

GR-2014-1-S18 Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 2* (1938), showing sectional through the waste gate and discharge tube.[18]

GR-2014-1-S19 Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 2* (1938), showing sectional through downstream side of the waste gates.[19]

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[11] Plans received from Dr. Harold Hassen, as copied from Illinois State Archives (Record Group 244?).
[12] Ibid.
[13] National Park Service and Illinois Department of Public Works and Buildings, *Waste Gates at Nettle Creek Aqueduct* (1938), Sheet 1. Copy on file at Will County Historical Society, Lockport, Illinois.
[14] Ibid.
[15] Ibid.
[16] Ibid.
[17] Ibid, Sheet 2.
[18] Ibid.

GR-2014-1-S20 Details of *Waste Gates at Nettle Creek Aqueduct, Sheet 2* (1938), showing sectional through upper and lower parts of the gates.[20]

GR-2014-1-S21 Plan of proposed modifications to the Nettle Creek spillway (1939).[21]

GR-2014-1-S22 Sectional/elevation view of the proposed modification to the Nettle Creek spillway (1939). The modifications called for the spillway to be extended to grade, as opposed to terminating at the edge of the abutment wing wall.[22]

GR-2014-1-S23 Sectionals through the Nettle Creek spillway, based on proposed modifications (1939). Plans called for a stone veneer to be applied over the concrete walls of the spillway. This stone veneer is lacking on the existing structure.[23]

GR-2014-1-S24 Cross sections of the Nettle Creek Aqueduct done in preparation of repairs planned in 1947.[24]

GR-2014-1-S25 Cross sections of the Nettle Creek Aqueduct done in preparation of repairs planned in 1947.[25]

GR-2014-1-S26 *Repairs to the I & M Aqueduct Over Nettle Creek, Sheet 2 of 5* (1947).[26]

GR-2014-1-S27 *Repairs to the I & M Aqueduct Over Nettle Creek, Sheet 3 of 5* (1947).[27]

GR-2014-1-S28 *Repairs to the I & M Aqueduct Over Nettle Creek, Sheet 4 of 5* (1947).[28]

GR-2014-1-S29 *Repairs to the I & M Aqueduct Over Nettle Creek, Sheet 5 of 5* (1947).[29]

GR-2014-1-S30 *Footbridge Across I & M Canal Aqueduct at Nettle Creek, Structural Details, Sheet 2 of 2* (1954).[30]

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[19] Ibid.
[20] Ibid.
[21] Illinois Department of Public Works and Buildings and National Park Service, *Nettle Creek I & M Canal Spillway* (1939). Copy on file at Will County Historical Society, Lockport, Illinois.
[22] Ibid.
[23] Ibid.
[24] Plan received from Dr. Harold Hassen, as copied from Illinois State Archives (Record Group 244?).
[25] Ibid.
[26] Illinois Department of Public Works and Buildings, Division of Waterways, *Repairs to the I & M Aqueduct Over Nettle Creek* (1947), Sheet 2. Copy on file at Illinois State Archives, Springfield.
[27] Ibid, Sheet 3.
[28] Ibid, Sheet 4.
[29] Ibid, Sheet 5.
[30] Illinois Department of Public Works and Buildings, Division of Waterways, *Footbridge Across the I & M Canal Aqueduct at Nettle Creek, Structural Details* (1954), Sheet 2. Copy on file at Illinois State Archives, Springfield.

GR-2014-1-S31 Photograph of the Nettle Creek Aqueduct, taken circa 1974. By this date, the bridge deck on the south side of the aqueduct apparently had been removed.[31]

GR-2014-1-S32 *I & M Canal Rehabilitations, Nettle Creek Aqueduct—Site Plan* (1997).[32]

GR-2014-1-S33 *I & M Canal Rehabilitations, Nettle Creek Aqueduct—Existing Reflected Plan* (1997).[33]

GR-2014-1-S34 *I & M Canal Rehabilitations, Nettle Creek Aqueduct—Abutments and Wing Walls* (1997).[34]

GR-2014-1-S35 *I & M Canal Rehabilitations, Nettle Creek Aqueduct—Details* (1997).[35]

GR-2014-1-S36 *I & M Canal Rehabilitations, Nettle Creek Aqueduct—Details* (1997).[36]

GR-2014-1-S37 Modern-day views of the Nettle Creek Aqueduct, showing conditions prior to the 2013 flood event. (TOP) View of the north elevation in 2012. (BOTTOM) View of the south elevation in 2009.[37]

GR-2014-1-S38 Additional modern-day views of the aqueduct, showing pre-2013 conditions. (TOP) View looking east along the pedestrian walkway and trunk. (BOTTOM) View of the south elevation, looking northeast. The spillway can be seen at left.[38]

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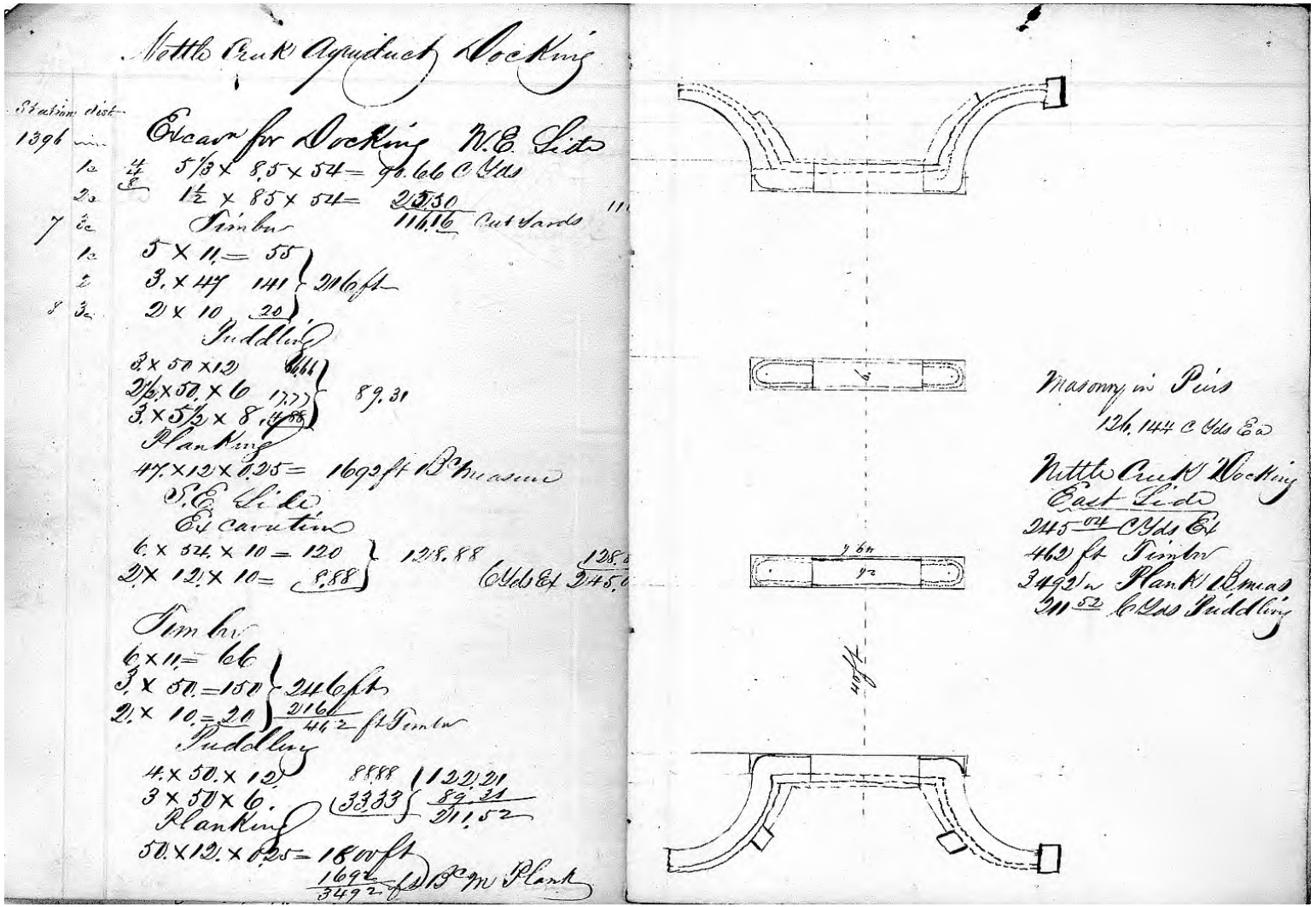
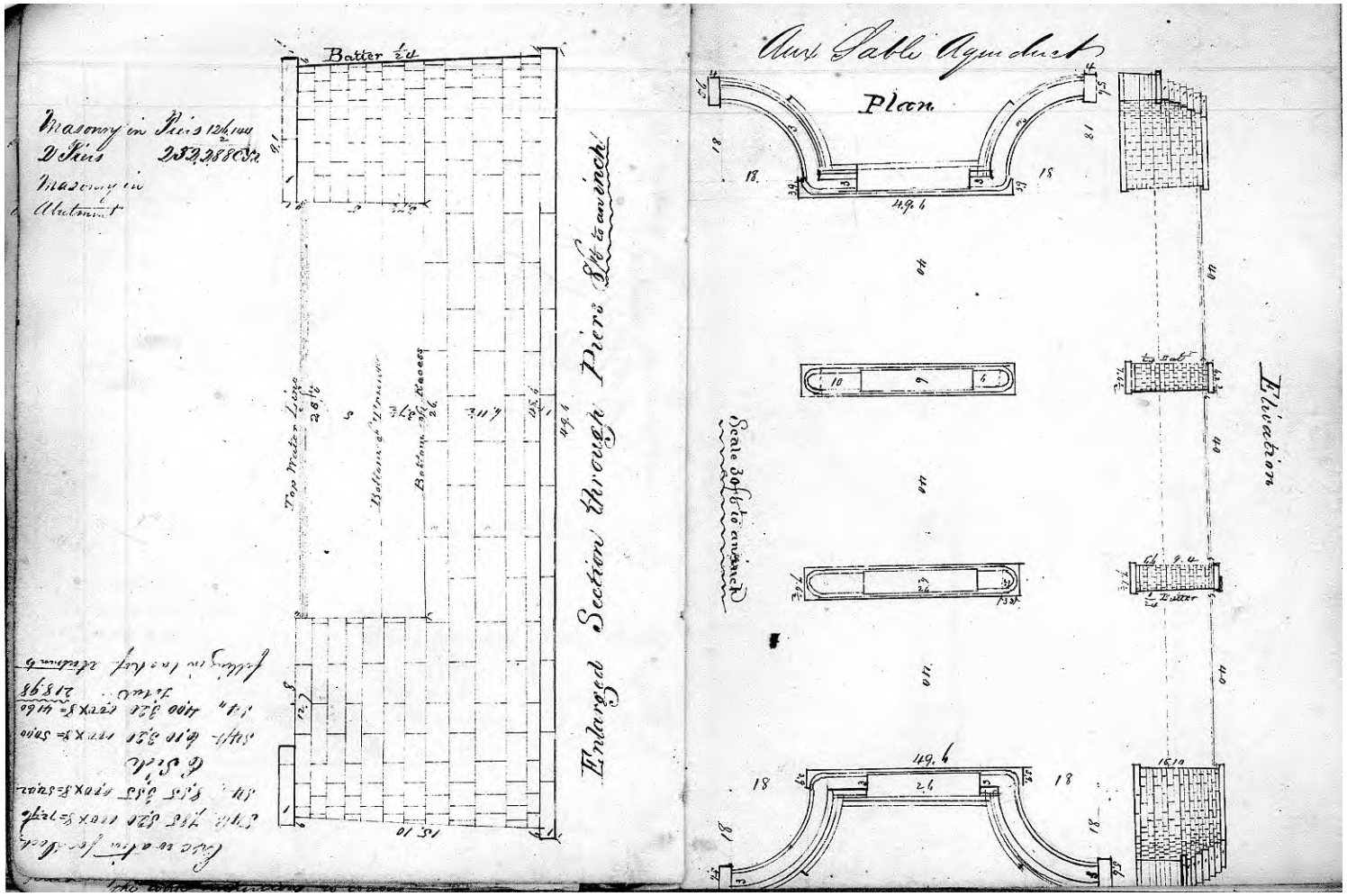
[31] Photo received from Dr. Harold Hassen, as copied from uncited report.
[32] Frauenhoffer & Associates, *I & M Canal Rehabilitations*, *Nettle Creek Aqueduct* (1997), Sheet S-15. Prepared for Illinois Capital Development Board.
[33] Ibid, Sheet S-16.
[34] Ibid, Sheet S-17.
[35] Ibid, Sheet S-18.
[36] Ibid, Sheet S-19.
[37] (TOP) Photo by Skip Burr, December 2012; (BOTTOM) Photo by Steve Conro, 16 June 2009 (www.bridgehunter.com).
[38] Photos taken by Skip Burr, December 2012 (www.bridgehunter.com)

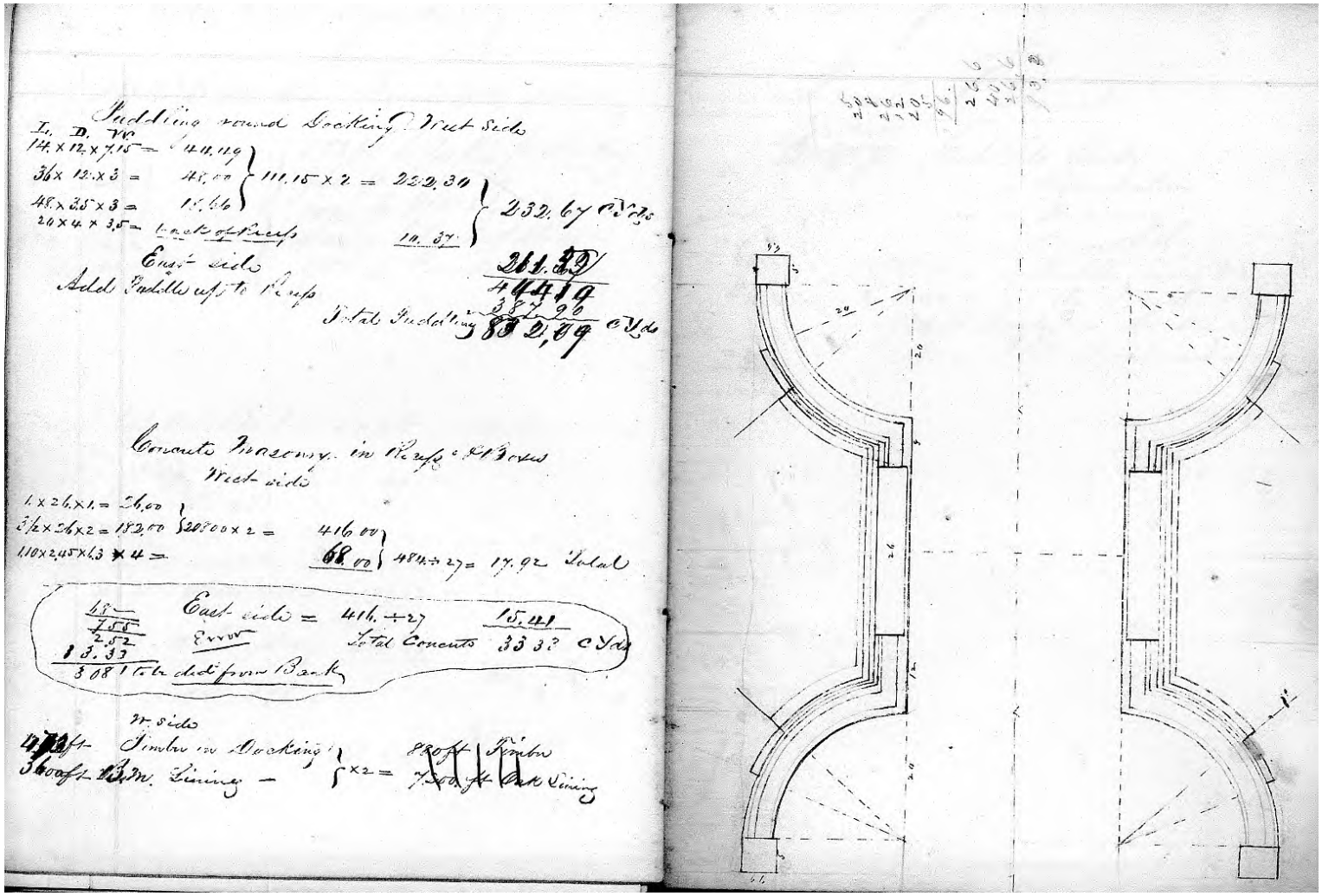
Detail of an 1841 map illustrating the surveyed route of the Illinois and Michigan Canal adjacent to Nettle Creek. The numbered flags on the map refer to the sections of the canal for which individual construction contracts were let. The map pre-dates the construction of the Nettle Creek Aqueduct. However, the structure's future location has been circled in red. This map provides a good depiction of settlement-era conditions immediately prior to the founding of Morris. The house labeled as "Armstrong's" to the east of the Nettle Creek, may have belonged to William E. Armstrong, who was awarded the contract for Section 125 and also participated in the construction of Section 126.



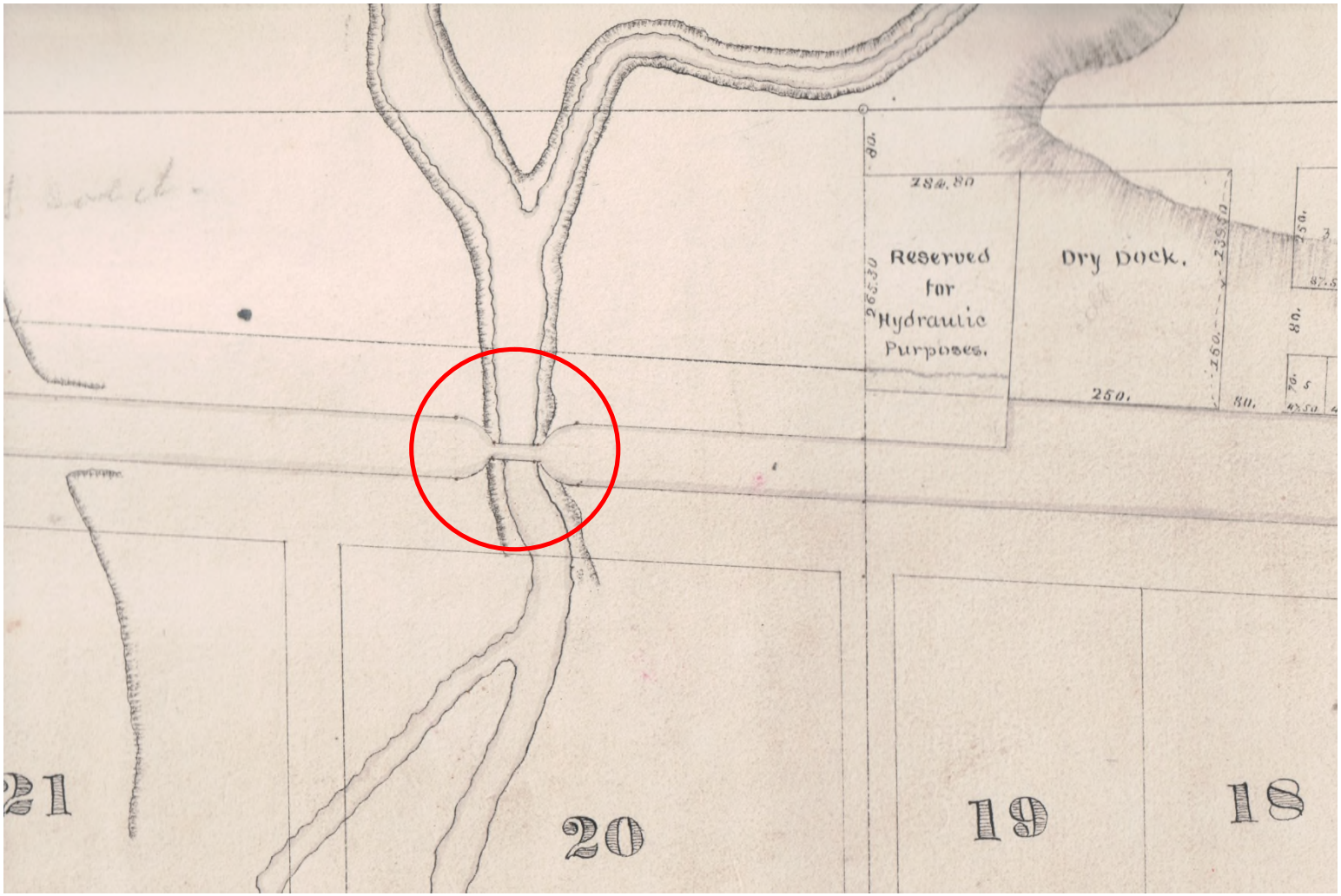
Sketch plan of the Nettle Creek Aqueduct and material estimates for the structure's "docking" (its wood lining), prepared in 1847. The plan shows the aqueduct as being much longer than ultimately it built, with two intermediate piers between the abutments. As built, the aqueduct had no piers (IMCR Survey and Field Notes, Book A-50 1847).



Plan and elevation views prepared in 1847 for the abutments and piers on the Aux Sable Aqueduct (located six miles east of Nettle Creek). These plan are identical to that initially proposed for the Nettle Creek (and illustrated in the previous figure), but in this case actually were followed through on in respect to the piers. The elevation view at left provides the best evidence we have of what the abutments for the Nettle Creek Aqueduct may have looked like originally (IMCR Survey and Field Notes, Book A-50 1847).

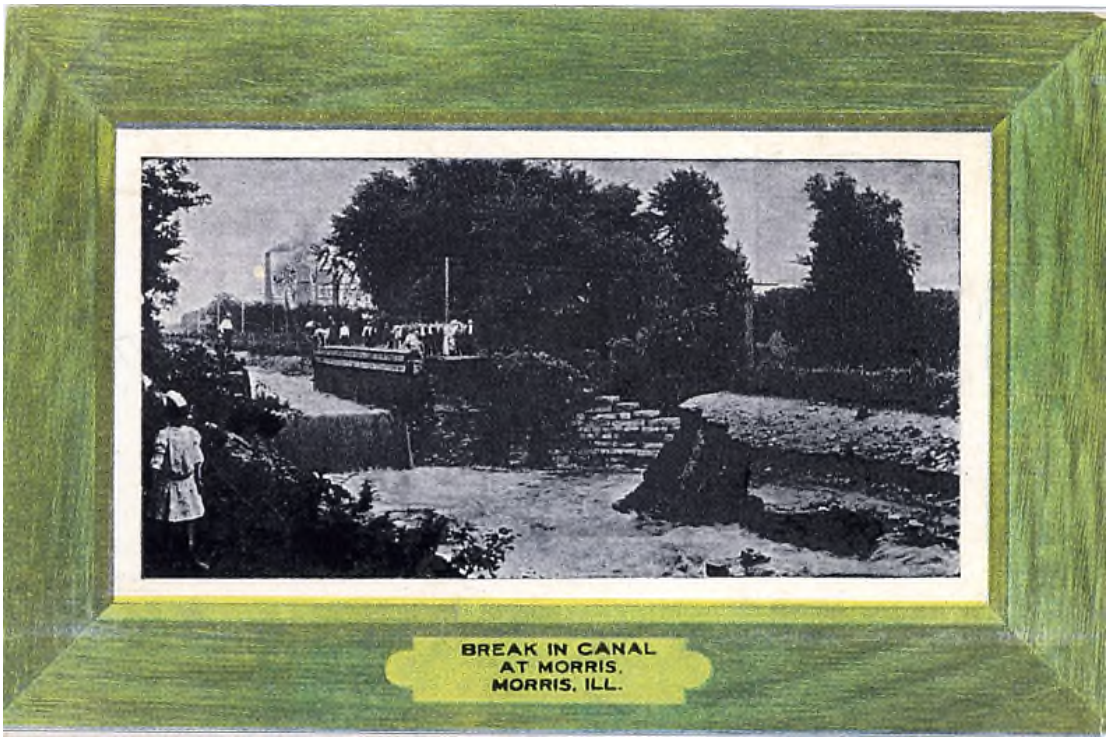


Plan and material estimates for an unnamed aqueduct, which is suspected to be that over Nettle Creek. The plan calls for a shorter span with no piers, and this reflects what ultimately was built at Nettle Creek (IMCR Survey and Field Notes, Book A-50 1847).



Detail of a circa-1848 plat of the Illinois and Michigan Canal showing the Nettle Creek Aqueduct and immediate vicinity. Note the two tracts of land to the east (right) of the aqueduct that are labeled "Reserved for Hydraulic Purposes" and "Dry Dock"; both front a wider section of the canal (called a "widewater") in Morris (IMCR, Plat of the Illinois and Michigan Canal, Book 2 [1848].

Two historic photographs of the Nettle Creek Aqueduct (looking south), likely dating from the late nineteenth century. These images capture the essence of the aqueduct's early design, with a frame trunk carried by a Howe Truss between two stone abutments. However, the structure actually had been rebuilt several times over by this point due to a series of devastating flood episodes and general decay. Note the ashlar stonework and regular coursing used for the abutments.

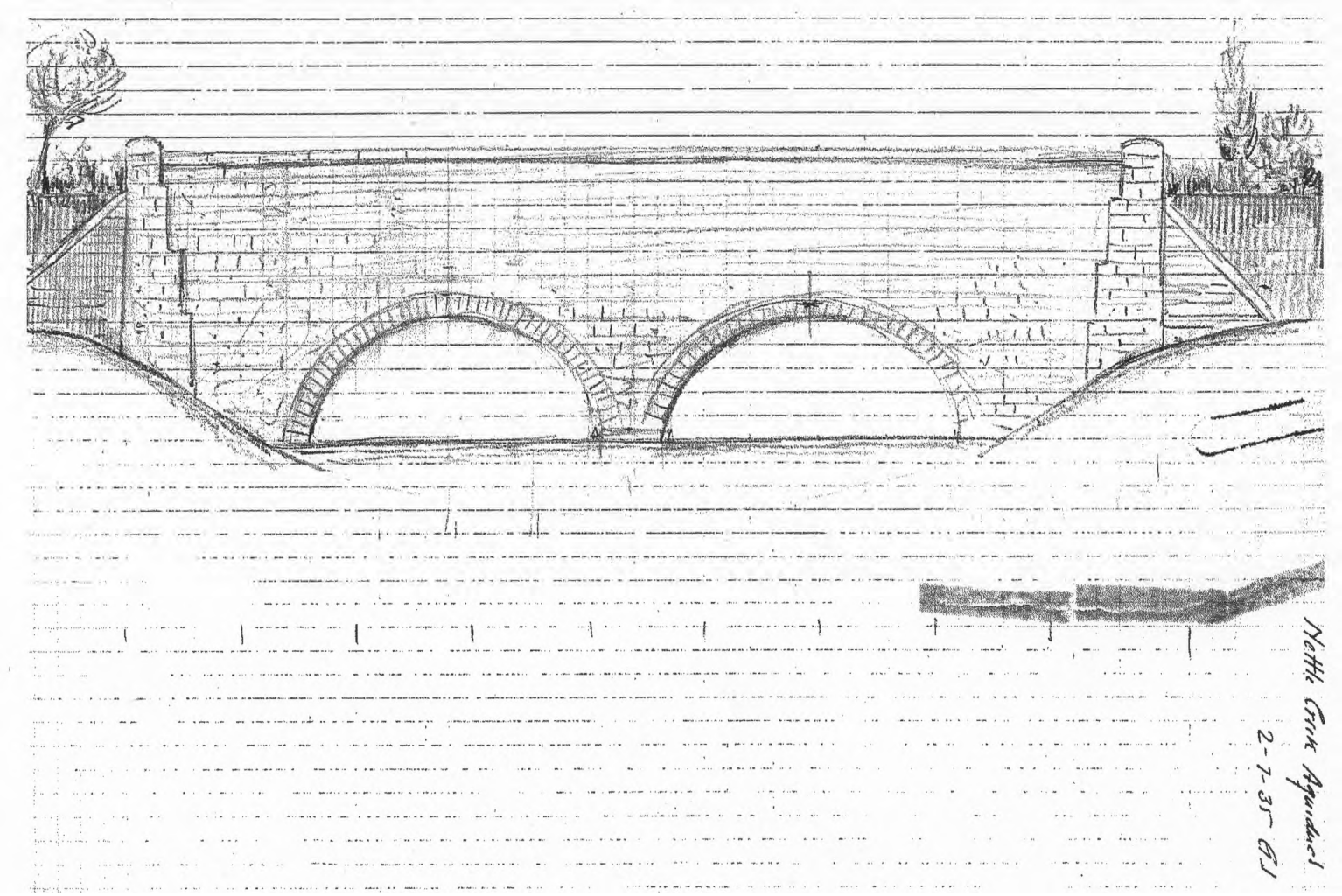


Two postcard views of the Nettle Creek Aqueduct taken after a break in the canal on its west end in the spring of 1910.

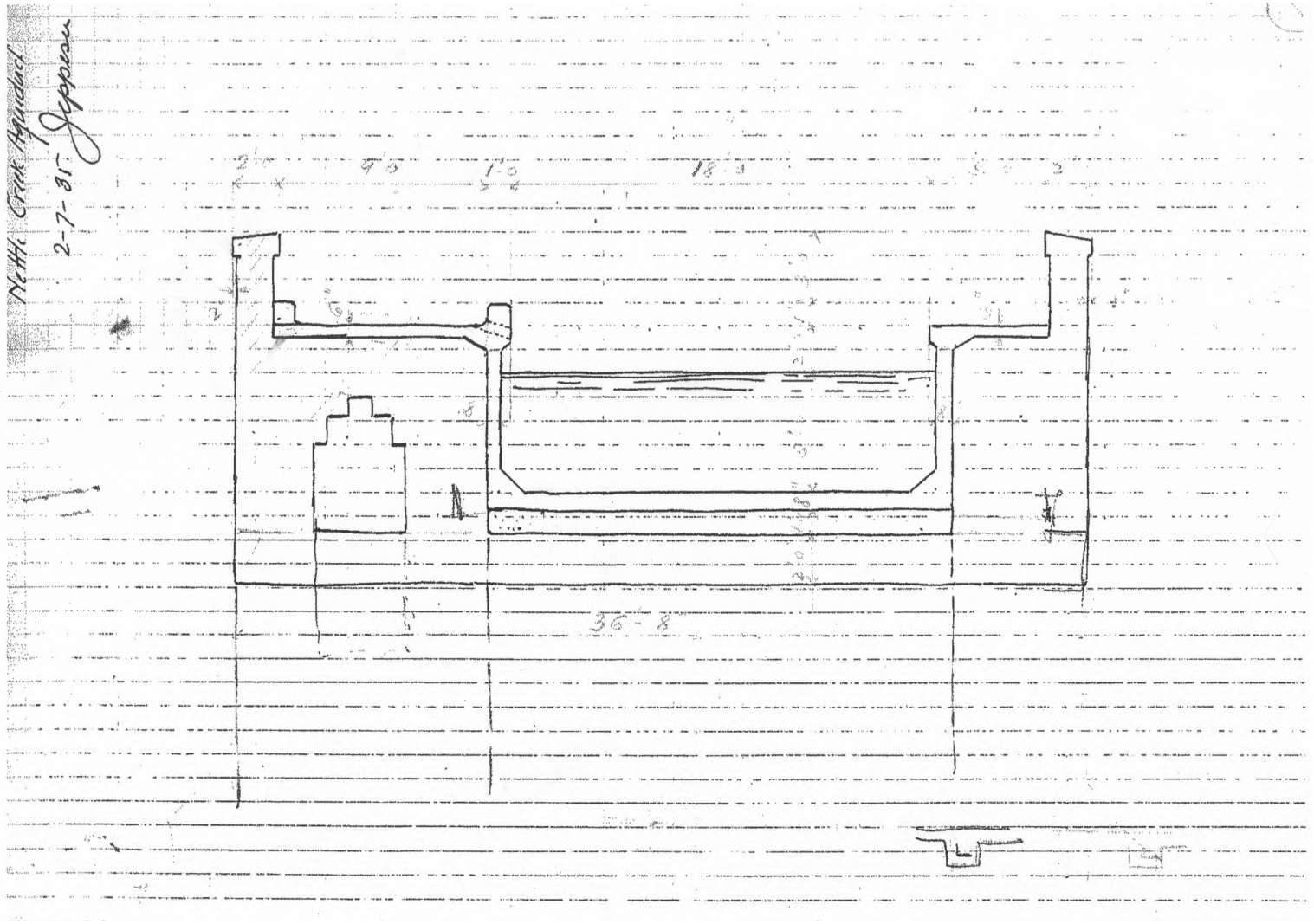
Another view of the Nettle Creek Aqueduct after the break in the canal in the spring of 1910. This image provides a good illustration of the manner in which the abutment wing walls were constructed.

Two views of the Nettle Creek Aqueduct showing the steel-frame structure that was installed in 1910. These photographs are undated but possibly were taken in the 1920s or early 1930s (based on the drastic leaks in the aqueduct's trunk). Both views show the north side of the aqueduct and look southeast. Note the addition of poured concrete along the lower part of the east abutment.

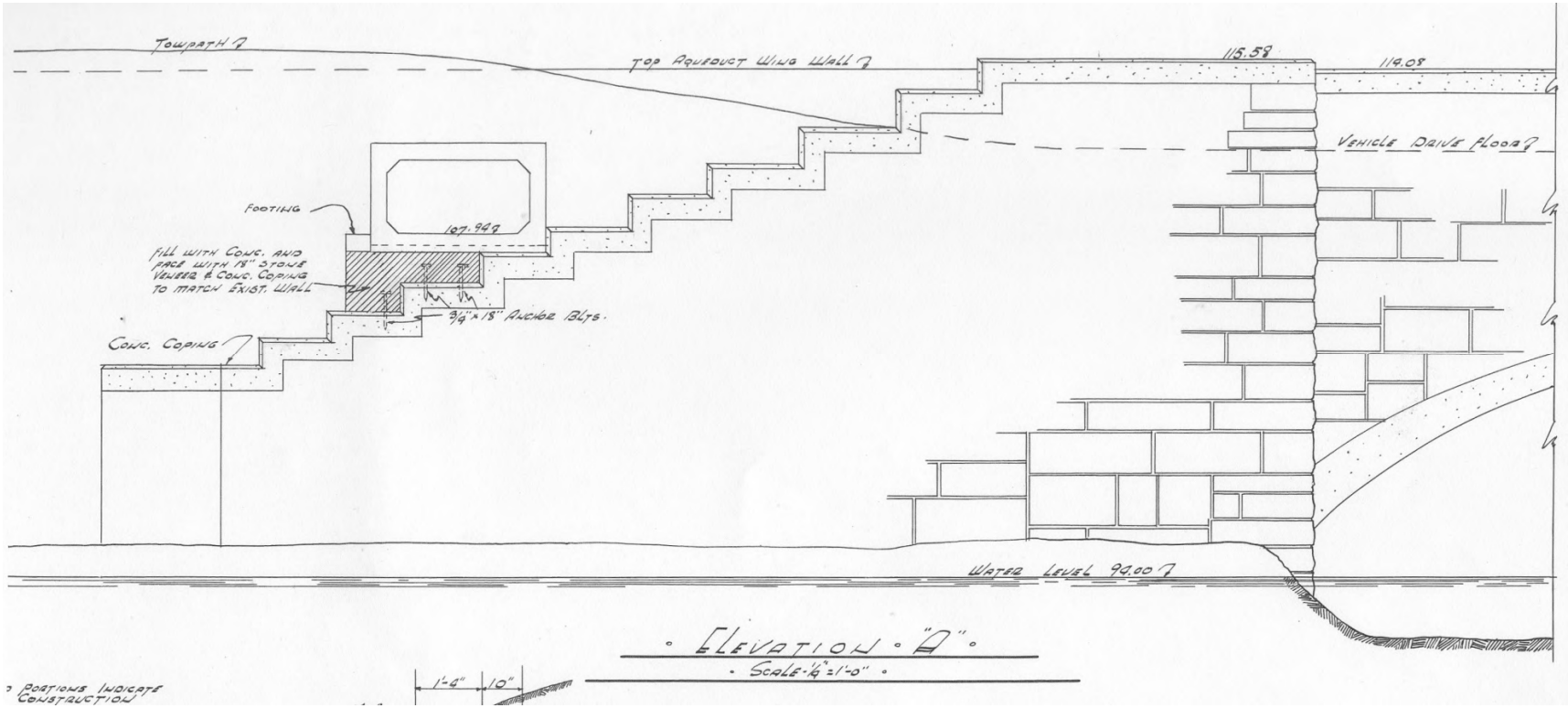
Two other undated photographs of the steel-frame aqueduct over Nettle Creek, possibly taken in the 1920s or early 1930s. Both views show the south side of the aqueduct and illustrate the vehicle bridge here. The downstream side of the bridge deck was carried by the Pratt Pony Truss.



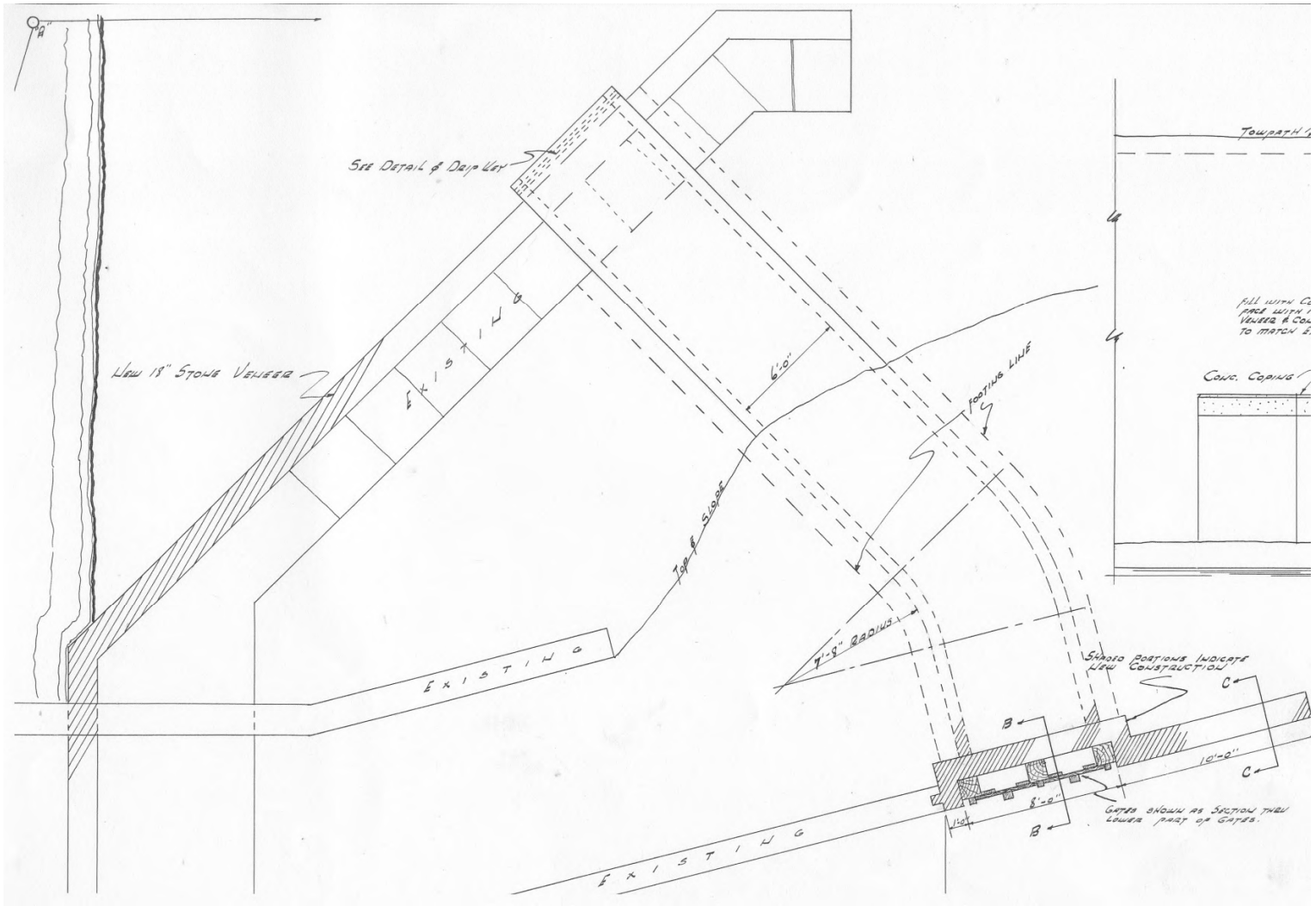
Conceptual sketch for the proposed rebuilding of the Nettle Creek Aqueduct, produced in 1935 and showing the north elevation of the structure. The dual arches shown here were not adopted for the final design; a single arch was employed instead (Illinois State Archives).



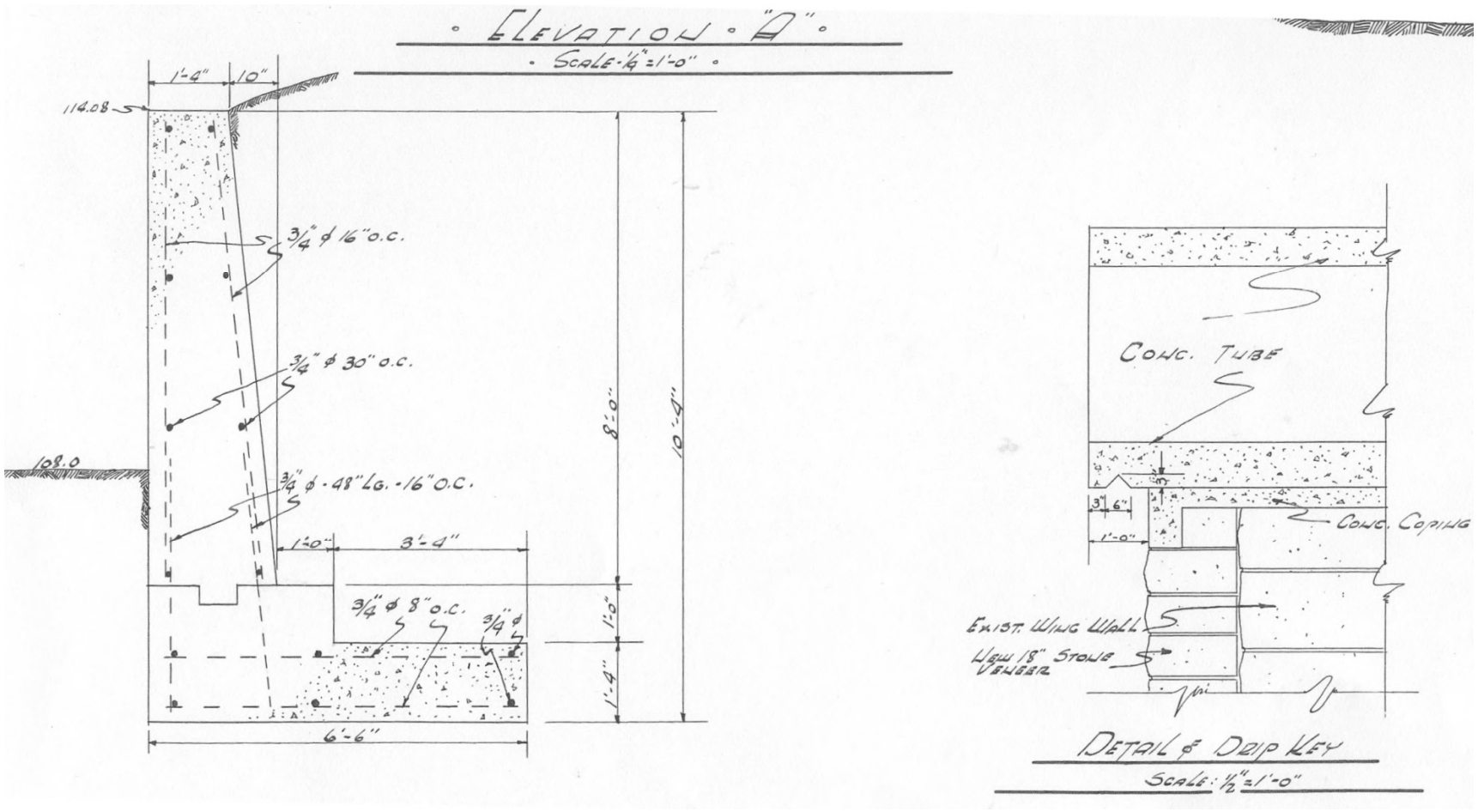
Sectional view for the proposed rebuilding of the Nettle Creek Aqueduct, drawn in 1935. This view looks west and shows a pedestrian walkway at right, canal trunk in center, and vehicle bridge at right. This drawing provides a rough approximation of the aqueduct's final design, though there were some deviations from it (Illinois State Archives).



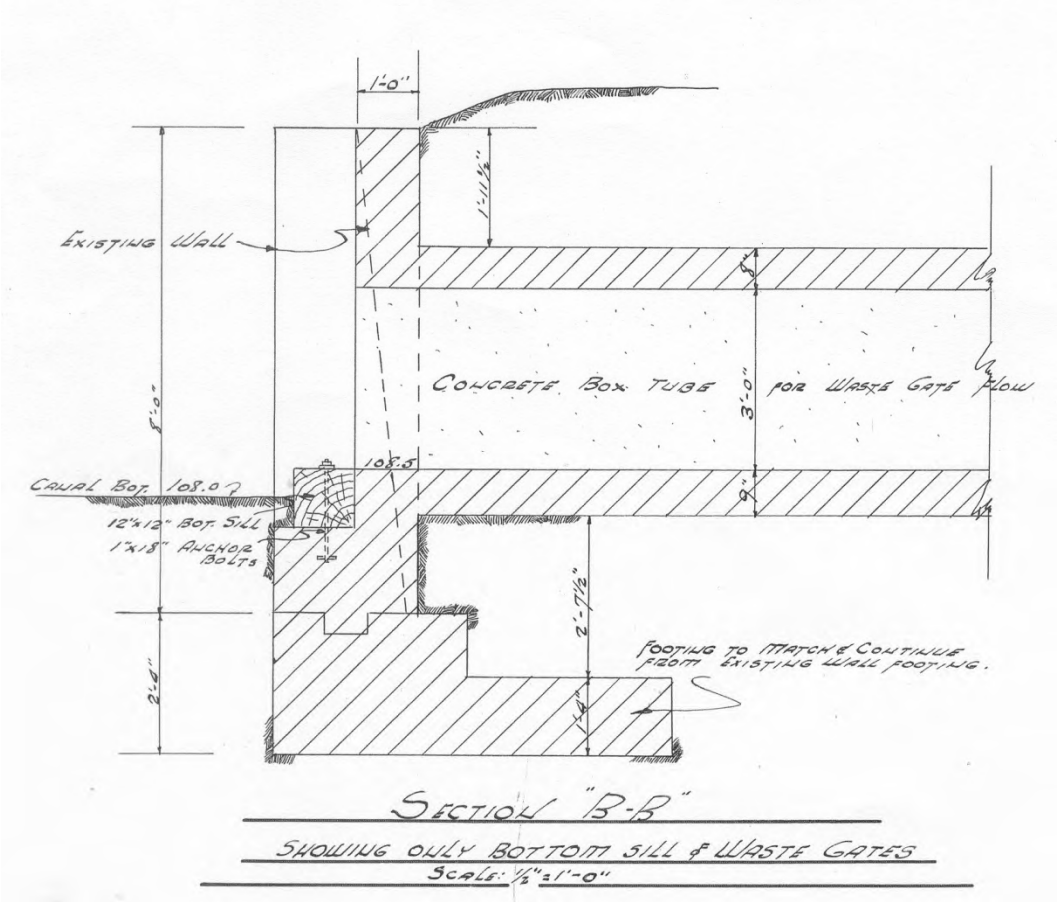
Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 1* (1938), showing the southwest corner of the Nettle Creek Aqueduct. This view provides a good, though partial, illustration of how the south side of the rebuilt aqueduct initially appeared. Note the irregularly coursed stonework employed by the CCC. The discharge tube for the waste gates appears on top of wing wall at left.

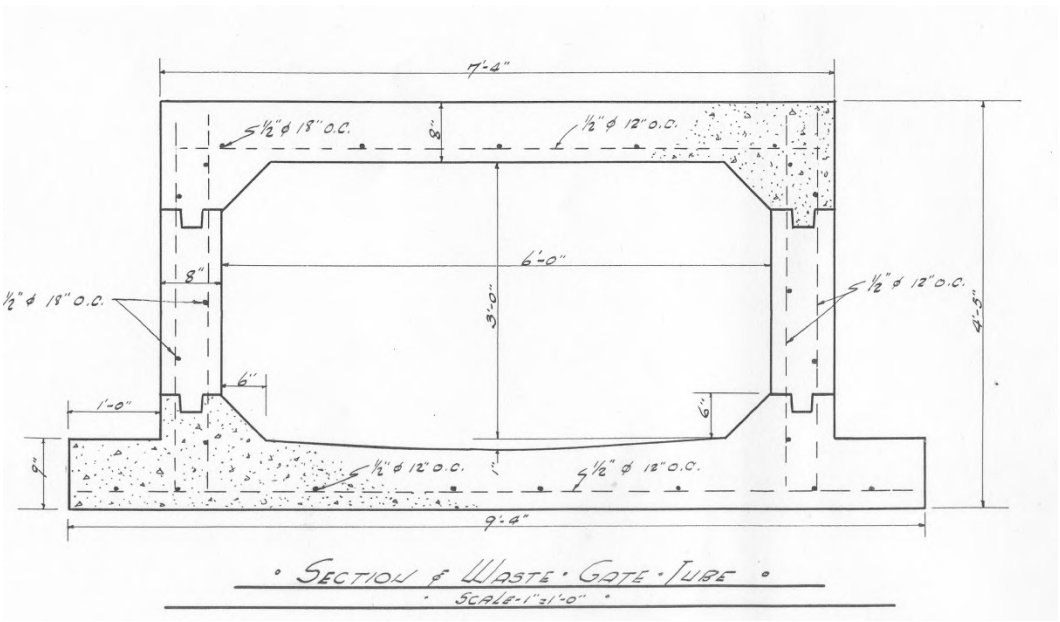


Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 1* (1938), showing plan of waste gates and discharge tube at the west end of the aqueduct. Note the proposed addition of an 18" stone veneer over the existing wing wall.

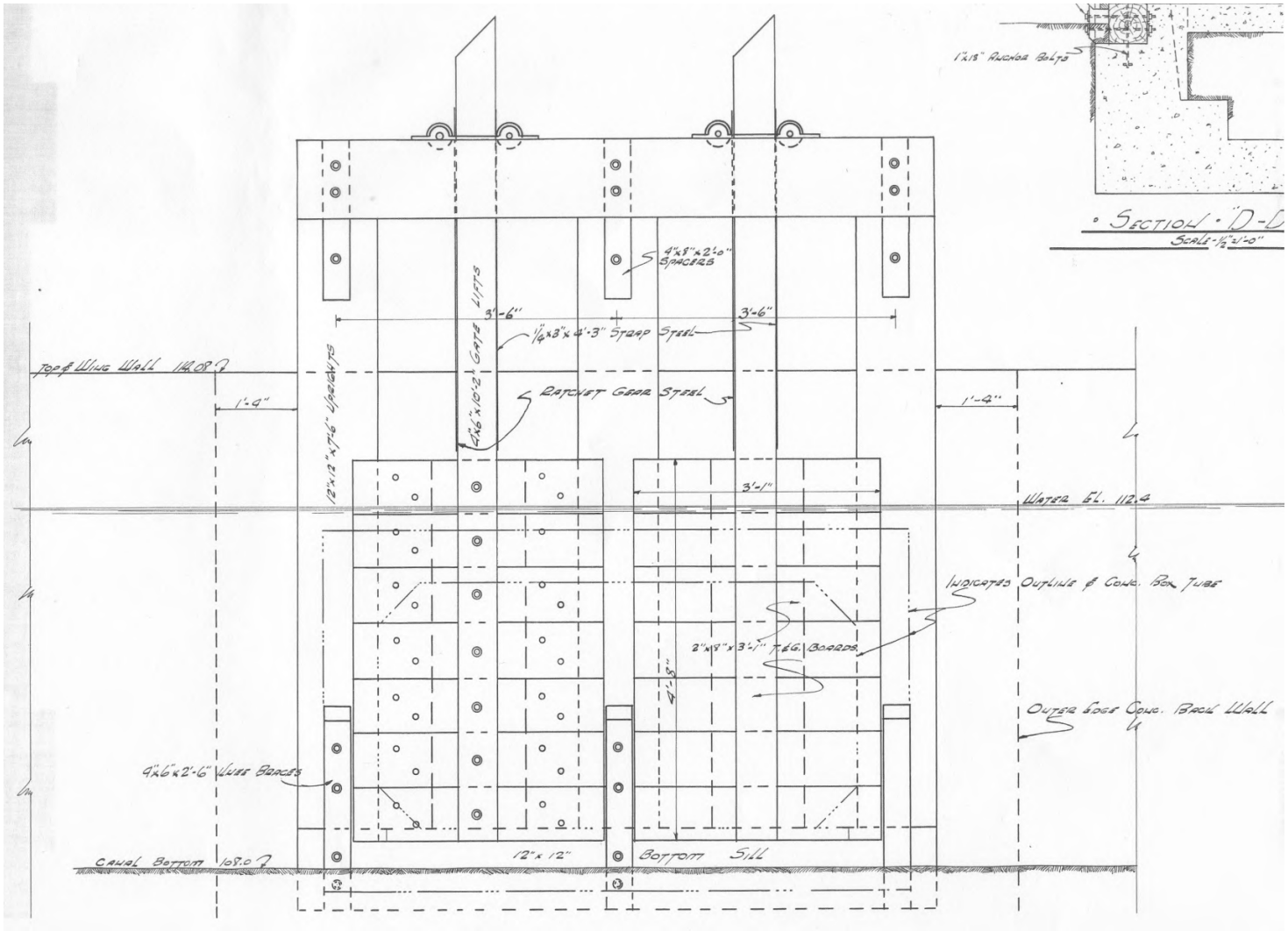


Details of *Waste Gates at Nettle Creek Aqueduct, Sheet 1* (1938). (LEFT) Sectional view through a proposed concrete retaining wall adjacent to the waste gates (see Section "C-C" on previous figure). (RIGHT) Detail of the drip key at end of the waste discharge tube. This drawing also indicates the veneer to be added to the existing wing wall.

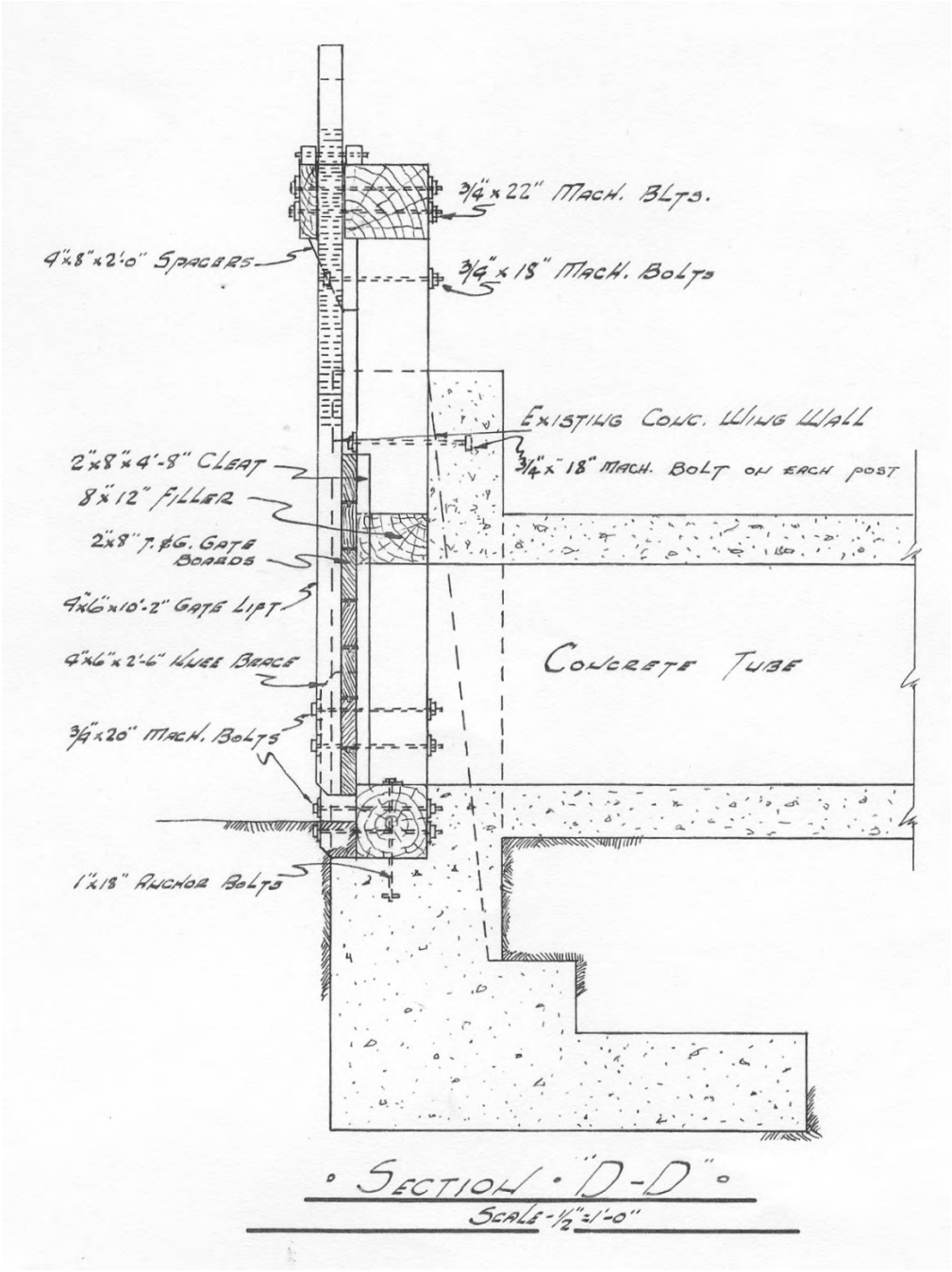




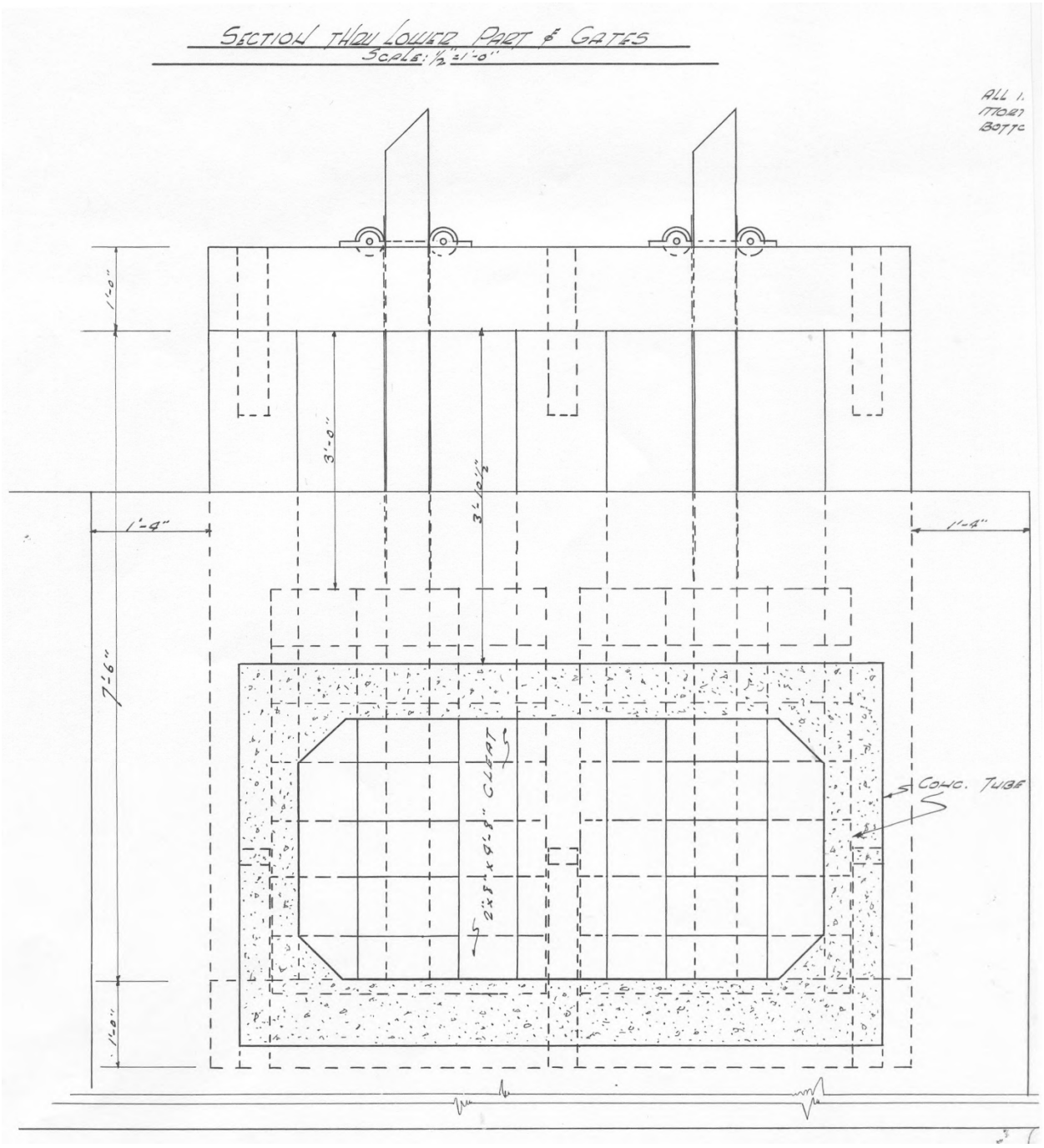
Details of *Waste Gates at Nettle Creek Aqueduct, Sheet 1* (1938), showing sectionals through the discharge tube associated with the waste gates.



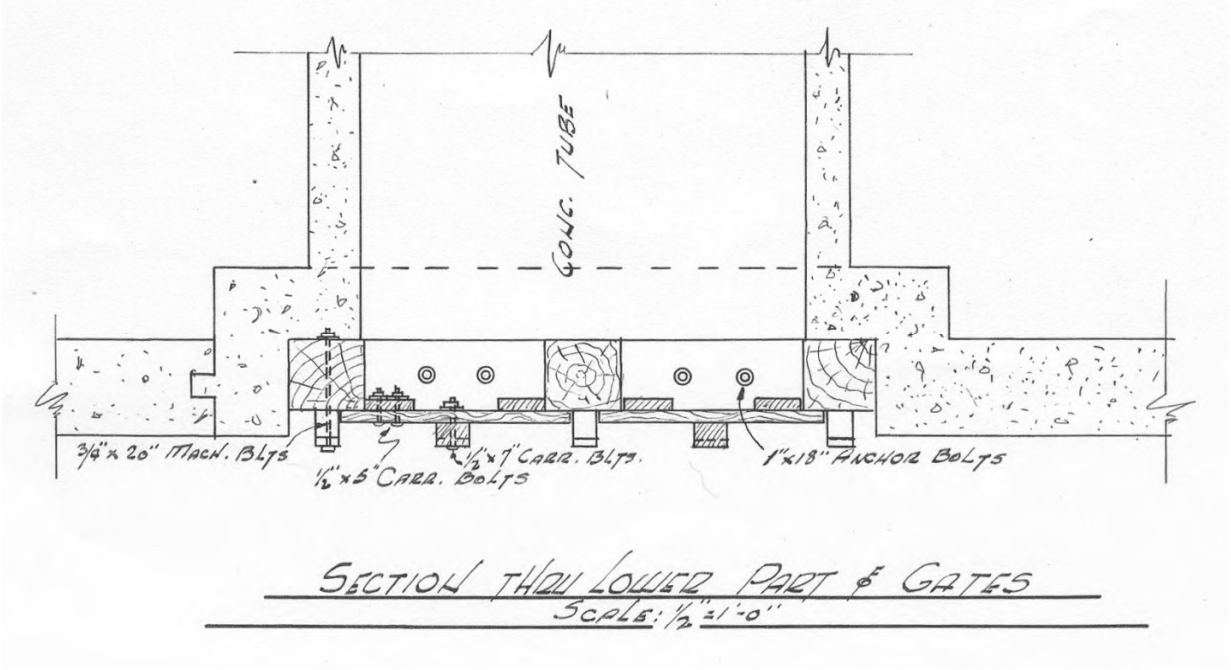
Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 2* (1938), showing upstream (canal side) of the waste gates.

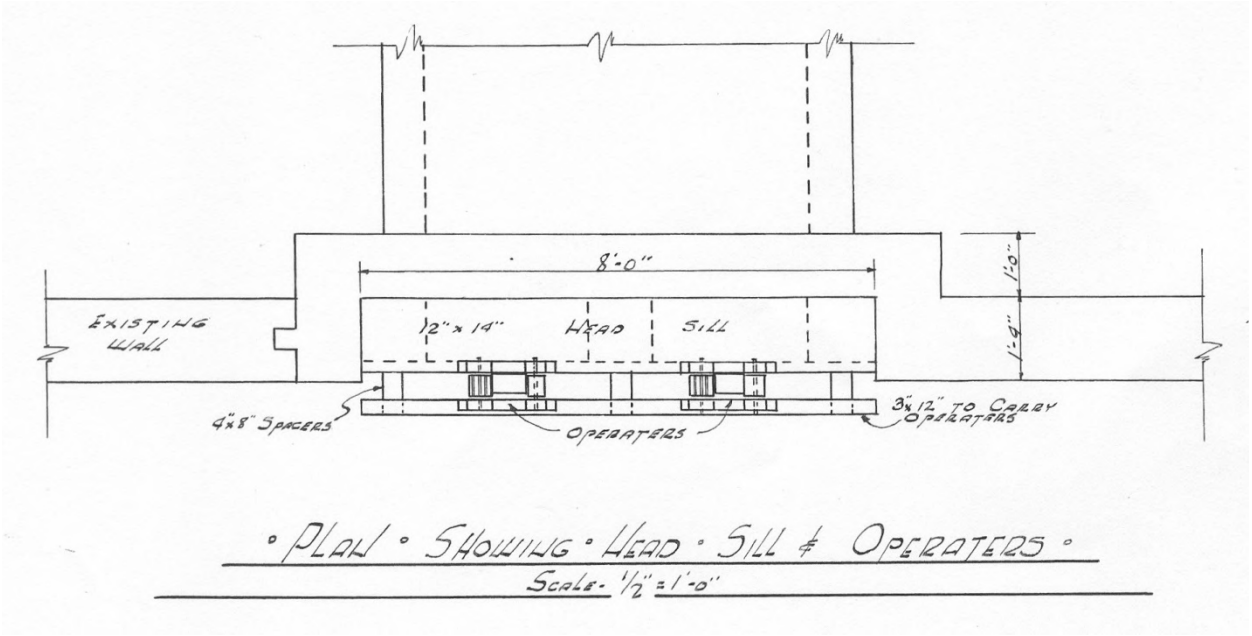


Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 2* (1938), showing sectional through the waste gate and discharge tube.

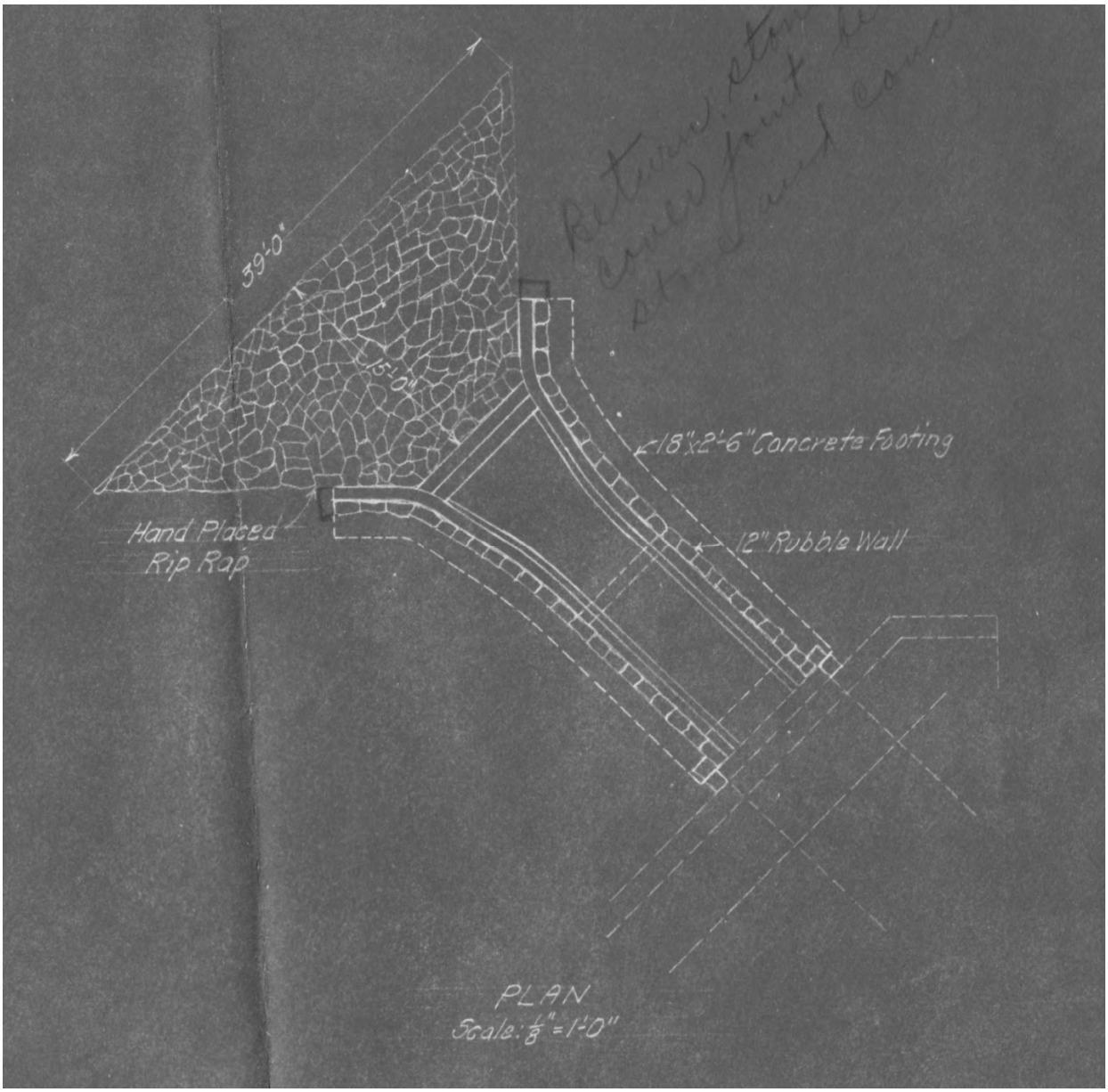


Detail of *Waste Gates at Nettle Creek Aqueduct, Sheet 2* (1938), showing sectional through downstream side of the waste gates.

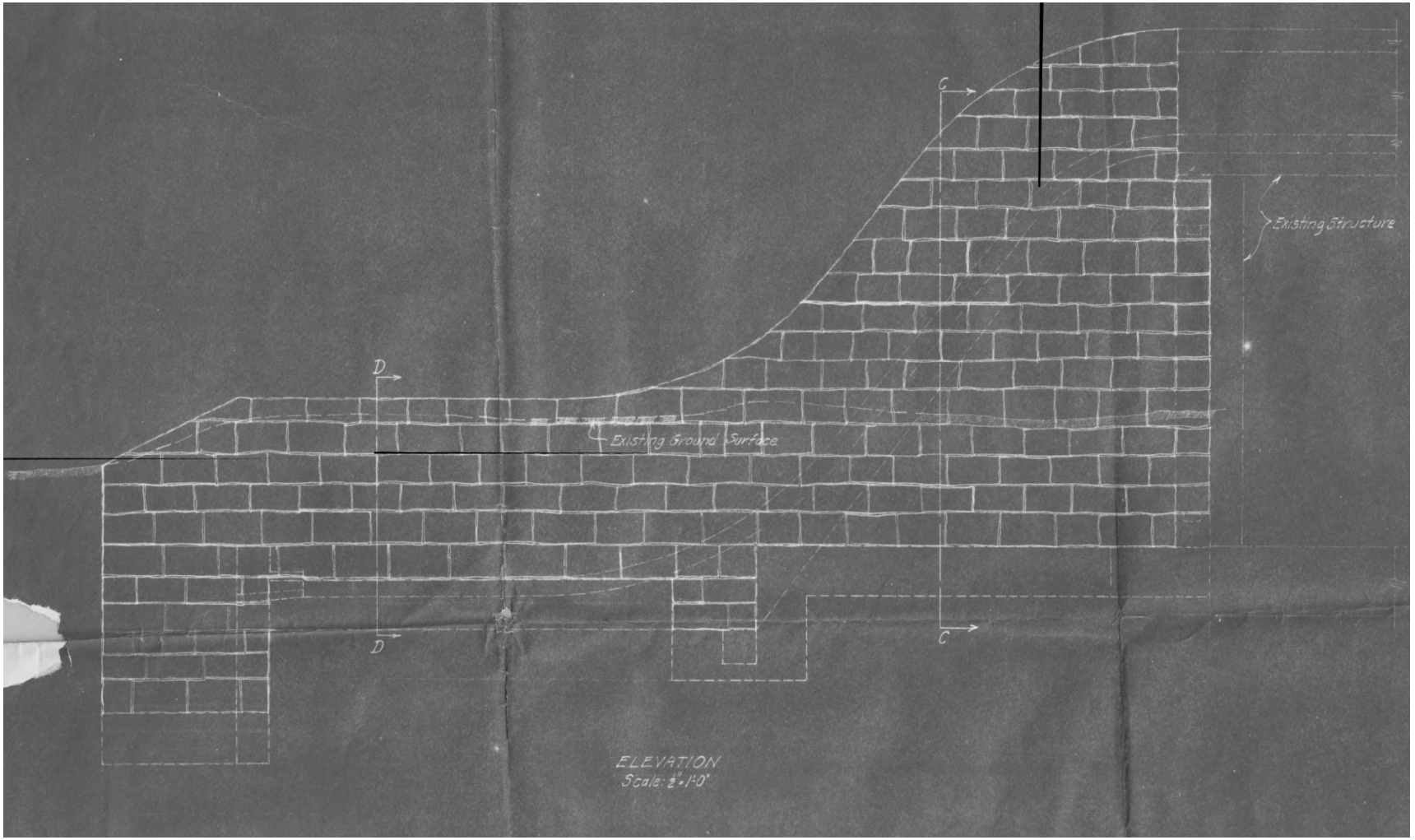




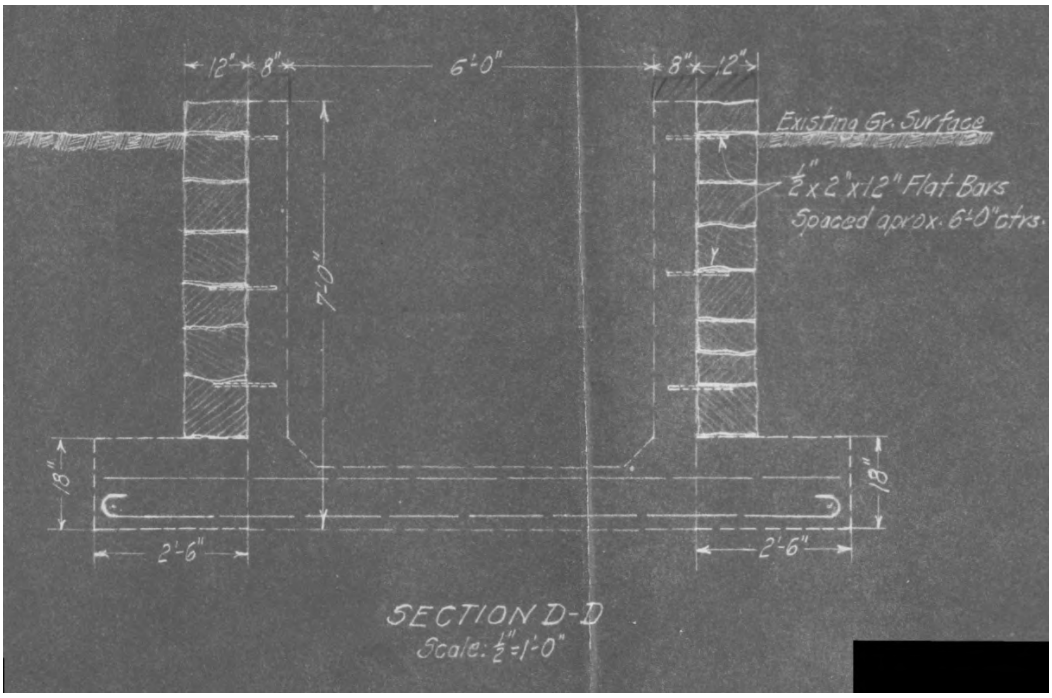
Details of *Waste Gates at Nettle Creek Aqueduct, Sheet 2* (1938), showing sectional through upper and lower parts of the gates.

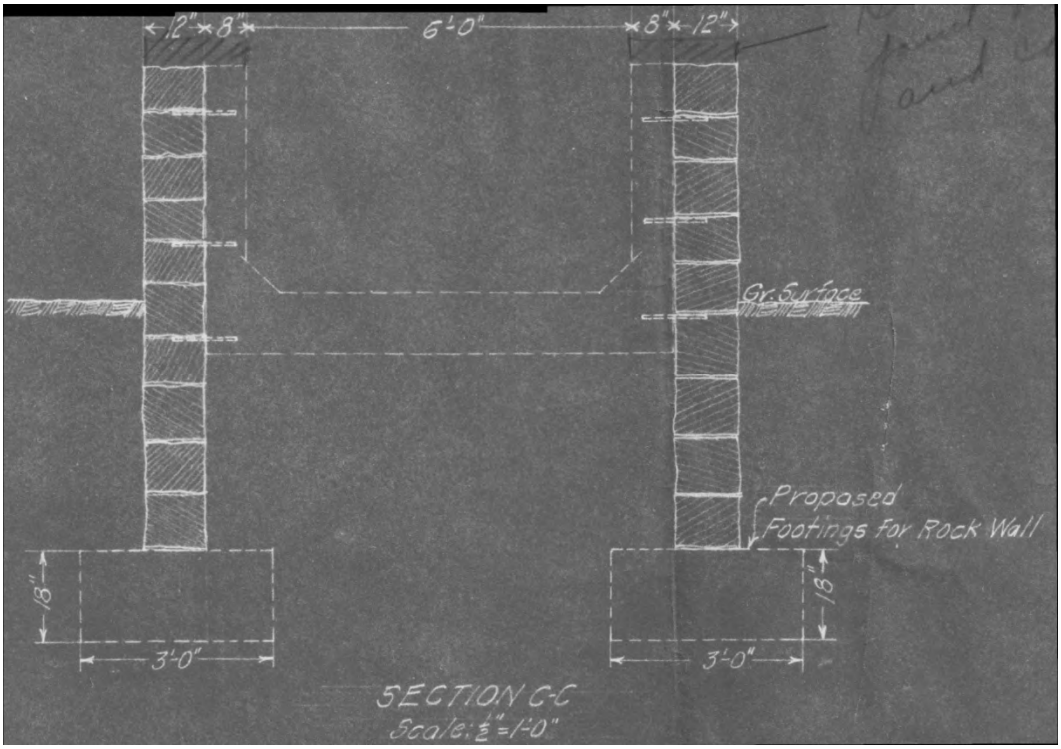


Plan of proposed modifications to the Nettle Creek spillway (1939).

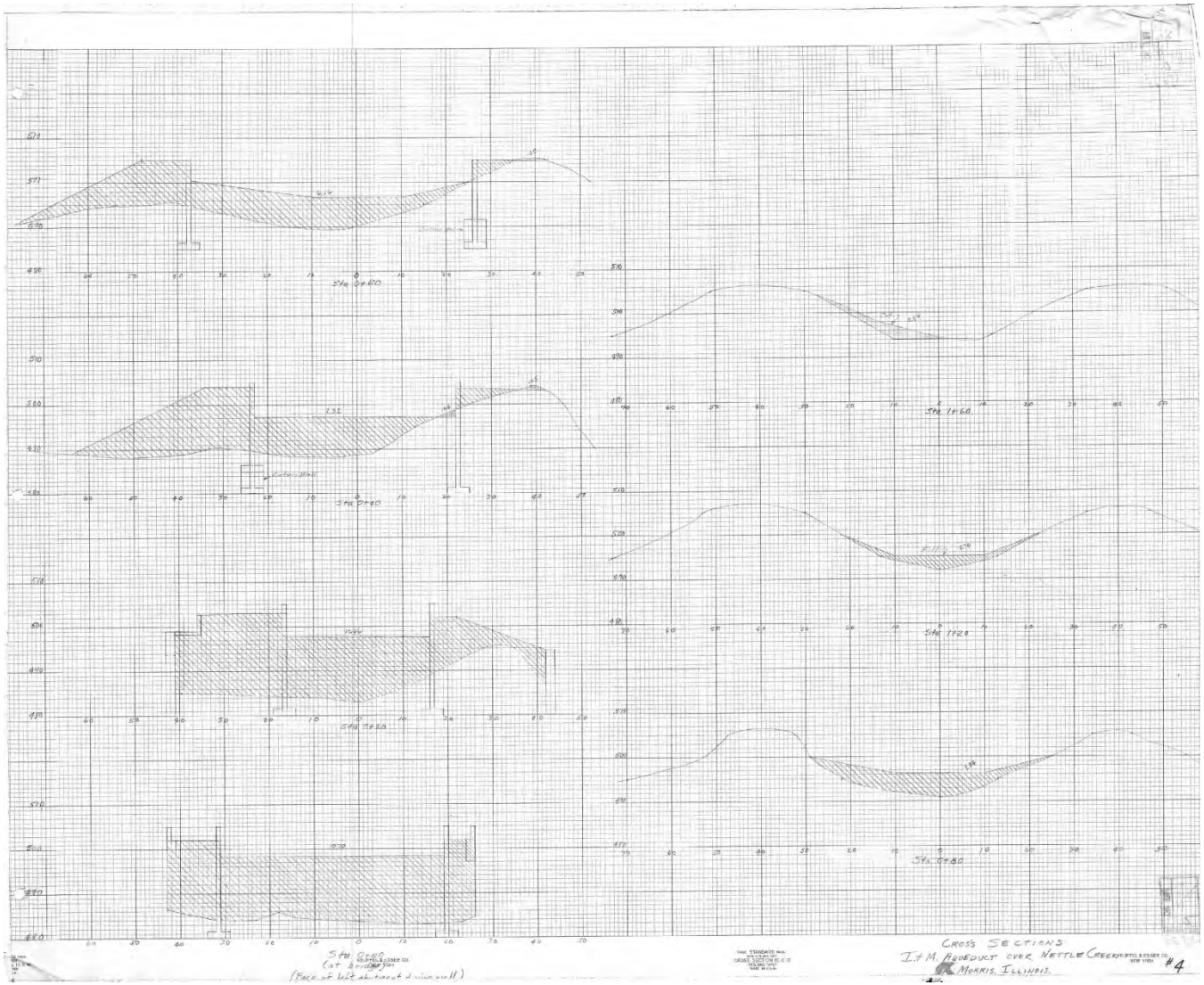


Sectional/elevation view of the proposed modification to the Nettle Creek spillway (1939). The modifications called for the spillway to be extended to grade, as opposed to terminating at the edge of the abutment wing wall.

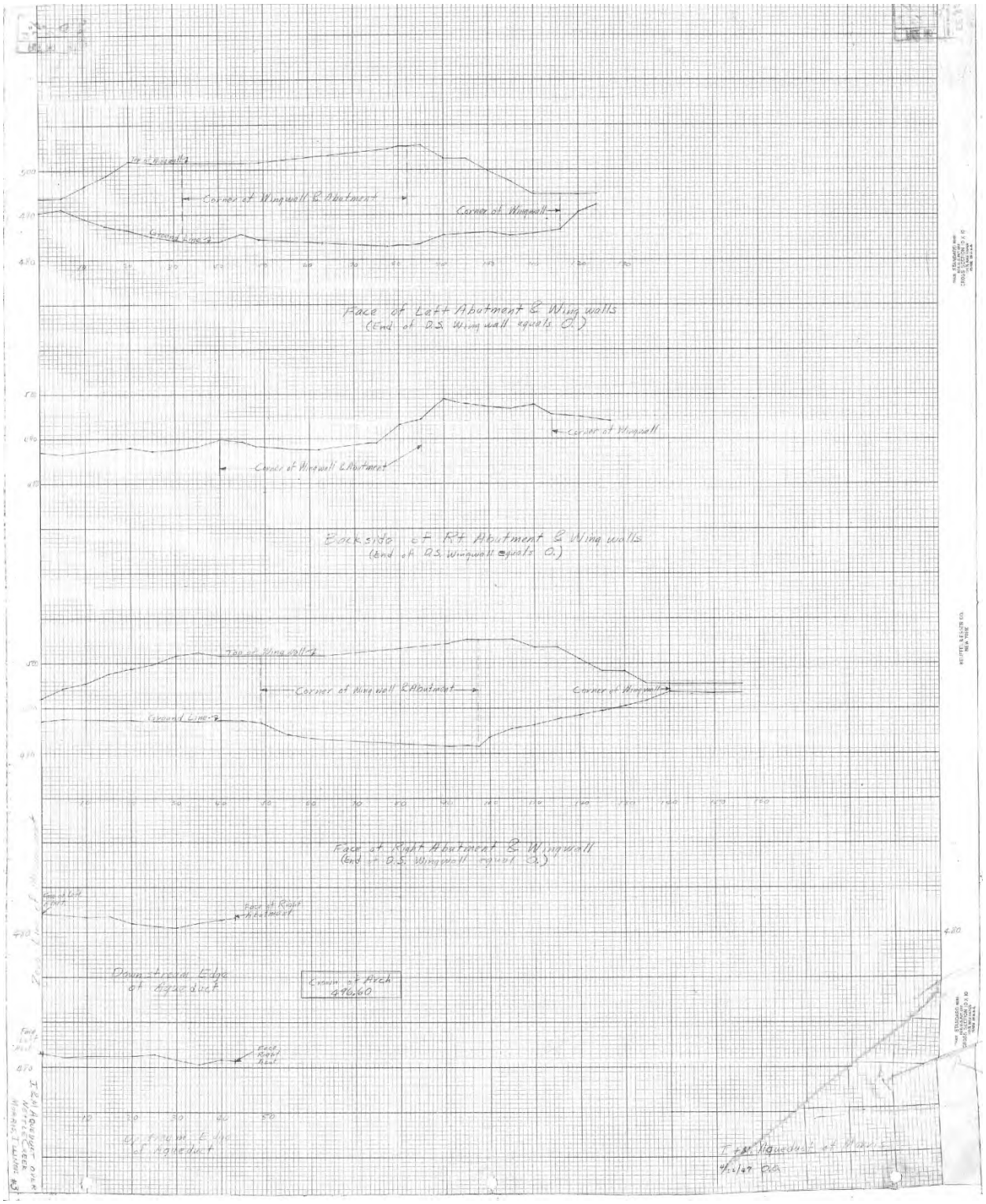




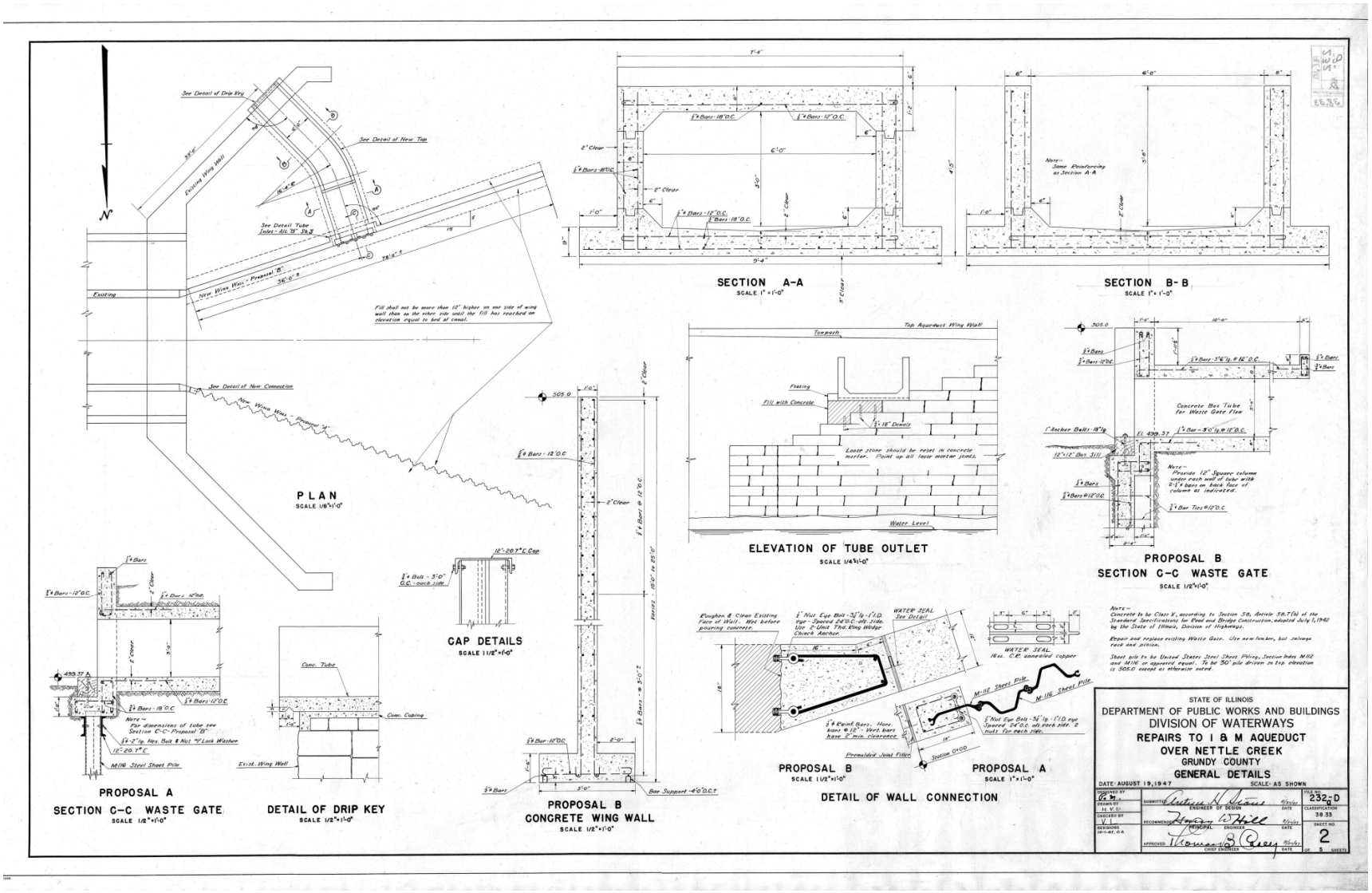
Sectionals through the Nettle Creek spillway, based on proposed modifications (1939). Plans called for a stone veneer to be applied over the concrete walls of the spillway. This stone veneer is lacking on the existing structure.



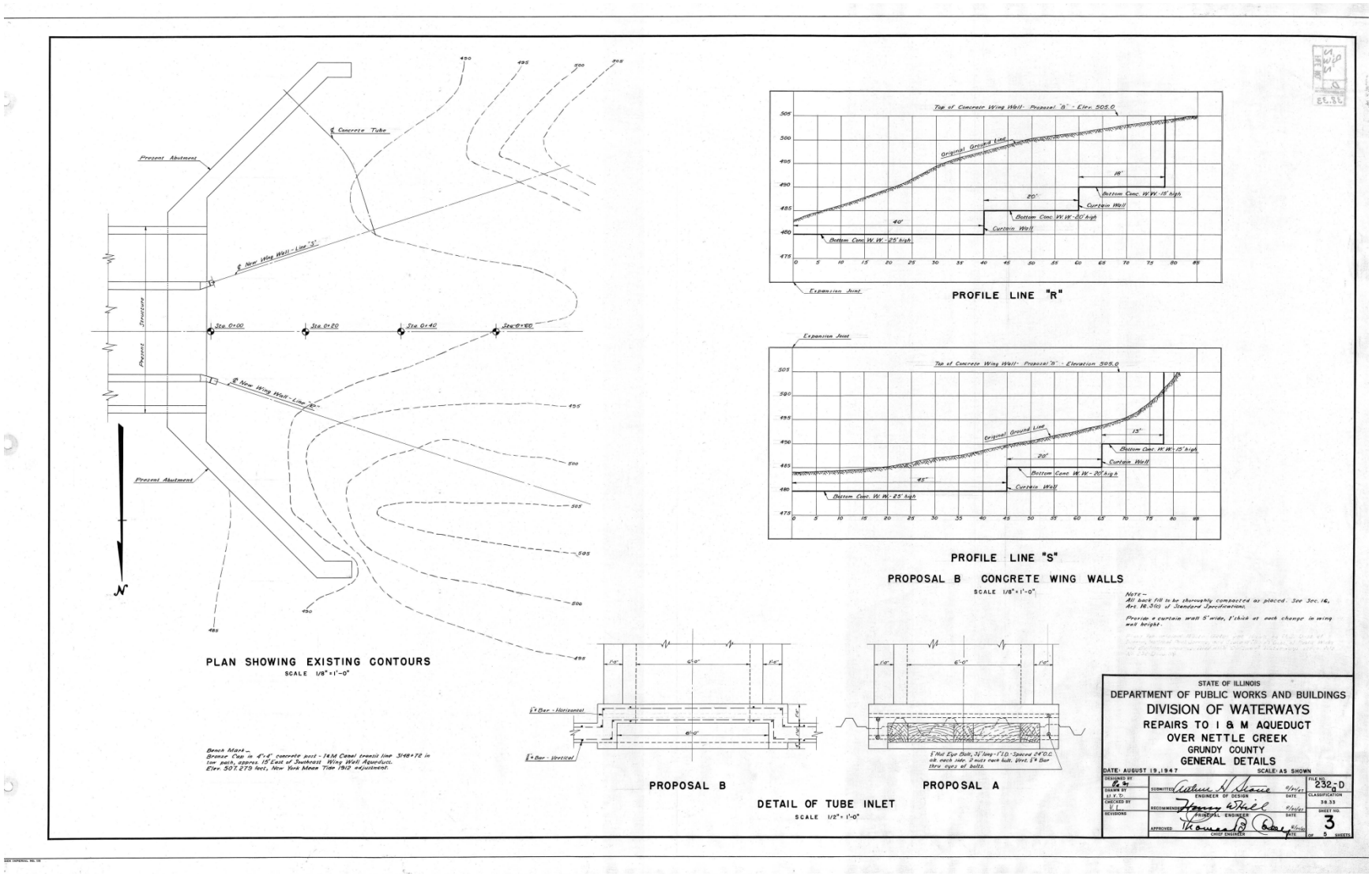
Cross sections of the Nettle Creek Aqueduct done in preparation of repairs planned in 1947.



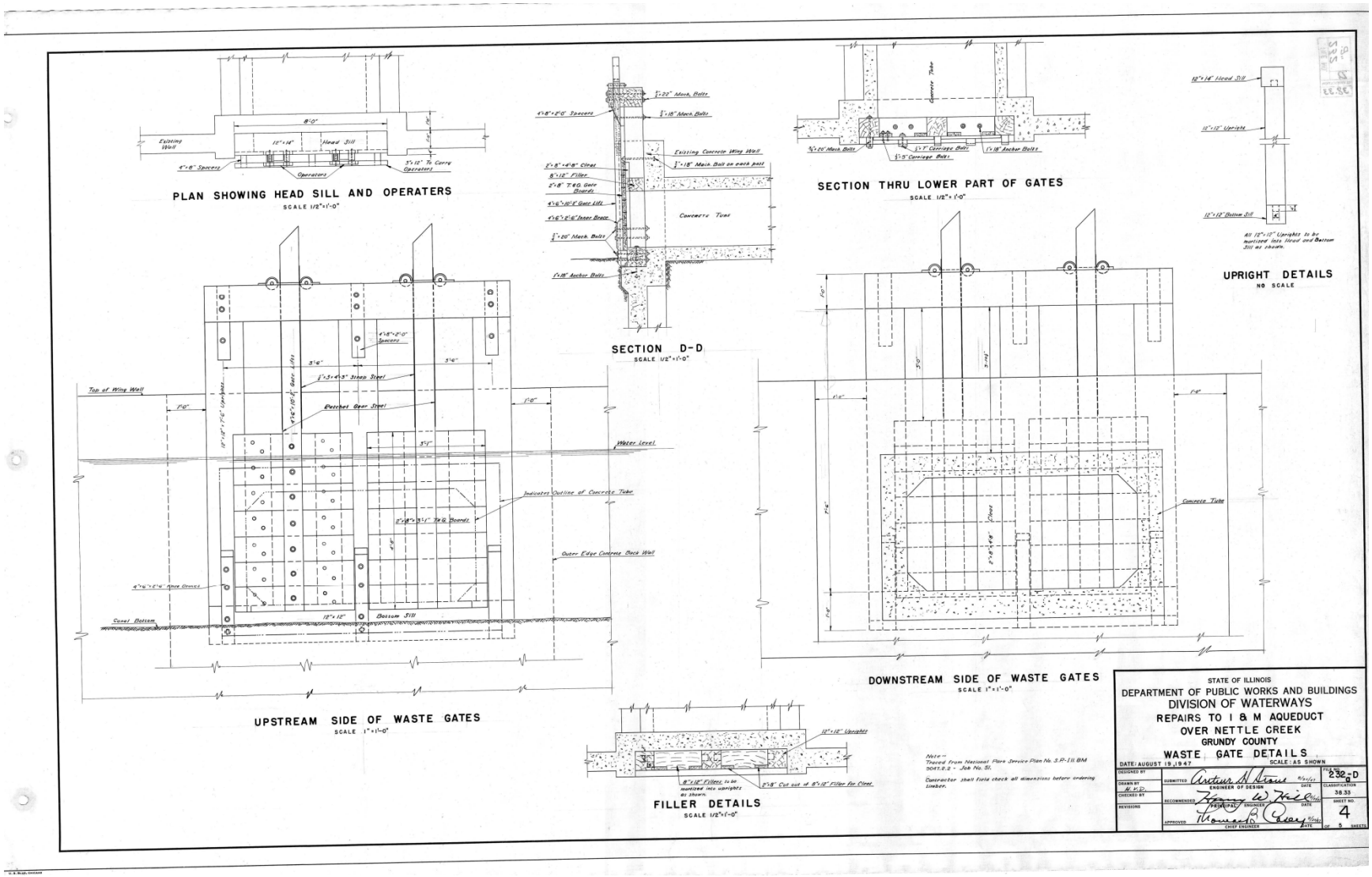
Cross sections of the Nettle Creek Aqueduct done in preparation of repairs planned in 1947.



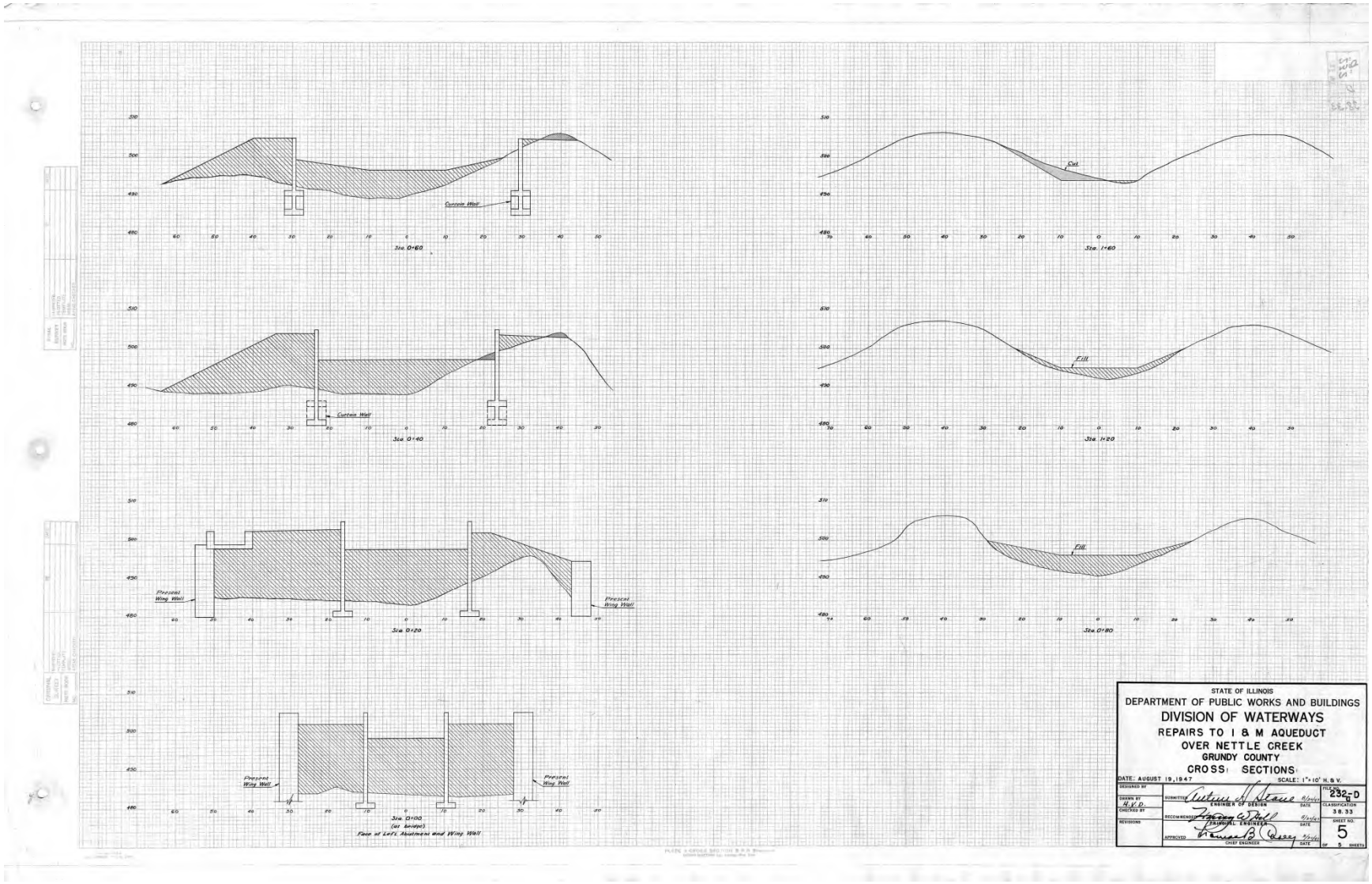
***Repairs to the I & M Aqueduct Over Nettle Creek, Sheet 2 of 5* (1947).**



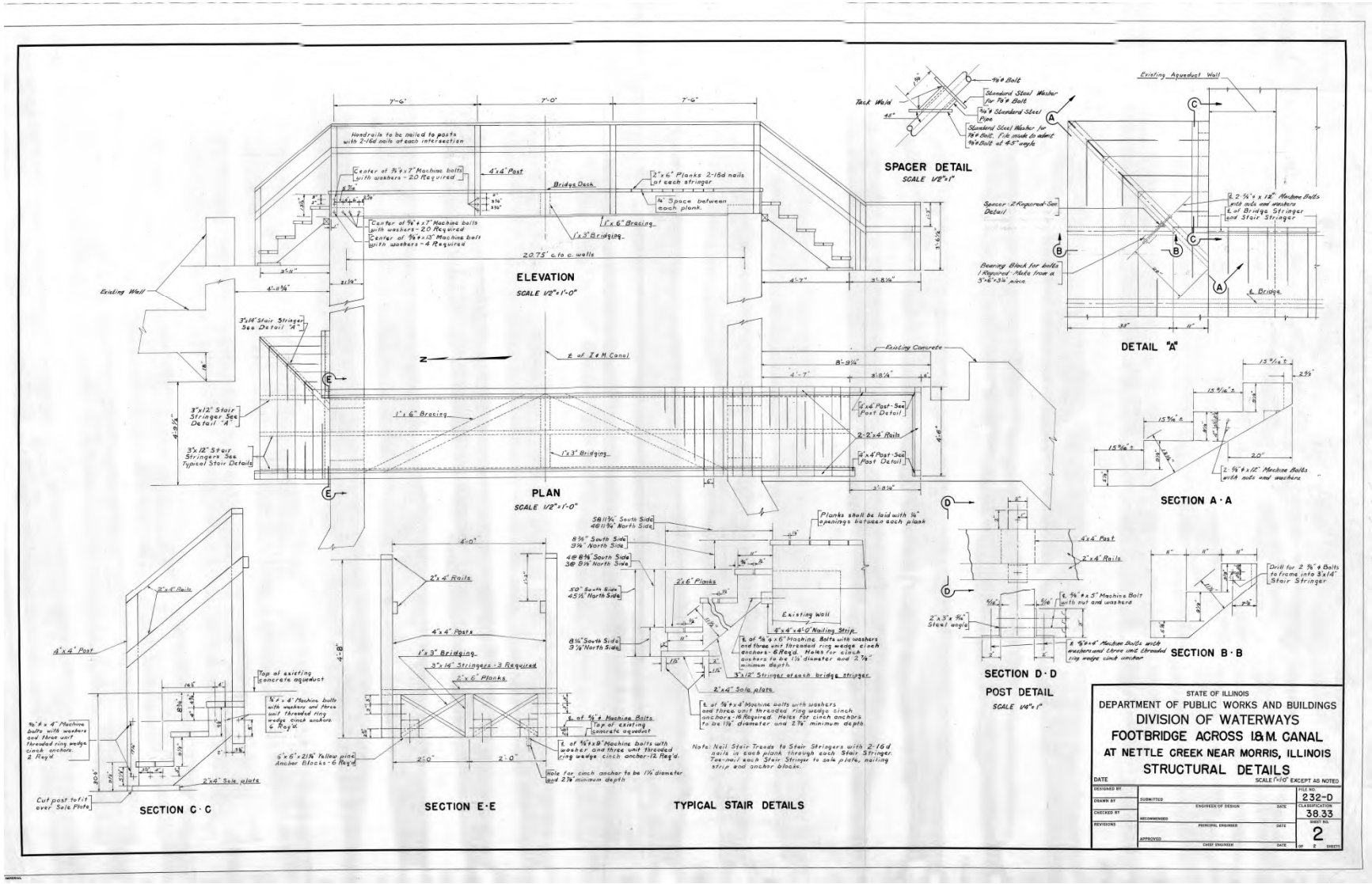
***Repairs to the I & M Aqueduct Over Nettle Creek, Sheet 3 of 5* (1947).**



***Repairs to the I & M Aqueduct Over Nettle Creek, Sheet 4 of 5* (1947).**

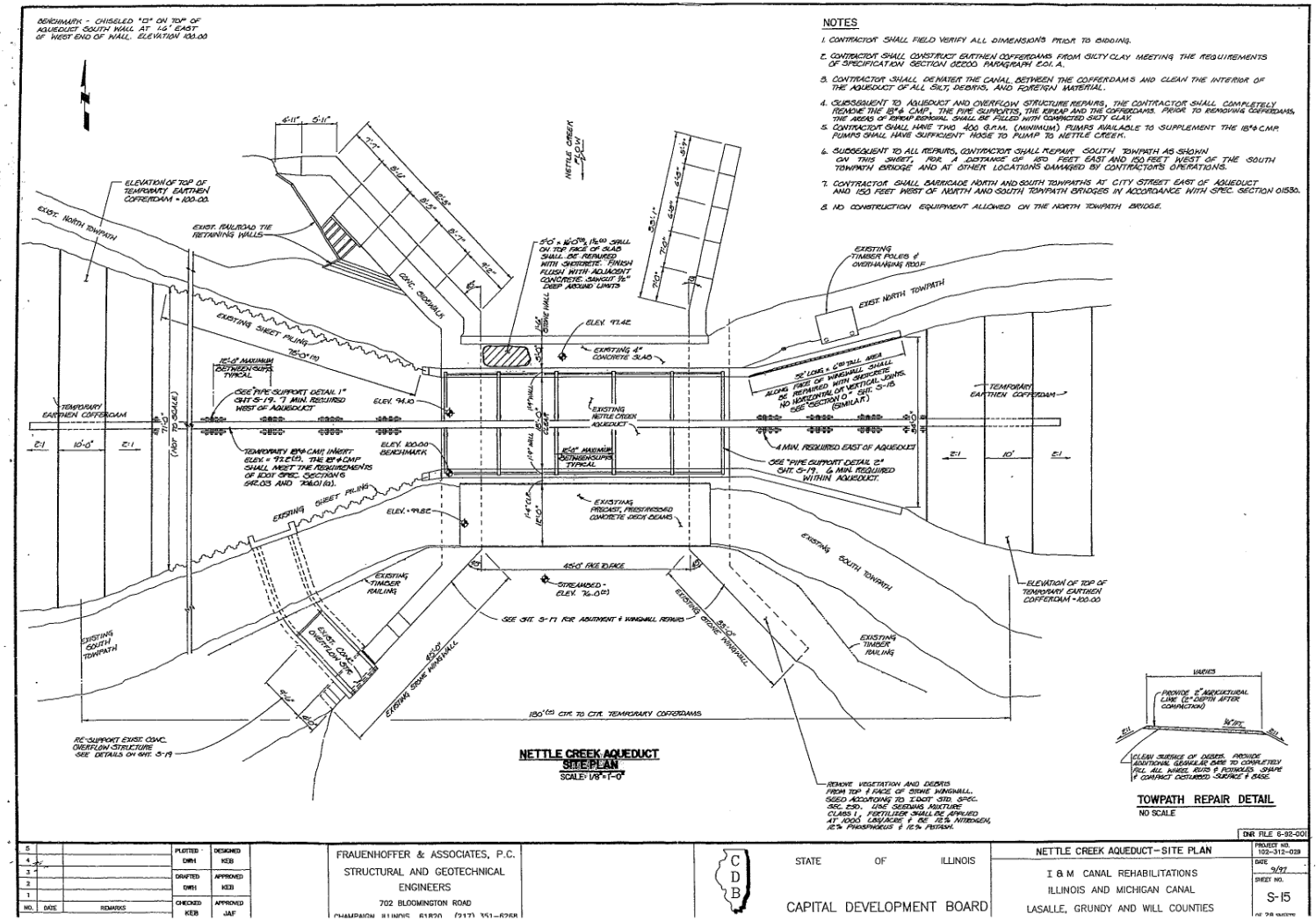


***Repairs to the I & M Aqueduct Over Nettle Creek, Sheet 5 of 5* (1947).**

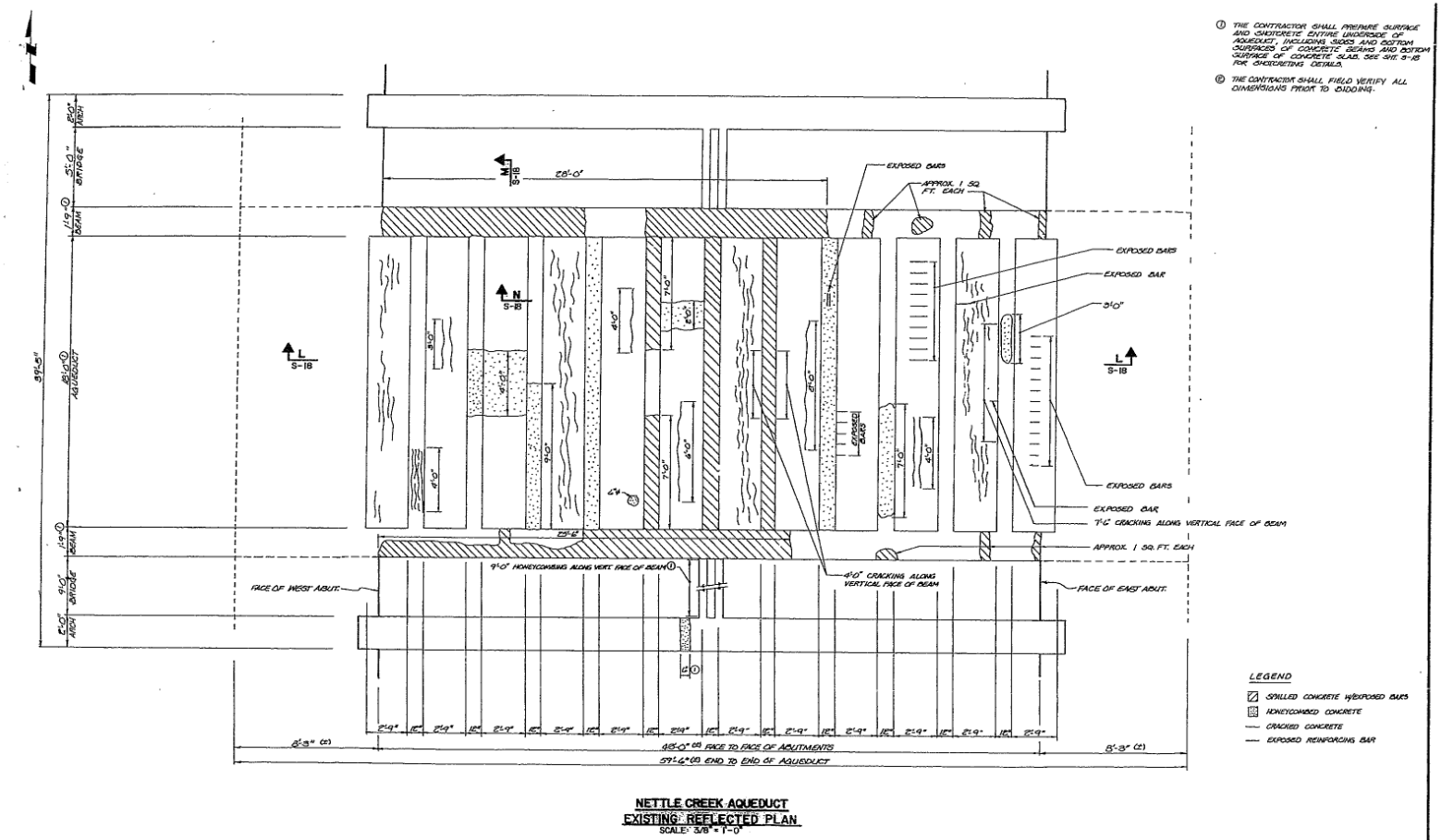


***Footbridge Across I & M Canal Aqueduct at Nettle Creek, Structural Details, Sheet 2 of 2* (1954).**

Photograph of the Nettle Creek Aqueduct, taken circa 1974. By this date, the bridge deck on the south side of the aqueduct apparently had been removed.



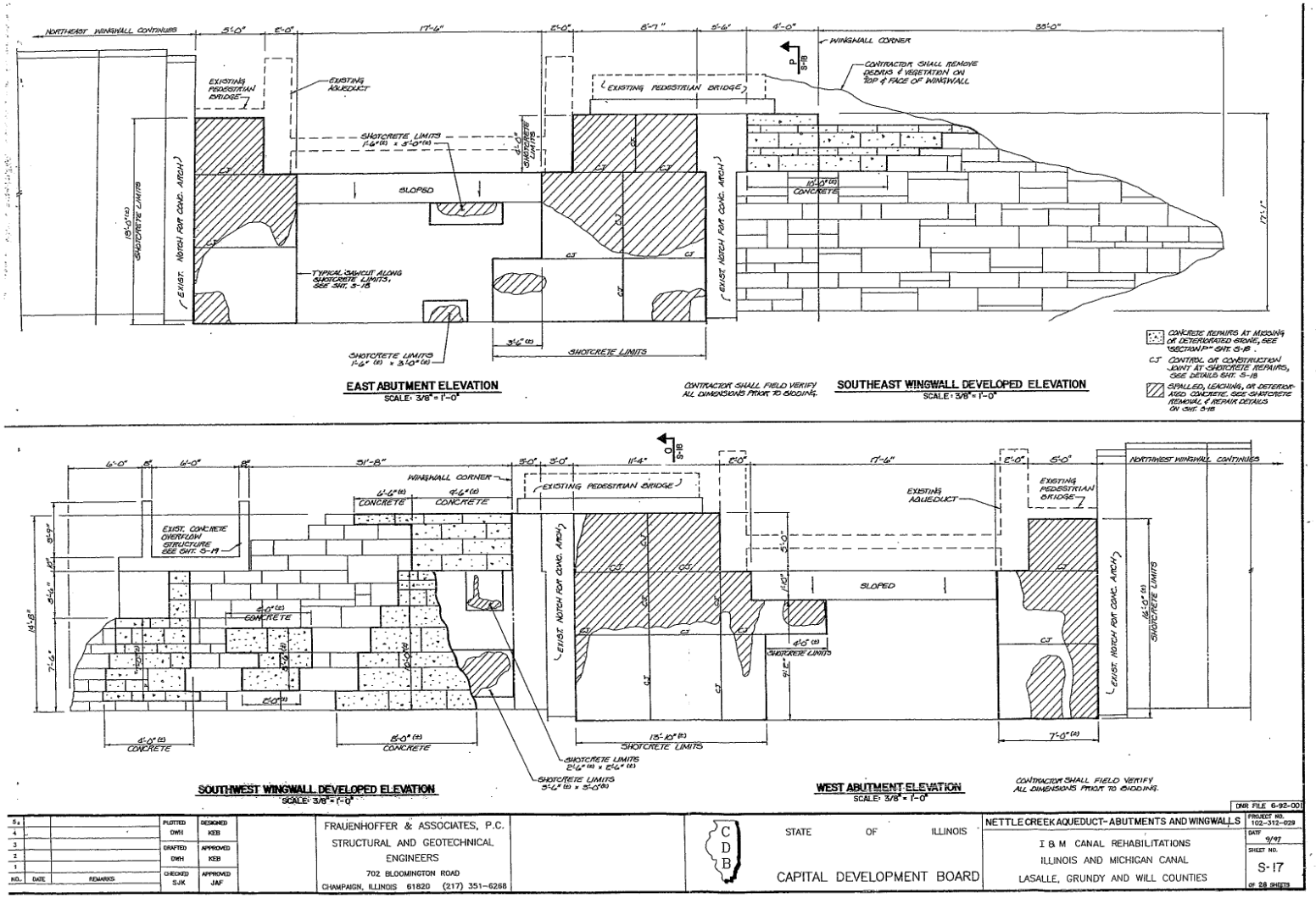
***I & M Canal Rehabilitations, Nettle Creek Aqueduct—Site Plan* (1997).**



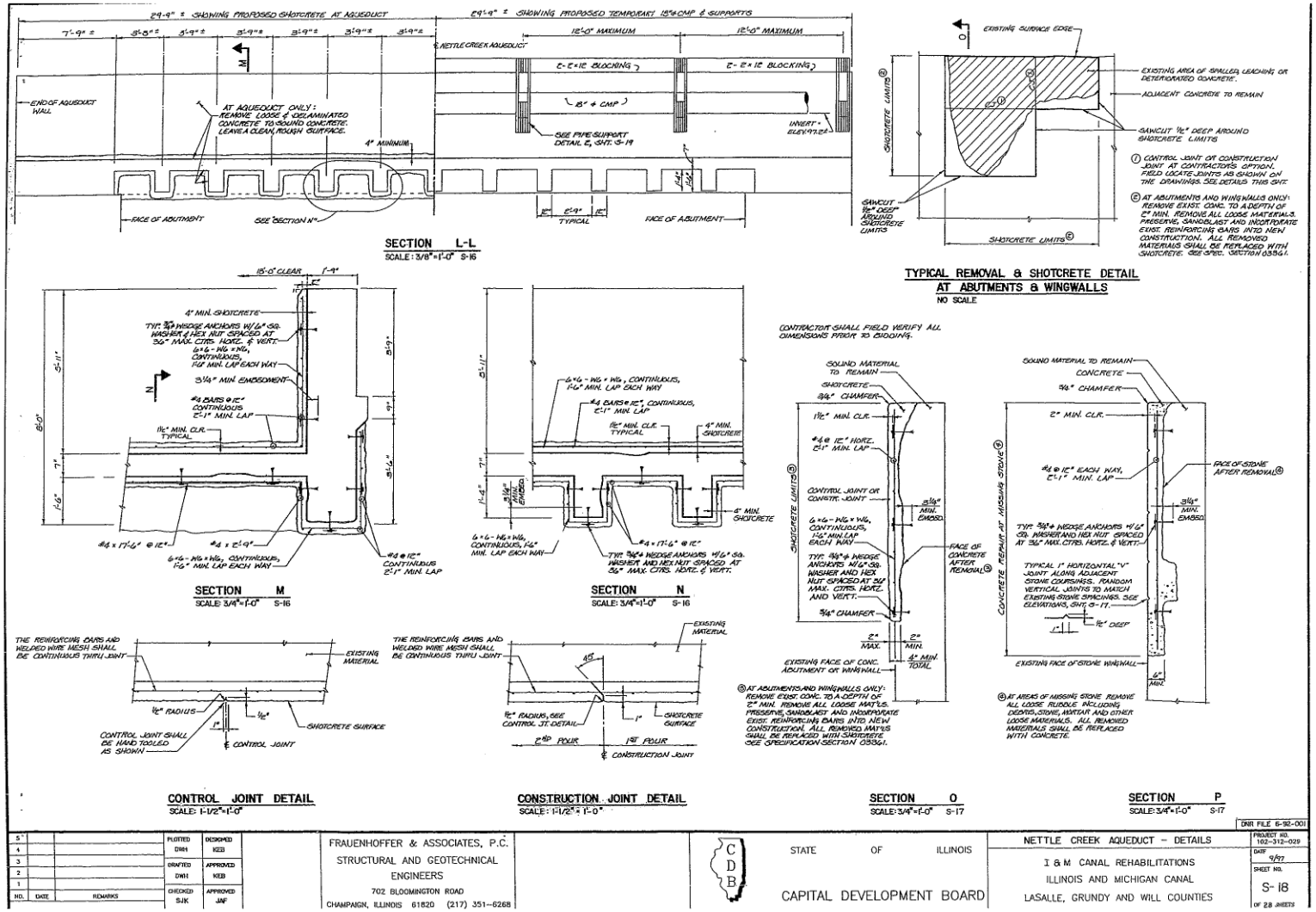
NETTLE CREEK AQUEDUCT
EXISTING REFLECTED PLAN
SCALE: 3/8" = 1'-0"

		PLOTTED DWH	DESIGNED KEB	FRAUENHOFFER & ASSOCIATES, P.C. STRUCTURAL AND GEOTECHNICAL ENGINEERS 702 BLOOMINGTON ROAD CHAMPAIGN, ILLINOIS 61820 (217) 351-6268	STATE OF ILLINOIS CAPITAL DEVELOPMENT BOARD	NETTLE CREEK AQUEDUCT—EXISTING REFLECTED PLAN	DNR FILE 6-92-001 PROJECT NO. 102-312-029
		DRAFTED DWH	APPROVED KEB			I & M CANAL REHABILITATIONS ILLINOIS AND MICHIGAN CANAL LASALLE, GRUNDY AND WILL COUNTIES	DATE 9/97
DATE	REMARKS	CHECKED SJK	APPROVED JAF				SHEET NO. S-16 OF 28 SHEETS

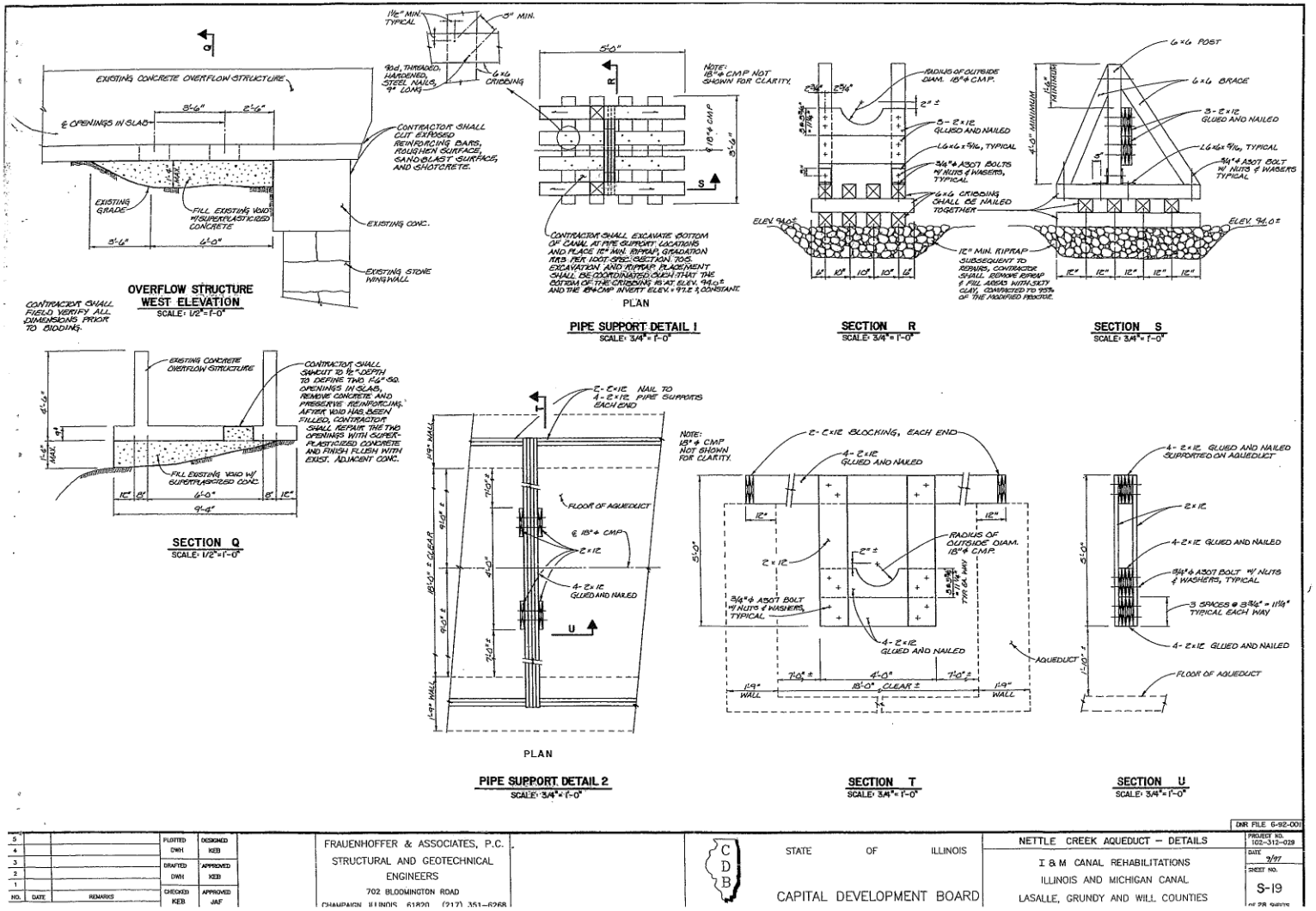
***I & M Canal Rehabilitations, Nettle Creek Aqueduct—Existing Reflected Plan* (1997).**



***I & M Canal Rehabilitations, Nettle Creek Aqueduct—Abutments and Wing Walls* (1997).**



***I & M Canal Rehabilitations, Nettle Creek Aqueduct—Details* (1997).**



***I & M Canal Rehabilitations, Nettle Creek Aqueduct—Details* (1997).**

Modern-day views of the Nettle Creek Aqueduct, showing conditions prior to the 2013 flood event. (TOP) View of the north elevation in 2012. (BOTTOM) View of the south elevation in 2009.

Additional modern-day views of the aqueduct, showing pre-2013 conditions. (TOP) View looking east along the pedestrian walkway and trunk. (BOTTOM) View of the south elevation, looking northeast. The spillway can be seen at left.

INDEX TO PHOTOGRAPHS

Nettle Creek Aqueduct IL HAER No. GR-2014-1
NE1/4, NE1/4, NW1/4 of Section 9
Township 33 North, Range 7 East of the 3rd P.M.
Morris
Grundy County
Illinois

Documentation: 19 photographs. Floyd Mansberger photographer (May and September 2014).

GR-2014-1.1 View of the Nettle Creek Aqueduct looking southeast from the west bank of Nettle Creek. Note the significant flood damage on the east end of the structure (Frame 8533).

GR-2014-1.2 View of the aqueduct looking northeast from the west bank of Nettle Creek. This view shows the vehicle bridge on the south side of the aqueduct and also illustrates the severe damage suffered by the east abutment's southern wing wall (Frame 8495).

GR-2014-1.3 View looking west down the length of the aqueduct showing pedestrian walkway at right, trunk in center, and vehicle bridge at left (Frame 8451).

GR-2014-1.4 View looking west showing aqueduct trunk and the vehicle bridge with its deck of pre-cast, pre-stressed concrete beams (Frame 8469).

GR-2014-1.5 View looking east down length of aqueduct showing collapsed end of structure (Frame 8538).

GR-2014-1.6 View of the west abutment showing mixture of stone and concrete construction here and juncture of arch for original vehicle bridge with abutment (Frame 9983).

GR-2014-1.7 View illustrating manner of construction of the concrete arch that originally supported the vehicle bridge. Re-bar for the original bridge deck can be seen sticking out above the concrete lip at left. Stonework, like that found the north side of the aqueduct, once filled the void above the arch (Frame 9939).

GR-2014-1.8 Construction detail illustrating the re-bar used in the construction of the aqueduct's trunk (Frame 9959).

GR-2014-1.9 View of the concrete arch carrying the pedestrian walkway on the north side of the aqueduct, looking southwest. This view also illustrates the character of the stonework laid up by the Civilian Conservation Corps (Frame 9914).

GR-2014-1.10 Another view of the pedestrian walkway on the north side of the bridge, showing doubled-up arch, connecting beam between it and trunk, concrete slab walkway, and stone sidewall (Frame 9962).

GR-2014-1.11 View of the southern wing wall of the west abutment, illustrating the regular-coursed ashlar masonry that pre-dates the 1938 rebuilding of the aqueduct. This stonework is markedly different that used by the Civilian Conservation Corps. Shotcrete repairs made in 1997 are also visible (Frame 9968).

GR-2014-1.12 View of the rear side of the northern wing wall of the east abutment showing the character of stonework, which is rougher and more irregularly coursed than that used on the front side of the abutments. The earth here was washed out during the flood event (Frame 8458).

GR-2014-1.13 Detail of the southern end of the east abutment, showing stone veneer applied by the Civilian Conservation Corps over the pre-existing wall. Most of the veneer here was washed out during the flood event, though one course can be seen above grade at left (Frame 9975).

GR-2014-1.14 View of the northern end of the east abutment showing character of stone veneer and concrete coping installed by the Civilian Conservation Corps (Frame 9928).

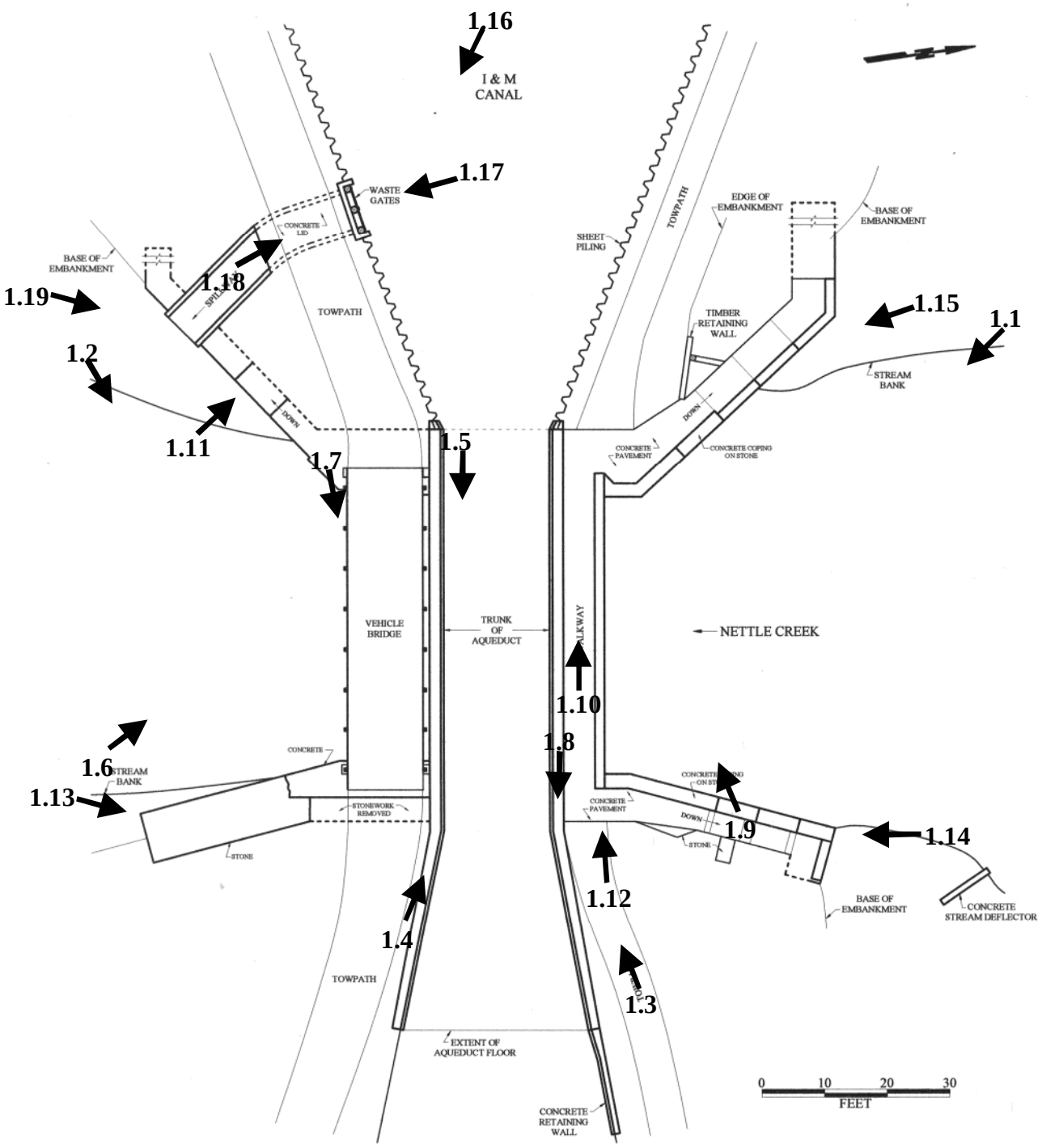
GR-2014-1.15 View of the northern wing wall of the west abutment, showing stepped character of the wall. The Civilian Conservation Corps installed a stone veneer and concrete coping here as well (Frame 8531).

GR-2014-1.16 View of the canal prism immediately downstream of the aqueduct (looking southeast), showing the sheeting piling and waste gates here (Frame 8501).

GR-2014-1.17 Close-up view of the waste gates located immediately west of the aqueduct (Frame 8504).

GR-2014-1.18 Interior view of the spillway associated with the waste gates, looking north. A portion of the spillway was covered with a concrete cap to accommodate traffic along the towpath. This cap later was extended to the south (shown in foreground). The waste gates are visible in background (Frame 9946).

GR-2014-1.19 View of the discharge end of the spillway, which straddles the southern end of the west abutment. Note shotcrete repairs made to the stonework below the spillway (Frame 8493).


1.16
I & M CANAL
1.17
WASTE GATES
CONCRETE LID
BASE OF EMBANKMENT
1.18
1.19
SPILL
TOWPATH
SHEET PILING
TOWPATH
EDGE OF EMBANKMENT
BASE OF EMBANKMENT
1.15
1.1
TIMBER RETAINING WALL
STREAM BANK
1.2
DOWN
1.11
1.7
1.5
CONCRETE PAVEMENT
CONCRETE COPING ON STONE
DOWN
VEHICLE BRIDGE
TRUNK OF AQUEDUCT
TOWPATH
NETTLE CREEK
1.10
1.8
1.6
CONCRETE
STREAM BANK
1.13
STONEWORK REMOVED
STONE
CONCRETE PAVEMENT
DOWN
STONE
1.9
1.14
1.12
BASE OF EMBANKMENT
CONCRETE STREAM DEFLECTOR
1.4
TOWPATH
1.3
EXTENT OF AQUEDUCT FLOOR
CONCRETE RETAINING WALL
0 10 20 30
FEET