

HISTORIC STRUCTURE REPORT
THE CATOCTIN AQUEDUCT

HISTORICAL DATA

CHESAPEAKE AND OHIO CANAL NATIONAL HISTORICAL PARK

MD – DC – WV

By

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CHRONOLOGY

1832, FEBRUARY 25: The C & O Canal Company formally accepted the bid of Tracy and Douglas to construct Aqueduct No. 3.

1833, EARLY OCTOBER: Aqueduct No. 3 was completed.

1833, OCTOBER: The C & O Canal Company formally accepted the bid of Gideon Davis to construct the railing for Aqueduct No. 3.

1835, APRIL: A breach in the wing walls of the aqueduct occurred, necessitating the construction of a temporary wooden trunk for the continuance of boat navigation.

1838–1839 WINTER: During the spring of 1838, a breach occurred in one of the wing walls and undermined the trunk. Thomas C. Coyle rebuilt the trunk the following winter, using his patented “American Cement.”

1973, OCTOBER 30: Aqueduct No. 3 collapsed, leaving only its eastern arch standing.

2007: Original aqueduct building stones from the collapse of the west and center arches were recovered from Catoctin Creek. Over four hundred original stones were sorted and stacked near the aqueduct.

2010, APRIL 24: Groundbreaking for the restoration of Aqueduct No. 3. Funding for the project came from Federal and State sources as well as donations from individuals and organizations. Dr. George Lewis a veterinarian and nearby resident was the original and primary visionary behind the effort for its reconstruction and served throughout as President of the Catoctin Restoration Fund, Inc.

2011, OCTOBER 15: Dedication of the newly restored Aqueduct No. 3

ADMINISTRATIVE DATA and STATEMENT OF HISTORICAL SIGNIFICANCE

Name of Structure:

Aqueduct No. 3 (Catoctin Aqueduct), Chesapeake and Ohio Canal National Historical Park, Catoctin Creek, Frederick County, Maryland.

Proposed Use of Structure and Justification for Such Use:

The list of Classified Structures for this park has not been completed. Therefore, the Order of Significance of Aqueduct No. 3 has not been established, nor has the level of treatment been determined. Because Aqueduct No. 3 collapsed in October 1973 and because it is located in a zone that the draft master plan proposes to designate for short-term, low-density use, it is recommended that the stabilized ruins of the aqueduct be given appropriate preservation treatment. Other than maintenance of the existing stabilized ruins, no further restoration or preservation work is recommended.

Provision for Operating Structure

The stabilized ruins of Aqueduct No. 3 should be used as an historic structure exhibit in-place to interpret the construction, maintenance and operation of the canal.

Cooperative Agreements, if any, Executed or Proposed for Operating Structure

There are no cooperative agreements executed or proposed for operating Aqueduct No. 3.

Description of Proposed Construction Activity

A definitive description of proposed construction activity cannot be made until the structures are fully studied. However, it is imperative that appropriate preservation/stabilization treatment be given to Aqueduct No. 3 as needed to prevent further deterioration of the structure.

Statement of Historical Significance

This structure is significant because it was important to the operation of the Chesapeake and Ohio Canal and represented a major engineering accomplishment for its period. It was the third of eleven masonry aqueducts to carry the canal across the larger tributaries of the Potomac River between Georgetown and Cumberland, Maryland.

CHAPTER I

Douglas and Tracy Build Aqueduct No. 3

The history of the construction of the canal between Point of Rocks and Harpers Ferry, the section on which the Catoctin Aqueduct is located, is intertwined with the story of the rivalry between the Chesapeake and Ohio Canal Company and the Baltimore and Ohio Railroad. Both enterprises, which held their groundbreaking ceremonies on July 4, 1828, chose the Potomac Valley as the route of their respective works. The canal company, feeling secure in its right of prior location that it inherited from its predecessor, the Potomac Company, proceeded in a regular fashion with its operations. The railroad company, on the other hand, sent surveyors ahead to locate its line and secure land waivers, especially in the narrow passes of the valley above Point of Rocks where a conflict with the canal might be expected.¹

To stop this usurpation of their rights, the canal company secured an injunction in the Washington County Court on June 10, 1828, prohibiting the railroad from proceeding beyond Point of Rocks, the place at which it entered the Potomac Valley.² The railroad company countered with three injunctions against the canal, which it obtained in the Chancery Court at Annapolis on June 23, 24, and 25.³ The canal company protested that the action taken by the Baltimore and Ohio Railroad was an infringement on the canal's chartered rights. The legal question involved was whether the Potomac Company's rights inherited by the Chesapeake and Ohio Canal Company were still valid or whether the Baltimore and Ohio Railroad had acquired them by virtue of its charter from the State of Maryland in 1827 and the first exercise of the rights of location. The real issue, however, was the political one between the City of Baltimore (through the State of Maryland) and the cities of the District of Columbia.⁴

After a lengthy legal struggle that prevented both groups from building above Point of Rocks, the Chancery Court rendered its decision in the September term of 1831. The railroad was released from the injunction against it, while those against the canal were made permanent. In making the decision, the court took the puzzling position that this was not the proper time to consider the question of prior right.⁵

The canal company appealed the Chancery Court's decision to the Court of Appeals of Maryland in its December session. In January 1832, by a vote of 3 to 2, the Court of Appeals reversed the decision of the Chancery Court and confirmed the canal company's claim to the right of prior

¹ Walter S. Sanderlin, *The Great National Project* (Baltimore, 1946), pp. 83–84.

² *First Annual Report* (1829), C & O Co., *Proceedings of the Stockholders*, A, 55. All manuscript source materials referred to in this report are deposited in the Department of the Interior files at the National Archives and are designated Record Group No. 79.

³ *Second Annual Report* (1830), C & O Co., in *Proceedings of the Stockholders*, A, 87-93.

⁴ Sanderlin, *The Great National Project*, p. 84. Also see Mercer to Ingle, July 25, 1829, Ltrs. Recd., C & O Co.

⁵ *Third Annual Report* (1831), C & O Co., in *Proceedings of the Stockholders*, A, 139.

location.⁶

The successful termination of the Baltimore and Ohio controversy enabled the Chesapeake and Ohio Canal Company to resume the construction of its waterway. The board wasted little time in following up its advantage and placed the entire line of canal to Williamsport under contract. It was now a twofold race: the five years allowed by the charter for the construction of the first hundred miles would expire in 1833, and the exhaustion of the company's immediate financial resources was imminent.⁷

Immediately after receiving the official copy of the decision, the board, on January 7, ordered

that the dam, across the river next below Harpers Ferry, and the aqueduct across Catoctin Creek, be let, at the office of the Company, on the 1st day of February, and that proposals be received therefore, until the 31st of January.⁸

Because the Potomac Mills at Shepherdstown had been unable to produce enough cement for the masonry work on the canal below Seneca, some canal officials feared that the contemplated construction of the line to Williamsport would be hindered by the lack of adequate supplies of water lime. Accordingly, on January 18, Inspector of Masonry A. B. McFarland suggested to President Mercer "the propriety of encouraging other individuals besides Messrs. Boteler and Reynolds [of the Potomac Mills] who may have water power to commence the manufacture of the article." McFarland reported his discovery of "ledges of the cement of an excellent quality" a "short distance from Harpers Ferry on the road leading to Shepherdstown" and "also at the mouth of the Antietam." Between Shepherdstown and Williamsport he had not found any lime for cement, but he had seen excellent "specimens" at the mouth of the Cacapon River, some thirty-three miles west of Williamsport.⁹

Three days later McFarland proposed the following modifications in the specifications for the aqueducts:

Backing stones for piers of cut masonry, where paid for as such, should be squared or well scabbled to form close joints and of equal thickness with the front courses, so as to admit of no small rubbish for filling in, and the headers or bond stones in work of this character should be perfectly parallel in their beds so as to have the same thickness in rear as in front.

The sheeting of arches, where cut and paid for as such, should be well scabbled at the ends so as to fill the square the whole width of the stone from the soffit to the extrados--in other respects, the old specifications are perfect enough, but the end joints of nearly all of the

⁶ *Proceedings of the President and Board of Directors*, C, 48. Also see *Fourth Annual Report* (1832), C & O Co., in *Proceedings of the Stockholders*, A, 200. For an in-depth analysis of this legal struggle, see H. H. Walker Lewis, "The Great Case of the Canal vs. the Railroad," *Maryland Law Review* 19 (1959): 1-26.

⁷ Sanderlin, *The Great National Project*, p. 90.

⁸ *Proceedings of the President and Board of Directors*, C, 50. On January 9 the directors solicited contracts for the canal all the way to Williamsport, but the severe winter forced the board to suspend the order for all work above Harpers Ferry. On March 14 and June 21, canal officials let enough of the line above Harpers Ferry to complete the hundred miles required by the charter. *Fourth Annual Report* (1832), C & O Co., in *Proceedings of the Stockholders*, A, 204-7.

⁹ McFarland to Mercer, Jan 18, 1832, Ltrs. Recd., C & O Co.

sheeting first prepared for the Monocacy Aqueduct were not squared any better than to common ashlar, 12 to 16 inches instead of three feet the width required.

McFarland also proposed the following changes in the storage of cement:

The cement or water lime for arches of every description, and for the faces of locks, should be put up into air-tight barrels, and unless this method would be considered by the Board of Directors as increasing too much expense, it would be desirable to have all of the water lime for every department of the work stored in the same manner. The delicacy of the article is such as to destroy many of its best properties so long as the present method is pursued of securing it into the imperfect lime houses.¹⁰

After some delays, the board, on February 25, took up for consideration the proposals offered for the construction of Aqueduct No. 3. The bid of Tracy and Douglas was accepted with the following provisions:

that a reasonable extra allowance should be paid the contractors for the transportation of any face stone necessarily transported over one mile; such extra allowance to be determined by the Engineers. That each party should pay half the cost of any coffer dams, which may be necessary in sinking and laying the foundation of the aqueduct, and that the contractors should obey any written directions of the Engineer in relation to the mode of transporting and preserving the cement.¹¹

Before the construction of Aqueduct No. 3 could commence, land for the right-of-way had to be purchased. Land on the east side of Catocin Creek from which the company had to purchase a right-of-way was owned by Clarissa and Serena Lockett, while that on the west bank belonged to Henry Claggett. After three months of unsuccessful negotiations with the Locketts, the company resorted to condemnation proceedings. On March 22 an inquisition was taken and \$400 in damages was assessed for "eight acres and ten and nine tenths square perches" of the Locketts' land, known as "Locketts' Merry Midnight."¹²

When Henry Claggett also refused to sell land on the west bank of Catocin Creek to the canal company, an inquisition was taken on May 5. The jury awarded Claggett \$725 for a part of a tract of land known as "Hawkins' Merry-Peep-a-Day." In addition, the company agreed to provide Claggett with a ferry and boat for his ferry trade.¹³

¹⁰ McFarland to Ingle, Jan. 21, 1832, Ltrs. Recd., C & O Co. A thorough search of the C & O Company records failed to turn up a copy of the early specifications for aqueducts.

¹¹ *Proceedings of the President and Board of Directors*, C, 78. A thorough search of the C & O Company records failed to turn up detailed plans and specifications for Aqueduct No. 3.

¹² Inquisition, Mar. 22, 1832, Deeds and Other Records Concerning Land Titles, C & O Co. The decision of the jury was confirmed by the Frederick County Court on June 4 and the deed conveying the property to the canal company was recorded on June 14. For a boundary description of this tract of land, see Appendix A.

¹³ Inquisition, May 5, 1832, Deeds and Other Records Concerning Land Titles, C & O Co. Also see Reference Book Concerning Land Titles, 1829-68, C & O Co. On August 18 the board agreed to allow \$300 to Claggett in lieu of the ferry and boat, bringing the total sum paid him to \$1,025. For a boundary description of this tract of land, see Appendix A.

On May 3 Contractor Douglas sent a letter to President Mercer complaining of the lack of good building stone in the vicinity of Aqueduct No. 3. He had opened two quarries and examined other sites in the region but had found no “favorable” stone. During his surveys he had found “a most superior stone” four miles above Harpers Ferry on the Shenandoah River, but Chief Engineer Fisk objected to opening this quarry because of the distance and additional expense of transportation. Instead Fisk insisted that Douglas open and work quarries where the contractor was certain good stone for cutting could not be found. Despite his personal misgivings, Douglas indicated that he was “willing to open and work any quarry when directed, if indemnified for expenses of opening, and the difference of working such quarry compared with the one above the Ferry.” Unless he received a decision on this question soon, he would be forced to discharge his stonecutters and submit a bill to the company for their pay.¹⁴

The board referred this letter on May 5 to Resident Engineer Alfred Cruger for comment. Upon Cruger’s report that Douglas had relinquished “all claim for indemnities for opening new quarries” in his contract for Aqueduct No. 3, the board directed Clerk Ingle to inform Douglas that the company “does not consider that it has anything to do with the cost of opening stone quarries.”¹⁵

As the masonry work above Point of Rocks commenced, Inspector of Masonry Robert Leckie, on May 5, recommended to the board that Engineer A. B. McFarland be given the responsibility of superintending this work. Leckie felt that in addition to this responsibility McFarland should also examine the region to find the location of good building stone and pay close attention to the puddling on the masonry works. Accordingly, on that same day the board ordered McFarland “to extend his superintendence, under the direction of the Resident Engineer, over the masonry recently put under contract between Point of Rocks and Harpers Ferry falls.”¹⁶

After a two-week inspection of the Potomac Valley between Point of Rocks and Harpers Ferry, Superintendent of Masonry McFarland, on May 23, reported to the board “that quarries suitable for cutting purposes are not likely to be so scarce on the new part of the line of canal as had hitherto been represented.” At Catocin Mountain, about one-half mile from the canal on the Virginia side of the river, he had found “an extensive quarry of white mountain granite similar to that used in the Monocacy Aqueduct but perhaps somewhat harder in its texture.” The same type of building stone was also discovered on the Maryland side about 1-½ miles from the river, but this was “of an inferior quality.” On each of the high ridges between the Monocacy River and Harpers Ferry, particularly on the Virginia side of the river, he had “discovered the same rock in great abundance.” He had continued his search on both sides of the river to “within 2 ½ miles of the mouth of the Antietam at which place there are extensive quarries of solid limestone close to the water’s edge.” None of these quarries were more than 2 ½ miles “from the locations of the locks and aqueducts,” and some were “within the distance of 1 mile.”

In his report to the board, McFarland complained that “there appears to be a great want of enterprise among the contractors for the masonry above Point of Rocks.” With the exception of a few

¹⁴ Douglas to Mercer, May 3, 1832, Ltrs. Recd., C & O Co.

¹⁵ *Proceedings of the President and Board of Directors*, C, 135.

¹⁶ Leckie to Mercer, May 5, 1832, Ltrs. Recd., C & O Co. Also see *Proceedings of the President and Board of Directors*, C, 135.

feet of partly cut stone, little masonry work had been done by any of the contractors. Although better quarries might yet be discovered, he intended “to set the contractors at work at cutting in those [quarries] already mentioned without further delay.”¹⁷

On June 4 McFarland submitted a second report to the board on the locations of prospective quarries for the construction of the masonry works between Point of Rocks and Harpers Ferry. Along with the report he sent specimens from the various sites for the directors to study. Formations of the type of white granite used on the Monocacy Aqueduct terminated “at Harpers Ferry immediately after which the limestone and marble commence.” According to McFarland there was “reason to believe that good quarries of the latter kind may be found convenient to the canal line throughout the limestone valley.”

The quarries at Catoctin Mountain were very extensive, “lining its west side near the summit.” Those in Virginia were about one mile from the canal, and those in Maryland were about 1 ½ miles distant. The next good quarries above Catoctin Mountain were found at Short Hills, Virginia. These extensive quarries were superior to Weaver’s quarries, which were nearly opposite on the Maryland side.

Of all the granite specimens he had surveyed, Mrs. Russle’s quarry was “perhaps the easiest cutting stone.” This quarry, already in operation, was very promising. A greater abundance of this stone was located at the summit of Catoctin Mountain, but it was of a harder texture. Stone in Mr. Wormwag’s quarry on the opposite mountain on the Maryland side was also extremely hard.¹⁸

On June 8 Resident Engineer Thomas F. Purcell reported to the board on “the quality of the stone discovered and about to be applied to the masonry of the canal from the Point of Rocks to Galloways Mill.”¹⁹ In his opinion, stone for facing the locks and aqueducts “will be found only with laborious search, and when procured will be expensive both for cutting and transportation.”

Purcell commented in the report on a recent resolution by the board to consider “the expediency of substituting hammered instead of cut stone facing” on the masonry works. Although he supported the proposed change, he felt that the old specifications should be kept for “the sheeting of the largest size arches of the aqueducts, and the ringstone of all culverts together with the hollow quoins, round and recess corners of the locks.”

As for the savings produced by such a change in the masonry specifications, Purcell informed the board that “hammering is in general worth about one half the value of cutting.” According to his calculations, the average price of hammered stone would be sixteen cents per superficial foot. Thus, the savings in building a lock that required about 5,000 superficial feet of hammered stone would amount to nearly \$900.²⁰

¹⁷ McFarland to Ingle, May 23, 1832, Ltrs. Recd., C & O Co.

¹⁸ McFarland to Board of Directors, June 4, 1832, Ltrs. Recd., C & O Co.

¹⁹ On June 2, 22 ½ miles of the canal between Harpers Ferry and the site of Dam No. 4 below the mouth of Opecon Creek had been placed under contract. See *Fourth Annual Report* (1832), C & O Co., in *Proceedings of the Stockholders*, A, 204-6.

²⁰ Purcell to Board of Directors, June 8, 1832, Ltrs. Recd., C & O Co.

McFarland, on June 20, informed the board that the stone cutting for the masonry works above Point of Rocks was ‘extremely slow in its progress.’ The quarrying and cutting for the masonry in the vicinity of Catoctin Creek still had not commenced. If the stone in the Catoctin Mountain quarries proved “obstinate” when they were finally opened, he recommended that the ashlar for these works be taken from the Monocacy quarries.²¹

In late June and early July the board passed several economy measures to help speed construction and prevent the further diminishing of company finances. On June 23 the board ordered the engineers to

dispense with the coping of the culverts and aqueducts, till the water, necessary to the transportation of the stone, be admitted into the canal, and with the coping of the locks, except that required for hanging the lock gates, provided, in all cases of a postponement of any part of the work, a due reduction be made, having reference to the contract price of the deferred work, of the cost the Company may incur in its subsequent completion.²²

Less than two weeks later the board decided

that the Resident Engineers may, where they shall deem it expedient, dispense with cutting the face work of the masonry, and require good hammered face work, in place thereof, deducting for the saving of expense, according to existing contracts.²³

Contractors Douglas and Tracy complained to the board in early June that their contract prices were inadequate to cover the rising costs of construction. Accordingly, the board referred the matter to President Mercer and Resident Engineer Cruger ‘with authority to make such modifications in the manner of constructing said aqueduct and in the contract with Tracy and Douglas for the same, as they may deem necessary and proper.’²⁴

Mercer, on August 18, reported an agreement with Douglas and Tracy, which was approved by the board with the condition

that the monthly estimates shall be made according to a scale to be prepared by the Engineer, giving a pro-rata value to the several descriptions of work and materials, the whole when done not to exceed the stipulated price of eight dollars per perch, and upon which terms a contract was ordered.²⁵

During the summer of 1832, the first one in which unrestricted construction was possible, a disastrous epidemic of Asiatic cholera struck the workers on the line of the canal. Late in August the dreaded disease, which had gradually been spreading south from Montreal, made its appearance on the line near Harpers Ferry. The plague was soon widespread from the Ferry down to

²¹ McFarland to Ingle, June 20, 1832, Ltrs. Recd., C & O Co.

²² *Proceedings of the President and Board of Directors*, C, 174.

²³ *Ibid.*, p. 179.

²⁴ *Ibid.*, pp. 166-67.

²⁵ *Ibid.*, p. 206.

Point of Rocks. Work was suspended on many of the sections, including Aqueduct No. 3, as the terrified laborers dispersed. The cholera gradually spread up the river to the west of Harpers Ferry, accompanied by the flight of the fearful workers.²⁶

The company immediately adopted measures to care for the sick and to calm the panic. Upon Mercer's recommendation, the board ordered

that the President be authorized to rent a suitable building near Harpers Ferry to be occupied as a cholera hospital, and, that a sum not exceeding \$500 be paid out of the "Contingent fund" to the order of Charles B. Fisk, to be applied, under his direction, to the relief of such laborers as may be attacked by disease, whilst employed on the canal.²⁷

On September 8 the board authorized the establishment of two hospitals, one at Harpers Ferry and one at Point of Rocks. The laborers and contractors were to share the expenses of these hospitals with the company. For its part, the board appropriated \$500 to be used in fitting up these hospitals and to be applied to the rent of two buildings.²⁸

The primitive hospitals were finally established in some cabins rented near Harpers Ferry and in a large shanty on Section No.112 west of Harpers Ferry. The method by which they were supported was a form of group insurance. Each of the workers contributed twenty-five cents a month for the doctor's fees and for the upkeep of the hospital.²⁹

With the arrival of colder weather and the disappearance of the cholera, work resumed on the canal. But the harm had been done. As a result of the suspension of the work, the cost of construction had risen sharply. Accordingly, the board, on November 3, passed the following resolution:

That such augmentation be allowed, of the price of the unfinished masonry below the head of Harpers Ferry falls, as may suffice to insure the prompt construction of the same and be approved by the President and the Resident Engineer.³⁰

Two days later, McFarland reported to Mercer on the progress of the work above Point of Rocks. Contractor Douglas had been "waiting more than 2 months for high water to enable him to boat the trifling quantity of 200 perches of stone from Weaver's quarries." Douglas had recently begun building the aqueduct and found "it practicable to obtain these stone in small boat loads the same as he had been respectively ordered to do before the season had become so far advanced." About half of his sheeting had been delivered, and McFarland thought that he might be able to close his arches before winter.

The masonry works below Harpers Ferry were facing still another hindrance to their construction. The large amount of Shepherdstown cement needed for the masonry works above Harpers

²⁶ Sanderlin, *The Great National Project*, pp. 94-95.

²⁷ *Proceedings of the President and Board of Directors*, C, 212.

²⁸ *Ibid.*, pp. 214-15.

²⁹ Mercer to Ingle, Sept. 3, 1832, and Mercer to W. Smith, Sept. 24, 1832, Ltrs. Sent, C & O Co.

³⁰ *Proceedings of the President and Board of Directors*, C, 233.

Ferry was already hindering the progress of operations below that point. Because the kilns at Tuscarora were not producing any cement, some of the masonry operations had already been slowed.³¹

McFarland, on November 11, complained to Clerk Ingle that Douglas had “privately instructed the stone cutters of the Patapsco to scabble his sheeting in the roughest possible manner instead of close cutting as he is paid for them.” He had also directed that the beds of these stones “be reduced 9 inches less in width than his contract or orders permitted him to do.” This “high handed fraud” had been going on for some time, but it was virtually impossible to stop. Although he had used “very reasonable remonstrances against the manner” in which Douglas was doing his work, McFarland was convinced that “a higher authority” was needed to correct the contractor. As a result of these operations, McFarland predicted that “we are going to have a ridiculous piece of masonry.”³²

Resident Engineer Cruger, on December 25, notified the board that 29,850 bushels of cement were urgently needed to continue the construction of the masonry works below Harpers Ferry. Of this total, 4,000 bushels were to be sent to Aqueduct No. 3.³³

In late January 1833 Douglas requested an advance of money to continue his operations on Aqueduct No. 3. Therefore the board ordered “that 500 dollars be paid to him out of the money heretofore retained” on the aqueduct in “accord with the late amendment of his contract.”³⁴

During the early part of June, Captain William G. McNeill of the U.S. Topographical Corps undertook an examination of the waterway “by order of the Secretary of the Treasury at the request of the President and Directors of the canal company.” In his report he made the following observations on Aqueduct No. 3:

Having passed the Point of Rocks and the works which succeed it, consisting of walling for the support of the Baltimore and Ohio Railroad, (which, for several miles between the Point and the temporary termination of the railroad at Harpers Ferry, is immediately in contact with the canal,) Locks Nos. 28 and 29, culverts, &c., at the distance of 53 miles from the Point, the canal crosses the Catoctin, a tributary to the Potomac, on a stone aqueduct, the whole of which, with the exception of the coping, had already been completed. This aqueduct, No. 3, includes three arches, two of which are semi-circular, of twenty feet span: the third being a

³¹ McFarland to Mercer, Nov. 5, 1832, Ltrs. Recd., C & O Co. Wever’s quarries were located near the river just below Lock No. 31, some seven miles above Catoctin Creek. They were owned by Casper W. Wever, a civil engineer who had purchased a 500-acre tract of land in the vicinity of present-day Weverton for the purpose of building a manufacturing town. He established the Weverton Manufacturing Company in 1834 and built a dam across the Potomac to supply water power to the factories that were soon attracted to the site. The expectations for a great manufacturing center perished soon after Wever’s death in 1850, and the factories were closed down and abandoned. See J. Thomas Scharf, *History of Western Maryland* (Philadelphia, 1882), 2:1285.

³² McFarland to Ingle, Nov 11, 1832, Ltrs. Recd., C & O Co. As the stone from Wever’s quarry became increasingly hard to cut, the face stones above the tops of the piers of Aqueduct No. 3 were obtained from the granite quarries of the Patapsco River. They were transported forty-six miles on the Baltimore and Ohio Railroad to the Point of Rocks, and then taken by wagon three miles to the aqueduct.

³³ Cruger to Board of Directors, Dec 25, 1832, Ltrs. Recd., C & O Co.

³⁴ Proceedings of the President and Board of Directors, C, 275-76, 280. Also see Ingle to Douglas, Jan 30, 1833, Ltrs. Sent, C & O Co. On February 23 Douglas received another advance of \$394 for Aqueduct No. 3.

semi-ellipsoid, of forty feet span and ten feet rise, supported on piers, the height of which is about eight feet above low water. The dimensions of this portion of the piers are six feet in width by thirty-three feet in length, while those of the portion under water (six or seven feet in depth) are eight feet wide by thirty-five feet long. The piers are founded on solid rock. The beds and joints of the face stone above the tops of the piers are cut, their face being left rough, or what is called *rock work*. These stone were obtained from the granite quarries of the Patapsco, and transported forty-six miles on the Baltimore and Ohio Railroad to the Point of Rocks, whence they were wagoned three miles to the aqueduct. The masonry below the tops of the piers is of ranged rubble work, the stone for which were boated down the Potomac seven miles, from a quarry near lock 31.

Besides the rough wings, (which cost \$2,000,) there are 2,800 perches of masonry laid in water cement. The bottom of the trunk is planked the same as the Monocacy aqueduct. Pilasters at the head of the piers are dispensed with. There is a water table projecting six inches, and the coping, one foot in thickness, projects ten inches. The thickness of the towpath parapet is seven feet, that of the berm parapet five feet, and the width of the water way twenty one feet.

The total cost of this aqueduct (exclusive of the iron railing with which it is intended to surmount the towing path) is stated to have been \$33,500.³⁵

In late October water was admitted into the canal at Harpers Ferry. By November 1 Resident Engineer Cruger was able to report to the board that

There is four feet [of] water from Harpers Ferry to the 1st lock below the Monocacy, and navigable water thence to the Beaver Dam Culvert, and the water [is] coming on rapidly to Seneca; it will reach here by 12 o'clock today. There is no leak or appearance of leak on the whole line; the manner in which the canal holds water is a subject of admiration to all those who are witnessing it.³⁶

When Aqueduct No. 3 was completed, the board let the contract for iron railings on the structure to Gideon Davis, the contractor for the railings on Aqueducts Nos. 1 and 2. On November 1 the board ordered "that leave be given to Gideon Davis to transport on the Canal, free of toll, the iron railing prepared by him for Aqueduct No. 3."³⁷ Seven weeks later, on December 20, the board advanced the sum of \$40 to Davis for his work on the railing.³⁸ On January 6, 1834, the board approved the final estimate of \$654.41 for the iron railing.³⁹

Cruger, on January 14, requested that the board send him all the contracts and related information on Aqueduct No. 3 so that he could make a final estimate on the structure. Work on the aqueduct had been completed since the first of the year, and Douglas was anxious to close his

³⁵ *Report of Capt. Wm. G. McNeill on the Condition of the Chesapeake and Ohio Canal* (Boston, 1833), reprinted in U. S., Congress, House, Committee on Roads and Canals, *Chesapeake and Ohio Canal: Report to Accompany H. R. 94*, 23d Cong. 1st Sess., 1834, H. Doc. 414, p. 149.

³⁶ Cruger to Board of Directors, Nov. 1, 1833, Ltrs. Recd., C & O Co.

³⁷ *Proceedings of the President and Board of Directors*, D, 1.

³⁸ *Ibid.*, p. 34.

³⁹ *Ibid.*, p. 40.

accounts with the company.⁴⁰

On February 13 Contractor Douglas sent the final estimate for Aqueduct No. 3 to the board, claiming a further allowance for the cut stone. According to Douglas, his original offer was as follows: “and in case of introducing faced or cut stone drawn or boated from a distance per foot face or surface of cut stone \$1 per foot.” The clause of his contract dealing with cut work was as follows: “and one dollar per foot for all cut work that may be required by the Engineers to be measured on the face of the work when completed.” Because the wording of these documents was so “perfectly plain,” Douglas requested “a review of the matter” and a remeasurement.⁴¹

Cruger, on March 21, reported to the board on Douglas’ request for a revision of the final estimate. His recommendation that \$126 be added to the final estimate was accepted by the board, and the amended estimate was ordered to be paid. At the same time the board refused to consider a subsequent request of Douglas for further allowances.⁴²

When water was readmitted into the canal on March 8 to begin the boating season, Aqueduct No. 3 “leaked considerably back of one of its abutments.” Chief Engineer Charles B. Fisk estimated that two or three weeks of work would be needed “to make it perfectly secure.” Although he felt that the work could be postponed until the following winter, he would not be surprised if the aqueduct would “interrupt the navigation for two or three days” during the spring.⁴³

Contractor Douglas, on March 22, again wrote to the board protesting that the final estimate for his work was incorrect. He repeated his earlier remarks that both his offer and contract specified that he was entitled to one dollar per superficial foot “for all the cut work that may be required by the Engineers & to be measured on the face of the work when completed.” On the other hand, Engineer Cruger had based his final estimate on the restrictive phrase “\$1 per superficial foot measuring on the face.”⁴⁴

When Douglas heard on April 4 that Director Janney had left Washington and that the board would not act on his case, he sent them an angry letter. In the bitter communication he indicated that his first step would be “to proceed by injunction to see if the work can be taken and not paid for.”⁴⁵

The board, on May 2, referred Douglas’ claim for further allowances on the cut stone to Clerk Ingle “with authority to settle the same as he shall deem correct.”⁴⁶ After a lengthy discussion with Mr. Alexander, the attorney hired by Douglas, Ingle informed the contractor on June 26 that “we have arranged an amicable settlement of your accounts.” According to the arrangement, the company agreed to pay Douglas \$4,640 in notes payable at twelve months, the sum originally

⁴⁰ Cruger to Board of Directors, Jan. 14, 1834, Ltrs. Recd., C & O Co.

⁴¹ Douglas to Board of Directors, Feb. 13, 1834, Ltrs. Recd., C & O Co.

⁴² *Proceedings of the President and Board of Directors*, D, 58-59.

⁴³ Fisk to Ingle, Mar. 8, 1834, Ltrs. Recd., C & O Co. Evidently minor repairs were made on the aqueduct to stem the breach, although available evidence does not indicate the extent of the work. Fisk to Board of Directors, Mar. 17, 1834, Ltrs. Recd., C & O Co.

⁴⁴ Douglas to Board of Directors, Mar. 22, 1834, Ltrs. Recd., C & O Co.

⁴⁵ Douglas to Board of Directors, Apr. 4, 1834, Ltrs. Recd., C & O Co.

⁴⁶ *Proceedings of the President and Board of Directors*, D, 84.

calculated by Cruger. Alexander, for his part, agreed to abandon the disputed claim for cut stone.⁴⁷

The canal company treasury was virtually depleted during the latter months of 1834. While the company desperately petitioned the legislatures of Virginia and Maryland and the U. S. Congress for financial aid, it delayed the payment of many of its bills, including the final estimate to Douglas. Therefore, in mid-January 1835, the contractor took the company to court to force payment.⁴⁸

On April 5 Chief Engineer Charles B. Fisk notified the board that high water had caused a breach at Aqueduct No. 3 “of a more serious nature than any that we have had above Seneca.” One of the wings had been undermined and had been “cracked to the very top close in to the back of the abutment,” causing the coping to settle “very considerably.” Fisk recommended that all of the wing walls be rebuilt in order to secure the structure. Because the wings had been poorly constructed, the aqueduct would never “be secure with 6 feet of water.”

In defending his recommendation, Fisk reminded the board of the proper methods for constructing wing walls:

The wings of an aqueduct ought particularly to have as firm a foundation as the piers and abutments themselves, and if rock can be had the foundations should be upon it. The wings ought to splay out to the full width of the canal as nearly at right angles to its direction as the nature of the stream will admit of, and connected with those wings there ought to be near their termination masonry with foundations equally good, extending in a direction nearly parallel with the canal & running into the bank. It is also of the greatest importance that the side of the wings next to the embankment and the back of the abutments and in fact all the masonry that joins the filling or the puddling, should batter and should have a face as smooth as masonry can be laid, without cutting, in order that the weight of the filling shall press it the closer against the masonry. In addition to all this the masonry should be as water tight as it can be made, and in no case should any dry masonry be admitted.

Because the reverse of these building methods had been used “in every particular” on Aqueduct No. 3, Fisk urged the board to consider his plans for the complete reconstruction of the wing walls, even though they involved an estimated cost of \$6,000. Because the earth had “gone out for the whole width of the canal between the wings,” Fisk intended to place a wooden trunk over the breach so that navigation of the waterway could be restored as soon as possible. After this was accomplished, the wings could be rebuilt when the high water of the Potomac River subsided.⁴⁹

The board, on April 9, approved Fisk’s recommendation to install a temporary wooden trunk but had to reject his proposal to reconstruct the wing walls because of the company’s embarrassing financial situation. A. B. McFarland and a crew of laborers were quickly dispatched to Aqueduct

⁴⁷ Ingle to Douglas, June 26, 1834, Ltrs. Sent, C & O Co.

⁴⁸ Ingle to Price, Jan. 26, 1835, Ltrs. Sent, C & O Co.

⁴⁹ Fisk to Board of Directors, Apr. 5, 1835, Ltrs. Recd., C & O Co.

No. 3 to commence the needed work under Fisk's supervision.⁵⁰

One week later, Fisk informed Ingle that the wooden trunk had been completed and that boats were passing over Aqueduct No. 3. While this work had been going on, the Potomac had risen "so high as to render it impossible to do any thing toward the foundation."⁵¹

At the seventh annual meeting of the canal company stockholders on June 1 the board stated:

The trade between the District and Harpers Ferry has been interrupted for several days during the present year, by the unfortunate occurrence of two or three breaches, the most considerable of which was at the Catoctin aqueduct. In order that the repairs at this point be made effectual and permanent, a temporary trunk has been constructed over the breach, by which boats can pass without difficulty, and the work is now progressing and will be completed with all practicable dispatch. The board, sensibly impressed with the inconvenience to the public and loss to the company, by the interruption to the navigation, occasioned by breaches, have deemed it of the first importance to have a thorough and critical examination of the entire canal from Georgetown to dam No. 5, with the view of having such repairs made and points strengthened during the present season, as will effectually secure it for the future against the recurrence of breaches. The board accordingly directed Mr. Purcell and Mr. Fisk to make the necessary examinations, and report to the board, which has been done, and a portion of the work is now under contract.⁵²

On October 30 Ingle informed George Bender, the newly-appointed canal commissioner, that the trial involving Douglas' suit had been set for November 6 at Frederick, Maryland. Because the wing walls of Aqueduct No. 3 were "so wretchedly bad," the company intended to attempt "to reduce the price allowed by Mr. Cruger by showing this fact." Chief Engineer Fisk would be the chief witness for the company.⁵³

At the board meeting on November 11, Ingle reported that Douglas had won his suit at Frederick. The board directed Mr. Price, the counsel for the company, to apply for a new trial in the case. If the motion for a new trial was declined, the judgment was to be paid. At the same time, the board cancelled the canal scrip amounting to \$4,640 that had been issued in May 1834 in payment of Douglas' claim.⁵⁴

The company's motion for a new trial was rejected within one week. On November 18 Douglas was given \$9,744.73 as his final payment, and the account for construction of Aqueduct No. 3 was closed. All told, the construction of the aqueduct and the repairs to its wing walls in 1835 had cost the company \$44,762.93.⁵⁵

⁵⁰ Ingle to Fisk, Apr. 9, 1835, Ltrs. Recd., C & O Co.

⁵¹ Fisk to Ingle, Apr. 16, 1835, Ltrs. Recd., C & O Co.

⁵² *Seventh Annual Report* (1835), C & O Co., p. 7.

⁵³ Ingle to Bender, Oct. 30, 1835, Ltrs. Sent, C & O Co.

⁵⁴ *Proceedings of the President and Board of Directors*, D, 426.

⁵⁵ *Ibid.*, p. 430.

CHAPTER II: THE AQUEDUCT FROM 1838 to 1973

Despite the repairs made on Aqueduct No. 3 in 1835, the structure continued to pose problems for the company. On April 12, 1838, one of its wing walls “gave way and occasioned a breach.” A temporary wooden trunk was again placed over the breach, and repairs were commenced.⁵⁶

While these repairs were being made, one of the sides of the wooden trunk gave way on June 18 and “let such a quantity of water out so as to undermine the trussing which supported the trunk.” According to Superintendent W. S. Elgin, the collapse had been caused “by heavy laden boats from time to time running against the sides.” Elgin had taken prompt steps to repair the damage and was hopeful that navigation on the canal could be restored in several days.⁵⁷

Experience had demonstrated that the aqueducts between Georgetown and Dam No. 5 leaked to some extent. Considerable thought was given by Chief Engineer Fisk and his subordinates to ways to control this situation. The plan finally settled upon in the spring of 1838 was to seal the aqueducts with “American Cement,” starting with Aqueducts Nos. 6 and 7 then under construction above Dam No. 5.⁵⁸

After Thomas C. Coyle, the patentee of “American Cement,” had applied his product to Aqueduct No. 6 in September, the board decided against using it on Aqueduct No. 7 because of its high cost. Accordingly, Fisk determined that the cement intended for that project should be used to rebuild the trunk of Aqueduct No. 3 when the water was drawn off for the winter.

Coyle, on December 13, notified Fisk that he was shipping 400 barrels of “American Cement” for Aqueduct No. 3 from Baltimore to Point of Rocks, pursuant to the chief engineer’s instructions. This cement would be applied at a cost of fifty cents per barrel, plus transportation costs, but this “prime cost” could not be continued in the future.⁵⁹

During the winter season Coyle applied 924 barrels of “American Cement” to Aqueduct No. 3 in rebuilding its trunk. On March 19 he was paid \$1,432.20 as a full settlement of his accounts with the company. The price of \$1.55 per barrel included Coyle’s services, the cost of transportation,

⁵⁶ *Tenth Annual Report* (1838), C & O Co., p. 12. Also see Proceedings of the President and Board of Directors, E, 388;.

⁵⁷ Elgin to Ingle, June 19, 1838, Ltrs. Recd., C & O Co.

⁵⁸ Edwin C. Bearss, *Historic Structure Report, Tonoloway Aqueduct* (Washington, 1967), pp. 31-37.

⁵⁹ Coyle to Fisk, Dec. 13, 1838, Ltrs. Recd., Chief Engineer. The cost of applying the cement on Aqueduct No. 6 had been seventy-five cents per barrel. Also see Fisk to Elgin, Dec. 16, 1838, Ltrs. Sent, Chief Engineer.

and charges for the resin, tar, and kettles.⁶⁰

The Catoctin Aqueduct was functioning well in June 1853 when Chief Engineer and General Superintendent Thomas L. Patterson reported that the “aqueducts are in good condition and require no repairs.”⁶¹

At a meeting of the board on June 26, 1856, General Superintendent A. K. Stake reported

that directions had been given to the Supts. of Divisions to have a cheap railing placed upon the inner edge of the coping of the several aqueducts on the line, which had been carried out upon most of the Divisions, & arrangements made to carry it out upon all of them; that it is a great improvement, both in appearance, and security to the passing teams.⁶²

Unlike several of the company’s “works of art,” Aqueduct No. 3 suffered no damage during the Civil War. According to the board in June 1866, “the masonry of the aqueducts, culverts and locks is both substantial and in good repair, the only exception requiring special remark being the aqueduct that spans the Conococheague River.” During the conflict that structure had been “wan- tonly and most seriously injured by rebel soldiers.”⁶³

In November 1869 the board traveled the entire line of the canal from Georgetown to Cumberland, and the following June they reported to the stockholders:

The masonry, we regret to say was mostly in very bad condition, caused principally by keeping the water in the canal, late in the season, after the freezing weather had commenced. The ice thus forming in the cracks of the works, expands and breaks the bonds of the cement, leaving the structure more like a pile of loose stone than a duct for conveying water; besides, when the ice is permitted to form on the surface of the water in the aqueducts, the expansion pushes out the wall on the berm side, which is only five feet in thickness, and therefore more liable to yield than the towing path side, which is from seven to eight feet thick.⁶⁴

President Josiah H. Gordon, on March 19, 1870, issued the following order relative to Aqueduct No. 3 at the recommendation of Chief Engineer William R. Hutton:

In approaching Catoctin Aqueduct, the master of any boat or float shall slacken its speed at least fifty yards therefrom, or at such distance as the Superintendent or any person acting by his authority may direct, and such boat or float shall enter and pass through said Aqueduct without striking the sidewalls of the same.

⁶⁰ Coyle to Fisk, Mar 6, 1839, Ltrs. Recd., C & O Co.; Fisk to Elgin, Mar. 19, 1839, Ltrs. Sent, Chief Engineer.

⁶¹ *Twenty-Fifth Annual Report* (1853), C & O., p. 9.

⁶² *Proceedings of the President and Board of Directors*, I, 274.

⁶³ *Thirty-Eighth Annual Report* (1866), C & O Co., pp. 7-8.

⁶⁴ *Forty-Second Annual Report* (1870), C & O Co., pp. 3-4

After this order was issued, Hutton dispatched “a competent man as watchman to remain at the Aqueduct” to see that it was complied with.⁶⁵

By the spring of 1873 the condition of Aqueduct No. 3 had deteriorated badly. On April 4 Charles Little, a boatman wrote the following letter to President Gorman:

I have made one trip and I have crossed Four Aqueducts, which are in a bad condition, in regards of no railings and I got my team overboard in the Catoctin Aqueduct and I got them out with out little damage and Bridges also. I write you this for the welfare of the Canal and protection for the Boatmen’s stock.⁶⁶

On May 31, 1873, Engineer Patterson reported that

Most of the aqueducts have been leaking more or less for years past; the consequence of which, owing to the freezing of water in the interior of the walls, has been a greater or less injury to their berm parapets and spandrills. This injury is so great, in the cases of the Seneca and Tonoloway Aqueducts, that it will be necessary to take down and rebuild a portion of the berm side of these structures.⁶⁷

The C & O Canal Company records do not indicate the effects of the devastating floods of 1877, 1886, and 1889 on Aqueduct No. 3. The flood of 1889 forced the canal company to go into a receivership, with the Baltimore and Ohio Railroad emerging as the majority owner of the canal company bonds. Under the railroad’s management, trustees were appointed, and the canal entered into its last period of operation. In 1924, after the railroad had captured almost all of its carrying trade, the Chesapeake and Ohio Canal ceased to operate. While documentary data in the C & O Company records dealing with maintenance and reconstruction problems for the period 1850-89 is sketchy, there is virtually *no* information dealing with these subjects for the years 1889-1924. However, secondary sources such as Sanderlin seem to indicate that the canal operated under the railroad much as it had in previous years.

In 1950 a field survey was made of Paw Paw Tunnel and of the aqueducts, culverts, and overpasses on the canal by Engineer C. D. Geisler. He observed that the center span of Aqueduct No. 3 had “developed a sag and is near collapse.” The “upstream spandrel with underlying section of arch barrel” had fallen away, and all three spans would “require complete reconstruction.”⁶⁸

⁶⁵ Gordon to Thomas and Hutton to Thomas, March 19, 1870, Ltrs. Sent, C & O Co. Because Aqueduct No. 3 is located at a sharp bend of the canal, the problem of boats running into its sides was a continuous concern to the company.

⁶⁶ Little to Gorman, Apr. 4, 1873, Ltrs. Recd., C & O Co.

⁶⁷ *Forty-Fifth Annual Report* (1873), C & O., pp. 28-29.

⁶⁸ U. S. Congress, House, Committee on Public Lands, *Chesapeake and Ohio Canal Report*, 81st Cong., 2d Sess., 1950, H. Doc. 687, p. 71. Although the date for the collapse of the upstream spandrel cannot be pinpointed, photographs taken in 1936 show that this event had taken place by that date.

On the morning of October 30, 1973, Aqueduct No. 3 collapsed, leaving only a remnant of its eastern arch standing. The remains of the structure's western pier and foundation can still be seen above the water surface of Catoctin Creek, and the damaged western abutment walls are still standing. The cost for its complete reconstruction has been estimated at nearly \$4 million.⁶⁹

⁶⁹ For a view of the remaining parts of Aqueduct No. 3, see Plates 7-9. In December 1973, Dean Robinson of Robinson Engineering in Falls Church, Virginia, conducted an investigation of Aqueduct No. 3 under an A & E contract with the National Park Service in order to offer recommendations for the repair and restoration of the structure. A copy of his report may be seen in Appendix C.

AFTERWORD

RESTORATION OF THE AQUEDUCT 2010–2011

As a result of the vision of veterinarian and nearby resident Dr. George E. Lewis, Jr. a major fundraising effort culminated in the Catoctin Aqueduct Restoration Project. The total funding involved \$3.93 million from the American Recovery and Reinvestment Act (ARRA); funds raised by Catoctin Aqueduct Restoration Fund, Inc. from families, friends, and corporations and an Adopt-A-Stone Program; The Community Foundation of Frederick County; the C&O Canal Association; Tourism Reinvestment in Promotion and Product Program Development grants from the Tourism Council of Frederick County; Maryland Heritage Areas Authority; a State of Maryland Bond Bill; and funds received through the Maryland State Highway Administration's Transportation Enhancement Program.

Under contracts with the National Park Service, the engineering design was completed by McMullan & Associates Consulting Engineers of Vienna, Virginia and the reconstruction was done by Corman Construction, based in Annapolis Junction, Maryland. Their in-stream work required cofferdams at the location of the two upstream piers.

The reconstruction involved the rebuilding of the collapsed arches with reinforced concrete faced with historic and new stones to recreate the original appearance of the aqueduct insofar as possible. In addition:

- The severely deteriorated western pier and footing were removed and reconstructed.
- Scour around existing abutments and piers were repaired.
- The berm and towpath parapets were rebuilt and topped with original coping stones when possible.
- Railing compatible with the original railing was installed along the towpath, incorporating original railing when possible.
- A retaining wall was built as an extension to the upstream wingwall to prevent scouring.

The final cost of the project was approximately \$4,500,000.

C&O Canal NHP Headquarters
Hagerstown, MD
November 2011

APPENDIXES

A: Boundary Descriptions of Land Tracts Purchased for Canal Right of Way over Catoctin Creek	19
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Appendix A.

Boundary Descriptions of Land Tracts Purchased for Canal Right-of-Way over Catoctin Creek

Land Tract Acquired by Inquisition from Serena and Clarissa Lockett, March 22, 1832

The boundaries of this tract of land were as follows:

beginning at the end of 10.24 chains on the division line between the said Clarissa and Serena Lockett and the heirs of Samuel Lockett and running 1st north fifty three degrees west six and three hundredths chains to a stone planted (the same being measured with a four pole chain composed of one hundred equal links), 2nd north fifty eight degrees west seven [and] thirty four [hundredths] chains to a stone planted, 3rd north sixty four and three quarters degrees west five and fifty four hundredths chains, 4th north seventy one and three quarters degrees west five and fifty eight hundredths chains to a stone planted, 5th north seventy three and one half degrees west ten and one tenth chains to a stone planted, 6th north seventy seven degrees west six and seventy five hundredths chains through a beach tree marked with six notches standing at the end of 3.65 chains on this line, to a point intersecting the first line between the Chesapeake & Ohio Canal and Henry Claggett, in the Catoctin Creek, thence south forty three degrees and one half degree east six and three tenths chains to another point in the Catoctin Creek on a line drawn south fifty four degrees west from the end of the eighth line through a large black oak tree marked with six notches, intersecting the last line between the canal and Henry Claggett, thence 8th north fifty four degrees east two and twenty one hundredths chains to a stone planted, 9th south seventy three and three quarter degrees east nine and ninety five chains to a stone planted, 10th south seventy one and three quarter degrees east five and thirty nine hundredth chains to a stone planted, 11th south sixty five degrees east five and thirty one hundredth chains to a stone planted, 12th south fifty eight degrees east seven and twenty four hundredth chains to a stone planted, 13th south forty eight and three quarter degrees east seven and eight hundredth chains to a stone planted at the end of seven and fifty one hundredth chains on the division line between the land [of] Misses Locketts and the heirs of Samuel Lockett, then 14th with said line north eleven and one half degrees east two and seventy three hundredth chains to the beginning.

Land Tract Acquired by Inquisition from Henry Claggett, May 5, 1832

The boundaries of this tract of land were as follows:

beginning at a point in the Catoctin Creek, where a line drawn north eighty three and one half degrees east (through a stone on the bank of said creek) from the end of the first line of this survey, intersects the sixth line of 'The survey of the land occupied by the Chesapeake & Ohio Canal and belonging to Miss Clarissa and Serena Lockett,' running 1st south eight [and] three and one half degrees west nine and thirty six hundredth chains to a stone now planted; 2nd south seventy five degrees and twenty eight minutes west ten and ninety seven hundredths chains to a stone planted; 3rd south seventy five and three quarter degrees west thirteen [and] sixty one hundredth chains to a stone planted; 4th south seventy two and three degrees west six and thirty six hundredth chains to a stone planted; 5th south seventy and one half degrees west, eight and twenty nine hundredth chains to a stone planted; 6th south seventy one degrees west, eight and twelve hundredth chains to a stone planted; 7th south sixty nine degrees and fifty five minutes west fourteen and seventy one hundredth chains to a stone planted on the division line between the said Henry Claggett and Grafton Duvall; 8th with said line south twelve degrees and forty two minutes east one and ninety two hundredth chains to a stone planted; 9th north sixty nine degrees fifty five minutes east fourteen and ninety one hundredth chains to a stone planted; 10th north seventy one degrees east eight and fourteen hundredth chains to a stone planted; 11th north seventy one degrees and fifteen minutes east eight and fifteen hundredth chains to a stone planted; 12th north seventy three degrees and twelve minutes east six and thirty six hundredth chains to a stone planted; 13th north seventy five and three quarter degrees east thirteen and fifty eight hundredth chains to a stone planted; 14th north seventy seven degrees east ten and eighty three hundredth chains to a stone planted; 15th south eighty four and one half degrees east five and forty four hundredth chains to a stone planted; 16th south eighty four degrees and twenty five minutes east through a stone on the bank of the Catoctin Creek, to a point in said creek intersecting a line drawn south fifty four degrees west from the end of the eighth line of the Miss Locketts, above referred to; 17th north forty three degrees and one half degree west six and thirty hundredth chains to a stone planted at the beginning, containing sixteen acres, one rod and sixteen square perches.

Appendix B

Payments Made by the Company for the construction of Aqueduct No. 3.

Douglas and Tracy, Contractors

Debit			Credits		
			<u>1832</u>		
May 1	To cement (288 bls)	\$60.48	Jun 1	For Const.	\$562.50
Jun 19	To Clement Smith	389.52	July 1	For Const.	2,586.75
Jun 19	To cement (342 bls)	71.82	Aug 1	For Const.	1,844.75
July 1	To cement (324 bls)	68.04	Nov 1	For Const.	1,793.00
July 14	To Clement Smith	1,997.58	Dec 1	For Const.	3,973.00
Aug 25	To cement (275 bls)	57.75			
Aug 25	To Clement Smith	1,407.76			
Nov 10	To Clement Smith	1,376.65			
Nov 24	To cement(1,047 bls)	219.87			
Dec 10	To Clement Smith	3,627.23			
Dec 26	To cement (344 bls)	72.24			
			<u>1833</u>		
Jan 12	To Clement Smith	1,610.56	Jan. 1	For Const.	2,103.50
Feb 11	To Clement Smith	2,287.40	Feb 1	For Const	2,287.40
Feb 11	To Clement Smith	894.00	Mar 1	For Const	2,535.00
Feb 27	To cement (675 bls)	141.75	Apr 1	For Const	5,251.50
Mar 11	To Clement Smith	2,393.25	May 1	For Const	5,404.00
Mar 28	To J. H. Watkins	436.04	June 1	For Const	2,205.00
Apr 10	To Clement Smith	4,924.47	July 1	For Const	1,435.00
May 10	To Clement Smith	5,012.00			
May 31	To J. H. Watkins	336.84			
June 10	To Clement Smith	2,018.15			
July 10	To Clement Smith	1,100.00			
			<u>1834</u>		
Jan 24	To Clement Smith	10.50	Mar 21	For Const.	3,217.89
Mar 24	To cement (120 bls)	25.20	May 31	For Const.	690.11
Mar 24	To Gideon Davis	654.41			
May 1	To Notes Payable	4,640.00			
May 1	To C. W. Weaver	30.00			

<u>1835</u>			<u>1835</u>		
Jun 1	Boteler & Reynolds	444.76	Dec 1	By amt. carried to 1836	7,347.55
Jun 1	To cement	27.50			
Sept 2	Robert Barnard	300.00			
Sept 2	To repairs	1,745.74			
Nov 13	To repairs	4,122.40			
Nov 13	To W. S. Elgin	25.75			
Nov 13	To W. S. Elgin	562.40			
Nov 13	Robert Barnard	15.89			
Sec 1	To Geo Reynolds	119.00			
<u>1836</u>	To amt. from Dec 1	7,347.55	<u>1836</u>		
July 1	To W. S. Elgin	870.21			
Sept 14	Robert Barnard	266.95			
Nov 1	To W. S. Elgin	968.43			
Dec 1	To W. S. Elgin	110.50			
			<u>1837</u>		
			<u>May 31</u>	For Const.	<u>9,563.64</u>
		\$44,762.93			\$44,762.93

Railings for Aqueduct No. 3

Gideon Davis, Contractor

Debit			Credits		
<u>1833</u>			<u>1833</u>		
Dec 20	Clement Smith	\$40.00			
<u>1834</u>			<u>1834</u>		
Jan 3	Clement Smith	<u>614.41</u>	Jan 3	For Const.	<u>654.41</u>
		\$654.41			\$654.41

Appendix C

Excerpts from Dean Robinson Report on Condition of Aqueduct No. 3 and Recommendations for Repair and Restoration, December 1973

We have analyzed the aqueduct both from an "As Built" and from the present points of view, and offer the following recommendations for repair and restoration, and comments in general about the structure and the surrounding site.

Before any complete restoration of the aqueduct arches and parapet is begun, the abutments should be stabilized, both for the safety of the remaining structure, and to prepare the abutments for the additional loads and stresses that will be reimposed when the arch barrel and remaining structure is replaced.

General Conditions

West Abutment: Both North and South wingwalls of the abutment appear to be in good condition, with both having some erosion of soil from behind. The North wingwall in particular is in the more serious condition, and will require some attention soon. The wingwalls consist of mass stone cemented together to form gravity retaining walls, with batter from both faces.

Between wingwalls the abutment portion of the wall has been severely damaged from the collapse of the adjacent arch barrel and the upstream junction of the abutment and North wingwall has some rather serious raveling of the stone, this raveling occurring from top to bottom. The downstream junction with the South wingwall is also damaged but not so severely.

East Abutment: The upstream or North wingwall of the abutment has some rather serious bulges just back of the junction of the abutment and wingwall. These bulges appear to have shifted the outside face out several inches, and some of the stone from this area is missing further back along the wingwall. There is another portion of the wall near ground line with missing stone, but only minor bulges are apparent here. The downstream or South wingwall has some of the capstones missing, but is in otherwise excellent condition.

Between wingwalls the abutment portion has in part collapsed, but the downstream portion of this section is in good condition. At the upstream face, the collapse of the upstream parapet and portion of the arch barrel at its junction with the abutment has caused this collapse.

Aqueduct: The arch barrels originally consisted of a three span filled spandrel arch with massive up and downstream parapets, spanning the stream. Spans were approximately 20'-40'-20', such spans being clear. Between spans was an approximate 6' wide pier. Shorter spans were circular arches, and the 40' span was an elliptical arch. All the second and third spans and a portion of the first span have collapsed. The remaining portion of the collapsed first span has several loose stones, but otherwise appears to be stable. The downstream parapet of the first span is still intact, but the upstream parapet is missing entirely.

The first pier also has collapsed to the same extent as the arch barrel. The second pier is intact

only from the top of footing down. Remains of the collapsed portion were salvaged by NPS and are stockpiled near the site. Judging from photographs taken before the final collapse of the second and third spans, almost all the upstream parapet was missing for some time, and it is doubtful that any substantial portion of these stones were found during salvage.

Previous descriptions are general and the extent of the damage can perhaps better be visualized by looking at the preliminary plans and the photographs taken by NPS.

Analysis:

During the course of the investigation we retained Dr. Peter Rebel P.E. an engineer specializing in foundation and soils, to assist with recommendations for repair, and causes for the failure, and plan on consulting him further during the second phase of the project.

Analyzing the "As Built" arch we have found force lines along the structure, and plotted them on the ringstone portion of the barrel. Our analysis consisted of taking a theoretical one foot wide section between parapet walls and loading with original fill material over that section, and in addition a separate force analysis loading with water over the barrel. From this force line analysis we found that the circular arches carried loads in compression all along the arch axis, but that the elliptical arch was unstable because the lines of force at one point actually touches the arch barrel. When this condition occurs the arch undergoes a tensile force which it cannot absorb. At this point there is a rotation in the arch barrel, and in this case it could be predicted that this rotation would occur and failure would result. The one foot wide analysis is on the conservative side, because it does not take it into account the mass of the parapet walls. Since we know that collapse did not occur when the structure was built we could only conclude that the strengthening by the parapet walls was substantial. From the history of the structure however, we find that actual rotation did occur, and that the center span shifted downward several inches and that recompression occurred by this shift.

After recompression occurred the structure stabilized itself, and the structure served its function for a good number of years.

By action of scour and age, the mortar between stones has disappeared, and in time the upstream parapet wall failed and collapsed into the stream. By the loss of the upstream parapet, the assumed loss of some of the downstream stones, and by action of the water, the final collapse of the middle span was predictable, and with it went one of the adjacent spans.

We find no reason to believe that any substantial failure of the piers or pier foundations occurred prior to the collapse of the two spans, however the loss of some of the key stones in the piers would have added to the tendency to collapse. The surprising thing about the structure is not that it collapsed, but that it stood so long prior to collapsing.

The abutments for the most part are in no immediate danger, with the exception of the bulging of the North wingwall of the East abutment, and of course those areas where the arch barrel rested against and delivered thrust to the abutments. From our analysis we believe that hydrostatic pressure from the saturated soil behind the wall has caused the bulging of the wingwall, and again

find no reason to believe that there is any substantial foundation failure.

Recommended Repair:

Two approaches are taken in the recommendations for repair, the first alternate assumes that the entire aqueduct will be rebuilt partially now, and the remaining portion at some future date. The second alternate assumes that the aqueduct will be stabilized as an in place ruin.

Alternate 1: Assuming that the future plans are to build the structure completely back as it was, the following procedure is recommended:

First before any restoration of the aqueduct arches is begun, the abutments should be stabilized, both for protection of the remaining structure and to prepare the abutments to receive any additional loads and stresses when the arch barrel is replaced. The West abutment is the most stable of the two and recommendations for its strengthening follows:

From behind the abutment, excavate narrow trenches, and from these trenches rotary drill and grout into the existing mass several reinforcing rods, extending these rods back into the trench. Then place mass concrete in the trenches, such concrete need to be of minimal strength. This concrete filled trench thus provides a counterfort to relieve stresses and pressures now being taken by the walls.

The counterfort picks up its loading from side friction with the surrounding soil. Refer to plans for preliminary location of these counterforts.

After the counterforts have been installed, and working from a platform on the water side of the abutment, install by rotary drilling anchor rods back into the mass of the unstable portion of the abutment to tie the structure into a more homogeneous mass. The anchor rods can be installed by inserting a packaged epoxy cement tube back into the drill hole, then inserting a reinforcing rod rupturing the tube, thus forming a bond between the stone mass, the anchor rod and the face. These anchor rods should be installed along the entire vertical face at approximately 4' on centers. It is not deemed necessary to anchor rod either the upstream or downstream wingwalls.

Finally after grouting has been accomplished, place drainage pipe with porous backfill behind the wingwalls to allow for a better drainage from behind these walls.

The East abutment requires stabilization in much the same way for the North wingwall of this abutment, first installation of the counterforts, and then from the face installation of anchor rods in the lower portion of this wall, then filling the voids in the lower portion of the wall. We do not recommend any extensive grouting of this wall because we would like to maintain as much drainage from behind this wall as possible.

We do not believe that it would be a good decision to attempt to rebuild the arch structure from masonry since the geometry of the middle span is such as to provide for the rebuilding of an unstable span. We therefore recommend that the rebuilding of the arch structure be as follows:

First place shoring under the structure remaining, then excavate by hand the loose rubble fill now present over the remaining portion of the structure, providing for room for a concrete arch to be placed over the remaining masonry arch barrel, and also provide for room for a concrete abutment for the arch to thrust against. Under the first stage of such construction only one concrete arch barrel would be constructed, with necessary reinforcement being stubbed out and protected for future construction. Without the actual excavation the extent of the excavation cannot be predicted but should not have to extend more than three to five feet below the spring line of the arch. Sections in the plans show the approximate limits of the concrete to be placed. After installation of the arch barrel in concrete, and necessary diaphragm walls and parapet walls, the waterproofing of these walls, the structure then should be backfilled, and drainage from behind should be provided for.

We do not feel that it be absolutely necessary to install the upstream masonry parapet, but feel that this installation from an economic standpoint would be desirable since the shoring and other necessities would be at the site. We do feel that it is necessary to install the concrete portion of the parapet walls to balance the structure and protect the investment from the action of the water.

The downstream parapet now standing could remain during construction but the cap stones of this wall, and the inside wall would have to be removed to provide for construction of the downstream parapet wall of concrete.

Shoring, now planned, and assumed to be in place at the time of any construction will have to be extended upstream to provide for additional support for the masonry and concrete arches beyond the limits of the shoring now proposed.

Alternate No. 2: Assuming the present structure is to be put in a stabilized condition, with no plans for rebuilding or restoring the entire arch in the future, becomes a job of much narrower scope, and our recommendations are as follows:

For the West abutment, the stabilization as outlined in the first alternate would be accomplished, and a final treatment to further protect the stone would be as follows:

After all stabilization work is completed, the areas where the collapse has raveled out the stonework would be hosed off with low pressure water to remove stones that are surface loose, then a clear waterproofing would be applied over the raveled areas, this waterproofing amounts to be a clear shellac, and would have to be redone at approximately 5 year intervals. The installation of this waterproofing is not an absolute essential, but would help prevent surface water from entering.

For the East abutment, the stabilization as outlined in the first alternate would be accomplished, and in addition the addition of three more counterforts would be placed behind the abutment portion of the walls, to help resist the hydrostatic pressures, and provide more mass for thrusting of the arch. The arch barrel, the rubble fill, and to a lesser extent the downstream parapet would have the anchor rods grouted in place much the same as outlined in the recommendations for the abutments.

Finally the clear waterproofing would be sprayed on the raveled portions of the rubble fill left in place.

The lower portion of the pier should be protected with a concrete panel to prevent further erosion of the rubble fill between the cut stones in this pier. This concrete panel would be anchored to the interior fill material only, and could be removed if desired.

The procedure outlined for Alternate 2 is not an irreversible process, because at some future date, the work outlined in Alternate 1 could be accomplished. However the installation of reinforcing and grouting, as well as the installation of the concrete counterforts for the East abutment will make this work more difficult. The excavation of the rubble fill, now much more homogeneous would be more difficult to remove. The counterforts would most probably remain, and become a portion of the new concrete arch abutment, but would make the excavation more difficult.

Attached at the end of this report is a description of grouting procedures by Dr. Rebull, and following that are copies of the stability and analysis computations.

Footbridges:

Shown in the plans are two alternate footbridges, one just upstream from the structure, and one just downstream from the structure. We favor the construction of a footbridge downstream from the structure, to prevent the possibility of damage from the possible washout of a bridge upstream endangering the arch remains.

High water on the Potomac, and resultant backwater to the Aqueduct is at approximately E1. 113 translating to our datum, or approx. 13 feet above the parapets of the aqueducts. This high water taken from the maximum flood of record on the Potomac.

From analysis of the watershed of Catoctin Creek (144 Sq. Mi) we believe the maximum flood level of the creek to be at E1. 102, assuming the Potomac is not in flood stage, and a damming effect would not be present, with the resultant level some 2 feet above the level of the parapets. With this elevation, we have set the deck of a footbridge at this E1. 102.

If the footbridge were to be constructed downstream, the water level would not be so critical for the structure, and the deck level of the footbridge could be held at deck elevation 94, resulting in a more advantageous level for interpretation. This footbridge, by virtue of its lower position however would be more vulnerable to flood damage

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1. Catoctin Aqueduct during the late operating era, date unknown.



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3. Aqueduct trunk showing the effects of the partial collapse of the center arch, upstream side, 1945.



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5. Catoctin Aqueduct from the Downstream Side, February 1960.



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9. Catoctin Aqueduct prior to collapse, 1973. Photographer K. Quinn.
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10. Catoctin Aqueduct prior to collapse, 1973. Photographer K. Quinn.



11. Catoctin Aqueduct after the October 30, 1973 collapse of the upstream and center arches.



12. Catoctin Aqueduct after the October 30, 1973 collapse with the railroad viaduct in the background.



13. Catoclin Aqueduct, October 30, 1974 showing the upstream abutment and base of the upstream pier with concrete cap.



14. Catoclin Aqueduct with Bailey Bridge in the foreground and railroad viaduct in the background.



15. Aerial view of Catoctin Aqueduct and railroad line, with Potomac River At the bottom. Note the sharp turn of towpath on both approaches to aqueduct.



16. Reconstruction nearing completion, September 3, 2011.



17. Reconstructed Catoctin Aqueduct, downstream side, October 2011



18. Reconstructed Catoctin Aqueduct, downstream side, October 2011

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