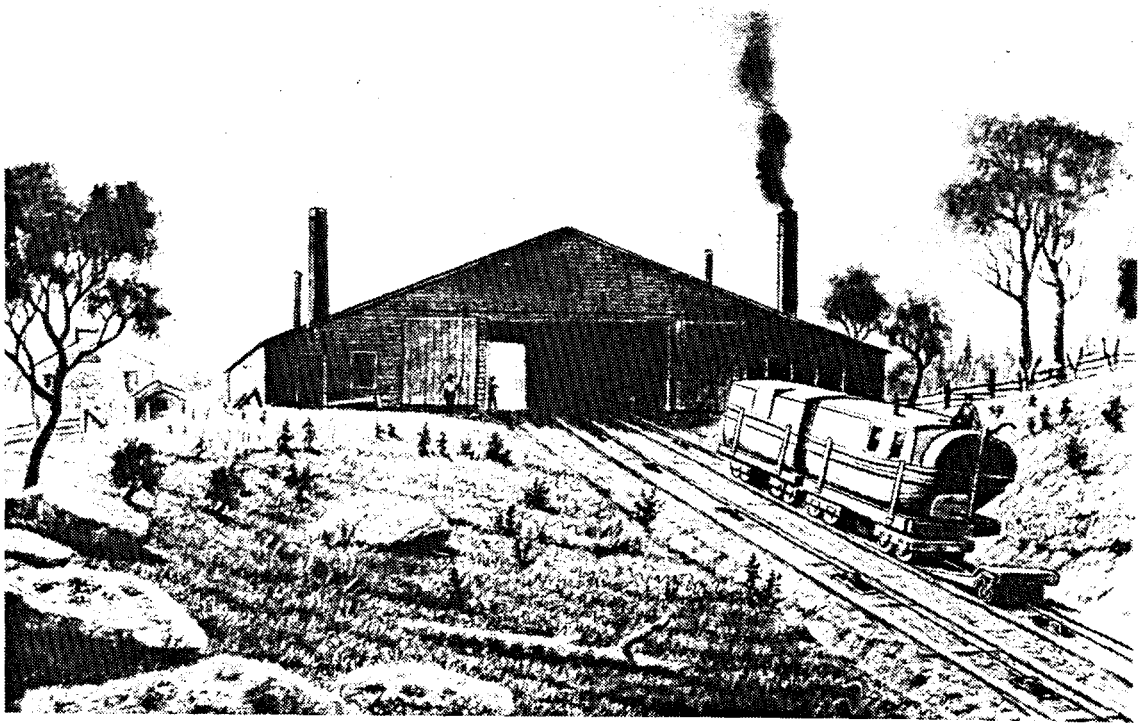
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Historic Structure Report
Administrative, Historical,
Architectural, and Engineering Data



Inclines and Levels 6 through 10
ALLEGHENY PORTAGE RAILROAD

National Historic Site • Pennsylvania

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Historic Structure Report
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September 1993

Inclines and Levels 6 through 10

ALLEGHENY PORTAGE RAILROAD

National Historic Site • Pennsylvania

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INTRODUCTION

SIGNIFICANCE OF THE ALLEGHENY PORTAGE RAILROAD

One of the greatest feats of early 19th century engineering in the United States was the construction and operation of the Allegheny Portage Railroad, which scaled the 1,400-foot elevation of the Allegheny Mountains in west central Pennsylvania, between Hollidaysburg and Johnstown. Built as part of Pennsylvania's canal system, the portage railroad allowed goods and passengers to be moved between Philadelphia and Pittsburgh without their having to be unloaded and then reloaded along the way. When completed in 1834, the portage railroad boasted four massive stone viaducts, more than 72 stone culverts, the first railroad tunnel in the country, 10 stationary steam-powered engine houses that demonstrated more brute strength than almost any technological achievement to date, and 36.65 miles of railway through narrow ravines and over rivers and streams. The railroad was unique because of its design in engineering load distribution, choice of materials, architectural configuration, and location. For over 20 years the railroad was one of the nation's major arteries for westward expansion and economic development.

The portage consisted of a sequence of 11 level planes that were linked by 10 steep inclined planes. (The inclines represent the vertical distance from one step to another, and the levels, the steps themselves.) The inclines were generally 0.25 to 0.5 mile in length, and the intervening levels ranged from 0.15 mile to 14 miles. Canal boats were put on flatbed railroad cars and pulled up or lowered down the inclines by stationary steam engines (30 to 35 horsepower), using a hemp rope approximately 7 inches in circumference. The ascending or descending cars were counterbalanced with weights, controlled by a simple pulley principle. The stationary steam engines that drove the hoist mechanisms were at the tops of the inclines; hitching sheds at the bottom. On the levels locomotives pulled the cars from one incline to the next. To support the railroad, an extensive network of revetments with relieving arches, arched or linteled culverts, diversionary channels, and numerous masonry structures were built. The twisted Skew Arch Bridge (or slanted stone construction) is at the base of incline 6 and is considered structurally unique.

The railroad was expensive to maintain, and severe weather conditions greatly increased maintenance tasks. Tracks were submerged and spread due to torrential rains and freezing. Locust wood ties, which were used to replace rotted pine timbers, also eventually rotted and broke. The hemp ropes stretched and broke, and had to be replaced with steel cables developed by John Roebling. Severe torrential rains in 1857 caused drains to clog and washed out culverts. These problems were so serious and costly that it was impossible to maintain or rebuild the structures. The development of more powerful steam locomotives also made the old portage railroad obsolete, and it was eventually replaced in 1855 by a new portage railroad without inclined planes, and then in July 1857 the entire operation was sold to the Pennsylvania Railroad Company.

Today the technological achievements of the portage railroad are commemorated at Allegheny Portage Railroad National Historic Site. The only remnant of the portage today is an earthen berm climbing up, over, and down Allegheny Mountain. The National Park Service interprets the human and engineering aspects of the railroad's history at levels 6, 8, 9, and 10. The largest and most accessible portion of the site is the summit level, which covers 462.7 acres. Existing structures are a large two-story stone structure known as the Lemon House and the stone foundation of engine house 6. The Lemon House, which houses park headquarters, is approximately 1,150 feet southwest of engine house 6. The Skew Arch Bridge can be seen east of the summit level at the bottom of incline 6.

SCOPE OF THIS DOCUMENT

The need for a historic structure report to document the resources of the Allegheny Portage Railroad was identified in the 1980 *General Management Plan.* The historical data section of the report was authorized in 1983 and 1984; the work was updated in 1990. A task directive approved on June 11, 1984, proposed to preserve, stabilize, and rehabilitate the portage railroad's historic structures and foundations.

In 1987 a *Site Concept Study* for the Summit unit was prepared to review how the Allegheny Portage Railroad related to themes associated with the America's Industrial Heritage Project. It also evaluated past recommendations for the Summit unit and alternatives for visitor use in light of changing patterns of use. The study proposed that the visitor experience be enhanced by

constructing a new entry to the summit level by way of Gallitzin Road

building a visitor center to interpret the story of the Allegheny Portage Railroad

excavating the trace to its historic elevation at the summit level and restoring the railroad tracks from the summit to below the Skew Arch Bridge to visually connect these elements of the railroad

developing full-scale interpretive models — one of a locomotive and passenger car in a fixed position at the summit, and another of a canal boat cresting the incline

converting the main floor of the Lemon House to exhibit historic furnishings representing a period house and tavern

building an interpretive shelter reminiscent of engine house 6 to interpret the technological aspects of the railroad

obliterating the west-bound lane of US 22

In accordance with this proposal, a 1989 addendum to the 1984 task directive authorized the completion of the architectural data section of the historic structure report. This section describes existing conditions at the summit unit; along inclines 6, 7, 8, 9, and 10, and the levels and culverts between them; the Lemon House porches; the Lemon Coal Mine entrance; the Skew Arch Bridge area; and historic foundations and hitching sheds. To fulfill the intent of the 1980 *General Management Plan* and the 1987 *Site Concept Study* recommendations are made to preserve these resources. The total cost of recommended minimum treatment is $1,144,055 (see appendix S).

The other two sections included in this report are the administrative data section and the engineering data section. The final section of this historic structure report — the archeological data section — will be released separately. Emphasis in research and writing has been placed on specific construction data relating to the various extant structures located along the railroad trace. This report is not a detailed history of the railroad as other National Park Service (NPS) publications and secondary source writings have addressed that topic. Administrative, historical, architectural, and engineering data for levels and inclines 1 through 5 will be completed at a later date and will be printed as a separate volume.

PART I: ADMINISTRATIVE DATA

PROJECT IDENTIFICATION

Name: Stabilize and Rehabilitate Foundations

Number: LCS Numbers 07736, 07731, 07735, 07738, 07740, 07734, 07737, 07732, 07733, 07741

Period: 1831–57

Significance: The Allegheny Portage Railroad was designated a national historic landmark on December 29, 1962. Allegheny Portage Railroad National Historic Site was listed on the National Register of Historic Places on October 15, 1966.

THE STRUCTURES' ORDER OF SIGNIFICANCE AND PROPOSED LEVEL OF TREATMENT

Order of Significance: National

Local History: The Allegheny Portage Railroad was constructed as a part of the Pennsylvania Mainline Canal system. It consisted of a series of 10 inclined planes and connecting levels that were used to transport railroad cars and canal boats over the Allegheny Mountains between Hollidaysburg and Johnstown — a distance of 36.65 miles. The railroad was considered a major engineering accomplishment in its time and included the first railroad tunnel constructed in the United States.

Proposed Level of Treatment: The proposed treatment is to attempt to restore the historic scene to the extent possible in the vicinity of the Lemon House and incline 6, and to preserve and stabilize as necessary any other structures, such as engine house foundations and culverts.

PROPOSED ANTICIPATED DEVELOPMENT WORK

Development will be in accordance with the *Site Concept Study, Summit Unit*, which was approved December 31, 1987. An amendment to the *General Management Plan* has been recently completed to address additional proposed development work.

PROPOSED USE OF THE STRUCTURES AND OPERATIONS AND MANAGEMENT REQUIREMENTS

Structures will be used for interpreting the historic period and the relationship of the Allegheny Portage Railroad to that period.

OUTLINE OF COOPERATIVE AGREEMENTS OR OTHER DOCUMENTS

There are no cooperative agreements that pertain specifically to these resources. However, the Bureau of Historic Preservation, Pennsylvania Historical and Museum Commission, prepared the national historic landmark documentation for the Allegheny Portage Railroad under a cooperative agreement. This documentation fulfills the requirements of section 110(a)(2) of the National Historic Preservation

Act of 1966, as amended, for these resources. Security and general safety services are provided by the park.

NPS DOCUMENTS FOR ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE

"Archeological Management Report, Summit Level" (Eastern Applied Archeology Center, American University 1989). See appendix O.

General Management Plan (Denver Service Center 1980). Approved July 2, 1980.

Historic Resource Study, by Anna Coxe Toogood (Denver Service Center 1973).

Historic Structure Report, The Lemon House, "Historical Data Section," by Anna Coxe Toogood; "Architectural Data Section," by Norman M. Souder (Denver Service Center 1972).

Historic Structure Report, The Lemon House, Archeological Data Section, by Kathleen Fiero, et al. (Denver Service Center 1984).

Historic Structure Report, The Lemon House, Architectural Data, by Penelope Hartshorne Batcheler (Denver Service Center 1982).

"Interpretive Prospectus Amendment" (Harpers Ferry Center 1989).

Site Concept Study, Summit Unit (Denver Service Center 1987). Approved December 31, 1987.

PART II: HISTORICAL DATA

by
Sharon A. Brown

PREFACE

Since its establishment, the Allegheny Portage Railroad National Historic Site has been the subject of several historical, archeological, and historic architectural studies. Anna Coxe Toogood's *Historic Resource Study, Allegheny Portage Railroad National Historic Site, Pennsylvania* (1973) is an authoritative and exhaustive study of the Allegheny Portage Railroad. The Lemon House has been scrutinized in a historic structure report with historic, archeological, and historic architectural sections.[1] This historic structure report focuses on specific extant structures along the railroad line that require preservation treatment in accordance with the national historic site's legislative mandate and NPS policies.

As Anna Coxe Toogood noted in the *Historic Resource Study,* it has not been possible to uncover original drawings, sketches, or specifications for railroad structures. Very little further evidence has been found of accurate descriptions of buildings, culverts, or bridges, and no original specifications were found at the Pennsylvania state archives in Record Group-17. Apparently the standard repositories do not have the original documents. There are good reasons to believe that many have been lost or destroyed, as will be discussed in the report.

Record Group-17 is a significant collection of documents that is vital to the study of the Allegheny Portage Railroad. After the Pennsylvania Board of Canal Commissioners (1825–58) ceased to exist, its records were placed in the Bureau of Land Records. The records fell into three categories: the board's records and papers; the superintendency papers kept by the superintendents of the different divisions; and the map books for each division of the canal, drawn by engineers and cartographers. In 1959 a guide to the materials was published, and in 1961 a recognition of the historical value of the records spurred their transfer from the Bureau of Land Records to the state archives. The collection of records was thus kept intact and is a very complete source of primary documents for the conception, construction, and operation of the Allegheny Portage Railroad.

Any new material presented in this report should be considered as supplemental to Toogood's *Historic Resource Study* and the *Historic Structure Report, Lemon House, Historical Data Section.* A relative lack of new documentary evidence has to be taken into account when considering the historical data section of this historic structure report. On a more positive note, previously unpublished photographs of the portage railroad trace and structures, ca. 1910 and 1922, were discovered in Harrisburg.

Research for the historical data section of this report was conducted during two field trips to Pennsylvania in February and July 1984. Research at this time followed guidelines provided in a task directive for a historic structure report approved by the regional director, Mid-Atlantic Region, on June 11, 1984. Most of the research material was found at the Pennsylvania Historical and Museum Commission's Division of Archives and Manuscripts and at the State Library of Pennsylvania, both in Harrisburg, Pennsylvania, but research was conducted elsewhere, as well. (See the lists of people and institutions consulted during research.) Historical documents refer to the inclines as inclined planes or simply as

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1. See the following NPS reports for Allegheny Portage Railroad National Historic Site: *Historic Structure Report, The Lemon House: Archeological Data Section,* by Kathleen Fiero et al. (Denver Service Center 1984); *Architectural Data Section,* by Penelope Hartshorne Batcheler (Denver Service Center 1982); *Historical Data Section,* by Anna Coxe Toogood (Denver Service Center 1973). The Toogood report contains an "Architectural Data Section" by Norman M. Souder (Denver Service Center 1972).

planes. For consistency in this document, the term incline is used in general text, while historical quotations or drawings may use the terms plane or inclined plane interchangeably.

The author would like to thank the staffs at the Harrisburg institutions for their assistance. In 1984 former superintendent Randy Cooley and his staff provided orientation and interpretation at the park as well as direction for the research. Superintendent Pete Nigh and his staff offered time and assistance in updating the report. Archeologist Paula Zitzler was not only a friend, but a helpful reader of the manuscript. Anna Coxe Toogood graciously offered assistance and new avenues to pursue in the search for the engineering/architectural drawings. Former supervisory historian Ronald W. Johnson provided invaluable guidance for this project when the author was in St. Louis and in Denver.

Sharon A. Brown
August 1984

updated
March 1991

OVERVIEW

The origins of the Allegheny Portage Railroad can be traced to the engineering wonder the state of New York presented to the nation in the form of the Erie Canal, completed in 1825. The efficiency, speed, and indeed, romance, of travel offered by the canal served to attract both the interest of west-bound pioneers and the envy of neighboring state governments. In Pennsylvania, turnpikes such as the Huntingdon, Cambria and Indiana, or "Great Northern Route," carried travelers across the countryside, but the Erie Canal was a vision of the future.

The commonwealth of Pennsylvania responded by appointing a three-man Board of Canal Commissioners in March 1824, which subsequently ordered surveys for the Pennsylvania Main Line, including possible routes over Allegheny Mountain. Plans changed several times (a plan for a tunnel at the mountain's summit was dropped) before the governor authorized the board to proceed with construction contracts in March 1831. Surveys made by Moncure Robinson, Lieutenant Colonel Stephen H. Long, and Major John Wilson were adopted as the railroad route between Hollidaysburg and Johnstown, a length of 36 miles. Samuel Jones, superintendent of the Western Division of the canal system, now was in charge of the railroad too.

An engineering corps was chosen to oversee the construction work. Sylvester Welch was the principal engineer for the line. He had three able assistants. Edward Miller was in charge of machinery, Solomon W. Roberts took charge of the western division, and William Milnor Roberts oversaw the eastern division. In early 1831 these men pitched their tents in the snow on the mountainside, slept under buffalo robes, and commenced working. Solomon W. Roberts located and supervised the construction of levels and inclines 1 and 2. The remaining levels and inclines were located and their construction supervised by William Milnor Roberts. With the aid of subassistants Thomas Gorton, Thomas J. Power, James E. Day, and Curtis F. Dixon, in addition to surveying targetmen, chainmen, and axemen, the engineers continued their work in the Pennsylvania forests throughout 1831, 1832, and 1833.

Clearing, grubbing, grading, and masonry work were just the beginning. Embankments protected by slope walls were needed as well as ditches, viaducts, culverts, and drains. The very first railroad tunnel in America was built — the 901-foot-long Staple Bend. Bridges of masonry crossed the Conemaugh and Juniata rivers. The Conemaugh Viaduct was considered the "most perfectly constructed arch in the United States." And, as if in a concerted effort to blend the past with the future, the Skew Arch Bridge carried the old "Northern" turnpike over the new inclined railroad. Rails were laid — a single track on the level sections and a year later, a double track. Engine houses were built, their stationary engines assembled, and hemp ropes were purchased to be used in hauling cargo and passengers up and down the inclines.

The engineers and their contracted construction crews worked on 11 levels and 10 inclines. Several of the levels earned local names: the "Johnstown" level was 4 miles long from Johnstown to the foot of incline 1; the "Long" level of 14 miles ran from the head of incline 1 to the foot of incline 2; the "Summit," from the head of incline 5 to the head of incline 6 ran 2 miles; the "Short" level was 0.15 mile from the foot of incline 6 to the head of incline 7; and the "Hollidaysburg" level ran 4 miles from the foot of incline 10 to the town. The other levels did not acquire local names, as far as is known. Steam locomotives were purchased to haul on the levels, an immediate technological improvement over the heretofore considered (and for a short time, used) horse power.

Auxiliary structures such as hitching sheds and housing for the engine tenders and riggers were built. In Hollidaysburg and Johnstown construction continued on basin slips and warehouses. By the spring of 1834 the alleged superiority of a railroad and canal system was ready to be tested.

The Allegheny Portage Railroad opened for business on March 18, 1834. All was confusion at first as individuals and transportation companies, who supplied their own horse power and railroad cars and were used to the "laws and independence" of turnpike travel, ran according to their own time schedules. Twenty-five cars were in use at the road's opening. This number increased to 80 by April 15. The canal commissioners were authorized by mid-April to use locomotive engines and to regulate the railroad traffic by means of agents and schedules. The railroad's effect on the cost of transportation was immediate. The cost of moving merchandise the distance of 53 miles from Hollidaysburg to Blairsville fell from $12.00 to $16.00 per ton to less than $4.00 a ton.

The railroad also opened to much critical acclaim. Engineers and local newspaper writers alike described both the wonder of modern engineering technology and the scenic beauty of a trip across Allegheny Mountain. As years passed, however, more emphasis was placed on the railroad's shortcomings and maintenance problems rather than its technological splendor.

Maintenance was a constant concern during the 20 years of operation. Harsh winters took their toll on the railroad's structural components. Freeze and thaw cycles resulted in spreading tracks. Pine timber under the rails rotted and had to be replaced by ties of locust and oak. Torrential rains submerged track, clogged drains, and washed out viaducts. Wooden water pipes froze and broke. Engine house foundations cracked and boilers exploded. The hemp ropes caused endless problems for they stretched and broke and had short life spans. Even two technological advancements, John Dougherty's introduction of sectioned canal boats in 1843 (which were carried whole on the railroad cars, thereby avoiding the labor intensive loading and unloading of cargo) and the use of John Roebling's wire rope on the inclines by 1849 as a substitute for the hemp, failed to stop the Allegheny Portage Railroad's structural and technological decline.

The commonwealth began searching for alternatives. Unwilling to pay the cost of upkeep on a deteriorating system and in an attempt to compete with the Pennsylvania Railroad Company, which was building a track from nearby Altoona to Johnstown without inclined planes, the commonwealth authorized surveys for routes to avoid the use of inclines in 1850. The result was the New Allegheny Portage Railroad, which went into operation in July 1855. Debts increased, however, and the commonwealth decided to give up. The entire Pennsylvania Main Line was sold to the Pennsylvania Railroad Company for $7.5 million on July 31, 1857.

Newer technology, in the form of railroad locomotive engines that could make the mountain's grade, along with improved rail systems, added to the portage railroad's demise. Travel along the entire length of the old road required changing power 33 times in 36 miles. According to William Bender Wilson:

> To move a section boat over the road from the basin at Johnstown to Hollidaysburg involved calling into requisition 12 stationary engines, 12 different teams of horses, and 9 locomotives. The minimum number of men to handle this was 12 engineers and 12 firemen at the stationary engines, 9 engineers and 9 firemen for the locomotives, and 12 drivers of the teams—making 54 persons in all."[2]

2. William Bender Wilson, "The Evolution, Decadence and Abandonment of the Allegheny Portage Railroad," in Mahlon J. Baumgardner and Floyd G. Hoenstine, *The Allegheny Old Portage Railroad 1834–1854* (n.p.: Published by the authors, 1952), p. 68. Wilson's text is a good, general history of the railroad.

Improvement on this system was inevitable.

People's lives were changed by the Allegheny Portage Railroad. Travelers could traverse Allegheny Mountain much more easily. Frontier businessmen shipped cargo faster and cheaper, which aided western settlement and development. Whole towns sprung up along the line. Local people, such as Samuel Lemon, who not only supplied coal, water, and horses to the railroad but built a stone house on the mountain summit to service travelers with food and drink, centered their livelihoods around the railroad during its years of operation. The Allegheny Portage Railroad left a legacy, not only in the remaining structures standing along its trace, but in the imaginations of 19th and 20th century peoples.[3]

3. Several primary and secondary sources were consulted for this general overview. See Wilson, mentioned above, pp. 36–83; R. K. Large, *The Old Portage, The Original New Portage and Their Relation to the Present New Portage* (n.p.: n.d.), n.p.; William Hasell Wilson, *Notes on the internal improvements of Pennsylvania* (Philadelphia: Railway World, 1879), pp. 41–44; Harry A. Jacobs, *The Juniata Canal and Old Portage Railroad* (Hollidaysburg, Pennsylvania: Blair County Historical Society, 1941, reprint., 1969), pp. 231. J. Elfreth Watkins, "History of the Pennsylvania State Canals and Railroads and the Consolidated System East and West of Pittsburgh," vol. 1 (n.p.: Pennsylvania Railroad Company, 1896), 1:150–85. (This text is unpublished and in galley form.) S. W. Roberts, *An Account of the Portage Railroad over the Allegheny Mountain, in Pennsylvania* (Philadelphia: Nathan Kite, 1836), p. 312.

CONSTRUCTION HISTORY

As stated in the "Preface," no drawings or specifications for structures along the Allegheny Portage Railroad have been found in the Board of Canal Commissioners papers (RG-17) in Harrisburg despite repeated visits and investigations by NPS researchers and others interested in the railroad's history. Only one drawing has been found, that of the Hollidaysburg Skew-Viaduct, drawn by William Minor Roberts (see NPS, HRS, Toogood, p. 214).

Roberts, who worked directly under Sylvester Welch, was the engineer responsible for supervising construction on inclines 3 through 10 and levels 3 through 11. Roberts himself provided a clue as to the likely disposition of his papers. In 1878, while speaking about the Allegheny Portage Railroad and earlier inclined planes at Maunch Chunk on the Lehigh River to the American Society of Civil Engineers, Roberts briefly stated: "Having long ago unfortunately lost my notes and drawings of this early railroad, [the Maunch Chunk] its cars, machinery, etc., as used in 1827, I can now only refer to them in a somewhat general way from recollection."[4] If Roberts lost his papers from the late 1820s, it is possible he also lost his notes and drawings of the Allegheny Portage Railroad. Why the Hollidaysburg Skew-Viaduct drawing survived and how it found its way into the Map Books in RG-17 in Harrisburg is, literally, anyone's guess. It is unlikely, at this point, that William Minor Roberts' Allegheny Portage Railroad drawings are extant.

In a report to the Board of Canal Commissioners, Sylvester Welch, chief engineer on the railroad, described in detail the physical characteristics of each road section from 1 through 35. At the end of his report Welch wrote, "The maps and profiles of the line, and plans for all the viaducts, culverts, etc. acquired, are herewith communicated for the examination of the Board."[5] Unfortunately, none of Welch's plans or maps have been located despite efforts in a number of repositories.

Other drawings of turnpike and canal structures from the same era do exist and these drawings can be studied for comparative data. In November 1824 the Pennsylvania Society for the Promotion of Internal Improvement was organized and supported by "gentlemen" interested in lobbying for Pennsylvania transportation improvements. This was an action taken as a direct response to the competing Erie Canal. The society appointed William Strickland as its agent.

Strickland sailed to England to observe and learn about that nation's vastly superior transportation systems. His reports were published in 1826 in Philadelphia, and he included 72 measured drawings, executed by Samuel H. Kneass, of locks, aqueducts, locomotives, turnpike roads and culverts. American engineers, and especially those in Pennsylvania, used the Strickland manual as a guidebook. Drains and culverts used on the English canals, Strickland reported, were the same in design and application as those used on turnpike roads. His verbal description stated:

> The best roads are cross-drained under the foot-paths, by arched, square, or triangular culverts. The arched culverts may be of course be made of any desirable magnitude; but the square are seldom more than fifteen inches on the top, and the triangular of about the same capacity. The water is conducted from the gutters of the road to the culverts, by drains, of masonry, which are generally covered with an iron grating. Sometimes . . . the drains are formed through the face of the curb at its lowest part,

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4. W[illiam] Milnor Roberts, "Reminiscences and Experiences of Early Engineering Operations on Railroads, with Especial Reference to Steep Inclines," *American Society of Civil Engineers Transactions* VII (August 1878): 198.

5. Reports & Misc. Documents, 1829–43, box 8, vol. 1, item 58. Allegheny Portage Records (Div. Rec.), Board of Canal Commissioners Records (BCC), Record Group-17 (RG-17), Division of Archives and Manuscripts, Pennsylvania Historical and Museum Commission (PHMC), Harrisburg, Pennsylvania.

> resembling the openings into the curb over the sewers of the city of Philadelphia, and pass under the footways into the side ditches.[6]

The Pennsylvania Main Line benefited from William Strickland's knowledge. A portion of the 1827 route survey was completed by George T. Olmstead under Strickland's directions. Both Strickland and Samuel H. Kneass were chief engineers and worked at different times during construction on the Susquehanna River section of the main line.[7]

It is possible that William Strickland's sample culvert designs served as models for those built on the Allegheny Portage Railroad. (See illustration 1 for culvert drawings.)

In 1831 William Hasell Wilson produced designs and cost estimates for structures on the Pennsylvania Railway, Philadelphia and Columbia Railway, and Philadelphia and Reading Railway. His drawings of railroad structures, especially culverts, may also have served as models for those built on the Allegheny Portage Railroad in 1832–33. Wilson's notebook contains sketches of timber and masonry bridges, tunnels, railway trackwork, road work, and other structures.[8] (See appendix A and illustrations 2–10 for culvert descriptions and drawings.)

ENGINE HOUSES

ENGINE HOUSES FOR INCLINE 6

On April 1, 1833, James Stackpole, William Woodburn, and H. Simonton won a contract to build "An Engine House and Road Shed at the Head of the Plane [incline 6], and a Road Shed at the foot of the plane together with all the Masonry Excavation & Connected with the Same."[9] The contractors were also required to build the framework required for the machinery, to hang and fit the engine sheaves, to excavate a 15-foot deep well for the use of the stationary steam engines, and to do any other work as deemed necessary by the principal engineer.

All of the construction was to be finished "agreeably" according to a "plan in the Engineer's Office, and the specifications thereunto annexed, which are to be considered and taken as part of this contract, subject however at all times to such variations, alterations and directions as may be given by the Engineer."[10]

An extant Allegheny Portage Railroad business journal provides data on the railroad's construction. The engine house at the head of incline 6 was completed by May 30, 1834, with the following work being done:

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6. William Strickland, *Reports on Canals, Railways, Roads, and Other Subjects made to "The Pennsylvania Society For the Promotion of Internal Improvement"* (Philadelphia: H.C. Carey & I. Lea, 1826), p. 20. A copy of this text was included in the records of the Board of Canal Commissioners.

7. William Hasell Wilson, *Notes on the internal improvements,* p. 41; William Bender Wilson, *The Evolution, Decadence and Abandonment,* p. 38.

8. W[illiam] H[asell] Wilson, "Notebook, Designs and Costs for Structures, 1831," unpublished manuscript, Division of Mechanical and Civil Engineering, National Museum of American History, Smithsonian Institution.

9. Contracts, 1851–55, box 2, vol. 4, item 139, APRR, Div. Rec., BCC, RG-17, PHMC.

10. Ibid.

860.77 c. yds. Ex^{n} at head of plane
273.33 Perches Masonry in Walls supporting Engine & mach^{y}
46.08 Perches Masonry in foundation walls at head of plane
12.00 Perches Masonry in foundation walls at foot of plane
57.28 c. yds Excav^{n} at foot of plane
303.00 ft lineal in frame supporting & connected with mach^{y}
Digging & Walling Well 15 ft. deep
Building Engine House & Shed
Building Shed at foot of plane
234.00 Sheaves hung & fitted
Hanging and fitting large Sheave at foot of plane
633.33 ft. lineal frame work connected with it
Furnishing materials and constructing movable car at head
Work not included in contract
Digging & boring Well 106.25 ft.
Boring 14.85 ft.

Costs were also included in the journal entry.[11]

A contract for a second engine house, store room, and coal shed at the head of incline 6 was awarded on June 23, 1834.[12] The contractors, James Stackpole, Casper Dull, and Hiram Willis, executed the following work by May 23, 1835:

104.39 c. yds of Excavation
144.44 c. yds of Hard pan
12.00 c. yds of Solid Rock
95.78 perches of Rubble wall
86.75 perches of Dressed wall
304 ft. linear Timber for Cylinder beds
Engine house complete
25,000 Brick in stack furnace
48.75 c. yds of Embankment
Furnishing & putting up tin pipes & Gutters
Work not included in contract[13]

No further construction information has been found. A sample specification for a locomotive engine house is in Toogood (HRS, pp. 159–63). Surveys of the lots at the head and foot of incline 6 have been located in engineering records in RG-17, but they provide no information regarding lot relationship to the incline.[14] (See illustration 11 for Plane 6 surveys.)

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11. Journal 1831–35, 1 vol., p. 338, Manuscript Group-2, Business Records Collection, 1681-1963, PHMC. A perch is any defined unit of measure in masonry. In this case, the historic literature identifies the measure as 25 cubic feet. The movable car at the incline head was part of the machinery in the engine house which held a 9′7″ sheave. For a description of the movable car's function, see *Sylvester Welch's Report on the Allegheny Portage Railroad 1833* (York, Pennsylvania: American Canal and Transportation Center, 1975), pamphlet, pp. 11-12.

12. Contracts, 1851–55, box 2, vol. 4, item 138, APRR, Div. Rec., BCC, RG-17, PHMC.

13. Journal 1831–35, 1 vol., p. 387, MG-2, PHMC.

14. Engineering Records, 1842–47, box 2, 1 vol., APRR, Div. Rec., BCC, RG-17, PHMC. No date was on the locomotive engine house specifications.

ENGINE HOUSES FOR INCLINE 9

Patrick Smith won the contract to build the engine house and road shed at the head, and the road shed at the foot of incline 9 on April 1, 1833. A little over a year later, on June 23, 1834, William Robson and David Borrers were contracted to build the second engine house and a coal shed and store room at the incline head.[15] These contracts provide specific information concerning rates of pay for work done, i.e., for common excavation, detached rock, solid rock and masonry, but no details of construction are provided.

The railroad construction journal provides the following data on the two engine houses, completed by May 20, 1834, and May 23, 1835, respectively:

First Engine House

1084.93 c. yds Excav^{n} at head of plane
271.92 Per. Mas^{y} in Walls sup^{g} & connected with Mach^{y}
58.40 Per. Mas^{y} in found^{n} walls, head of plane
16.45 Per. Mas^{y} in found^{n} walls, foot of plane
48.96 c. yds Excav^{n} at foot of plane
303.00 ft. lineal timber in frames sup and con^{d} with said sheaves
240.00 Sheaves hung & fitted on plane
Hanging & fitting large sheaves at foot of plane
633.33 ft. lineal timber in frames con^{d} with said sheaves
Digging & Walling Well 15 feet deep
Materials & workmanship in Moveable Carriage at head of Inclined plane
Building Engine House and Shed at head
Building Road Shed at foot of plane
Work not included in contract[16]

Second Engine House

115.00 c. yds of com. Excavation
310.00 c. yds of Slate
183.93 c. yds of Hard Pan
200.00 c. yds of Solid Rock
90.58 perches of Rubble Wall
86.75 perches of Dressed Wall
304.00 ft. lineal of Timber for cylinder beds
Engine house complete
22,500 Brick in Stack furnace
163.15 c. yds of Embankment
Furnishing & putting up tin Pipes & Gutters
Work not included in contract[17]

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15. Contracts, 1851–55, box 2, vol. 4, items 144, 145, APRR, Div. Rec., BCC, RG-17, PHMC. Another name, Hemperly, was on the contract, but was crossed out. "Smith & Hemperly Cont." was found, however, in the construction journal entry for work completed on plane 9.

16. Journal 1831–35, 1 vol., p. 337, MG-2, PHMC.

17. Ibid., p. 387.

Surveys of lots at the head and foot of incline 9 were located in engineering records.[18] (See illustration 12 for incline 9 surveys. Also found were surveys for inclines 7 and 8; see illustrations 13 and 14.) Another survey of a house and lot at the head of incline 9 clearly shows the engine house on the railroad tracks. This survey (along with surveys of inclines 8 and 10) was found in damage claim records filed by contractors seeking relief from the Board of Canal Commissioners. The surveys provide directional orientation, lot size, distance from the center of the railroad, configuration of structures, topographical information, and scale.[19] (See illustration 15 for Survey of House and Lot at Head of Inclined Plane 9.)

ENGINE HOUSES FOR INCLINE 10

George Grier and Henry Keely built the engine house, road shed, and engine tender's dwelling at the head of incline 10 and a road shed and small dwelling house at the foot of the incline under the provisions of a contract awarded April 1, 1833. The second engine house at the incline head, and a store room and coal shed, were built by Jesse Woodcock and David S. Rhule under a contract dated June 23, 1834.[20]

The contracts were standard forms, with information pertaining to individual contractors entered, signed by both the contractor and Samuel Jones as superintendent. Therefore, like the contracts for the engine houses at inclines 6 and 9, the incline 10 engine house contract offered no details of construction.

Some data was provided in the construction journal concerning work completed on the first engine house by May 20, 1834, and on the second engine house by May 23, 1835:

First Engine House

867.91 c. yds Excav^{n} at head of plane
273.04 Perches Mas^{y} in Walls for support of Engine & Mach^{y}
71.13 Perches Mas^{y} in found^{n} Walls head of Inc^{d} plane
90.00 Perches Mas^{y} in found^{n} Walls foot of Inc^{d} plane
108.06 c. yds. Excav^{n} at foot of plane
247.00 ft. lineal timber in frames supporting and connected with machinery at head
Digging and Walling Well 15 ft. deep
Building Engine House & Road shed at head of plane
Building Shed at foot of plane
200.00 Sheaves hung & fitted on Inclined Plane
Hanging and fitting large Sheave foot of Inc^{d} plane
647.16 ft. lineal timber in frame connected with said Sheave
Furnishing Materials and constructing moveable carriage at head of Inclined Plane
Building Dwelling House at head of plane
Building Dwelling House at foot of plane
Work not included in Contract in house at foot of plane
Work not included in Contract[21]

18. Engineering Records, 1842–47, box 2, 1 vol., items 151, 156, APRR, Div. Rec., BCC, RG-17, PHMC.

19. Damage Claims Contractors for Relief, box 5, vol 1, B-W, item 80, APRR, Div. Rec., BCC, RG-17, PHMC.

20. Contracts, 1851–55, box 2, vol. 4, items 146, 147, APRR, Div. Rec., BCC, RG-17, PHMC.

21. Journal 1831–35, 1 vol., p. 336, MG-2, PHMC.

Second Engine House

16.67	c. yds of com Excavation
136.25	c. yds of Slate
151.82	perches of Rubble Wall
86.75	perches of Dressed Wall
304.00	ft lineal of Timber for cylinder beds
	Engine House complete
22500	Brick in Stack furnace
76.93	c. yds. of Embankment
	Furnishing & putting up tin pipes & Gutters
	Work not included in contract[22]

Any further data on the engine houses for inclines 6, 9, and 10, other than dates of construction or alterations, could not be found in the Board of Canal Commissioners records. Paintings of the engine house at the head of incline 6 exist, as well as three photographs ca. 1845, 1884–87, 1890 (see NPS, HSR, Toogood, illustrations 2, 47, 48; HRS, Toogood, illustration 11, p. 216; HSR, Fiero, figure 4, p. 6). These can be examined for construction details not available from written sources. Additionally, Philip Hoffman, an artist and engineer, executed several drawings of engine house machinery. Sylvester Welch's reports provided the data for the Hoffman drawings. Fred R. Connacher also executed drawings of the engine house 6. The 1980 *General Management Plan* for Allegheny Portage Railroad National Historic Site recommended a "structure" be built to protect engine house foundations and to house exhibits.[23] A preservation shelter for the foundations of engine house 6, recreating the historic structure in scale and mass, will have to be based on these sketches, photographs, and written specifications, and not on any extant architectural drawings.

Surveys of the lots at the head and foot of incline 10 were found in the engineering records.[24] (See illustration 16 for incline 10 surveys). The damage claim survey of the lot at the head of incline 10 shows the location of the engine house (see illustration 17 for Survey of House and Lot at head of Inclined Plane 10).[25]

In October 1834 Sylvester Welch reported to the Board of Canal Commissioners on the estimated cost of the engine houses, along with the other structures built along the line.[26]

CULVERTS

The historical record does not provide much data concerning culverts and drains located along the Allegheny Portage Railroad. There were discrepancies, possibly because of changing design decisions among the engineers on the line as to the exact number of culverts. Superintendent Samuel Jones

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22. Ibid., p. 388.

23. See NPS, HRS, Toogood, p. 216 and HSR, illustrations 2, 47, 48. Both Hoffman's and Connacher's drawings can be found in *Sylvester Welch's Report.* Welch's text contains much valuable detail concerning the engine houses, machinery, ropes and operation of the railroad; *General Management Plan, Allegheny Portage Railroad National Historic Site, Johnstown Flood National Memorial, Pennsylvania,* Denver, August 1980, p. 23.

24. Engineering Records, 1842–47, box 2, 1 vol., item 151, APRR, Div. Rec., BCC, RG-17, PHMC.

25. Damage Claims Contractors for Relief, box 5, vol. 1, B-W item 82, APRR, Div. Rec., BCC, RG-17, PHMC.

26. "Report of Sylvester Welch, Engineer," Appendix to Vol. II of the Journal of the House of Representatives 1833–34 Containing the Canal Commissioners Report and Accompanying Documents (PHJ, App. to Vol. II), pp. 74–91.

referred to 72 in 1831, but to 68 in 1832. On November 1, 1832, Sylvester Welch reported there were 68 culverts and 85 drains on the portage railroad. He described the structures:

> Culverts, there are sixty eight culverts; the spans vary from three to twenty five feet, of these fifty seven are completed, and the remaining eleven are nearly finished. The culverts are built of good stone laid in common lime mortar. The faces of the walls at the ends of each culvert are built of hammered stone, laid in courses. The coping and steps and the voussoirs that form the heads of the arch, are smoothly.cut. Drains; There are 85 drains or square culverts of from two to three feet span. These are built by the contractors for grading the sections, the walls are laid without mortar; seventy-six of the drains are finished, the remaining nine will be completed before the first of December next. These together with the four viaducts make one hundred and fifty seven passages for water under the railroad.[27]

In 1833 Welch reported 68 culverts, but 87 drains.[28] In 1836 Solomon W. Roberts wrote: "Sixty-eight culverts of masonry laid in mortar, the sum of the spans of which is 494 feet, pass under the rail-road, besides 85 drains of dry masonry, of from 2 to 3 feet span." William H. Wilson wrote of the railroad in 1879: "there were 68 arched culverts with spans varying from 3 to 25 feet, and 87 drains or box culverts of from 2 to 3 feet span. . . ."[29]

An engineer's estimate, dated August 2, 1831, provides data for culverts on sections 36 through 45 regarding shape, diameter, amounts of wood and stone needed for construction, and the contractor. (See appendix B for Allotment Culverts upon Allegheny Portage Railroad.) Sylvester Welch provided a list of culverts for sections 1 through 35 and a general description of the culverts on the entire line. (See NPS, HRS, Toogood, pp. 128–29, 142; see appendix C for road section description, sections 35–45.)

INDEX TO LIST OF CULVERTS

Research on the culverts conducted in 1984 followed guidance provided in the task directive dated June 11, 1984. The following Allegheny Portage Railroad culverts were identified:

Three at the Summit level
One near Skew Arch Bridge
One at incline 7
Two at level 8
Two at incline 8
Two at level 9
Five at level 10
One at incline 10

Research was thus conducted without corroborating knowledge of physical remnants of the culverts and drains. In updating this text, efforts have been made to identify the historic culverts through the original construction numbering system, current station numbers, and original descriptions of the

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27. "Report of S. Jones, Superintendent," Journal of the Forty Second House of Representatives of the Commonwealth of Pennsylvania, Vol II (Harrisburg: Printed by Henry Welsh 1831 '32) p. 184 (PHJ, Vol II); "Report of the Board of Canal Commissioners" Appendix to Vol. II of the Journal of the House of Representatives, 1832–33 Containing the Canal Commissioners Report, and Accompanying Documents, (PHJ App to Vol II) p. 8. "Report of Sylvester Welch, Engineer," PHJ, App. to Vol. II, 1832–33, p. 76.

28. "Report of Sylvester Welch, Engineer," PHJ, App. to Vol. II, 1833–34, pp. 80–81;

29. Roberts, *An Account of the Portage Railroad,* p. 7; William Hasell Wilson, *Notes on the internal improvements,* p. 42.

railroad sections (see table 1). The guidance provided in the 1984 task directive has thus been expanded to include data found on all culverts on levels and inclines 6 through 10. The station numbers provide the culvert locations on drawing 423/3001. (The drawing was reproduced from original drawings for the 1964 *Master Plan.* The drawing shows culvert locations and section numbers 1 through 45. See illustration 18 for reference purposes only. The original can be obtained from the Technical Information Center, Denver Service Center.)

CULVERT CONSTRUCTION

Culvert 35A. Culvert 35A was built by Andrew Colvin and Andrew Fitzpatrick under a contract dated May 10, 1832. They were paid $2.56 for the stone work and three cents per foot board measure for the carpentry work, including materials, provided the foundation was not solid rock.[30]

Culverts 36A, B. Philip Haley entered into a contract with Samuel Jones on August 4, 1831, to "perform all the labor necessary to construct and finish in every respect, in the most substantial and workmanlike manner, 2 Culverts which will be required under the Rail Road, on the following section, viz: Number Thirty Six being marked A. & B. on Said Section."[31] Haley was to be paid "Two dollars & twelve & a half cents" for stone work, per perch of twenty-five cubic feet, including the materials. For the carpentry work, including materials, "provided the foundation is not solid rock, and has to be made with timber," Haley was paid two cents per foot board measure.[32]

Culvert 37A. William Groves, William Pollard, and Alex W. K. Groves built culvert A on section 37 under a contract dated October 13, 1831. They were paid $2.35 for the stonework, per perch of 25 cubic feet; three cents per foot board measure for carpentry work; and "For Excavation of all Kinds of material, except Solid Rock, 25 cents per cubic yard For Solid Rock, 75 Cents per Cubic yard."[33]

Culverts 38A, B and 39A. Culvert A on section 38 was built by William Groves, William Pollard, and Alex W. K. Groves under a contract dated October 13, 1831. James Stewart, W. W. Fenlon, and B. Ford built culvert B on section 38, as well as culvert A on section 39, under their contract with Samuel Jones dated August 4, 1831. The rate of pay Groves, Pollard, and Groves earned was the same as their pay for culvert A on section 37. Stewart, Fenlon, and Ford received $2.75 for stone work, per perch of 25 cubic feet; 1 cent per foot board measure for carpentry; and 15 cents per cubic yard for excavating foundations.[34]

Culverts 40A and 41A, B. Culvert A on section 40 was built by James Stewart, W. W. Fenlon, and B. Ford under a contract dated August 4, 1831. William Robson built culverts A and B on section 41 under a contract dated the same day. Stewart, Fenlon, and Ford were paid the same wages as for their work on culvert A on section 39. Robson received $2.80 for stone work, per perch of 25 cubic feet; and 3½ cents per foot board measure.[35]

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30. Contracts, 1851–55, box 2, vol. 4, item 210, APRR, Div. Rec., BCC, RG-17, PHMC.

31. Ibid., item 212.

32. Ibid.

33. Ibid., item 213.

34. Ibid., items 213, 214.

35. Ibid., items 214, 215.

TABLE 1: SECTION AND STATION NUMBERS FOR HISTORIC CULVERTS, ALLEGHENY PORTAGE RAILROAD

LEVEL OR INCLINE	STATION NO.*	HISTORIC STRUCTURES REFERENCED IN CONSTRUCTION DOCUMENTS (BY SECTION NO.)	HISTORIC STRUCTURES IDENTIFIED (BY STATION NO.)	DESCRIPTIONS OF ROAD SECTIONS, MAY 1831**
Level 6	1320 — 1387	Culvert 35A	1342	Section 35 — 1 culvert, 4 drains
		Drain or Culvert	1356	
		Culvert 36A	1382	Section 36 — 2 culverts, 2 drains
Summit Level	1387 — 1401			
Incline 6	1401 — 1428		1422 (modern culvert)	
Level 7	1428 — 1436	Culvert 36B	1428 (destroyed)	
Incline 7	1436 — 1463			
Level 8	1463 — 1498	Culvert 37A	1464	Section 37 — 1 culvert, 3 drains
		Drain or culvert	1490	
Incline 8	1498 — 1529	Culvert 38A	1503	Section 38 — 2 culverts, 2 drains
		Culvert 38B	1529 (destroyed)	
Level 9	1529 — 1592	Culvert 39A	1532	Section 39 — 1 culvert, 4 drains
		? (discrepancy between historical records and extant remains)	1586	
Incline 9	1592 — 1622			
Level 10	1622 — 1712	Culvert 40A	1624	Section 40 — 1 culvert, 2 drains
		Culvert 41A	1635	Section 41 — 2 culverts, 4 drains
		Culvert 41B	1656	
		Culvert 42A	1692	Section 42 — 4 culverts, 2 drains
		Culvert 42B	1697	
Incline 10	1712 — 1738	Culvert 42C	1733	
		Culvert 42D		
		Culvert 43A		Section 43 — 2 culverts
		Culvert 43B		
		Culvert 44A		Section 44 — 2 culverts, 2 drains
		Culvert 44B		
		Culvert 45A		Section 45 — 1 culvert
Level 11	1738 — 1935			

* See "Appendix J: Table of Grades, 1832–33."
** From NPS, HRS, Toogood. pp. 127–28, 132–36.

Culverts 42A, B, C, D. Construction of the culverts on level 10 and incline 10 was split between five contractors. G.W. Henry and John Dougherty contracted on August 4, 1831, for culverts A and B on section 42. They were paid $2.20 for the stone work; and 2½ cents for the carpentry work, provided the foundation was not solid rock and had to be made with timber. Henry and Dougherty also built culverts C and D on section 42, but at different prices: for C, $2.10 for stone work and two and one half cents for carpentry; and for D, $2.50 for stone work and 2 cents for carpentry. These contracts were dated August 4, 1831, and September 5, 1831.[36]

Culverts 43A, B. William Groves and Alex W. K. Groves, under a contract dated August 4, 1831, built two culverts, A and B on section 43. They were paid $2.48 per perch of 25 cubic feet for the stone work, and 3 cents per foot board of timber for carpentry.[37]

Culverts 44A, B. Construction of two culverts, A and B on section 44, were started by Jacob Snyder under a contract dated August 4, 1831, but the work was completed by James O'Connor and William Griffin after October 1, 1831. These contractors were paid $2.39 per perch of 25 cubic feet of stone work, and 1¾ cents per foot board measure for carpentry work.[38]

Culvert 45A. On August 4, 1831, a contract was let with William Robson to build culvert A on section 45. He was paid the same price for this culvert as he was for building the two culverts on section 41.[39] (Further information on work done on the railroad, costs of grading and masonry, details of culvert construction and cost can be found in appendixes D, E, F, G, H, I.)

HITCHING SHEDS

INCLINE 8

The hitching shed (or road shed) at the foot of incline 8 was built under a contract dated July 15, 1833, by George Greer (Grier) and Henry Keely.[40]

No other construction data is known. Generalized surveys of incline 8 were in RG-17 engineering records (see illustration 14). Another undated survey found in damage claim records featured a drawing of the hitching shed. A miscellaneous document illustrated a brickyard and shed at the foot of the incline.[41] (See illustrations 19, 20, 21 for surveys of houses and lots at foot and head of incline 8, and sketch of brickyard at foot of incline 8.)

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36. Ibid., items 216, 217, 218.

37. Ibid., item 219.

38. Ibid., items 220, 221.

39. Ibid., item 215.

40. Ibid., item 141.

41. Engineering Records, 1842–47, box 2, 1 vol., item 156, APRR, Div. Rec., BCC, RG-17, PHMC; Damage Claims Contractors for Relief, box 5, vol. 1, B-W, items 77, 78, APRR, Div. Rec., BCC, RG-17, PHMC.

INCLINE 9

Patrick Smith built the hitching shed at the foot of incline 9 under a contract dated April 1, 1833. No other construction data is known. The damage claim survey of the incline foot shows the location of the hitching shed.[42] (See illustration 22.)

Sketches of inclines 8 and 9, which clearly depict the hitching sheds, can be seen in William Bender Wilson's text on the Allegheny Portage Railroad.[43]

SKEW ARCH BRIDGE

On July 15, 1832, J. Fenlon, A. and J. Darlin, and R. Kininmouth won the contract to build "A Stone Bridge which will be required for the passage of the Turnpike road over the Rail Way on Section No. 36 of the Portage." The bridge was to be built according to specifications attached to and considered part of the contract.[44] According to the railroad construction journal, the following work was done on the Skew Arch:

October 1, 1832 —	85 perches masonry	
October 25, 1832 —	260 perches masonry	
December 10, 1832 —	540 perches masonry	FINAL
May 21, 1833 –	611.14 perches masonry	
	31.11 cubic yards broken stone[45]	

The bridge design was changed in 1833 to accommodate a bend in the turnpike road, hence the skewed arch. The construction journal duly noted on May 21, 1833, the expense of "Taking up & relaying masonry in consequence of alteration in place."[46]

No specifications for the Skew Arch Bridge were found in the records of the Board of Canal Commissioners. Archeological testing in the area will determine grade based on the existence of historic wooden rail supports located just east of the bridge. (See illustrations 23, 24 for photographs of the Skew Arch Bridge ca. 1910.)

GRADE OF INCLINE 9

Few specific mentions of the grade of incline 9 have been found. In 1878 Solomon Roberts remembered that "the inclination of these planes varied from about 8 to 10-1/4 per cent except No. 9, which was 7-1/4 percent."[47] Sylvester Welch reported to the Board of Canal Commissioners in 1832 that incline 9, from station 1592 to 1622, was 0.51 mile long, was 30.72 miles from Johnstown, and was

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42. Contracts, 1851–55, box 2, vol. 4, item 145, APRR, Div. Rec., BCC, RG-17, PHMC; Damage Claims Contractors for Relief, box 5, vol. 1, B-W, item 79, APRR, Div. Rec., BCC, RG-17, PHMC.

43. William Bender Wilson, "The Evolution, Decadence and Abandonment," pp. 63, 66.

44. Contracts, 1851–55, box 3, vol. 6, item 58, APRR, Div. Rec., BCC, RG-17, PHMC.

45. Journal 1831–35, 1 vol., pp. 196, 213, 132, 277, MG-2, PHMC.

46. Ibid., p. 277.

47. Roberts, "Reminiscences," p. 200.

1,041.90 feet in descent from the summit. (See illustration 25 for Welch's table of grades and a profile of grades on the entire line. See appendix J for table of grades. See also NPS, Toogood, HRS, p. 137, for distances and elevations of inclined planes.) Welch offered the same information on the incline 9 grade to the board in 1833, adding the fact that the incline's descent per 100 feet was 7.25 feet.[48] Further determination of incline 9 grade restoration will be accomplished by archeological testing.

LEMON COAL MINE ENTRANCE

The entrance to Samuel Lemon's coal mine, which supplied coal for the portage railroad from 1839 to 1850, was documented through archeological testing in 1984 and 1990. An 1840 map and 1878 sketch of the grounds show the coal mine and wharf to be across the railroad track to the north of the Lemon House. (See NPS, HSR, Toogood, pp. 9, 25–30.) A draft archeological report detailing the location of both the mine and the wharf was being prepared in 1990.[49]

The 1875 Second Geological Survey of Pennsylvania provided limited data on the mine. Samuel Lemon opened two diggings on the outcrop line of Bed E, Upper Freeport, near the head of incline 6. He dug on an outcrop south of the railroad and sank a shaft measuring 60 feet deep. "The mouth of the shaft was a few hundred yards west of the head of the plane."[50] The following dimensions are the thickness of the coal bed in this vicinity:

Coal	2′10″
Slate	0′ 1″
Coal	1′ 4″
Slate	0′ 3″
Coal	0′ 6″

Dip from 2° to 3° to N.W.[51]

PORTAGE RAILROAD SURVEY

The quantity of research needed to locate and identify any or all of the structures built along the railroad line is beyond the scope of this historic structure report. However, Anna Coxe Toogood has done preliminary work towards this end when she identified structures, townsites, and other features along the railroad. (See NPS, Toogood, HRS, historic base maps 1–7, p. 230.) Additionally, archeologists have conducted a reconnaissance survey of the Allegheny Portage Railroad from the foot of incline 10 to the summit. This survey documented impacts to the portage trace, identified associated sites, and discussed the results of individual shovel tests. The fieldwork was completed in 1984, and a draft report was being prepared in 1990.[52]

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48. "Report of Sylvester Welch, Engineer," PHJ, App. to Vol. II, 1832-33, pp. 80-81; "Report of Sylvester Welch, Engineer," PHJ, App. to Vol. II, 1833-1834, p. 77.

49. Telephone interview with Paula Zitzler, archeologist, Louis Berger and Associates, Inc., Johnstown, Pennsylvania, November 28, 1990.

50. F. and W.G. Platt, *Report of Progress in the Cambria and Somerset District of the Bituminous Coal-Fields of Western Pennsylvania,* Second Geological Survey of Pennsylvania 1875 Part I. Cambria (Harrisburg: Board of Commissioners, 1877) p. 23.

51. Ibid., p. 24.

52. Telephone interview, Zitzler, November 28, 1990.

LEMON HOUSE PORCHES

The Lemon House, built by Samuel Lemon around 1831, was a landmark on the Allegheny Portage Railroad. Samuel Lemon and his family lived in the house and, for the 20 years the railroad was used, serviced both the railroad operation and the passengers who traveled on the line. The house was located at the head of incline 6, and Samuel Lemon operated a tavern and presumably managed his coal mining operation from within its walls. After the Allegheny Portage Railroad's decline Samuel Lemon and his family moved to nearby Hollidaysburg in 1847, although the family continued to own the house until 1907. (See illustration 26 for a ca. 1910 photograph of the Lemon House.)

The National Park Service has conducted historical, archeological, and architectural research on the Lemon House in the past (see NPS, Toogood, 1972; Fiero, 1984; Batcheler, 1982; Souder, 1972). It has been ascertained that soon after the house was built in 1831, both a south and an east porch were added. By the late 1800s a larger east porch had been built, but the south porch no longer existed. No photographs of the Lemon House that depict this south porch have been found despite research into this subject. Additionally, no photographs of the original east porch have been found.

Comparative data is thus needed to be able to consider the reconstruction of the Lemon House porches. In 1982 architect Penelope Hartshorne Batcheler (NPS, HSR, *Architectural Data Section,* pp. 144–49) drew a basic outline for further comparative research. She identified seven porch styles found on structures throughout southeast and central Pennsylvania, along with three different railing types. Batcheler also identified two publications containing further information on porch types.

Charles Morse Stotz's *The Architectural Heritage of Early Western Pennsylvania* (1936, 1966) is a documentary record evolving out of the Western Pennsylvania Architectural Survey, conducted in 1932–35. This survey preceded the Historic American Buildings Survey by 18 months. Its purpose was to locate buildings built in western Pennsylvania before 1860, to compile and collect pictures, drawings, and historical information on the buildings, extant or not, and to make measured drawings and photographs of representative buildings for publication.[53]

Representative porch types in the Stotz text can be found in the following photographs:

page 46 — the Alexander McConnell house near Bishop (built 1805); Washington County
page 47 — a house near West Brownsville (date unknown); Washington County
pages 50–51 — the John Frew house in Crafton (built before 1800); Allegheny County
page 73 — the Richard Hill house near Upper Middletown (built about 1820); Fayette County
pages 84–85 — "Kingston House," the Alexander Johnston house near Latrobe (built 1815); Westmoreland County
page 88 — the Joshua Wright house near Finleyville (built about 1821); Washington County
page 92 — the Hiram Smith house in Centerville (built 1830); Washington County
pages 98–101 — the Daniel Royer house near Williamsburg (built about 1815); Blair County
— "Porches were seldom used on the original Georgian houses. The first porches in

53. Charles Morse Stotz, *The Architectural Heritage of Early Western Pennsylvania A Record of Building Before 1860* (Pittsburgh, University of Pittsburgh Press, 1936, reprint ed., 1966), p. 280.

western Pennsylvania, introduced late in the Post-Colonial period, were of the type seen on the . . . Royer house(s)."[54]

page 184 — "Compass Inn" in Laughlintown (built 1799); Westmoreland County

page 184 — the Defibaugh Tavern near Everett (date unknown); Bedford County

page 184 — the Moxley Tavern near Searights (built 1818); Fayette County

page 184 — the Ling Tavern at Claysburg (built 1838); Blair County — The Ling Tavern is an obvious choice for a comparative study with the Lemon House. It is located in the same county, it served as a tavern, it is constructed of stone with a two-story wooden porch, and it was built only seven years after the Lemon House. (See illustration 27.)

Additional research in 1984 in the Western Pennsylvania Architectural Survey collection in the Music and Art Department at the Carnegie Library in Pittsburgh uncovered two more structures located in Blair and Cambria counties that may be compared to the Lemon House. These structures were not illustrated in the Stotz text.

Stone House — Scotch Valley, 5 miles northeast of Hollidaysburg (n.d.); Blair County Franks-town Township; owner (date of survey): Richard Schultz

Riffles Tavern "Summithouse" Summit House — Cresson (n.d.); frame, Cambria County Cresson Township; owner (date of survey): Mrs. Bertha Fisher — This structure is, of course, the "Summithouse" which stood at the head of incline 5 on the Allegheny Portage Railroad. It was probably built by James Riffle and was servicing railroad guests by 1837. The structure has a two-story porch. (See illustration 28.)

Charles Morse Stotz offered further general information on porches:

> Porches were not common in early Georgian architecture in America and, except for the taverns, were almost never seen in western Pennsylvania before 1815. Many houses, in later times, have been disfigured by the addition of porches, with little or no regard for the original design. . . . The two-story gallery porch probably originated with the tavern, where it served as a second-floor corridor to private rooms and was reached by an outside stair (see Defibaugh Tavern). . . . The two-story porch of the Royer House is typical of the later farmhouses in the eastern district.[55]

Eleanor Raymond's *Early Domestic Architecture of Pennsylvania* (1931) features structures in the eastern part of the state. There is no accompanying text for the 158 photographs, which feature religious buildings, schools, houses, farm outbuildings, barns, and other structures and details. The value of the photographs is diminished by the lack of explanatory text and construction dates.

Representative porch types found in the Raymond photographs are as follows:

plate 58 — House at Brandywine Manor, Chester County; one-story lean-to, with crawl space and pilaster support

plate 61 — Mount Pleasant at Bulltown, Chester County; one-story porch on grade, heavy timber framing

plate 62 — House at Compass, Chester County; two-story walkout porch on basement level

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54. Ibid., p. 45.

55. Ibid., p. 144.

plate 66 — House between Martindale and Hinkletown, Lancaster County; two-story porch, front and back veranda, with first floor raised on plaster piers
plate 66 — Old Bull House at Elverson, Chester County; two-story porch, veranda on grade
plate 67 — Darrah House near Manatawny Creek, Berks County; first story brick pilasters, wood columns, three-rail balustrade
plate 67 — Old Trexler House, Trexlertown, Berks County; two-story porch with balustrade
plate 71 — House on the Old York Road, York County; two story, second floor, four railing balustrade
plate 72 — House on Horseshoe Pike near Downingtown, Chester County (formerly a toll-gate house); cantilevered porch
plate 78 — House near Martinville, Lancaster County; two story, heavy timber on first floor
plate 79 — House near Downingtown, Chester County; one-story porch with turned columns, rails across columns[56]

A third publication featuring Pennsylvania structures is *Survey of Chester County, Pennsylvania, Architecture 17th, 18th and 19th Centuries* by Margaret Berwind Schiffer (1976). Most of the structures featured in the Schiffer text predate the Lemon House by almost 100 years, yet they can be examined for the information provided on the evolution of porch styles. Construction styles were often copied and transmitted to different geographical areas. Styles from Chester County may have served as models for porches built in Blair and Cambria counties. Schiffer's text features the following porches:

page 24 — Barnes Brinton House, Pennsbury Township (built 1704–1715); one-story porch, takes shape at beltcourse
page 26 — Chadds House, Birmingham Township (built around 1702); one-story porch on columns, possible extension of basement wall
page 30 — Temple House, West Bradford Township (built 1714); one-story porch
page 33 — Parke House, Caln Township (built before 1725); one-story porch with turned columns, four columns on grade
page 41 — Plumstock, Willistown Township (built early 18th century); one-story porch, two engaged columns at wall surface, two heavy timber columns in front
page 50 — Marshallton Blacksmith Shop, West Bradford Township (built mid-18th century); one-story porch, heavy timber columns with braces
page 51 — Ashbridge House, East Caln Township (built early 18th century); one-story porch at grade
page 78 — Center Chimney House, London Grove Township (built about 1763); one-story porch raised on piers
page 81 — House of Nathan Sharpless (n.d.); one-story wraparound porch with flat roof
page 100 — Allen House, Pocopson Township (built 1780 or 1781); two-story porch with four columns
page 105 — Milltown Hickman Plank house, East Goshen Township (built ca. 1800); one-story porch raised on piers with single rail[57]

56. See Eleanor Raymond, *Early Domestic Architecture of Pennsylvania* (New York: William Helburn Inc., 1931).

57. See Margaret Berwind Schiffer, *Survey of Chester County, Pennsylvania, Architecture 17th, 18th, and 19th Centuries* (Exton, Pennsylvania: Schiffer Publishing LTD, 1976).

CONCLUSION

The Allegheny Portage Railroad was the engineering wonder of its day. Many records concerning the railroad's construction, use, employees, and expenses have survived. Nevertheless, only three photographs (c. 1845, 1884–87, 1890) of engine house 6 have been found despite investigations by several NPS historians; perhaps no other contemporary photographs of any railroad structures exist. The same situation is true for architectural drawings of structures, only one drawing has been found. Photographs of inclines 6–10 taken in 1910 and 1922 were found in Harrisburg in 1984. These detail the portage railroad's stone sleepers, an engine house ruin at the head of incline 7, and some grades. (See illustrations 27–36.)

RECOMMENDATIONS FOR FURTHER RESEARCH

While searching for survey drawings of William Milnor Roberts or Solomon W. Roberts, the author learned of the existence of the Pennsylvania Railroad records. Stored until recently in a Philadelphia warehouse, the collection measures 300,000 cubic feet, and in 1984 several institutions were involved in deciding how to handle the papers and where to deposit them. Dr. Michael Nash, Hagley Museum and Archives, Wilmington, Delaware, was in charge of the project. He stated there were "five or six rooms of drawings" alone, that the "drawings are a rat's nest," and that it would be a "long time before we can get into them." Dr. Nash did not believe that an inventory of the drawings would be available until the end of the project.[58]

On July 24, 1984, the author was able to go through several boxes of Pennsylvania Railroad drawings which had, just that week, arrived at the archives in Harrisburg. These drawings and other materials were to be deposited at the archives because they were obviously related to Pennsylvania. Associate archivist Harry Parker pulled a box marked "Allegheny" and another with the name "Robert Faries" on a map. The maps and drawings, both blueprints and tracings, were in no order and some were drawings of structures in states other than Pennsylvania. The author found no maps dating earlier than 1890.

By December 1990 approximately 99 percent of the Hagley Museum and Archives' Pennsylvania Railroad records had been processed. The collection is in Acc. 1807 and Acc. 1810, and a two-volume inventory exists. The collection apparently does not contain much material dating from the 19th century.[59]

In December 1990 the state archives in Harrisburg were closed, and an update on the Pennsylvania Railroad records was not obtained.

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58. Telephone interview with Dr. Michael Nash, Hagley Museum and Archives, Wilmington, Delaware, June 27, 1984.

59. Telephone interview with Chris Baer, Hagley Museum and Archives, Wilmington, Delaware, December 21, 1990.

CONSULTATION AND RESEARCH LOCATIONS

PERSONS CONSULTED DURING RESEARCH

1984

Diana Alten, Manuscripts Librarian, Haverford College Library, Haverford, Pennsylvania
Penelope H. Batcheler, Historical Architect, National Park Service, Philadelphia, Pennsylvania
Sandy Blust, Librarian, Bureau of Topographic and Geologic Survey, Harrisburg, Pennsylvania
Henry Bown, Associate Archivist, Pennsylvania State Archives, Harrisburg, Pennsylvania
Beth Carroll, American Philosophical Society, Philadelphia, Pennsylvania
John Coleman, Professor, St. Francis College, Loretto, Pennsylvania
Grant Talbot Dean, Associate Librarian, Chicago Historical Society, Chicago, Illinois
Sylvia Emerson, Blair County Historical Society, Baker Mansion, Altoona, Pennsylvania
Jeff Flannery, Archivist, Archive of Industrial Society, University of Pittsburgh, Pittsburgh, Pennsylvania
Ken Fones-Wolf, Archivist, Temple University, Philadelphia, Pennsylvania
Amy Harding, Historical Society of Pennsylvania, Philadelphia, Pennsylvania
Bob Ilisevich, Meadville, Pennsylvania
David Kimball, National Park Service, Philadelphia, Pennsylvania
Charles Mann, Archivist, Pennsylvania State University, State College, Pennsylvania
Lance Metz, Center for Canal History and Technology, Easton, Pennsylvania
Anne Mott, Librarian, Engineering Society Library, New York City, New York
Edward Mountz, Librarian, Carnegie-Mellon University, Pittsburgh, Pennsylvania
Dr. Michael Nash, Hagley Museum and Archives, Wilmington, Delaware
Harry Parker, Associate Archivist, Pennsylvania State Archives, Harrisburg, Pennsylvania
Beth Pelle, Librarian, Jervis Public Library, Rome, New York
H. Benjamin Powell, Professor, Bloomsburg State University, Bloomsburg, Pennsylvania
Ruth Reed, Archivist, Historical Society of Western Pennsylvania, Pittsburgh, Pennsylvania
Linda Ries, Associate Archivist, Pennsylvania State Archives, Harrisburg, Pennsylvania
Donald Sayenga, Bethlehem Wire Rope Works, Williamsport, Pennsylvania
William Shank, American Canal and Transportation Center, York, Pennsylvania
John Shelly, Associate Archivist, Pennsylvania State Archives, Harrisburg, Pennsylvania
Martha Simonetti, Harrisburg, Pennsylvania
David Snell, Curator, Earth and Mineral Sciences Museum, Pennsylvania State University, State College, Pennsylvania
Joel Tarr, Professor, Carnegie-Mellon University, Pittsburgh, Pennsylvania
Anna Coxe Toogood, Historian, Independence National Historical Park, Philadelphia, Pennsylvania, National Park Service
William Trimble, Journal Editor, Historical Society of Western Pennsylvania, Pittsburgh, Pennsylvania
Robert Vogel, Curator, Division of Mechanical and Civil Engineering, National Museum of American History, Smithsonian Institution, Washington, D.C.
Kristine Waldron, Library Assistant, Institute Archives and Department of Special Collections, Rensselaer Polytechnic Institute, Troy, New York
John White, Curator, Division of Transportation, National Museum of American History, Smithsonian Institution, Washington, D.C.
William E. Worthington Jr., Museum Specialist, Division of Mechanical and Civil Engineering, National Museum of American History, Smithsonian Institution, Washington, D.C.

1990

Chris Baer, Archivist, Hagley Museum and Archives, Wilmington, Delaware
Benjamin Kline, Acting Curator, Railroad Museum of Pennsylvania, Strasburg, Pennsylvania.
Paula Zitzler, Archeologist, Louis Berger and Associates, Inc., Johnstown, Pennsylvania.

INSTITUTIONS VISITED DURING RESEARCH

Carnegie Library of Pittsburgh, Music and Art Department, Pittsburgh, Pennsylvania
Pennsylvania Historical and Museum Commission, Division of Archives and Manuscripts, Harrisburg, Pennsylvania
State Library of Pennsylvania, Harrisburg, Pennsylvania

SOURCES INVESTIGATED AT PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION, DIVISION OF ARCHIVES AND MANUSCRIPTS, HARRISBURG, PENNSYLVANIA

Record Group (RG)-17 Records of the Bureau of Land Records, Board of Canal Commissioners.

Board Records and Papers
- Reports and Resolutions 1819–58, 1 box,
  - Strickland Report 1826
- General Correspondence and Surveys, 1825–60, 4 boxes
  - Surveys and Correspondence, 1825–29, 2 volumes
  - Miscellaneous Papers, Reports, Documents, 7 volumes
- Engineering Records, 1825–52, 2 boxes
- Damage Claim Records 1827–59, 4 boxes

RG-17 Records of the Bureau of Land Records, Board of Canal Commissioners, Divisional Records,
- Allegheny Portage Railroad
- Contracts, 1851–55, 6 volumes
- Damage Claims, 1831–68, 10 volumes
- Reports and Miscellaneous Documents, 1829–57, 7 volumes

Allied Records (incorporated into RG-17)
- Pennsylvania Railroad Blue Print Maps of the Pennsylvania Canal
- Pennsylvania Canal Records
  - Engineer's Accounts, Estimates, Work Receipts, 1830–36, boxes 1 and 35

Map Books

Manuscript Group (MG)-2 Business Records Collection 1681–1963
- C. Transportation Accounts, 1795–1923
  - Allegheny Portage Railroad (Pennsylvania Canal) 1831–52
    - Journals 1831–52
    - 1831–35, 1 volume
    - 1849–51, 1 volume
    - 1850–51, 1 volume
    - Ledger 1850

MG-11 Map Collection

MG–110 Schuylkill Navigation Company Records
Solomon Roberts Correspondence in Various 1815–1940, Box 3

MG-163 Dr. Hubertis M. Cummings Collection, 1929–1957
Author's Manuscripts
The Pennsylvania Canal (Short Form) 1954–55, Unpublished MSS Maps

MG-199 Railroad Museum of Pennsylvania Collections, ca. 1830–1974
(The author was able to look through a portion of the historical material in this collection in 1984. The collection itself was split between the archives and the museum in Strasburg, Pennsylvania.)

MG-218 General Photograph Collection
II Transportation
B.Railroads

MG-213 Postcard Collection
Blair County
Cambria County

MG-263 George A. Richardson Collection, 1869–1974
book (album) #5

MG-285 Pennsylvania Railroad Photograph Collection, Allegheny Portage Railroad

MG-327 Ira J. Stouffer Photographs, ca. 1910.

Pennsylvania Railroad Records
Sources searched at the State Library of Pennsylvania

Pennsylvania House Journals
1831–32, volume 2
1831–32, volume 3
1832–33, appendix to volume 2
1833–34, appendix to volume 2
1834–35, appendix to volume 2

PART III: ARCHITECTURAL DATA

by
Norma T. Camarena

PREFACE

Extended time and resources were needed to fully analyze historic structural problems of the Allegheny Portage Railroad and to recommend preservation and stabilization solutions; as a result, several trips were made at different times to fully assess the resources. Any further delay of treatment will increase the deterioration of the existing historic structures.

The historic masonry is susceptible to many kinds of deterioration, and the best treatment or other means for preservation, rehabilitation, and stabilization have been identified, diagnosed, and researched to support the recommended treatment. In describing the conditions of the miscellaneous stone structures, various architectural terms were used, and a glossary has been included at the end of this document to assist the reader. One of the recommendations involves the removal of vegetation and soil, which could affect threatened or endangered species (see appendix K for a list of such species in Pennsylvania).

My grateful thanks to Superintendent Peter Nigh and his staff, who provided a wealth of information; and to structural engineer Lew Gridley, who provided invaluable assistance in preparing the text. It would also be appropriate for me to give credit to those persons who have offered me the opportunity to hone my knowledge in historic preservation. Many thanks to architect Kenneth Bennett, who assisted in the process of architectural investigations.

Norma T. Camarena
March 1991

SUMMARY OF DOCUMENTARY INFORMATION

HISTORIC PHOTOGRAPHS

Numerous historic photographs were retrieved from the Pennsylvania Historical and Museum Commission, Division of Archives and Manuscripts, Harrisburg, Pennsylvania; and from the Allegheny Portage Railroad National Historic Site collection. However, few of these key historic photographs were used to record, delineate, and recommend applicable treatments. The historic photographs included in the "Illustrations" section of this report were provided by Larry Trombello, chief of interpretation at Allegheny Portage Railroad National Historic Site.

CURRENT PHOTOGRAPHS

All photographs of existing conditions were taken by Denver Service Center's Eastern Team staff. Many were used to develop existing conditions drawings.

HISTORIC DRAWINGS

The historic drawings were acquired from *Historic Resource Study, Allegheny Portage Railroad National Historic Site,* by Anna Coxe Toogood (NPS 1973; see the Historic Base Map, Allegheny Portage Railroad, illustration 37; and sketch maps, illustration 38).

EXISTING CONDITIONS DRAWINGS

Existing conditions drawings (423/25,005, sheets 1 through 54) were developed from photographs and were prepared by the Denver Service Center, Branch of Drafting and Eastern Team. The drawings follow the Illustrations section of this report.

MAPS

The Historical Information Map in this report (see illustration 18) shows engine houses, heads and foots of inclines, sheds, culverts, viaducts, railroad tracks, etc.

CALENDAR OF EVENTS

December 6, 1824	Surveys of routes over Allegheny Mountains completed.
1831	Surveys made, and 120-foot clearing for railroad track started.
	Eleven levels and 10 inclines proposed by Moncure Robinson, Stephen H. Long, and John Wilson.
March 21, 1831	Contracts let for building the Allegheny Portage Railroad.

1833	The railroad was built with the technical assistance of John Roebling.
	A machine shop and riggers loft for the storage of ropes of the inclined planes built on the summit of mountain where railroad crosses the turnpike.
Nov. 28, 1833	Canal completed from Columbia to Hollidaysburg.
March 18, 1834	First track of portage railroad put in operation, and railroad officially opened.
May 21, 1834	Contract let for construction of a second track.
1834	Completion of four massive stone viaducts; 68 stone culverts; country's first railroad tunnel; 10 stationary steam-powered engine houses; and 36 miles of railway with stone sleepers.
March 1835	Second track of portage railroad put in service.
1853	Due to constant maintenance problems and weather conditions, funds for a new route to bypass the incline were appropriated.
1853	Locomotive engines at levels between the inclines were introduced.
1854	Use of inclines on Old Portage Railroad discontinued.
1855	The state's New Portage Railroad replaced the Old Portage, eliminating the expensive inclines. The railroad and railroad tunnel were completed and put in operation.
1857	The entire canal and railroad system publicly auctioned.
April 22, 1872	Canal between Hollidaysburg and Williamsburg closed.
August 31, 1964	Allegheny Portage Railroad Historic Site authorized for inclusion in the national park system.
1990	Parts of the portage railroad are being used by Conrail, which crosses the trace of the Allegheny Portage Railroad nine times on the east side of the mountain. The western upper two-thirds of the inclines are owned by National Park Service; the lower portion is owned by Conrail.

INCLINES AND LEVELS OF THE PORTAGE RAILWAY

The levels and inclines are numbered from west to east, with level 1 starting at Johnstown and level 11 ending at Hollidaysburg. This "Architectural Data Section" covers the eastern portion of the portage, from the Summit unit (level 6) through incline 10. The length of each level or incline, the lift, and the number of culverts to provide drainage are shown below.

Level and Incline	Length in Miles	Elevation Overcome in Feet	No. of Culverts
Level 6 — Summit	1.60		3
Incline 6	0.51	266.50	1
Level 7 — from incline 6 to 7	0.15	0.00	0
Incline 7	0.51	260.50	0
Level 8 — from incline 7 to 8	0.63	5.40	2
Incline 8	0.58	308.00	2
Level 9 — from incline 8 to 9	1.25	12.00	2
Incline 9	0.51	189.50	0
Level 10 — from incline 9 to 10	1.76	29.58	5
Incline 10	0.43	180.52	1
Level 11 (towards Hollidaysburg)	3.74	146.71	0
	8.07	1,398.71	16

GENERAL DISCUSSION AND FINDINGS

No construction details remain for the railroad, engine houses, or sheds, as noted in the "Historic Data Section." However, measured drawings by Samuel H. Kneass, which were published in 1826 by William Strickland, have been used as a guide to construction chronology. The only available original information refers to rates of pay and the type of work done on the inclines (for example, excavating, detaching solid rock, and masonry work).

Two reports that provided information about railroad construction details on the inclines and planes are Jacob W. Gruber, *The Allegheny Portage Railroad, Cresson, Pennsylvania,* prepared for the National Park Service (appendix N) and Mahlon J. Baumgardner and Floyd G. Hoenstine, *The Allegheny Old Portage Railroad, 1834–1854* (by the authors, 1952; reprinted, 1985).

TRACKS

Tracks were laid on the 10 inclines and 11 levels. Iron plates and edge rails were primarily laid on top of aggregate and large stone blocks (see illustration 39). Heavy foundation blocks of cut sandstone, identified as sleepers, carried the rails horizontally on the ground. On the inclines wooden ties were used instead of heavy stone sleepers because gravity would have caused them to gradually creep down the slope. Timber was also used as a foundation for the railway on embankments, including turnouts. Edge rails, plate rails, pins and wedges for edge rails, nails and splicing plates for plate rails, and chairs were manufactured in England.

STONE STRUCTURES

Locally quarried sandstone was a major natural material used in the construction of culverts, drains, revetments, and the Skew Arch Bridge (see table 2).

TABLE 2: EARLY SANDSTONE QUARRIES IN PENNSYLVANIA

DATE	PLACE
c 1758	Lumberville
1767	Middletown
1777	Danville
c 1780	Avondale
1796	Beaver County
by 1800	Hummelstown
1800	Brownsville
c 1829	Virginville
1835	Waynesville
1840	Lackawaxen
1846	Stevens Point
Mid 1800s	Fisherville

ENGINE HOUSES AND SHEDS

Each of the engine houses at the heads of the inclines was built of wood and contained the stationary steam engine, cog wheels, gears, hydraulic pistons, vertical 8-foot wheels, horizontal 9-foot by 7-inch sheaves, and wells approximately 3 feet wide and 8 feet deep. The cast-iron wheels or sheaves that drove the hoist mechanism were placed beneath the railway system. The use of these mechanical features helped make the most efficient use of power and reduced the strain on the steam engines. The wells accommodated suspending weights and connecting chains that allowed the carriage to be drawn backward and forward (see illustrations 40–42).

Approximately 15 feet apart along the inclines, a cavity with vertical sheaves was installed to control the mobility of the ascending and descending cars. The stone sleepers were placed every 3 feet on center along the planes.

Wooden hitching sheds, where the rigs were either hooked or unhooked from the cable, were constructed at the bottom of each incline. Sheds were built with foundations of masonry to shelter and support the stationary engines and cable sheaves.

MASONRY DRAINAGE STRUCTURES

Approximately 150 masonry drainage structures were built for the Allegheny Portage Railroad, and William Strickland's sample culvert designs probably served as models for those built on the Allegheny Portage Railroad.[60] William Hasell Wilson also designed some of the structures, mainly culverts. Sixty-eight stone culverts, spanning from 5 to 20 feet, were constructed of stone laid in mortar, while the others were dry-laid. The faces of the walls at the ends were built of hammered stone laid in courses. The coping, steps, and the ringstones or voussoirs that form the heads of the arches were smoothly cut. The keystones established the strength and durability of these stone culvert arches. There were 87 drains, with spans ranging from 2 to 3 feet. The walls were fitted and laid by hand, and without mortar. The viaducts, culverts, and drains together made 157 passages for water to flow under the railroad. The fact that many of these structures are still functioning after 140 years proves the strength and durability of ringstone or voussoir arches.

Stone masons used two methods to split sections of stones. Using their experience and feel for the stone, they would locate the weakest plane to split off sections with an axe. To quarry sandstone, the masons outlined the shape of the block with hand-drilled holes. The drill used was a long piece of iron with a chisel-like end. It was held by one workman and struck with a sledge hammer by another, and it was rotated after each blow. Drill holes were separated by channels several inches wide, and cut to the desired depth. The block was then split-off in sections by striking along the weak planes with a mason's axe. During winter masons would repeatedly pour water into cracks; as the water froze it would expand the cracks and eventually crack the rock. The great masses of stone split off in the quarry were usually subdivided on the spot, to the approximate size needed for the specified design. Levers were used to maneuver the stones into a sledge, stone boat, or cart.

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60. William Strickland, *Reports on Canals, Railways, Roads, and Other Subjects Made to "The Pennsylvania Society for the Promotion of Internal Improvement"* (Philadelphia: H. C. Carey & I. Lea, 1826), p. 20.

EXISTING CONDITIONS

Numerous portions of the old portage have been cut and filled; the surface has been cleared, grubbed, and graded; minimal masonry work has been undertaken; a stream's direction has shifted; and portions of historic structures have been removed. New construction has modified the topography, resulting in the destruction of some historic structures, traces, and embankment walls, and the burial of some culverts, barrels, headwalls, and revetments/embankments. For example, when US Route 22 was initially constructed, grades and drainages were modified, and some historic structures were either totally or partially buried. Existing structures are now being affected by erosion, vegetation growth, and other problems that are slowly destabilizing and destroying existing ruins. Drainage and water ponding problems are creating wet areas at inclines, levels, and embankments, which are slowly deteriorating and eroding. Areas surrounding inclines, levels, and embankments are covered with grass and shrubs, concealing the existing historic structures.

Existing conditions for the most significant remaining structures associated with the Allegheny Portage Railroad are discussed below. These include the Summit unit structures (principally the Lemon House and the foundations of engine house 6), the Skew Arch Bridge at the foot of incline 6, the foundations of engine house 8 (which is buried in wood chips), and 13 existing historic stone culverts. Other structures have been destroyed, buried, or cannot be identified. Further archeological investigations may or may not find the remains of these structures.

GENERAL CONDITIONS OF MASONRY STRUCTURES

The stability of the stone structures is affected by both intrinsic and extrinsic factors:

> Intrinsic conditions are inherent in a structure and make it susceptible to deterioration as a result of environmental conditions. Tests and analyses of soil-bearing capacity, plasticity, chemical composition, climate, and geologic stratifications were almost certainly not conducted as part of the portage design plan. If such tests had been conducted, some of the existing problems would probably have been avoided. Typical problems and conditions that were detected are discussed below. Many of these problems were mitigated by using sandstone, which is excellent in terms of hardness, workability, porosity, thermal conductivity, chemical composition, and physical structure.
>
> Extrinsic conditions are external forces that, in combination with intrinsic conditions, produce deterioration. External agents can be natural, chemical, biological, or human. Natural factors include runoff, ponding water, seepage, and freeze/thaw cycles. The original drainage channels have changed over time, leading to problems related to water ponding, seeping into historic stone foundations, and dislodging stones as a result of freezing and thawing. Biological problems include plant growth on the stone facade and subsequent erosion. Human-related factors include direct impacts, such as the construction of roads and highways along the old portage, and indirect impacts, such as vibration caused by vehicular traffic.

Roots of trees and shrubs are slowly pushing some stones out of alignment. Certain types of lichens (crusty, crust talus, and leafy) are composed of long fibers intertwined with chains of algae cells, which cause stone to decompose. Moss growth indicates that moisture and condensation are potential problems leading to deteriorated and weakened masonry structures. There is no existing indication of

soot or smoke causing deterioration or discoloring historic stones. Soil erosion has resulted in sediment being deposited at the bottom of stone culverts, thus blocking drainage through the barrel. Iron deposits on stone cause it to stain and to oxidize, resulting in deterioration. Problems along the historic revetment and riprap walls are similar to those associated with the historic stone culverts, including stones slipping, bulging, and collapsing.

Walls of dry-laid stones are along the embankments, normally adjacent to inlets and outlets. These walls are providing some support to the historic stone culverts, as well as preventing embankment erosion at the culverts. Few existing walls actually splay out from the arch.

The major problems jeopardizing the stability of some revetments and embankments are erosion, buckling, collapsing, and stones slipping from revetments/embankments. These stones may be lying at the bottom of a culvert's springbed and springline zones, or around the culvert's perimeters. Load pressures are affecting the stability of structures. Despite their hardness and durability, some stones have fissures, cracks, and spalls as a result of freeze/thaw action. This stone damage is one of the major problems associated with the structures. Moisture gains access to the stone through capillary action and can either damage it by freezing or by recrystallizing soluble salts. An examination of the surfaces and structural foundations showed that they were either in a fairly good condition or that there was serious structural deterioration.

LEVEL 6

Historic resources associated with the summit level (from west to east) are culverts 1342, 1356, and 1382, the Lemon House, the Lemon Coal Mine, and engine house 6.

CULVERT 1342

Culvert 1342 is approximately 200 feet west of the NPS gate and 240 feet east of where US Highway 22 crosses above the historic trace. It is not known if the dry-laid stone structure is part of the culvert, which may be either partially buried, totally buried, or no longer extant. The exposed arch stone may be either the culvert's voussoirs or a stabilizing arch relieving the revetment wall load and deflecting soil erosion. The area's topography was modified during the construction of the new US 22 (to the south, behind the arch and revetment wall).

Embankment (South Elevation). The existing revetment wall has various segments of in-laid stone in stable condition. A tree 14 inches in diameter is growing 18 feet above the stone arch and is causing the dry-laid stone wall to bulge and dump stones along either the probable streamline or streambed perimeters. The bulge is approximately 6 feet high by 14 feet wide.

Embankment (North Elevation). Because trees, vegetation, and dead branches obscure the embankment, it is difficult to determine if the north revetment wall is entirely laid with sandstone. A warning sign approximately 150 feet east of the outlet alerts people to call the Arco Pipe Line Company in Independence, Kansas (316-331-3381) in case of an emergency or before excavating the area (see illustration 43). It is unknown if there are easements rights.

Drainage (North Elevation). The immediate northern area has been cleared, trees have been chopped down, and branches were used to construct a rough fence. Approximately 49 feet from the north

embankment and stone arch is a drainage path that is infilled with dead logs and erosion debris. There is evidence of flowing water.

Inlet (South Elevation). The existing contours, which look like a swale or basin, compound water drainage problems since the probable inflow is completely blocked. The existing grade may either be a streambed or streamline. The existing arch is partially buried, except for a few exposed ringstones or voussoirs. There is evidence of moisture retention on the arch's left side, moss is growing on the stone face, and vegetation is sprouting around the joints. The typical tapered ringstone dimensions vary from 16 to 24 inches deep, from 9 to 12 inches wide at the top, and from 8 to 10 inches wide at the bottom, and approximately 16 to 22 inches high. An oval, springwater well (29 inches by 18 inches, unknown depth) was found 22 feet east at the existing grade (see illustration 44).

Outlet (North Elevation). The existing stone arch is partially buried except for a few exposed ringstones. The in-laid stone wall is overturning and spanning over onto the blocked opening. Even though the orifice is totally concealed with debris, infill, and stones from the revetment wall above, water is trickling out. The existing moisture retention is causing vegetation growth and insignificant swelling at the arch's perimeters. There is no springing line (where the arch rises from its support). The structure's conditions are typically the same as the south elevation's inlet.

CULVERT 1356

Culvert 1356 is a dry-laid stone culvert approximately 1,300 feet east of culvert 1342 and approximately 1,160 feet east of US 22, which crosses above the historic trace.

Inlet (South Elevation). This rectangular culvert is coursed with heavy, symmetrical, dry-laid stone lintels. The rectangular drain's interior core is in fairly sound condition. The exterior headwall has notably deteriorated. The top coping stone is overturning and spanning the culvert's opening. All existing stone work is in poor condition. The narrow opening shows no blockage since water seems to flow through. The existing streambed is clogged with stones, which have fallen approximately 10 feet behind the inlet's rectangular orifice. The bottom of the existing springbed zone is sedimented and is partially concealed by rubble. Moisture is causing moss to grow on the stone face, and ferns are growing around the culvert's perimeter. The existing foliage-covered embankment shows minimal erosion.

Outlet (North Elevation). The culvert's headwall is overturning and spanning over onto the blocked opening. Tree trunks and root systems are causing the stone to partially heave, bulge, and shove the existing stone wall out of plumb. At the bottom of the embankment is a pile of rubble that has completely buried the outlet's probable stone opening. It is not known if the rubble is from a collapsed wing wall or batter wall or if the stones slipped from the embankment. There is no record or evidence as to whether the outlet's construction was similar to that of the inlet. Moisture retention has resulted in rapid vegetation growth. The outlet is generally in the same condition as the inlet.

CULVERT 1382

Culvert 1382 is approximately 2,500 feet east of culvert 1356. From the trace above culvert 1382 the east elevation of the Lemon House can be seen.

Trace and Embankments. Near the dry-laid stone, curvilinear culvert are several historic sleepers, with water ponding at the center of the rutted trace, above the existing barrel. This problem causes some concern about water retention and rutting, along with increased erosion.

The barrel's interior is lined with dry-laid stone. The stone ceiling is partially caving in 10-feet from the opening, probably due to water seeping through the rutted trace and freeze/thaw action, thereby creating expansion pressure on individual stone units. Continued freeze/thaw action will eventually affect the barrel's stability and result in reduced load tolerance and the potential for the vault to collapse. Daylight can be seen at inlet's opening.

The north and south dirt embankments are sloped and in stable condition; they are covered with foliage and a few scattered stones. There is no evidence of riprap.

Inlet (South Elevation). The reassembled stone arch culvert has a unique curvilinear profile and is in poor to fair condition. The reset stones were not replaced in their original locations because the stones do not match (stones with heavy moss have been relaid next to stones without any moss). The reconstructed culvert has seven dry-laid courses of relatively large rectangular and flat stones. There is no evidence of existing fissures on the stone facade. Some shimming or chinking has been done to fill large gap joints. Moss and vegetation growth around the peripheral area is minimal. However, two trees, approximately 12 inches in diameter, are causing the symmetrical stone sides to rotate out about 8 inches. The stone arch is popping out, and the stones above the voussoirs are heaving, probably due to hidden moisture and thrust problems (freeze/thaw action). As a result, the wall is obviously out of plumb. Six voussoirs are exposed, plus a partially buried, exfoliating or shearing ringstone. The existing grade and springbed impound debris. This structure is a good example of a clear drainage culvert. The earth embankment is in stable condition.

Outlet (North Elevation). The construction, design, profile, problems, and condition of the existing six dry-laid course curvilinear culvert is similar to that of the inlet except for a vertical fissure in one headwall stone. The culvert was dismantled and reconstructed at one time, and the top section of the voussoirs are moving outward. The joints are much larger than those at the inlet. There is no evidence of exfoliated stones, but moss is growing and is thicker on this side. The barrel's ceiling, which is lined throughout with dry-laid stone, is caving in about 10-feet from entrance. The earth embankment is in stable condition, but there is notable erosion.

Modern Culvert. Approximately 35 feet south of the relaid historic outlet, a modern 24-inch outside diameter, concrete culvert pipe was stabilized with loose stone; no mortar was used. There is no drainage problem. The culvert is in stable condition.

SUMMIT LEVEL

Trace. The railroad trace at the summit level is maintained as a cleared, regraded, and grubbed dirt trace approximately 26 feet wide; it is in good condition. There is minimal evidence of ruts. The approximate boundaries of the historic trace perimeters at the summit level are 25 feet west of the Lemon House, 10 feet north of the existing tracks/sleepers, east of engine house 6, and 10 feet south of the Lemon House.

The trace, level, and incline have apparently been regraded at an elevation estimated to be 1 to 3 feet higher. Part of the existing trace was regraded with soil, gravel, bitumen, or other materials, and

reseeded. Thus, historic features have been buried. This modified area is north of the Lemon House and west and east of Gallitzin Road (see illustrations 45 and 46a and b).

Archeological testing at the Lemon House in 1989 uncovered intact subsoil approximately 2 to 3 feet below the present grade south of the Lemon House (Louis Berger & Associates 1989). This provided evidence of an earlier alignment of Gallitzin Road, which crosses the Summit unit and separates the Lemon House from the head of incline 6 and the engine house. (This road was present during the historic period.) A few scattered bricks and pavement were found 1 foot below grade under the Lemon House picket fence, and a path was uncovered northeast of the trace (the edge of Gallitzin Road). Another possible section of pavement was found about 1 foot below Gallitzin Road, southeast of the trace. These discoveries confirm the presence of earlier footpaths.

Along the trace's edge west of Gallitzin Road four rows of stone sleepers were exposed, and east of Gallitzin Road stone sleepers were found beneath the historic fills. A rock wall or foundation was identified a few feet south of the trace (west of the Gallitzin Road); its function is unknown (see illustration 45).

Approximately 3.7 feet below the new road, a series of intact wooden planks representing a ramp was unearthed. The ramp was presumably used to allow the Gallitzin Road to cross the railroad. Illustration 45 shows where these specific historic features were found.

The original track between engine house 6 and the head of incline 6 was delineated and uncovered in archeological testing in February 1989 (Eastern Applied Archeology Center 1989).

Lemon House. The Lemon House is a stone structure that is classified as being of second order significance. Samuel Lemon, who built the house probably in 1831, added porches at the south and east elevations. However, in the late 1800s a larger porch replaced the east side porch and was removed at an unknown date.

Architectural investigations in 1982 by Penelope Hartshorne Batcheler resulted in full accounts of existing conditions of exterior walls, and conjectural drawings of porch plans and elevations between 1831 and 1899.

Archeological investigations conducted in September 1984 (by the Eastern Applied Archeology Center, through the cooperative park studies program at American University) provided 15 individual drawings, which give information about the locations of porch foundations, wall profiles, and floor plans of excavations on the east side of the Lemon House. In 1984 additional architectural investigations were conducted by Kenneth Bennett and the author. Structural investigations were conducted by Lew Gridley in April 1990.

Lemon Coal Mine Entrance. The Lemon Coal Mine is north of the trace, just across from the front door of the Lemon House (illustration 48 shows a rough sketch, circa 1878). According to the 1972 *Historic Structure Report* for the Lemon House, the mine entrance reportedly was covered over in 1950s, and written details on its prior characteristics did not seem be in existence.[61] Park staff have indicated the mine's vicinity, and DSC surveyors discovered the collapsed entrance to the coal mine. A small earthen ramp and a small concrete feature were visible at the orifice. (Illustration 49 shows the buried entrance; concrete detail and the ramp were not visible.) Existing conditions around the

61. NPS, HSR, Toogood, p. 9.

sunken perimeters may be dangerous since the mine may not have totally collapsed; these questionable safety conditions led to the termination of subsequent investigations. Superintendent Nigh recommended that this historic feature not be further investigated.

Engine House 6 Foundations. No additional records about engine house 6 were located by Coxe Toogood, Sharon Brown, or David L. Fritz (the latter searched about 20 different repositories in nine different cities in January and February 1990). Clues on the construction were found in a request for bids published in 1833 in the *Ebensburg Sky* and in a general specification dating between 1851 and 1855 (see appendix L). Other available information includes a ca. 1845 photograph (illustration 50), a 1975 "Historic Structure Report" on the engine house by Carnegie-Mellon University (appendix M), and illustrations showing the structure from the east (illustrations 51–55) and the west (illustrations 47 and 56). The only remains that can be seen now are the massive sandstone foundations. Presumably, the engine house was constructed in 1833, but in 1852 the structure blew up and a second engine house was built at the same location. After the railroad was abandoned in 1890 the engine house was converted to a barn (see illustration 57).

Appendix L provides information on an unknown engine house, and it gives architectural details that are not seen in the photograph or paintings of engine house 6. The general specification calls for pilasters and cornices, end pediments, four doors, and sandstone keystones for the door arches.

Engine house 6 was a partially subterranean, roughly square structure. It housed two 35-horsepower stationary steam engines, with boilers at ground level on the north and south sides of the track at the east end of the structure; one engine was used only as a spare. In the center of the east end at the lower level the sheave room housed horizontal sheaves (9-foot 7-inch diameter) and vertical wheels (8-foot diameter). This section was roughly 10 feet below grade, in between the aboveground north and south boilers. The weight well (approximately 3 feet wide by 9 feet deep) was on the east side of the sheave room. (See drawing 423/25,005, sheets 14–17; illustrations 40–42; and appendix M.) The engine house 6 site was excavated by staff from the Applied Archeology Center, and the existing ruins are now exposed.

An examination of the paintings (illustrations 51–56) shows inconsistencies in details. The painting of the west view shows windows on the south elevation wall, but the east view paintings show the south wall with a door. (Note that illustration 47 shows a window and two probable door openings.) Also, the structure's dimensions are not consistent. One of the views (from the summit) shows a probable 65- by 90-foot wooden engine house with a set of brick stacks and steam exhausts extending out from a gable roof.

Appendix N includes a 1970 report documenting a historical and archeological survey of the Allegheny Portage Railroad by Jacob W. Gruber. The report remarked on important facts that most of the salvageable historic metal was melted down for scrap by the Pennsylvania Railroad. Many of the stone sleepers were robbed, and the newer construction destroyed valuable elements. The Pennsylvania Railroad's Muleshoe Curve destroyed much of the base for incline 8. US Highway 22 destroyed parts of incline 7 and stretches of the levels. The foundations for engine house 6 were robbed, contributing to partial cave-ins, and over time the extensive depressions were used as a fill area for rubbish and for the sweepings and debris from the nearby highway. The nature of the fill made the presumed features difficult to define during excavation. The results of the excavation, which were initiated at the head of incline 6 and at the eastern end of the summit level, were preliminary. The work did reveal the approximate size of the original structure and the scope of work yet to be done.

Excavations along the trace east and west of the Gallitzin Road uncovered rows of stone sleepers in three 20-foot by 20-foot areas (west of the Gallitzin Road and in front of the Lemon House, and east of the Gallitzin Road toward engine house 6). At the engine house site large areas of sod were removed, and an attempt was made to define internal wall locations. The foundation walls were set into an irregular excavation and backfilled.

The area was mined at one time, and there are 4-foot bituminous coal seams in the vicinity of level 6. The mine openings are southeast of engine house 6 and at the hillside just off the roadbed. However, while there are five different seams/layers at varying depths throughout the area, it is only the uppermost seam that is of immediate concern because it is directly beneath the engine house structure. The collapse of other mine openings directly beneath the engine house has affected the structure itself.

The 1975 Carnegie-Mellon University "Historic Structure Report" for the engine house assumes that the structure was symmetrical about the centerline of the incline and that the original structure had been altered or added to (see appendix M). These assumptions were based on several discrepancies and details in existing drawings and paintings. The paintings show proportions of the east and west faces being broader than those in an earlier drawing. Again, the paintings and drawings do not agree with existing documentation. Two drawings included in the Carnegie-Mellon report (appendix M) do not give that appearance if drawn in the 1800s. An unknown artist drew conjectural 1834 and 1837 plans and elevations of the engine house. These drawings do not conform with other available information.

In 1978 a portion of the engine house foundation was reconstructed by Salvador Marano, but not to historic specifications. The 56-foot-long and 2-foot-wide north wall was the best preserved feature. However, cinder block retaining walls were constructed to stabilize the engine house foundation walls, which resulted in the destruction and disturbance of archeological evidence. Before the construction of the protective shelter in 1993 the retaining walls were in poor condition. A vertical crack in the east cinder block wall was gradually expanding as a result of freeze/thaw action. The other masonry walls were in fair condition. Loose stones were lying in a line (east to west) on the floor of the ruins. It is not known where these stones belong.

In 1988 an archeological investigation searched for the location of the south wall and was unable to produce any evidence. The report concluded that either the south wall was not constructed at the location excavated (meaning that the engine house was not symmetrical), or that the wall was destroyed by post-portage railroad era construction or landscaping (see appendix O). The 1988 archeological investigations did uncover a French drain (gravel drain) surrounding the engine house. NPS personnel installed the drain in the 1970s, after the south half of the engine house was reconstructed. Archeological testing in 1991 also did not uncover any evidence of the south wall, meaning that the wall may have been destroyed or was located elsewhere (see appendix P).

An archeological work plan for the archeological testing was submitted for review to the Denver Service Center on August 30, 1990 (see appendix Q). The testing was designed to provide important information for the completion and design development of the engine house shelter.

Note that engine houses 6 and 8 do not follow exactly the same plan, although the general conformation of the structures is the same since the functions were identical.

INCLINE 6

The new railroad tracks that have been set to the east of engine house 6 on incline 6 are not historic. The modern wooden ties, which have been set in ballast, were erroneously constructed (see illustrations 39a, b, and c).

The foot of incline 6 may have been destroyed or buried by the construction of old US 22. There is inconclusive evidence of the historic incline grade.

SKEW ARCH BRIDGE

Downhill from incline 6 is the famous Skew Arch Bridge, which was built to allow the Huntingdon, Cambria and Indiana Turnpike to cross over the portage railroad — the only road bridge purposely built along the portage. Today the bridge is in fair condition. Illustrations 58 and 59 show Storm's paintings of the bridge from the east and west elevations. The original bridge design was altered some time in 1833 to a skewed or twisted design in order to carry the turnpike at an angle over the railroad, thus avoiding an inconvenient bend in the turnpike road on the steep hill from the head to the foot of incline 6.

The skew arch is 60 feet 5 inches long on the south elevation, 54 feet 11 inches long on the north elevation, and 22 feet 2 inches high. Broken stone and stone sleepers taken from a section of the railroad were perched, fitted, and laid diagonally by hand without mortar. The top of the bridge was not tilted but the arch's imposts were offset and constructed directly across from each other. Rectangular stones were cut into an L shape and were placed to reinforce the external corners of the pilasters and walls. No historic specifications or drawings have been found.

The Skew Arch Bridge is parallel to the west-bound lane of US 22. A subsurface drain was installed to divert water from the bridge at the centerline of the historic railroad right-of-way. The drain is buried beneath US 22, the trace, and the Skew Arch Bridge; it angles approximately from the center of the bridge's north elevation and extends out from the east side of the bridge to the end of an existing gully and shallow streambed. The vitrified subdrain is partially visible beneath the bridge. The semi-buried pipe extends out to the streambed, where there is a modern metal culvert below the Skew Arch Bridge for drainage. Water does not drain from the existing nonfunctional culverts, but discharges out to the area where the only two original stringers known to exist have been exposed. This discovery, made during the 1988 archeological fieldwork, is the only conclusive evidence of the original fabric and original grade of incline 6.

Deep depressions and poor drainage on the modified trace have been caused by heavy water channeling and ponding. These problems are seriously eroding the historic incline and probably affecting the stability of the Skew Arch Bridge. The bridge and the original grade on the incline below the bridge will be adversely affected and impacted by continued erosion in the streambed and by any ground disturbance.

In 1979 the bridge was stabilized and repaired at various locations (see existing conditions drawing 423/25,005, sheet 21). Nearly all of the bridge's exterior has been repointed, except for various spots inside the barrel. The top wall repointing is in good condition. Other significant joints and cracks were pointed to match adjacent joints on the interior face of the bridge's parapet top. Limited sealing was done at adjacent joints with a gray mastic material. The impost stone on the east side has been

extensively raked and repointed. The north elevation angle facade has been mortared, but nearly 30 percent of the facade is slowly eroding. Lime and sand mortar have been used at the coping stone joints. The back of the barrel's arch was waterproofed, and the top of the masonry vault was repaired with pneumatically applied concrete (shotcrete). The top section of the former road was modified and the lower section was regraded (see existing conditions drawing 423/25,005, sheet 24).

Existing swales and erosion caused by poor drainage are major problems along the Skew Arch Bridge perimeters. Water ponds in low areas. At the bridge's southeast corner water is being drawn into the stone through capillary attraction, and the stone is damp. Dampness is also staining and exfoliating the stone at the bottom of the barrel and the exterior walls. Efflorescence on the barrel walls is caused by water seeping from above and trickling through the stone wall and ceiling. Problems at the northeast corner are similar to those at the opposite side. There is notable stone crazing at the shallow keystone of the bridge's arch and other areas of the northeast wall.

These major problems are causing individual stones to crack, structural cracking or shearing, and differential settlement, which results in the rotation of the northeast wall (see existing conditions drawing 423/25,005, sheet 18, detail D). In some areas stone is deteriorating, predominantly on the northeast elevation of the splayed wing wall. Water is flowing down from the top of the parapet wall into the joints and ponding at the top of the wall's stone ledge and at the bottom of the wall. Moisture is also causing the stone to spall. At the top of the stone ledge conditions are suitable for vegetation growth.

According to retired park mason Salvador Marano, stone sleepers have been scavenged for use as steps and retaining walls. Mr. Marano also thought that the bridge parapets were built by using dislodged stones from the wing walls. Stone stairs are bulging and being dislodged. At the northeast corner a large stone is cracking at numerous points; and the bottom of the stone wall is slowly deteriorating.

The slope embankments are poor, and the grade is slowly eroding. Loose soil, dead branches, trees, and debris further complicate site conditions. Water is not draining water away from the structure, and the area is still boggy.

Trace and Embankments

The new south embankment is partially covered with excess loose asphalt (maintenance spoil), debris, and vegetation. The approximate 18-foot-wide historic trace is probably on the north elevation, below US 22 and 28 feet 6 inches above a historic stone outlet. The probable historic trace is grass-covered and partially concealed by vegetation. Above the historic outlet, the partially hidden north embankment's riprap is also covered with shrubs and young trees. The roots are apparently either loosening or helping to stabilize the stone structure, riprap, and soil. US 22 can be seen above the culvert.

Culvert 1422

Remains of this culvert could not be found; they were probably destroyed when the highway was constructed. A modern square concrete culvert likely replaced the historic culvert.

TRACE, LEVEL, AND INCLINE 7

Most of the historic features associated with the trace, level 7, and incline 7 were probably either destroyed or buried during the construction of US 22. Historian David L. Fritz found a painting by Storm that showed two buildings on the right side of the Skew Arch Bridge. Archeologist Jed Levin hopes to find some artifacts beneath the westbound lane of old US 22.

LEVEL 8

Access to level 8 is from old US 22 (driving east), through an NPS service gate, and up a steep dirt road. The historic trace has been cleared and grubbed; resources (from west to east) include culverts 1464 and 1490 and the foundation of engine house 8.

CULVERT 1464

Culvert 1464 is on the side of a very steep embankment (approximately a 33 percent grade) on the north side of US 22 heading east. It is approximately 4,015 feet east of Skew Arch Bridge.

Inlet (South Elevation). The historic stone inlet has been replaced by a modern, formed-concrete culvert, barrel, and wings; this apparently occurred when US 22 was constructed. This is an functional culvert and in good condition. It is not known if the historic inlet and inlet barrel were partially destroyed or plugged; daylight cannot be seen from the north elevation, and a breeze cannot be felt.

Outlet (North Elevation). The existing dry-laid stone drain is in fair condition. The lintel stone (5 feet 4 inches long, 2 feet 4 inches deep, and 11 inches wide) is dislodged, and a 5-inch diameter tree, ferns, and other vegetation growing out from the top of lintel are causing the stone to tilt forward and the four stone courses on each side of the opening to spread apart and heave outward. The joints range from 1 to 4 inches wide.

The 2-foot 5-inch square stone orifice is clean, but about 7 feet inside the barrel the ceiling has partially collapsed. There is a minimal flow of water trickling out, and the culvert is rated as a nonfunctional outlet.

A modern metal culvert 59 feet east of the historic outlet is part of an existing functional drainage system. This aqueduct may be hooked up to the new concrete inlet on the south elevation.

CULVERT 1490

There is no indication of either a historic drain or a culvert at this location. A dry-laid riprap embankment (25 feet wide and 50 feet long) was constructed, and fallen stones from the riprap embankment may have buried the culvert's historic outlet. Seepage was probably partially responsible for the collapse of the riprap. The riprap is covered with moss, and moisture retention is discoloring the stone. Running water and poor drainage are causing moss growth over a fairly large area. It is unknown if this culvert was either buried, destroyed, or was not located at this site. In the section where water is seeping from the mound of slumped rubble three fairly large trees are growing. It is probable that the trees caused the historic outlet to collapse. The existing streambed runs across a possible logger's trail.

ENGINE HOUSE 8 FOUNDATIONS

The existing historic foundations at the head of incline 8 have been buried with wood chips. Consequently, investigations and documentation could not be obtained. The 1970 archeological survey by Jacob W. Gruber reported that engine house 8 did not follow exactly the same plan as engine house 6, but that the structures generally conformed since the functions were identical. Gruber recommended that engine house 8 should be developed and used for interpretation since the remains were more complete than those for engine house 6 (see appendix N).

INCLINE 8

Resources on incline 8 originally included culverts 1503 and 1529.

CULVERT 1503

Culvert 1503 is accessible from eastbound US 22. Just before the highway's stone bridge is a steep dirt road that leads to an NPS service gate (the Muleshoe is on the south side of the gate). The culvert is approximately 1,900 feet beyond the gate.

Trace and Embankments. The 23-foot-wide trace has been cleared and grubbed. The embankment along the inlet's south elevation is constructed of dry masonry. The dry-laid riprap on the dirt side walls supports the embankments and trace, and it also controls water drainage. At the top of the embankment are a few void areas. At the edge of the embankment's north elevation is a small section of a horizontally dry-laid coursed stone wall (1-foot wide by 2-feet high). The outlet's embankment side has debris, dead trees, and fallen branches, as well as shrubs and young trees. The north and south embankments are both in fair, stabilized condition, and presumably vegetation is keeping the stone in place.

Inlet (South Elevation). There is a triangular cavity 87 feet by 78 feet by 62 feet and approximately 15 feet deep at the supposed location of the inlet. The culvert could not be investigated since it is totally buried, and the stone arch is probably buried as well. It is unknown if the culvert's inlet, arch, and barrel have been destroyed or were built at another location. These features may be found buried under soil, rubble, and vegetation.

The 87-foot riprap embankment wall probably serves only as a retaining wall for stabilizing the trace and grade. The dry-laid masonry measures 2 to 8 inches wide, 12 to 40 inches long, and 14 to 18 inches deep and is laid perpendicular to the existing south elevation dirt embankment. The wall appears to be in good condition.

A 62-foot riprap revetment wall is below a 12-foot-wide logger's path. There is a spotty eroded section directly beneath a 12-foot-diameter tree, at the far south side of the cavity's wall. Water puddles at bottom of the triangular basin, and vegetation is growing.

Outlet (North Elevation). The historic outlet consists of a coursed dry-laid barrel ringstone culvert with a 3-foot 6-inch opening. The outlet measures 13 feet long and approximately 5 feet 8 inches high. The existing side walls and channel are covered with debris. The keystone and six ringstones are in good condition, and there is no sign of stones slipping out. The stone wall's joints have been shimmed or chinked. The stone facade is relatively flat, and the ends are curvilinear wing walls. The dry-laid

stones have been placed with a stepping stone configuration. The typical stone dimensions are 10 to 12 inches long and 18 inches wide. The curving wing walls are in fair condition; however, there is evidence of minimal overturn and soil erosion at the wall ends. A 6-inch diameter tree growing above the riprap embankment's side, near the trace's edge, may eventually cause dirt to yield and stones to slide out.

Stones are falling from the barrel's ceiling and wall, approximately 15 feet from the opening. Even though the existing barrel may be either partially plugged or destroyed, a strong breeze can be felt coming through the barrel.

CULVERT 1529

No evidence of culvert 1529 has been found.

LEVEL 9

Two historic culverts have been found along level 9 — culverts 1532 and 1586.

CULVERT 1532

The section of the trace at this location can be accessed through an NPS service gate south of old US 22 (eastbound lane). It is about 1,800 feet from the stone bridge on US 22. The historic culvert is a five-minute walk from the trace and down the north side of the grade, approximately 725 feet. (See existing conditions drawings, 423/25,005, sheet 2.)

This stone culvert is 18 feet wide (inside dimension of stone arch) and 10 feet 8 inches high (from the streambed to the keystone's top); the barrel is 23 feet 4 inches long. The tapered ringstone dimensions are approximately 2 feet long, 23 inches deep, 8 to 9 inches wide at the bottom tapered end, and 12 inches wide at top. About 5 percent of the barrel's slab stone ceiling has been repointed. The culvert is dry-laid, similar to the construction of the other culverts. Freeze/thaw action may be creating expansionary pressures on the culvert's arch, barrel, and headwall. Water running down the embankment penetrates through the joints and affects the structure's stability.

Trace. The cleared and grubbed trace at this location is approximately 17 feet 6 inches wide (the width of the trace ranges from 12 feet 6 inches to 20 feet). A 12-inch cast-iron pipe section was uncovered on the west side of the historic culvert, buried beneath the trace. It is unknown if this utility pipe is functional or is part of a nonfunctional abandoned system. It is probable that the buried pipe runs through the trace and crosses the historic stone bridge culvert. Easement rights are unknown.

Serious erosion along the trace's shoulders is changing the width of the trace and is endangering the culvert's stability. Relatively near the historic stone culvert a large tree has toppled across the trace, and there is concern that other dead trees may fall and destroy the structure. Roots, erosion, and water drainage are the basic factors affecting the stability of the trace's shoulders.

Embankments. The embankment's shoulders, dirt grades, and dirt areas surrounding the historic culvert are seriously eroding, and falling loose dirt is probably burying the curvilinear wing walls. Within six months erosion escalated from poor to serious, with loose dirt and stones slipping off and

tree roots becoming exposed; as a result, emergency repairs are required. Fallen trees and live tree root systems are affecting the embankment's stability and the culvert's structural stability.

Drainage. The stream running north-south is flowing through the culvert and is carrying debris and dead logs. The dross is deposited at the tumbled ringstone perimeters.

Inlet (South Elevation). In April 1984 the arch was in fairly stable condition, except for the stone ends, which showed gradual heaving. An October 1989 investigation found that the barrel's ceiling was heaving, dead trees had fallen, and the embankments were eroding. By April 1990 the conditions had accelerated from poor to serious, with further structural instability and deterioration.

It is not known if wing walls/batter walls were constructed at each end of the culvert. If curvilinear wing walls were constructed, they were probably 12 feet wide and 8 feet high and may be buried beneath soil that has sloughed off from the embankment above and the trace shoulders.

Outlet (North Elevation). The ringstones at the outlet arch were probably assembled similar to those at the inlet's arch. The existing curvature begins at the springline, which is partially hidden beneath vegetation, soil, and stones. This elevation is slowly eroding and is unstable. Major sections of the outlet are collapsing, resulting in significant structural failure. The existing heaved stones and sliding dirt are mounding at each end of the arch. The structural ends are totally failing, and the arch's ringstones have been completely thrust off and may be buried at the bottom of the streambed perimeters. The barrel's crown has been exposed as a result of vehicular vibration, rain, and tree roots. These problems are causing serious arch failure and exterior and interior structural deterioration; the historic structure's integrity has been affected. Immediate repairs are required.

CULVERT 1586

Culvert 1586 is approximately 3,225 feet east of culvert 1523 and can be reached by way of a new maintenance spoil road. It is necessary to walk south from the maintenance road about 65 feet and about 35 feet up the slope, from where the 15-foot historic trace is visible. The culvert is at the bottom of the embankment, 71 feet below the historic trace. (See existing conditions drawing 423/25,005, sheets 2 and 39.)

Trace. The modern asphalt road, which was constructed parallel to the north side of the historic trace, did not disturb the historic stone culvert or the historic trace; but it probably buried the historic outlet and embankment. Approximately 34 feet 7 inches above the new road, the 15-foot historic trace has been cleared, grubbed, and regraded.

Embankments. About three-quarters of the south embankment wall, which extends horizontally approximately 400 feet and slopes down 71 feet, is stabilized with riprap. Tree roots and water drainage are the major problems. The embankment is relatively steep, and gravity has caused the soil to creep and erode, and in several areas stones have slid to the bottom of the grade.

The historic trace's north embankment, which slopes approximately 34 feet 7 inches toward the new road, is about 15 percent riprap. Trees and vegetation have stabilized the other 85 percent of the dirt slope. The construction of the new road did not disturb the historic embankment, but it may have buried or destroyed the historic outlet.

Drainage. The streambed has no notable damage. There is evidence of water channeling down to the inlet, where debris has been deposited in the inlet's mouth.

Inlet (South Elevation). The historic culvert is 71 feet below the trace. The culvert's features are similar to those of culvert 1342 at the summit level. However, the relieving arch, which is 11 feet above the streambed, is collapsing and is endangering the structure's stability. The existing dry-laid culvert's ringstone and orifice are almost totally buried beneath stones and soil that have sloughed off from the steep riprap embankment above. It is likely that wing/batter walls are concealed; wall widths are probably 6 feet. The exposed mossy voussoir and three ringstones on each side are in good condition. Because there is considerable movement and stone separation, primarily at the relieving arch, the inlet elevation is evaluated to be unstable and in poor condition.

Above the culvert's ringstone arch are two courses of stone with a curvilinear profile. This area shows a section of loose soil, failure of the stone relieving arch, and stones slumping down to the cavity bottom. There is evidence of unstable riprap and vegetation growth, including rapidly spreading root systems.

The barrel's interior is in perfect shape, no damage was found on either walls or ceiling. However, stones have been found at the bottom of the barrel's grade, approximately 100 feet from the opening. It is not known if these stones were washed down and carried through the inlet, or if they fell from the barrel's ceiling. There is no daylight in the barrel and no evidence of moisture; but there is air movement.

Outlet (North Elevation). The historic outlet could not be found, and probably it was either destroyed or buried at the time the new asphalt road was constructed. The width of the new road is approximately 93 feet 6 inches.

LEVEL 10

Five historic culverts have been found along level 10 — 1624, 1635, 1656, 1692, and 1697.

CULVERT 1624

Trace. The historic site, where the distinctive elliptical arch culvert is extant, is in a small draw on the portage's lower eastern stretch. Access is by way of one of the southeastern NPS service gate and from the cleared, grubbed, and graded trace. The grassy trace is approximately 31 feet wide and seems to be maintained regularly. Obvious depressions in the trace occur above the culvert. One notable 18-inch diameter hole has been detected on the east side of trace, near a tall spruce tree. Another 1-foot 9-inch square hole occurs on the west side, 4 feet 11 inches away from the end of the inlet's headwall. This section is evidently affected by freeze/thaw action.

Drainage. A fast-flowing stream runs through the culvert. There seem to be no problems, except for minimal debris deposited near the outlet. The outlet's streambed has generally been maintained and cleared.

Inlet (South Elevation). The inlet for culvert 1624 is a unique dry-laid, elliptical stone arch, which has been maintained by the National Park Service. The inlet consists of 21 exposed voussoirs, two stone courses above the arch, and an elliptical step wing wall. Because the historic structure has been

maintained, there has been minimal deterioration. The top stone course edge has been capped with a concrete skim wash, and the joints between the ashlar masonry (cut stones) have been repointed, with grapevine tooling. Some moss is growing on the ringstone's face, and vegetation is growing through the joints. There are several fissures or cracked voussoirs. The east embankment's corner is a 1-foot 1-inch opening. To prevent the existing barrel's stone ceiling from collapsing, it was partially stabilized. The ceiling at the inlet has a 5-foot by 9.5-foot parged area.

Outlet (North Elevation). There are 23 voussoirs, and 70 percent of the stone face is discolored due to moisture retention and moss. Ferns are growing through the deteriorated repointed joints. A small section at the top has been repointed and capped with portland cement. The existing morass, debris, and vegetation may be detrimental to the structure's stability. The wing wall ends are rotating outward and upward, and voussoirs are being dislocated at various points.

CULVERT 1635

Culvert 1635 is approximately 1,100 feet east of culvert 1624. It is accessible along the historic trace.

Trace and Embankments. Vehicles are permitted to drive along the 20.6-foot, cleared, grubbed, and regraded historic trace. The existing stone culvert/bridge is slowly collapsing due to traffic vibrations, tree roots, freeze/thaw cycles, erosion, and stone heaving. These major problems require immediate attention before other serious developments occur. Soil is slowly creeping off the embankments, and no riprap has been placed along the existing eroded embankments. Large tree stumps are along existing embankments and at the top edge of the voussoirs.

Drainage. Trash, vegetation, and dead logs along the streambed are impeding drainage. As a result, the channel is branching and backing up the inlet zone, causing moisture on the stone wall and probably causing the stone to spall.

Inlet (South Elevation). The dry-laid inlet structure is 28 feet 7.5 inches wide; the barrel is 35 feet long and 14 feet in diameter. As of 1984, the culvert was in poor condition and gradually failing because vegetation and tree roots were heaving stones out of position; water was draining down along the culvert's sides and causing major erosion on the embankments and in the areas above the wing wall; and the historic stone wall was being slowly dislodged. Freeze/thaw action was also affecting the structure's stability. As a result, the wing walls and arch ends were out-of-plumb; approximately seven voussoirs had moved and separated, leaving exceedingly wide gaps; the bottom southeast base was missing; and two courses of stone from the facade had fallen off. (The fallen stones are lying in the streambed and on the grade.) There were a few broken and fissured voussoirs; and patches of thick moss and dirt were slowly damaging the stones. The voussoir's face has a rough tooled finish.

These problems required emergency stabilization. The orifice has been temporarily and partially plugged with sandbags, and a 5-foot-diameter corrugated metal pipe has been installed for temporary drainage and reinforcement. The metal pipe does not go all the way through the barrel. The sandbags seem to be supporting the stone arch, wall, and metal pipe.

Investigations in April 1990 found the sandbags almost totally decomposed and sand pouring from holes. Soil erosion was continuing at the stepped wing wall, with soil being deposited at the sides and grade. At the top of the arch voussoir is the stump of a tree that had been cut to reduce the pressure on the keystone and ringstones. Vegetation and moss are growing from the ringstone joints, and several ringstones are spalling. The spreading vegetation is helping dislodge several other stones.

The barrel's stone ceiling is bulging, probably due to vibration from vehicles driving along the trace, freeze/thaw action, or a combination of both. The northeast ceiling and the stone base are gradually popping out. Joints have been mortared, and several areas at the arch's intrados and on the ceiling have been parged. Repointing and chinking at numerous joints have prevented stones from slipping; nevertheless, several stones are missing. There is indication of moisture retention, and water permeation at joints is staining and discoloring the stone wall with salts and causing efflorescence.

Outlet (North Elevation). Problems associated with freeze/thaw action have caused several stone courses above the keystone to fall off and settle on the streambed. Erosion is one of the most serious problems. Loose soil is creeping down the embankments, the trace's edge shoulder, and the dirt areas above the wing wall. Sandbags have been placed in the void areas to prevent the structure from collapsing. Problems seen here are generally the same as those noted at the inlet.

CULVERT 1656

The historic trace and culvert are about a five-minute walk from the highway. About 25 feet behind the trace and the north elevation of the outlet are homes, pasture, and the old US 22 alignment.

Trace. The abandoned railroad trace ranges from 10 to 14 to 21 feet wide. The trace and its perimeters have been cleared, cleaned, grubbed, and graded, and trees have been removed, thus temporarily solving problems related to ponding water, dendritic drainage, and erosion. This work may have disturbed the historic embankment and inlet. Erosion has occurred on the east and west embankments.

Embankments. The riprap on the north embankment is slowly heaving and being dislodged. Water-related problems and drainage are jeopardizing the embankment's stability and causing movement and erosion.

Drainage. Drainage problems that caused water to pond, freeze, expand, and thaw on the trace were solved in 1990 by clearing, grubbing, regrading, and rechanneling the streambed. A new drainage system was installed, and water now flows under the trace and spills out at a location away from the historic outlet.

Modern Outlet (South Elevation, Upper Section). Near the top of the hill and just below the new railroad gravel roadway is a modern outlet. The new culvert has four courses of stone, a 24-inch inside diameter concrete drain pipe, mortar joints, and a 2- to 3-inch dripline at the top of the stone course. Previously water flowed out and down the drainageway and carried trash, logs, vegetation, and stones, depositing them at the historic trace. Now water flows down and through the rechanneled path. The outlet requires no repair since it is in good condition.

Historic Inlet (South Elevation, Lower Section). (Note that the historic outlet is on the north elevation but both the historic inlet and the new outlet are on the south.) The historic inlet is thought to be approximately 116 feet below the new outlet. The modern culvert has probably caused several major drainage overflows and spills at the bottom of the slope where the historic inlet is probably buried (at the pocket segment). Before the area was cleared, grubbed, regraded, and rechanneled there was evidence of flooding, overflows, and drainage directly into the historical perimeters. (See existing conditions drawing 423/25,005, sheet 48.)

In October 1989 a hole was dug to determine the location of the historic inlet. Stone was struck approximately 7.5 feet below the top of the grade and is probably the barrel's stone crown. The historic

inlet may have been plugged or covered at the time the new gravel road was built. If the structure is buried at this location, then the existing historic embankment may be buried as well. The area has been regraded. It is unknown if a historic riprap embankment and historic inlet are buried beneath the modified grade.

Historic Outlet (North Elevation). The historic dry-laid stone arch culvert, which is approximately 147 feet below the modern concrete culvert, has partially collapsed. Structural failure has occurred at the voussoirs and stone walls, where stones have heaved and fallen to the culvert's boundaries. These conditions have been caused by erosion, dendritic drainage, roots, and soil sliding from the existing eroded embankment.

Approximately 3 feet of voussoirs or ringstones have collapsed, exposing the barrel's crown. Even though the crown is uncovered, the existing stone barrel seems to be in fair condition, except for stones becoming dislodged and slipping from the ceiling (see illustration 60). There is no debris blockage, and no breeze can be detected coming through the barrel.

A 16-inch diameter tree growing on top of the ringstone has damaged the culvert's headwall and arch; the root system, however, is somewhat protecting the culvert from collapsing. Water, movement, and erosion have seriously affected the culvert and have thrust the historic stone wing wall out of place, and stones have spilled along the historic outflow slope path. The wall's full length and base could not be investigated because these features have been buried by rubble, debris, vegetation, and loose soil. The wall's configuration may be similar to a battered wall.

CULVERT 1692

Culvert 1692 is about 3,500 feet east of culvert 1656. The historic culvert is on the south embankment of the historic trace, at the bottom of the 56-foot embankment (see existing conditions drawing 423/25,005, sheets 49 and 50).

Trace. The historic trace was partially buried to accommodate the railroad bed for the new trace. The bed was built-up with dirt, maintenance spoil, ballast, and gravel, and it lies on top of the existing historic culvert. The new railroad bed mound either destroyed or buried the north outlet, embankment, and trace.

The old portage trace, which is partially buried, is on the south elevation, 76 feet east of the center line of culvert 1692 to the exposed shoulder of the trace. The grubbed and cleared trace is approximately 20 feet below the new railroad bed.

Embankment (South Elevation). The 56-foot steep embankment (1:1) is covered with vegetation and dead branches, and there is no indication that riprap has been used to stabilize the gradient. Several trees 2 to 8 inches in diameter are growing above the outlet's stone headwall.

Drainage. Behind the inlet zone are stepping grade levels where a stream flows down to the buried inlet. The channel ranges from 5 feet to 6 feet 6 inches wide. Logs, rubble, vegetation, and berms obstruct the drainage flow.

Inlet (South Elevation). About 90 percent of the culvert is covered with berms and mounds of dirt that have eroded from the surrounding steep slopes. Eventually the culvert's orifice will be totally buried. At the present time the streambed and both wing or batter walls are buried. The walls are being

pushed outward, stones are being dislodged or are falling to the bottom of the grade, joints are widening, and several horizontal stones are cracking. One voussoir is missing, and a few others are unstable. The dry-laid sandstone slabs above the arch are rough random coursed; they are shimmed and chinked in between the horizontal stone joints. Above the ringstones the longitudinal headwall stones are shearing, and above the headwall serious erosion is occurring, and a course of coping stones is slumping off. Other concerns include tree roots and predominantly heavy loads. The quality of the sandstone seems to be inferior. Overall conditions of the culvert and site are in poor condition.

Barrel. Even though the barrel's opening is almost completely blocked by eroded soil, rubble, and debris, the stone barrel's walls show evidence of moisture (within 3 feet). There is no indication of stones being dislodged.

Outlet (North Elevation). Since the outlet was not found, it was impossible to accurately determine the barrel's length; it may be from 50 to 75 feet long and buried about 60 feet below the new trace. Due to load, it is likely that the historic outlet may be totally collapsed and unsalvageable.

A modern mortar-coursed stone culvert with a cast-iron barrel is approximately 192 feet northeast of the probable location of the historic culvert. This outlet may have been diagonally hooked to the historic stone barrel. The modern cast-iron outlet has a plank board platform that covers a water reservoir. The culvert is in good condition.

CULVERT 1697

Culvert 1697 is approximately 615 east of culvert 1692, on the south embankment. From the trace to the embankment the distance is about 72 feet and drops 20 feet where the stone culvert is found. There is no evidence of this culvert's outlet on the north elevation.

Trace. From the inlet's northwest lateral, the 15.5-foot historic trace, embankment, and outlet were buried when the new trace was constructed to the north. The old trace extends out from the south embankment of the new trace (see existing conditions drawing 423/25,005, sheets 49 and 50). Water ponds at the point where the two traces meet. Eventually water will percolate down to the barrel's core and subsequent freeze/thaw action will adversely affect the historic outlet and barrel, if they still exist.

Embankment. The embankment is generally in the same condition as the embankment for culvert 1692, except for different dimensions. This embankment's vertical slope is 20 feet. Even though trees, vegetation, and dead branches partially cover the embankment's wall, there is no indication of riprap. Erosion is a problem. A tree approximately 30 inches in diameter is growing out from the embankment's grade and may endanger the culvert's structural stability if the roots are spreading toward the barrel's crown and haunch, which could cause the barrel to eventually collapse. Natural forces are causing the steep earth embankment to slowly fail.

Drainage. Debris, rocks, and sediment are cluttering the bottom of the culvert's streambed and perimeters.

Inlet (South Elevation). The dry-laid stone arch inlet is in fair and stable condition. The curvilinear wing walls are semi-buried with soil that has slumped from the eroded embankment above. Vegetation, erosion, and freeze/thaw cycles are moderately expanding and contracting the existing stone courses. A 30-inch diameter tree is growing from the embankment, near the culvert, and the root system may be affecting the historic structure's stability. Stepping stones at the ends of the wing walls are slowly

being dislodged, heaving, and collapsing. The existing dry-laid stone culvert headwalls are turning over. The stepping stone slabs show evidence of moisture retention and moss growth. One voussoir is missing.

Barrel. The dry-laid stone barrel is not plugged and was found to be in good condition within 25 feet; daylight cannot be seen, probably because the outlet has either been destroyed or buried beneath the new trace. The barrel's crown and ceiling seem to be in stable condition.

Modern Outlet (North Elevation). The original historic outlet was probably buried or destroyed during the construction of the new dirt and gravel trace. A modern culvert laid in mortar is approximately 325 feet to the northwest (measured from the inlet's centerline to the new culvert's centerline). This culvert is coursed with coping stone, four mortar-laid stone courses, and a cast-iron barrel; it is in good condition. A large tree (approximately 16 inches in diameter) directly above the modern outlet may eventually either damage the cast-iron barrel, or its root system may be stabilizing the drainage unit. It is probable that the new barrel and drainage system is connected with the functioning inlet, and drainage is through the new, mortared outlet.

INCLINE 10

CULVERT 1733

Access to the historic trace and the south elevation inlet is from eastbound US 22, turning south on Mill Street, and west on to a dirt road, where there is an NPS service gate. The stream that used to flow through the culvert has been realigned and now flows south instead of north and is crossed by a wooden footbridge (see illustration 61).

Trace. The historic 19-foot trace was cleared, grubbed, and regraded, and a hole was found directly above the existing historic stone barrel (see illustration 62). Rutting occurs along the trace.

Embankments. When the stream was realigned and widened to approximately 24 feet for drainage purposes, the north embankment was sheared, the historic outlet facade destroyed, and the barrel's length shortened. The dimensions of the previous embankment have been lost, and the original construction drawings and records of the trace, inlet, and outlet have never been found. The embankment is steep and heavily scarred by water erosion, and trees and shrubs are growing over the embankments. It is classified as being in very poor condition.

The south embankment has also been eroded by water and is in poor condition. Dead trees, branches, and other vegetation are affecting the structure's stability. There are ruts and dips where water ponds.

Drainage. The historic culvert's streambed was radically modified by clearing, grubbing, regrading, and changing the stream's direction. There is no indication of water flowing into the historic inlet.

A river parallels the trace and is adjacent to the dirt sheared embankment (see existing conditions drawing 423/25,005, sheet 54).

Barrel. In a 4-foot area at the barrel's spine the stones are slowly heaving due to water ponding along the trace, seeping down to the crown, and then freezing, expanding, and thawing. The barrel's interior shows evidence of stone slippage at the ceiling and along the walls. A cast-iron ring and iron post were installed to support the center of the barrel's load and to stabilize the existing historic structure.

Approximately 15 feet 5 inches from the orifice to the cast-iron support, the stones in the ceiling show moisture retention. The modified barrel is approximately 27 feet 4 inches.

There is evidence of minimal chinking, and three large stones are missing. The culvert has been subject to vandalism, and tools that were apparently used to dig out the blocked interior outlet were found inside the barrel, but the trespassers failed to remove the outlet's metal cover.

Inlet (South Elevation). The curvilinear, dry-laid stone culvert has been reconditioned by partially clearing and removing vegetation and partially mortaring the barrel's joints. The historic structure has been severely damaged, but the voussoirs at the inlet are basically in fair shape. The existing east curvilinear wing wall is stable; the west wing wall, however, has been partially displaced and buried as a result of soil erosion. Top course stones have slipped and are severely tilted, and the wall has heaved about 7 inches. A major section of one voussoir has spalled from the west side bottom corner.

The exterior facade displays notable movement and numerous cracks, probably as a result of both vegetation growth and structural settlement. A whitish haze on a few stones indicates efflorescence. Moss growth at various spots on the curvilinear wing walls is a result of water draining down from the steep soil slopes and banks above the side walls. Plants are wedged in between stone courses as well as in cracks, crevices, and joints, and the roots are causing some minor breakup of stones. Moisture may eventually contribute to further damage as a result of freeze/thaw cycles. The headwalls are obviously out of plumb.

Outlet (North Elevation). As discussed above, the outlet was severely damaged by the partial removal of the embankment. The outlet is currently blocked with dirt and a metal cover. Its condition is very poor.

OTHER STRUCTURES — LEVELS AND INCLINES 6 THROUGH 10

ENGINE HOUSE FOUNDATIONS

No investigations were done of any foundations of the other historic engine houses besides those at the summit level and level 8. These structures have apparently been either destroyed or buried.

HITCHING SHEDS

No foundations for the hitching sheds have been located. They may be covered by vegetation, or buried beneath rubble, debris, and other unknown obstacles; or they may have been destroyed. Weather conditions hampered a thorough search for these structures.

OTHER HISTORIC FOUNDATIONS AND SITES

Other historic foundations and sites may have been destroyed or buried. No investigations were done, and no information is available. (See illustration 63.)

RECOMMENDATIONS FOR PRESERVING HISTORIC STONE STRUCTURES

The 1987 *Site Concept Study* for the Summit unit of Allegheny Portage Railroad National Historic Site generated recommendations with various alternatives; however, the study states that additional planning decisions will need to be made, and that the concept study will be the basis for making those decisions. The alternatives, along with other proposals, have been considered, and the recommendations of this study are in accordance with the findings of previous documents and investigations and the *Cultural Resources Management Guideline (NPS-28).* Every effort was made to ensure that no unneeded changes or additions were made and that no over-restoration was performed on the site's structures.

The degree of damage to historic structures will determine the extent and nature of the remedial measures. The following general proposed architectural and structural engineering treatments are based on (1) onsite architectural investigations conducted by Ken Bennett and the author in fall 1989 and on-site structural investigations by Lewis Gridley in spring 1990; (2) information gathered for the "Historical Data Section"; (3) nomination forms for the National Register of Historic Places; (4) comments by the Mid-Atlantic Regional Office; (5) park staff research; and (6) oral comments from local citizens. Conditions, causes, and treatments for the historic stone structures are based in part on information presented by Dr. Earhart Winkler, who is an expert in stone preservation.[62] All recommended actions would have a beneficial effect in terms of the stabilization, preservation, or rehabilitation of the specific structures.

GENERAL RECOMMENDATIONS

The historic stone structures associated with the Allegheny Portage Railroad will be preserved in their present condition or restored to their approximate condition during the 1837–57 period. The general approach will be preservation by cleaning, stabilizing, and repairing. If the degree of deterioration is minimal, and if the problem does not threaten the integrity of a structure, a no-treatment alternative will be followed. Where stabilization and restoration are necessary, the work will be performed in a manner consistent with legislative mandates and NPS policies and guidelines.

If repointing is required, mortar with a high portland cement content should not be used since it can create a bond that is often stronger than stone. Differences between the coefficient of expansion and the permeability of the material can cause serious deterioration to a historic masonry structure.

Natural vegetation will be removed from faces of designated masonry structures and adjacent areas with care and by following a proper sequence of steps to avoid impairing the existing historic fabric. Plant growth will be removed from stones by hand, with methods such as knife blades or stiff bristle or nonferrous soft wire brushes. A "Gloquat C" solution can be prepared by mixing the fungicide with water and applying with a pneumatic garden-type sprayer that is two-thirds full of the diluted fungicide. (The concentrate is sold in 1 liter bottles and should be diluted with 24 parts of water.)

Voids that contribute to masonry deterioration will be filled by methods and materials to match the adjacent masonry.

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62. Association for Preservation Technology, seminar, "Conservation of Sedimentary Building Stones," Denver, June 11, 1971.

Collapsed and dislodged wing walls and headwalls built of dry-laid stones will be repaired. All recessed stones should be removed and reset flush with the face of the masonry wall. The stepping-stones should be removed and reset. Collapsed wing walls will be rebuilt where necessary to complete the stabilization and maintain erosion control.

If wing walls or any parts of the masonry culverts need to be dismantled or removed, these structures will be photographed and recorded in sufficient detail to permit accurate reassembly. Before any removal, the types and sizes of stone will be identified on site to determine the possible original placement and function of each stone removed. The stones will be marked on the nonexposed side and identified with a number that will be recorded on drawings.

When it is necessary to partially dismantle a masonry feature or structure, one stone at a time will be removed to prevent the redistribution of loads, which could cause structural failure. Care will be taken so as not to mar the historic stone surfaces. The stones will be stockpiled in a way to facilitate reassembly. All dismantling work will be monitored to identify and prevent any great pressures that may cause wall stones to be dislodged, thus endangering the integrity of the entire structure. Shoring may be required to protect an adjacent wall or to prevent disturbance of an existing wall or embankment.

All masonry will be reassembled to match the original design, using stones and mortars that match the original materials in composition, color, texture, and overall geometry. Loose mortar will be raked out, and existing joints will be repaired with a tested lime mortar.

Misaligned portions of dry-laid stone walls will be realigned by dismantling and resetting the stones on beds of mortar placed toward the back of the walls so as to give the appearance of a dry-laid wall.

Skilled craftsmen should be employed for the work, and proper supervision will ensure close adherence to specifications.

To avoid erosion and to enhance the natural setting, the surrounding areas should be graded and revegetated with native species. Some minimal grubbing, clearing, and regrading would be required to mitigate erosion problems.

When backfilling or regrading is required, and when the soil cannot be adequately compacted by other methods, tamping will be allowed.

Chipped, cracked, fractured, disfigured, or unsound stone will not be used on the exterior wall surface; no such stone will be removed from the job site without approval. Any badly deteriorated stone should be replaced with properly surfaced stones that match the original in composition, color, and texture.

If a culvert has completely collapsed, a decision will be made as to its functional value. Depending on the decision, the culvert will either be restored or replaced with a masonry structure similar but not identical in character to the original.

Work will be performed on one approximately 6- to 8-foot section of wall at a time. This will avoid an excessive amount of stockpiled materials.

The replaced railroad rails on incline 6 will be maintained and kept in line during winter.

Spring flooding will be controlled by maintaining and cleaning the existing culverts and channels.

Stone sleepers will be preserved.

Structures will be maintained to prevent future deterioration of related components of the railroad.

SPECIFIC RECOMMENDATIONS AND ALTERNATIVES

Every effort should be made to halt further deterioration and wherever possible to stabilize, preserve, and rehabilitate the culverts between the inclines and levels, the engine house 6 foundations, the Skew Arch Bridge, the inclines and levels themselves, and other historic foundations and sites. However, no attempt should be made to reconstruct any major historic features that have been lost and cannot be accurately reconstructed. Before any nonhistoric additions are removed, they will be thoroughly documented.

The recommended preservation steps and rehabilitation treatments discussed below will involve varying degrees of dismantling, stabilization, preservation, and rehabilitation, and they will entail high expenditures. The extent of the proposed recommendations will be determined by administrative requirements and available funds.

Specific recommendations and alternatives for final treatments are discussed below for individual structures. If specific recommendations are not discussed, then the general recommendations discussed above will apply.

A historic structure preservation guide will be programmed for the maintenance and conservation of the historic features associated with the Allegheny Portage Railroad. This guide should be integrated with the maintenance management system.

LEVEL 6

Culvert 1342.

Embankment (South Elevation): On the south elevation cut out, fill, and regrade approximately 20 cubic yards of dirt to remove the existing swale and to reconstruct the drainage path. During excavation ensure that no damage occurs to the existing historic outlet. Remove existing trees by cutting flush with the embankment. Remove vegetation and root systems from the revetment walls and relieving arch to preserve the integrity and stability of the structure. No repair is required in the area approximately 6 feet high by 14 feet wide where the stone is heaving and a tree is growing because the roots are probably stabilizing the embankment. Do not replace stones in the random voids nearby.

Embankment (North Elevation): As required, carefully remove existing vegetation and trees that are jeopardizing the wall's stability. Replace stones in void areas on the riprap embankment by using stones salvaged from the bottom of the revetment wall and near the arch stone (north elevation).

Drainage: Regrade and reconstruct the drainage path.

Inlet (South Elevation): Investigate further and excavate, if required, to determine if the stone arch functions as either a culvert or a wall stabilizer. If the structure is a historic culvert, preserve and stabilize by removing remaining infill, debris, and vegetation. Reopen inflow and outflow orifices, and carefully stabilize the barrel and vault. Protect a water well 22 feet east of the inlet during stabilization work.

Outlet (North Elevation): If the stone arch functions as a relieving arch, then remove vegetation and trees to stabilize it and to restore its historic integrity and appearance. If the structure is a culvert, clear away existing infill and debris from around the outlet.

Culvert 1356.

Embankments: Remove approximately 10 cubic yards of rubble and clean the culvert's perimeters to prevent erosion and to permit proper drainage flow. Remove trees on the embankments that are jeopardizing the structure's stability by cutting them flush with the embankment and leaving the stumps in place.

To maintain a continuous flow through the culvert, regrade and improve the channel, clean the drainage, clear the opening, and locate the streambed.

Inlet (South Elevation): Clear debris from the exterior perimeters and opening. Remove the stones that are leaning forward and replace them in their proper location. Before dismantling the headwall, record and number each stone, and identify its location and the overall pattern. Replace the missing stones on the barrel's ceiling with stones found in the streambed. Remove vegetation and trees that may weaken the structure's stability. Cut trees flush with the embankment; do not remove stumps or roots.

Outlet: Remove existing piled stones and clear away debris in order to determine the structural composition, dimensions, and other construction features. If the rubble is from collapsed wing walls, reconstruct the wall similar to the inlet wall. Dismantle and reassemble the overturned stone wall. Replumb the wall as required. If there is evidence of a rectangular stone drain, reconstruct it similar to the historic inflow drain.

Culvert 1382.

Trace and Embankments: Clean and bury the stone sleepers found on the trace in wood chips. Maintain the trace's character by correcting erosion and ponding problems at the center of the trace and above the barrel. Regrade and crown the trace by installing protective material to prevent water from seeping through the barrel. Reseed the work area. Cut two trees at the top of the earth embankment and near the trace flush with the grade, plus trees that are within 10 feet of the culvert. Remove debris and vegetation, including at the revetment area.

To improve drainage, regrade banks by removing approximately 10 cubic yards within 50 feet of the inlet. Clean out the inlet as required and inlay granular fill to allow a cleaner and direct flow.

Inlet (South Elevation) and Outlet (North Elevation): Since the existing structures are leaning forward, dismantle and relay the stones in their proper locations, with a smaller joint gap, and ensuring that the stones match one another. Remove all recessed or heaved symmetrical coping stones and voussoirs, and reset flush with the stone headwall. Fill all voids in the wall with stone found onsite. Excavate behind stone headwalls and construct new footings. Replace the deteriorated exfoliating voussoirs with

properly surfaced stones that match the original in composition, color, and texture. Remove existing moss with low-pressure water and brush off with soft natural bristle brushes. Remove debris from the streambed and clean the channel. Replace ceiling stones, using stones deposited at the bottom of the barrel.

SUMMIT LEVEL

Structures. The 1980 *General Management Plan* and the 1987 *Site Concept Study* recommend that the Summit unit be redeveloped to resemble the George Storm painting of the historic period (see illustration 52). The construction of the protective shelter for engine house 6 was nearing completion at the time of the final editing of this *Historic Structure Report.* In addition, an addendum to the *Historic Structure Report* for the Lemon House will include a section on the historic landscape, with specific recommendations for future treatment.

Lemon House. No recommendation is being made for the Lemon House pending the completion of an addendum to the *Historic Structure Report* for the Lemon House.

Lemon Coal Mine. The 1972 *Historic Structure Report* for the Lemon House noted the possibility that an archeological survey would turn up evidence of the coal wharf, as well as give more information on the exact location of the coal mine entrance and its dimensions. The mine entrance reportedly was covered over in the 1950s; no written details on its prior characteristics have been found.[63] Even though the mine entrance has since been found, archeological investigations are needed for verification and to make recommendations. Specific recommendations will be presented in the addendum to the *Historic Structure Report.*

Engine House 6. The construction of a protective shelter that is slightly larger than the engine house foundation is nearly completed. The scale and mass is in proportion to the historic structure, and the foundation will be visible for interpretation. Three alternatives for the engine house were considered during the preparation of this *Historic Structure Report.* One was not to construct any shelter, a second to construct a partial shelter, and a third to construct a shelter similar to the present project.

INCLINE 6

Skew Arch Bridge. The following actions should be undertaken in the order listed as funding becomes available.

Trace: Excavate, reopen, and investigate the barrel's top and determine if materials need to be replaced; regrade and crown the trace with suitable and approved membrane material.

Embankments: Remove vegetation from the embankments, under the direction of the contracting officer (cut trees flush with the grade). Cut, fill, regrade, and compact the slope's eroded areas; fill holes or shallow areas with clean topsoil, and compact. Rechannel drainage away from the bridge. These actions will protect the structural stability of the Skew Arch Bridge, retard stone deterioration, prevent water intrusion, and preserve the bridge.

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63. NPS, HSR, Toogood, p. 9.

Drainage: Improve drainage away from the bridge, possibly using a French drain. Relocate the northern belt subdrain, regrade the area, and rechannel the streambed (see existing conditions drawing 423/25,005, sheet 22). New grading plans must ensure the protection of cultural resources. Grading and construction practices that disturb natural features promote erosion and require extensive revegetation.

Stairs and Bridge: Undertake a major stabilization. For all joints that have been affected by weather on the Skew Arch Bridge and stone stairs, rake approximately 1 inch deep and repoint; match existing mortar composition and proportions as well as color and texture. Remove excess mortar from stone edges and faces after it is well set (to prevent smearing), but before it has fully hardened.

Stabilize eroded or deteriorated areas at the splayed wing walls. Carefully remove loose stone fragments; clean, reuse, and reset all dislodged stones. Ensure that replacement stones are similar to adjacent stones in color and texture so that the new work will not be distinguishable from the original work.

Clear all surfaces of vegetation and loose materials. Clean exterior stone surfaces where efflorescence, salts, moss, or soot are present with fiber bristle brushes, water, and possibly detergent. (Before work begins obtain from the manufacturer a written statement indicating that the products specified are appropriate for this particular use.) Use a stiff fiber bristle brush to clean all debris, dust, oil, and other foreign material from all masonry and stone areas to be patched.

Modern Culvert: Clean the existing debris and improve the streambed drainage by either regrading, rechanneling, or enclosing the stream drainage flow, with provision for archeological investigation, monitoring, and re-evaluation.

Regrade and infill areas where water is channeled and accumulates. Stabilize and bury exposed historic stringers for protection. Either install a new culvert at another location where water may be redirected, or replace the rusted metal culvert, but redirect the drainage path away from the historic stringers.

Consideration should be given to visitor safety, depending on future accessibility to the structure.

Culvert 1422. If old US 22 is removed, culvert 1422 may be located. If evidence is found of the historic embankment and structures, they should be treated in a manner consistent with the general recommendations of this report.

LEVEL 8

Culvert 1464.

Alternative A: Leave the south embankment and inlet buried, and only stabilize or replace the north embankment if there are void riprap areas. Protect the structural stability of the historic outlet by realigning the historic culvert and by removing debris and vegetation from the north embankment. Above the historic outlet's boundary, realign and stabilize loose riprap, if required. Do not regrade.

Retain the culvert as a nonfunctional structure, and maintain the existing streambed as is. Clear away vegetation approximately 10 feet on each side, and cut trees flush to grade. Remove the small tree growing out of the lintel stone. Realign and replumb by dismantling the culvert's heaved stones and reinstalling as required.

Alternative B: Maintain the existing condition since the construction of old US 22 probably buried the stone culvert's inlet.

Recommendation: Do not uncover the probable buried inlet (alternative B).

Culvert 1490. It is assumed that culvert 1490 has been totally destroyed. Water drains from the riprap embankment through a pile of stones at the bottom of the grade, and no treatment is required. No further investigation is recommended.

Engine House 8 Foundations.

Alternative A: Keep the historic structure buried with wood chips to preserve the historic stone foundations.

Alternative B: Since the remains of engine house 8 are more complete than those of engine house 6, preserve, develop, and interpret this structure rather than engine house 6, as recommended in the 1970 report (see appendix N). Protect the remains with a canopy shelter.

Recommendation: Keep the historic structure buried with wood chips to preserve the historic stone foundations (alternative A).

INCLINE 8

Culvert 1503.

Trace: Crown, regrade, and remove vegetation from the trace to prevent rutting and water from pooling and seeping through the riprap embankment's walls.

Embankments: Reuse stones and fill in void areas. Stabilize, repair, and reset loose stones as required with stones found at the immediate site. Remove all trees that may cause stones to fall from the riprap walls. Cut trees flush with the grade, but do not remove stumps and roots.

Barrel (at North Elevation): Patch voids in the ceiling by reusing and repositioning stones found inside in the streambed. Redirect drainage away from the structure to eliminate water condensation, pooling, and water seeping through the existing barrel; regrade the adjacent slopes.

Inlet (South Elevation): Carefully excavate to locate the culvert's opening, and thoroughly examine. Stabilize heaved stones on the inlet's facade by resetting stones. If the inlet's stone arch and opening are found to be unimpaired, clean where needed. If the inlet has been destroyed, either reconstruct if there is evidence that it was similar to the outlet or construct a drop inlet. (The existing partial stone arch may be a stabilizing arch for the riprap embankment and trace, rather than a culvert arch, in which case no work would be undertaken.)

Outlet (North Elevation): Reset and realign the culvert's stones, and ensure they are plumb. Remove vegetation in the stone joints and carefully remove the tree above the culvert, along with any other vegetation that may affect the stability of the historic stone structure. Cut trees in other areas flush with the grade and remove vegetation by sections. Selectively clear vegetation at the culvert's perimeters

to stop water accumulation, regrade drainage paths, and unblock the culvert's opening. As a nonfunctional outlet, maintain periodically.

Culvert 1529. Because no culvert or active drainage flow could be found, there are no recommendations.

LEVEL 9

Culvert 1532.

Trace and Embankments: Stabilize the trace's shoulders and dirt embankments. Excavate and crown the barrel before regrading, infilling, and compacting eroded and void areas. Remove trees and vegetation that are affecting the stability of the historic trace, embankments, and arch culvert. Regrade, slope sides, and channel water to flow away from the culvert's facade so as to eliminate puddling and water seeping through and dislodging the ceiling stones.

If the 14-inch cast-iron pipe that runs across the trace is functional, relocate away from the existing historic structure; if it is nonfunctional, remove the portion of pipe above the historic culvert. (Removal of the pipe will prevent staining of the barrel as the cast iron deteriorates and exfoliates.)

Culvert/Bridge: Reconstruct the stone arches and walls for the inlet and outlet. Use either buried voussoirs, or replace the ringstones with material found in the immediate area. If wing wall stones are discovered at the time of excavation and debris removal, reconstruct and stabilize according to the probable original configuration. If possible, install stones at their original position (carefully note the location of the recovered stones with respect to the arch above and the side walls; and study the stone patterns). To reduce moisture entry, excavate approximately 25 feet from the arch's stone side and install a moisture barrier behind the perimeters of the wing walls. Infill and compact areas where trees and vegetation have been removed.

Barrel: Check the barrel's interior stability and rehabilitate by replacing stones in void areas and by minimal repointing.

Streambed: Remove existing debris and locate the original streambed. Improve the streamflow by cleaning and removing debris from the bed and from around the culvert's perimeters. Preserve and maintain the site's natural drainage contours.

Emergency Work: To prevent a domino effect of falling ringstones, immediately undertake emergency stabilization, tree and root removal, and temporary shoring. Do not allow vehicles to cross the stone bridge culvert, and do not allow hikers near the structure. Post a warning sign.

Culvert 1586.

Trace: No treatment is required since the historic trace has been cleared, graded, and grubbed, and it is in good condition.

Embankment: Remove debris and vegetation from the approximate 400-foot riprap embankment above the perimeters of the historic inlet; cut trees flush with the grade, leaving roots and stumps. Stabilize the existing riprap embankment by reinstalling loose stones and resetting missing stones.

Drainage: Remove eroded and dumped soil, debris, rubble, and vegetation; locate the original streambed and probably rechannel and place aggregate.

Barrel: Remove debris and clean the inside of the historic opening.

Inlet (South Elevation): Conduct an exploratory excavation to recover and inventory deposited and buried stones found in the existing cavity; reset stones in their original locations, if possible. Reconstruct the relieving arch as required. Reset voussoirs to their proper locations. Excavate and reconstruct wing walls if found, using salvaged stones from the immediate area.

Outlet (South Elevation): Since the historic outlet has not been found and is probably buried, undertake no further action to excavate, locate, and reconstruct.

LEVEL 10

Culvert 1624.

Trace: Remove sod and crown the trace to divert water so that it does not pond and leak through joints and cause ceiling failure. Regrade and reseed the trace.

Drainage: Clean out the morass and remove vegetation, debris, and fallen trees from the stream and around the step wing walls. Deepen the channel.

Embankments: Carefully remove trees and bushes from the perimeters of the culverts. Infill and compact holes in the embankments. Remove bushes and other vegetation that could affect the stability of the historic structures.

Inlet (South Elevation): Remove vegetation from the joints and other areas where it is affecting the culvert's condition and integrity. Tuckpoint all joints that show signs of major settling and cracking with raised mortar (grapevine). Replace, clean, and tuckpoint vulnerable spots where water retention would affect the structure's stability. Reset the dislodged elliptical step wall.

Barrel: Do not parge the ceiling or walls; repoint as needed to prevent stone slippage.

Outlet (North Elevation): Remove moss by washing stones with clear water and using a stiff bristle or nonferrous soft wire bush. Remove existing parging and repointing. Carefully remove, reinstall, and rearrange the rotated and heaved stepping stones at the curvilinear ends; dry-lay the stone; and reposition slipped voussoirs.

Culvert 1635.

Trace and Embankments: Post a warning sign for vehicles not to trespass or drive along the trace. Cut trees flush with the grade and remove tree stumps. Excavate the trace, and investigate the condition of the barrel's crown. Install a waterproof membrane before infilling, regrading, and compacting the modified trace and embankments.

Remove from the historic embankments all vegetation, dead limbs, logs, and debris that are threatening the historic culvert's stability. Remove tree stumps and roots, and cut designated trees flush with the

grade. Regrade, infill, and compact void areas, primarily around the culvert's perimeters, in order to drain water away from the historic structure. To prevent soil creeping off from the slope, place excelsior matting on the regraded embankments and reseed.

Drainage: Remove dead limbs, logs, and debris from the channel. Restore all disturbed areas to the original contours, if they can be determined.

Barrel: Carefully remove the sandbags and 5-foot-diameter corrugated metal pipe at the inlet's opening; before stabilization and reconstruction work, shore the barrel, erect a temporary vault, and brace the deteriorated exterior walls. Investigate the barrel's crown and correct any problems. If there is evidence of water seepage or stones dislodging, install a waterproof membrane on the barrel's crown; infill and compact accordingly. To stabilize the barrel's base, replace missing stones, using stones found along the streambed in the barrel.

Inlet and Outlet: Repair both the inlet and outlet arches and walls by resetting the stones. Remove and reset the voussoirs at the bottom of the arch. Remove all stones that are popping out, mark their locations, assign and record identifying numbers on drawings, stockpile for probable cleaning, and reset. Clean stones and remove the moss and dirt that are damaging the voussoirs. Reuse salvageable stones found in the culvert's vicinity to fill voids. Remove from the historic perimeters all vegetation, dead limbs, logs, and debris that are threatening the integrity of the historic culvert.

Culvert 1656. Refer to existing conditions drawing 423/25,005, sheet 48, for locations of the historic and modern inlets and outlets.

Trace: Excavate the modified trace (it has been cleared, cleaned, grubbed, and graded), and provide a crown to ensure continued proper drainage.

Embankments: Carefully excavate the area where the probable historic inlet and probable south embankment may be buried. If the inlet is found, either restore it (depending on its condition) or construct a new inlet with a stabilized embankment. Regrade the inlet's perimeter without affecting the natural landscape. Fill and compact the embankments as required, install excelsior matting, and reseed to stabilize and prevent erosion. Remove vegetation in the surrounding areas, and cut trees flush with the grade. Infill and compact to divert water from flowing around and into the structure's joints. Reposition dislodged stones in the north embankment's riprap.

Modern Outlet and Drainage (South Elevation, Upper Section): Remove debris, rubble, and dead logs from the new culvert's drainage path. Clean and improve the drainageway by placing stepping stones to slow the flow of water and to prevent water from collecting at the bottom of the grade where the historic inlet may be buried. (The new modern culvert is approximately 152 feet above the historic inlet and modified trace.)

To curtail soil erosion and boglike conditions, rechannel approximately 114 feet of the existing drainage system (which is located below the modern culvert) where the altered trace has been regraded (±53 feet); ensure that the rechanneling is harmonious with the site's natural contours. (Water now flows through the modern assembled stone outlet, down the hill, through the historic stone barrel, and out the historic outlet.)

Historic Inlet (South Elevation, Lower Section): Excavate the modified trace where the historic barrel and inlet may be buried. If the historic inlet is not found, construct a new inlet with compatible

materials rather than reconstructing any major historic features that have been totally lost and cannot be accurately reconstructed. If the inlet and barrel are partially collapsed, replicate its features; distinguish new construction (joints, sizing, and color of materials) from original fabric. Determine the extent of work after excavating and investigating area, and based on administrative requirements and available funds.

Historic Outlet (North Elevation): Preserve and stabilize the historic outlet and barrel. Define the culvert's side walls and water-scored embankment walls by removing debris, clearing away all eroded soil, and infilling voids with either compacted soil or stone. Carefully remove the large tree growing at the top of the arch and other obstructing vegetation around the culvert's perimeter. Reinstall the dislodged voussoirs, and fill all voids with salvageable stones found nearby. Reuse existing stones to reconstruct the exterior facade arch; secure reinstalled stones to prevent slipping. Remove loose soil and attempt to find the wing walls; if found, stabilize the wing or batter wall's foundations and replace missing stones by using stones found in the area and along the stream's historic outflow.

Historic Drainage: Because water in the new drainage path will stream down and flow into the reconstructed historic inlet, through the barrel, and spill out from the existing historic outlet and into the streambed, clean and remove debris and logs in the drainageway. Regrade as necessary to obliterate ponding and erosion at the perimeters and below the historic outlet's lower drainage zone.

Culvert 1692.

Trace: Because the historic trace was partially buried in the process of building the new portage railroad, make no effort to uncover it. Because there are no problems on the section of the partially exposed historic trace 76 feet southeast of the historic inlet, do no work.

Embankment: Clear vegetation and tree stumps from the south embankment; remove trees and root systems that would affect the historic culvert, and cut other trees flush with the embankment; infill and compact cavities.

Drainage: To maintain the streamflow, remove logs, rubble, vegetation, and berms from the existing channel. Rechannel, clean, and regrade to the original streambed, approximately 200 feet. Since the existing streamflow is approximately 5 gallons per minute, install step stone stairs as velocity inhibitors approximately 175 feet along the streambed to slow the flow and reduce the impact of splashing water. (It is likely that water flows through the partially blocked inlet and through the barrel, but it is not known where the outlets are.)

Inlet (South Elevation): Excavate and remove the existing berms, which are almost totally blocking and burying the inlet's opening (approximately 20 cubic yards at the southwest elevation and 30 cubic yards on the southeast elevation). If required, temporarily shore the inlet at the collapsing headwalls. After removing the existing mounds, conduct an engineering assessment of the unearthed walls before any repair. Record stones that are found and removed from the historic culvert. With the engineer's approval, carefully dismantle the out-of-plumb head and side walls, as well as all loose stones, and reset them in their original positions; add matching new stones as required. Clean the orifice and, if required, part of the stone barrel. If stones in the barrel's ceiling have been dislodged, carefully reposition. Restore all disturbed areas to their original historic appearance. Prevent further erosion by regrading and installing excelsior matting.

Barrel: The barrel's condition could not be examined beyond 3 feet because the opening is almost completely blocked with eroded soil, rubble, and debris. Therefore, electronically inspect the barrel's interior with a video camera.

Historic Outlet (North Elevation): Do not attempt to uncover this buried structure.

Modern Outlet: No action is required as the outlet appears to be in good condition.

Culvert 1697. Like culvert 1692, this structure was probably buried when the new portage railroad was constructed, and it would be exorbitantly expensive to uncover. Therefore, only actions to stabilize existing historic structures should be undertaken.

Trace: Clean the historic trace, and where the old and new traces are linked, regrade the pocket areas and provide a positive drainage system.

Embankment: Stabilize the steep slope (no evidence of riprap) and the culvert's surroundings by clearing, removing trees (cut flush to grade), dead limbs, and roots, and using excelsior matting. Regrade, infill, and compact voids in the probable vicinity of the historic culvert. Regrade around the culvert's perimeters.

Drainage: Remove dead branches, debris, and rubble from the streambed to restore the original elevation; narrow the streambed's width for approximately 200 feet of drainage path. This procedure will prevent water from gushing down with force and debris. Remove about 10 yards of soil on each side of the existing inlet. For drainage insurance at the north run-off, clean the streambed.

Inlet (South Elevation): Remove vegetation, and cut the 30-inch diameter tree that is growing above the inlet. Remove vegetation and eroded soil mounded at the bottom sides of the curvilinear walls. Before removing heaved stones, shore and brace the arch as required. Carefully remove and number heaved stones, record identification numbers on drawings, and stockpile for later replacement in the original locations. Replace missing voussoirs and other stones.

Barrel: Reopen the barrel and remove debris from the inside. Conduct a remote video inspection before making final recommendations. (A waterproof membrane may be required over the crown.)

Modern Outlet (North Elevation): Because the modern culvert is in good condition, remove vegetation that may eventually affect the structure's stability. Cut a 16-inch-diameter tree growing above the outlet flush with the grade.

INCLINE 10

Culvert 1733.

Trace: Excavate the trace and install a waterproof membrane above the culvert's barrel, infill and regrade, and reseed an area approximately 50 feet above the historic structure. Infill and compact the trace's sloped sides, and install excelsior matting to deflect drainage and deter soil erosion.

Embankments: Clear debris, tree limbs, and underbrush from the north and south embankments. Clean and clear approximately 50 feet of the east elevation and 75 feet of the west elevation, and place fill

to stabilize the embankment. Carefully remove roots, and cut trees flush with the existing embankment. (Exercise caution because the dirt embankment may weaken and erode during clearing.) Divert existing runoff by regrading, infilling, and compacting low areas. Install a waterproof membrane and excelsior matting, and reseed the embankments for stabilization.

Various means to stabilize the embankments and prevent erosion were considered, including a concrete retaining wall, concrete ties, and riprap at the north elevation. These means would only be acceptable if the size and color of the retaining wall could be distinguished from the existing adjacent original fabric. However, every effort should be made to restore the embankment to its historical appearance and to prevent further erosion on both the north and south embankments.

Barrel: Replace missing stones inside on the barrel wall. Stabilize the barrel by carefully repositioning dislodged stones, using stones found in the immediate vicinity. To prevent future vandalism, cover the opening (provide ventilation holes in the cover to deter moisture retention and smells).

Inlet (South Elevation): Stabilize the culvert's loose or dislodged stones, and tuckpoint as needed. Dismantle the dislodged and heaved wing walls, and align wall sections to match the alignment of the remaining sections. Patch spalled and broken stones with mortar where fragments are not available.

Remove all grime, vegetation, and other foreign material around or near the stone structure. Consider various techniques to eliminate moss, spalling, and efflorescence (efflorescence can probably be water washed with detergents, as long as there is no danger of freezing or frost). Control vegetation through cyclic maintenance, mechanical means, and the limited use of herbicides. Regrade ground surfaces around the inlet culvert to a minimum of a 4 percent slope away from the stone structure so that any surface water is channeled away to a satisfactory watercourse. Fill shallow areas or depressions with clean topsoil; allow the soil to settle and refill if required.

Outlet (North Elevation): Do not reconstruct historic features that have already been lost.

RECOMMENDATIONS FOR FURTHER STUDY

Engine House Foundations

As a separate package, undertake an aerial topographic survey to locate and record foundation ruins; conduct archeological, architectural, engineering, and land surveys to verify the presence of any historic ruins. Before proceeding with archeological testing, investigation, and thorough documentation, unearth the historic foundations and historic grade by grubbing and clearing vegetation in the surrounding area. Stabilize and protect the ruins from weather as may be required; bury the structures in wood chips, and restore the grade according to archeological findings.

Hitching Sheds

As a separate package, conduct an aerial topographic survey to find the foundations of the hitching sheds. To delineate these ruins, undertake archeological, architectural, engineering, and land surveys.

Other Historic Foundations and Sites

Conduct an aerial topographic survey, as a separate package, to locate and record other foundation ruins and historic sites. Undertake archeological, architectural, engineering, and land surveys.

Long-Term Preservation Maintenance

A final recommendation addresses long-term preservation maintenance needs at Allegheny Portage Railroad National Historic Site. Periodic and proper inspection, along with routine maintenance activities, can prevent costly repairs later and the loss of historic fabric. Therefore, a historic structure preservation guide and maintenance management manual should be prepared for curatorial, funding, inspection, maintenance, programming, staffing, and treatment needs. These documents would also provide the basis for compliance with section 106 of the National Historic Preservation Act of 1966, as amended, for all maintenance activity.

Historic Landscape Study

To enhance our understanding of designated areas along the Allegheny Portage Railroad, and to mitigate the effects of any ground-disturbing treatments, a historic landscape study should be prepared for the trace between the summit level and incline 10. Such a report would be particularly helpful in providing a more thorough understanding of the important characteristics of the trace. Information should be collected, analyzed, and evaluated, and alternative treatments should be presented. The report should also contain all pertinent available information to describe the significance, development, appearance, and use of the designated areas.

SAFETY AND CODE ANALYSIS

Culverts, Retaining Walls, Bridges

Culverts, retaining walls, and bridges are not addressed under *The BOCA Basic Building Code* and the *Life Safety Code* (LCS). All design methods will be in accordance with the standard specifications of the American Association of State Highway and Transportation Officials (AASHTO), sections 1.4 and 6.1, "Culvert Location, Length, and Waterway Openings," and section 5, "Retaining Walls," and the recommendations of the "AASHTO Guide on Hydraulic Design of Culverts."

Summit Level, Lemon House, Engine House 6 Foundations

Issues related to the summit level, the Lemon House, and engine house 6 are being addressed during 1993 construction projects or in an addendum to the *Historic Structure Report* for the Lemon House.

PART IV: ENGINEERING DATA

by
Lew Gridley

OVERVIEW

EVALUATION OF THE PRESENT DRAINAGE SYSTEM

The stone masonry culverts examined have resisted the torrential rains and freeze/thaw cycles that have plagued the Allegheny Portage Railroad for nearly 160 years and that contributed to its high maintenance cost during its years of operation. As noted in the "Historical Data" section, clogged drains and washed out viaducts contributed to the railroad's structural defects.

Even though the culverts are still resisting torrential rains and weather-related elements, an even greater threat is the total lack of maintenance. The culvert inlets are being clogged by debris from streams, and tree roots have caused displacement of the supporting arches. Maintaining the culverts would help preserve them by preventing further deterioration.

The construction of the new portage railroad and the Pennsylvania Railroad contributed to the destruction of the old portage railroad by physically crossing and destroying portions of the roadbed; however, these actions also contributed to its preservation by improving drainage. Portions along the entire length of the remaining Old Portage Railroad are adjacent to or supported by the new portage railroad or the Pennsylvania Railroad bed. The old portage railroad is uphill of the newer railroads, and when these railroads were constructed, drainage was improved by installing more efficient, modern culverts. The new earthen embankments have helped stabilize the original old portage railroad bed and are undoubtedly the reason the historic trace remains today.

Several of the original stone masonry culverts remain as the only drainage structures for the drainage basins they serve. A review of topographic maps indicates each base drains several acres, and runoff calculations should be done for each drainage basin and culvert.

EVALUATION OF PRESENT STRUCTURAL CONDITIONS

In general, the culverts have remained intact and are functional drains. However, the culvert inlets and outlets are in various stages of collapse. In some cases stream debris and settlement have completely filled the intake, and in other cases the wing walls have collapsed and fallen into the flow line, causing more debris to build up and clog the culvert.

After determining the watershed's runoff potential, the culverts should be made functional to allow adequate drainage. If this is not done, an intense thunderstorm could dump large amounts of water in a short time, and conceivably the railroad's earthen embankments could serve as a dam for the runoff. If these dams were breached, downstream damage of unknown proportions could result.

TREATMENT

Decisions concerning repairing the stone masonry culverts will vary with each structure. Initially, each culvert should be evaluated from the basic assumption of a functional versus a nonfunctional role. If it is determined that a flooding hazard exists and that the drainage should be maintained, then the second consideration is the cost of making the existing stone masonry drain functional versus another method of maintaining proper drainage.

Four basic treatment methods exist:

1. Replace the historic drainage structure with another structure and stabilize the original culvert in its present state. Reroute the entire streambed flow to bypass the historic masonry culvert and/or allow a small amount of water to flow through.

2. Excavate, stabilize, or restore the original culvert to make it functional.

3. Partially restore the culvert by sleeving (inserting another pipe to serve as a liner) to prevent additional collapse and to serve as the water carrying conduit.

4. Combinations of the three methods.

Common to all recommendations is the necessity to remove trees from all adjacent embankments. Replanting with native plant materials (non-exotic) to prevent erosion will also be necessary.

Treatment of the existing stone masonry culverts can be categorized basically as stabilization or restoration.

RECOMMENDATIONS

Using one of the four methods listed above, the recommendations for each structure are summarized below. Actual details of construction could include concealed concrete footers, grout materials, gravel, membrane liners, French drains, and culvert pipes (concrete, treated corrugated metal pipe, plastic). Appendix S itemizes all minimum treatment actions and gives estimated costs (1991 dollars).

CULVERT 1342

New US Highway 22 severs the drainage area and leaves a very small drainage basin to contribute runoff. Consequently, flooding should not be a problem even during severe rainfall.

RECOMMENDATIONS

The culvert should be exposed (inlet and outlet) to determine the structural condition. Depending on the results of this examination, complete recommendations will be made at a later date. In general, trees should be removed from the embankment (inlet and outlet), and the upstream side should be cleaned up (dead trees removed) to prevent debris from collecting at the culvert inlet.

Minimum treatment (complete in 1 to 5 years):

1. Remove all trees from the trace embankment by cutting trunks flush with the existing grade; leave tree roots in place. Trees should be felled so that no damage occurs to the culvert or embankment. If trees cannot be removed by conventional methods, then provisions should be made to remove the trees mechanically (by crane or other heavy equipment) so as to prevent damage to the culvert or embankments.
2. Excavate channel (inlet and outlet) to culvert invert and expose culvert. Excavation is to be monitored by an archeologist and supervised to prevent any culvert or embankment damage.
3. Complete engineering investigation of the culvert after excavation and to make recommendations for stabilization.
4. Crown top of trace (minimum 3% slope) and resod with native grasses.

Maximum treatment:

5. Install Insituform sleeve liner or equal to preserve the culvert.

COST SUMMARY — CULVERT 1342

Minimum treatment: Recommendations 1–4	$39,535
Maximum treatment: Install 70 LF of Insituform (70 LF @ $200/LF)	14,000
Total for minimum and maximum treatment	$53,535

CULVERT 1356

This is a small culvert and the outlet end is collapsed. The condition of the interior barrel is undetermined, and video cameras could be used to help determine that. Assuming the culvert interior has not collapsed, this culvert could be sleeved and grouted, and the inlet and outlet retaining wall and headwall relaid. Additionally, some channel realignment and tree removal would keep this culvert stabilized.

This culvert could also be excavated and completely restored. The amount of overburden to remove (fill material), compared to other culverts, would make this practicable. It appears all of the outlet head and wing wall material is simply lying loose in a moss-covered pile of rocks.

The inlet of this culvert could be stabilized for interpretation. The rest of the culvert could be allowed to remain as is and in time allowed to collapse. The streamflow would be directed to a new culvert structure to maintain the drainage.

RECOMMENDATIONS

Minimum treatment (complete in 2 to 4 years):

1. Crown top of trace (3% minimum slope) and resod.
2. Remove all trees. (See recommendation 1 for culvert 1342 for tree removal precautions.)
3. Use a video camera to inspect interior to determine extent of collapsed culvert.
4. Implement one of the following alternatives:
   - A. Maintain in present state and allow to deteriorate; interpret as a ruin. Realign channel, construct modern culvert to maintain drainage.
   - B. Use Insituform or approved equal to stabilize existing culvert. Reconstruct outlet using original materials.
   - C. Restore original culvert, excavate fill (embankment) to original culvert, and reconstruct outlet using original materials.

COST SUMMARY — CULVERT 1356

Minimum treatment: Recommendations 1–3, plus 4A	$38,665
Intermediate treatment: Recommendation 4B (use Insituform lining — 70 LF @ $200/LF)	14,000
Total for minimum treatment plus 4B	$52,665
Maximum treatment: Recommendation 4C (restore original culvert with existing materials — 70 LF @ $800/LF)	56,000
Total for minimum treatment plus 4C	$94,665

CULVERT 1382

This culvert should remain functional. Structurally, its condition is such that it can be stabilized by using a sleeve liner and relaying the inlet and outlet wing walls. It appears all stone masonry materials are in place but need realignment. The proximity of the culvert to the visitor center and rails make complete restoration the ideal solution because interpretation could highlight the quality of the construction for the greatest number of visitors.

RECOMMENDATIONS

Minimum treatment (2 to 4 years):

1. Remove debris and sediment build-up down to original flow line (inlet to outlet invert)
2. Excavate embankment fill behind headwall and wing wall to relieve soil pressures.
3. Shore embankment to prevent soil/slope movement during construction. Number headwall and stone masonry for repositioning and replacement.
4. Construct concrete retaining wall.
5. Replace stone masonry.
6. Regrade trace slopes and stabilize with native grasses.
7. Crown trace.

Maximum treatment:

8. Implement one of the following alternatives:
   A. Complete minimum treatment outlined above plus use Insituform or approved equal to sleeve culvert and stabilize stone masonry culvert in place.
   B. Restore culvert.

COST SUMMARY — CULVERT 1382

Minimum treatment: Recommendations 1–7	$59,240
Maximum treatment:	
Alternative 8A: Install sleeve culvert (65 LF @ $200/LF)	13,000
Total for minimum treatment plus 8A	$72,240
or	
Alternative 8B: Restore 75 feet of culvert and head/wing walls (75 LF @ $1,000/LF)	75,000
Total for minimum treatment plus 8B	$134,240

ENGINE HOUSE 6

All that remains of the engine house are portions of the stone masonry foundation walls, stairs, and dry well. Approximately 50 linear feet of concrete block walls, varying in height from 3 feet to 6 feet, had been added to outline the location of the engine house foundation walls and to serve as a retaining wall. The foundations are being stabilized in association with the construction of the protective shelter.

SKEW ARCH BRIDGE

Repair work on the Skew Arch Bridge has been done in the past (most recently in 1979), as evidenced by the presence of modern sealant compounds (see existing conditions drawing 423/80,007, sheets 20 and 21).

The bridge is in a low area as a result of embankment construction for US 22. Water collects in this low-lying area under the bridge, and the overall drainage needs to be improved.

RECOMMENDATIONS

A more comprehensive study incorporating all available data should be the basis for any major treatment of the Skew Arch Bridge.

To determine whether joints can be raked without damage, tests should be conducted — one on the back elevation of the bridge and one on the underside of the vault. After the joints are raked, it must be decided whether repointing is needed. (Vertical surfaces will probably need repointing to prevent moisture entry, but the vault, which was apparently intended to weep moisture through dry-laid joints, may not require repointing.) Where repointing is warranted, the sample panel will provide a standard for the dry-laid appearance. If it is determined that the vault is leaking excessively, the top of the bridge should be sealed, perhaps by using a waterproof membrane. The loose and misaligned steps should be reset.

One or two small excavations should also be made above the crown of the vault to assess the condition of the back of the vault, which has been shotcreted, as well as the applied waterproofing.

A new culvert and head/wing walls should be installed 134 feet east of the bridge; they should be located away from the historic, exposed stringers in the streambed.

COST SUMMARY — SKEW ARCH BRIDGE

Minimum treatment	$327,290

CULVERT 1422

No remains of the historic culvert have been found; there is now a modern culvert here.

CULVERT 1464

This culvert does not need to be maintained as a functional drain. The culvert appears stable in its partially collapsed condition, with total collapse a matter of time. Water is draining through the culvert. Due to the interference of old US 22, the condition of the inlet is unknown. The outlet wing walls are collapsed in the streambed.

Even if the culvert collapses entirely, the rubble stone masonry would still allow natural drainage to filter through.

The amount of restoration to be done would depend on the amount of interpretation desired. The culvert could be partially sleeved and the wing walls restored for interpretive purposes. Cost would be a prime consideration relative to the degree of interpretation required.

RECOMMENDATIONS

Minimum treatment (2 to 4 years):

1. Remove all trees (25 feet each side of the culvert) from the trace embankment by cutting trunks flush with existing grade. Leave tree roots in place. Trees should be felled so that no damage occurs to the culvert or the embankment. If trees cannot be removed by conventional methods, then provisions should be made to remove trees mechanically (by crane or other heavy equipment) so as to prevent damage to the culvert or embankments.
2. Use a video camera to inspect the culvert to determine the extent the stone masonry culvert has collapsed.
3. Remove debris and sediment build-up down to the original flow line (invert).
4. Remove earth fill, grade, and place excelsior matting or equal to prevent erosion of newly seeded native grasses.
5. Use Insituform or approved equal to sleeve and stabilize the culvert.

COST SUMMARY — CULVERT 1464

Minimum treatment: Recommendations 1–5	$25,825

CULVERT 1490

Culvert 1490 appears to be an active drainage. Above the stone pile the trace has been riprapped with hand-laid rock that appears to be stable.

RECOMMENDATIONS

Minimum treatment:

1. Leave culvert in present condition.
2. Remove trees within 25 feet each side of culvert centerline.

COST SUMMARY

Minimum treatment: Recommendations 1–2	$4,345

CULVERT 1503

Culvert 1503 is one of the more remote, but easy to drive to, culverts on the original trace. This portion of the trace is well preserved and has been affected by few man-made changes. However, some repair and maintenance is still required. Completely reconstructing the culvert and riprapped area would be expensive and the least desirable alternative in terms of preserving this historic structure.

Each side (inlet and outlet, south and north) of the embankment has been riprapped with dry-laid stone. On the inlet side, sediment has completely filled the culvert so that it cannot be seen.

On the inlet side, the natural terrain and the many years of runoff have formed a bowl approximately 60 feet by 100 feet. Using this as a catch basin, a new drainage system could be provided that would parallel the trace on the south until the trace could be crossed and drainage provided into a streambed.

The existing culvert outlet could be stabilized with sleeving to prevent collapse and by relaying the wing walls. In addition, trees and roots should be removed, and the crest should be graded to improve drainage.

RECOMMENDATIONS

Minimum treatment (2 to 4 years):

1. Remove all trees from the trace embankment by cutting trunks flush with the existing grade. Leave tree roots in place. Trees should be felled so that no damage occurs to the culvert or embankment. If trees cannot be removed by conventional methods, then provisions should be made to remove trees mechanically (by crane or other heavy equipment) so as to prevent damage to the culvert or embankments.
2. Crown trace.
3. Construct new drain system to bypass the historic culvert.
4. Excavate and construct a new concrete headwall and footing at the outlet to stabilize the embankment.
5. Relay ordinary stone masonry headwall and wing wall as veneer.

Maximum treatment (5 to 10 years):

6. Make historic drain functional by taking the following actions:
   - A. Excavate inlet and expose culvert.
   - B. Use a video camera to inspect the culvert and make recommendations on restoration.
   - C. Install Insituform in culvert.
   - D. Remove bypass drain system (recommendation 5 above) or use as back-up.

COST SUMMARY — CULVERT 1503

Minimum treatment: Recommendations 1–5	$49,420
Maximum treatment:	
6A. Excavate inlet and expose culvert (43 CY @ $100/CY; 1,125 SF = 43 CY)	4,300
6B. Video inspect culvert (8 hrs @ $100/hr)	800

6C. Install Insituform (90 LF @ $300/LF)	27,000
Subtotal	32,100
Total for minimum and maximum treatment	$ 81,520

CULVERT 1529

There is no evidence of a culvert onsite.

CULVERT 1532

This culvert has deteriorated rapidly in the past five years, as indicated in the photographs and onsite inspections. The culvert is in such a state of deterioration and is of such significance that complete restoration would be the easiest to accomplish. Because the culvert is 18 feet wide and 10 feet 8 inches high, it would be difficult (or at the very least expensive) to use a sleeve liner for support, and the liner would be fully visible, destroying the historic appearance of the structure.

To stabilize 90 percent of the culvert, a temporary wood liner (shoring) would be built (similar to the original construction). With the temporary shoring in place, trees could be removed along with the overburden. This would expose the cast-iron pipe and aid in its removal or ensure that the pipe is not supported by the culvert. At this point the restoration of the culvert could begin. To aid in future preservation, the stream should be realigned to prevent debris build-up and the culvert being destroyed by a local flood.

During restoration the installation of membranes on the barrel roof to keep out moisture should be considered. Also, the installation of French drains, regrading, and periodic maintenance to prevent tree growth should complete the restoration.

RECOMMENDATIONS

Minimum treatment:

1. Construct temporary shoring and uniformly remove earth fill.
2. Remove channel rubble.
3. Restore the missing arch, using original materials.
4. Place an 8-inch concrete backing layer on the outside of the stone masonry barrel.
5. Water seal the 8-inch concrete layer.

COST SUMMARY — CULVERT 1532

Minimum treatment: Recommendations 1–5	$133,050

CULVERT 1586

A major drainageway is required for the drainage basin behind this culvert. Additional investigation is needed to determine the best repair method to keep this culvert functional.

There is a naturally occurring outcrop of large boulders at the toe of the embankment that was built for the new Pennsylvania Railroad. No water was flowing through the streambed, but it is evident that water does flow because the rocks are heavily coated with green moss. There appears to be a cavity in the rocks where there may be evidence of masonry construction. Further investigation is required to determine if this is a rubble pile or a collapsed stone masonry section, or if it is coincidental that this rock outcropping occurs at the embankment.

The size of the drainage basin indicates there needs to be a functional drain. If this is not feasible, a bypass drainage structure would be costly, but may be necessary.

RECOMMENDATIONS

The following actions are generally in priority sequence, although some actions in 2 may need to be done prior to actions in 1, depending on site conditions.

Minimum treatment:

1. Remove all trees from the trace embankment by cutting trunks flush with the existing grade. Leave tree roots in place. Trees should be felled so that no damage occurs to the culvert or embankment. If trees cannot be removed by conventional methods, then provisions should be made to remove trees mechanically (by crane or other heavy equipment) so as to prevent damage to the culvert or embankments.
2. Excavate the channel inlet to the culvert invert to expose the culvert face.
3. Relay dislodged stone arch and riprap face of embankment.
4. Use a video camera to inspect the entire culvert, if possible, or at least from the inlet and outlet ends.
5. Ensure this culvert remains functional, since it serves as a drainage structure for a large drainage basin.
6. On the south inlet, remove trees, clean out (excavate) culvert inlet to invert, including build-up in front of headwall/wing wall, if they exist.

Maximum treatment:

7. Decide on one of the following alternatives:
   A. Depending on culvert conditions (as shown in the video), leave as is and only reconstruct inlet end.
   B. Use Insituform or approved equal to line the culvert. Reconstruct the inlet headwall/wing wall.

COST SUMMARY — CULVERT 1586

Minimum treatment: Recommendations 1–6 plus 7A	$127,140
Maximum treatment: 7B (use Insituform sleeve liner — 150 LF @ $400/LF)	60,000
Total for minimum treatment plus 7B	$187,140

CULVERT 1624

This culvert has been stabilized by previous work. However, the repair work was done with little regard for the original texture, and much of the repair work should be redone (stone masonry repaired, wing walls stabilized, etc.).

Sink holes in the trace indicate settlement and movement of the stone masonry arch. This movement was arrested to a large degree when the arch was formed up from underneath and concrete was poured. It was uncertain from the limited field inspection how this was accomplished. The concrete could have placed from above by removing some of the stone masonry.

The wing walls should be stabilized by repointing them to match the original construction. The culvert roadway should be stripped of all loose material, and the roadbed should be resealed with a membrane to keep water from draining through the stone masonry.

RECOMMENDATIONS

Minimum treatment:

1. Strip trace (roadway bed) to a minimum depth of 1 foot and seal the roadbed with a waterproof membrane.
2. Replace and compact roadway soils and resod, crown trace, and clean up debris.

COST SUMMARY — CULVERT 1624

Minimum treatment: Recommendations 1–2	$26,410

CULVERT 1635

To protect the culvert from any additional traffic loads, the trace, which is now used as an access road, should be barricaded and closed to traffic. A bypass would be constructed to provide for occasional local traffic.

Temporary shoring should be constructed to prevent the culvert from collapsing, the sand bags removed, and the culvert reconstructed. All roadbed fill materials should be removed and the stone masonry reset. With load restrictions, this structure could be put back into service.

RECOMMENDATIONS

Minimum treatment:

1. Construct temporary shoring to prevent any further collapse of the culvert and uniformly remove earth fill.
2. Construct reinforced concrete liner on exterior of culvert.
3. Water seal concrete, replace fill, regrade trace, and restore to ordinal elevations.

COST SUMMARY — CULVERT 1635

Minimum treatment: Recommendations 1–3	$78,950

CULVERT 1656

Culvert 1656 should be restored and maintained as a functional culvert. The culvert is small and has easy access, if permission to cross private property is granted. As a safeguard, an overflow or bypass drainage structure should be constructed along with velocity inhibitors upstream. Additionally, the culvert should be protected by sealing above the culvert with a membrane before replacing the fill material and restoring the original grade.

RECOMMENDATIONS

Minimum treatment:

1. Excavate fill above culvert.
2. Restore culvert and wing walls.
3. Restore trace to its original configuration.

COST SUMMARY — CULVERT 1656

Minimum treatment: Recommendations 1–3	$55,870

CULVERT 1692

The drainage basin above this culvert demands a functional drainage structure. A complete analysis of the surface runoff should be included. Additional investigation is needed to determine the adequacy of the culvert. Obviously during maximum runoff, debris is carried downstream to the inlet, which restricts water flow and reduces the culvert's capacity. It appears the trace embankment serves as a dam during maximum runoff, and the standing water seeps through the partially blocked culvert.

The headwall/wing walls are buried, and the wall above the ringstones is breaking and collapsing. The outlet is a modern culvert approximately 325 feet northwest of the historic inlet's centerline. It is a 24-inch cast-iron pipe with a concrete head wall. How or where this connects with the historic culvert is unknown, and as a minimum an examination with a video camera will be needed for additional information.

RECOMMENDATIONS

Minimum treatment:

1. Stabilize existing south inlet walls and facade. Regrade upstream to reduce build-up of debris. Install velocity inhibitors. Sleeve existing culvert as far in as practical from both ends.

Maximum treatment:

2. Depending on results of video inspection, install Insituform sleeve liner.

COST SUMMARY — CULVERT 1692

Minimum treatment: Recommendation 1	$127,140
Maximum treatment: Recommendation 2 (install Insituform sleeve liner — 150 LF @ $400/LF)	60,000
Total for minimum treatment plus 2	$187,140

CULVERT 1697

Minimal debris has built up in front of the inlet (south side of the trace) because the streambed is long and not as steep as at other sections. The wall above the ringstones has been displaced, probably from the embankment surcharge, and will need to be put back in place. This culvert has also been improved with a modern 24-inch cast-iron culvert at the downstream end (outlet north side of the trace).

RECOMMENDATIONS

Minimum treatment:

1. Stabilize existing south inlet walls and headwall.
2. Regrade upstream to reduce build-up of debris.
3. Install velocity inhibitors.
4. Sleeve existing culvert as far in as practical from both ends.
5. Videotape culvert and remove trees.

COST SUMMARY — CULVERT 1697

Minimum treatment: Recommendations 1–5	$24,600

CULVERT 1733

This culvert does not need to be a functional drain and can be used for interpretation. It is conveniently located near a trail and picnic area. The culvert will need protection from vandalism.

RECOMMENDATIONS

Minimum treatment:

1. Remove existing bank material to allow installation of a membrane to reduce water infiltration.
2. Stabilize the embankment for erosion and revegetate with native plants that control erosion, but do not conceal the culvert.

3. Seal off culvert at the collapsed end with stone masonry or a concrete wall.

COST SUMMARY — CULVERT 1733

Minimum treatment: Recommendations 1–3	$26,575

TREATMENT SUMMARY

The category of minimum treatment is not synonymous with emergency stabilization; minimum treatment is considered to be acceptable level of final treatment. Maximum treatment is also a final treatment category and reflects the optimum treatment if funds are available. The estimated cost for the minimum treatment of all structures evaluated, excluding the engine house, is $1,144,055. (Engine house 6 is being addressed during the current [1993] protective shelter project.)

In addition to the minimum and maximum levels of treatment, there are also immediate concerns that should be addressed to ensure the protection of features associated with the portage until funds are available for final treatments. These treatments consist primarily of (1) grading to redirect surface water, (2) temporary shoring and bracing, (3) removing trees, and (4) removing debris that is contributing to deterioration. The features that require immediate treatment, the general nature of the treatments required, and cost estimates are listed below:

FEATURE	TREATMENT DESCRIPTION	COST
Culvert 1342	Clean streambed	$ 1,700
Culvert 1356	Reset stone, clean streambed, cut trees	5,200
Culvert 1382	Shore vault, bury sleepers, cut trees, regrade	4,400
Skew Arch Bridge	Rechannel drainage, regrade, bury stringers	1,200
Culvert 1464	Reset lintel, cut vegetation and trees	3,900
Culvert 1503	Cut trees, restack stones, and brace	2,800
Culvert 1532	Cut trees, regrade, clean streambed, install shoring	9,400
Culvert 1586	Remove tree, relay dislodged stone, brace	1,800
Culvert 1635	Install shoring	7,500
Culvert 1692	Install shoring	2,000
Culvert 1697	Install bracing, cut tree	1,300
Culvert 1733	Cut trees, regrade, install shoring	1,800
Total		**$ 43,000**

PART V: COMPLIANCE WITH PROVISIONS OF THE NATIONAL HISTORIC PRESERVATION ACT OF 1966

Some of the proposed undertakings in this *Historic Structure Report* were reviewed in compliance with section 106 of the National Historic Preservation Act prior to the completion of the report. In April 1990 the section 106 compliance review for a visitor center/headquarters building and for site development at the summit level was completed. The following cultural resources were found to be affected:

CULTURAL RESOURCE	STRUCTURE NO.	LCS NO.
Lemon House	001	00017
Railroad Trace Ruins	LS-24	07731
Stone Culvert, Summit Level	WW-28	07732
Drain, Summit Level	WW-29	07733
Engine House Ruins	RMU-21	07734
Inclined Plane No. 6	LS-25	07735
Skew Arch Bridge	BR-32	07736
Gallitzin Road		

The regional director of the Mid-Atlantic Region, the Advisory Council on Historic Preservation, and the Pennsylvania state historic preservation officer concurred that the following proposed undertakings would facilitate a visitor's understanding of the site's significance by restoring, to the extent possible, the summit level to its historic appearance during the years of the railroad's operation (1834–57), and it would not adversely affect the distinguishing qualities for which the Allegheny Portage Railroad National Historic Site is significant:

- Changing visitor access to the park from old US 22 to the Gallitzin Road, thereby taking advantage of a better access from new US 22 and providing a pleasant transition from the hubbub of the modern four-lane US 22 to the rural, wooded, mid-19th century park setting at the historic inclined plane railroad and Lemon House

- Removal of asphalt on the Gallitzin Road from old US 22 through the historic area and replacement with a stabilized surface that is more compatible with the historic scene yet that will serve emergency purposes

- Upgrading of a portion of the Gallitzin Road from new US 22 south to the site of the proposed new visitor facilities/headquarters complex

- Obliteration of a small portion of the Gallitzin Road where it enters the proposed new visitor center/headquarters complex to enhance traffic circulation

- Removal of asphalt trails in the historic area and replacement with more aesthetically suitable materials/trail alignments

- Obliteration of an existing trail between the Lemon House and the site of the new visitor center and replacement with a handicapped accessible trail connecting the new visitor facilities with the historic area

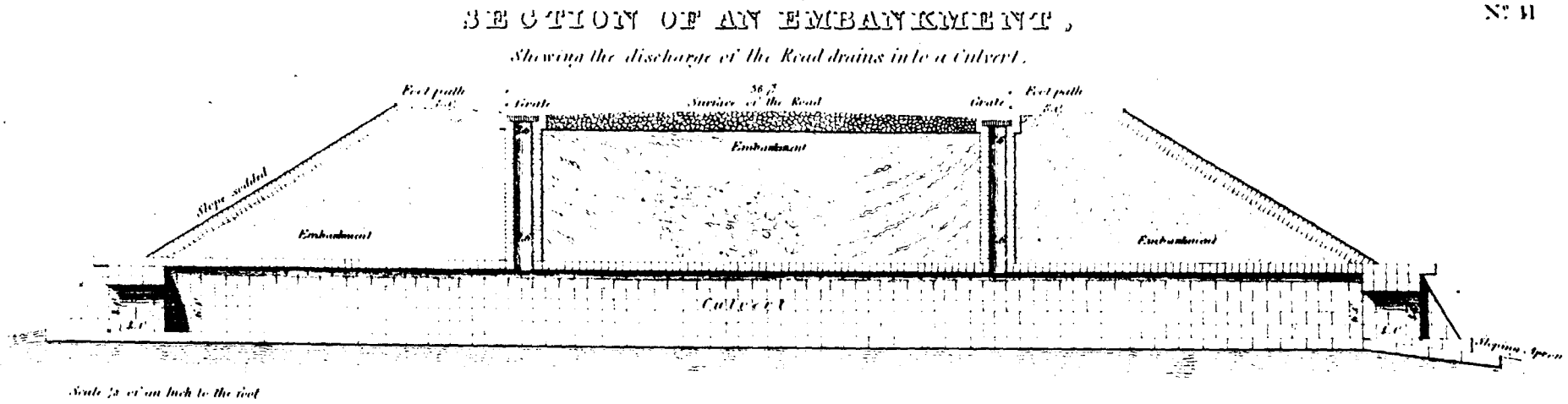
- Obliteration of the west-bound lanes of old US 22 and restoration of the historic grade so as to link the Skew Arch Bridge once again with the historic incline

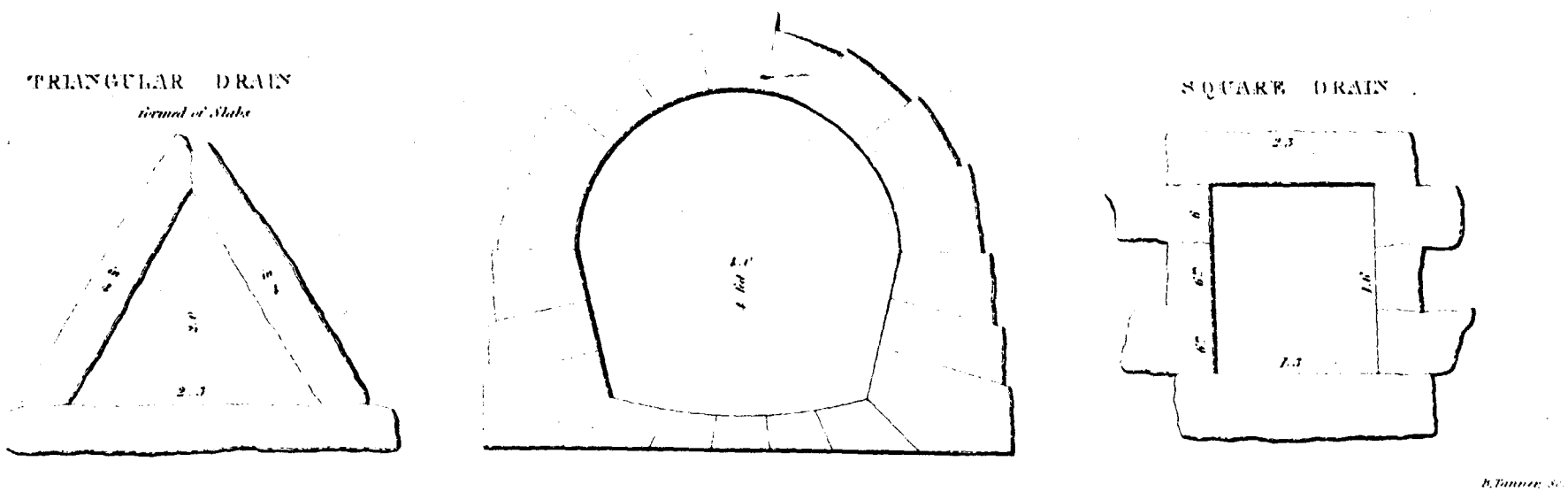
- Planting of trees along old US 22 to block out existing visual and noise impacts from large trucks
- Removal of the existing parking area and amphitheater
- Construction of a new visitor center, parking, and amphitheater along the Gallitzin Road north of the historic area — these facilities are designed to function as a visitor center for the park as well as the America's Industrial Heritage Project
- Installation of utilities necessary for proper functioning of visitor facilities at the site
- Restoration of portions of the Lemon House interior to interpret the house's historic functions
- Conversion of the first floor of the Lemon House to a period house and tavern while leaving the existing second floor for office space
- Reconstruction of the inclined plane railway tracks from the bend northwest of the Lemon House to the Skew Arch Bridge
- Construction of an engine house over the foundations of the original engine house, which structure would be designed to preserve the historic foundations — it will utilize the same massing and materials as the original to fit into the historic scene, but it will be slightly larger
- Removal of the existing modern engine display house
- Construction of a full-scale model locomotive and passenger car, to be placed at the summit level above the new engine house
- Construction of the two full-scale models carrying canal boats on the incline below the new engine house — one at the top of the incline and one representing its counterweight at the bottom of the incline

Because this *Historic Structure Report* both explicates what is significant about the Allegheny Portage Railroad National Historic Site and analyzes periods of construction, building techniques, and source materials, those undertakings approved but not yet implemented at the summit level (e.g., the restoration of the first floor of the Lemon House) will be reexamined in consideration of the information now available and resubmitted for section 106 compliance review, if necessary.

Proposed undertakings to stabilize, preserve, and/or restore the remaining culverts, arches, embankments, inclines, or foundations identified in this *Historic Structure Report* will comply with the provisions of section 106 of the National Historic Preservation Act of 1966 (as amended in 1980), and the "Regulations of the Advisory Council on Historic Preservation" (36 CFR Part 800). Such undertakings will be documented in an assessment of actions having an effect on cultural resources, and the criteria of effect will be applied by appropriate professionals for the regional director of the Mid-Atlantic Region, the Advisory Council on Historic Preservation, and the Pennsylvania state historic preservation officer.

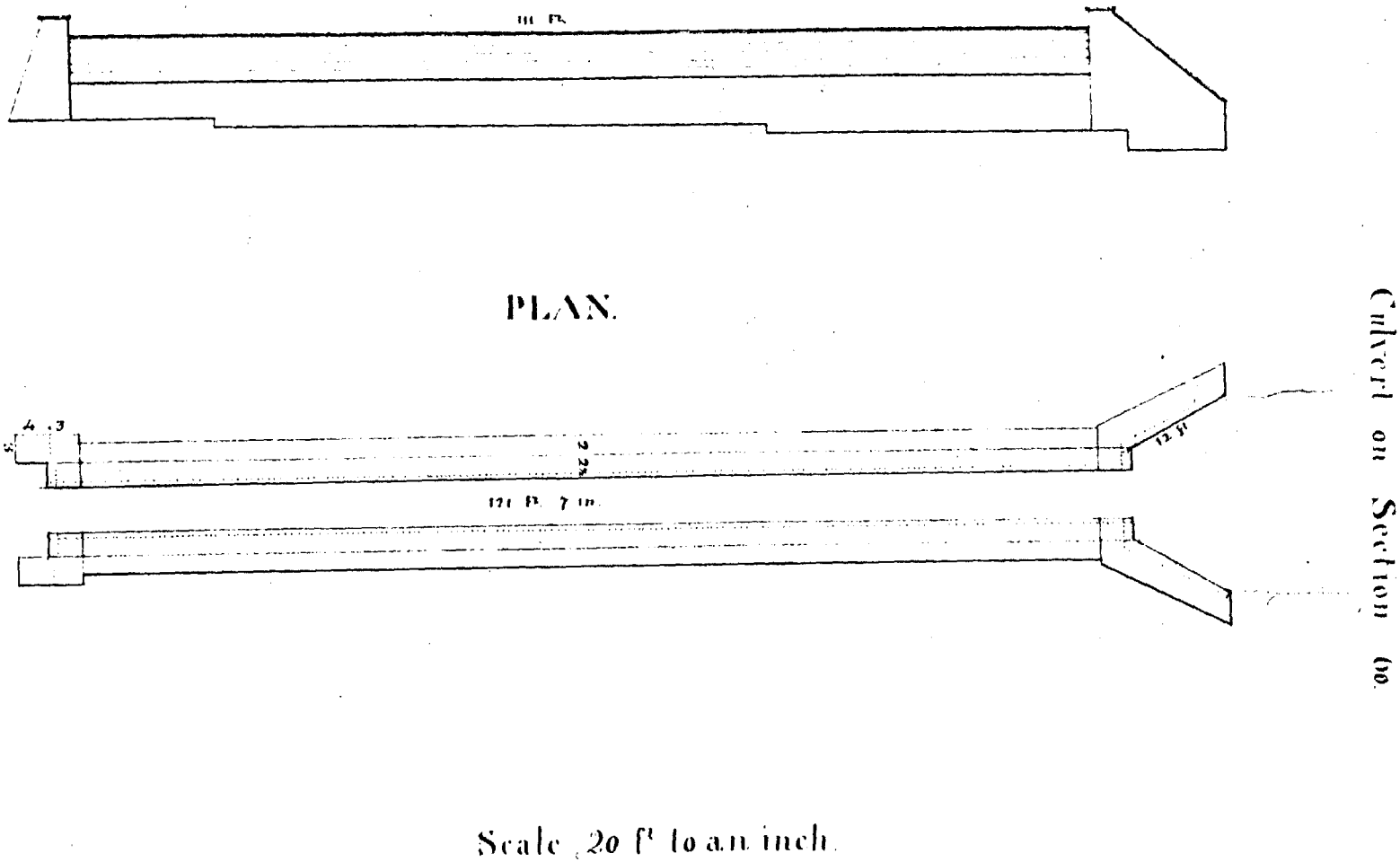
ILLUSTRATIONS





1. PLATE 41 "TURNPIKE ROADS. SECTION OF AN EMBANKMENT, SHOWING THE DISCHARGE OF THE ROAD DRAINS INTO A CULVERT. SECTION OF A CULVERT, – TRIANGULAR DRAIN FORMED OF SLABS, – AND SQUARE DRAIN."

Source: William Strickland, *Reports on Canals, Railways, Roads, and Other Subjects Made to "The Pennsylvania Society for the Promotion of Internal Improvement,"* (Philadelphia: H. C. Carey & I. Lea, 1826), p. 49.

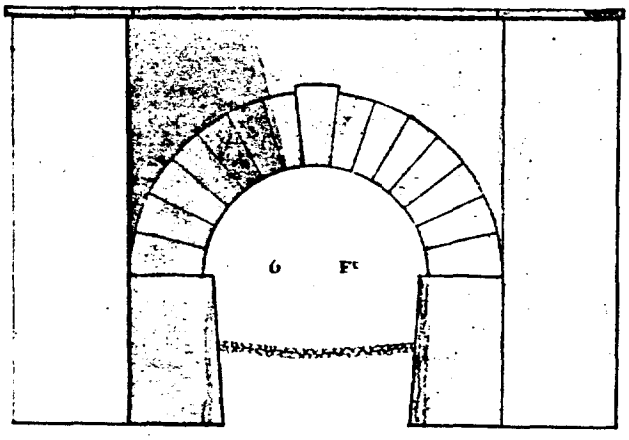


2. CULVERT ON SECTION 60.

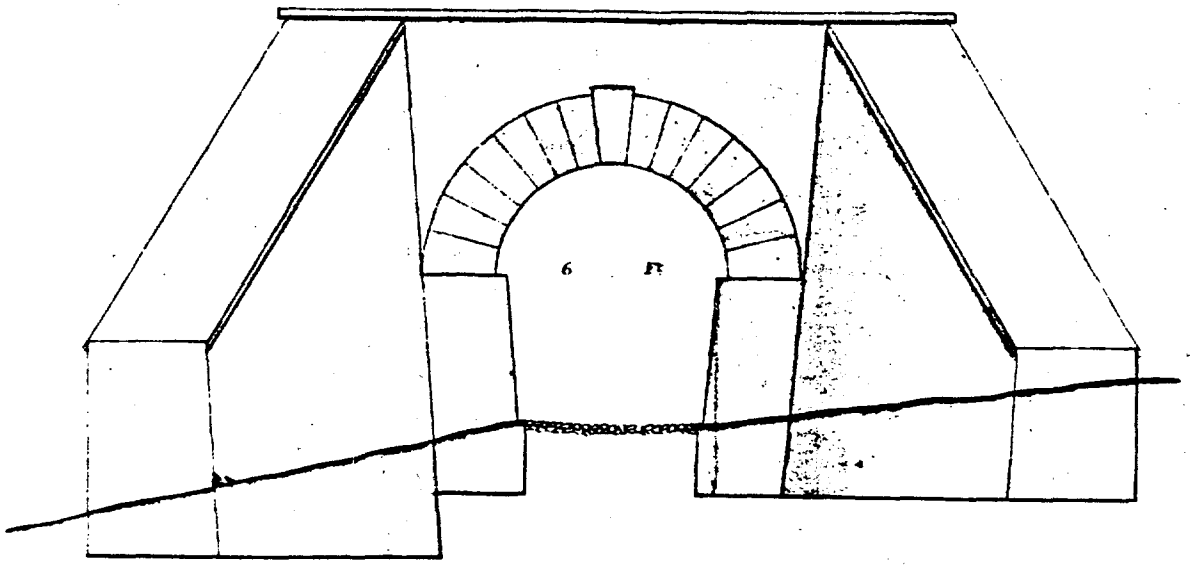
Source: W[illiam] H[asell] Wilson, "Notebook, 1831."

Designs and Costs for Structures, Pennsylvania Railway, Philadelphia & Columbia Railway, Philadelphia & Reading Railway.

Pennsylvania Railway.



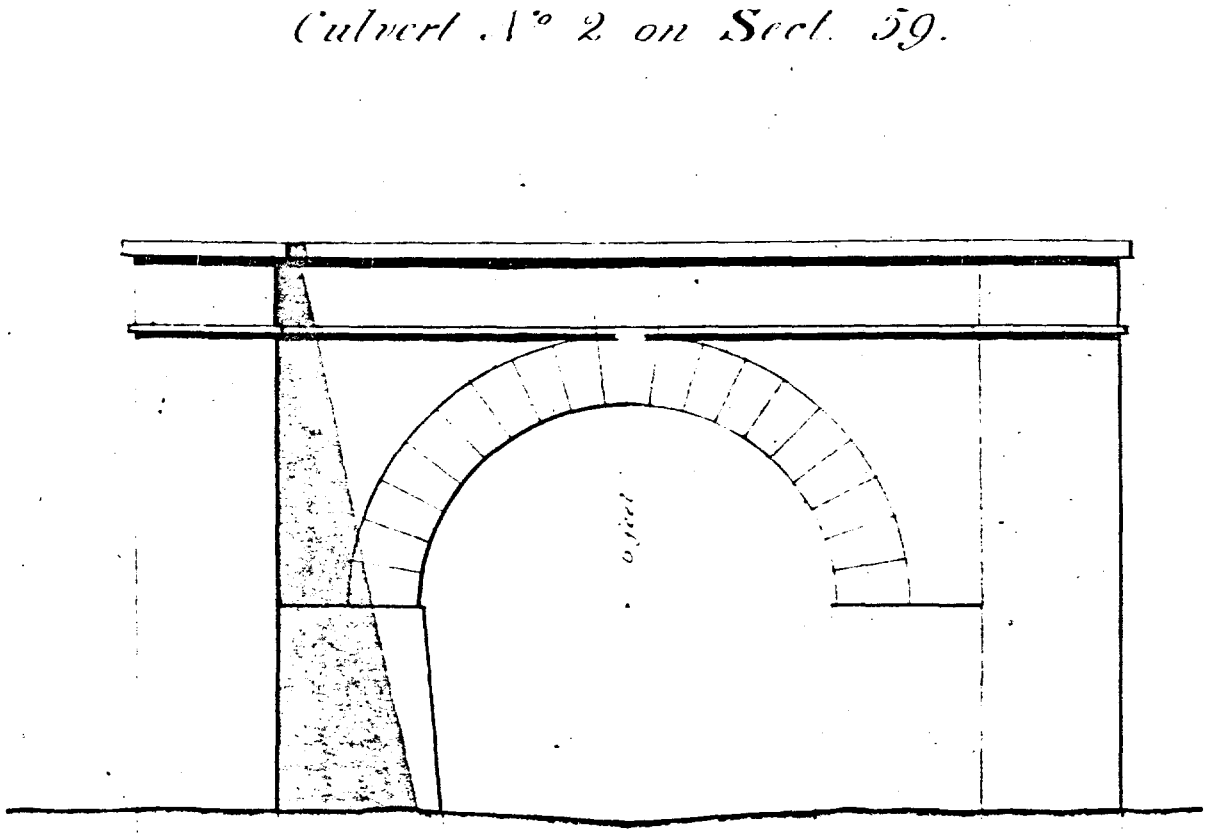
SECTIONS.



Scale 5 ft to an inch.

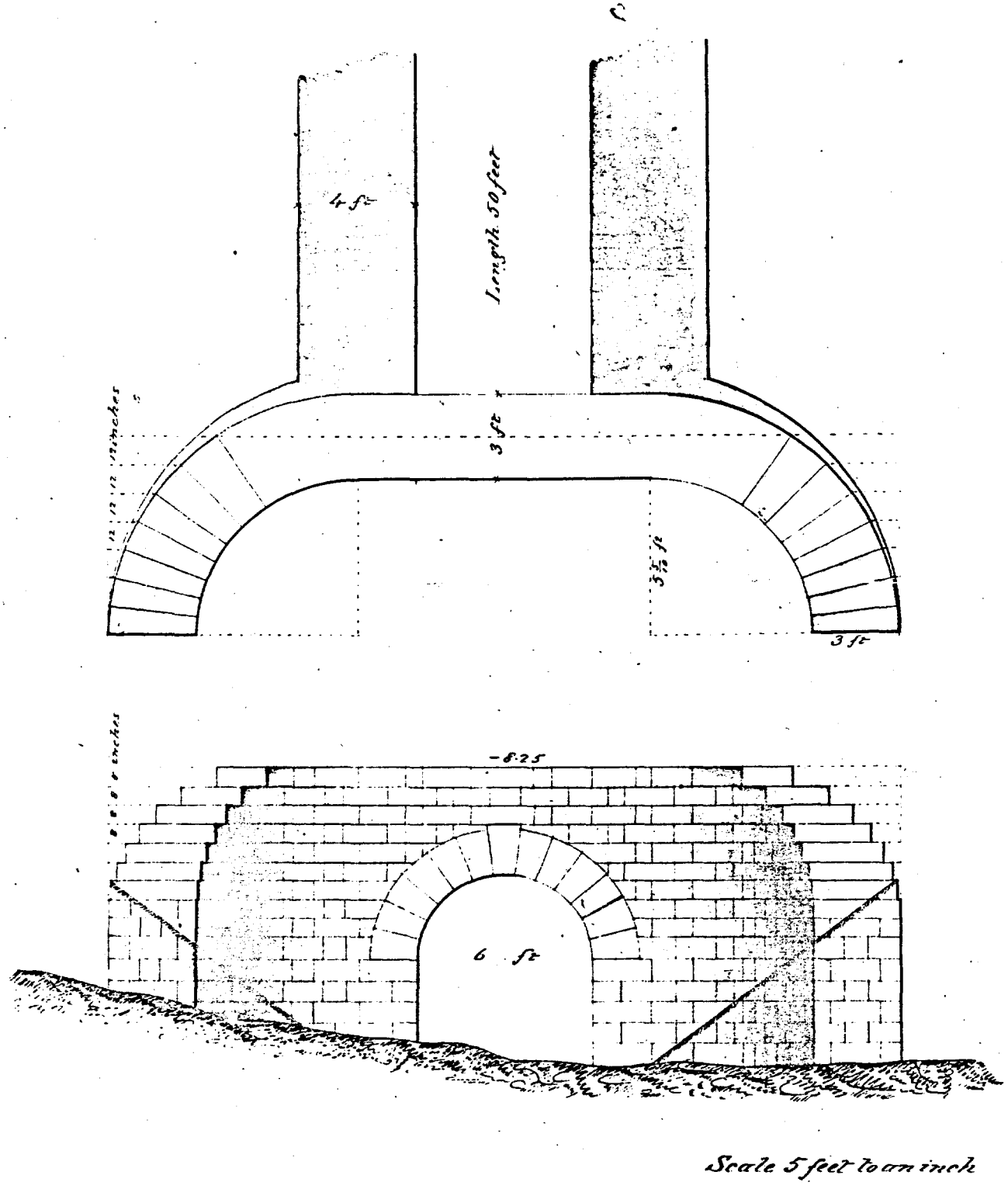
3. PENNSYLVANIA RAILWAY SECTIONS.

Source: Wilson, "Notebook, 1831."



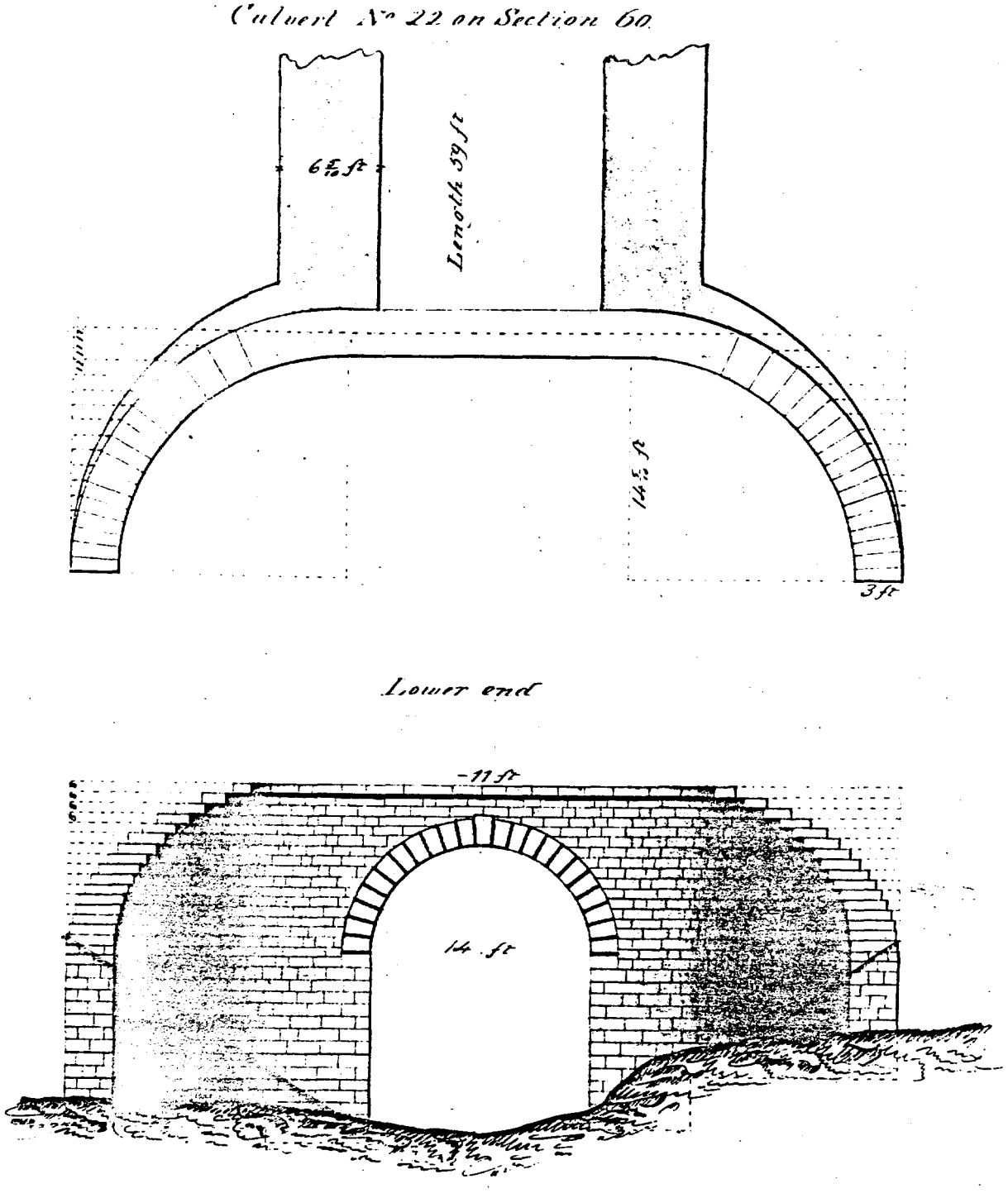
4. CULVERT NO. 2 ON SECTION 59.

Source: Wilson, "Notebook, 1831."



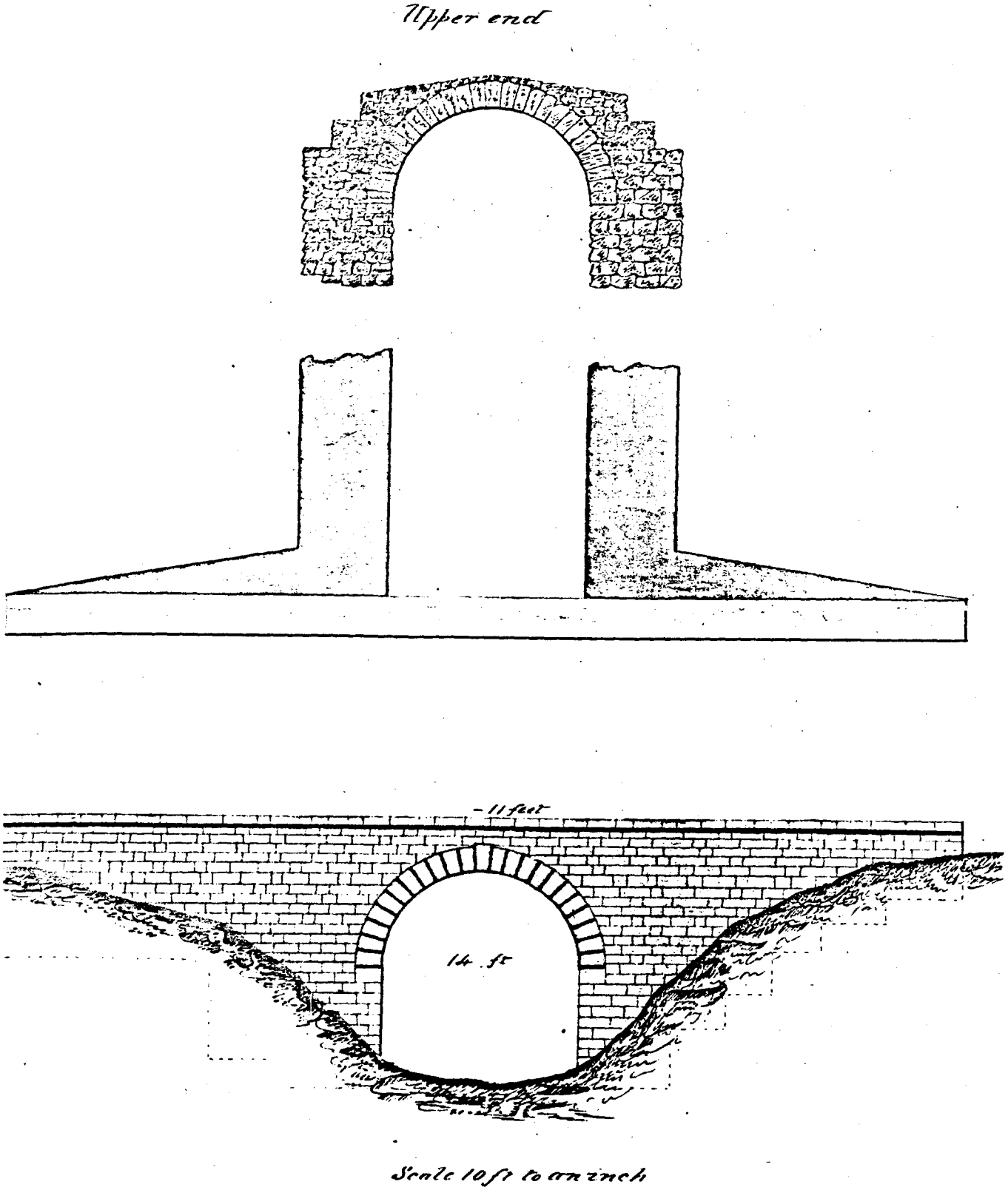
5. CULVERT NO. 20 ON SECTION 48.

Source: Wilson, "Notebook, 1831."



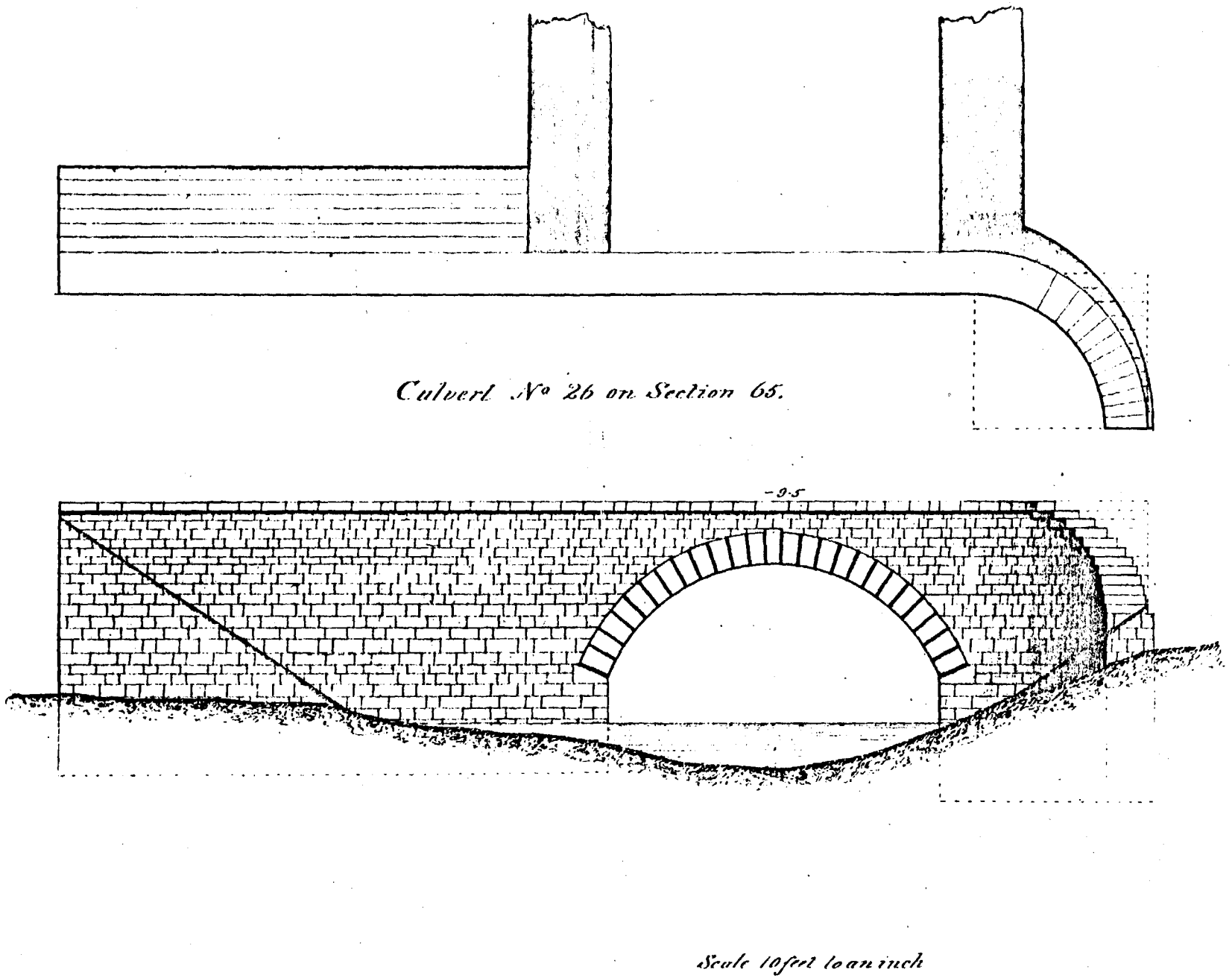
6. CULVERT NO. 22 ON SECTION 60.

Source: Wilson, "Notebook, 1831."



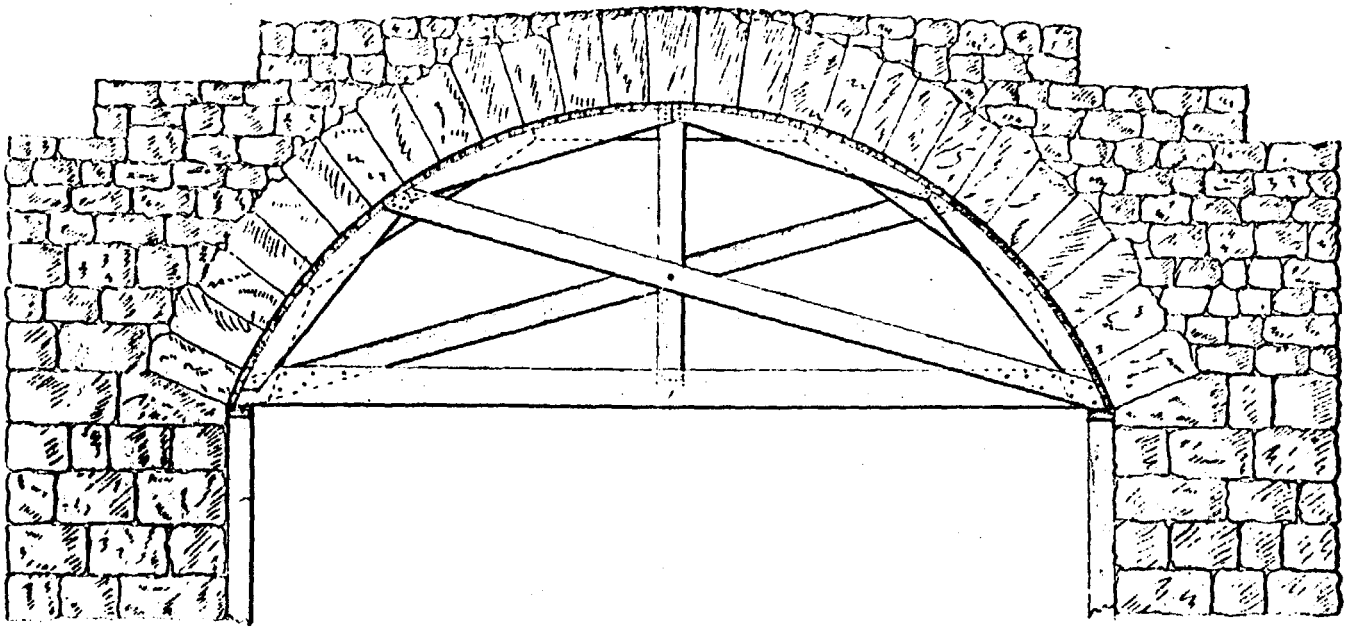
7. CULVERTS.

Source: Wilson, "Notebook, 1831."



8. CULVERT NO. 26 ON SECTION 65.

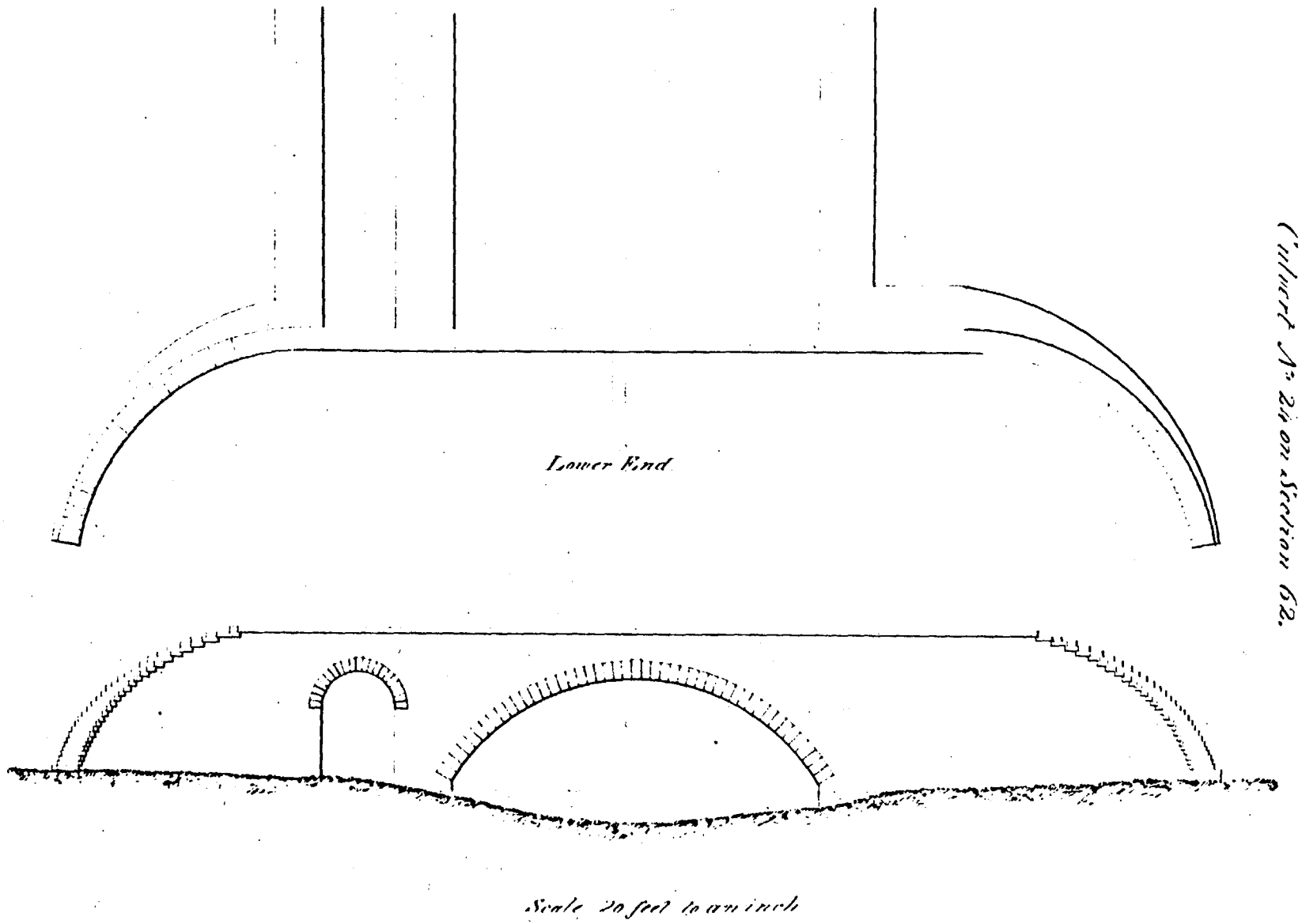
Source: Wilson, "Notebook, 1831."



Scale 5 ft to an inch

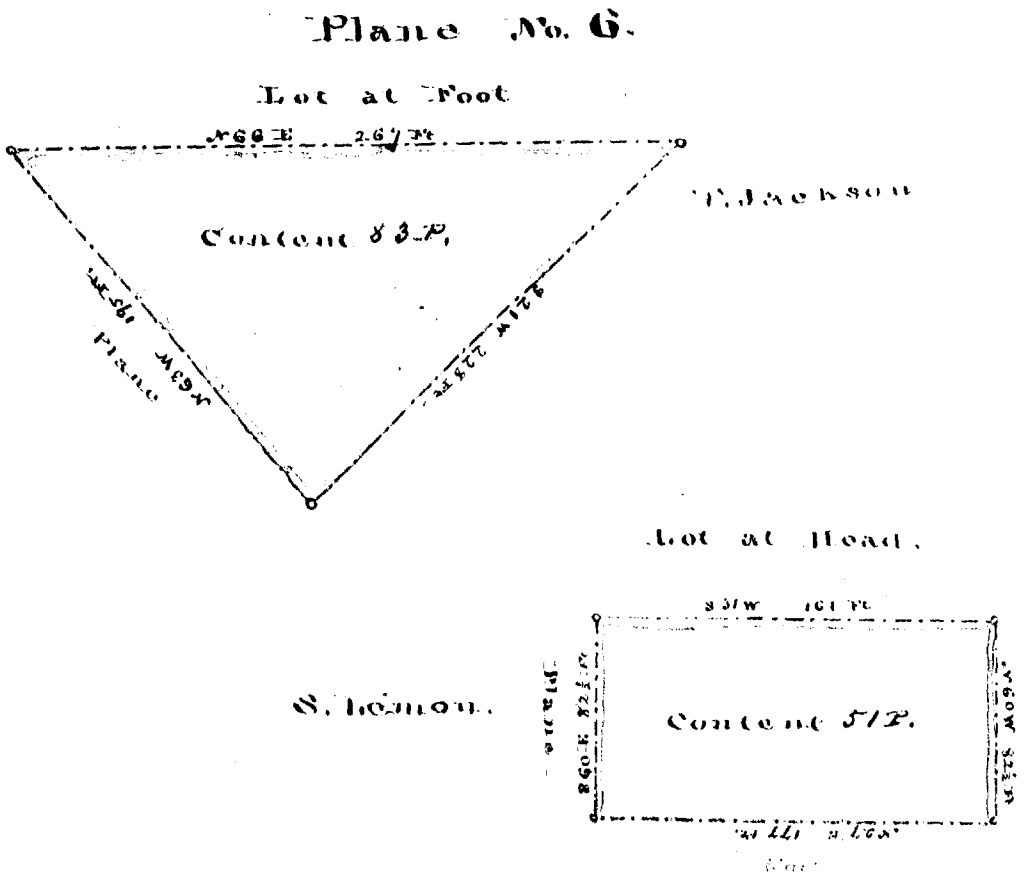
9. CULVERT.

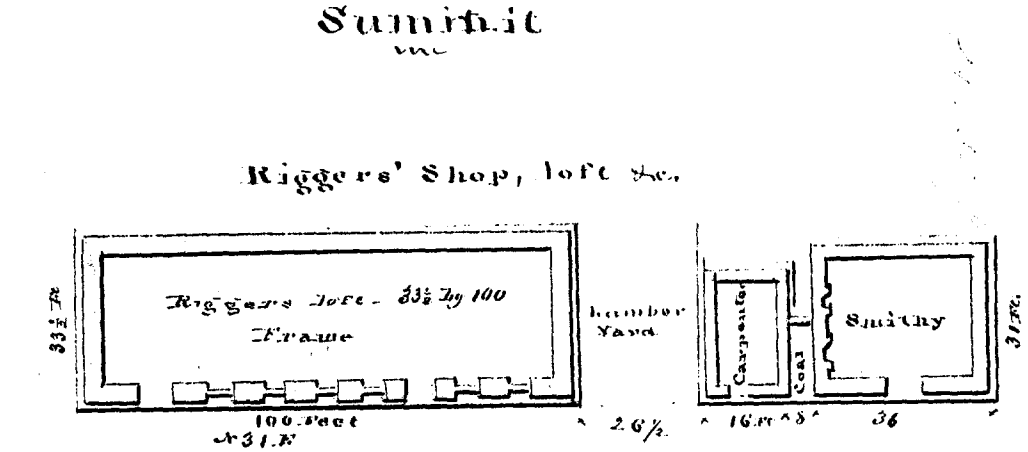
Source: Wilson, "Notebook, 1831."



10. CULVERT NO. 24 ON SECTION 62.

Source: Wilson, "Notebook, 1831."





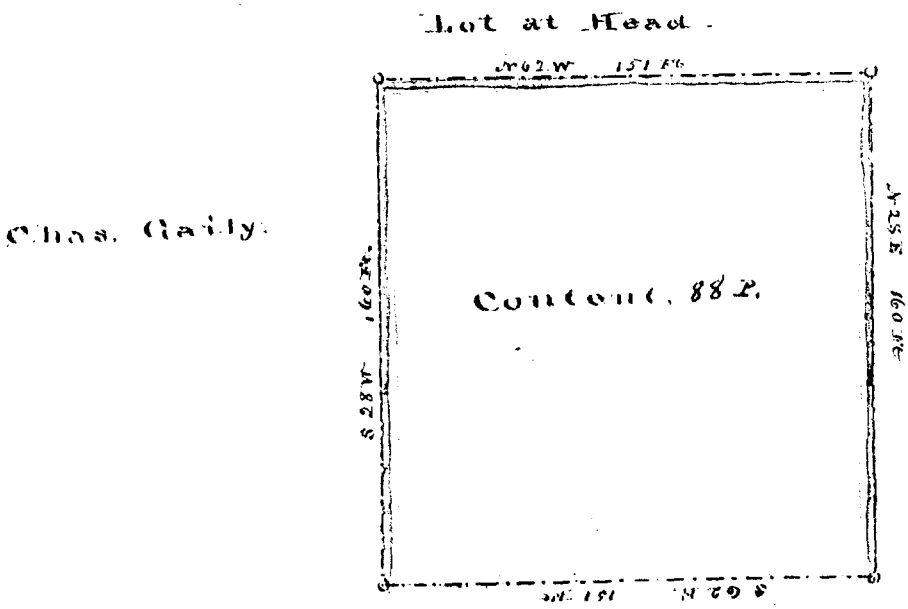
The front of Buildings is 50 feet from Centre of Rail Road

11. PLANE NO. 6 SURVEY.

Source: Engineering Records, RG-17.

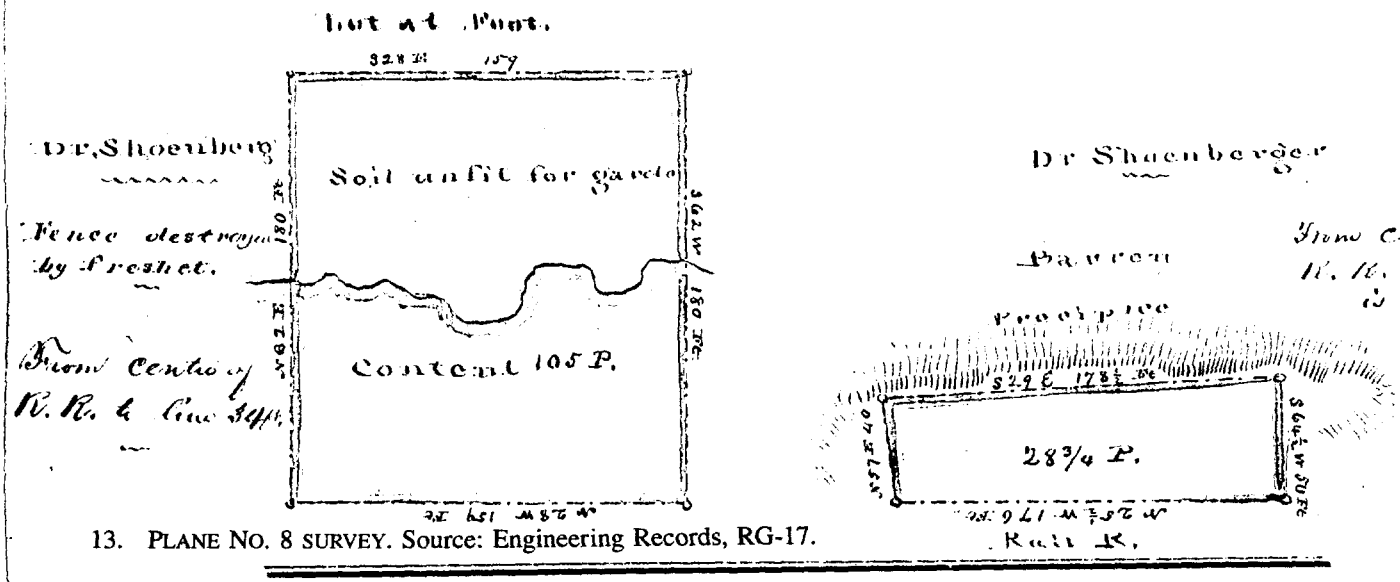
1576

Plane No. 9.



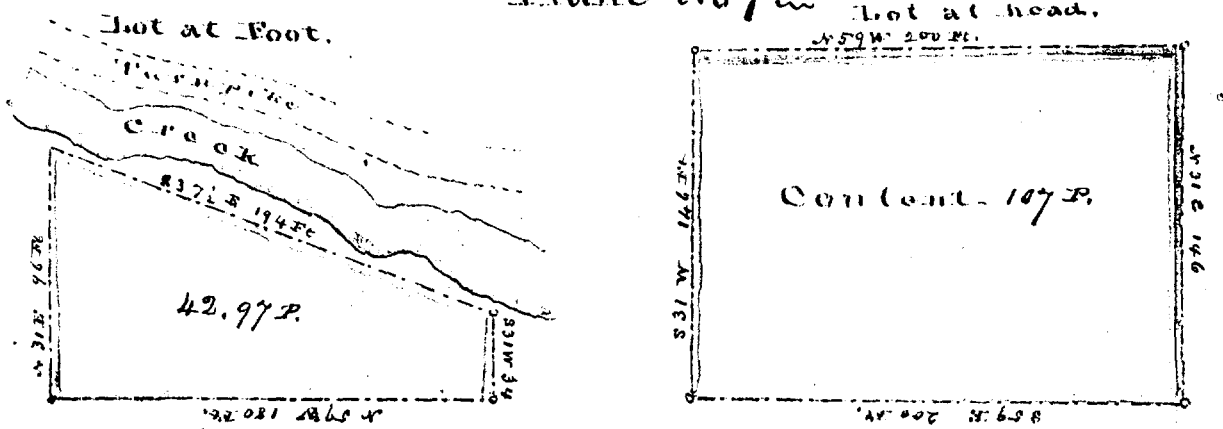
12. PLANE NO. 9 SURVEY. Source: Engineering Records, RG-17.

Plane No 8.

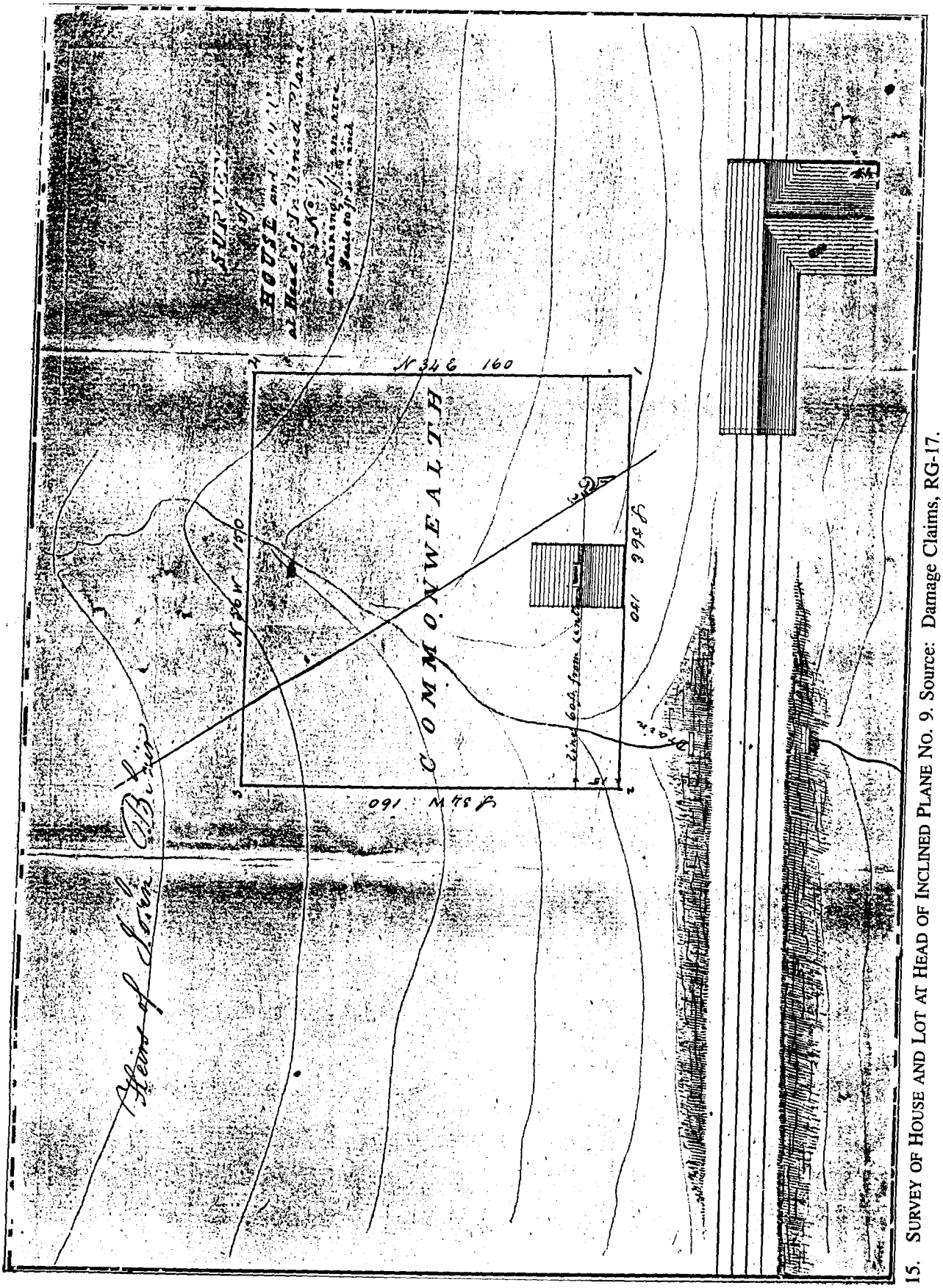


13. PLANE NO. 8 SURVEY. Source: Engineering Records, RG-17.

Plane No 7 Lot at head.



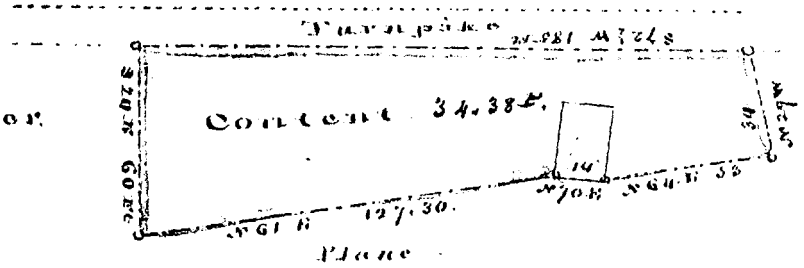
14. PLANE NO. 7 SURVEY. Source: Engineering Records, RG-17.



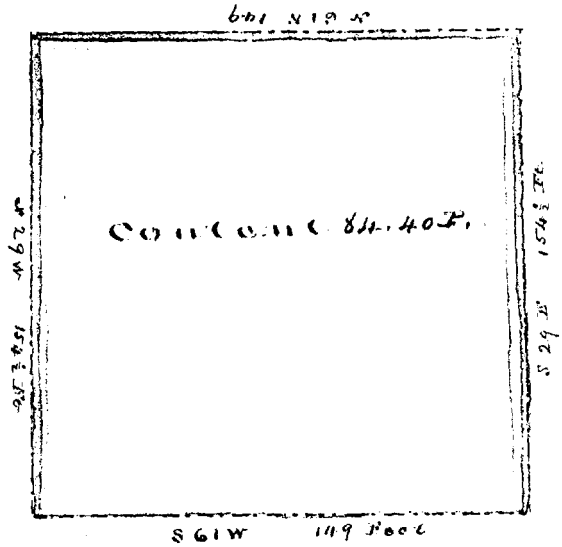
15. Survey of House and Lot at Head of Inclined Plane No. 9. Source: Damage Claims, RG-17.

Plane No 10 (4 Miles from Hollidaysburg)

Lot at Foot.



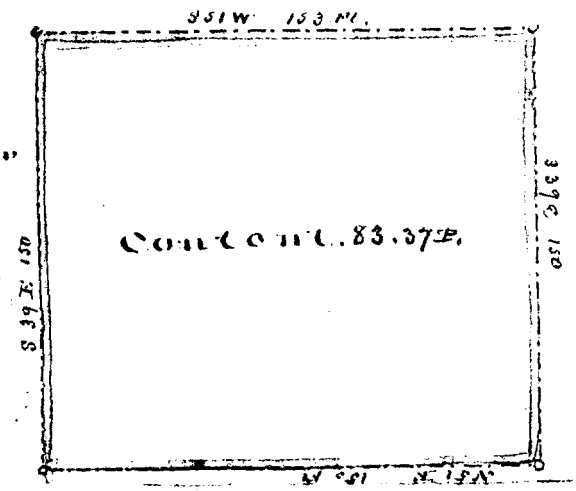
Lot at Head.



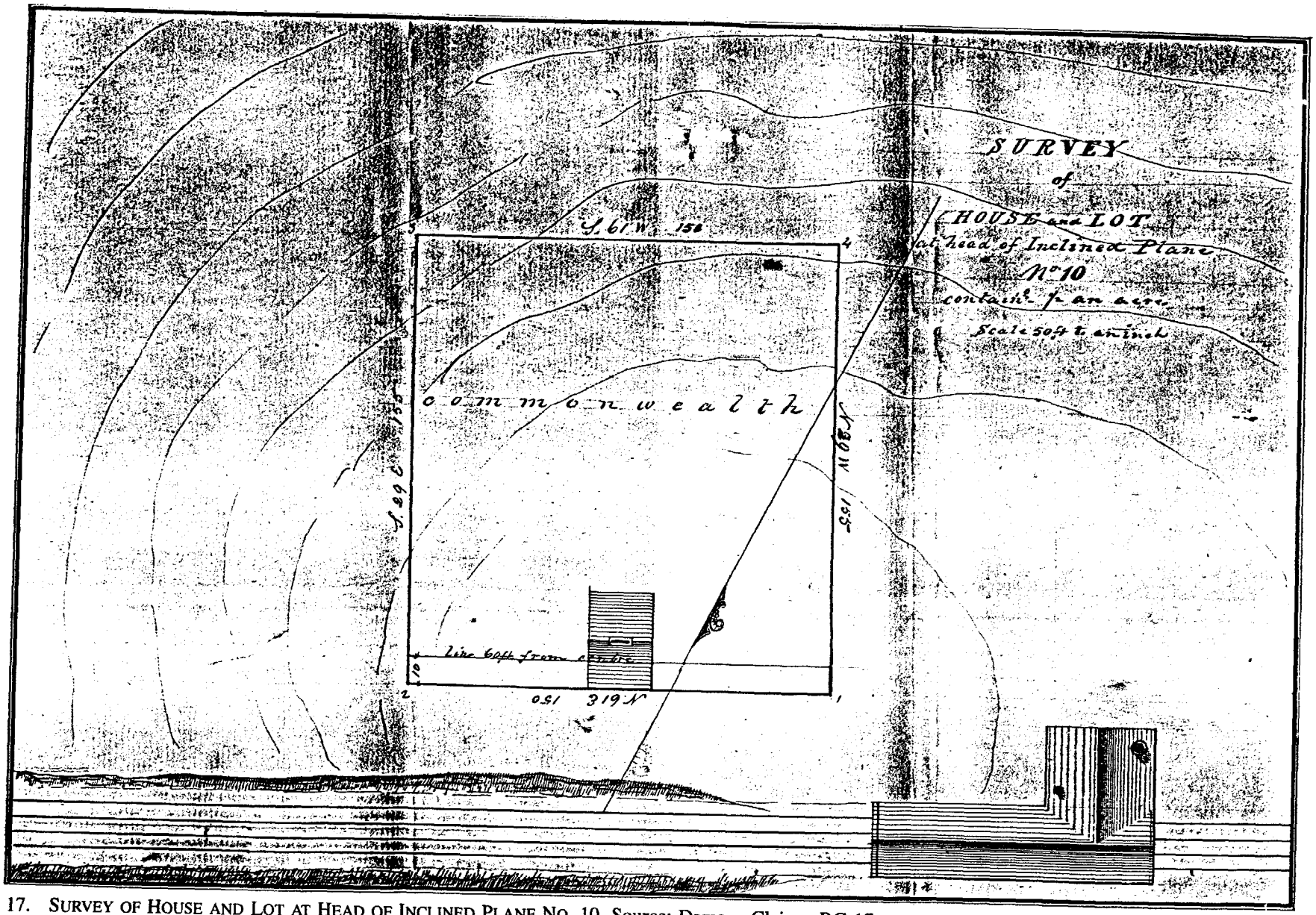
16. PLANE NO. 10 SURVEY. Source: Engineering Records, RG-17.

Plane No 9

Lot at foot.



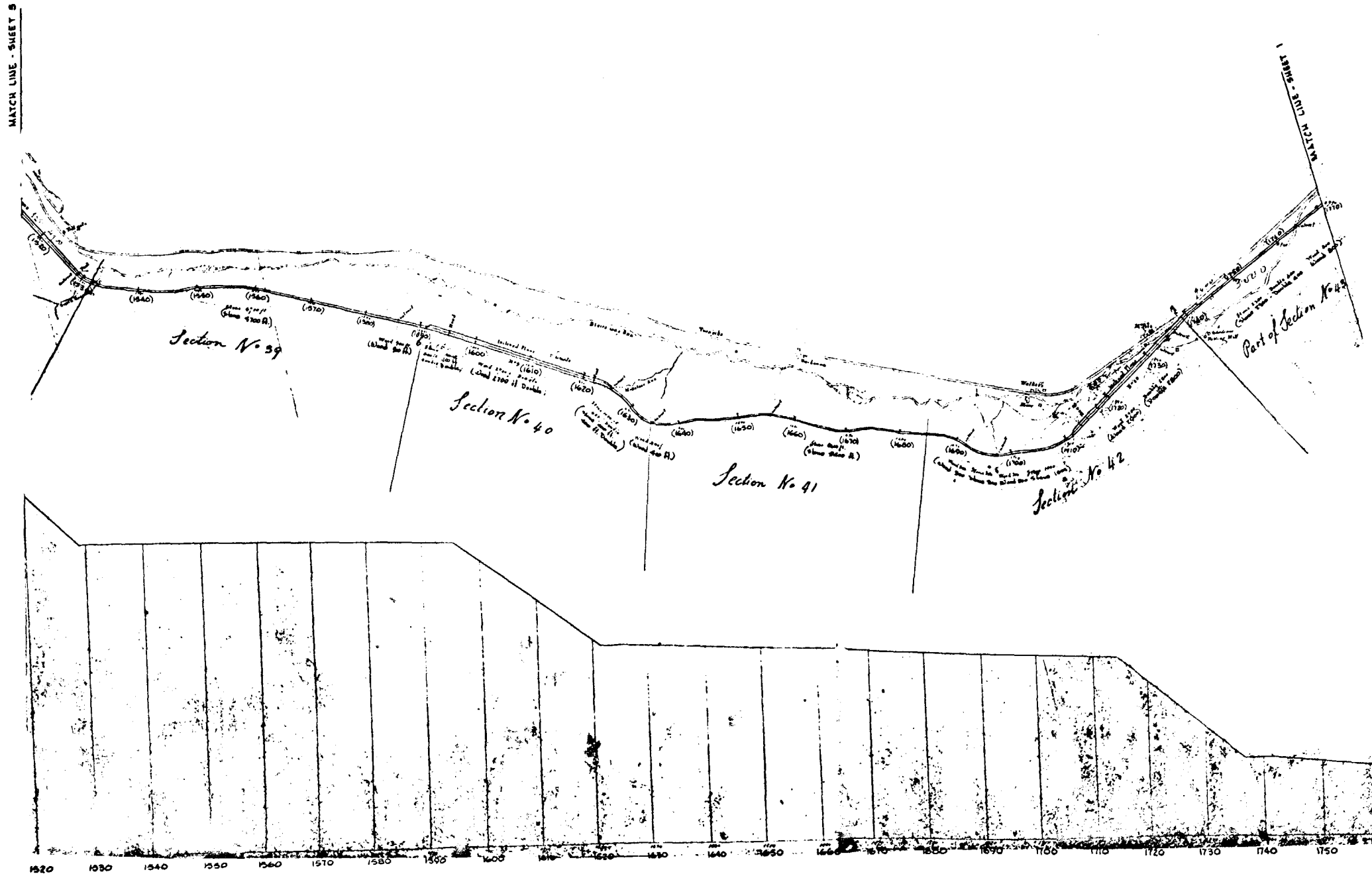
From Centre of R.R. to Line at right angles is 55 feet



17. SURVEY OF HOUSE AND LOT AT HEAD OF INCLINED PLANE NO. 10. Source: Damage Claims, RG-17.

18. HISTORICAL INFORMATION (DRAWING 423/3001, SHEETS 2-4).

Source: *Master Plan*, Allegheny Portage Railroad National Historic Site, 9 sheets, 12/64.



ORIENTATION

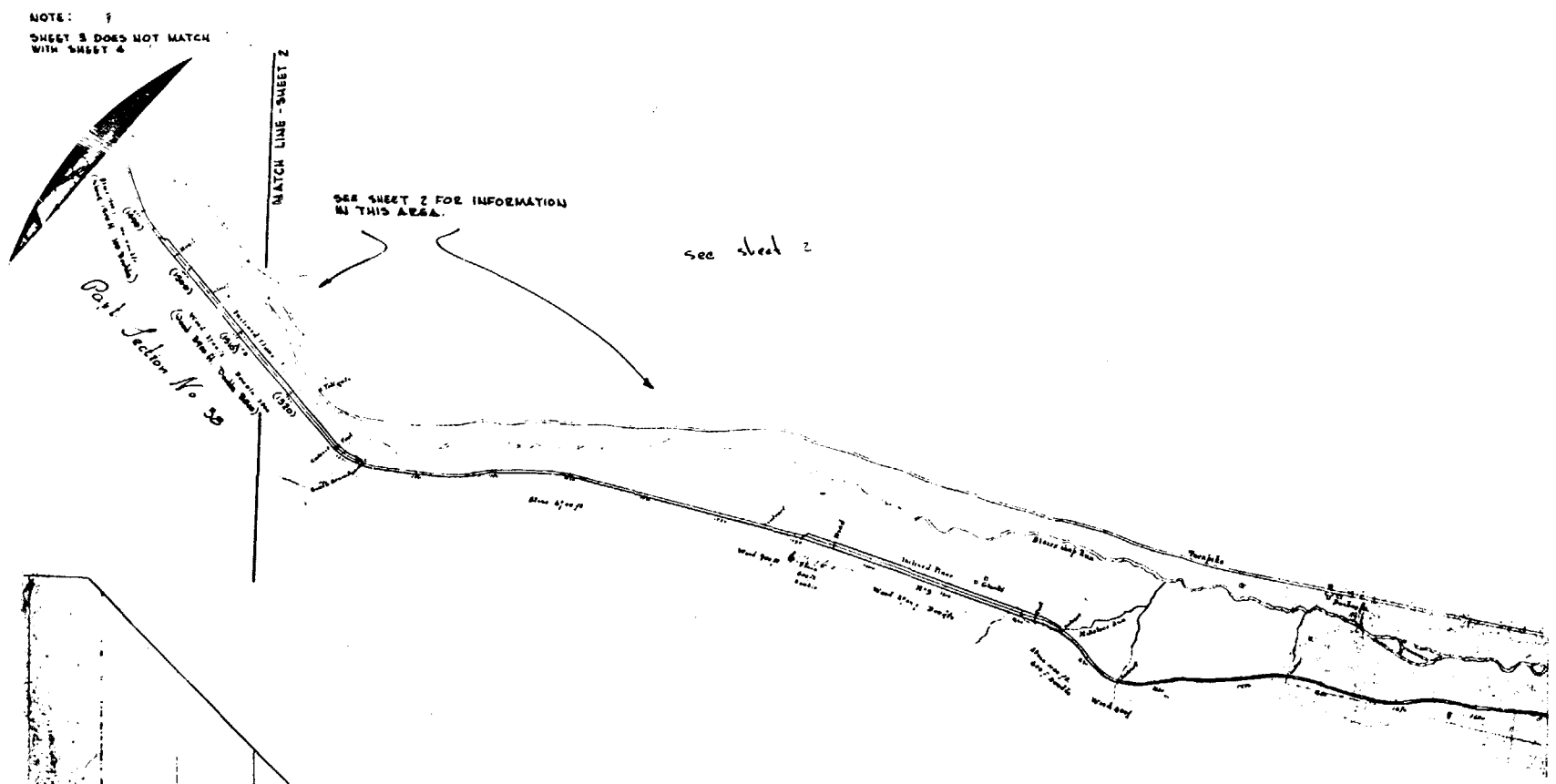
0 1000' 2000' 3000' 4000'

Scale : 1 = 1000' (approx.)

UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE DESIGN & CONSTRUCTION PLANNED BY EASTERN OFFICE	PREPARED / DESIGNED / DRAWN HANSON / CHECKED / DATE / INITIAL / REVISED / REGION NORTHEAST / SHEET 2 OF 9
TITLE OF DRAWING: HISTORICAL INFORMATION — PART OF MASTER PLAN; LOCATION WITHIN PARK: ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE; NAME OF PARK:	DRAWING NO. NHS-APR 3001 / DATE 1-12-66

ON MICROFILM

NOTE: 1
SHEET 3 DOES NOT MATCH WITH SHEET 4



NOTE:
PROFILE MISSING BETWEEN STATIONS 1410 AND 1490

0 1000' 2000' 3000' 4000'
Scale: 1" = 1000' (approx.)

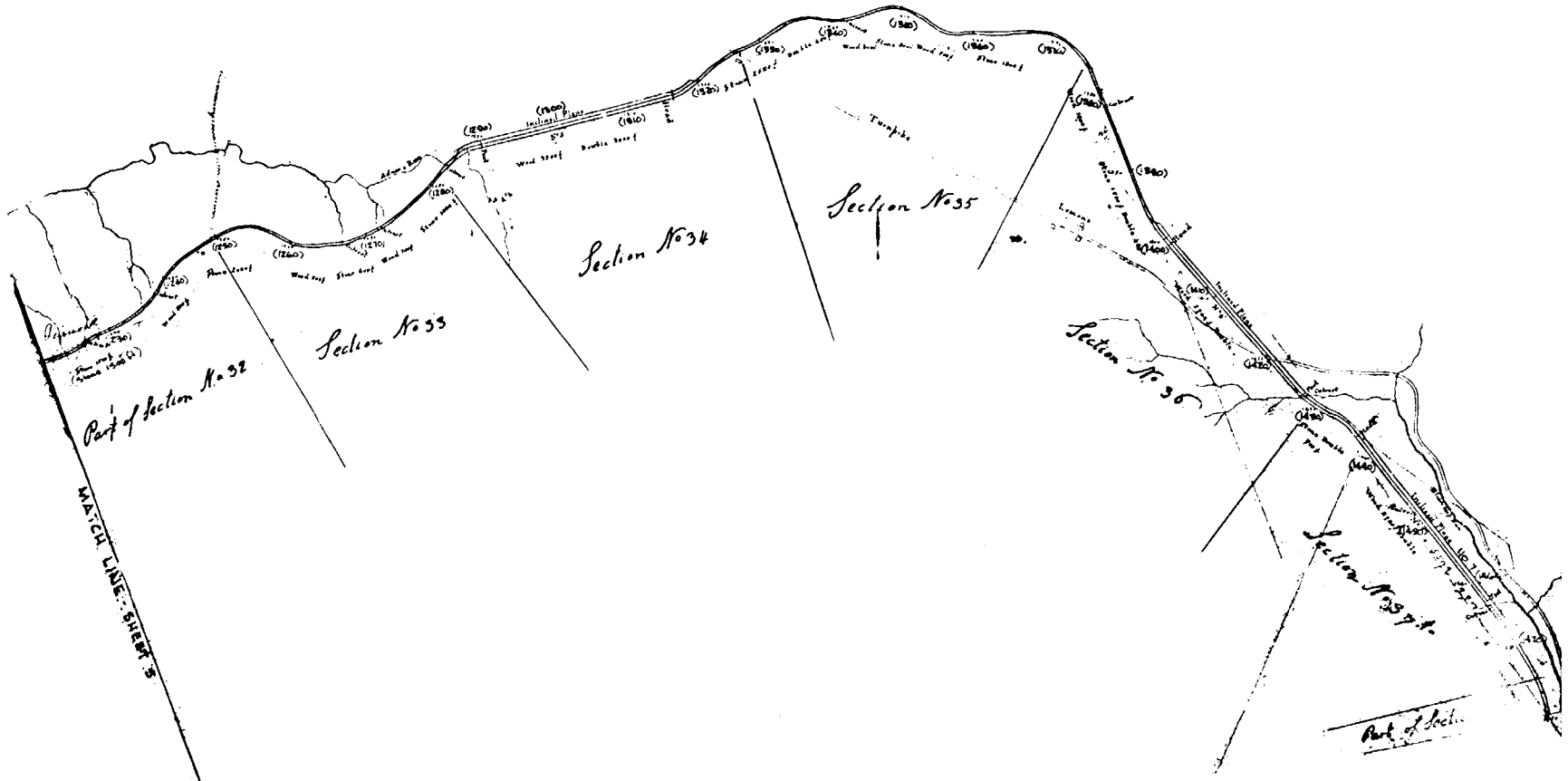
ORIENTATION

PREPARED	
DESIGNED	
DRAWN HANSON	
CHECKED	
DATE	INITIAL
REVISED	
REGION	NORTHEAST
SHEET 3 OF 9	
DRAWING NO	NHS:APR 3001
DATE: 12.64	

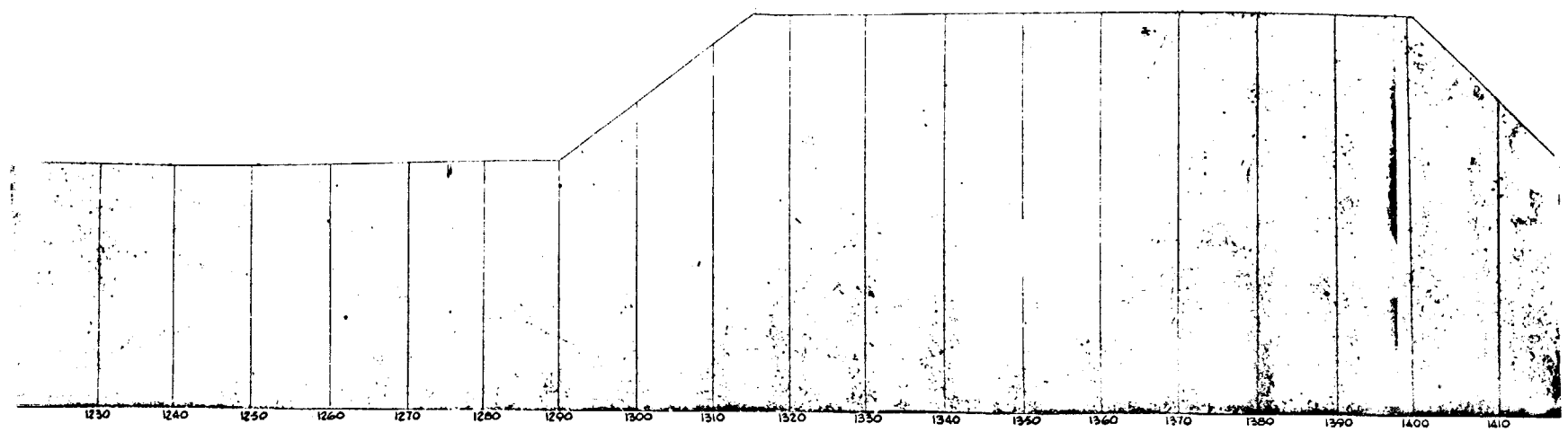
UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DESIGN & CONSTRUCTION
PREPARED BY
EASTERN
OFFICE

TITLE OF DRAWING
HISTORICAL INFORMATION
PART OF MASTER PLAN
LOCATION WITHIN PARK
ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE
NAME OF PARK

ON MICROFILM



NOTE:
SHEET 4 DOES NOT MATCH WITH SHEET 3



NOTE:
PROFILE MISSING BETWEEN STATIONS 1410 AND 1490

0 1000' 2000' 3000' 4000'

Scale: 1" = 1000' (approx)

ORIENTATION

PREPARED	
DESIGNED	
DRAWN	HANSON
CHECKED	
DATE	INITIAL
REVISED	
REGION	NORTHEAST
SHEET 4 OF 9	
DRAWING NO	NHS APR 3001
DATE: 12-64	

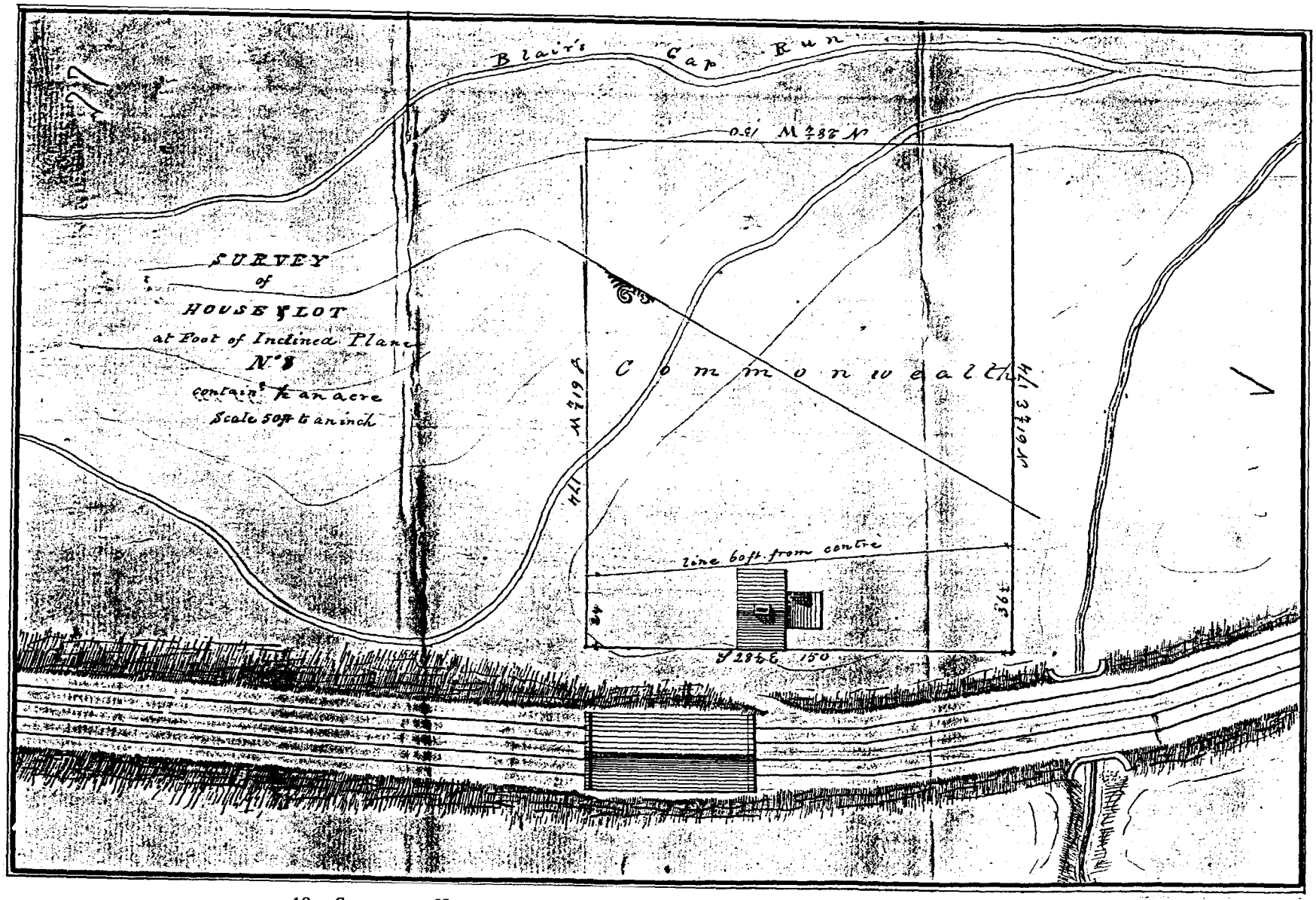
UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DESIGN & CONSTRUCTION
PREPARED BY
EASTERN
OFFICE

HISTORICAL INFORMATION
TITLE OF DRAWING

PART OF MASTER PLAN
LOCATION WITHIN PARK

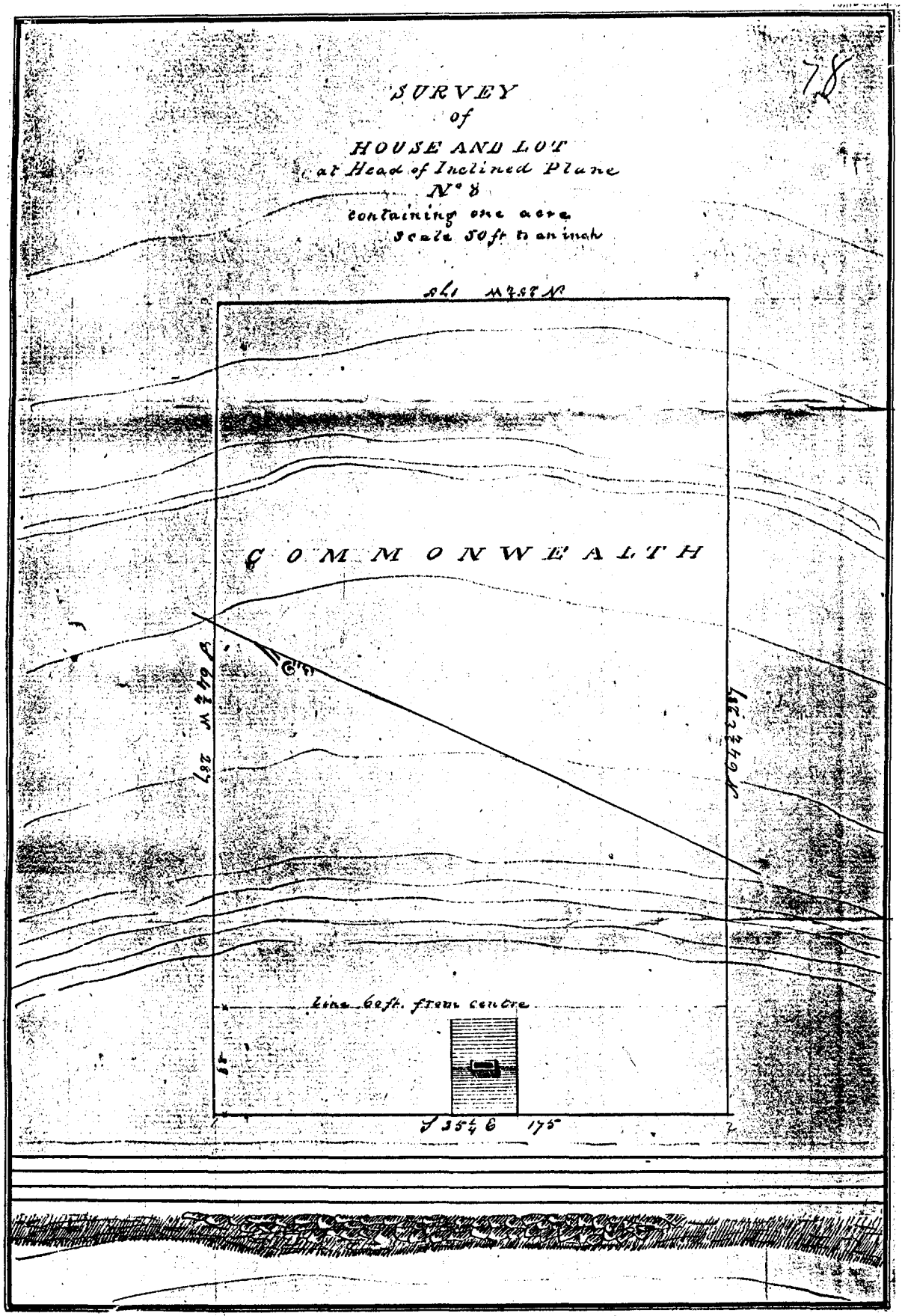
ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE
NAME OF PARK

ON MICROFILM

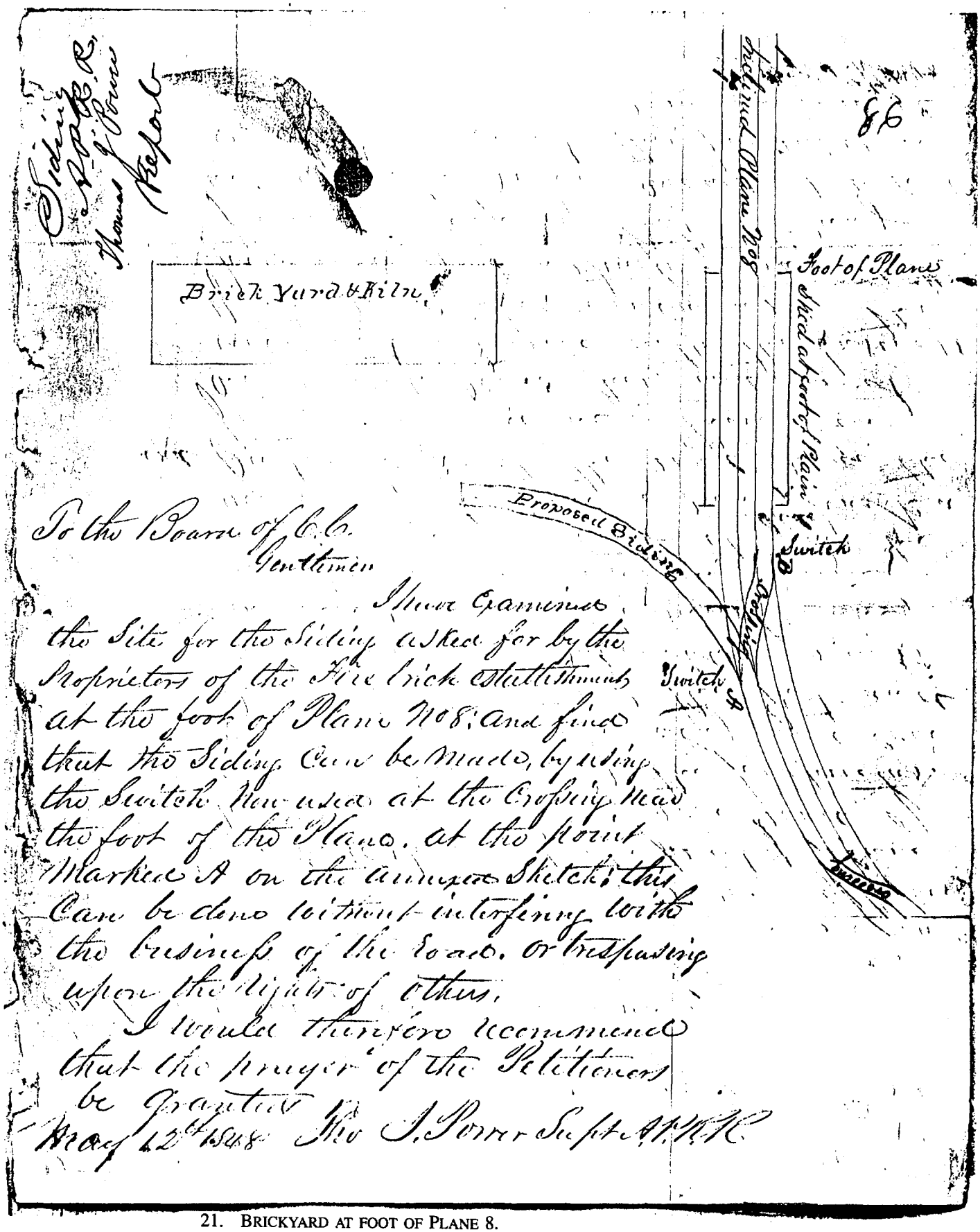


19. SURVEY OF HOUSE AND LOT AT FOOT OF INCLINED PLANE NO. 8.

Source: Damage Claims, RG-17.

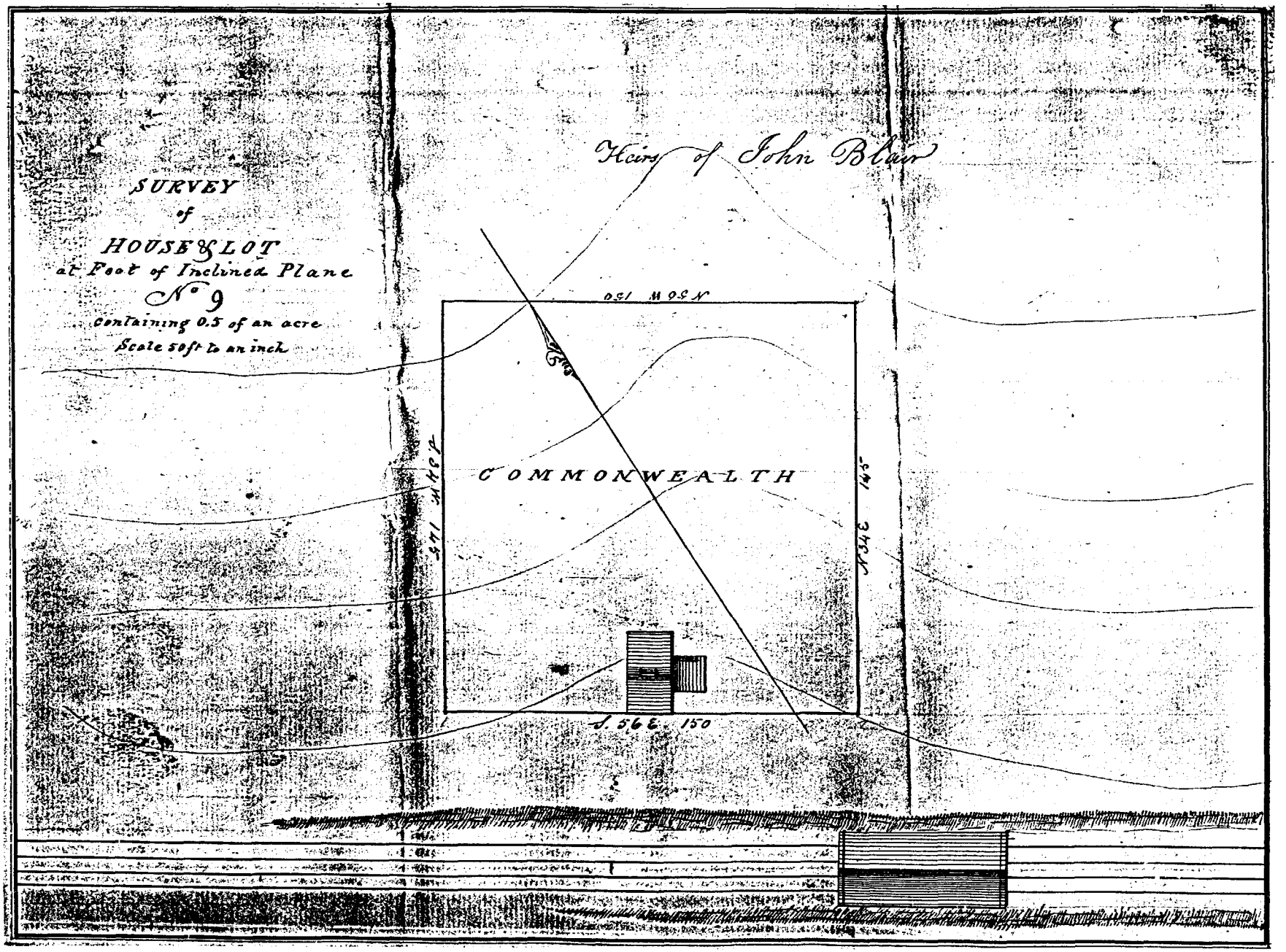


20. SURVEY OF HOUSE AND LOT AT HEAD OF INCLINED PLANE NO. 8. Source: Damage Claims, RG-17.



21. BRICKYARD AT FOOT OF PLANE 8.

Source: Reports and Miscellaneous Documents, box 10, vol. 2, item 86, APRR, Div. Rec., BCC, RG-17, PHMC.

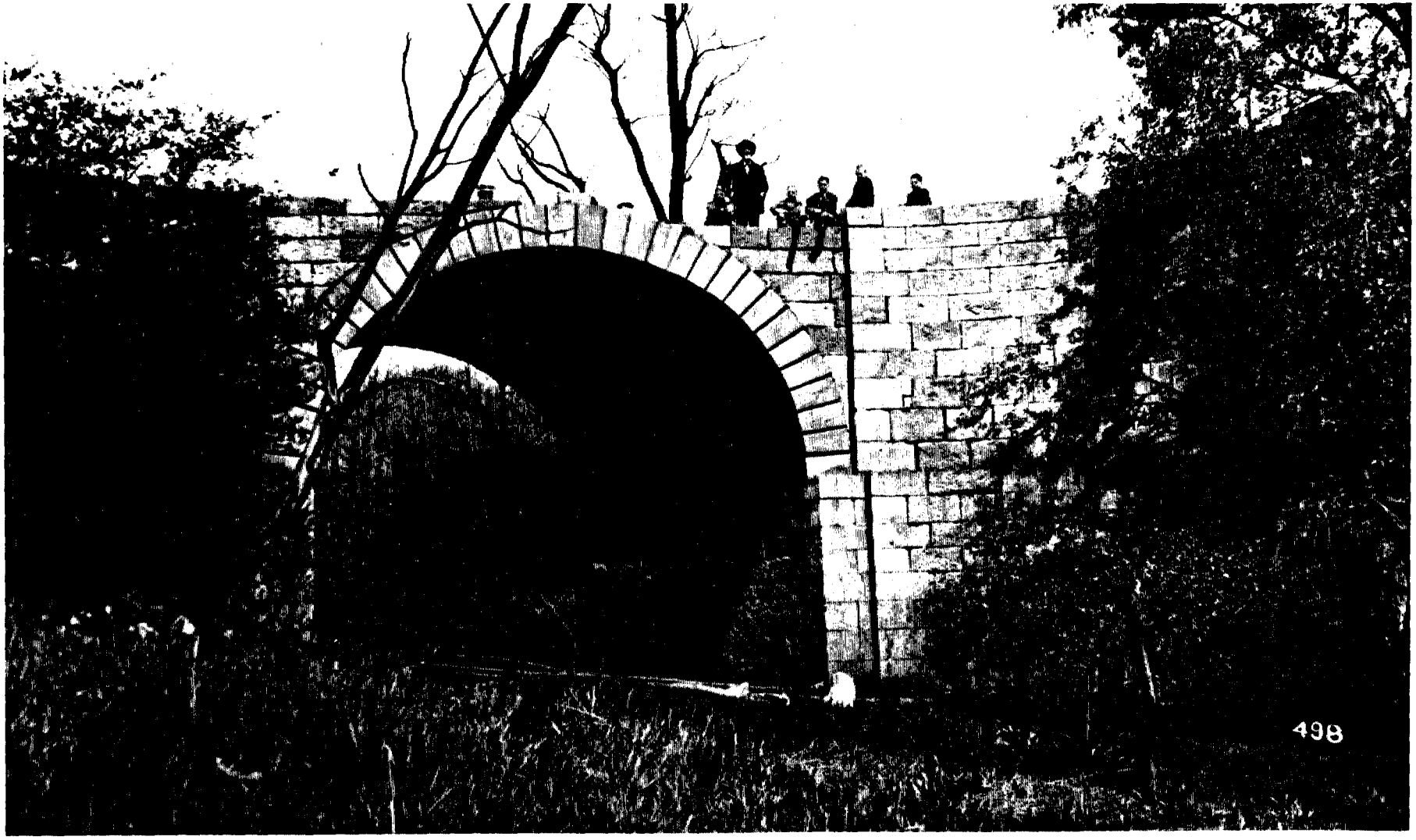


22. SURVEY OF HOUSE AND LOT AT FOOT OF INCLINED PLANE NO. 9. Source: Damage Claims, RG-17.

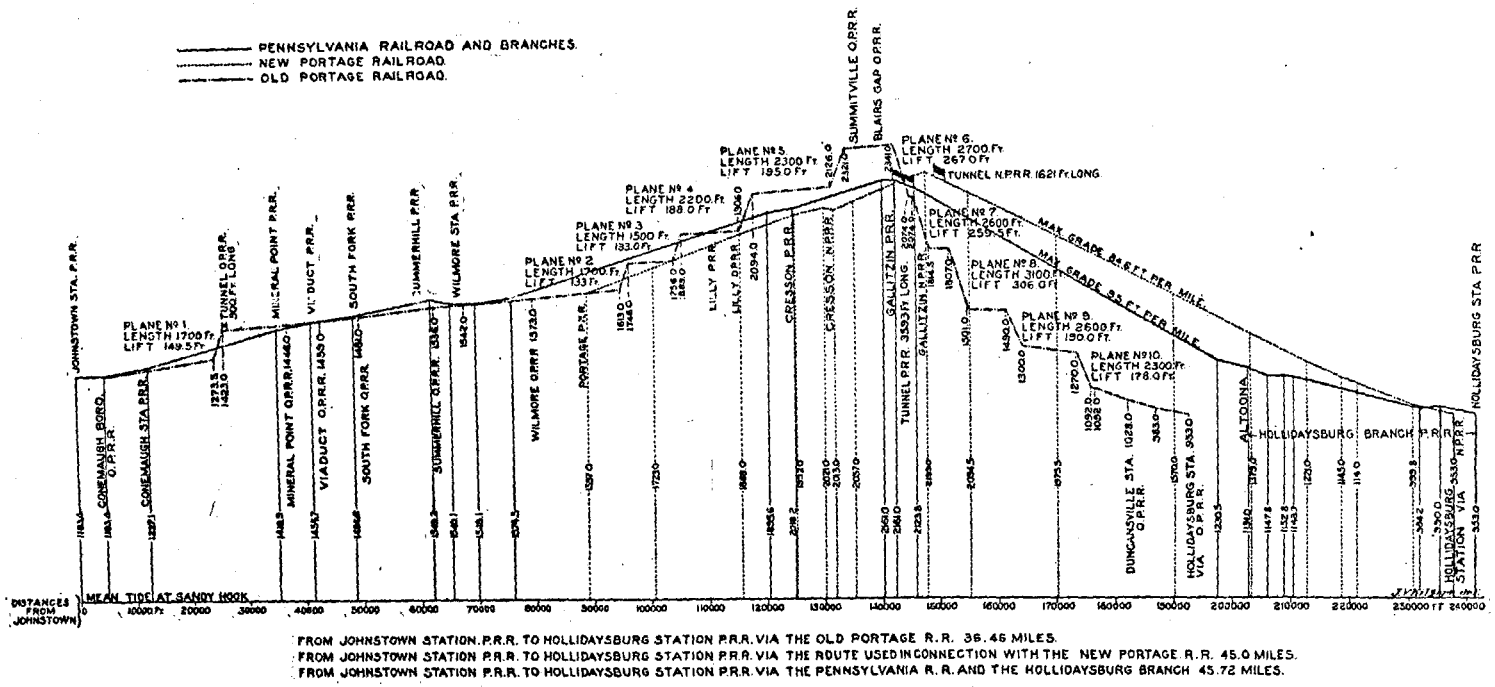


23. PLANE NO. 6 OLD PORTAGE RR, CA. 1910.

Source: MG-327, Ira J. Stouffer Collection.



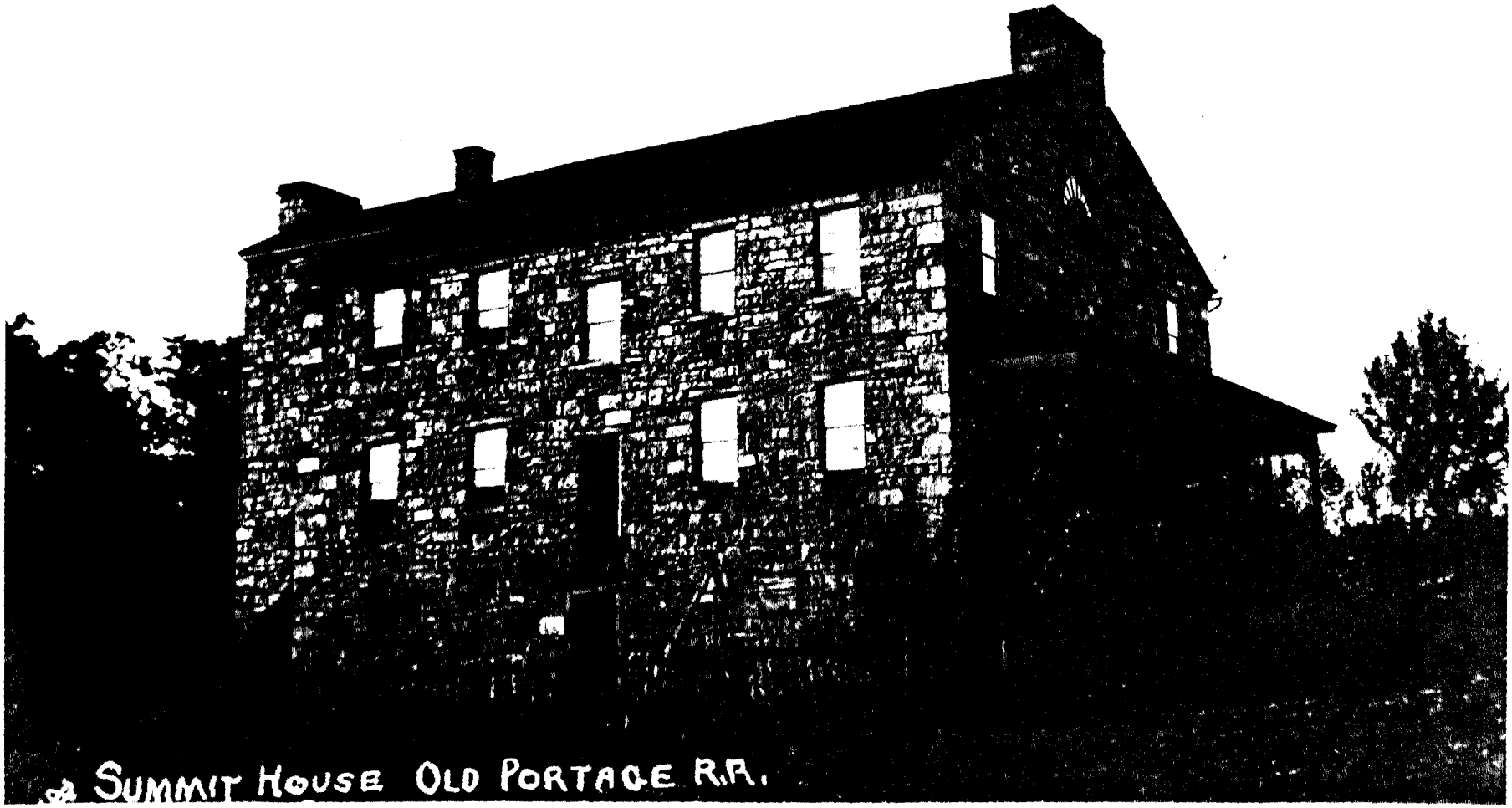
24. SKEW ARCH, CA. 1910. Source: MG-327, Ira J. Stouffer Collection.



PROFILE OF GRADES ON THE PORTAGE RAILROAD

25. PROFILE OF GRADES ON THE PORTAGE RAILROAD

Source: J. Elfreth Watkins, *History of the Pennsylvania Railroad Company*, p. 158.



26. SUMMIT HOUSE [LEMON HOUSE], CA. 1910.

Source: Ira J. Stouffer Collection.



27. STONE SLEEPERS, SUMMIT LEVEL, CA. 1910.

Source: Ira J. Stouffer Collection.



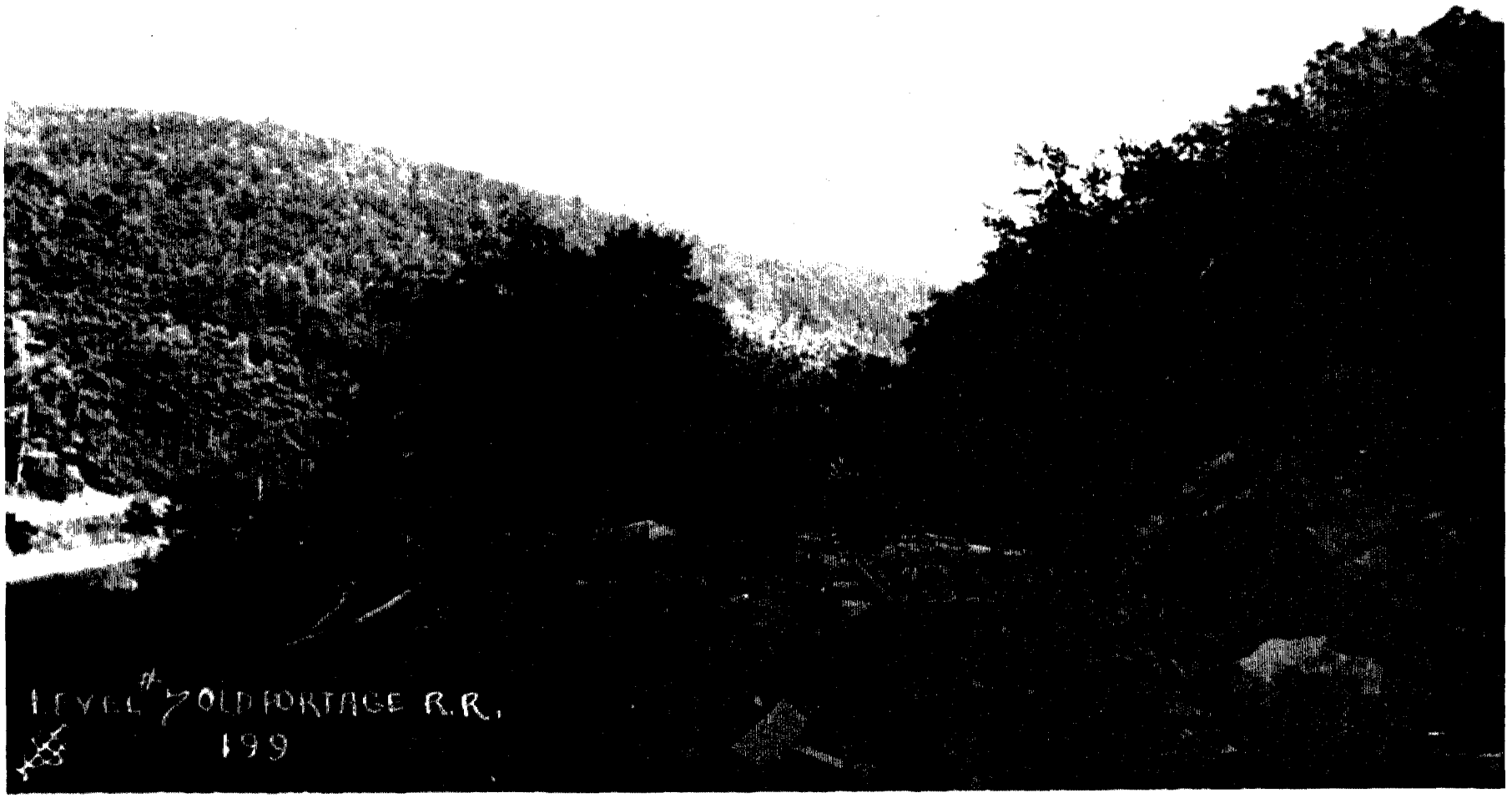
28. STONE SLEEPERS, LOOKING EAST FROM SUMMIT, CA. 1910.

Source: Ira J. Stouffer Collection.



29. SUMMIT LEVEL, CA. 1910.

Source: Ira J. Stouffer Collection.



30. LEVEL 7, CA. 1910.

Source: Ira J. Stouffer Collection.



31. PLANE 8, CA. 1910.

Source: Ira J. Stouffer Collection.



32. PLANE 9, CA. 1910.

Source: Ira J. Stouffer Collection.



33. PLANE 10, LOOKING TOWARDS DUNCANSVILLE, CA. 1910.

Source: Ira J. Stouffer Collection.



34. LEVEL 6, HALF-WAY ON SUMMIT, 7/16/22.

Source: George A. Richardson Collection.



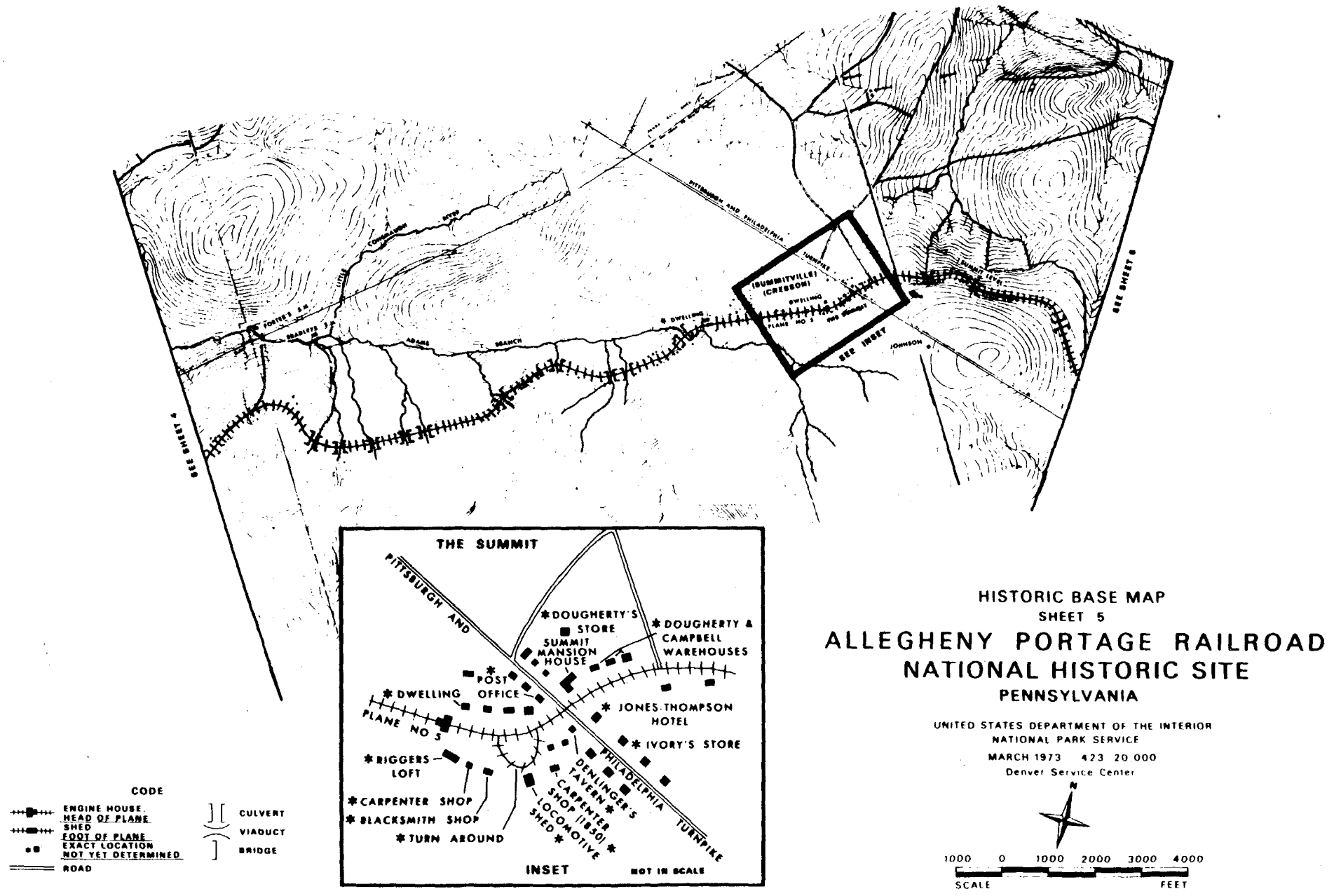
35. PLANE NO. 6 DOWN TO HOLLIDAYSBURG, TAKEN FROM LEMON HOMESTEAD, 7/16/22.

Source: George A. Richardson Collection.



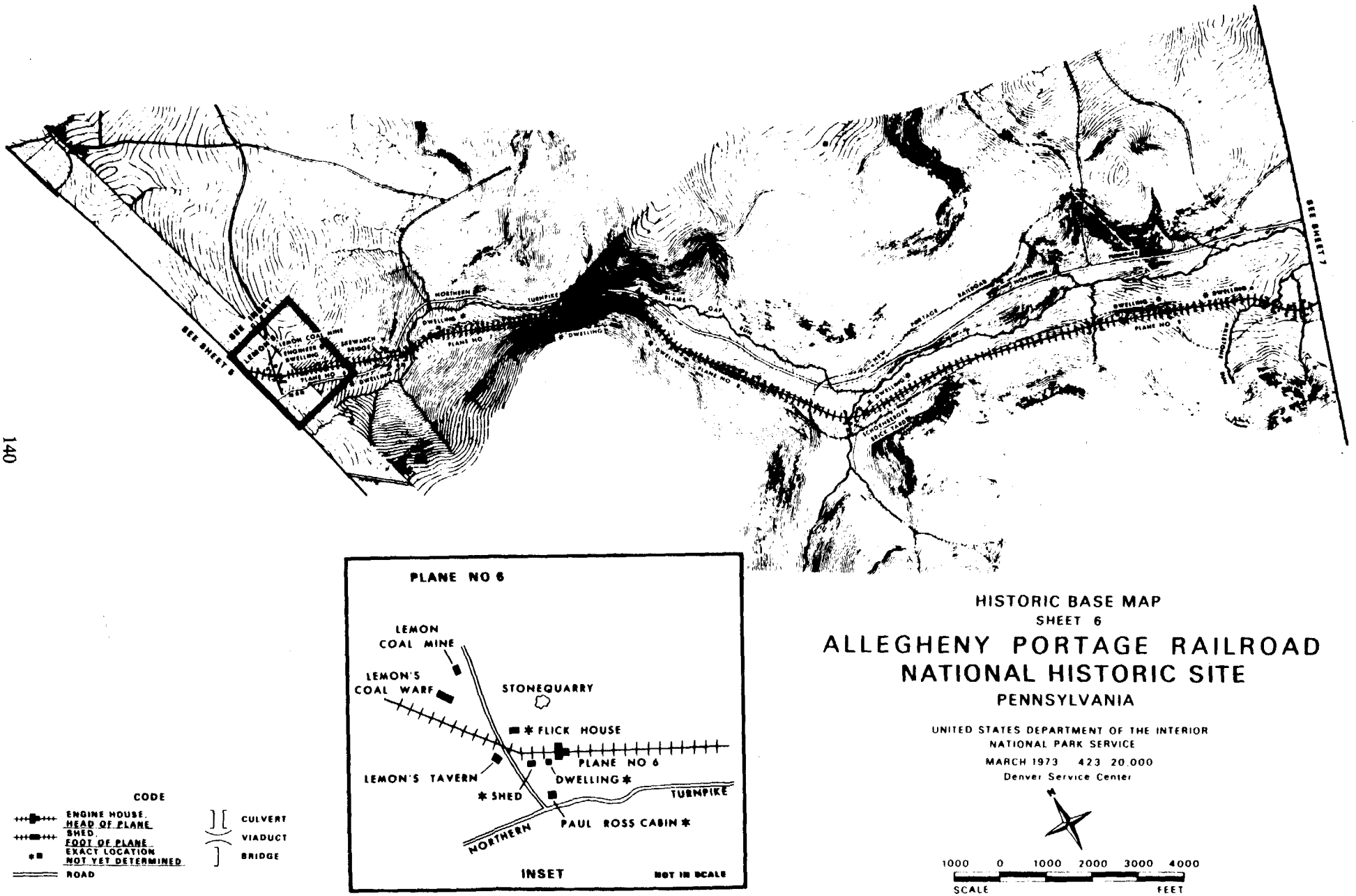
36. OLD ENGINE HOUSE FOUNDATION – HEAD OF PLANE 7 JUST BEYOND PENN HIGHWAY, 7/16/22.

Source: George A. Richardson Collection.



37. HISTORIC BASE MAP, DRAWING 423/20,000. Source: National Park Service, Denver Service Center.
    a. Sheet 5.

ON MICROFILM



CODE

- ENGINE HOUSE, HEAD OF PLANE
- SHED, FOOT OF PLANE
- EXACT LOCATION NOT YET DETERMINED
- ROAD
- CULVERT
- VIADUCT
- BRIDGE

HISTORIC BASE MAP
SHEET 6

ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE

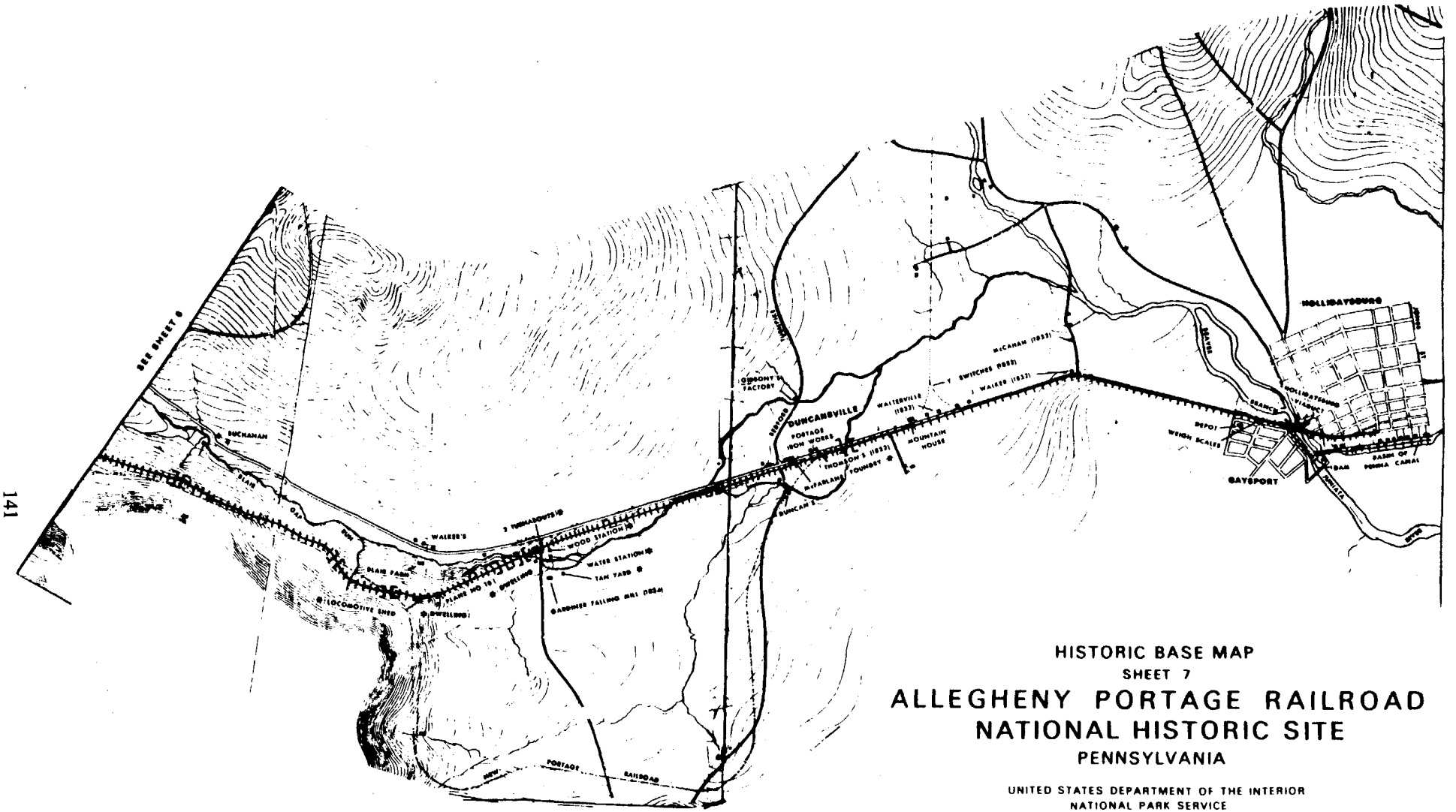
PENNSYLVANIA

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
MARCH 1973 423 20,000
Denver Service Center

N

1000 0 1000 2000 3000 4000
SCALE FEET

b. Sheet 6.



CODE

- ENGINE HOUSE, HEAD OF PLANE
- SHED, FOOT OF PLANE
- EXACT LOCATION NOT YET DETERMINED
- ROAD
- CULVERT
- VIADUCT
- BRIDGE

HISTORIC BASE MAP

SHEET 7

ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE

PENNSYLVANIA

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
MARCH 1973 423 20,000
Denver Service Center

N

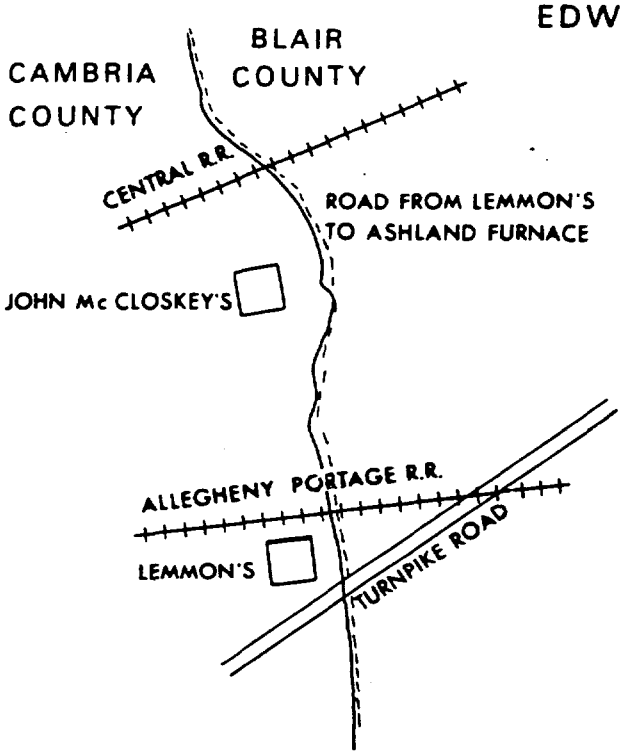
1000 0 1000 2000 3000 4000
SCALE FEET

c. Sheet 7.

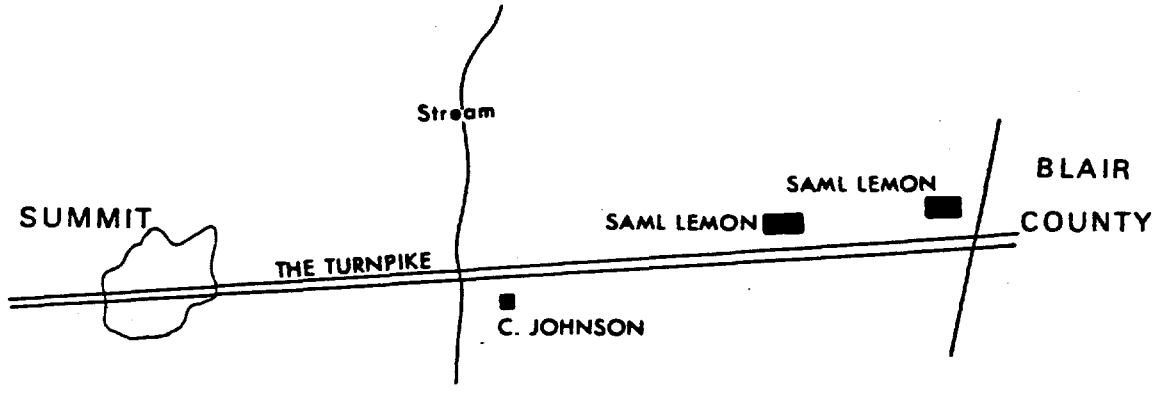
ON MICROFILM

SKETCH OF MAPS
1849 and 1867

1849: BOUNDARY LINE BY JAMES L. SWIN, BLAIR
EDWIN A. VICKROY, CAMBRIA



1867: BEER'S MAP OF CAMBRIA COUNTY

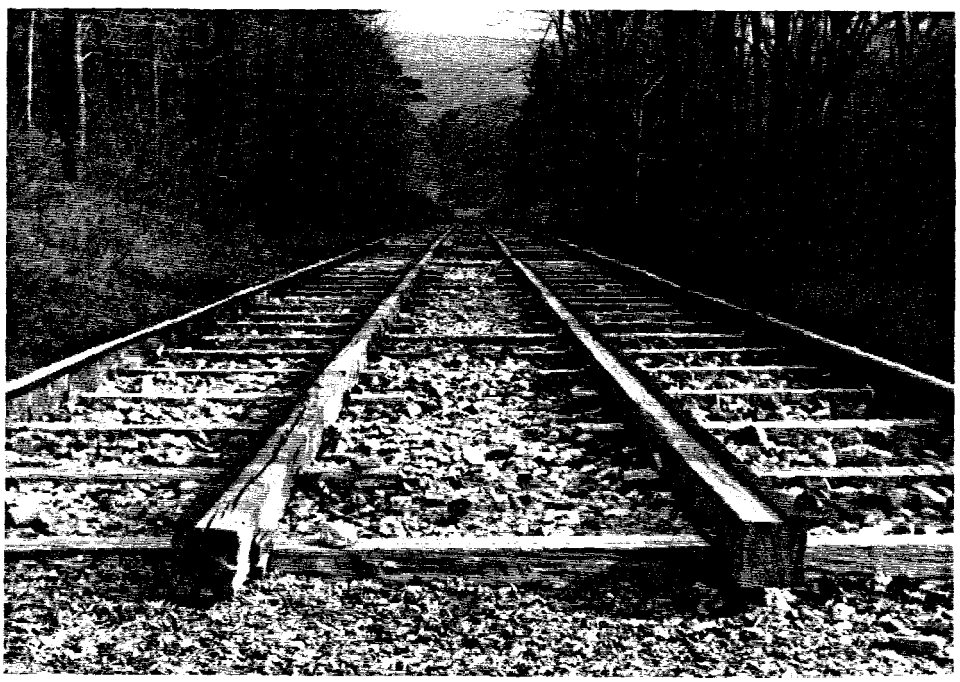


38. SKETCH OF MAPS, 1849 AND 1867.

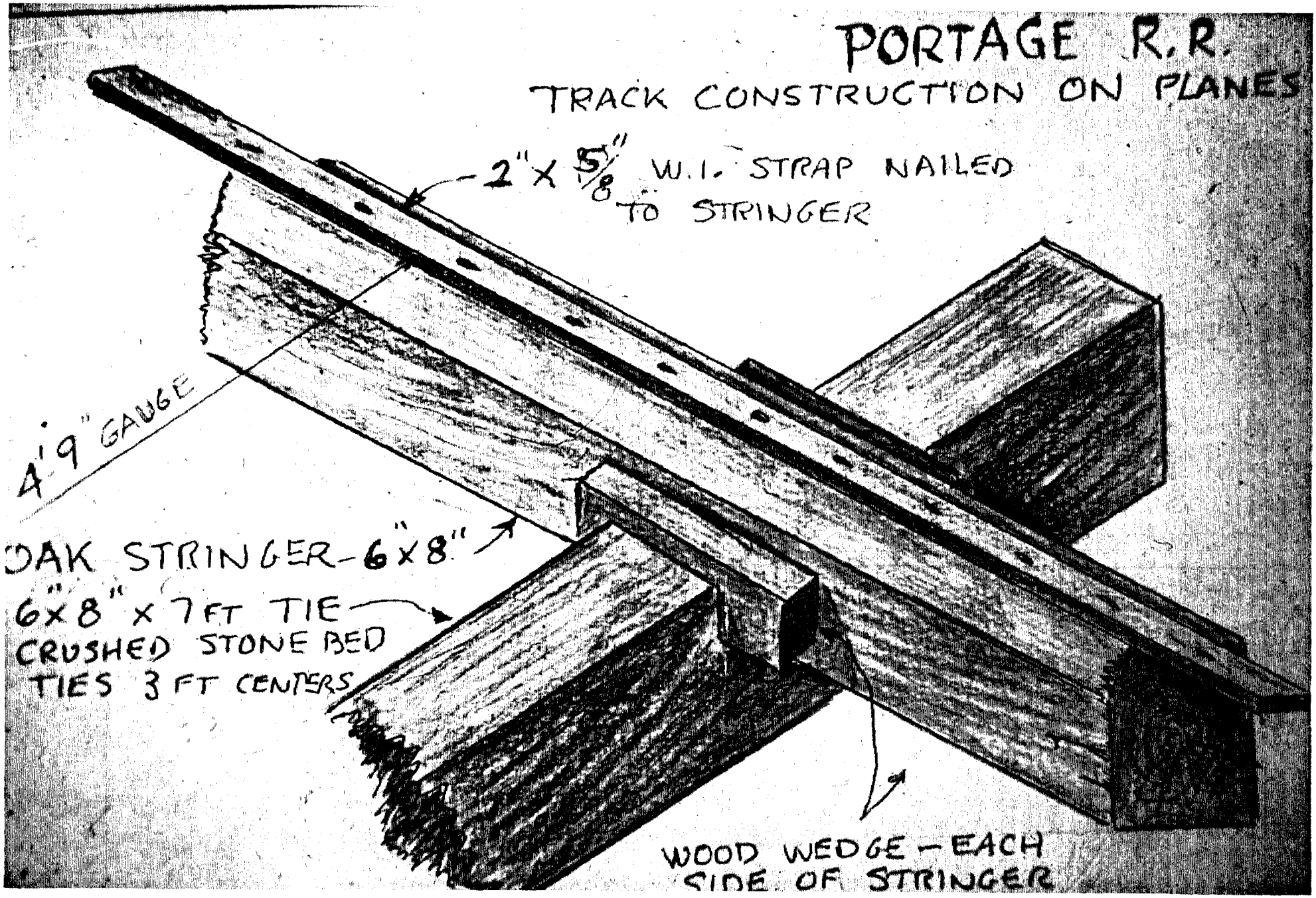
Map shows the boundary between Blair and Cambria counties. The 1849 map indicates that the north road was constructed to connect the Lemon Tavern with Ashland's furnace. The 1867 map shows that two structures belong to Samuel Lemon.

Source: D. J. Beers, Map of Cambria County (Philadelphia: A. Pomeroy, 1867), as found in the Cambria County Historical Society.

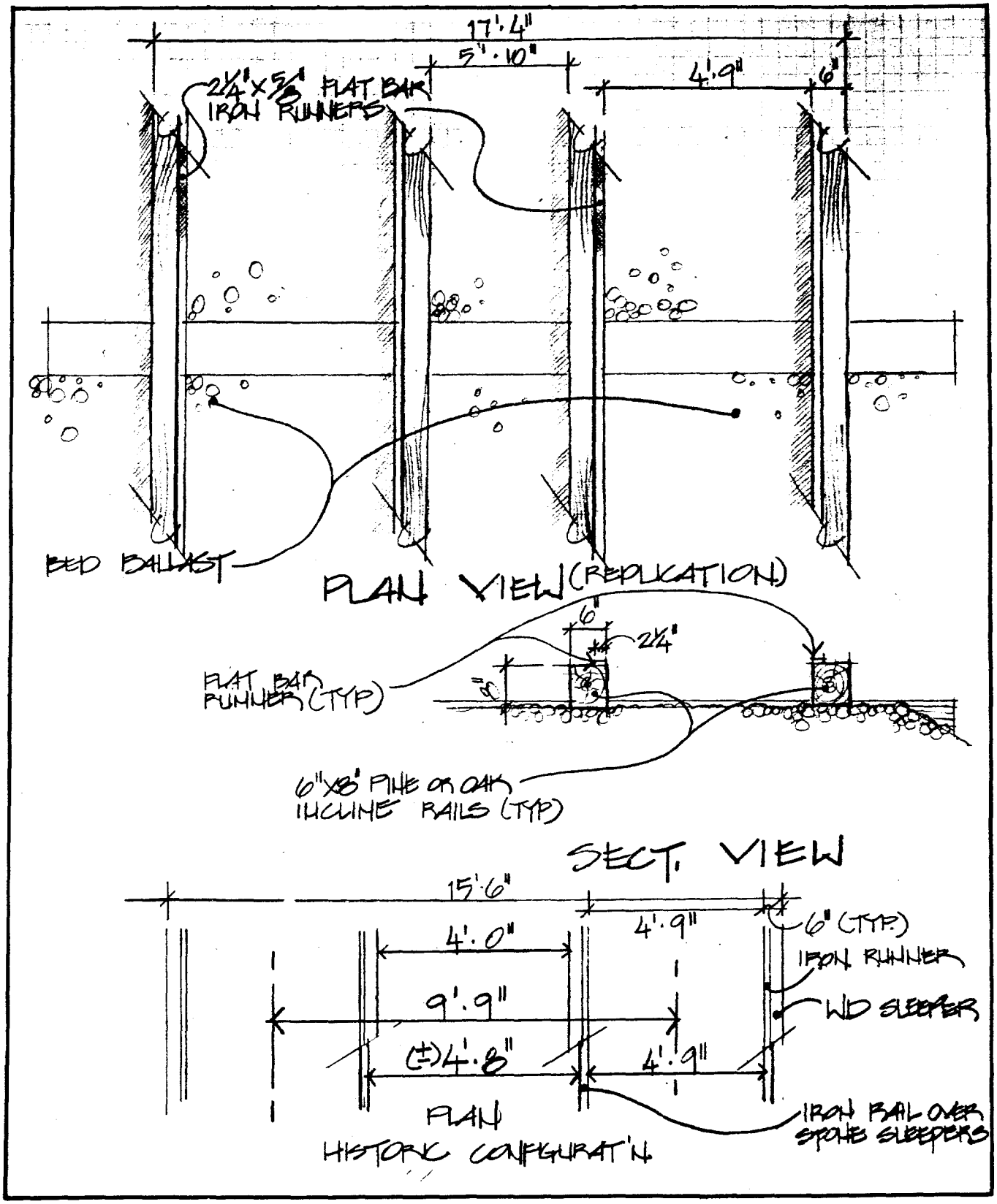
39. NEW TRACKS INSTALLED AT INCLINE 6, 1988. Source: National Park Service.



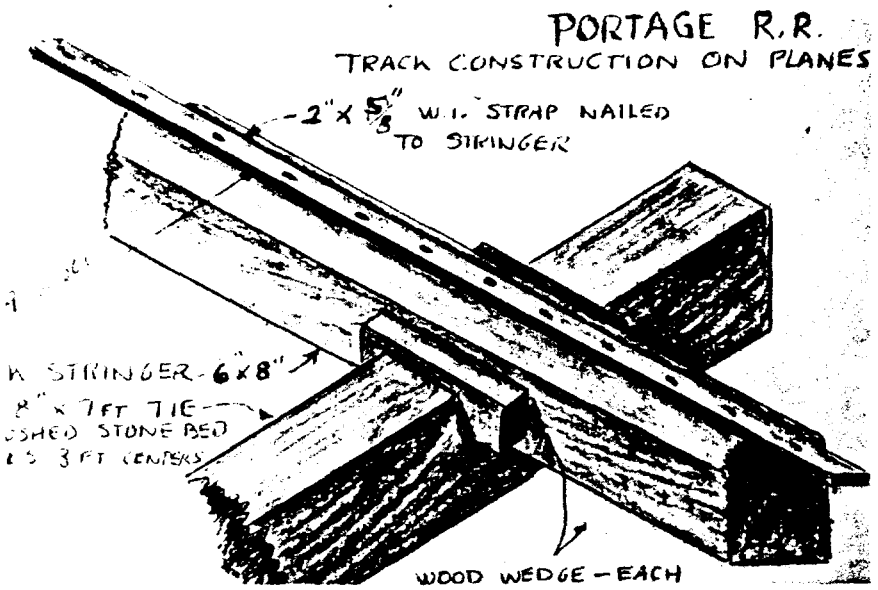
a. Photograph is from the engine house 6 site. Looking down the incline, the Skew Arch Bridge can just be seen.

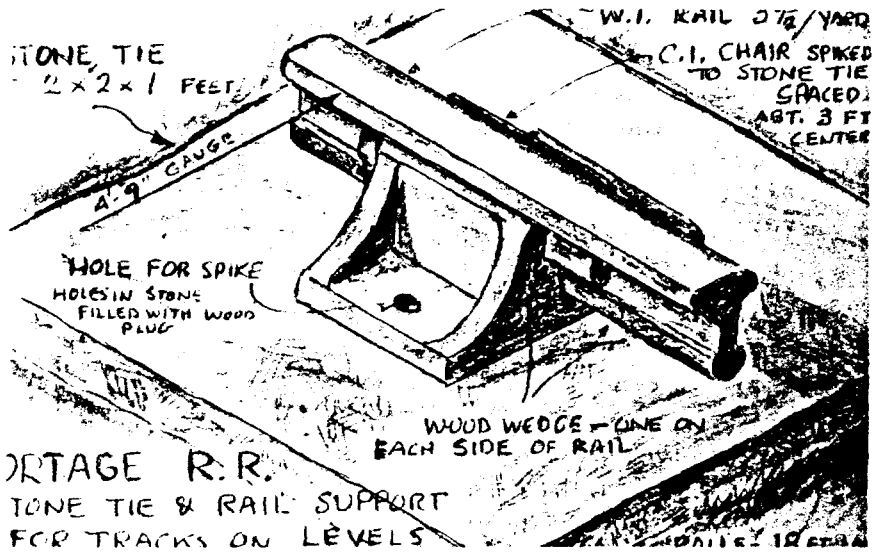


b. Drawing of nonhistoric track. This design was used in constructing the track on incline 6, which was done by the Youth Conservation Corps (YCC) in 1974.



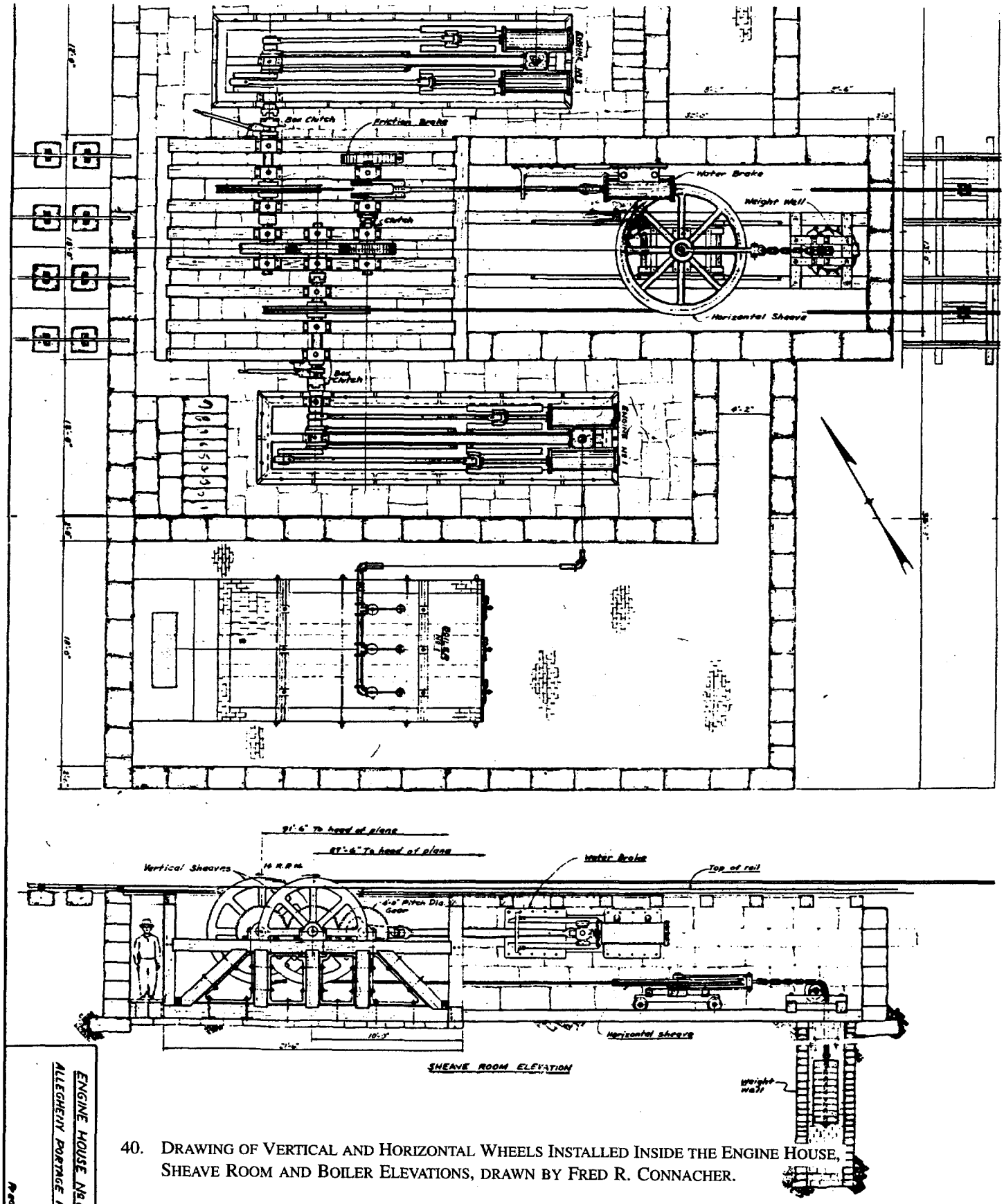
c. Plan view of nonhistoric incline 6 track and section view of historic track. Drawing by Ken Bennett, 1990.





d. Drawings of railroad track construction (no date).

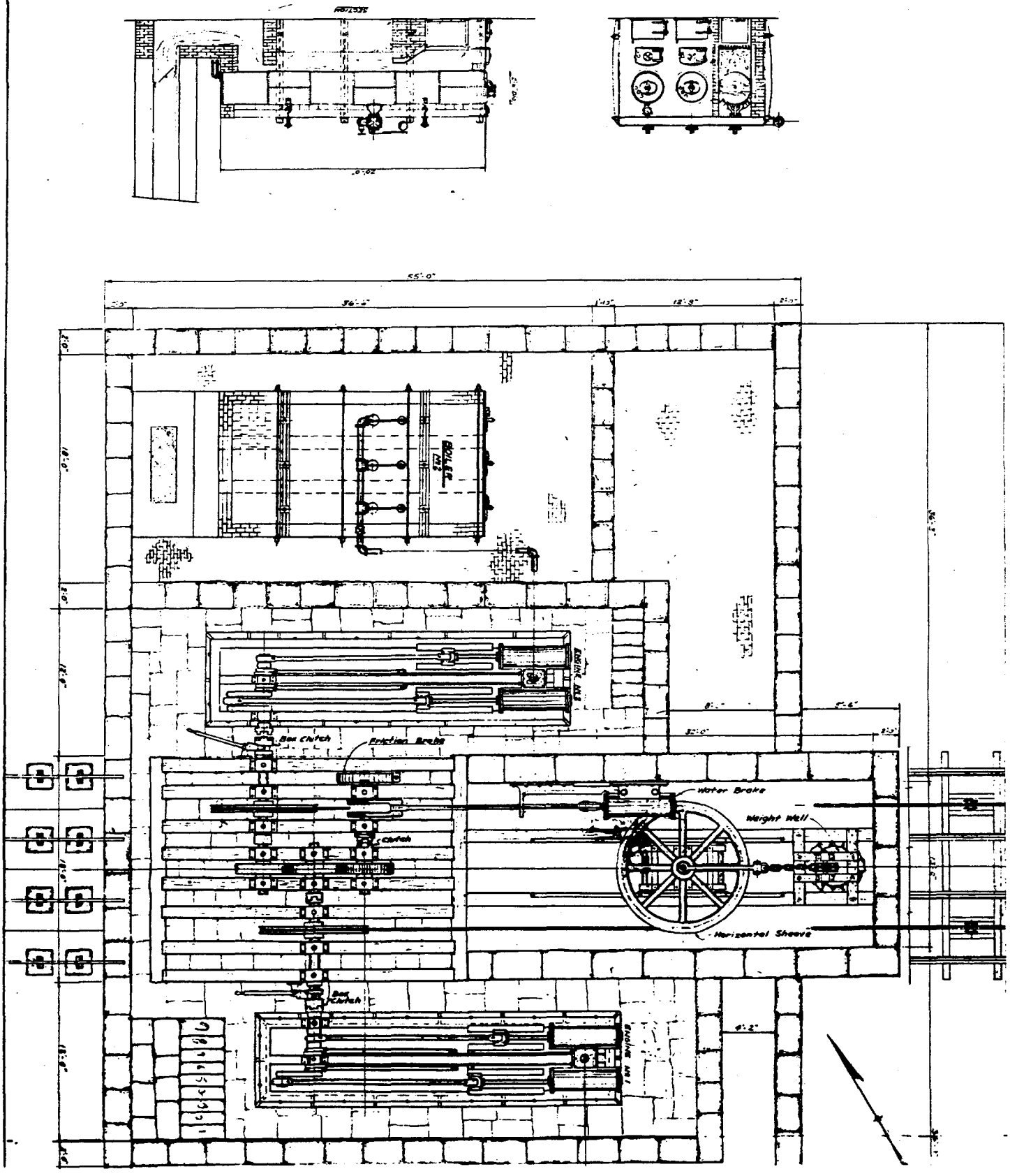
Source: National Park Service, *Allegheny Portage Railroad National Historic Site, Historic Resource Study,* by Anna Coxe Toogood (Denver Service Center 1973), 227.

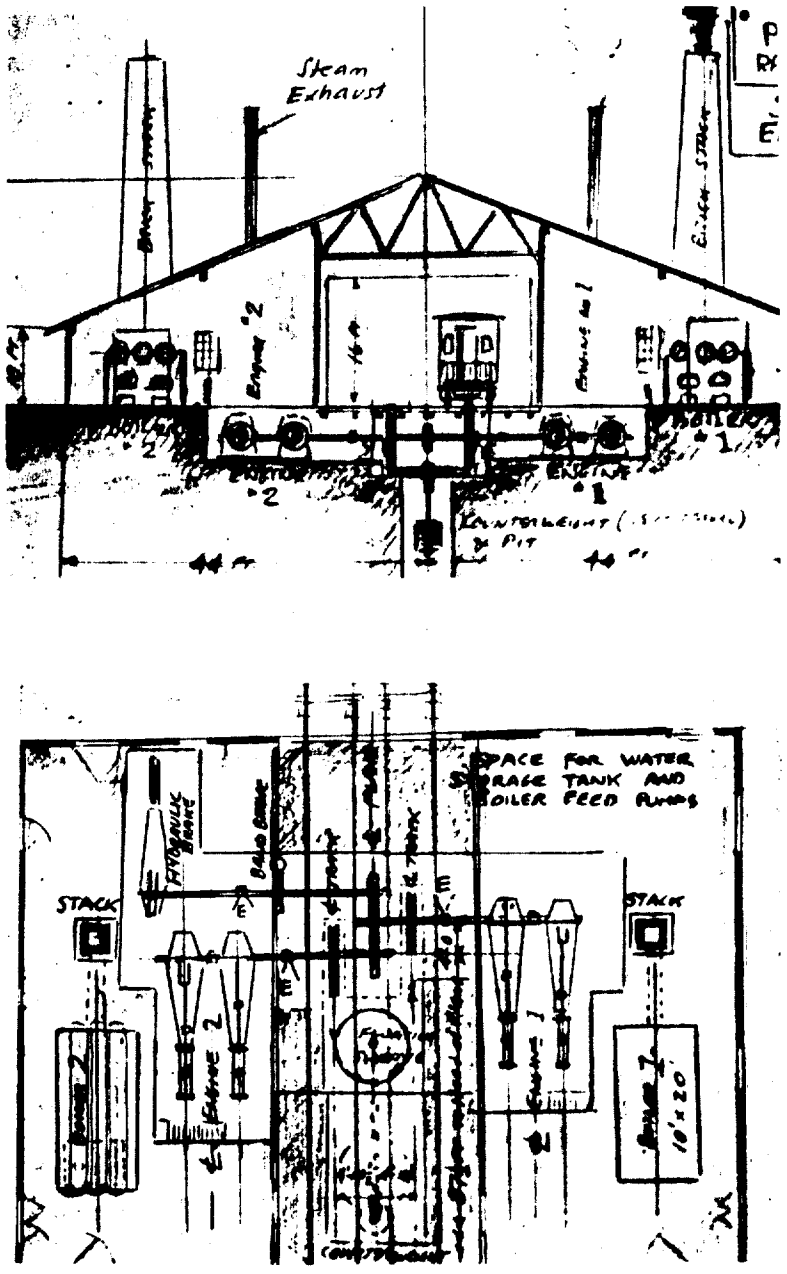


40. DRAWING OF VERTICAL AND HORIZONTAL WHEELS INSTALLED INSIDE THE ENGINE HOUSE, SHEAVE ROOM AND BOILER ELEVATIONS, DRAWN BY FRED R. CONNACHER.

Source: *Sylvester Welch's Report on the Allegheny Portage Railroad, 1833,* with an introduction by William H. Shank (York, PA: American Canal and Transportation Center, 1975), p. 23.

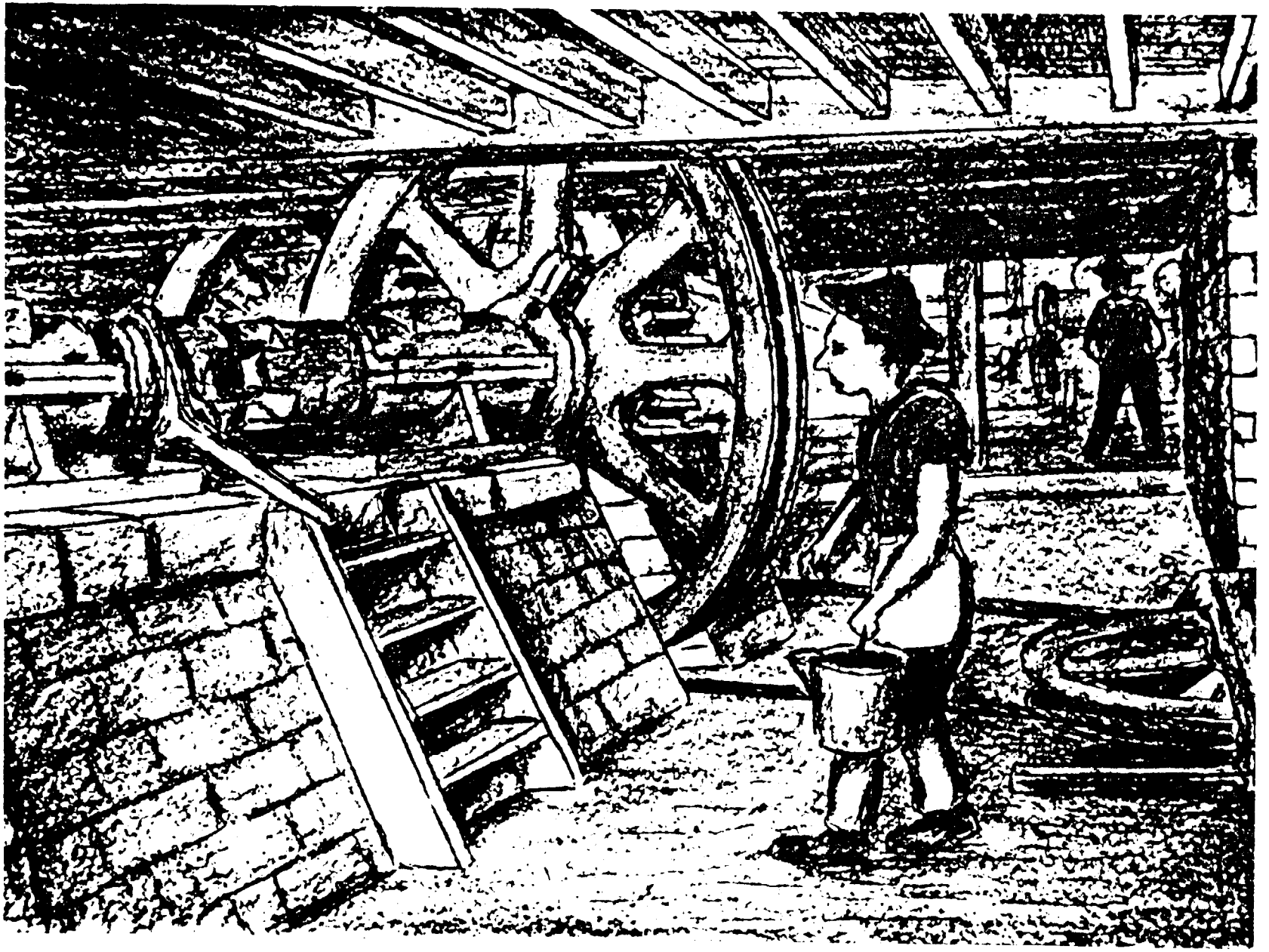
Boiler elevation





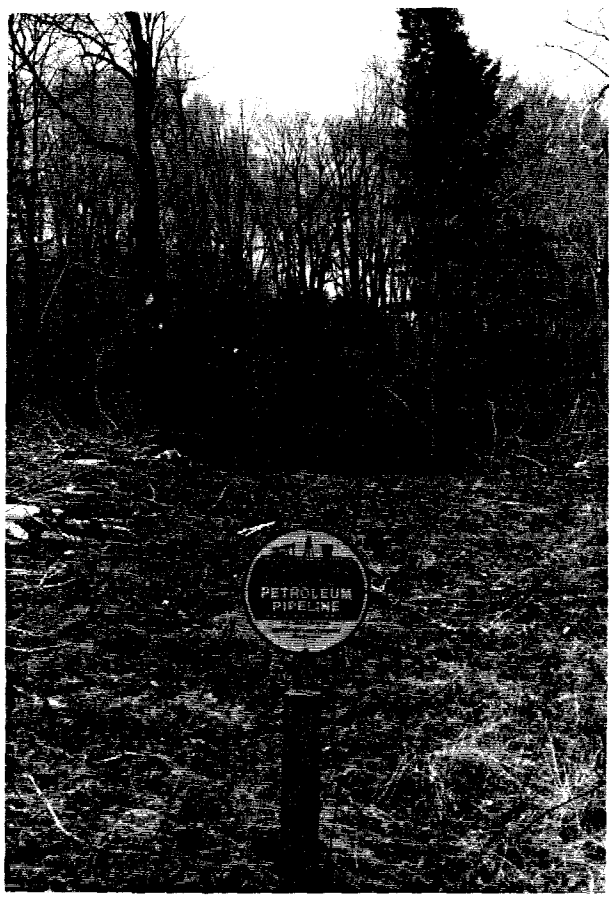
41. ROUGH SKETCHES OF TRANSVERSE SECTION AND FLOOR PLAN, ENGINE HOUSE.

Source: *Sylvester Welch's Report on the Allegheny Portage Railroad, 1833,* with an introduction by William H. Shank (York, PA: American Canal and Transportation Center, 1975), p. 15.

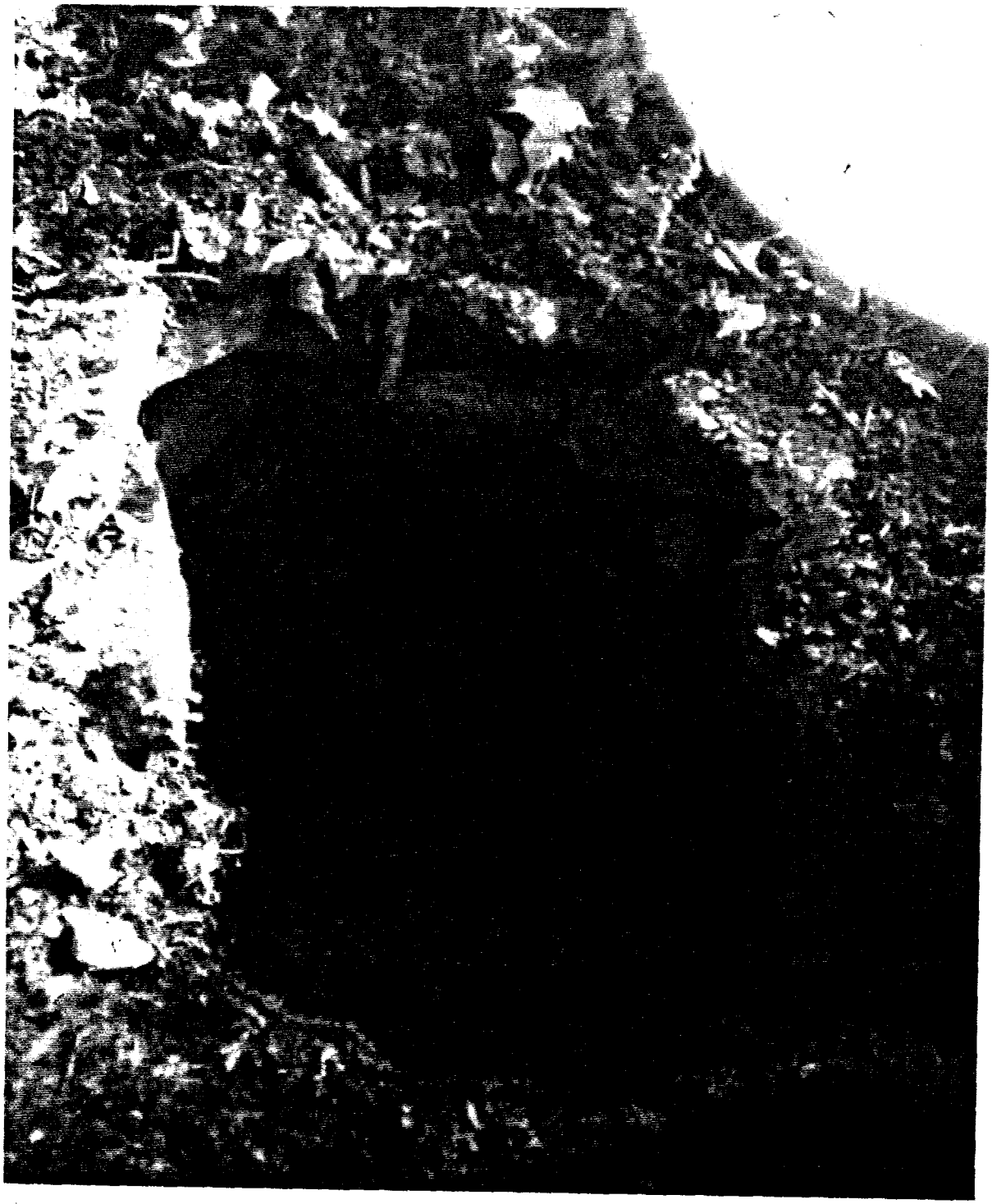


42. ROUGH SKETCH OF ENGINE HOUSE, LOWER LEVEL.

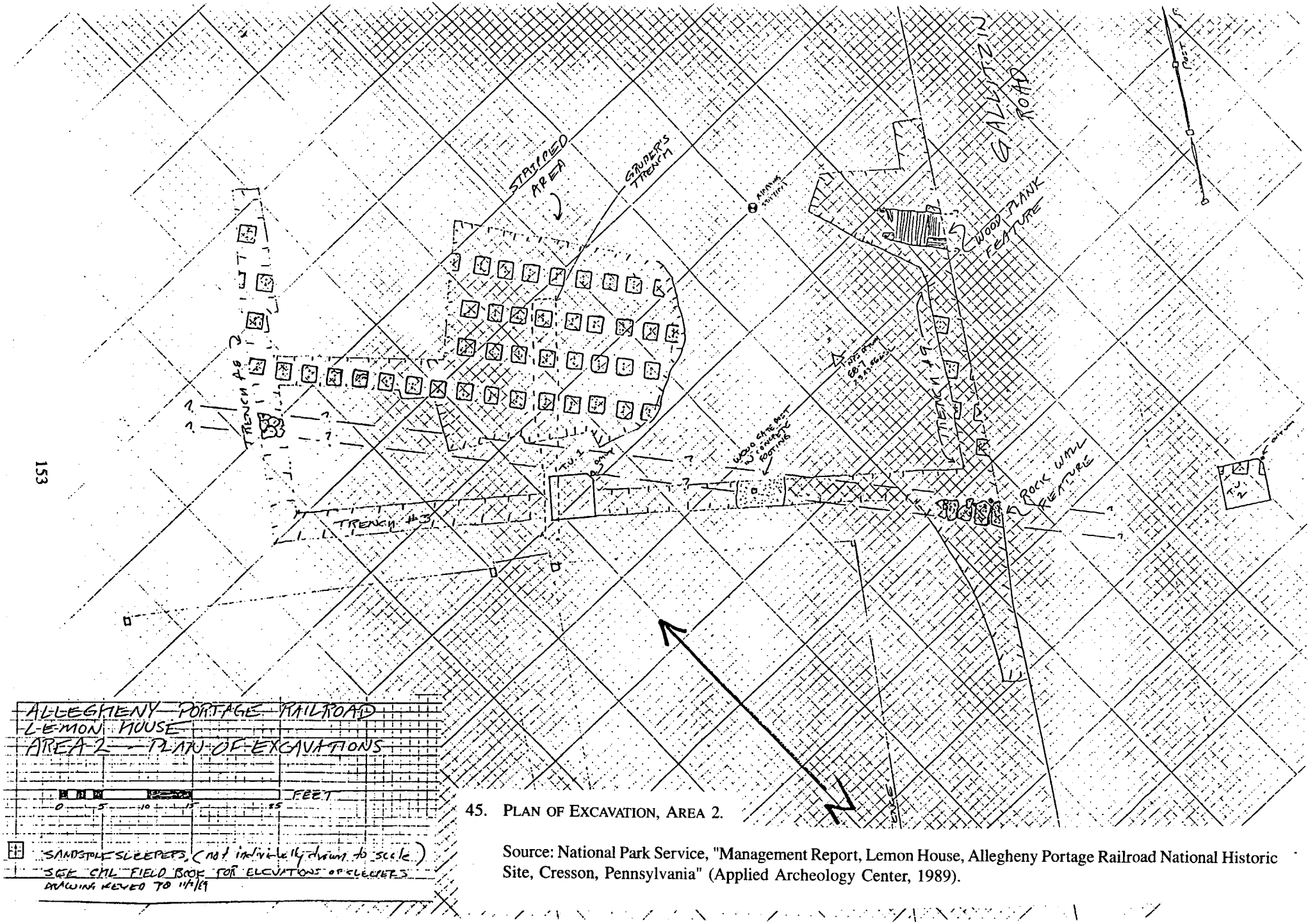
Source: Allegheny Portage Railroad National Historic Site.



43. WARNING SIGN SEEN NEAR CULVERT 1342, NORTHEAST ELEVATION, 1989. Source: National Park Service.



44. SPRINGWATER WELL FOUND SOUTHEAST OF CULVERT 1342, 1989.
Source: National Park Service.



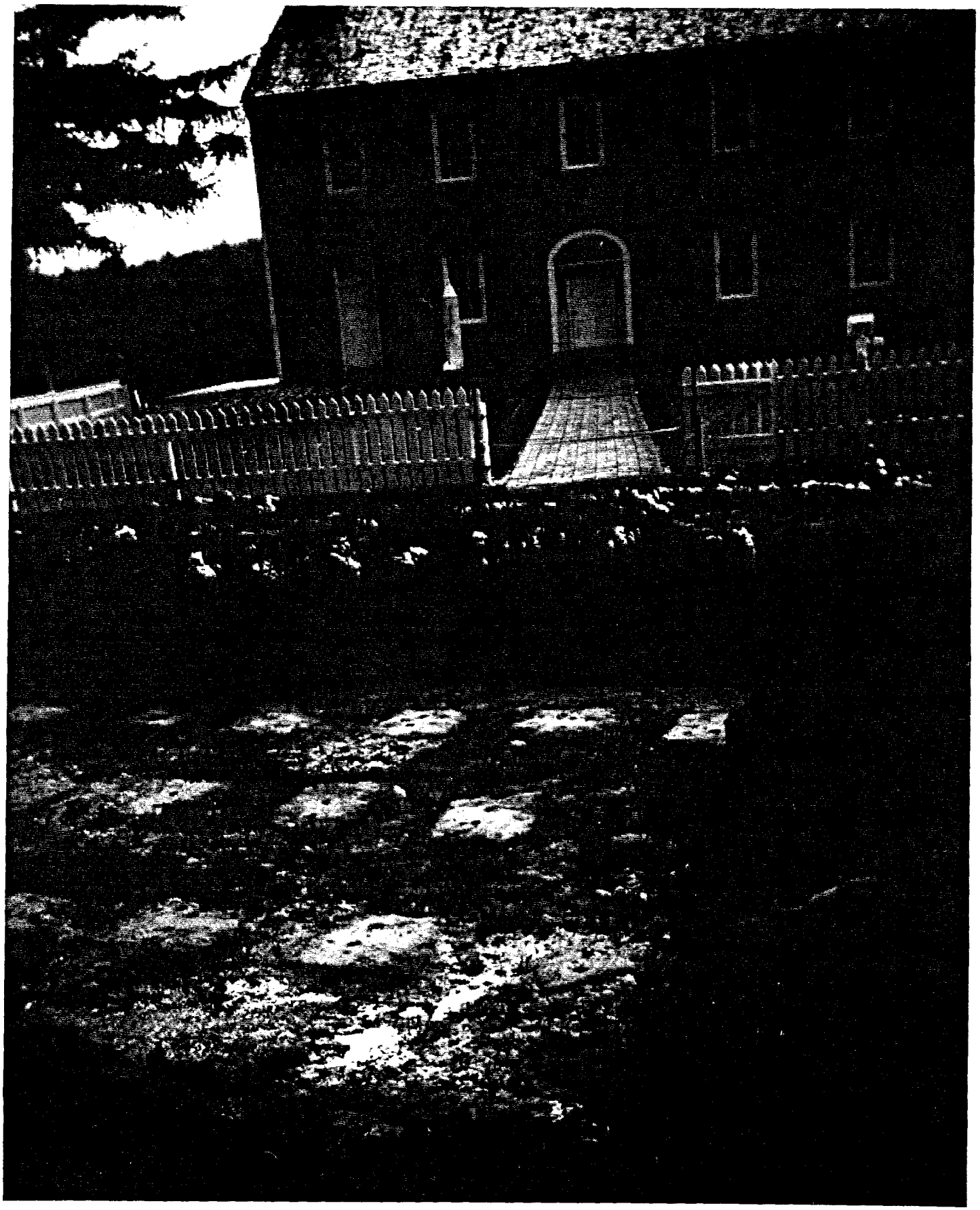
45. PLAN OF EXCAVATION, AREA 2.

Source: National Park Service, "Management Report, Lemon House, Allegheny Portage Railroad National Historic Site, Cresson, Pennsylvania" (Applied Archeology Center, 1989).

46. TRACE EXCAVATIONS IN FRONT OF THE LEMON HOUSE, 1990. Source: National Park Service. a. Excavation, viewing northeast elevation, October 1990.



TRACE EXCAVATION IN [illegible]NT OF LEMON HOUSE (VIEWING EAST EL.)

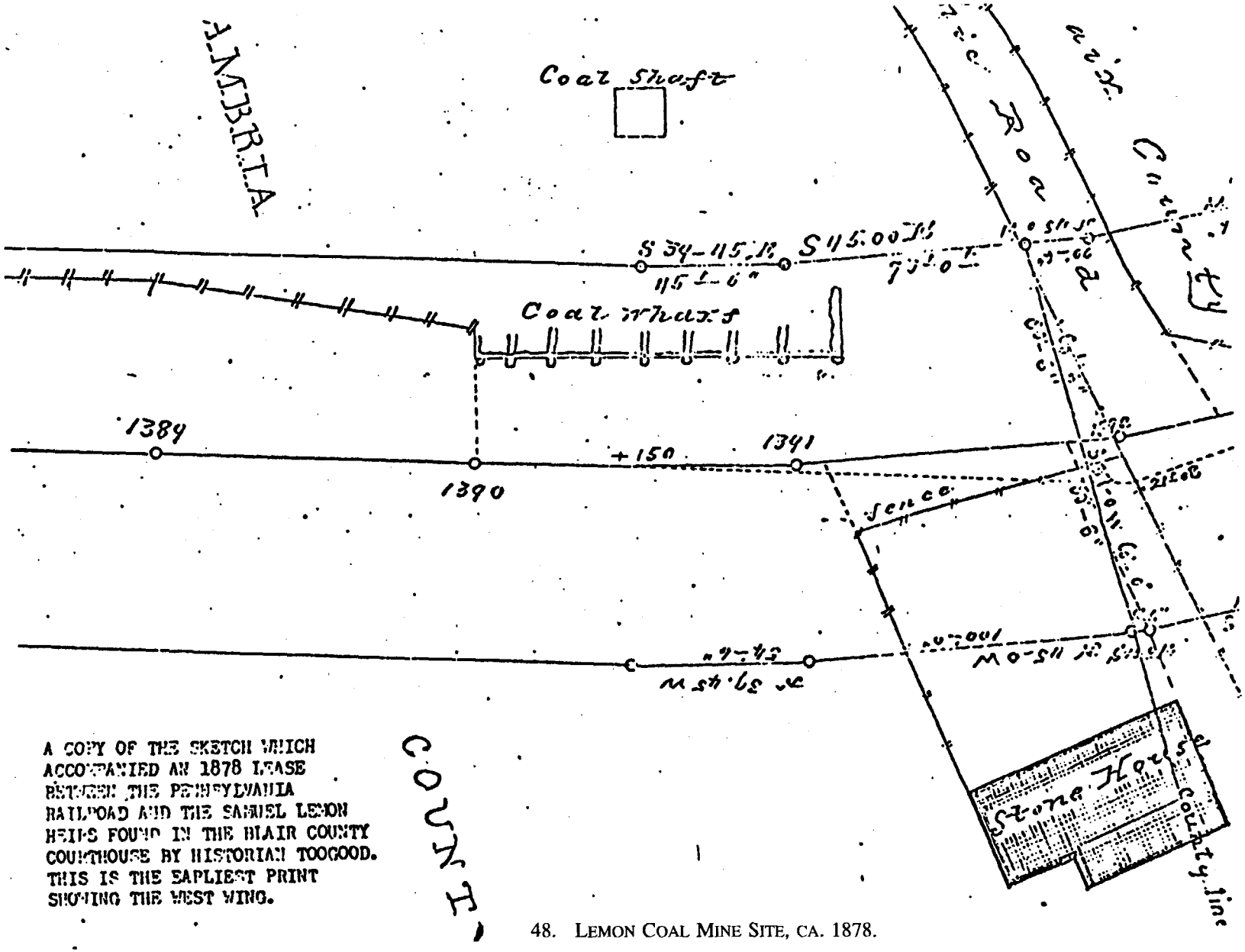


b. After excavation, historic sleepers were exposed. View toward south elevation, October 1990.



47. LEMON HOUSE AND ENGINE HOUSE 6, SOUTHWEST ELEVATIONS, CA. 1884–87.

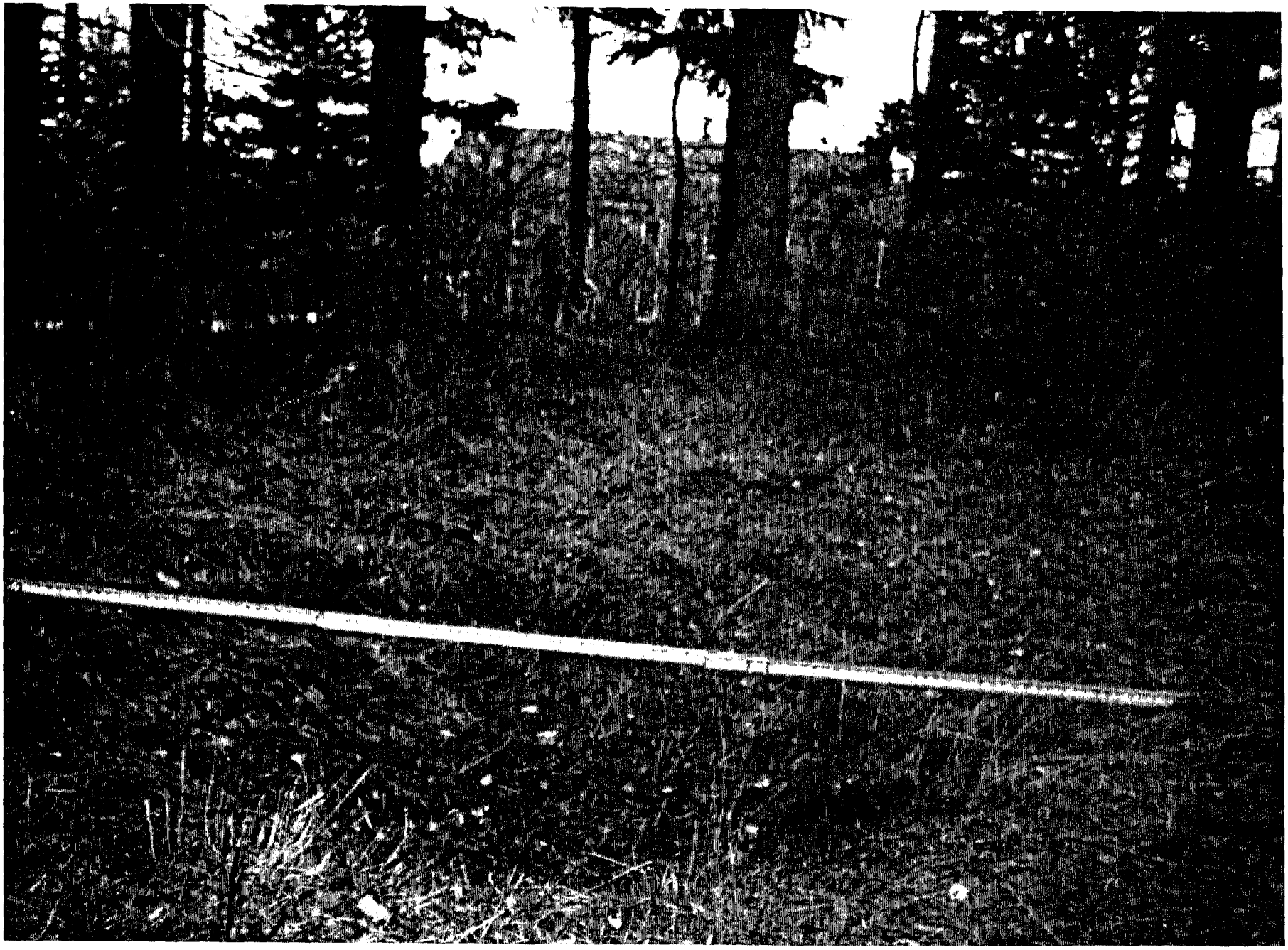
Source: Negative on file at Allegheny Portage Railroad National Historic Site.



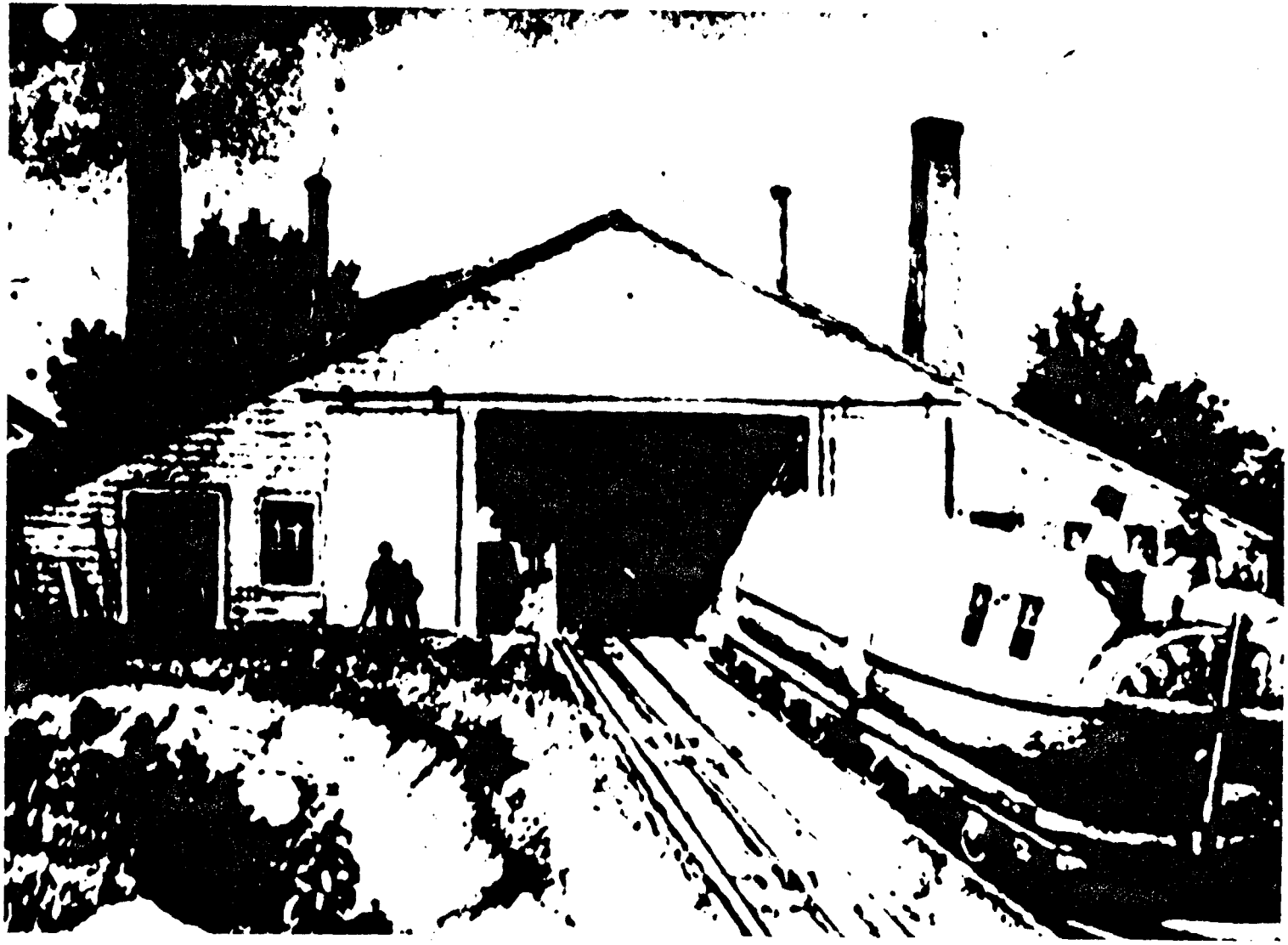
48. LEMON COAL MINE SITE, CA. 1878.

Map shows the Lemon House, the coal mine, the coal wharf, and other features.

Source: Record Group 17, Map Book 3, p. 16, Division of Archives and Manuscripts, Pennsylvania Historical and Museum Commission, Harrisburg.

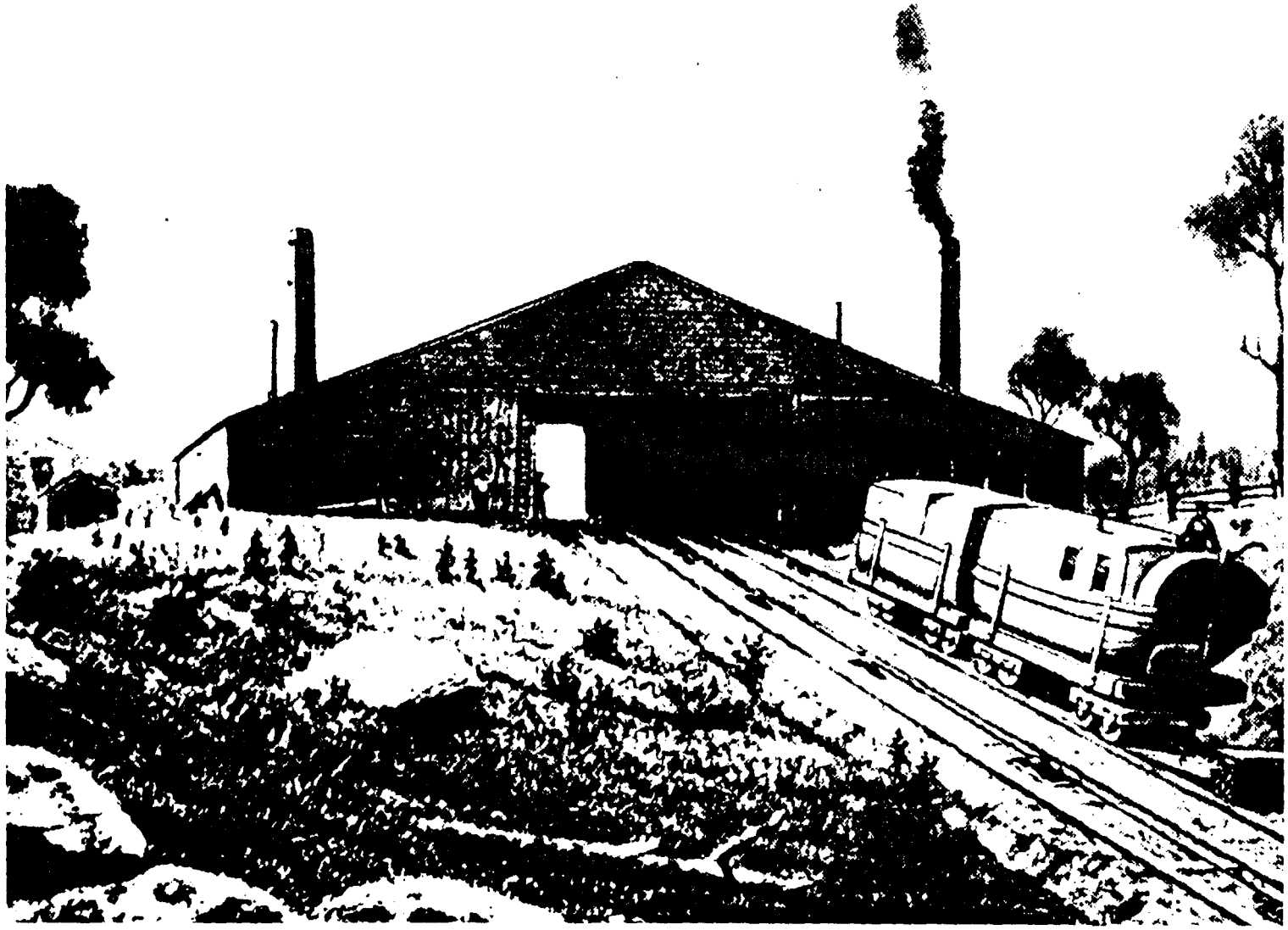


49. LEMON COAL MINE SITE, 1989.
Source: National Park Service.



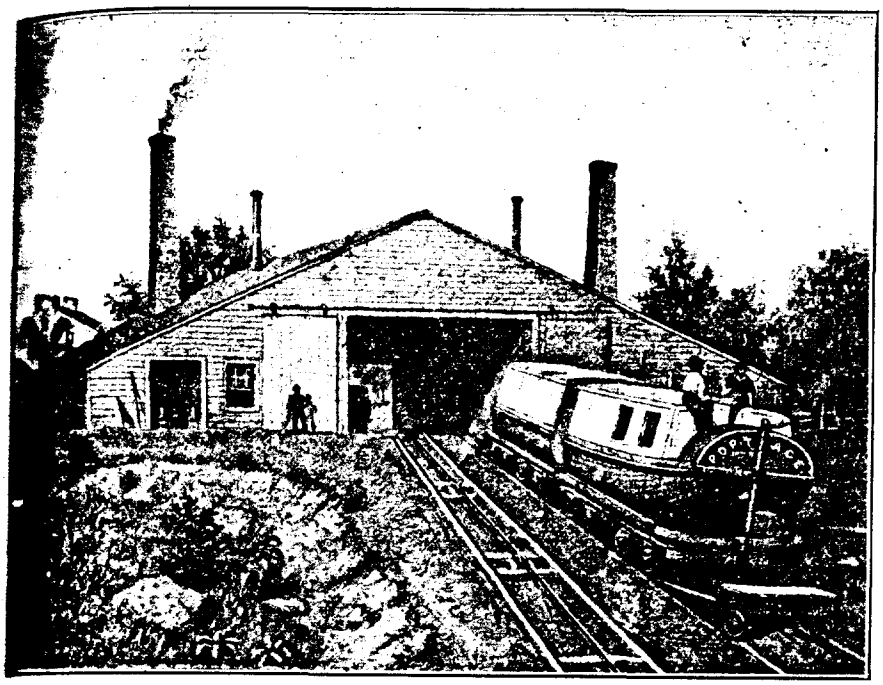
50. ENGINE HOUSE 6, EAST ELEVATION, CA. 1845.

Source: Allegheny Portage Railroad National Historic Site.



51. GEORGE STORM PAINTING OF ENGINE HOUSE 6, EAST ELEVATION, AND HEAD OF INCLINE 6.

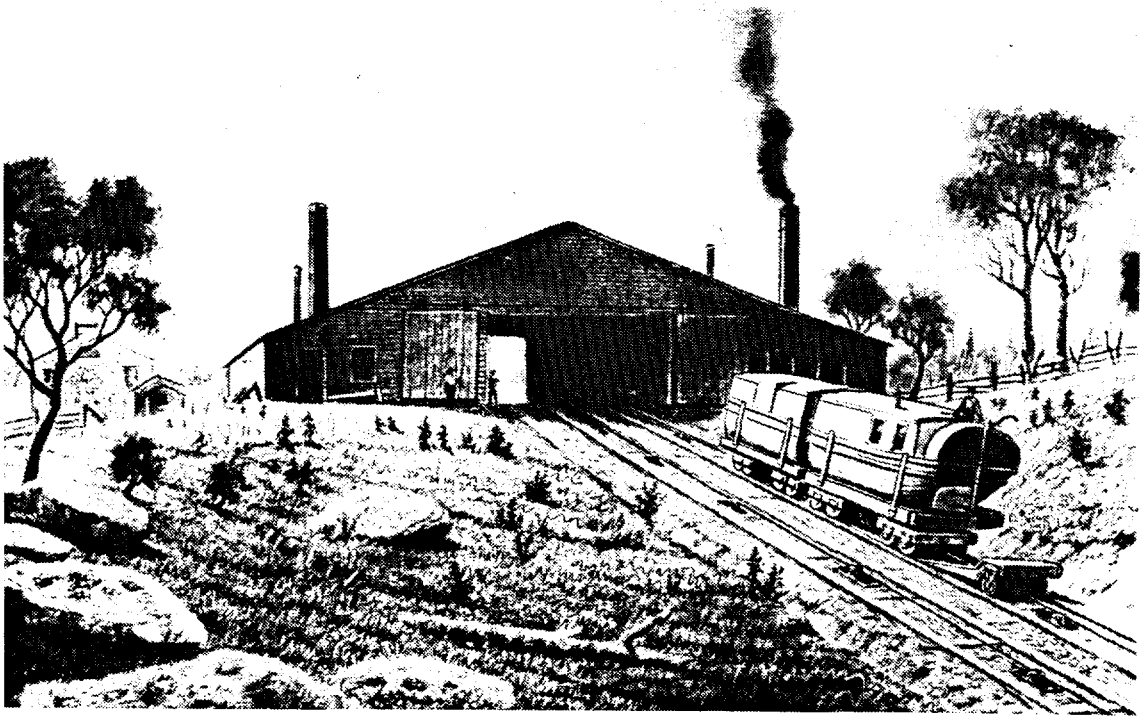
Storm may have derived his information from the ca. 1845 photograph in illustration 50.
Source: Allegheny Portage Railroad National Historic Site.



Head of Plane No. 6. Old Portage Railroad.
Geo. W. Storm, Artist.

52. HEAD OF PLANE NO. 6, OLD PORTAGE RAILROAD, GEO. W. STORM, ARTIST.

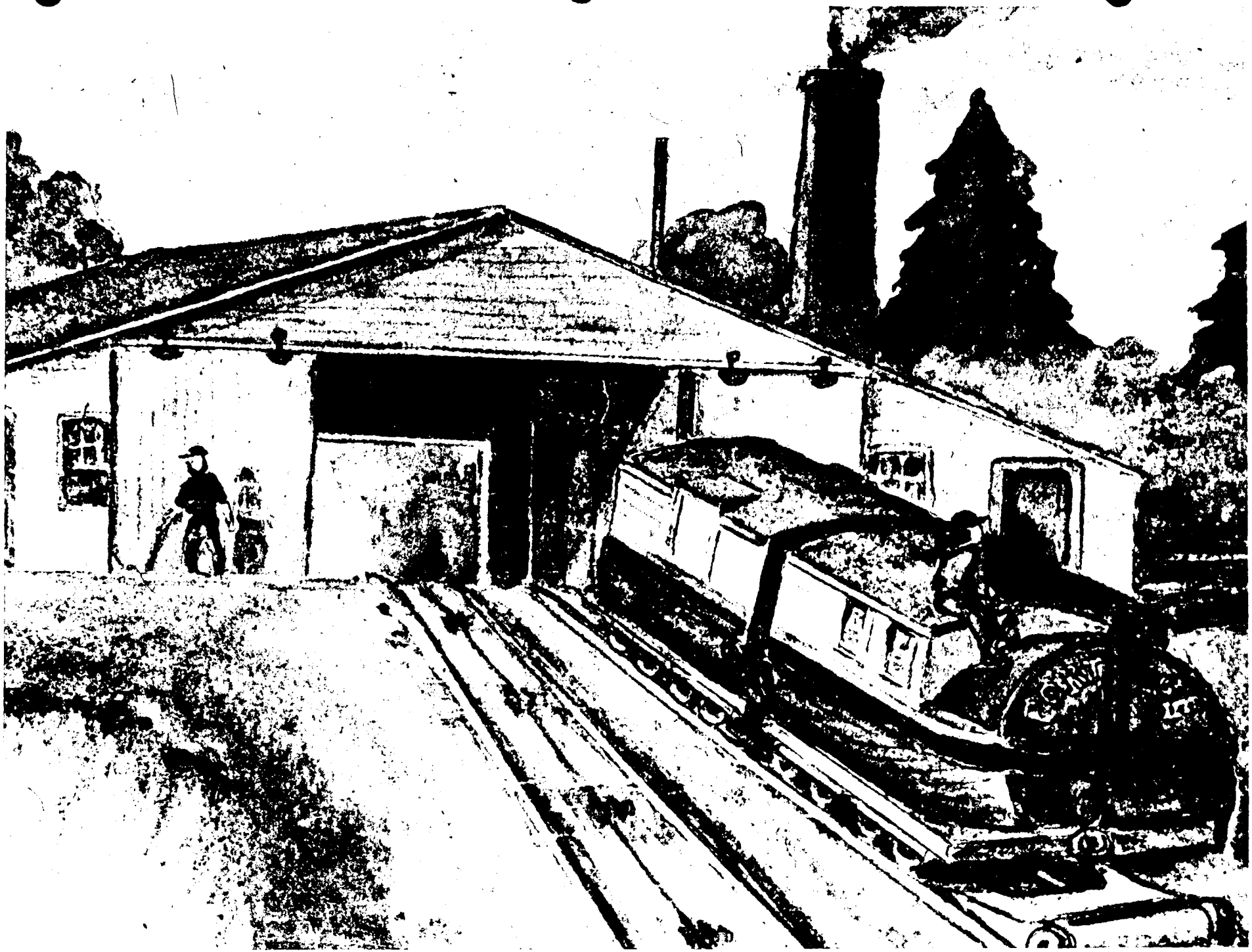
Source: Henry Wilson Storey, *History of Cambria County, Pennsylvania,* vol. 1 (New York: Lewis Publishing Company, 1907).



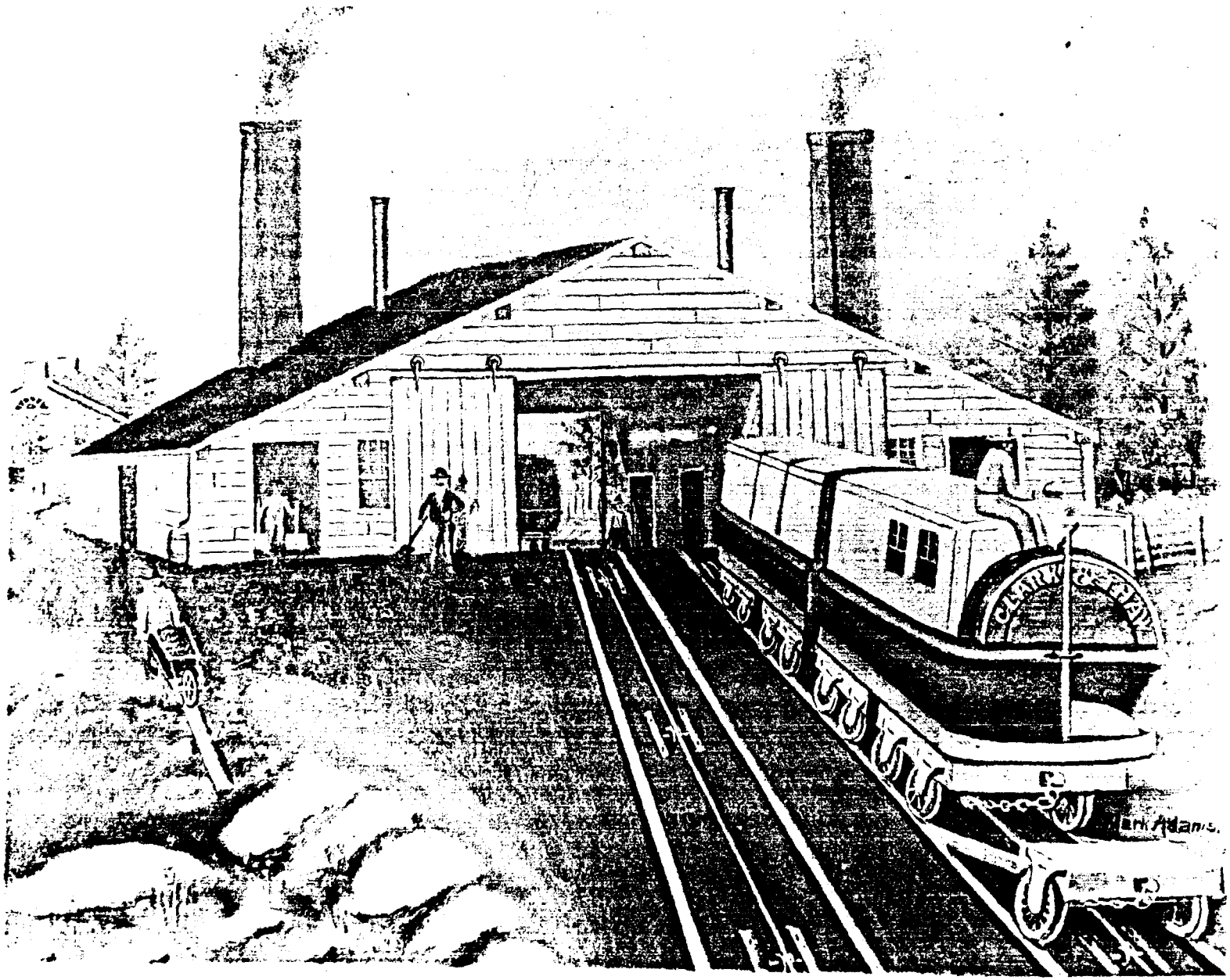
Sectional canal boat ascending Plane #6 on the Old Portage Railroad, highest of the planes on the Hollidaysburg side of the Allegheny Mountain. Plane length 2713 feet; lift 266 feet. Lemon House can be seen in the left background. Hemp ropes were first used to draw the cars and boats up the planes, powered by Stationary Steam Engines at the top. The ropes were approximately seven inches in circumference, cumbersome to handle and not safe. Note "Safety Car" at lower right. Steel cables, developed by John Roebling, were later substituted for the hemp ropes.

53. SECTIONAL CANAL BOAT ASCENDING PLANE #6 ON THE OLD PORTAGE RAILROAD.

Source: *Sylvester Welch's Report on the Allegheny Portage Railroad,* with an introduction by William H. Shank (York, PA: American Canal and Transportation Center, 1975).



54. ENGINE HOUSE 6, EAST ELEVATION. Source: Allegheny Portage Railroad National Historic Site.

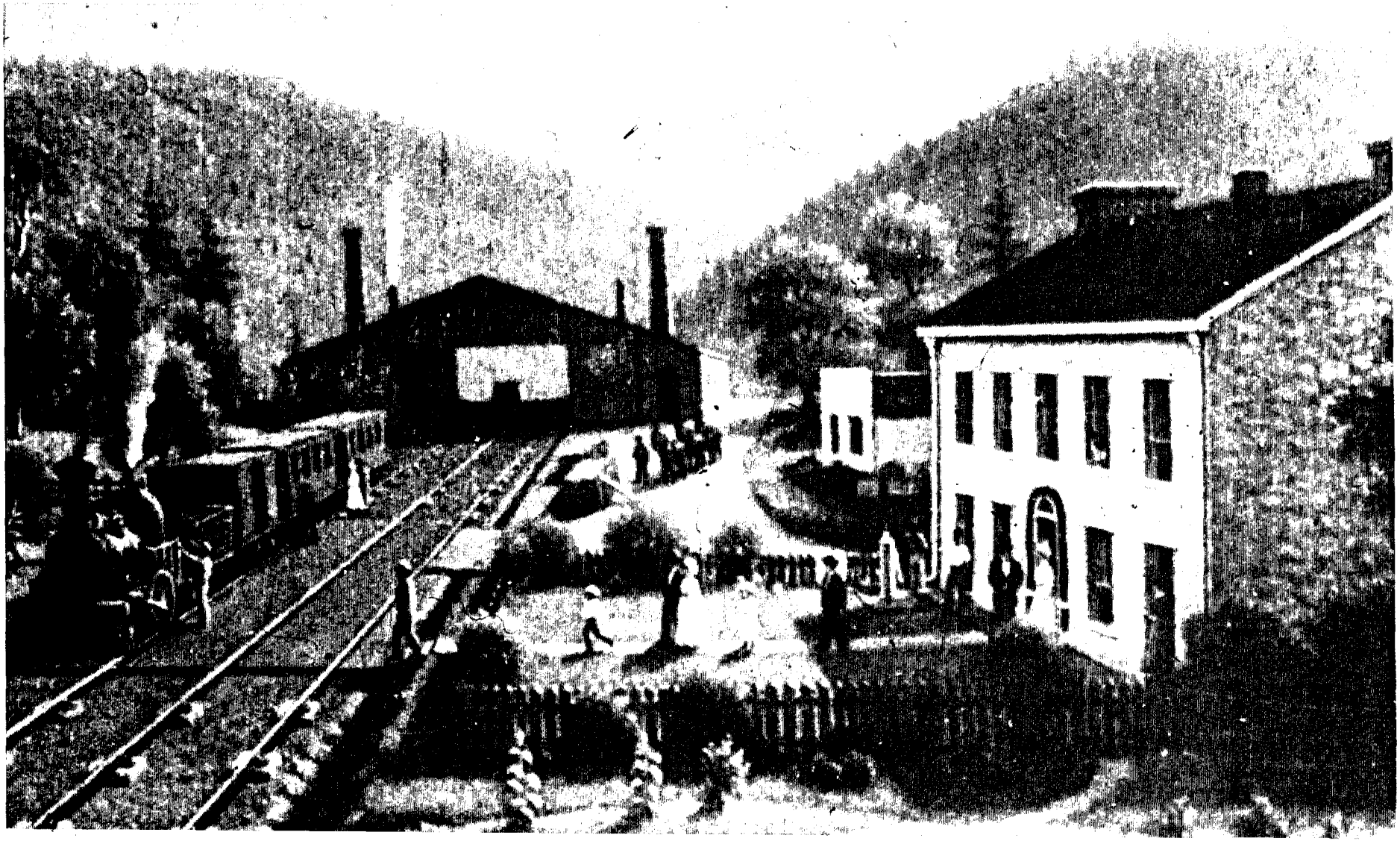


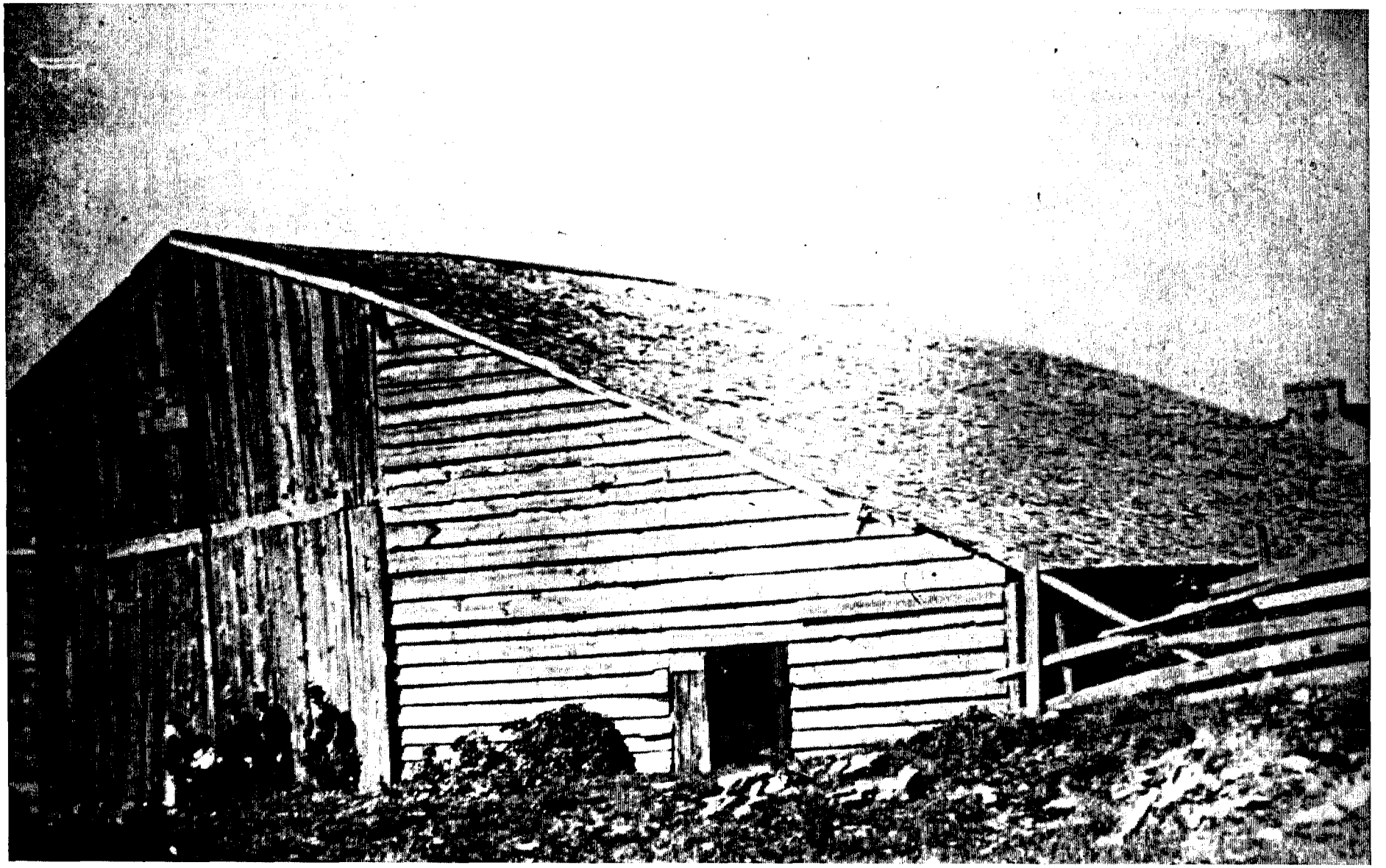
55. MARK ADAMS PAINTING OF ENGINE HOUSE 6, DATE UNKNOWN. Source: On file at Allegheny Portage Railroad National Historic Site.

56. GEORGE STORM PAINTING OF THE SUMMIT UNIT, DATE UNKNOWN.

Paintings shows west elevation of engine house 6, the top of incline 6, and other important features.

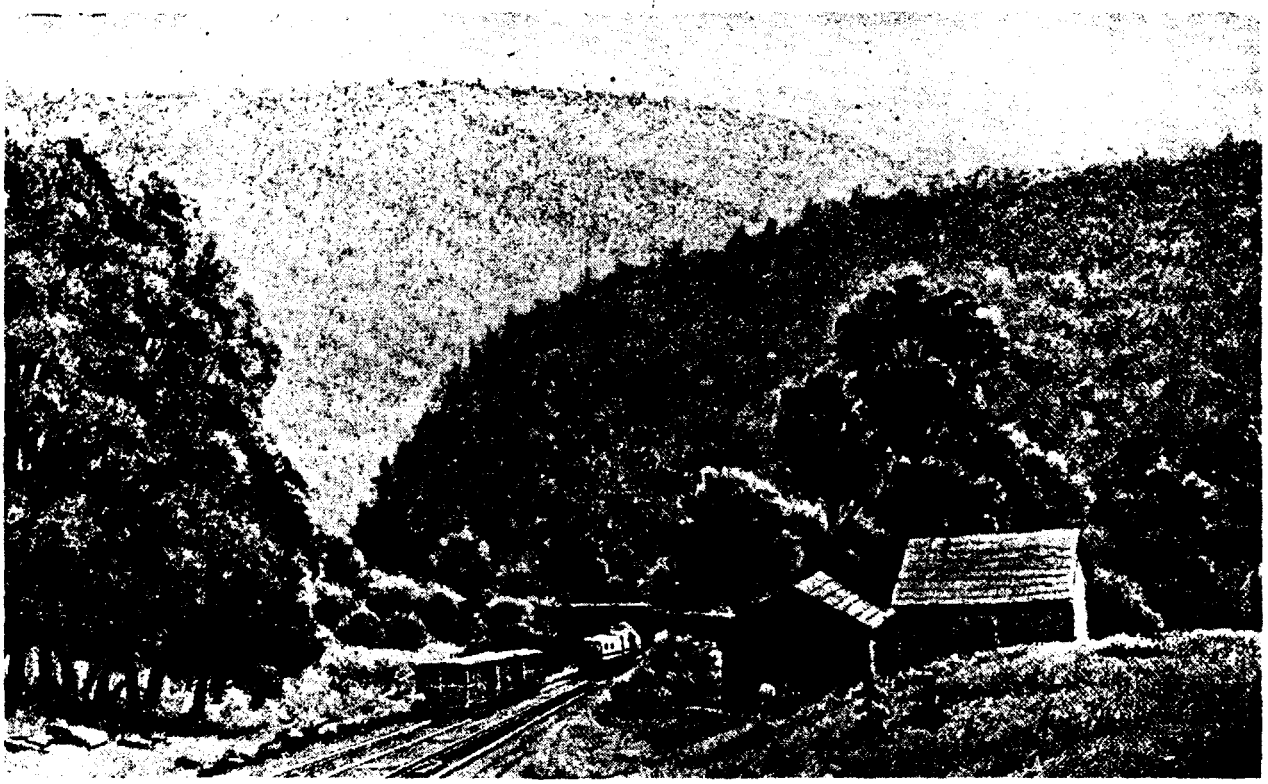
Source: Blair County Historical Society; negative on file at Allegheny Portage Railroad National Historic Site.





57. ENGINE HOUSE 6 BEING USED AS A BARN, DATE UNKNOWN.

The roof of the Lemon House can be seen on the right side. Source: Allegheny Portage Railroad National Historic Site.



INCLINED PLANE No. 6
Located on the eastern slope about 10 miles from Hollidaysburg. The Skew Arch bridge shown in the distance was used by traffic on the Huntingdon, Cambria and Indiana Turnpike.

58. SKEW ARCH BRIDGE, VIEWED FROM INCLINE 6.

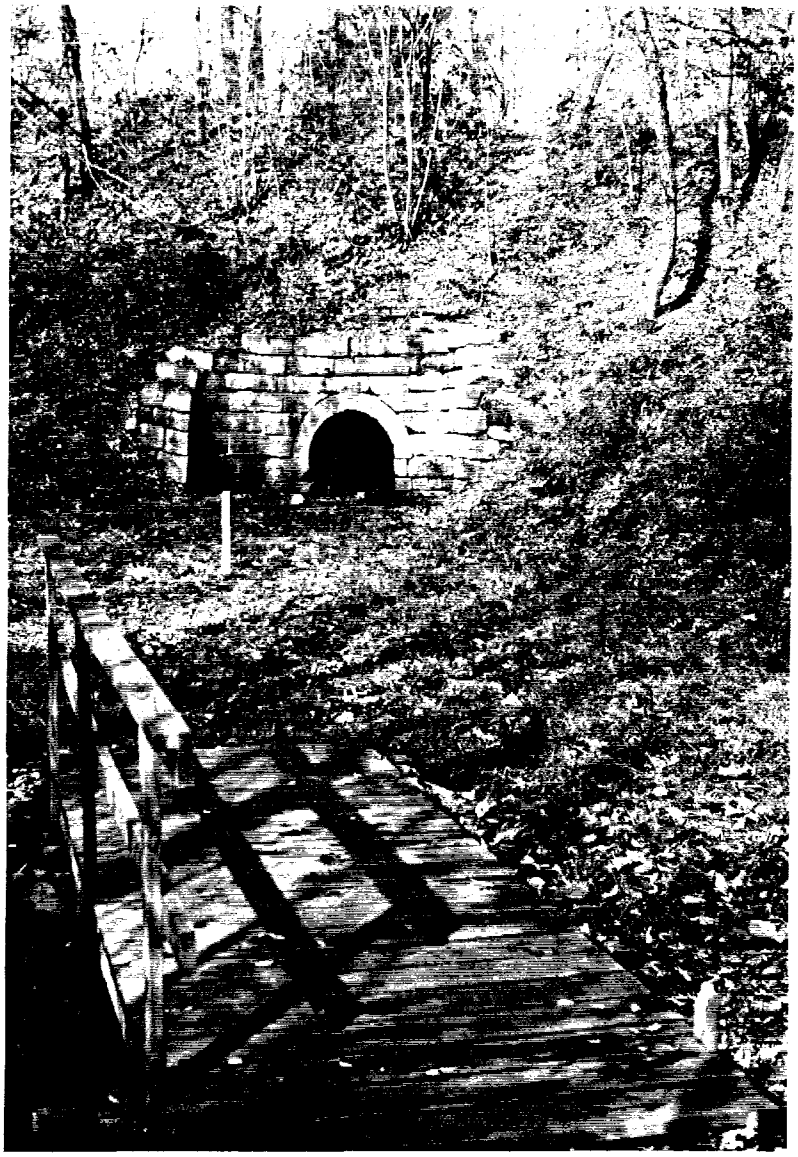
Source: Mahlon J. Baumgardner and Floyd G. Hoenstine, *The Allegheny Old Portage Railroad, 1834–1854, Building, Operation and Travel between Hollidaysburg and Johnstown, Pennsylvania* (N.p.: By the authors, 1952).



59. GEORGE STORM PAINTING OF INCLINE 6 AND SKEW ARCH BRIDGE, 1840S.
Source: On file at Allegheny Portage Railroad National Historic Site.



60. CULVERT 1656, 1989. Photograph was taken from the outlet looking into the interior of the culvert. Stones are slowly slipping and dislodging from the ceiling. Source: National Park Service, Denver Service Center.



61. CULVERT 1733, SOUTH ELEVATION, 1989.

On their way to the culvert, visitors walk through a graded and vegetated area and cross a modern wooden bridge.

Source: National Park Service, Denver Service Center.



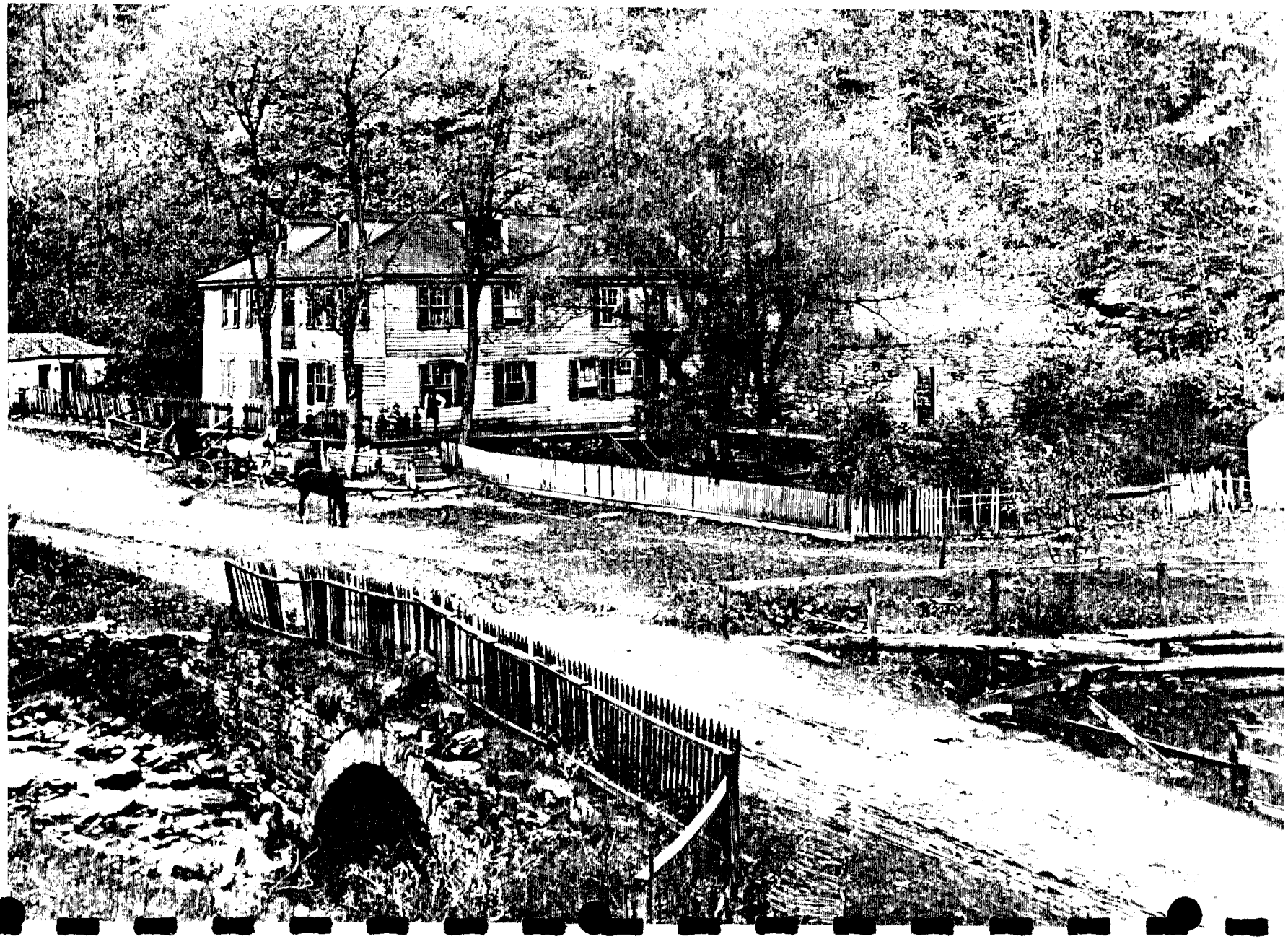
62. TRACE ABOVE CULVERT 1733, 1989.

Photograph shows hole in the trace above the culvert's barrel.

Source: National Park Service, Denver Service Center.

63. LARGE WOODEN HOUSE IN VICINITY OF LEVEL 7, DATE UNKNOWN.

Source: Railroad Museum of Pennsylvania, Strasburg.



EXISTING CONDITIONS DRAWINGS

23. CROSS-SECTION
24. DETAILS
25. MODERN CULVERT 1422: GENERAL INFORMATION

LEVEL NO. 8

26. CULVERT 1464: ELEVATIONS, TRACE, & DETAILS
27. PLAN
28. CROSS-SECTION
29. STRUCTURAL RECOMMENDATIONS
30. CULVERT 1490: ELEVATIONS & DETAILS
31. PLAN & CROSS-SECTION

INCLINED PLANE NO. 6

32. CULVERT 1503: TRACE, ELEVATIONS & DETAILS
33. PLAN & CROSS-SECTION
34. STRUCTURAL RECOMMENDATIONS

LEVEL NO. 9

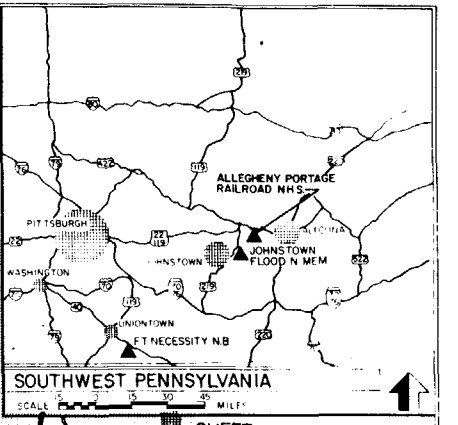
35. CULVERT 1532: ELEVATIONS & TRACES
36. NORTH ELEVATION, TRACE & DETAILS
37. PLAN & CROSS-SECTION
38. STRUCTURAL RECOMMENDATIONS
39. CULVERT 1586: TRACES, ELEVATIONS & DETAILS
40. ELEVATIONS
41. PLAN, CROSS-SECTION, STRUCTURAL RECOMMENDATIONS

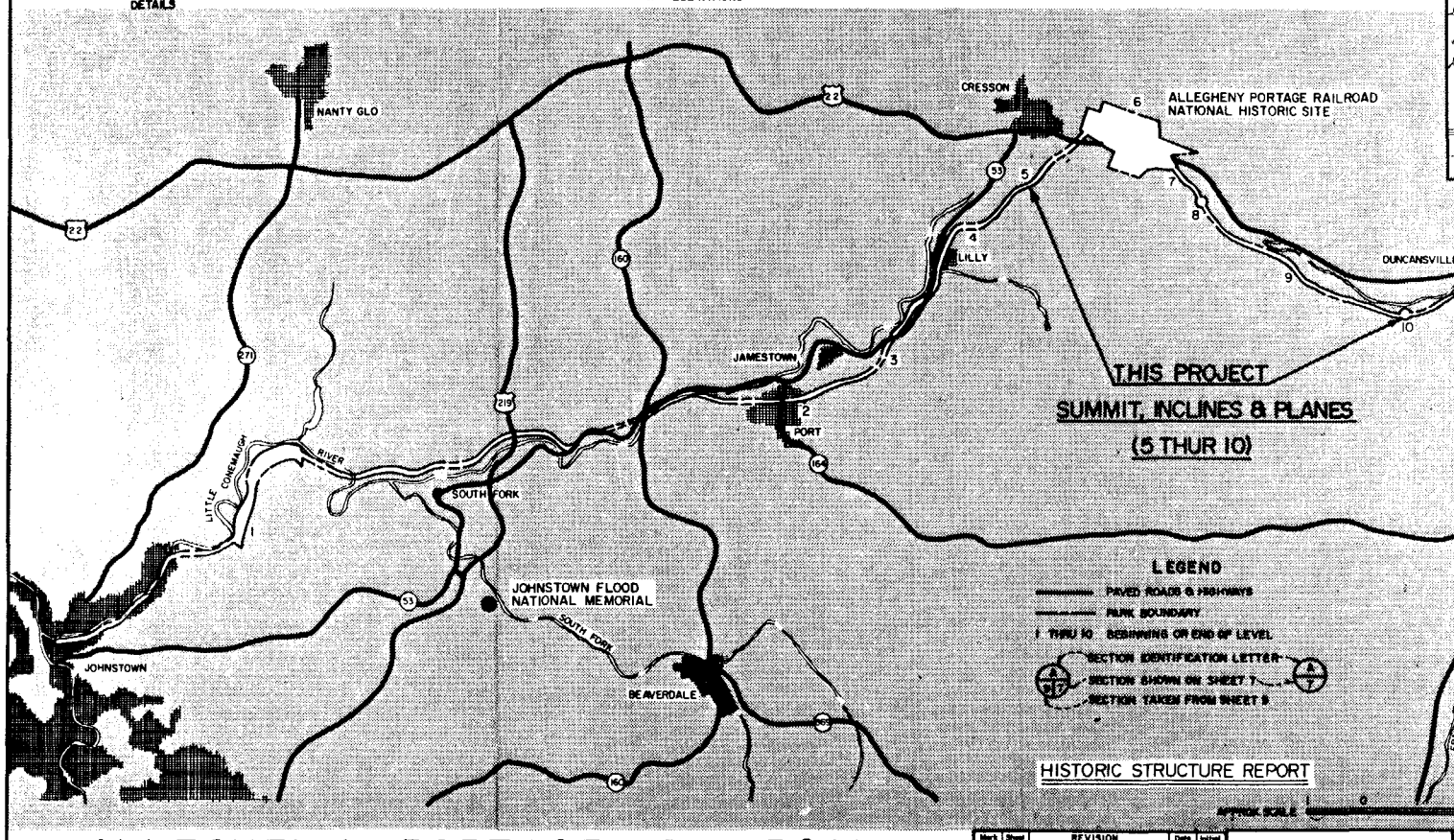
LEVEL NO. 10

42. CULVERT 1624: TRACE VIEWING WEST & EAST ELEVATIONS & NORTHWEST ELEVATION
43. ELEVATIONS
44. PLAN, CROSS-SECTION, & STABILIZATION RECOMMENDATIONS
45. CULVERT 1635: TRACES, ELEVATIONS & DETAILS
46. PLAN, CROSS-SECTION & STABILIZATION RECOMMENDATIONS
47. CULVERT 1656: TRACES, ELEVATIONS & DETAILS
48. SCHEMATIC PLAN, CROSS-SECTION, & STABILIZATION RECOMMENDATIONS
49. CULVERT 1692: TRACE, ELEVATION & DETAIL
50. PLAN, CROSS-SECTION, & STABILIZATION RECOMMENDATIONS
51. CULVERT 1697: TRACE & ELEVATIONS
52. PLAN, CROSS-SECTION & STABILIZATION RECOMMENDATIONS

INCLINED PLANE NO. 10

53. CULVERT 1733: TRACE, ELEVATION, & DETAIL
54. PLAN & CROSS-SECTION





SHEET NO.	TITLE
1.	COVER SHEET
2.	TOPOGRAPHIC MAP, PROFILE, TABLE
3.	LEGEND
	LEVEL NO. 6
4.	CULVERT 1342: ELEVATIONS & TRACES
5.	PLAN, ELEVATION, CROSS-SECTION & DETAIL
6.	STRUCTURAL RECOMMENDATIONS
7.	CULVERT 1356: ELEVATIONS, TRACE & DETAIL
8.	PLAN & CROSS-SECTION
9.	STRUCTURAL RECOMMENDATIONS
10.	CULVERT 1382: ELEVATIONS, TRACE & DETAIL
11.	PLAN & CROSS-SECTION
12.	STRUCTURAL RECOMMENDATIONS
	SUMMIT LEVEL
13.	LEMON HOUSE ELEVATIONS
14.	ENGINE HOUSE NO. 6: FOUNDATION PLAN & TRACES
15 & 16.	CROSS-SECTIONS & ELEVATIONS
17.	TOPO, CONJECTURAL EAST EL., & VIEWS
	INCLINED PLANE NO. 6
18.	SKEW ARCH BRIDGE: ELEVATIONS, TRACE & DETAILS
19.	BRIDGE DETAILS
20.	1979 STABILIZATION
21.	PLANS, UPPER & LOWER SECTIONS
22.	EAST & WEST ELEVATIONS

ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE

BASIC DATA: GPO 1973 515-986/130; 423/27,000; 423/80,007

Mark	Sheet	REVISION	Date	Initial

EXISTING CONDITIONS DRAWINGS

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DENVER SERVICE CENTER

PREPARED: EXISTING
DESIGNED: GONZALES
DRAWN: H. LaFLEUR
CHECKED:
AUGUST 1990 DATE

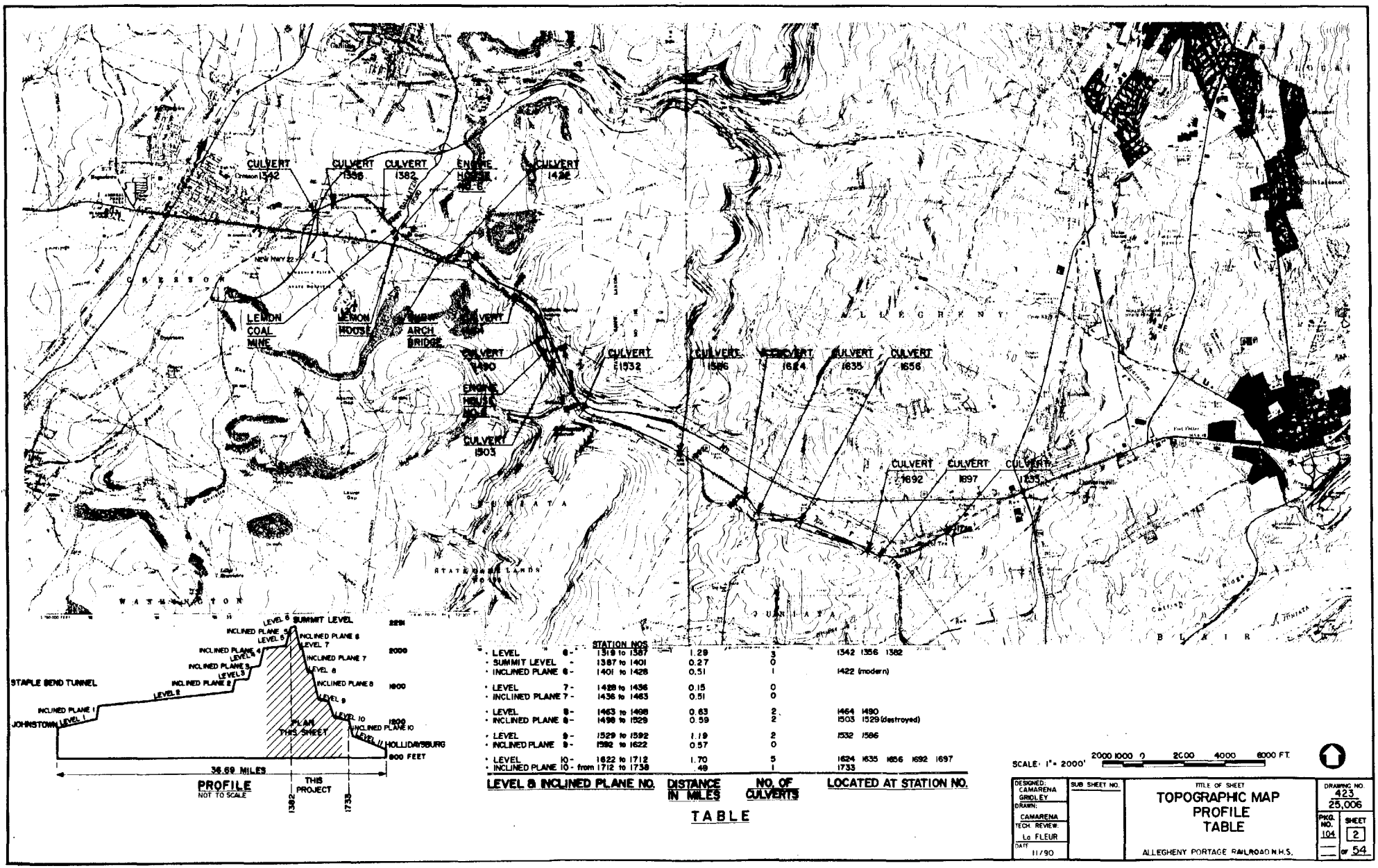
TYPE OF DRAWING: HISTORIC STRUCTURE REPORT DRAWINGS
LOCATION WITHIN PARK: INCLINES & PLANES 5 THRU 10
NAME OF PARK: ALLEGHENY PORTAGE RAILROAD N.H.S.
MID ATLANTIC REGION | BLAIR COUNTY | PENN STATE

DRAWING NO. 423/25,005
PKG NO. 104
SHEET 1 OF 54

GPO 1974 678 711

ON MICROFILM

ON MICROFILM



LEVEL & INCLINED PLANE NO.	STATION NOS	DISTANCE IN MILES	NO. OF CULVERTS	LOCATED AT STATION NO.
· LEVEL 6 -	1319 to 1387	1.29	3	1342 1356 1382
· SUMMIT LEVEL -	1387 to 1401	0.27	0	
· INCLINED PLANE 6 -	1401 to 1428	0.51	1	1422 (modern)
· LEVEL 7 -	1428 to 1436	0.15	0	
· INCLINED PLANE 7 -	1436 to 1463	0.51	0	
· LEVEL 8 -	1463 to 1498	0.63	2	1464 1490
· INCLINED PLANE 8 -	1498 to 1529	0.59	2	1503 1529 (destroyed)
· LEVEL 9 -	1529 to 1592	1.19	2	1532 1586
· INCLINED PLANE 9 -	1592 to 1622	0.57	0	
· LEVEL 10 -	1622 to 1712	1.70	5	1624 1635 1656 1692 1697
· INCLINED PLANE 10 -	from 1712 to 1738	.49	1	1733

TABLE

SCALE: 1" = 2000' 2000 1000 0 2000 4000 6000 FT.

DESIGNED: CAMARENA GINDLEY	SUB SHEET NO.	TITLE OF SHEET: TOPOGRAPHIC MAP PROFILE TABLE	DRAWING NO. 423 25,006
DRAWN: CAMARENA			PKG. NO. 104 — SHEET 2
TECH. REVIEW: Lo FLEUR		ALLEGHENY PORTAGE RAILROAD N.H.S.	OF 54
DATE: 11/90			

KEY TO WORK SCHEDULE

(USE THIS SCHEDULE FOR INTERPRETING DRAWN CIRCLE, LETTERS, AND NUMBERS SHOWN ON DRAWING SHEETS 4 THROUGH 54)

SUBJECT

A. ARCH
B. BARREL
C. BATTER WALLS
D. RECTANGULAR CULVERT
E. EMBANKMENT
F. GRADE
G. JOINTS
H. LINTEL
I. ORIFICE/OPENING
J. REVETMENT
K. RINGSTONES/VOUSSOIR
L. SLOPE
M. STREAMBED/CHANNEL
N. STONE
O. STAINS
P. SWALE/BASIN
Q. TRACE
R. VEGETATION
S. WALL (HEAD)
T. CONCRETE CULVERT
U. WING/HEAD WALLS
V. CAVITIES
W. OTHER
X. MATERIAL
Y. BRIDGE

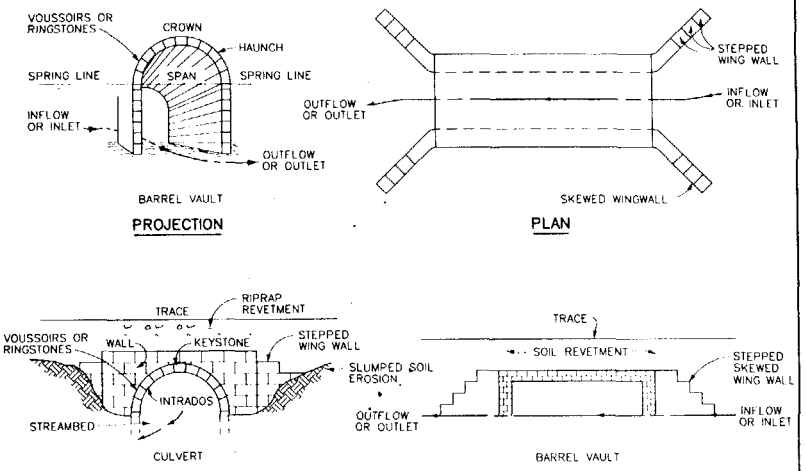
EXISTING CONDITIONS

E- 1 BITUMINOUS
E- 2 BLOCKED/BURIED/PLUGGED
E- 3 BULGING
E- 4 CAPILLARY ACTION
E- 5 CLEAR/GRUBBED/GRADED
E- 6 COLLAPSED/DETERIORATED
E- 7 CRACK/BROKEN/FISSURE
E- 8 DEBRIS/DEAD BRANCHES/TRASH
E- 9 DEPOSITS
E-10 RUTS
E-11 DIRT
E-12 DRAINAGE/WATER FLOWS
E-13 DRY-LAID
E-14 EFFLORESCENCE/SALTS
E-15 EROSION
E-16 EXCELLENT TO GOOD CONDITION (100%-75%)
E-17 EXFOLIATING/DELAMINATING
E-18 EXPANSION
E-19 FREEZE/THAW CYCLE
E-20 GOOD TO FAIR CONDITION (75%- 45%)
E-21 GRAVEL
E-22 HEAVING/DISLODGING
E-23 HEAVY DRAINAGE
E-24 HISTORIC
E-25 IN-LAID/INLAY
E-26 GAPS
E-27 LOOSE MATERIAL
E-28 MIRE/MORASS
E-29 MODIFIED/DIVERTED
E-30 EVIDENCE OF MOISTURE RETENTION
E-31 MORTAR/PARGED/REPOINTING
E-32 MOSS/LICHENS
E-33 NO EVIDENCE OF WATER
E-34 NON-FUNCTIONAL
E-35 NON-HISTORIC
E-36 OUT OF PLUMB
E-37 PARTIALLY BURIED
E-38 PONDING
E-39 FAIR TO POOR CONDITION (45%- 0%)
E-40 RIPRAP/STONE RETAINING WALL
E-41 ROOT SYSTEM
E-42 RUBBLE
E-43 SANDBAGS
E-44 SCARRED DUE TO DRAINAGE
E-45 SEDIMENT
E-46 SLIPPING/SPANNING
E-47 SLOPE
E-48 SPALLING
E-49 STABLE
E-50 STAINS
E-51 UNKNOWN CONDITIONS
E-52 VEGETATION-LITE (GRASS,BUSHES,FERNS)
E-53 VEGETATION-HEAVY (TREES)
E-54 WATER SEEPING
E-55 CHINKING
E-56 RELAID
E-57 FUNCTIONAL
E-58 VOIDS
E-59 UNSTABLE

RECOMMENDATIONS

R- 1 CLEAN
R- 2 COMPACT AS REQUIRED
R- 3 CUT-FILL
R- 4 DIVERT RUNOFFS
R- 5 DISMANTLE
R- 6 EXCAVATE/REOPEN/INVESTIGATE
R- 7 INFILL
R- 8 LEVEL
R- 9 MATCH
R-10 MODIFY
R-11 NEW CONSTRUCTION
R-12 NO TREATMENT (IN SITU)
R-13 OTHER
R-14 RANDOM REPLACEMENT
R-15 RECHANNEL
R-16 REGRADE
R-17 REMOVE
R-18 REPLACE
R-19 CHANNEL/AGGREGRATE
R-20 REPLUMB
R-21 REPOINT/PARGE
R-22 RESET
R-23 RESTORE/RECONSTRUCT
R-24 STABILIZE-REHABILITATE-PRESERVE
R-25 REUSE STONE FOUND AT EXISTING PERIMETERS
R-26 TOTAL REMOVAL (ROOTS AND TREES)
R-27 PARTIALLY REMOVE TREES (FLUSH TO EMBANKMENT)
R-28 CROWNING
R-29 VIDEO INSPECTION
R-30 CHINKING
R-31 EXCELSIOR MATTING
R-32 WATERPROOF MEMBRANE
R-33 TEMPORARY SHORING
R-34 TRAFFIC (LOAD RESTRICTIONS)
R-35 NON-TRAFFIC
R-36 SIGNAGE
R-37 EMINENT REMOVAL
R-38 PLASTIC LINER/SLEEVE
R-39 SWALE

GRAPHICAL GLOSSARY



ABBREVIATIONS

O.A.	OVER-ALL
N.T.S.	NOT TO SCALE
D	DEPTH
W	WIDTH
L	LENGTH
H.S.R.	HISTORIC STRUCTURE REPORT

SYMBOLS

BALLAST
CONCRETE
DIRECTION OF WATER FLOW
DIRT
GRAVEL
MAINTENANCE SPOIL
METAL
RIPRAP
STONE
EXCAVATE, REGRADE
IMPORTED BORROW
EXCELSIOR MATTING
DIRECTION OF WATER FLOW

THE SECRETARY OF THE INTERIOR'S "STANDARDS FOR REHABILITATION"

1. EVERY REASONABLE EFFORT SHALL BE MADE TO PROVIDE A COMPATIBLE USE FOR A PROPERTY WHICH REQUIRES A MINIMAL ALTERATION OF THE BUILDING, STRUCTURE, OR SITE AND ITS ENVIRONMENT, OR TO USE A PROPERTY FOR ITS ORIGINALLY INTENDED PURPOSE.
2. THE DISTINGUISHING ORIGINAL QUALITIES OR CHARACTER OF A BUILDING, STRUCTURE, OR SITE AND IT'S ENVIRONMENT SHALL NOT BE DESTROYED. THE REMOVALOR ALTERATION OF ANY HISTORIC MATERIAL OR DISTINCTIVE ARCHITECTURAL FEATURES SHOULD BE AVOIDED WHEN POSSIBLE.
3. ALL BUILDINGS, STRUCTURES, AND SITES SHALL BE RECOGNIZED AS PRODUCTS OF THEIR OWN TIME. ALTERATIONS THAT HAVE NO HISTORICAL BASIS AND WHICH SEEK TO CREATE AN EARLIER APPEARANCE SHALL BE DISCOURAGED.
4. CHANGES WHICH MAY HAVE TAKEN PLACE IN THE COURSE OF TIME ARE EVIDENCE OF THE HISTORY AND DEVELOPMENT OF A BUILDING, STRUCTURE, OR SITE AND ITS ENVIRONMENT. THESE CHANGES MAY HAVE ACQUIRED SIGNIFICANCE IN THEIR OWN RIGHT AND THIS SIGNIFICANCE SHALL BE RECOGNIZED AND RESPECTED.
5. *DISTINCTIVE STYLISTIC FEATURES OR EXAMPLES OF SKILLED CRAFTSMANSHIP WHICH* CHARACTERIZE A BUILDING, STRUCTURE, OR SITE SHALL BE TREATED WITH SENSITIVITY.
6. DETERIORATED ARCHITECTURAL FEATURES SHALL BE REPAIRED RATHER THAN REPLACED WHENEVER POSSIBLE. IN THE EVENT REPLACEMENT IS NECESSARY, THE NEW MATERIAL SHOULD MATCH THE MATERIAL BEING REPLACED IN COMPOSITION, DESIGN, COLOR, TEXTURE AND OTHER VISUAL QUALITIES. REPAIR OR REPLACEMENT OF MISSING ARCHITECTURAL FEATURES SHOULD BE BASED ON ACCURATE DUPLICATIONS OF FEATURES, SUBSTANTIATED BY HISTORICAL, PHYSICAL, OR PICTORIAL EVIDENCE RATHER THAN CONJUCTURAL DESIGNS OR THE AVAILABILITY OF DIFFERENT ARCHITECTURAL ELEMENTS FROM OTHER BUILDINGS OR STRUCTURES.
7. THE SURFACE CLEANING OF STRUCTURES SHALL BE UNDERTAKEN WITH THE GENTLEST MEANS POSSIBLE. SANDBLASTING AND OTHER METHODS THAT WILL DAMAGE THE HISTORIC BUILDING MATERIALS SHALL NOT BE UNDERTAKEN.
8. EVERY REASONABLE EFFORT SHALL BE MADE TO PROTECT AND PRESERVE ARCHEOLOGICAL RESOURCES AFFECTED BY, OR ADJACENT TO ANY PROJECT.
9. CONTEMPORARY DESIGN FOR ALTERATIONS AND ADDITIONS TO EXISTING PROPERTIES SHALL NOT BE DISCOURAGED WHEN SUCH ALTERATIONS AND ADDITIONS DO NOT DESTROY SIGNIFICANT HISTORICAL, ARCHITECTURAL, OR CULTURAL MATERIAL, AND SUCH DESIGN IS COMPATIBLE WITH THE SIZE, SCALE, COLOR, MATERIAL, AND CHARACTER OF THE PROPERTY, NEIGHBORHOOD, OR ENVIRONMENT.
10. WHENEVER POSSIBLE, NEW ADDITIONS OR ALTERATIONS TO STRUCTURES SHALL BE DONE IN SUCH A MANNER THAT IF SUCH ADDITIONS OR ALTERATIONS WERE TO BE REMOVED IN THE FUTURE, THE ESSENTIAL FORM AND INTEGRITY OF THE STRUCTURE WOULD BE UNIMPAIRED.

GENERAL NOTES

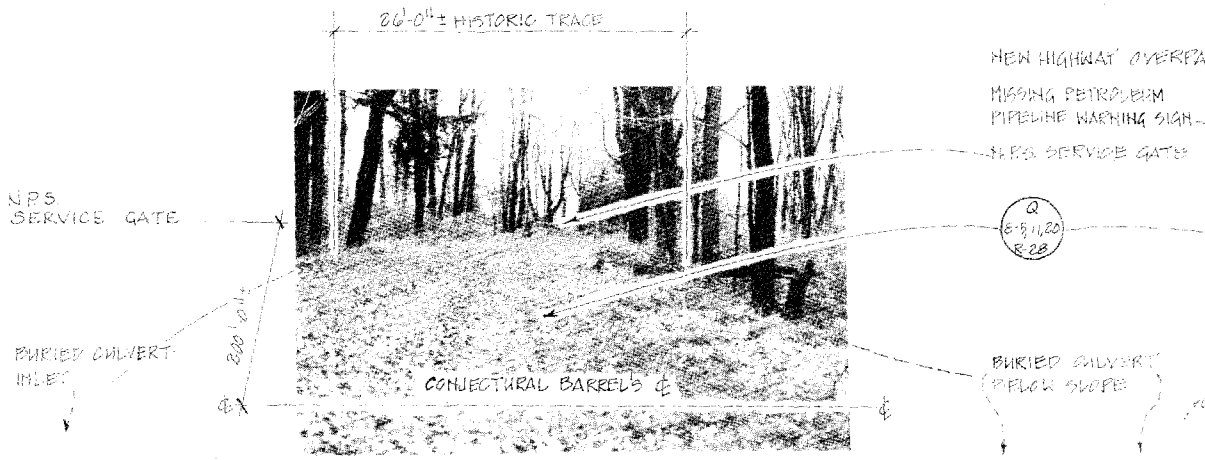
1. FIELD EVALUATIONS AND DIMENSIONS, INFORMATION, ASSESSMENTS WERE TAKEN EITHER FROM THE SPRING LINE, SIDE OF REVETMENT WALL, TOP OF TRACE, OR FROM DRAINAGE PATH, AND AT TYPICAL AND TEMPORARY LOCATIONS, ETC. UNDER THESE VARIABLE CIRCUMSTANCES, IT SHOULD BE REALIZED THAT VARIATIONS AND THE ACCURACY OF THE EVALUATION DIMINISHES SOMEWHAT RELATIVE TO WORK ITEMS LOCATED HIGHER ON THE STRUCTURE AND AREAS THAT WERE DIFFICULT TO MEASURE. ALL WORK ITEMS SHOULD BE REEVALUATED AND ALL DIMENSIONS, QUANTITIES, AND LOCATIONS VERIFIED.
2. THIS SHEET INTENDED FOR INFORMATION PURPOSES ONLY. CONTRACTOR SHOULD VISIT THE SITE PRIOR TO BIDDING TO DETERMINE THE EXTENT AND CONDITION OF ALL EXISTING SITE ELEMENTS. APPROPRIATE ADJUSTMENTS SHOULD BE MADE PRIOR TO PROCURING, COMMENCING, AND INSTALLING ANY MATERIAL.
3. AT INCLINED PLANE HEADS, ENGINE HOUSES WERE CONSTRUCTED. AT FOOT OF INCLINES, HITCHING SHEDS WERE CONSTRUCTED.
4. DETAILS AND INFORMATION HAVE BEEN BASED ON EXISTING CONDITION DRAWINGS NHR-APR/3,001, SHEET NUMBERS 2, 3, AND 4.
5. EACH HISTORIC CULVERT IS DESIGNED DIFFERENTLY IN SHAPE, FORM, AND DIMENSION. THE EXISTING PROBLEMS ON EACH STRUCTURE ARE TYPICALLY THE SAME, BUT STABILIZATION AND RESTORATION PROPOSALS MAY NOT APPLY TO THOSE UNIQUE CULVERTS.
6. CONDITIONS OF FOUNDATIONS, BARREL INTERIORS, AND BURIED CULVERTS ARE UNKNOWN. THEREFORE, CLEARING, GRUBBING AND EXCAVATING WILL BE ANTICIPATED.
7. *PARTICULAR HEADWALLS, WING WALLS, SECTIONS OF CULVERT BARRELS WILL* NOT BE DISMANTLED.
8. IF DISMANTELING IS REQUIRED, NUMBER EACH STONE ACCORDINGLY.
9. RETRIEVE ALL STONE AND REUSE IN STABILATION AND RESTORATION. IF SUFFICIENT QUANTITIES CAN NOT BE EITHER SALVAGED OR RECOVERED ON THE SITE, STONE MAY BE EITHER REPLACED WITH MATCHING ORIGINAL MATERIAL; OR AREAS OF MISSING STONE MAY BE PATCHED/REPAIRED WITH CONCRETE.
10. RAKE EITHER CRACKED OR DETERIORATED JOINTS; CLEAN AND REPOINT.
11. REGRADING, BACKFILLING, COMPACTION, AND RESEEDING HAVE BEEN PROPOSED.

DESIGNED: GRIDLY, CAMARENA, SHAH	SUB SHEET NO.	TITLE OF SHEET: LEGEND	DRAWING NO. 423 25,005
D. SHULL, TECH. REVIEW			PKG NO. 104 SHEET 3
H.A. LaFLEUR, DATE: 12/90		ALLEGHENY PORTAGE RAILROAD N.H.S.	OF 54

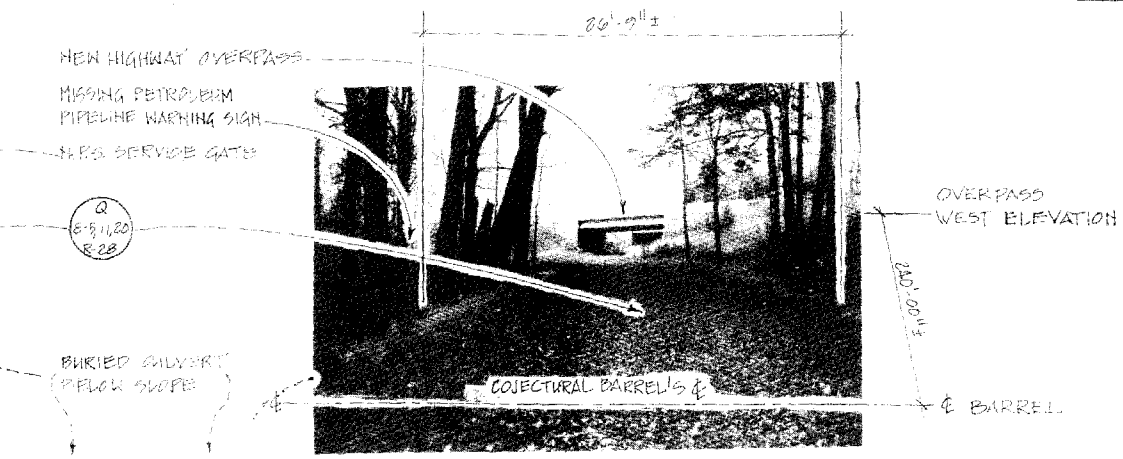
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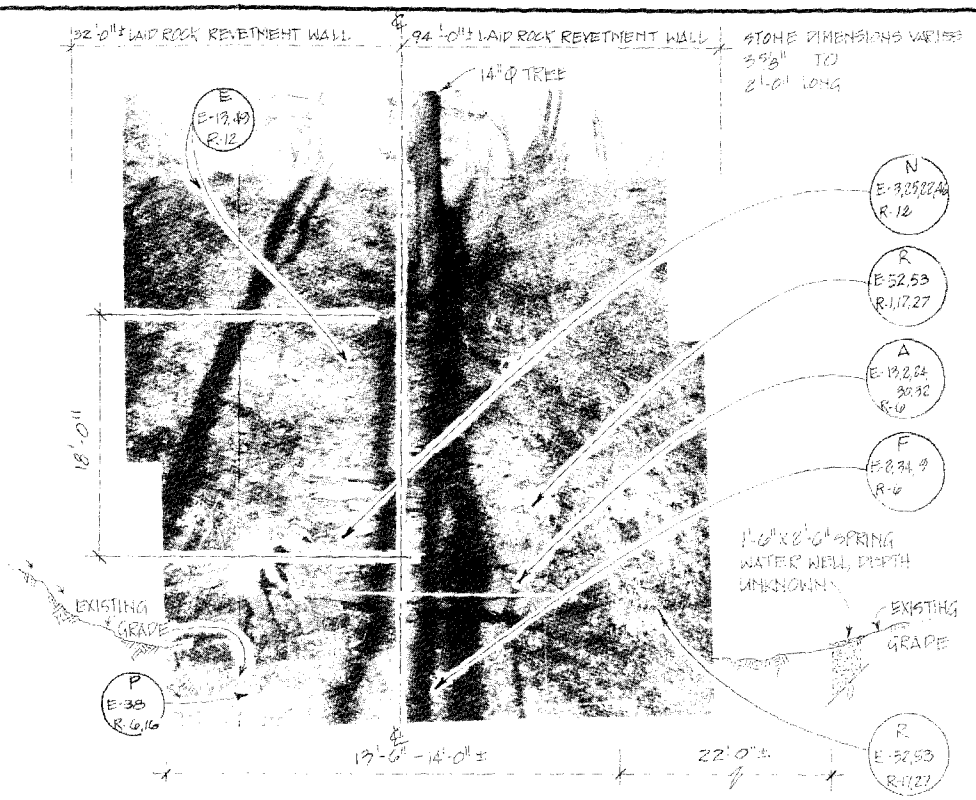


TRACE-WEST VIEW (A)
NOT TO SCALE

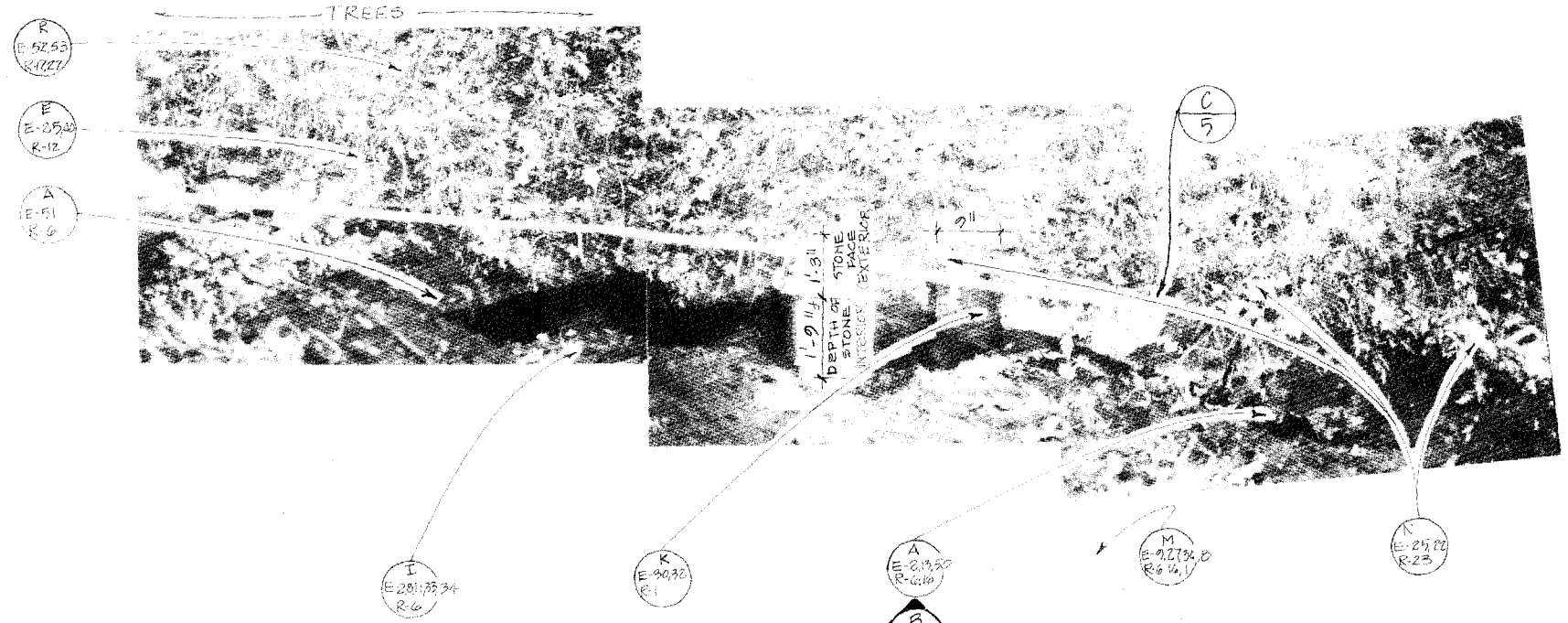


TRACE-EAST VIEW (B)
NOT TO SCALE

OVERPASS WEST ELEVATION



INLET - SOUTH EL. (C)
NOT TO SCALE



NOT TO SCALE

OUTLET - NORTH EL. (D)

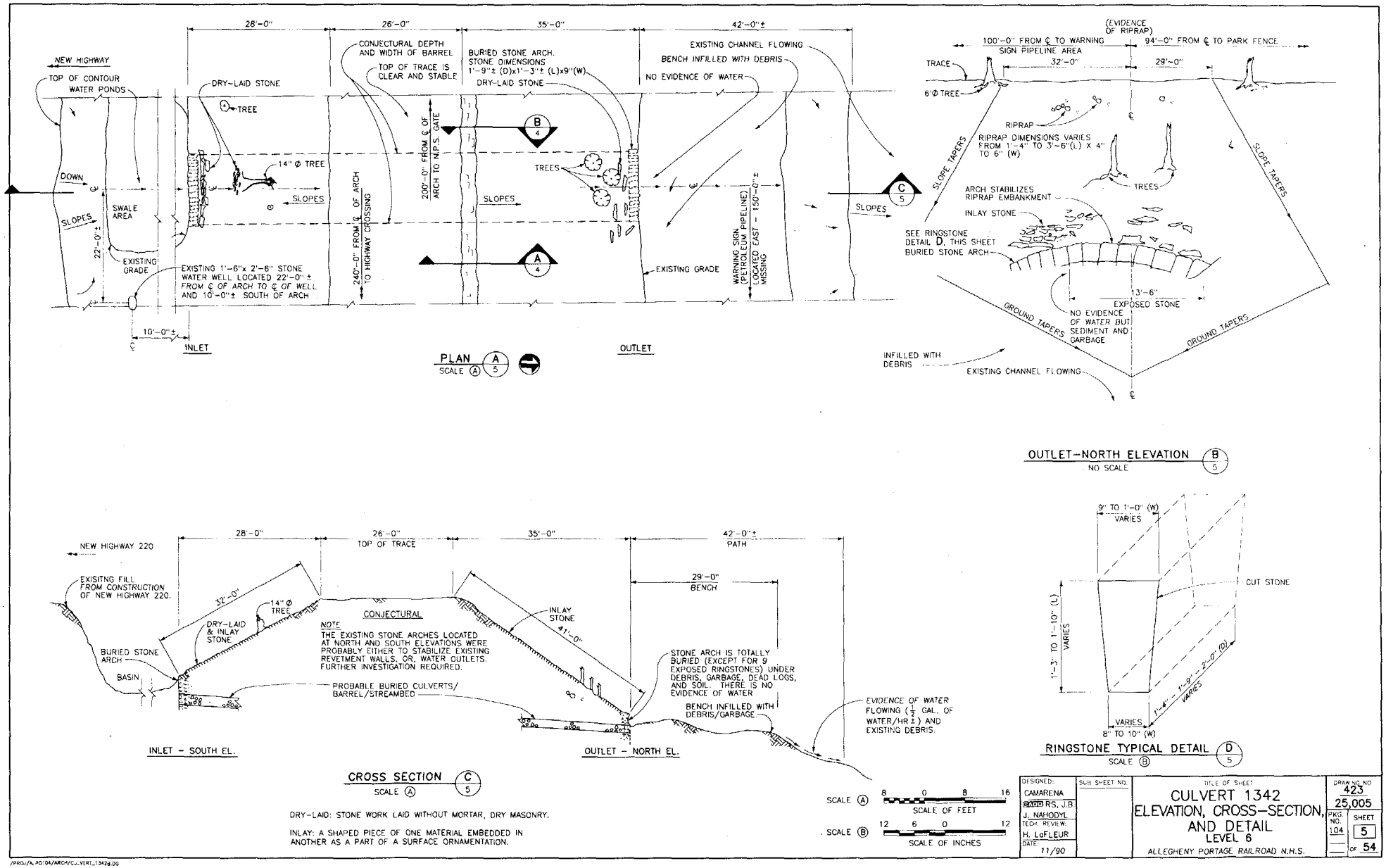
NOTE:
REFER TO SHEET NO. 6 FOR INFORMATION AND INTERPRETATION OF DRAWING LETTERS AND NUMBERS.

EXISTING CONDITIONS
PHOTOS TAKEN ON OCTOBER 1989

ON MICROFILM

DESIGNED: CAMARENA DRAWN: CAMARENA TECH. REVIEW: H. LAFLEUR DATE: 1/91	SUB SHEET NO.	TITLE OF SHEET CULVERT 1342 ELEVATIONS, & TRACES LEVEL 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 / 25,005 PKG. NO. 104 SHEET 4 OF 54

☆ U.S. GOVERNMENT PRINTING OFFICE: 676-100



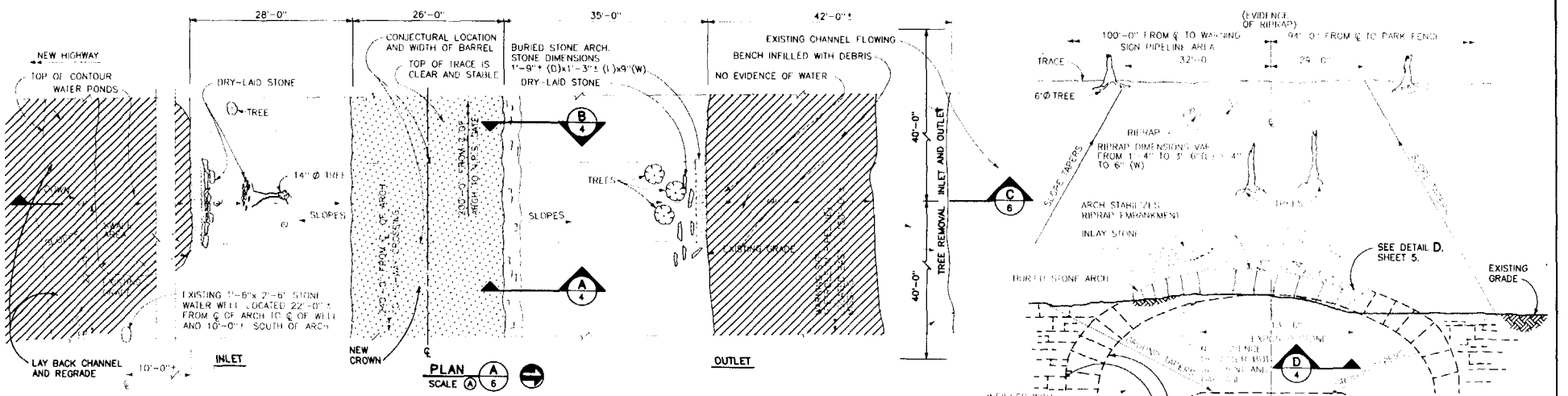
DRY-LAID: STONE WORK LAID WITHOUT MORTAR, DRY MASONRY.

INLAY: A SHAPED PIECE OF ONE MATERIAL EMBEDDED IN ANOTHER AS A PART OF A SURFACE ORNAMENTATION.

DESIGNED: CAMARENA	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1342 ELEVATION, CROSS-SECTION, AND DETAIL LEVEL 6	DRAWING NO. 423 25,005
CHKD RS, J.B. J. NAHODYL		ALLEGHENY PORTAGE RAILROAD N.H.S.	PKG. NO. 104 SHEET 5 OF 54
TECH. REVIEW: H. LaFLEUR			
DATE: 11/90			

/PROJ/A.R0104/ARCH/CULVERT_1342B.DG

ON MICROFILM



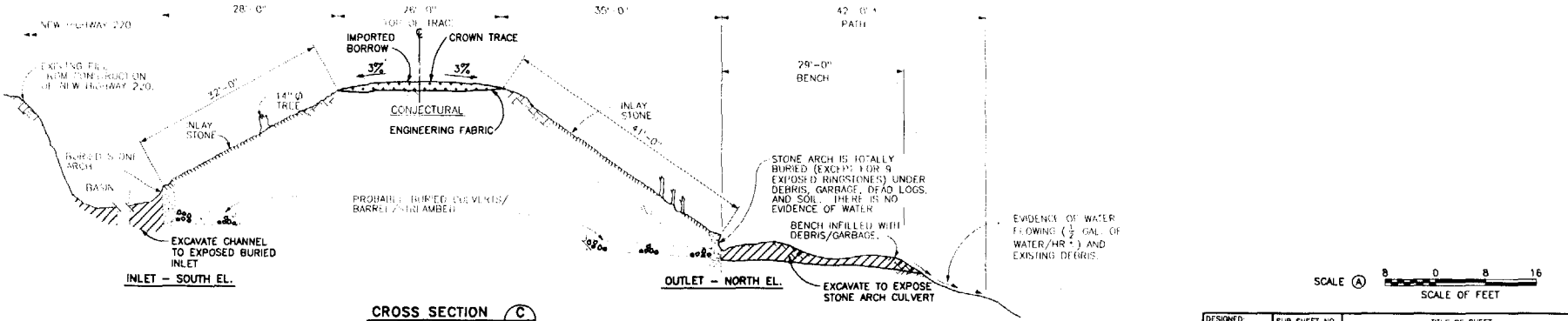
NOTES:

STABILIZATION RECOMMENDATIONS:

THE CULVERT SHOULD BE EXPOSED (INLET AND OUTLET) TO DETERMINE STRUCTURAL CONDITIONS; DEPENDING ON RESULTS OF THIS EXAMINATION, COMPLETE RECOMMENDATIONS WILL BE MADE AT A LATER DATE. IN GENERAL, REMOVE EXISTING TREES FROM EMBANKMENT (INLET AND OUTLET). DO SOME CLEANING UP (DEAD TREE REMOVAL) ON UPSTREAM SIDE TO PREVENT DEBRIS FROM COLLECTING AT CULVERT INLET.

MINIMUM EFFORT
(COMPLETE IN 1 TO 5 YEARS)

1. REMOVE ALL TREES FROM TRACE EMBANKMENT BY CUTTING TRUNKS FLUSH WITH EXISTING GRADE. LEAVE TREE ROOTS IN PLACE. TREES SHOULD BE FELLED SO AS NO DAMAGE OCCURS TO CULVERT OR EMBANKMENT. IF CUTTING TREES AND "FELLING" THEM WILL DAMAGE THE EMBANKMENT, THEN PROVISIONS SHOULD BE MADE TO SUPPORT THE TREE BY CRANE OR OTHER HEAVY EQUIPMENT SO THAT THE TREE CAN BE CUT FLUSH WITH THE EXISTING EMBANKMENT/GROUND AND REMOVED WITHOUT DAMAGE TO THE EMBANKMENT. HEAVY CRANES AND EQUIPMENT WILL NOT BE ALLOWED ON THE EMBANKMENT OVER CULVERTS.
2. EXCAVATE CHANNEL (INLET AND OUTLET) TO CULVERT INVERT AND EXPOSE CULVERT. EXCAVATION IS TO BE MONITORED BY ARCHEOLOGIST AND SUPERVISED TO PREVENT ANY DAMAGE TO CULVERT OR EMBANKMENT.
3. DSC ENGINEER TO COMPLETE INVESTIGATION OF CULVERT AFTER EXCAVATION AND MAKE RECOMMENDATIONS FOR STABILIZATION.
4. CROWN TOP OF TRACE WITH A MIN. OF 3%SLOPE AND RESEED WITH NATIVE GRASSES.
5. INSTALL PLAQUE FOR MONUMENTING.



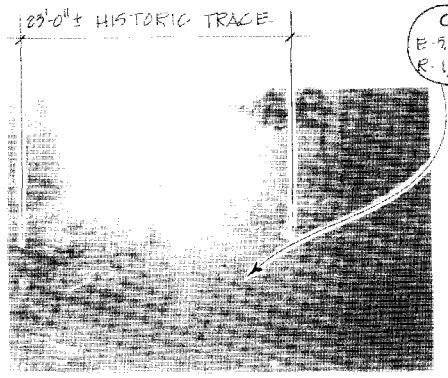
CROSS SECTION C 6
SCALE A

SCALE A 8 0 8 16
SCALE OF FEET

DESIGNED: L. GRIDLEY; CHKD: RS; J. NAHODYL; TECH. REVIEW: M. PAUL; DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1342 STRUCTURAL RECOMMENDATIONS LEVEL 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005; PKG. NO. 104; SHEET 6 of 54

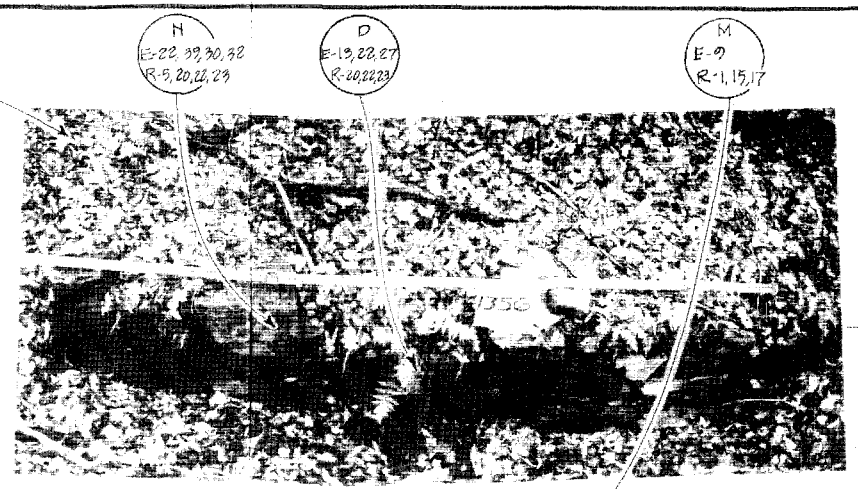
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ON MICROFILM



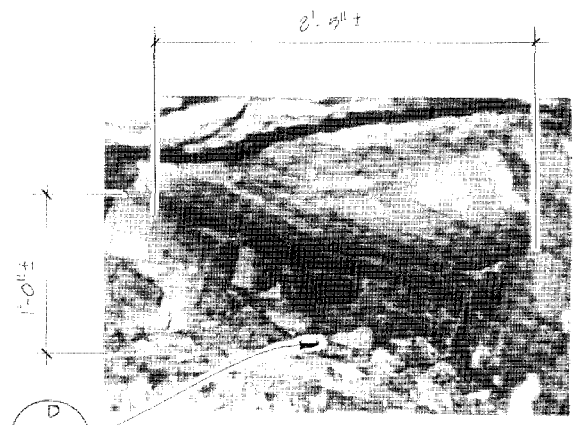
TRACE
EAST AND WEST - TYPICAL (A)
NOT TO SCALE





INLET - SOUTH EL (B)
NOT TO SCALE

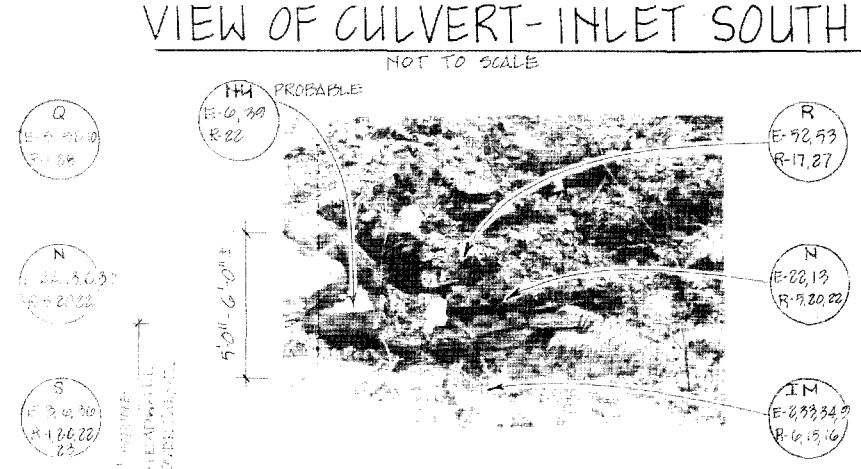
VIEW OF CULVERT - INLET SOUTH EL (C)
NOT TO SCALE



INLET'S INTERIOR (D)
NOT TO SCALE



OUTLET - NORTH EL (E)
NOT TO SCALE



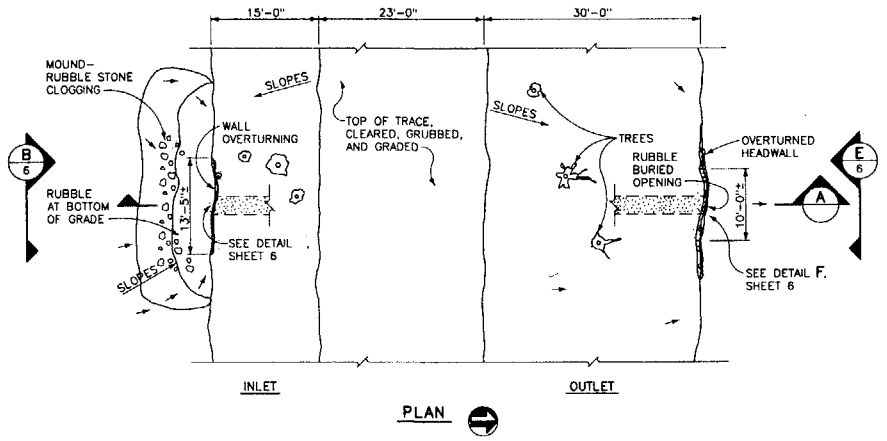
VIEW OF CULVERT - OUTLET NORTH EL (F)
NOT TO SCALE

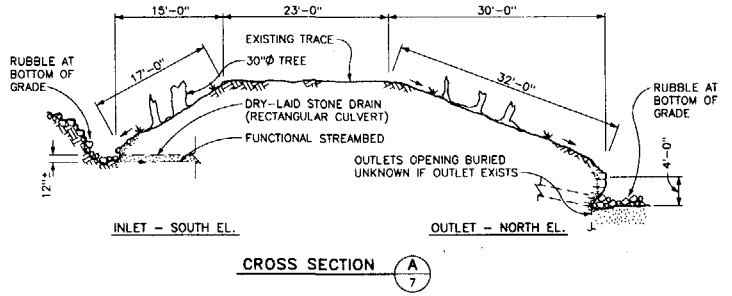
EXISTING CONDITIONS
PHOTOS TAKEN IN OCTOBER 1989

ON MICROFILM

NOTE:
TO INTERPRET CIRCLES, REFER TO SHEET 3 LEGEND. THIS WILL IDENTIFY AND EXPLAIN THE MEANING OF CIRCLES, LETTERS AND NUMBERS.

DESIGNED: CAMARENA DRAWN: CAMARENA TECH. REVIEW: H. LAFLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET CULVERT 1356 ELEVATIONS, TRACE & DETAIL LEVEL 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 7 OF 54



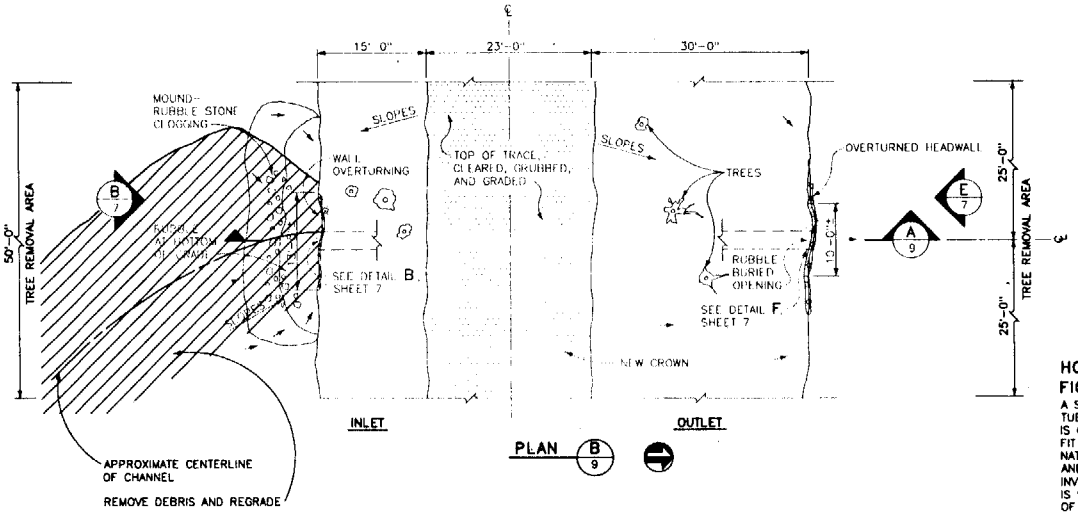


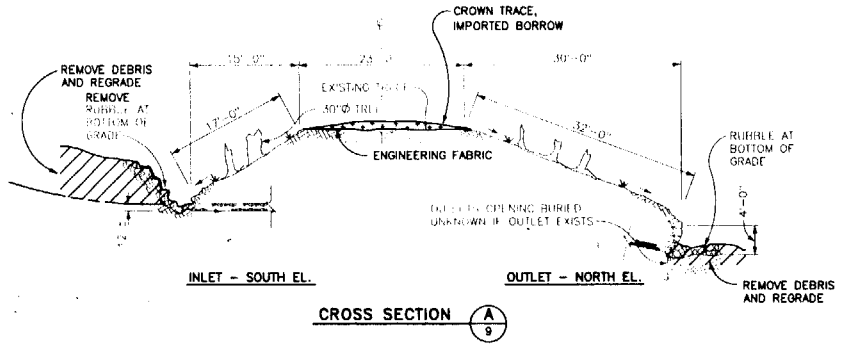
8 0 8 16
SCALE OF FEET

DESIGNED: MAJOR DC	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1356 PLAN AND CROSS SECTION INCLINE 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005
TECH. REVIEW: H. LoFLEUR			PKG. NO. 104
DATE: 12/90			SHEET 8 OF ___

ON MICROFILM

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STABILIZATION RECOMMENDATIONS:

MINIMUM EFFORT (2 TO 4 YEARS)

1. CROWN TOP OF TRACE 3% MINIMUM SLOPE AND RESEED.
2. REMOVE ALL TREES. SEE NOTE (1.) CULVERT 1342 FOR TREE REMOVAL.
3. VIDEO INSPECT TO DETERMINE EXTENT OF COLLAPSED CULVERT.
4. DECIDE ON ONE OF THE FOLLOWING ALTERNATIVES:
   A. MAINTAIN IN PRESENT STATE AND ALLOW TO DETERIORATE AND INTERPRETED AS A RUIN. REALIGN CHANNEL, CONSTRUCT MODERN CULVERT TO MAINTAIN DRAINAGE.
   B. RECONSTRUCT ORIGINAL CULVERT, EXCAVATE FILL (EMBANKMENT) TO ORIGINAL CULVERT AND RECONSTRUCT OUTLET USING ORIGINAL MATERIALS.
   C. USE "INSITUTUBE" OR APPROVED EQUAL TO STABILIZE EXISTING CULVERT. RECONSTRUCT OUTLET USING ORIGINAL MATERIALS.
5. INSTALL PLAQUE FOR MONUMENTING.

HOW INSITUFORM IS INSTALLED

FIGURE 1.

A SPECIAL NEEDLED FELT RECONSTRUCTION TUBE (INSITUTFORM), COATED ON THE OUTSIDE, IS CUSTOM ENGINEERED AND MANUFACTURED TO FIT THE DAMAGED CULVERT EXACTLY. IT IS IMPREGNATED WITH A LIQUID THERMOSETTING RESIN AND LOWERED INTO A MANHOLE THROUGH AN INVERSION TUBE. ONE END OF THE INSITUTFORM IS FIRMLY ATTACHED TO THE LOWER END OF THE INVERSION TUBE ELBOW.

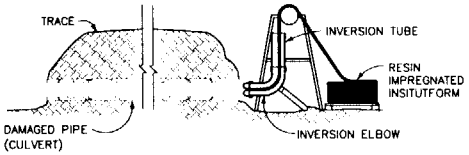


FIGURE 2

THE INVERSION TUBE IS THEN FILLED WITH WATER. THE WEIGHT OF THE WATER PUSHES THE INSITUTFORM INTO THE DAMAGED CULVERT AND TURNS IT INSIDE OUT, WHILE PRESSING THE RESIN IMPREGNATED SIDE FIRMLY AGAINST THE INSIDE WALLS OF THE OLD CULVERT. THE SMOOTH COATED SIDE OF THE INSITUTFORM BECOMES THE NEW INTERIOR SURFACE OF THE PIPE.

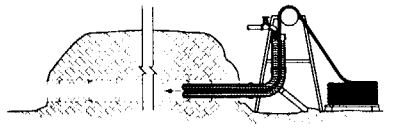
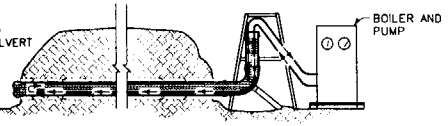


FIGURE 3

AFTER THE INSITUTFORM IS INVERTED THROUGH THE CULVERT TO THE DISIRED LENGTH, THE WATER IS CIRCULATED THROUGH A BOILER. THE HOT WATER CAUSES THE THERMO-SETTING RESIN TO CURE WITHIN A FEW HOURS, CHANGING THE PLIABLE INSITUTFORM INTO A HARD, STRUCTURALLY SOUND, PIPE-WITHIN-A-PIPE (INSTITUPIPE TM.). IT HAS NO JOINTS OR SEAMS AND IS USUALLY STRONGER THAN THE CULVERT IT REPLACED. THE ENDS ARE CUT OFF AND THE INVERSION TUBE AND SCAFFOLDING ARE REMOVED. NORMALLY, THERE ARE NO MESSY EXCAVATION REPAIRS TO BE MADE SINCE MOST WORK IS DONE WITHOUT DIGGING OR DISRUPTION.

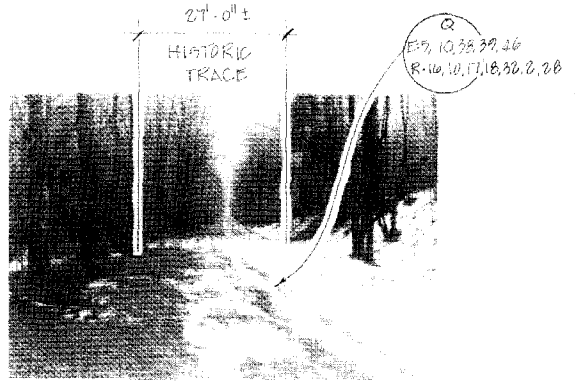


DETAIL C 9
NO SCALE

8 0 8 16
SCALE OF FEET

DESIGNED: L. GRIDLEY; CHECKED: G. NEVILLE; TECH. REVIEW: M. PAUL; DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1356 STRUCTURAL RECOMMENDATIONS LEVEL 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005; PKG. NO. 104; SHEET 9 of 54

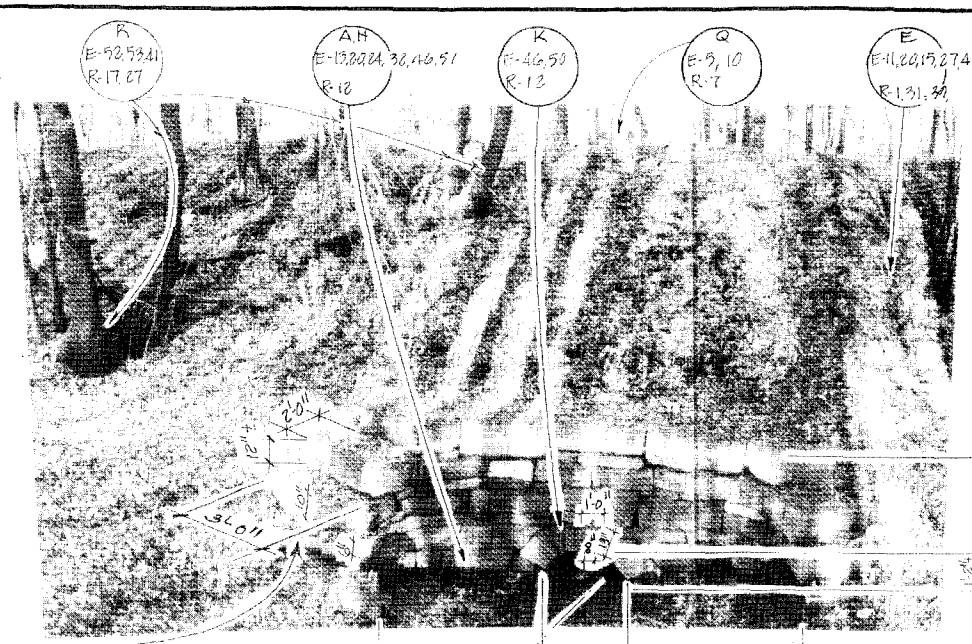
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TRACE
EAST AND WEST - TYPICAL (A)

NOT TO SCALE

NOTES: SLEEPERS WHICH ARE BURIED IN WOOD CHIPS ARE FOUND AT TRACE, INLET OF MODERN CULVERT

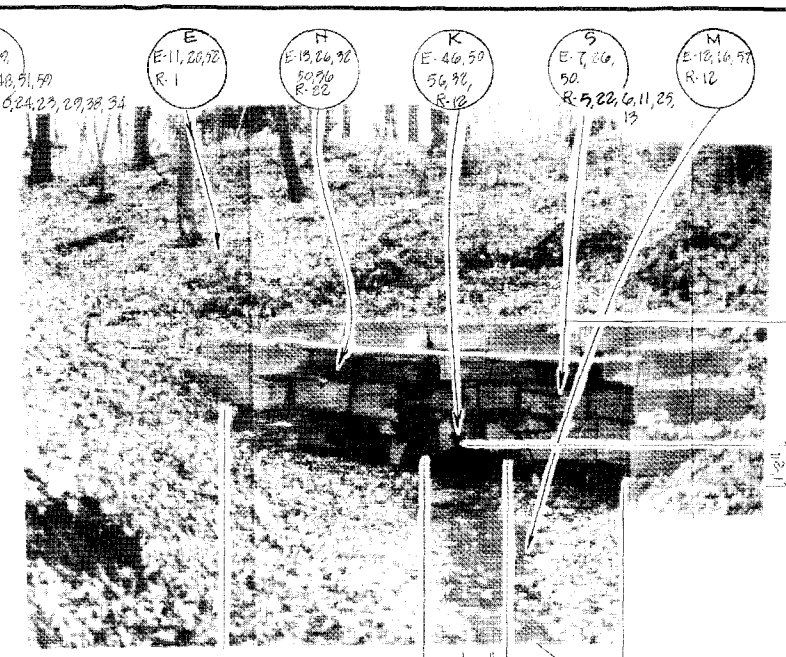


DRY-LAID BARRIER WALL (TYP.) AT INLET AND OUTLET

BARREL'S CEILING IS GRADUALLY CAVING.

INLET - SOUTH EL. (B)

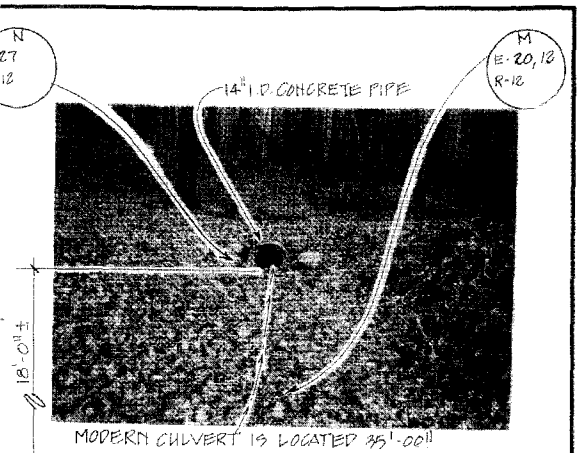
NOT TO SCALE



OUTLET - NORTH EL. (C)

NOT TO SCALE

TO MODERN CULVERT, SEE DETAIL D, SHEET 10



MODERN CULVERT IS LOCATED 35'-0" NORTH OF HISTORIC CULVERT, SEE DETAIL B, SHEET 11.

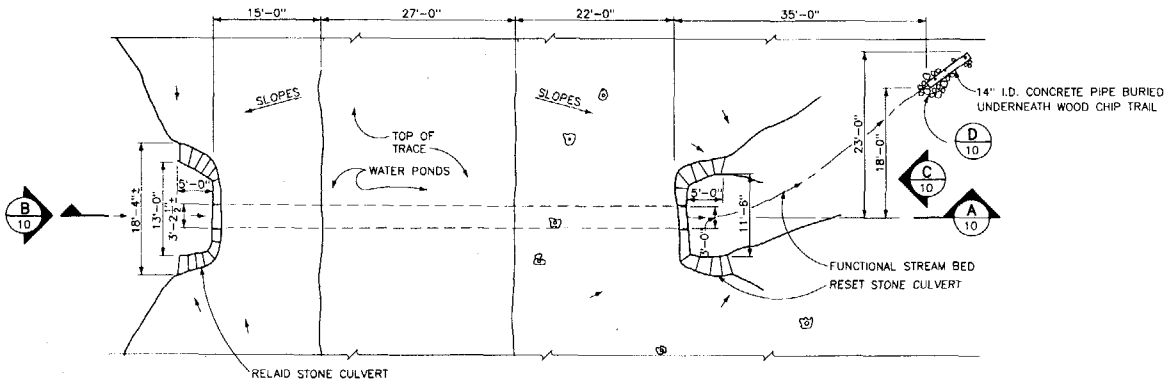
MODERN - INLET (D)

NOT TO SCALE

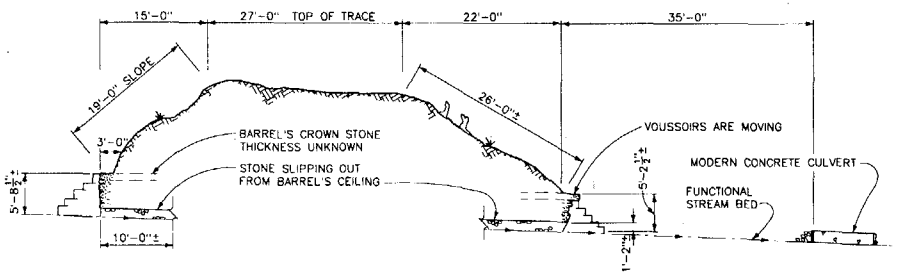
EXISTING CONDITIONS
PHOTOS TAKEN ON OCTOBER 1989

ON MICROFILM

DESIGNED: CAMARENA DRAWN: CAMARENA TECH. REVIEW: H. LAFLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET CULVERT 1382 ELEVATIONS, TRACE & DETAIL LEVEL 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 / 25,005 PKG. NO. 104 SHEET 10 OF 54



PLAN B/11



CROSS SECTION A/11

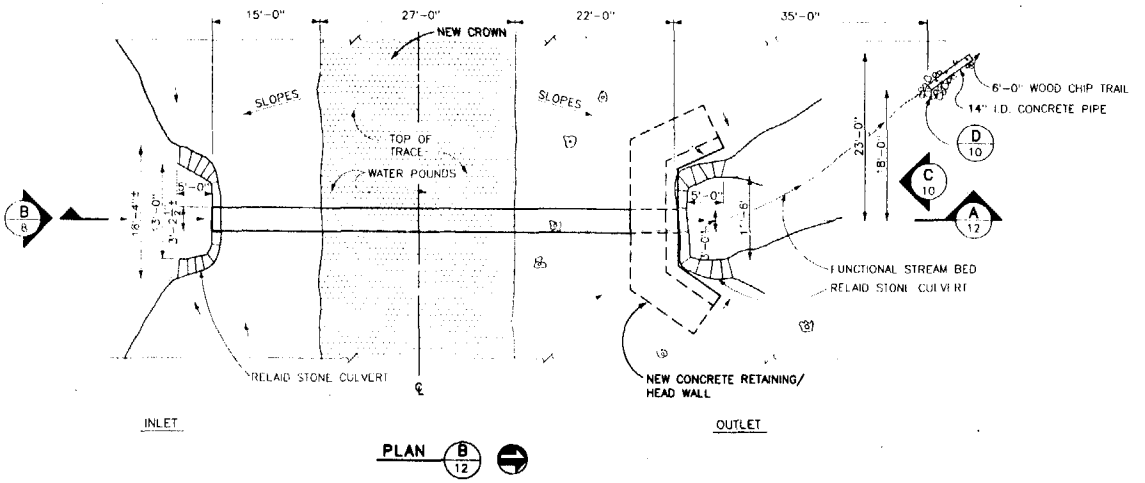
8 0 8 16
SCALE OF FEET

DESIGNED: CAMARENA; DRAWN: EC 10; CADD; TECH. REVIEW: H. La FLEUR; DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1382 PLAN AND CROSS-SECTION LEVEL NO. 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005; PKG. NO. 104; SHEET 11 54

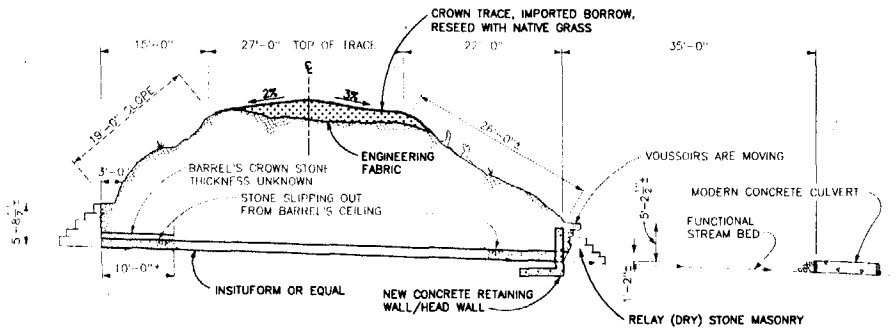
/PROJ/ALP0104/ARCH/CUL_1382.DG

ON MICROFILM

ON MICROFILM



PLAN B 12



CROSS SECTION A 12

NOTES

STABILIZATION RECOMMENDATIONS:

MINIMUM EFFORT

1. REMOVE DEBRIS AND SEDIMENT. BUILD-UP DOWN TO ORIGINAL FLOW LINE (INLET TO OUTLET INVERT)
2. EXCAVATE EMBANKMENT FILL BEHIND HEAD/WING WALL TO RELIEVE SOIL PRESSURES.
3. SHORE EMBANKMENT TO PREVENT SOIL/SLOPE MOVEMENT DURING CONSTRUCTION. NUMBER HEADWALL AND STONE MASONRY FOR RE-POSITIONING AND REPLACEMENT.
4. CONSTRUCT CONCRETE RETAINING WALL.
5. REPLACE STONE MASONRY.
6. REGRADE TRACE SLOPES AND STABILIZE WITH NATIVE GRASS.
7. CROWN TRACE.
8. INSTALL PLAQUES AND MONUMENTS.
9. DECIDE ON ONE OF THE FOLLOWING ALTERNATIVES:

ALTERNATIVES

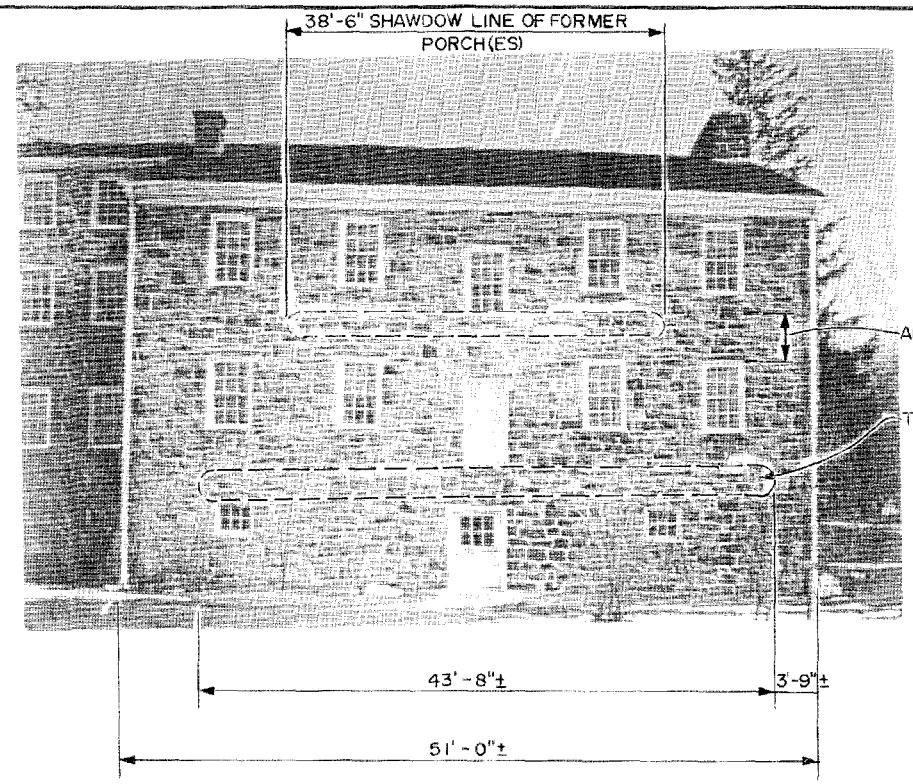
(A) 1, THRU 8 ABOVE AND (2 TO 4 YEARS) USE INSITUFORM (SEE DETAIL C , SHEET 9) OR APPROVED EQUAL TO SLEEVE CULVERT AND STABILIZE STONE MASONRY IN PLACE.

(B) RECONSTRUCT CULVERT

8 0 8 16
SCALE OF FEET

DESIGNED: L. GRIDLEY	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO. 423 25,005
CADD TECH. REVIEW: M. PAUL		CULVERT 1382 STRUCTURAL RECOMMENDATIONS LEVEL NO. 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	PKG. NO. 104 SHEET 12
DATE: 11/90			OF 54

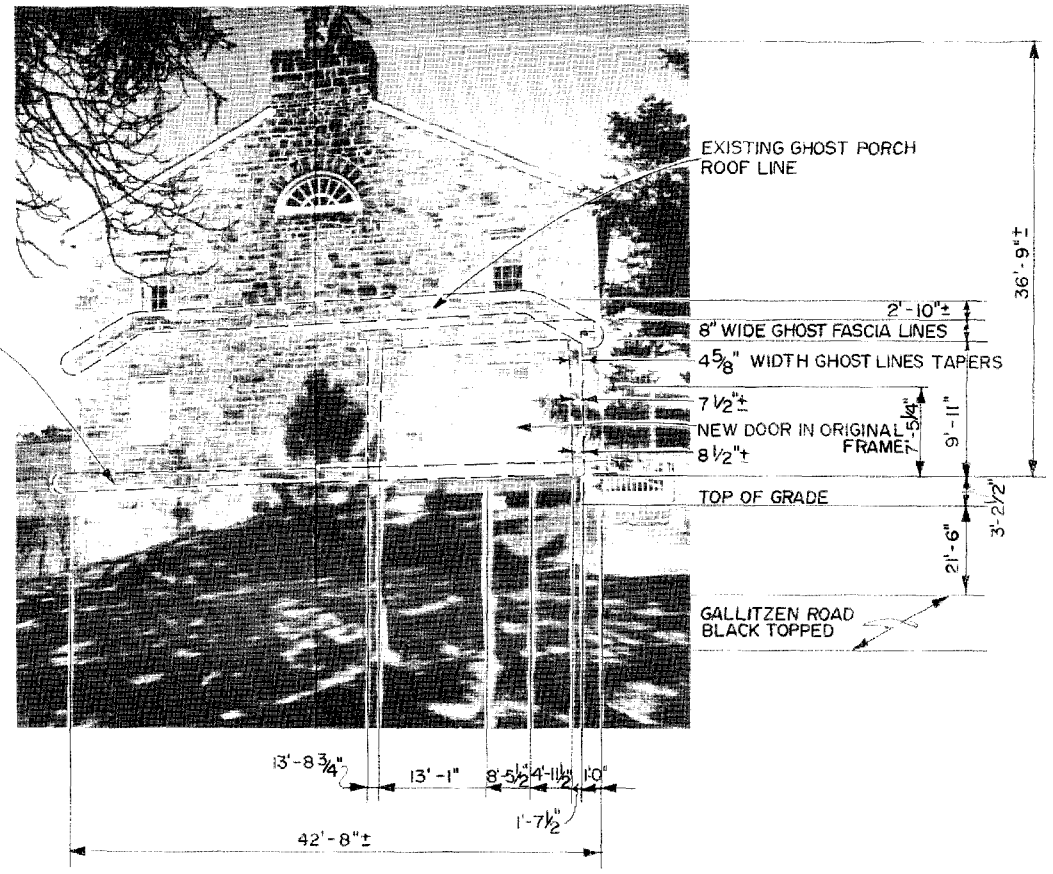
/PRO/alpo104/arch/culvert_1382.DG



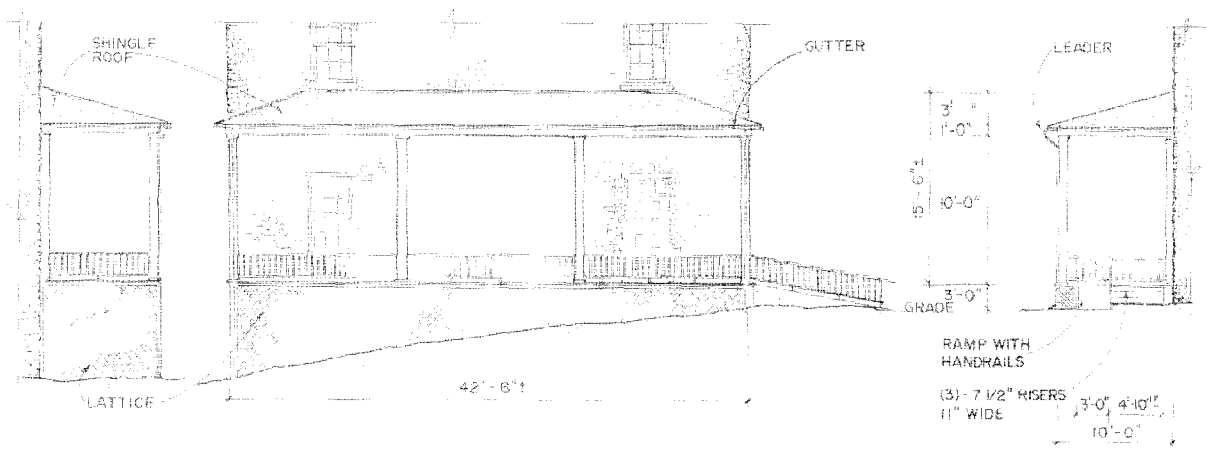
SOUTH ELEVATION

EXISTING PORCH FLOOR GHOST LINE

LEMON HOUSE WAS BUILT IN 1831 AND PORCHES WERE ADDED AT THE SOUTH AND EAST ELEVATIONS. IN THE LATE 1800'S, A LARGER PORCH REPLACED THE EASTSIDE PORCH. PORCHES WERE REMOVED AT A UNKNOWN DATE. EXIST. ARE SHAWDOW LINES OF FORMER (PORCH(ES).



EAST ELEVATION



SOUTH EL. EAST ELEVATION NORTH EL.

SCHEMATIC PORCH DETAIL
(NON-HISTORIC)

NOT TO SCALE

ON MICROFILM

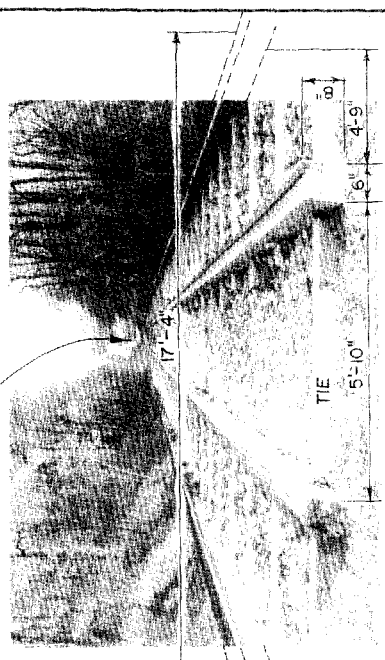
EXISTING CONDITIONS
(EAST ELEVATION) PHOTO TAKEN OCTOBER 1960
(SOUTH & EAST ELEVATIONS) PHOTOS TAKEN 1984

NO SCALE

DESIGNED: N. CAMARENA DRAWN: N. CAMARENA TECH. REVIEW: H. LAFLEUR DATE: 1/91	SUB SHEET NO.	TITLE OF SHEET: LEMON HOUSE ELEVATIONS SUMMIT LEVEL ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 13 OF 54

U.S. GOVERNMENT PRINTING OFFICE: 675-100

ON MICROFILM



NON-HISTORIC REPLICATION OF INCLINE SIX (A)
TRACK - TOP OF SUMMIT SIX

WOODEN FENCE

GRAVEL EXTENDS 16" FROM EACH SIDE OF PATH

4'-4"± WIDE BITUMINOUS PATH

SOUTH SIDE LOST AND DESTROYED (CONJECTURAL AREA)

EXISTING ENGINE HOUSE FOUNDATIONS



TRACE - SUMMIT SIX (B)

EXISTING CONDITIONS
PHOTOS TAKEN IN 1989

DESIGNED camarena
DRAWN camarena
TECH. REVIEW H. LAFLEUR
DATE 11/90
SUB SHEET NO.

TITLE OF SHEET
ENGINE HOUSE 6 FOUNDATION PLAN AND TRACES
SUMMIT LEVEL
ALLEGHENY PORTAGE RAILROAD N.H.S.

DRAWING NO. 423 / 25,005
PKG. NO. 104
SHEET 14 OF 54

SLOPES
20'-6"±
60'-7"±
11'-3"
3'-4"
1'-10"
37'-2"
6'-2"
5'-9"
4'-2"±
2'-0"
14'-6"±
20'-6"±
SOUTH ANTE-CHAMBER
14'-4"
SLOPES
PAVED STONE FLOOR
SOUTH ENGINE ROOM
STONE FLOOR
LOOSE FITTED STONE
TOP OF GRADE & STONE STEP
18'-7"
7'-0"±
VERTICAL CRACK ON CINDER BLOCK WALL
SHEAVE ROOM
68'-0"±
16'-11 5/8"
43'-7"±
49'-0"±
68'-0"±
88'-6"±
91'-0"±
EXISTING CINDER BLOCK WALL
NORTH ENGINE ROOM
SLOPES
24'-6"
8'-10"
2'-10"±
NORTH ANTE-CHAMBER
2'-4"
LOWER GRADES EXPOSED WITH APE PARTIALLY STONE
TOP GRADE
2'-4"±
2'-8"
7'-4"
15'-4"
10'-5"
10'-7"
26'-0"
30'-3"
38'-11"
42'-2"
46'-0"
56'-0"

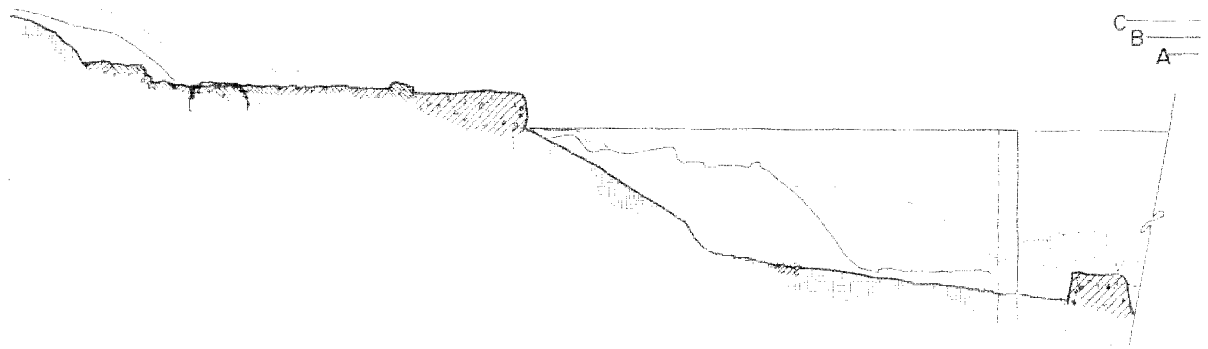
BE CONSTRUCTIVAL AND SHOULD BE VIEWED WITH ARCHEOLOGY MANAGEMENT REPORT FOR FULL SUMMARIES PROJECT FINDINGS.

ENGINE HOUSE FOUNDATION PLAN

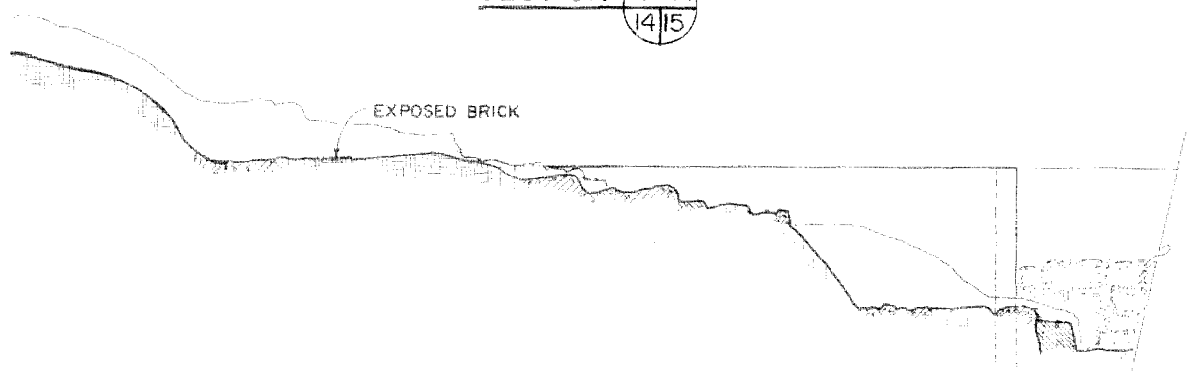
SCALE 1/4" = 1'-0"

0 1 2 3 4 8 12 FEET

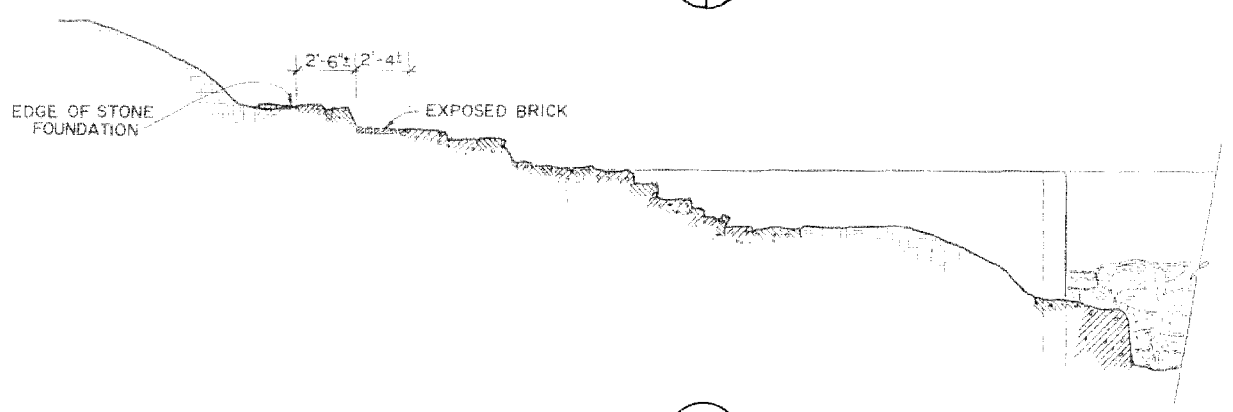
FIELD EVALUATION, ASSESSMENTS, AND DIMENSIONS WERE TAKEN FROM TOP OF GRADE, INSIDE, OUTSIDE TYPICAL LOCATIONS OF EXISTING RECONSTRUCTED STONE FOUNDATION WALLS, AND OTHER EXISTING FEATURES. DUE TO VARIABLE CIRCUMSTANCES AND VARIATIONS, ACCURACY AND DIMENSIONS WILL PROBABLY CHANGE. ALL WORK ITEM DIMENSIONS MAY



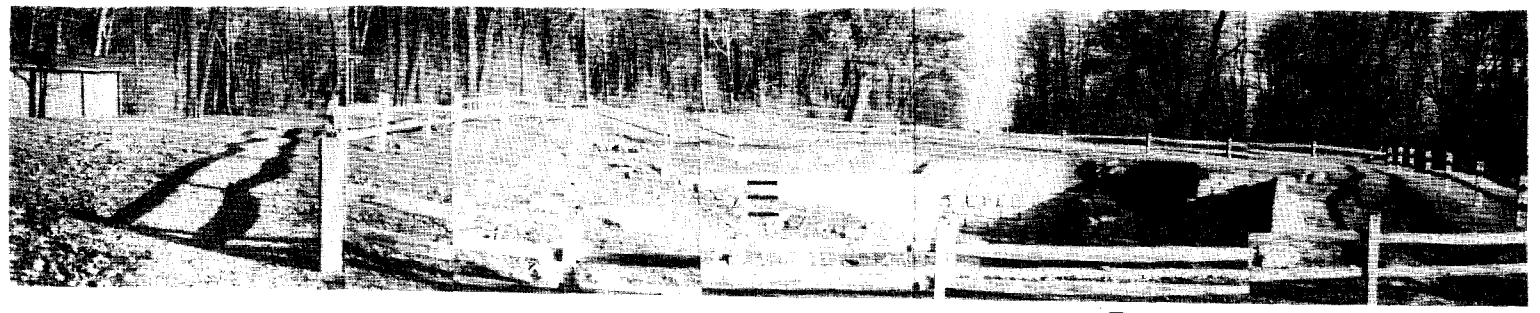
SECTION A - A
14|15



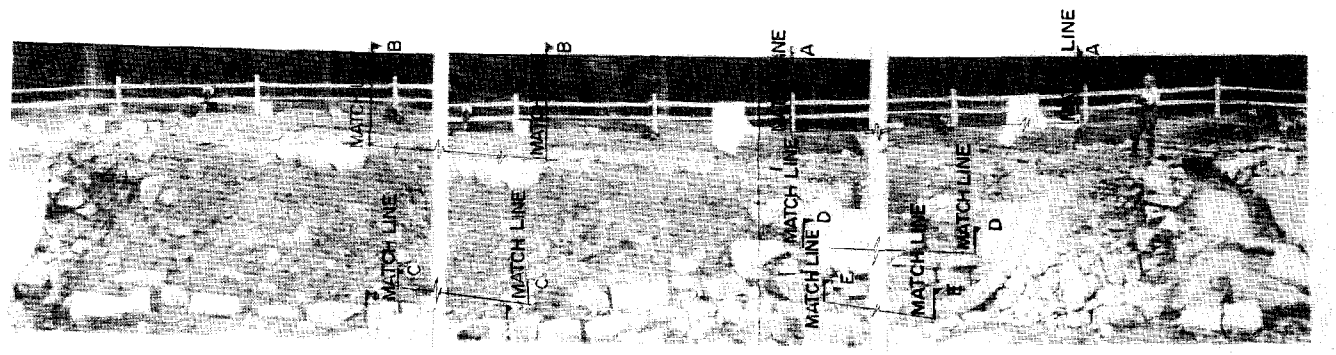
SECTION B - B
14|15



SECTION C - C
14|15



NORTHEAST VIEW OF 1989 EXISTING CONDITIONS D-D
14|15



NORTH VIEW OF 1984 EXCAVATIONS E-E
14|15



F-F 14|15 NORTHEAST VIEW AND NORTHWEST VIEW G-G 14|15
OF 1984 EXCAVATIONS



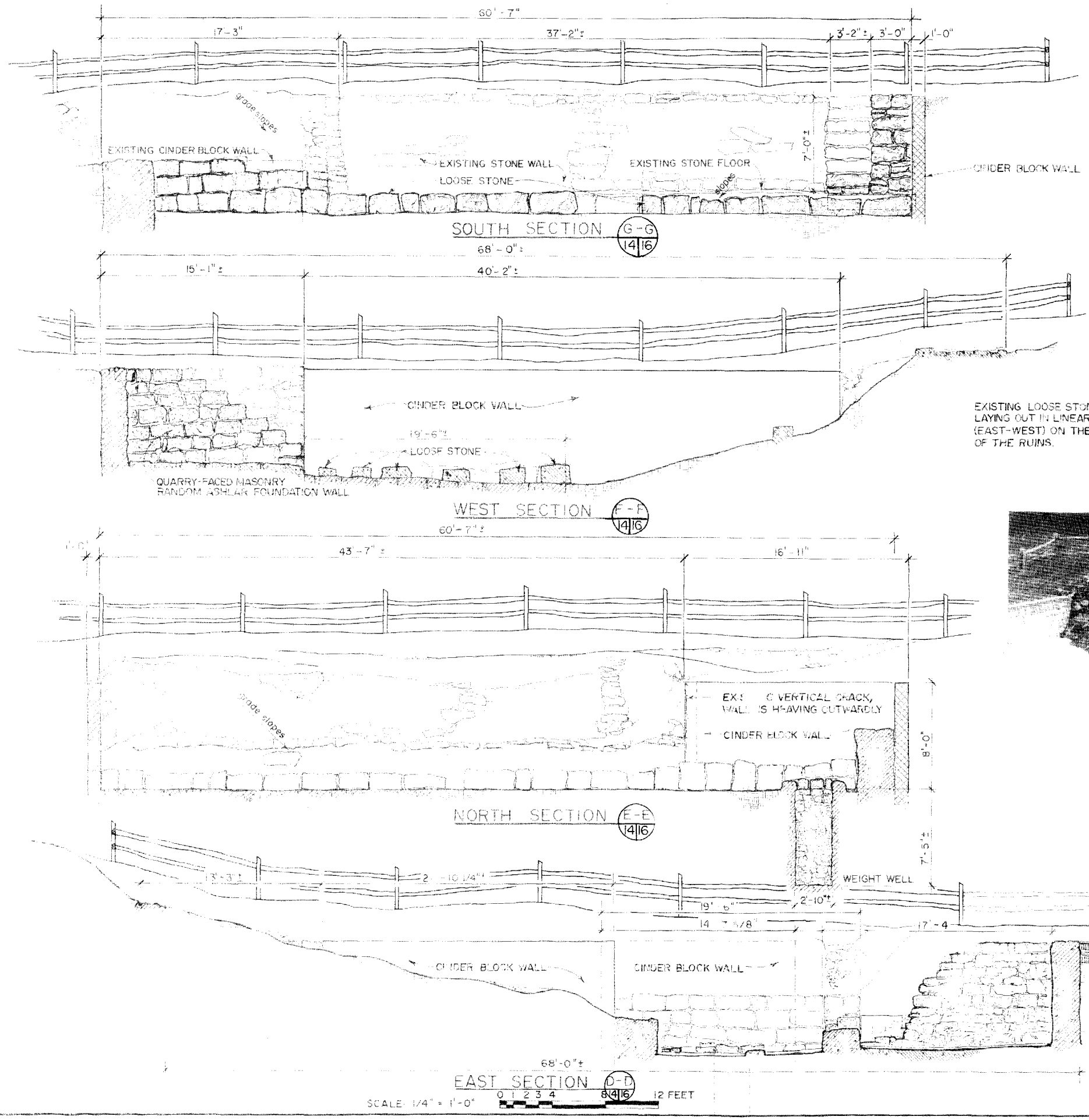


NORTHEAST VIEW OF 1989 EXISTING CONDITIONS H-H
14|15

SCALE: 1/4" = 1'-0" 0 1 2 3 4 8 12 FEET

ON MICROFILM

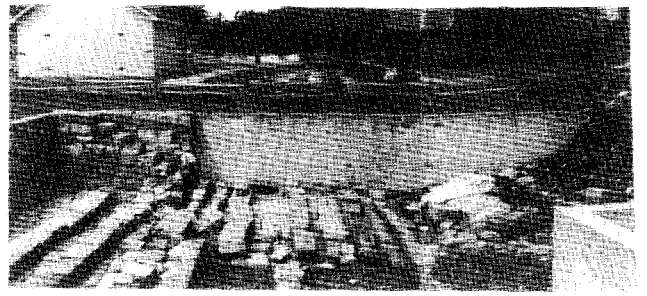
DESIGNED: camarena DRAWN: camarena TECH. REVIEW: H. LA FLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET ENGINE HOUSE 6 CROSS-SECTIONS AND ELEVATIONS SUMMIT LEVEL ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 15 OF 54



EXISTING LOOSE STONE ARE LAYING OUT IN LINEAR FASHION (EAST-WEST) ON THE FLOOR OF THE RUINS.



SOUTH ELEVATION G-G



WEST ELEVATION F-F



NORTH ELEVATION E-E

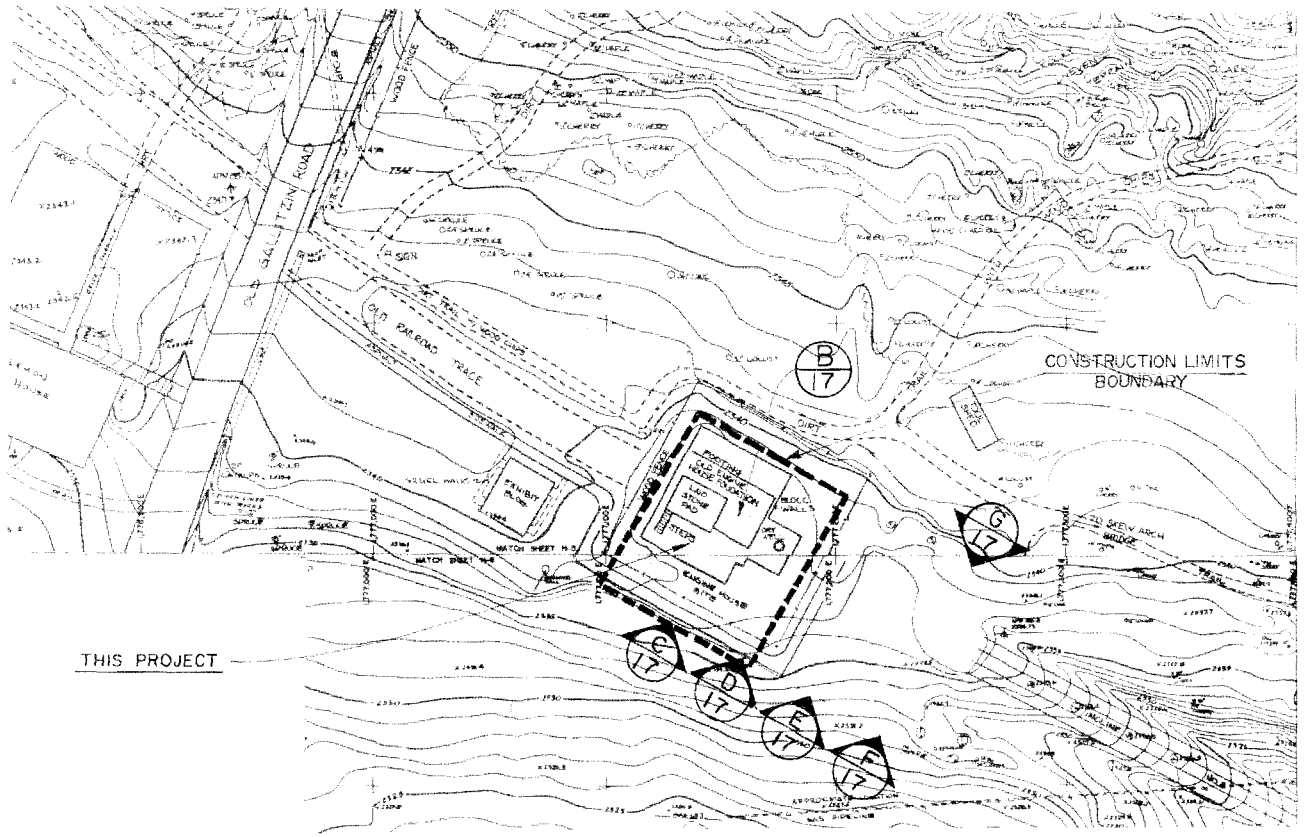


EAST ELEVATION D-D

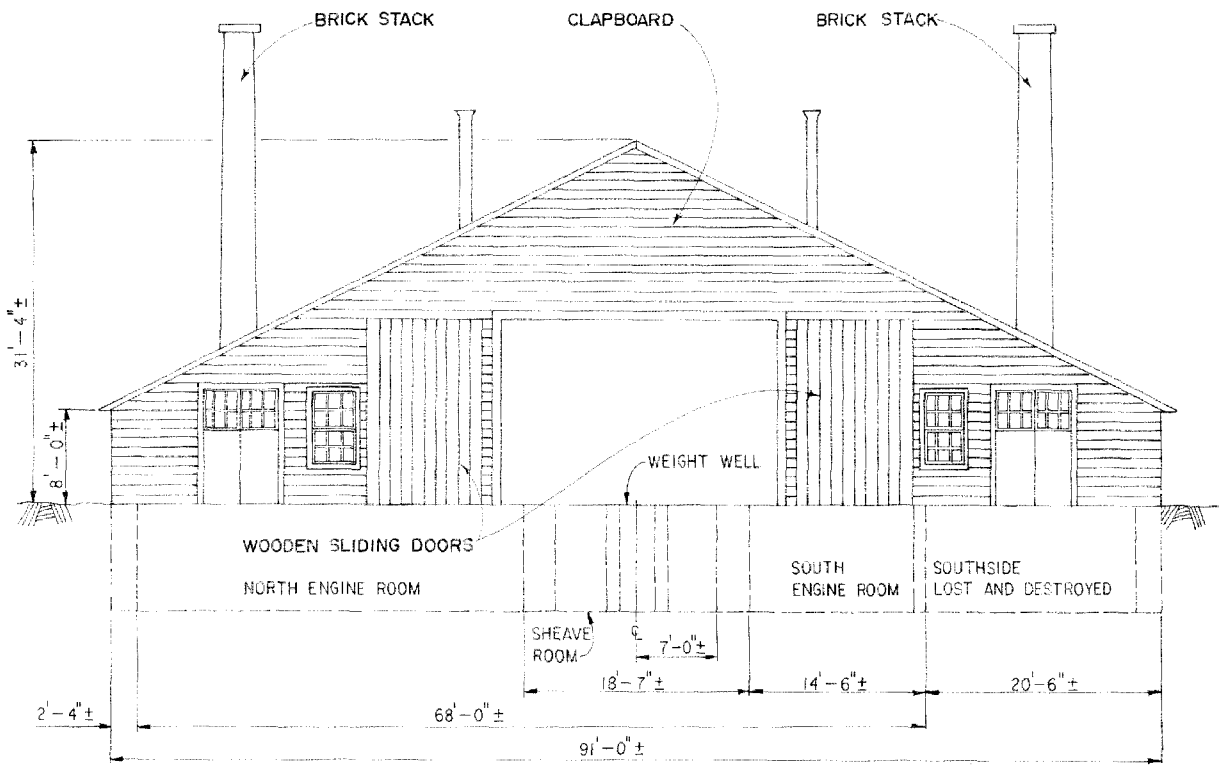
EXISTING CONDITIONS
PHOTOS TAKEN SEPTEMBER 1984

DESIGNED: camareng	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
DRAWN: camareng		ENGINE HOUSE 6 CROSS SECTIONS AND ELEVATIONS	423 25,005
TECH. REVIEW: H. LAFLEUR		SUMMIT LEVEL	PKG. NO. 104 / SHEET 16
DATE: 11/90		ALLEGHENY PORTAGE RAILROAD N.H.S.	OF 54

ON MICROFILM



ENGINE HOUSE 6 TOPO (A)
SCALE (A)



ENGINE HOUSE 6 CONJECTURAL EAST ELEVATION (B)
SCALE (B)

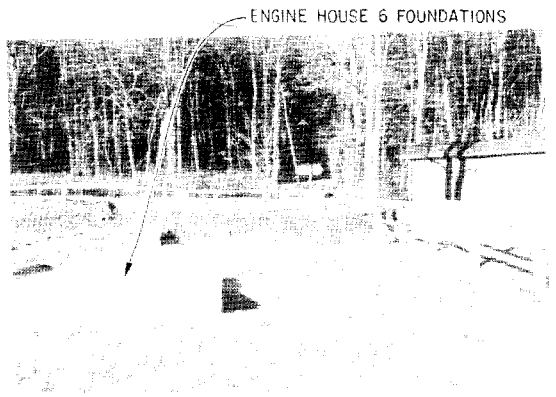
LIMITED DATA ON ENGINE HOUSE 6 WAS USED TO INTERPRET BUILDING AND DEVELOPE CONJECTURAL ELEVATION. DEPECTED INFORMATION FROM:

1. *GEORGE STORM PAINTINGS, 1840'S*
2. PHOTOGRAPH CA 1846
3. JAMES E. MUELLER'S SKETCH AND REPORT DATED 11-27-84
4. FRED R. CONNACHER'S PLAN – *TAKEN FROM WELCH'S REPORT*
5. EXISTING CONDITION DRAWINGS

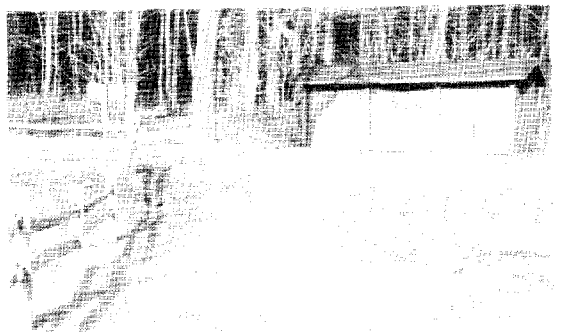
THERE IS ARCHEOLOGY THAT REMAINS TO BE DONE AND IT IS NOT FEASIBLE TO ESTABLISH EXACT BUILDING PARAMETERS. *THE REMAINING EXPLORATORY* ARCHEOLOGY WORK NEEDED ON THE SOUTHSIDE WILL PROBABLE DETERMINE HISTORIC DIMENSIONS; SPECIAL CONSTRUCTION DETAILS; AND ESTABLISH PARAMETERS FOR THE REPLICATION OF ENGINE HOUSE NO. 6, SHELTER.



NORTH VIEW (C)



NORTH VIEW AT EAST END (D)



NORTHEAST VIEW (BEYOND ENGINE HOUSE 6 FOUNDATIONS) (E)



NORTHEAST VIEW (BEYOND ENGINE HOUSE 6 FOUNDATIONS) (F)



SOUTHEAST VIEW (BEYOND ENGINE HOUSE 6 FOUNDATIONS) (G)

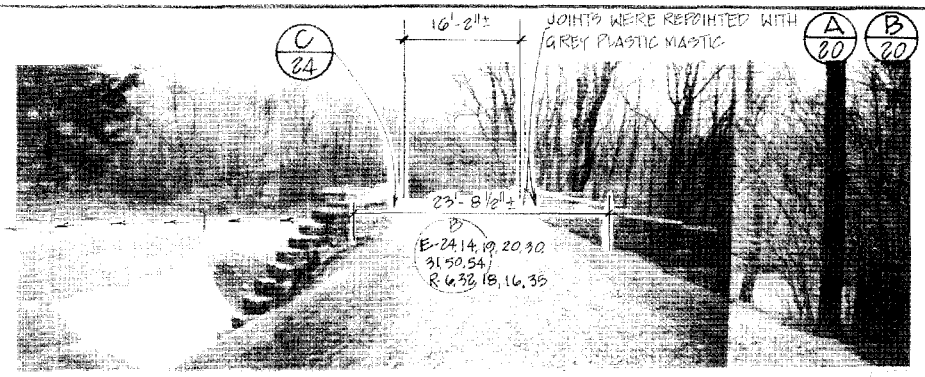
EXISTING CONDITIONS PHOTOS TAKEN IN 1989

ON MICROFILM

SCALE (B) 8 0 8 16 SCALE OF FEET

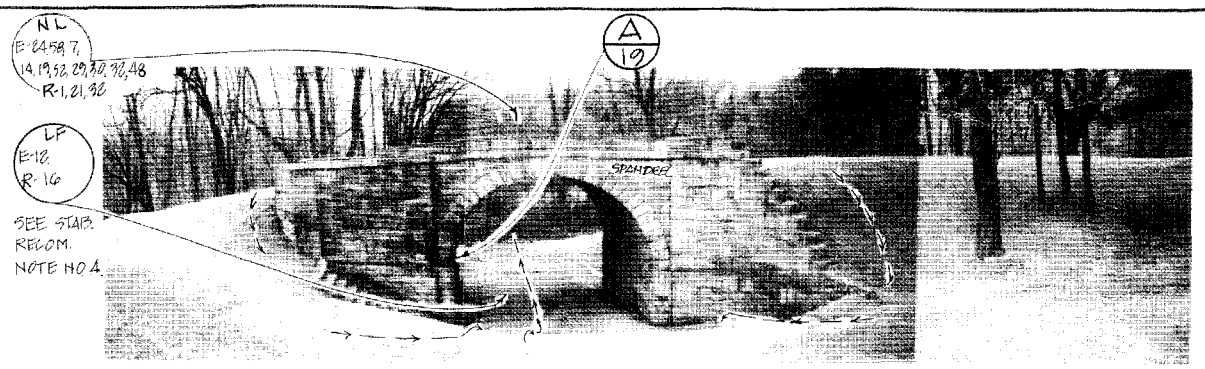
SCALE (A) 40 0 40 80 SCALE OF FEET

DESIGNED: N. CAMARENA	SUB SHEET NO.	TITLE OF SHEET: TOPO, ENGINE HOUSE 6 CONJECTURAL EAST ELEVATION, AND VIEWS SUMMIT LEVEL ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005
DRAWN: N. CAMARENA			PKG. NO. 104
TECH. REVIEW: H. LAFLEUR			SHEET 17 OF 54
DATE: 11/90			



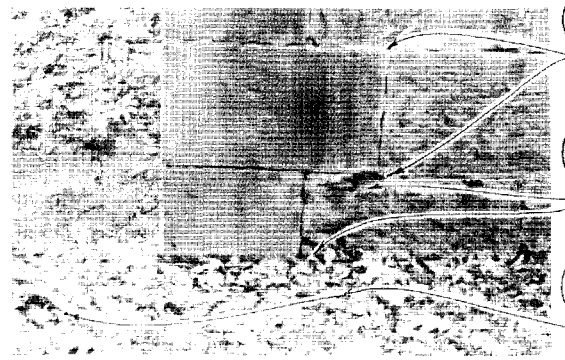
TRACE - NORTHEAST VIEW (1)

NOT TO SCALE



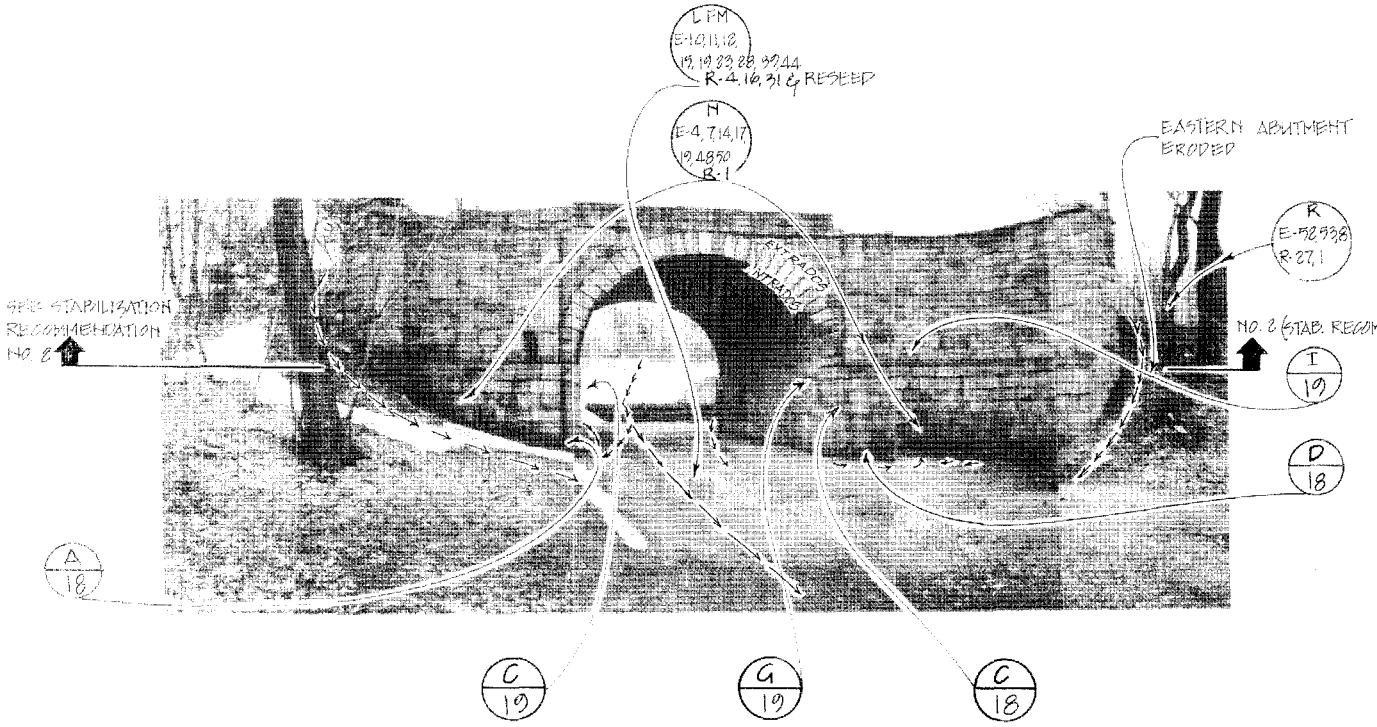
BRIDGE - WEST EL. (2)

NOT TO SCALE



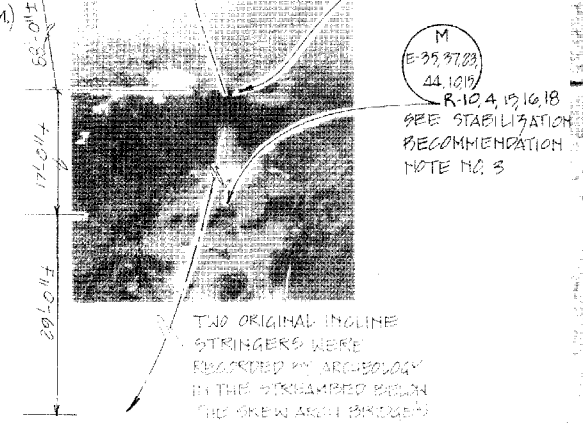
SOUTHEAST CORNER BOTTOM DETAIL (A 3/18)

NOT TO SCALE



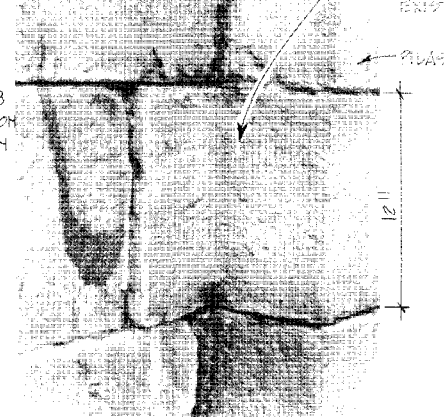
BRIDGE - EAST EL. (3)

NOT TO SCALE



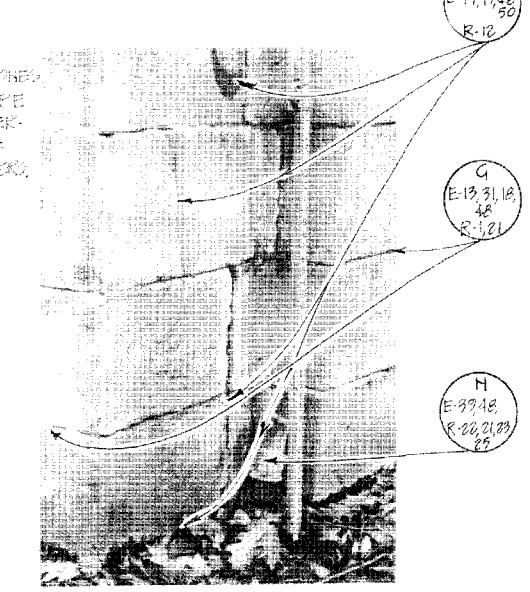
MODERN CULVERT EAST EL. (B 3/18)

NOT TO SCALE



STONE DETAIL (C 3/18)

NOT TO SCALE



CORNER DETAIL NORTHEAST (D 3/18)

NOT TO SCALE

STABILIZATION RECOMMENDATIONS

1. ALL LOOSE MATERIALS (WOOD CHIPS, SOILS, GRAVELS ETC.) SHOULD BE REMOVED FROM THE TOP OF THE SKEWED ARCH BRIDGE (ROADBED) TO SEE WHAT HAS BEEN DONE TO SEAL THE BRIDGE DECK FROM MOISTURE (RAINFALL). REPAIR WORK DOES NOT APPEAR ADEQUATE AS APPARENT BY VISIBLE MOISTURE WEEPING IN THE STONE MASONARY JOINTS, AND THE TOP OF THE SKEW ARCH BRIDGE SHOULD BE SEALED BY SOME METHOD, SUCH AS USING A WATER PROOF MEMBRANE OR A PLASTER LINER.
2. RAKE 1/4" - 3/8", (WEATHERED) REPOINT AS REQUIRED.
3. INSTALL A NEW CULVERT AT ANOTHER LOCATION, REGRADE, & RECHANNEL TO BY PASS EXISTING HISTORIC STRINGERS.
4. INSTALL FRENCH DRAIN.

GENERAL NOTES

1. FOR VISITOR SAFETY, INSTALL 34" RAILING, ABOVE BARREL, PARALLEL TO EXISTING EAST & WEST PARAPET WALLS.
2. NOTE: ORIGINAL HISTORIC INCLINE STRINGERS WERE FOUND IN THE STREAMBED BELOW THE SKEW ARCH BRIDGE. THESE FEATURES SHOULD BE REBURIED AND CONSIDER REROUTING THE STREAM, WITH PROVISIONS FOR ARCHEOLOGY MITIGATION. THEREFORE, INSTALL NEW CULVERT & HEAD/WING WALLS, LOCATED 134 FEET, EAST OF SKEW ARCH BRIDGE. RELOCATE AWAY FROM HISTORIC STRINGERS.
3. RIPRAP DOWN STREAM TO CONFLUENCE OF CREEK.

EXISTING CONDITIONS PHOTOS TAKEN IN 1989

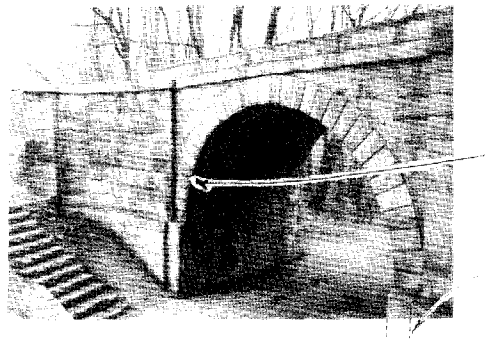
ON MICROFILM

DESIGNED: N. CAMARENA DRAWN: N. CAMARENA TECH. REVIEW: H. LA FLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET: SKEW ARCH BRIDGE ELEVATIONS, TRACE, AND DETAILS INCLINED PLANE NO. 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 18 OF 54



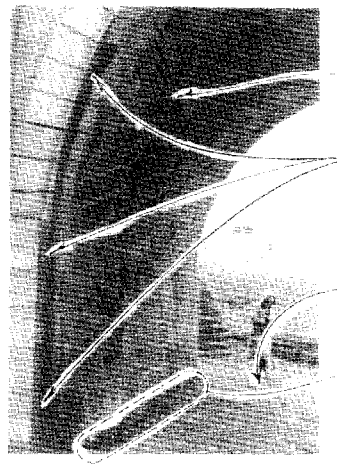
BARREL DETAIL - NORTHWEST EL. (A)

NOT TO SCALE



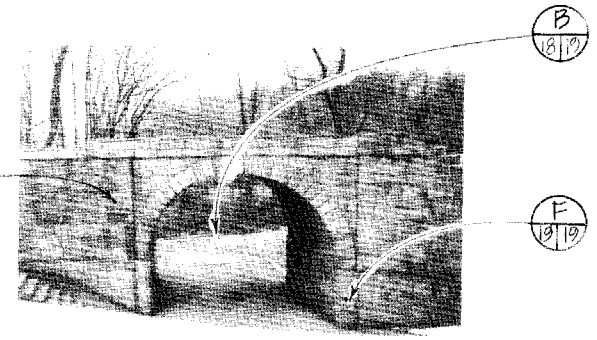
BRIDGE DETAIL - NORTHWEST EL. (B)

NOT TO SCALE



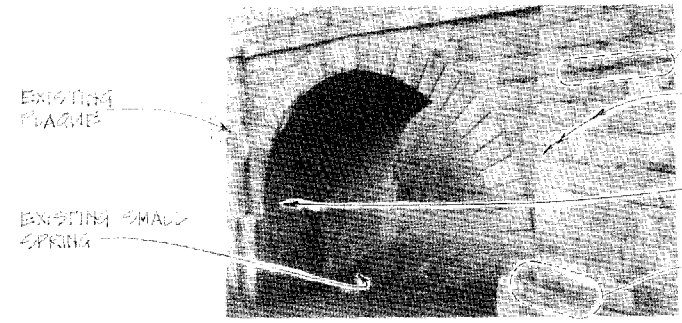
BARREL CONSTRUCTION DETAIL - SOUTHEAST EL. (C)

NOT TO SCALE



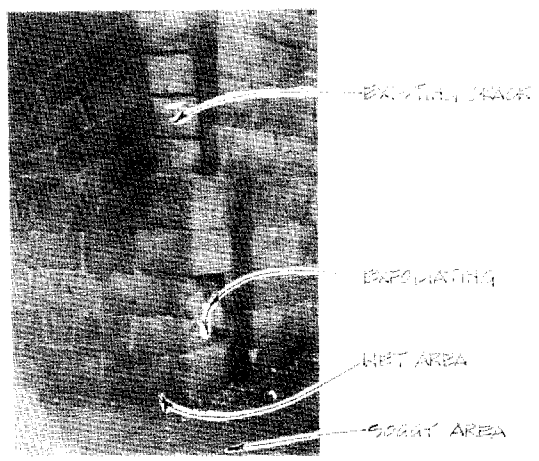
BRIDGE DETAIL - WEST EL. (D)

NOT TO SCALE



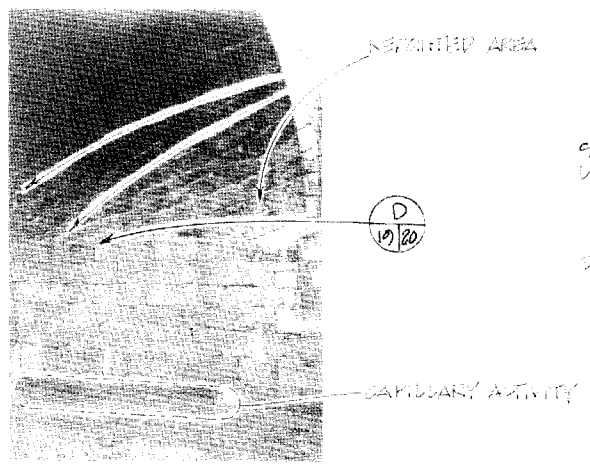
BARREL CONSTRUCTION DETAIL - NORTHWEST EL. (E)

NOT TO SCALE



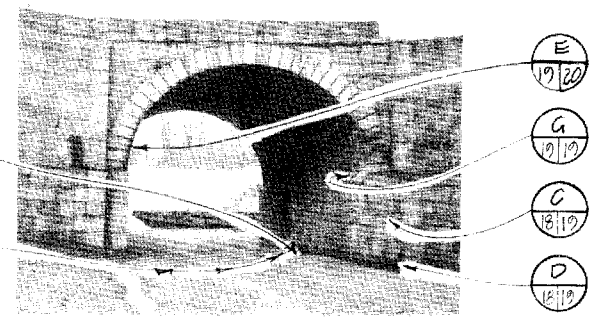
CORNER DETAIL SOUTHWEST EL. (F)

NOT TO SCALE



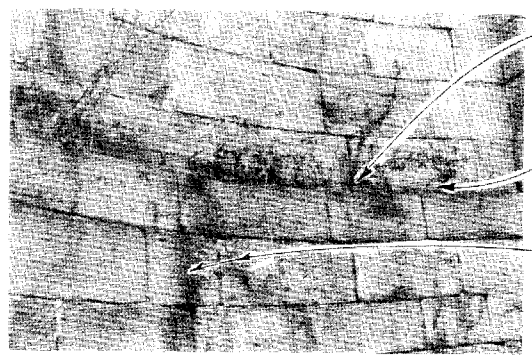
BARREL CONSTRUCTION DETAIL - NORTHEAST EL. (G)

NOT TO SCALE



BRIDGE DETAIL - EAST EL. (H)

NOT TO SCALE



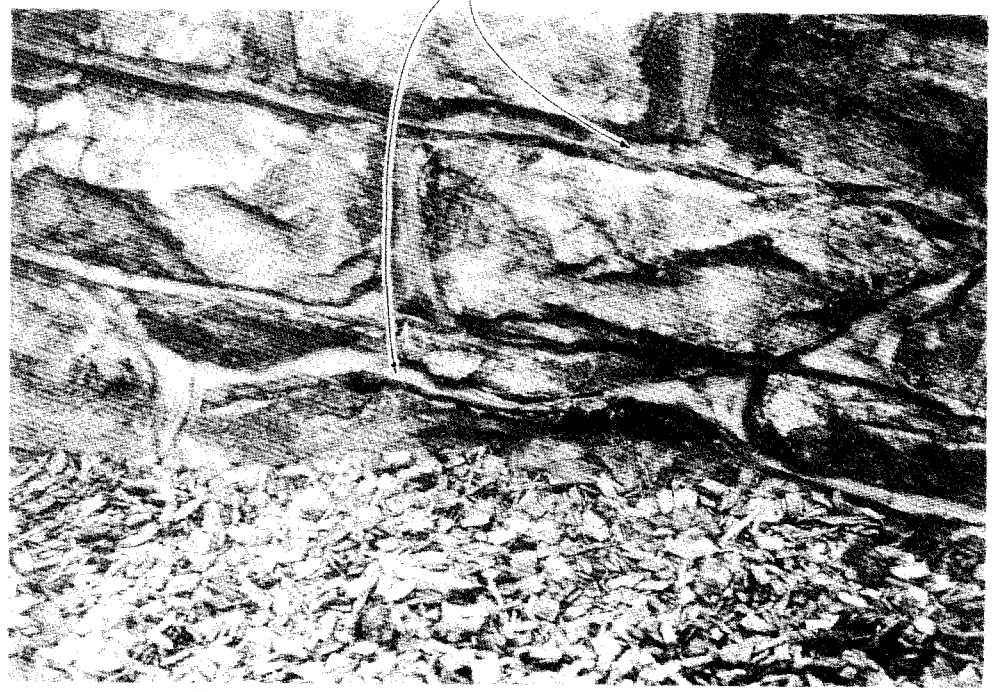
WATERTABLE DETAIL NORTHEAST EL. (I)

NOT TO SCALE

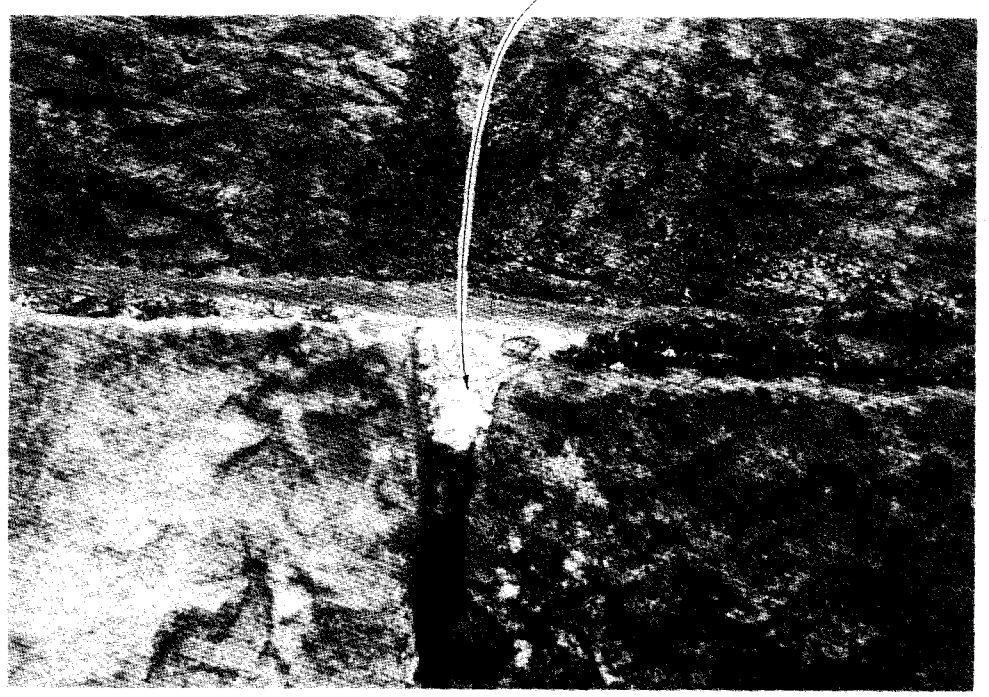
EXISTING CONDITIONS PHOTOS TAKEN IN 1980

DESIGNED: N. CAMARENA DRAWN: N. CAMARENA TECH. REVIEW: H. LA FLEUR DATE: 11/80	SUB SHEET NO.	TITLE OF SHEET SKEW ARCH BRIDGE DETAILS INCLINED PLANE NO. 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 19 OF 54

ON MICROFILM



A JOINT DETAIL - EAST ELEVATION (ROADWAY INTERIOR BOTTOM OF PARAPET WALL)



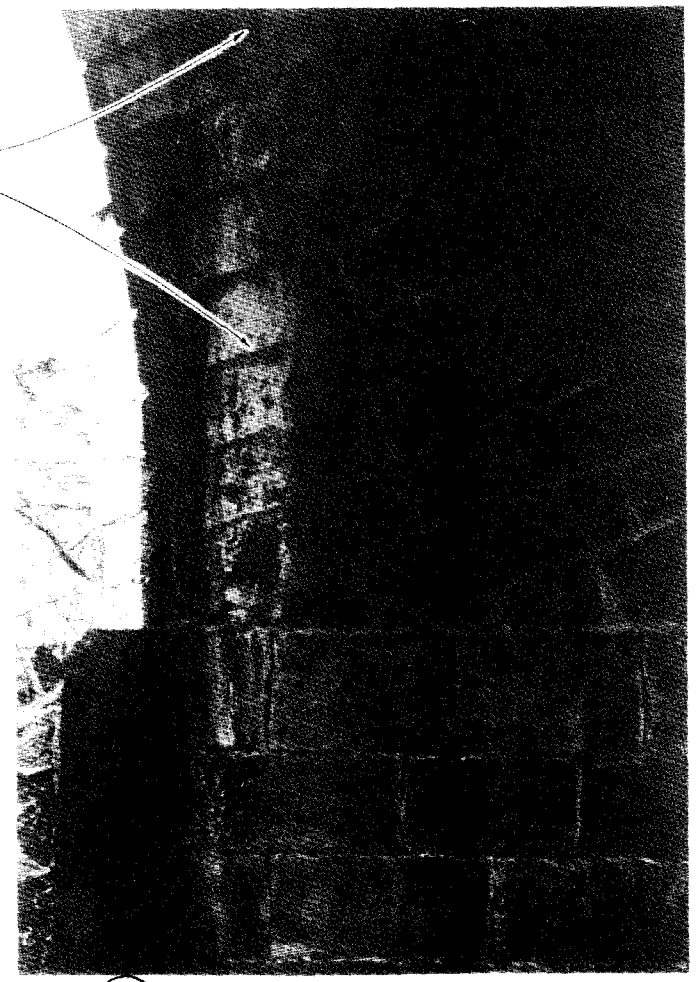
B JOINT DETAIL - EAST ELEVATION (ROADWAY INTERIOR CENTER OF PARAPET WALL)



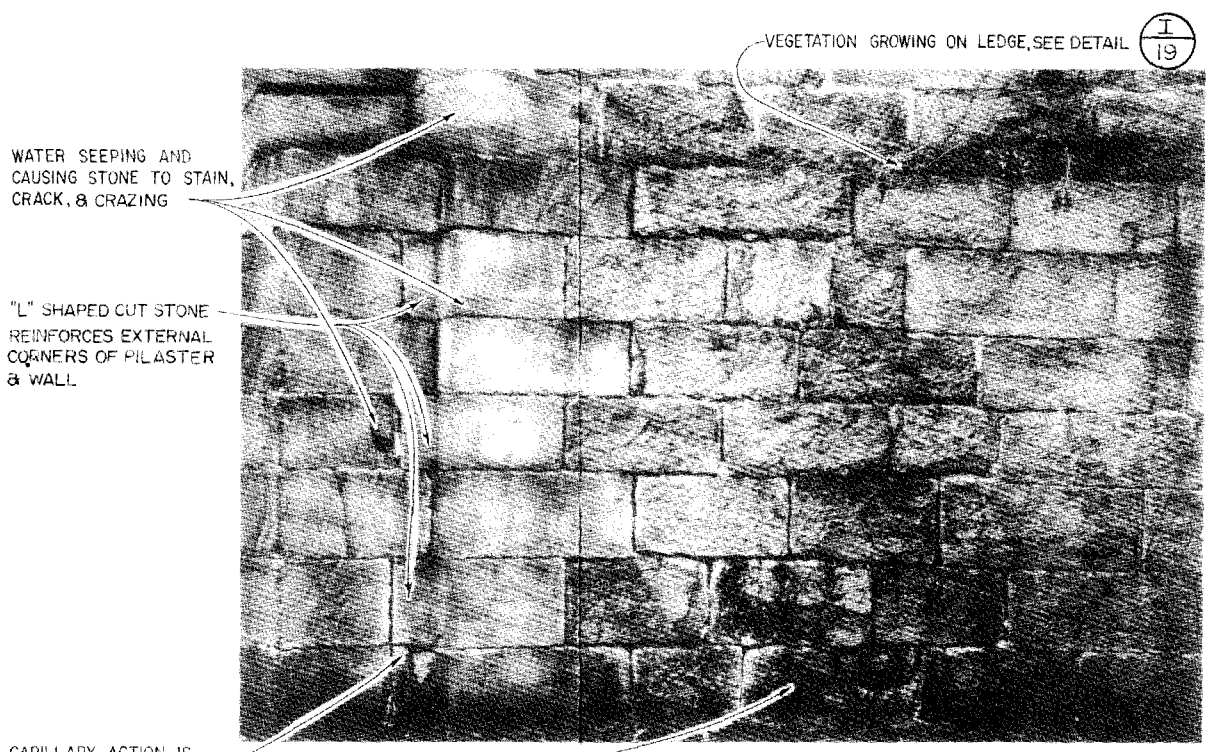
C JOINT DETAIL - WEST ELEVATION (ROADWAY INTERIOR OF PARAPET WALL)



D REPOINTING DETAIL (NORTHEAST ELEVATION BARREL'S INTERIOR)



E BARREL DETAIL (SOUTHEAST ELEVATION)



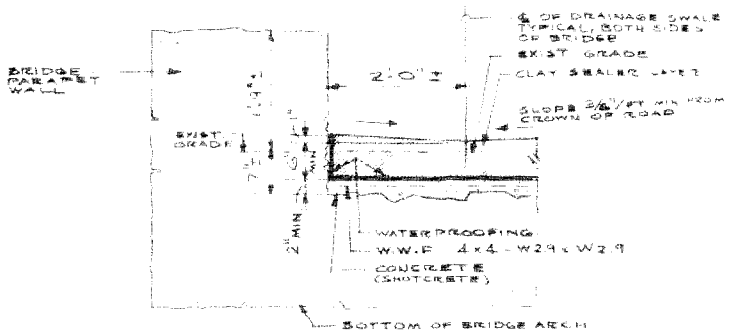
F EXTERIOR WALL DETAIL (NORTHEAST ELEVATION)

EXISTING CONDITIONS PHOTOS TAKEN IN 1989

DESIGNED: N. CAMARENA DRAWN: N. CAMARENA TECH. REVIEW: H. LAFLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET SKEW ARCH BRIDGE DETAILS INCLINED PLANE NO. 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 20 OF 54

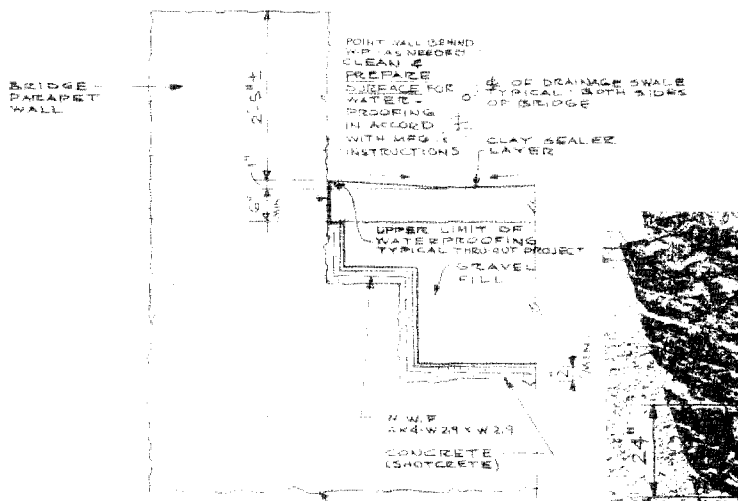
ON MICROFILM

☆ U.S. GOVERNMENT PRINTING OFFICE: 875-100



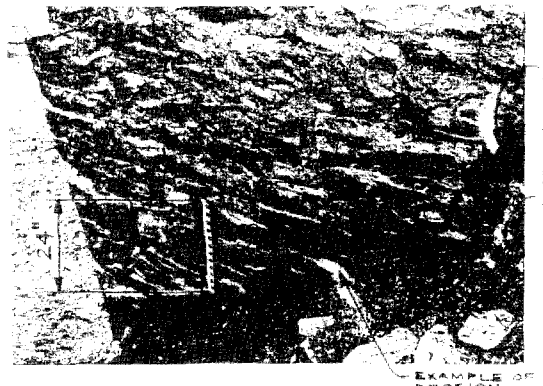
SECT./DET A-A

SCALE: 3/4"=1'-0"



SECT./DET B-B

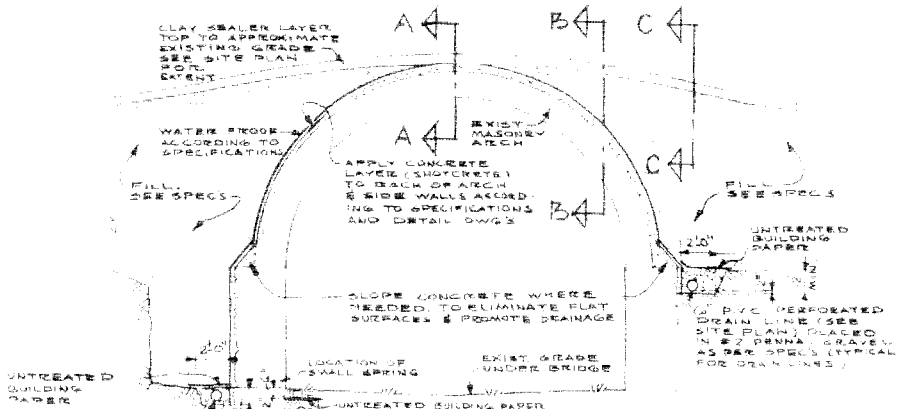
SCALE: 3/4"=1'-0"



EXAMPLE OF EROSION

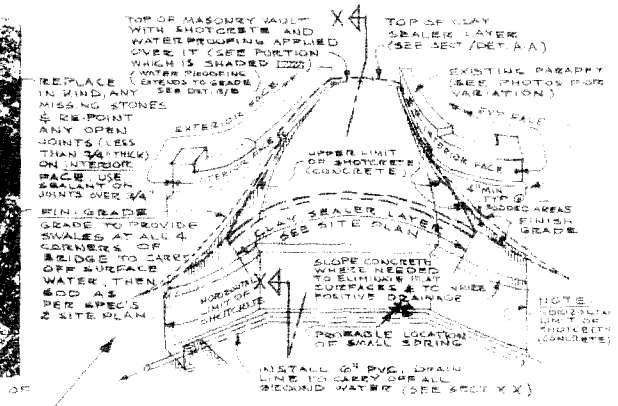
VIEW Nº 3

OF EASTERN ABUTMENT
SEE SKETCH & SITE PLAN



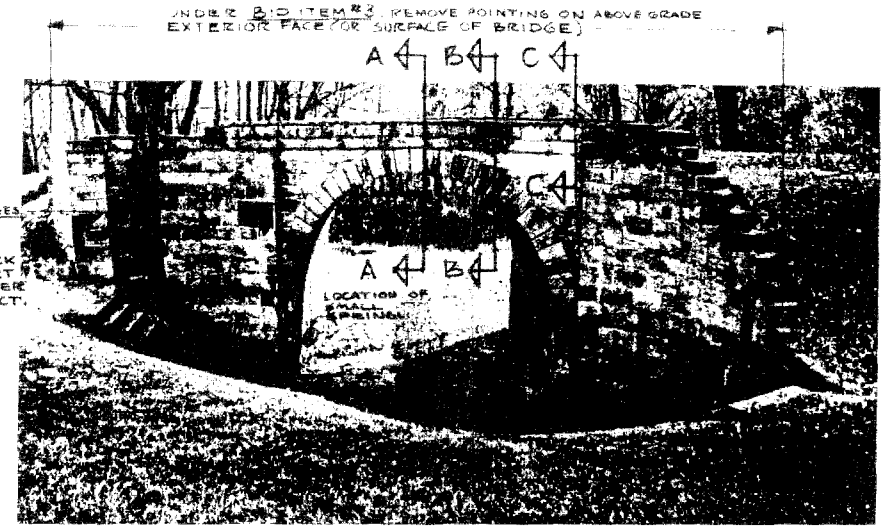
SECTION X-X

SCALE 3/16"=1'-0"±



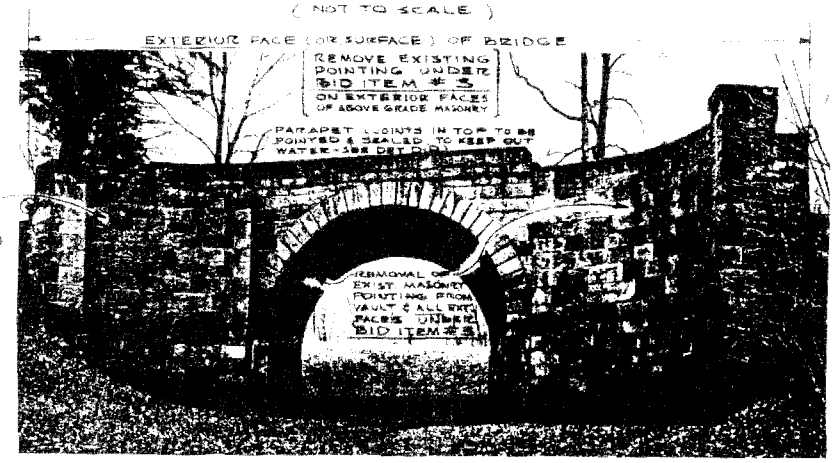
SKETCH VIEW OF BRIDGE FROM NORTHEAST

(NOT TO SCALE)



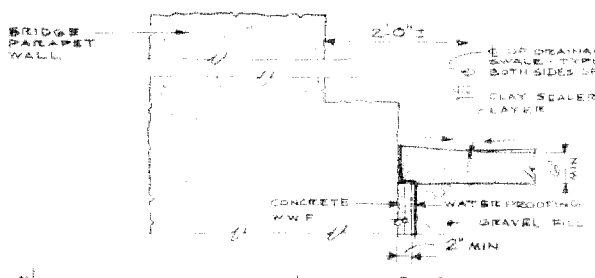
VIEW Nº 1 (FROM NORTHWEST)

(NOT TO SCALE)



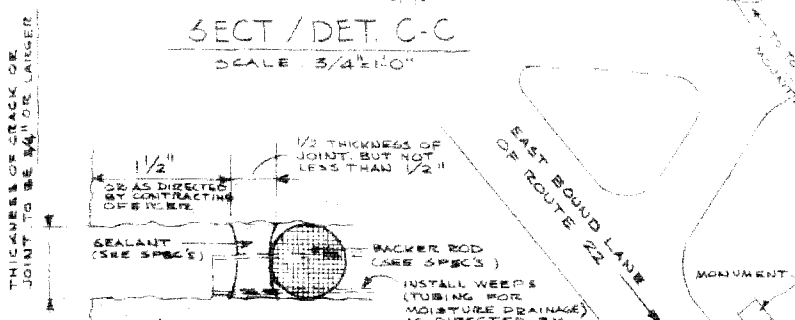
VIEW Nº 2 (FROM SOUTHEAST)

(NOT TO SCALE)



SECT./DET C-C

SCALE 3/4"=1'-0"



SECT./DET. D-D

(CRACK & JOINT SEALANT) UNDER BID ITEM #3

SCALE: FULL SIZE.

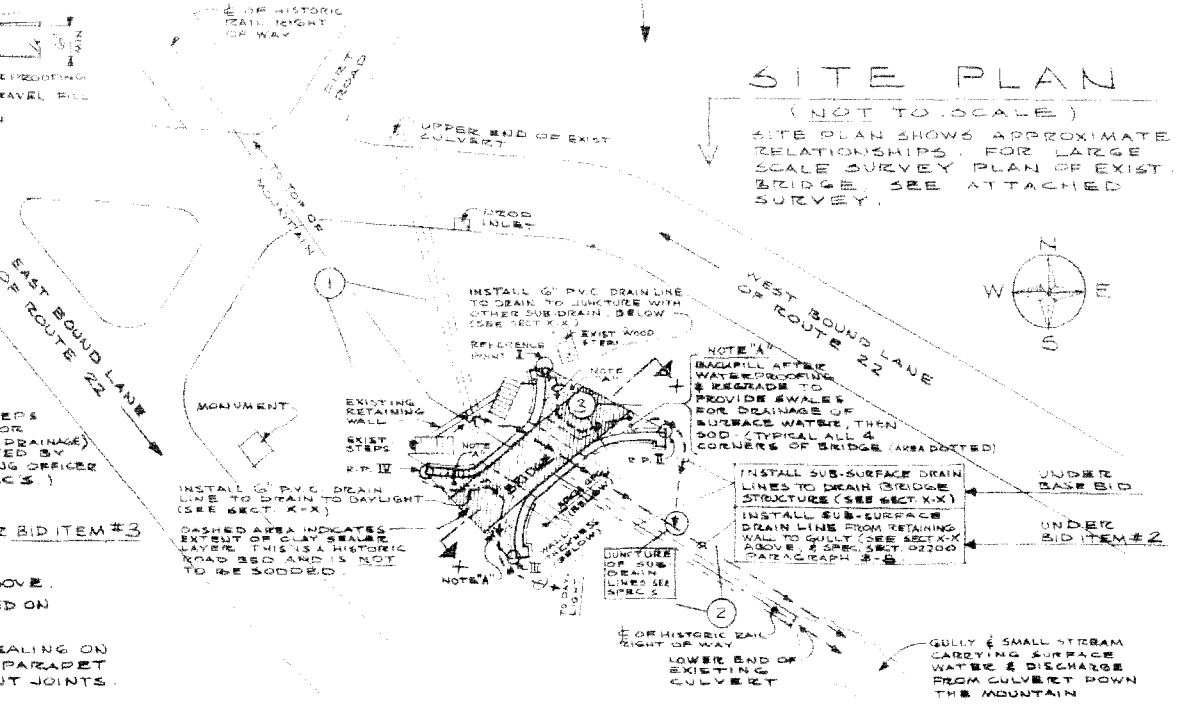
NOTE: - DETAIL OF RECESSED JOINT ABOVE IS FOR CRACKS, OR JOINTS TO BE SEALED ON EXTERIOR FACE OF BRIDGE.

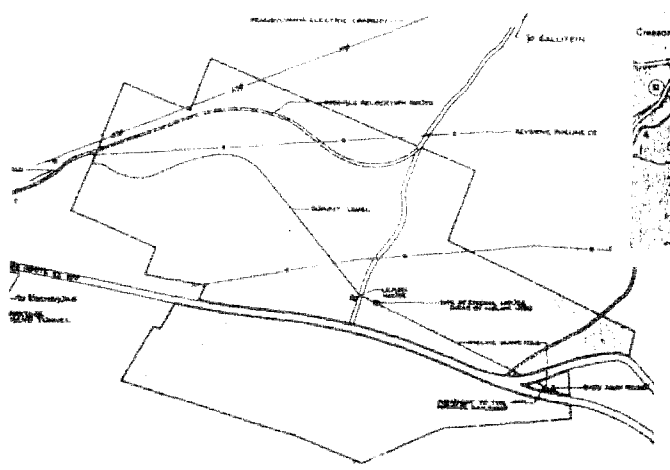
NOTE: - CRACKS & JOINTS REQUIRING SEALING ON INTERIOR FACE OF BRIDGE & TOP OF PARAPET SHALL BE MADE FLUSH TO MATCH ADJACENT JOINTS.

SITE PLAN

(NOT TO SCALE)

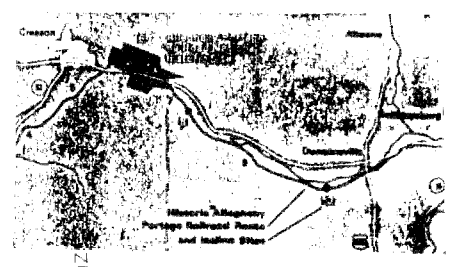
SITE PLAN SHOWS APPROXIMATE RELATIONSHIPS. FOR LARGE SCALE SURVEY PLAN OF EXIST BRIDGE SEE ATTACHED SURVEY.





MAP OF PARK

0 400 800 1600 FT.



VICINITY MAP

0 1/2 1 MILES

GENERAL NOTES:

1 - FOR SURVEY OF EXISTING STRUCTURE, SEE ATTACHED DRAWINGS PREPARED BY HISTORIC AMERICAN BUILDING SURVEY.

2 - CONTRACTOR MUST INSPECT BRIDGE & SITE PRIOR TO SUBMITTING BID.

3 - CONTRACTOR MUST VERIFY ALL DIMENSIONS & EXISTING CONDITIONS & NOTIFY CONTRACTING OFFICER OF ANY DISCREPANCIES IN CONTRACT DOCUMENTS.

4 - THE HISTORIC IMPORTANCE OF THIS STRUCTURE MAKES IT ESSENTIAL THAT IT BE PRESERVED INTACT WHERE IT IS NECESSARY TO REPAIR A PORTION OF BRIDGE, CONTRACTOR SHALL UTILIZE ORIGINAL MATERIALS IN THEIR ORIGINAL LOCATION UNLESS OTHERWISE DIRECTED BY CONTRACTING OFFICER.

5. - FINISH GRADE WILL BE DETERMINED IN FIELD BY C.O. AT PRE-BID CONFERENCE

6 - CONTRACTOR MUST PROTECT BRIDGE FROM ALL DAMAGE (SEE SPECIFICATIONS)

7 - QUANTITIES OF MATERIALS & EXTENT OF WORK ARE TO BE DETERMINED ON SITE BY CONTRACTOR.

8 - PNEUMATICALLY PLACED CONCRETE IS ALSO CALLED SHOTCRETE & CONCRETE ON DRAWING & IN SPECIFICATIONS.

9 - JOINTS IN TOP OF PARAPETS TO BE POINTED & SEALED TO KEEP OUT WATER (SEE SECT./DET D-D)

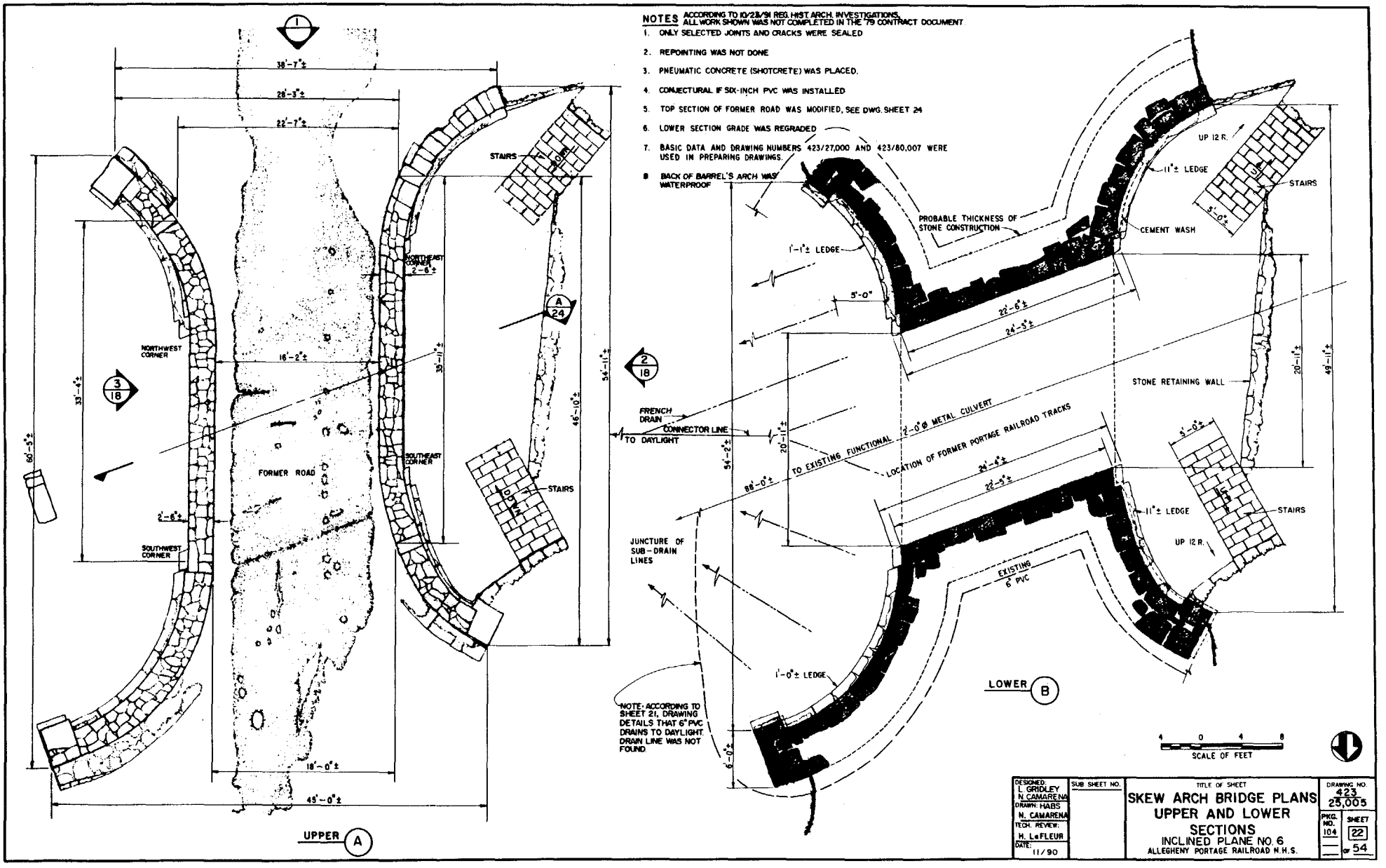
ABBREVIATIONS:

C.O.	- CONTRACTING OFFICER	CONC	- CONCRETE
DET.	- DETAIL	DWG.	- DRAWING
EXIST.	- EXISTING	EXT.	- EXTERIOR
FIN.	- FINISH	MFR.	- MANUFACTURER
FT.	- FOOT	SPECS.	- SPECIFICATIONS
MIN.	- MINIMUM	SURF.	- SURFACE
P.V.C.	- POLY-VINYL-CHLORIDE	TYP.	- TYPICAL
W.W.F.	- WELDED WIRE FABRIC	R.P.	- REFERENCE POINT
W.P.	- WATER PROOFING		

REVISIONS

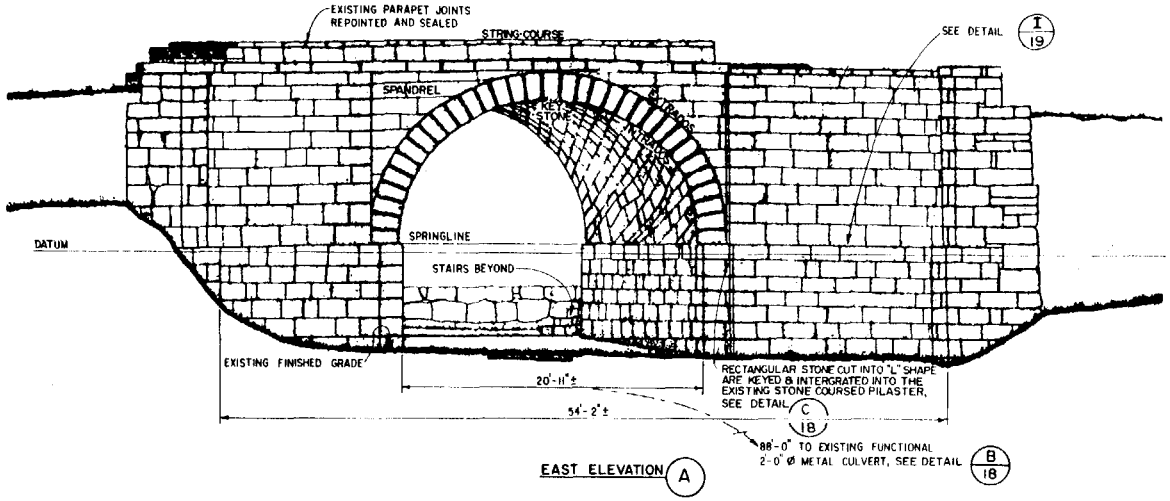
DESIGNED: J. INGLE	SUB SHEET NO.	TITLE OF SHEET: SKEW ARCH BRIDGE 1979 STABILIZATION INCLINED PLANE NO. 6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005
DRAWN: J. INGLE			PKG. NO. 104
TECH. REVIEW: H.J. MAGAZINER			SHEET 21 of 54
DATE: 1979			

ON MICROFILM

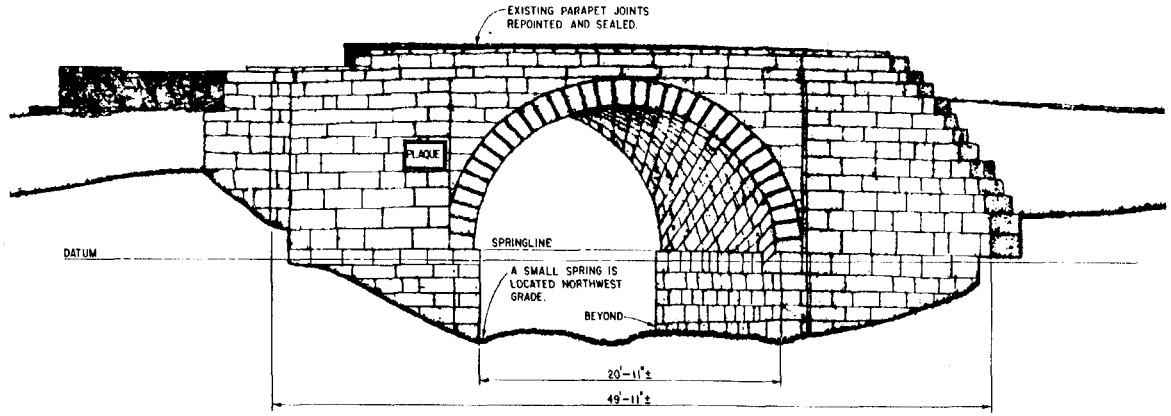


ON MICROFILM

ON MICROFILM



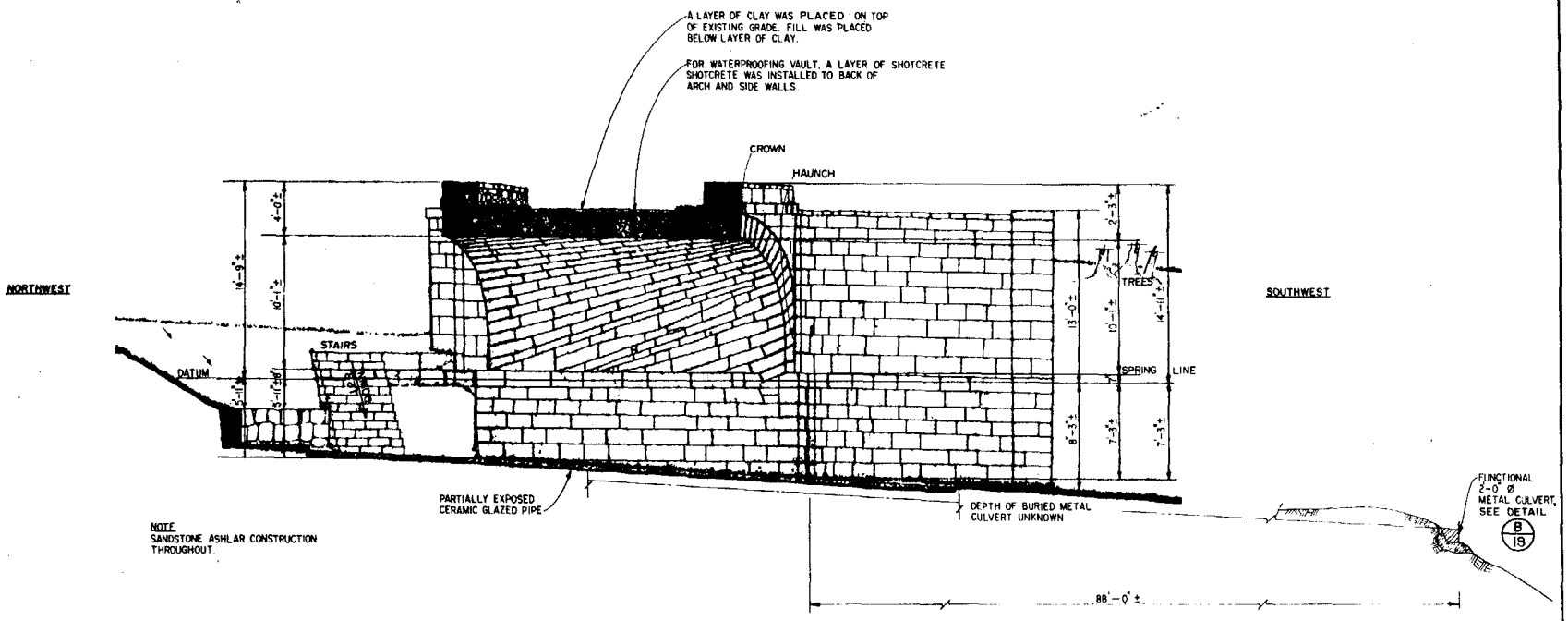
EAST ELEVATION (A)



WEST ELEVATION (B)

4 0 4 8
SCALE OF FEET

DESIGNED: N. CAMARENA	SUB SHEET NO.	TITLE OF SHEET: SKEW ARCH BRIDGE EAST & WEST ELEVATIONS	DRAWING NO. 423 25,005
DRAWN: HABS N. CAMARENA		INCLINED PLANE NO 6	PKG. NO. 104
TECH. REVIEW: H. LaFLEUR		ALLEGHENY PORTAGE RAILROAD N.H.S.	SHEET 23 OF 54
DATE: 11/90			



NOTE
SANDSTONE ASHLAR CONSTRUCTION THROUGHOUT.

SECTION A-A

SCALE OF FEET

DESIGNED CAMARENA DRAWN HABS, CAMARENA TECH. REVIEW H. La FLEUR DATE 11/90	SUB SHEET NO	TITLE OF SHEET SKEW ARCH BRIDGE CROSS-SECTION INCLINED PLANE NO.6 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO 422 25,005 PKG NO. 104 SHEET 24 OF 54

ON MICROFILM

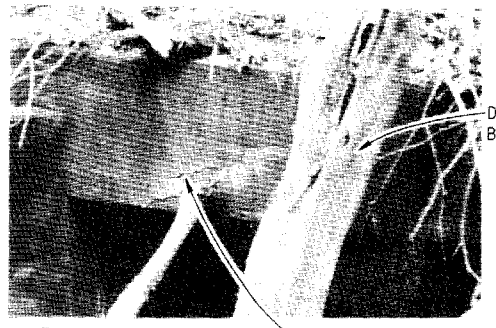


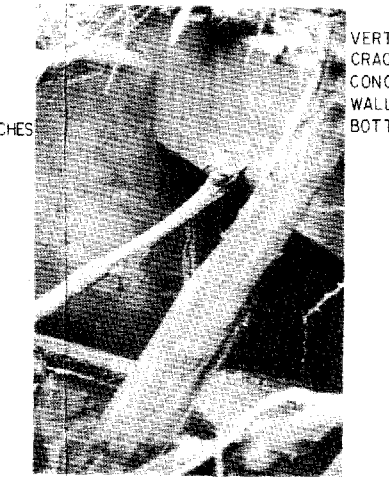
SOUTH EMBANKMENT



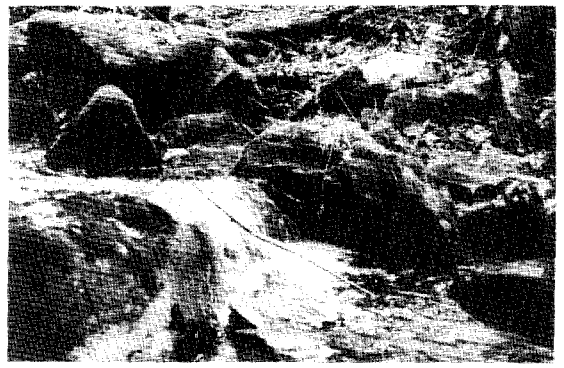
INLET- SOUTH EL.


CLOSE-UP VIEWS OF INLET- SOUTH EL.



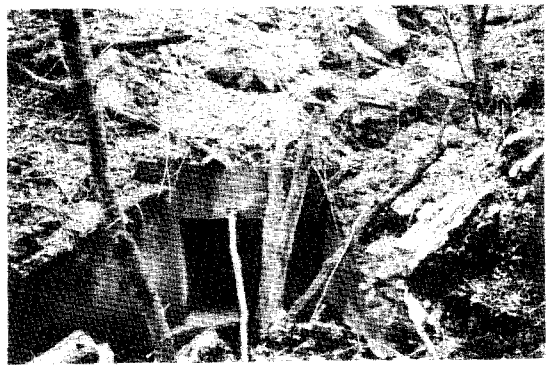


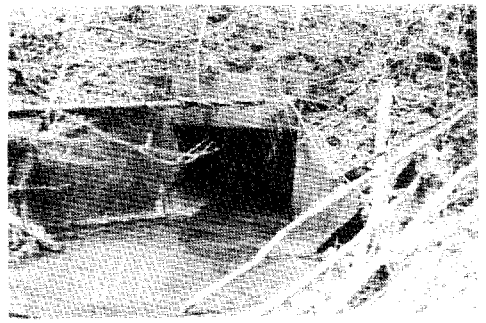
PARTIAL INTERIOR VIEW OF INLET


INLET STREAM-SOUTH EL.



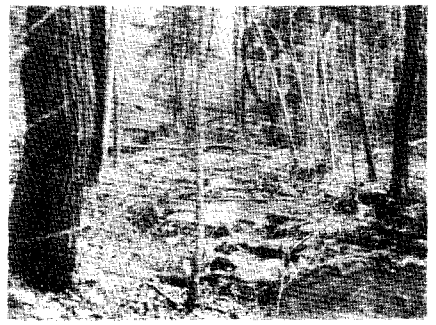
INLET STREAM


VIEWING INLET- SOUTH EL.

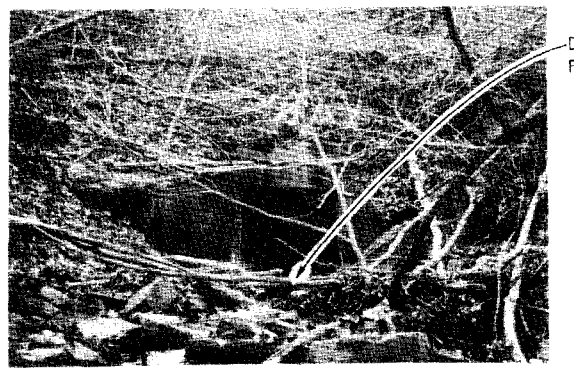

VIEWING OUTLET-NORTH EL.

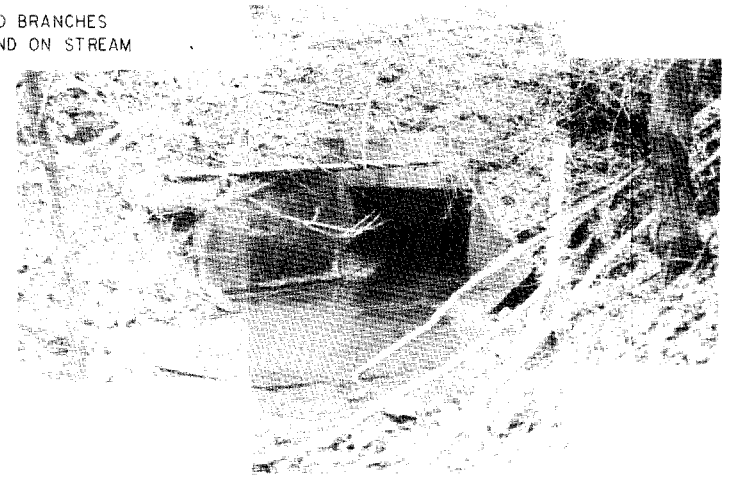

OUTLET STREAM-NORTH EL.


OUTLET STREAM- NORTH EL.

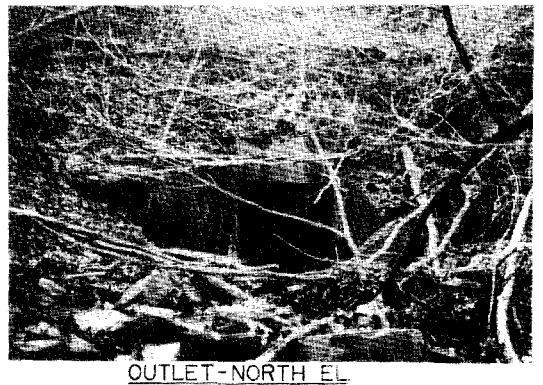

OUTLET STREAM- NORTH EL.


OUTLET STREAM- NORTH EL.

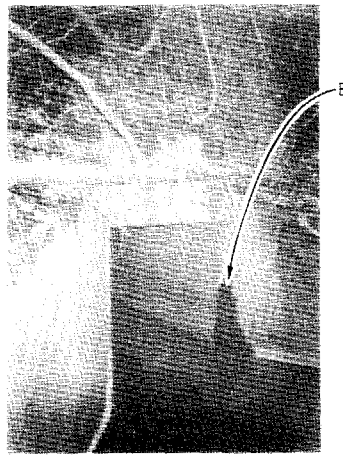

OUTLET VIEW-NORTH EL.



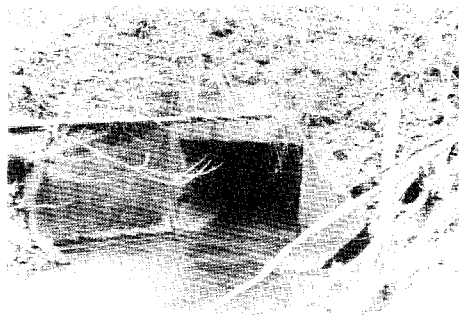
OUTLET- NORTH EL.


OUTLET-NORTH EL.


VIEW OF OUTLET-NORTH EL.



VIEW OF OUTLET-NORTH EL.


VIEW OF OUTLET-NORTH EL.

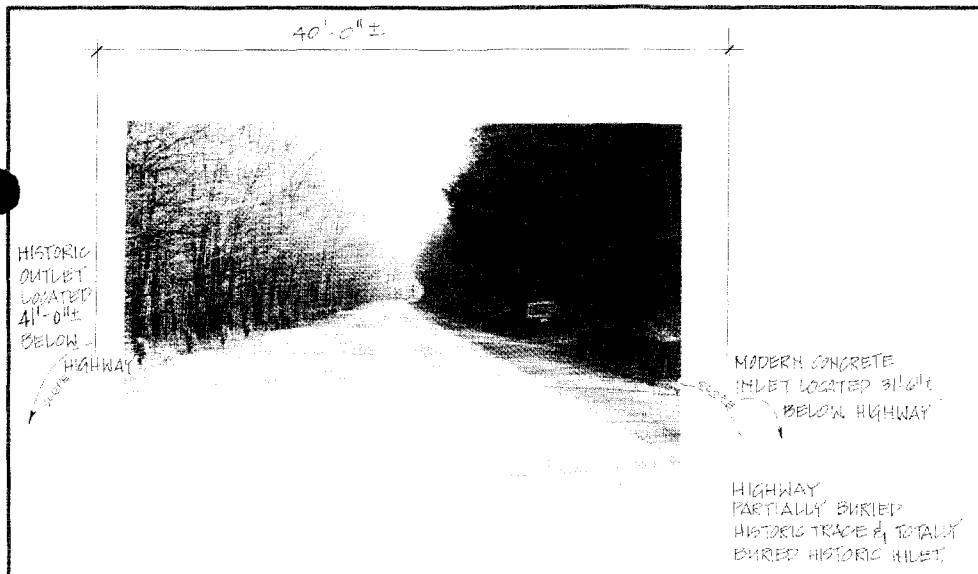
NOTE: HISTORIC CULVERT 1422 WAS NOT FOUND. IT WAS EITHER BURIED OR DESTROYED AT THE TIME THE HIGHWAY WAS CONSTRUCTED. NO WORK IS PLANNED FOR THIS CULVERT.

EXISTING CONDITIONS
PHOTOS TAKEN IN 1990

NO SCALE

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
N. CAMARENA		MODERN CULVERT 1422 GENERAL INFORMATION	423 25005
DRAWN: N. CAMARENA		INCLINED PLANE NO. 6	PKG. NO. 104
TECH. REVIEW: H. LAFLEUR		ALLEGHENY PORTAGE RAILROAD NHS	SHEET 25 OF 54
DATE: 11/90			

ON MICROFILM



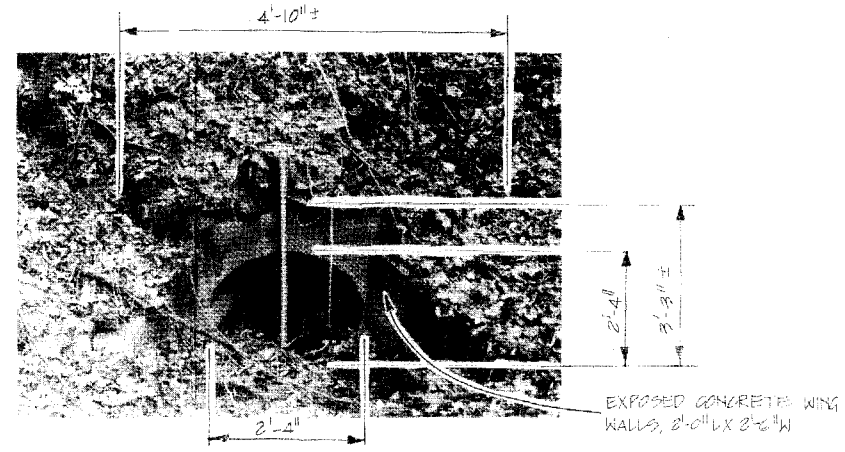
OLD U.S. ROUTE 22 - EAST VIEW (TYP.) (A)

NOT TO SCALE



DRAINAGE - SOUTH EL. (LOOKING UP) (B)

NOT TO SCALE



MODERN CULVERT - NORTH EL. (C)

NOT TO SCALE



MODERN METAL CULVERT OUTLET - NORTHEAST EL. (D)

NOT TO SCALE

HISTORIC OUTLET - NORTHWEST EL. (E)

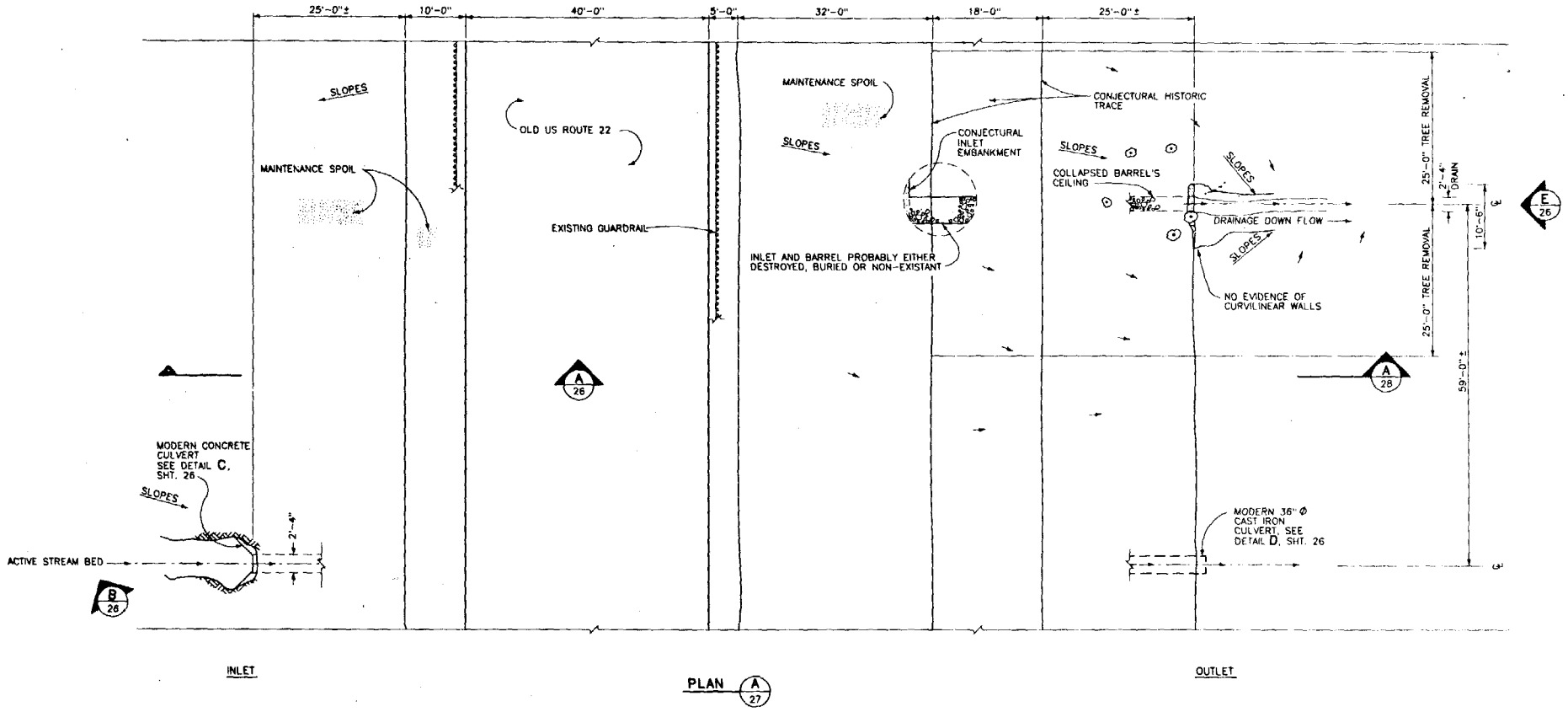
NOT TO SCALE

EXISTING CONDITIONS
PHOTOS TAKEN IN OCTOBER 1980

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1464 ELEVATIONS, TRACE AND DETAILS LEVEL NO. 8 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005
DRAWN: N. CAMARENA			PKG. NO. 104
TECH. REVIEW: H. LAFLEUR			SHEET 26 OF 54
DATE: 1/9			

☆ U.S. GOVERNMENT PRINTING OFFICE: 876-100

ON MICROFILM

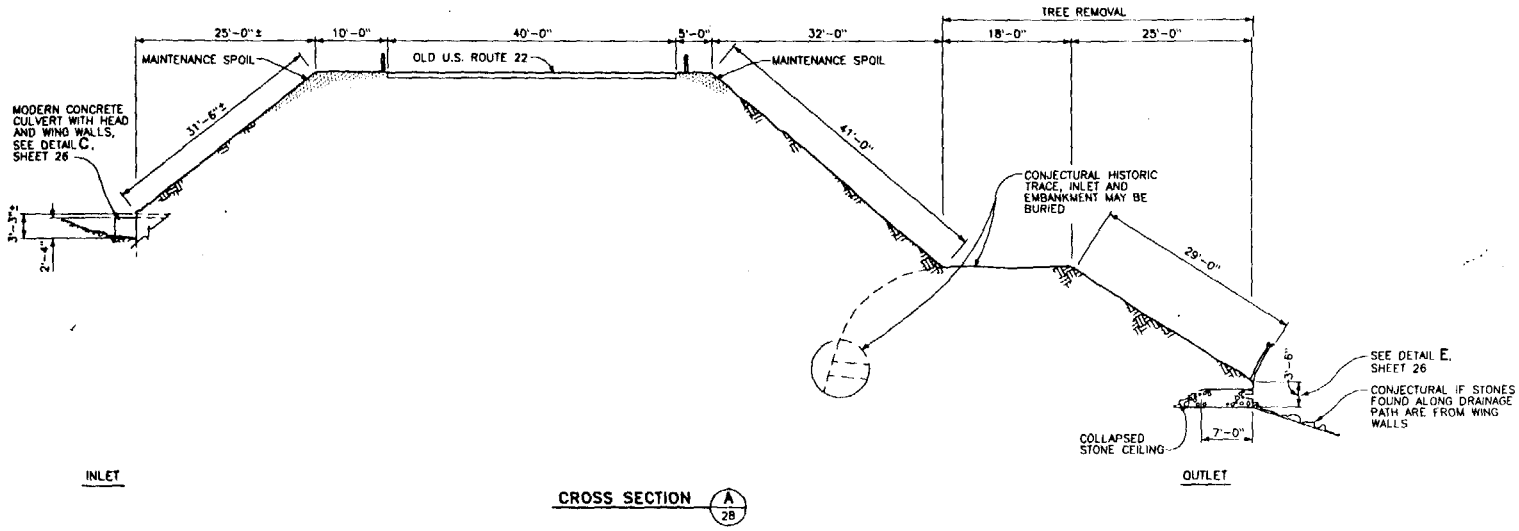


DESIGNED: CAMARENA 4/90	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1464 PLAN	DRAWING NO. 423 25,005	
D. SHULL TECH. REVIEW: H. LOFLEUR DATE 11/90		LEVEL NO. 8 ALLEGHENY PORTAGE RAILROAD N.H.S.	PKG NO. 104 —	SHEET 27 54

/PROJ/ALPO104/ARCH/PLAN_1464.DG

217

ON MICROFILM

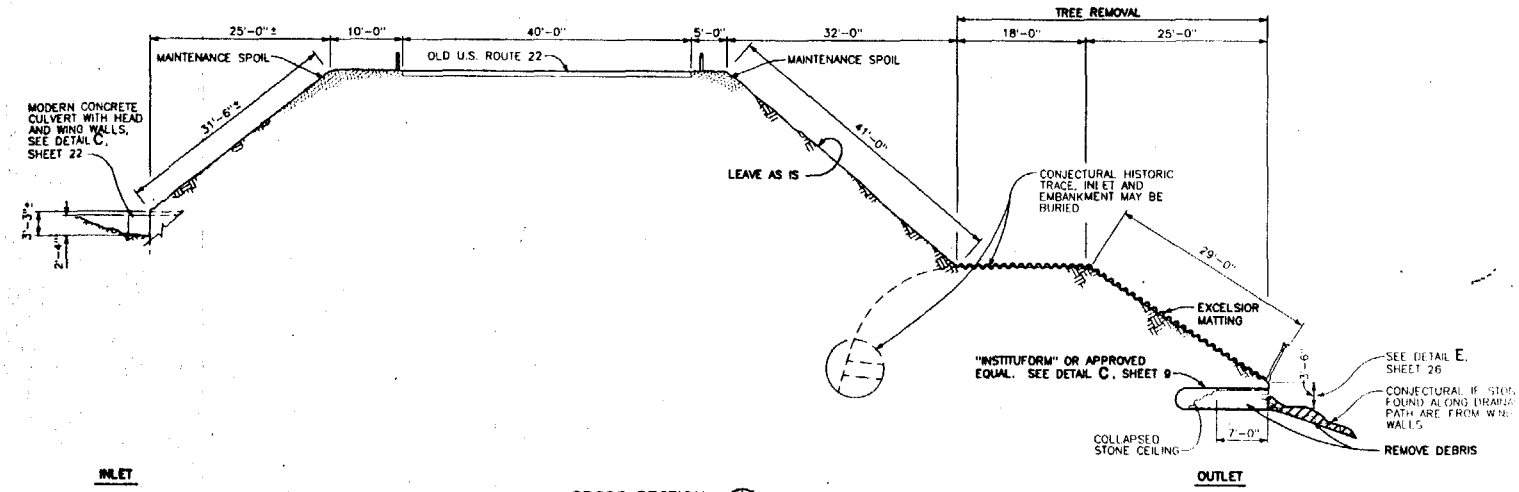


CROSS SECTION A/28

8 0 8 16
SCALE OF FEET

DESIGNED: CAMARENA; DRAWN: ASD; TECH. REVIEW: S. MOORE; DATE: 11/90; M. LO FLEUR	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1464 CROSS-SECTION; LEVEL 8; ALLEGHENY PORTAGE R.R. N.H.S.	DRAWING NO. 423 25,005; PKG NO. 104; SHEET 28 OF 54

/PROJ/ALP0104/ARCH/CULVERT_1464.DD



CROSS SECTION A / 29

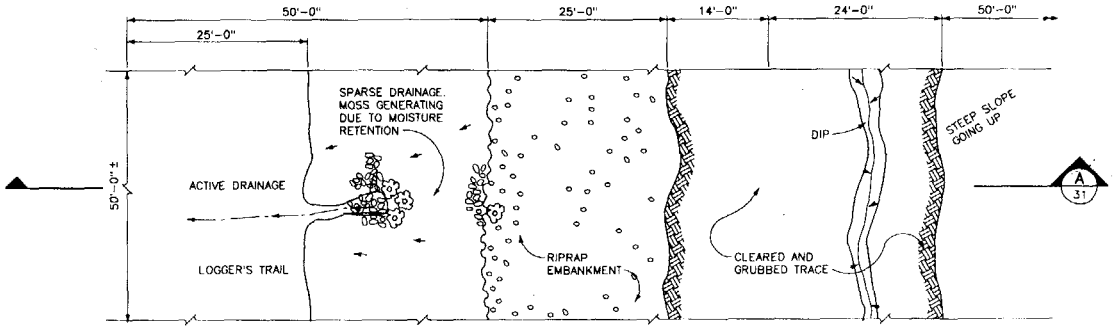
STABILIZATION RECOMMENDATIONS:

MINIMUM EFFORT (3 TO 6 YEARS)

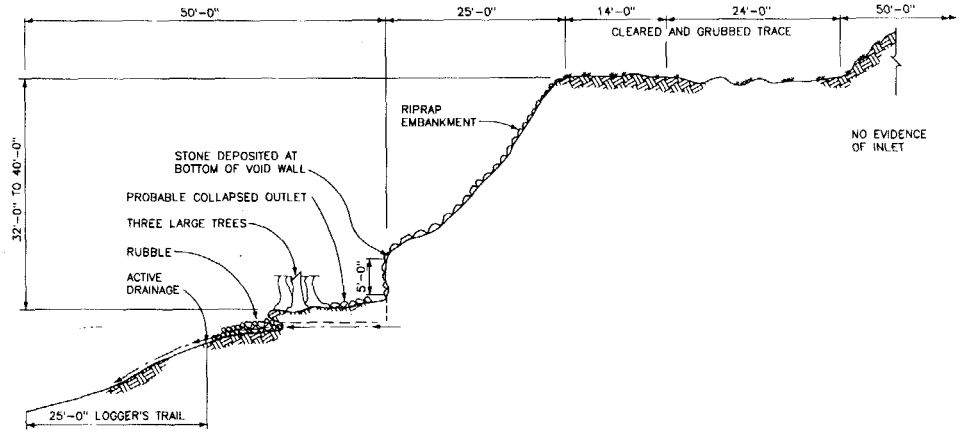
1. REMOVE ALL TREES (25 FEET EACH SIDE OF CULVERT) FROM TRACE EMBANKMENT BY CUTTING TRUNKS FLUSH WITH EXISTING GRADE. LEAVE TREE ROOTS IN PLACE. TREES SHOULD BE FELLED SO AS NO DAMAGE OCCURS TO CULVERT OR EMBANKMENT. IF CUTTING TREES AND "FELLING" THEM WILL DAMAGE THE EMBANKMENT, THEN PROVISIONS SHOULD BE MADE TO SUPPORT THE TREE BY CRANE OR OTHER HEAVY EQUIPMENT SO THAT THE TREE CAN BE CUT FLUSH WITH THE EXISTING EMBANKMENT/GROUND AND REMOVED WITHOUT DAMAGE TO THE EMBANKMENT. HEAVY CRANES AND EQUIPMENT WILL NOT BE ALLOWED ON THE EMBANKMENT OVER CULVERTS.
2. VIDEO INSPECT CULVERT TO DETERMINE EXTENT OF COLLASPED STONE MASONRY CULVERT.
3. REMOVE DEBRIS AND SEDIMENT BUILD-UP DOWN TO ORIGINAL FLOW LINE (INVERT).
4. REMOVE EARTH FILL, GRADE AND PLACE EXCELSIOR MATTING OR EQUAL TO PREVENT EROSION OF NEW SEEDING OF NATIVE GRASSES.
5. INSTALL MONUMENT (PLAQUE) TO DESCRIBE CRONOLOGICAL HISTORY OF CULVERT.
6. USE "INSTITUFORM" OR APPROVED EQUAL TO SLEEVE AND STABILIZE CULVERT. SEE DETAIL C, SHEET 9.

8 0 8 16
SCALE OF FEET

DESIGNED/DRAWN: L. GRIDLEY / CHKD: S. MOORE	SUB SHEET NO. SHEE DETAIL	TITLE OF SHEET: CULVERT 1464 STRUCTURAL RECOMMENDATIONS LEVEL 7 ALLEGHENY PORTAGE R.R. N.H.S.	DRAWING NO. 423 25,005
TECH. REVIEW: M. PAUL			PKG. NO. 104
DATE: 11/90			SHEET 29 OF 54



PLAN (B/31)



CONJECTURAL CULVERT CROSS SECTION (A/31)

STABILIZATION RECOMMENDATIONS

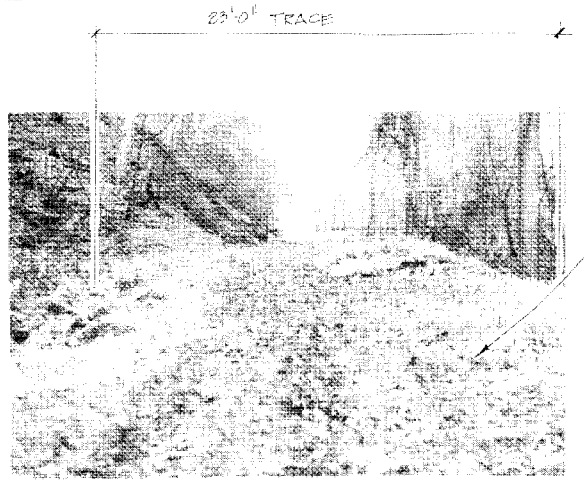
1. MONUMENT WITH PLAQUE AND LEAVE IN PRESENT CONDITIONS.
2. REMOVE TREES 25 FEET EACH SIDE OF CULVERT CENTERLINE.

8 0 8 16
SCALE OF FEET

DESIGNED: GRIDLEY CAMARENA DRAWN: J. BENDORF TECH. REVIEW: M. PAUL, M. LaFLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET CULVERT 1490 PLAN AND CROSS SECTION LEVEL 7 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 31 OF 54

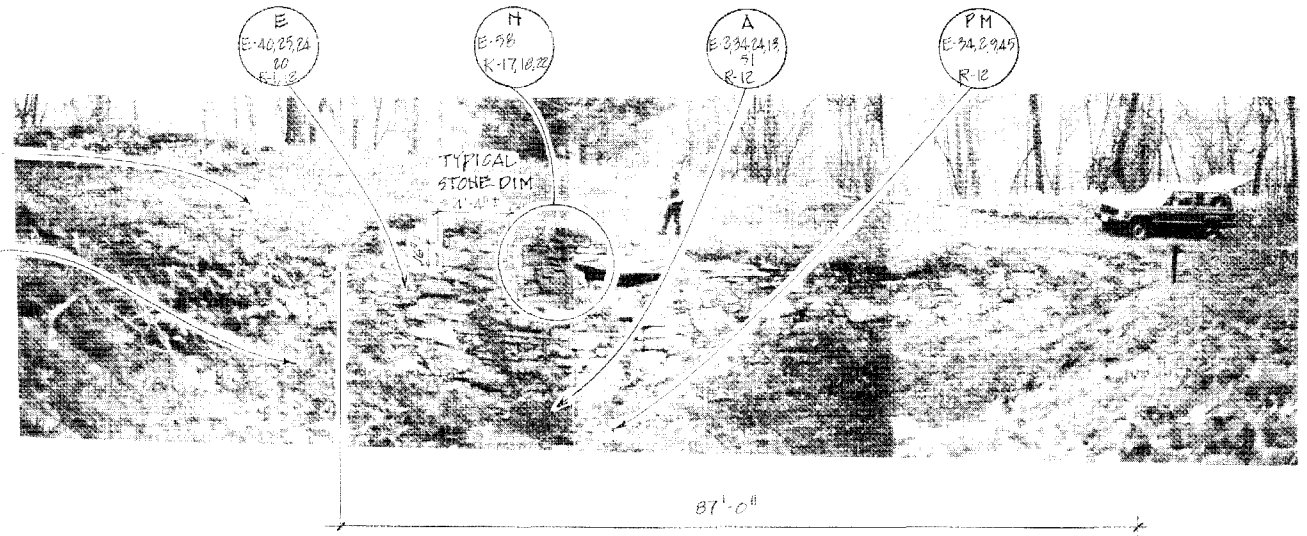
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ON MICROFILM



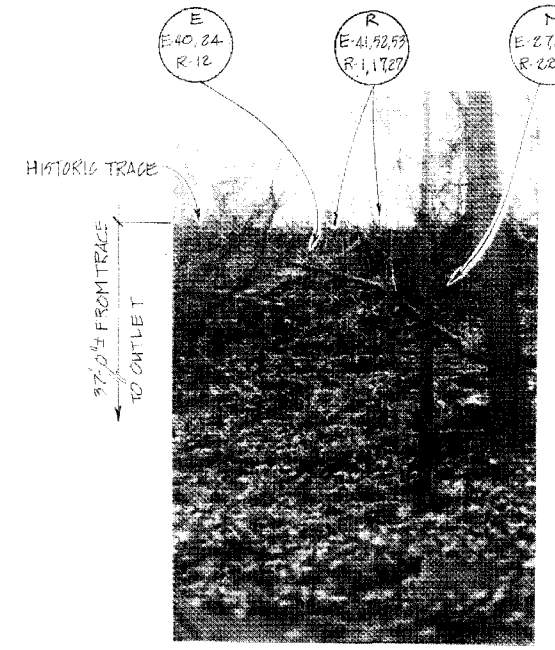
TRACE - WEST VIEW (A)

NOT TO SCALE



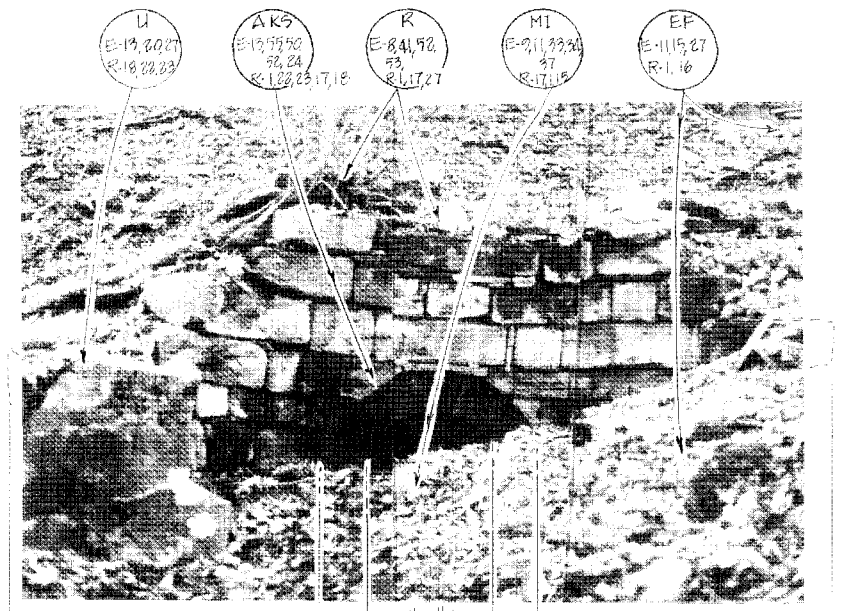
INLET - SOUTH EL. (B)

NOT TO SCALE



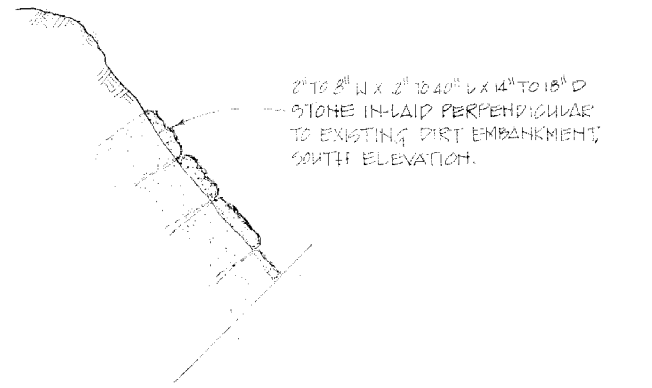
EMBANKMENT NORTH EL. (C)

NOT TO SCALE



OUTLET - NORTH EL. (D)

NOT TO SCALE



DRY, INLAID STONE DETAIL (E)

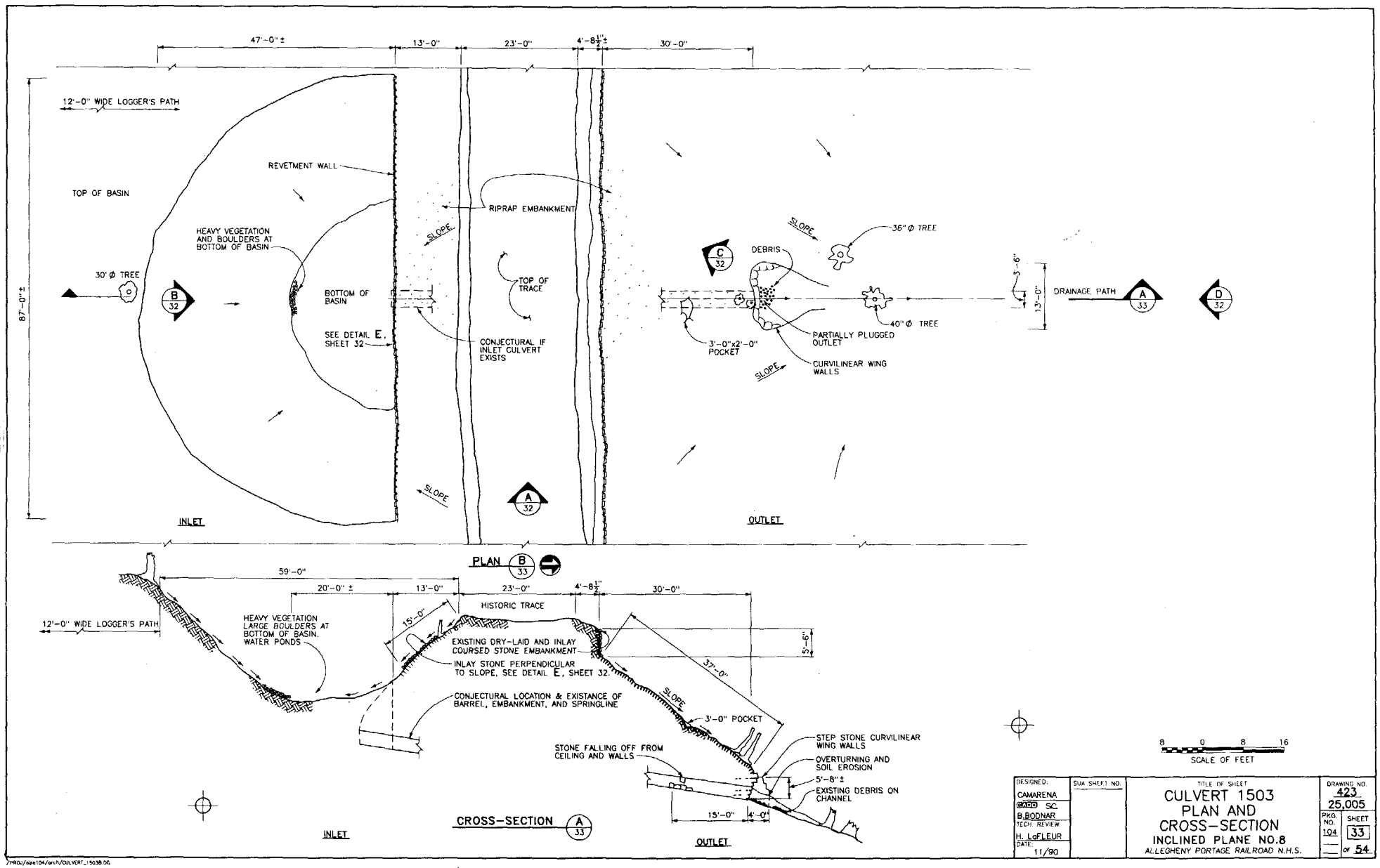
NOT TO SCALE

EXISTING CONDITIONS PHOTOS TAKEN IN 1989

ON MICROFILM

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1503 TRACE, ELEVATIONS AND DETAILS; INCLINED PLANE NO. 8; ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005
DRAWN: N. CAMARENA			PKG. NO. 104
TECH. REVIEW: H. LAFLEUR			SHEET 32 OF 54
DATE: 1/91			

U.S. GOVERNMENT PRINTING OFFICE 675-100

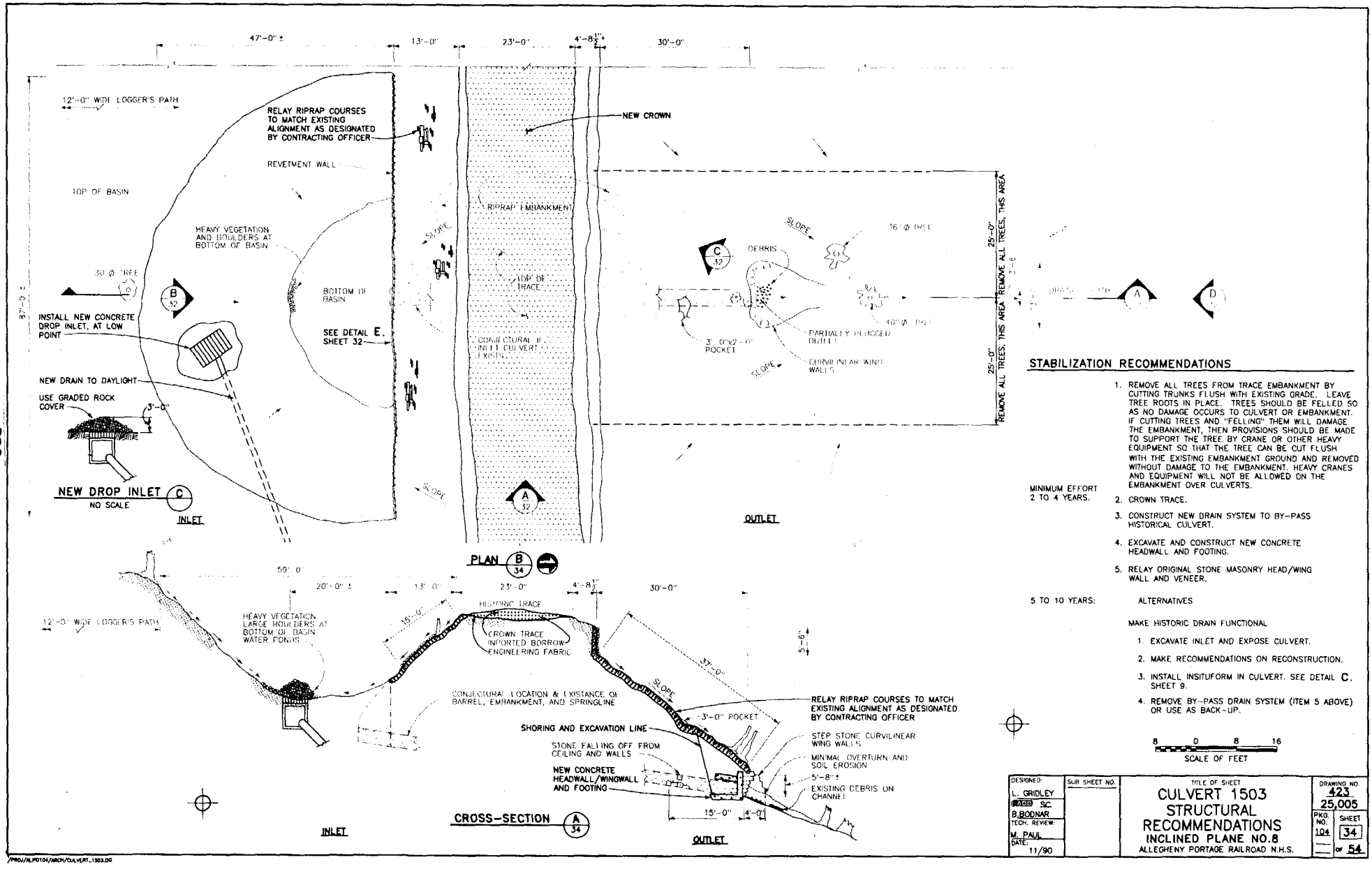


DESIGNED: CAMARENA; DRAWN: SC; B.BODNAR; TECH. REVIEW: H. LaFLEUR; DATE: 11/90	SUA SHEET NO.	TITLE OF SHEET: CULVERT 1503 PLAN AND CROSS-SECTION INCLINED PLANE NO.8 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005; PKG. NO. 104; SHEET 33 OF 54

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ON MICROFILM

ON MICROFILM



STABILIZATION RECOMMENDATIONS

1. REMOVE ALL TREES FROM TRACE EMBANKMENT BY CUTTING TRUNKS FLUSH WITH EXISTING GRADE. LEAVE TREE ROOTS IN PLACE. TREES SHOULD BE FELLED SO AS NO DAMAGE OCCURS TO CULVERT OR EMBANKMENT. IF CUTTING TREES AND "FELLING" THEM WILL DAMAGE THE EMBANKMENT, THEN PROVISIONS SHOULD BE MADE TO SUPPORT THE TREE BY CRANE OR OTHER HEAVY EQUIPMENT SO THAT THE TREE CAN BE CUT FLUSH WITH THE EXISTING EMBANKMENT GROUND AND REMOVED WITHOUT DAMAGE TO THE EMBANKMENT. HEAVY CRANES AND EQUIPMENT WILL NOT BE ALLOWED ON THE EMBANKMENT OVER CULVERTS.

MINIMUM EFFORT 2 TO 4 YEARS.

2. CROWN TRACE.
3. CONSTRUCT NEW DRAIN SYSTEM TO BY-PASS HISTORICAL CULVERT.
4. EXCAVATE AND CONSTRUCT NEW CONCRETE HEADWALL AND FOOTING.
5. RELAY ORIGINAL STONE MASONRY HEAD/WING WALL AND VENEER.

5 TO 10 YEARS: ALTERNATIVES

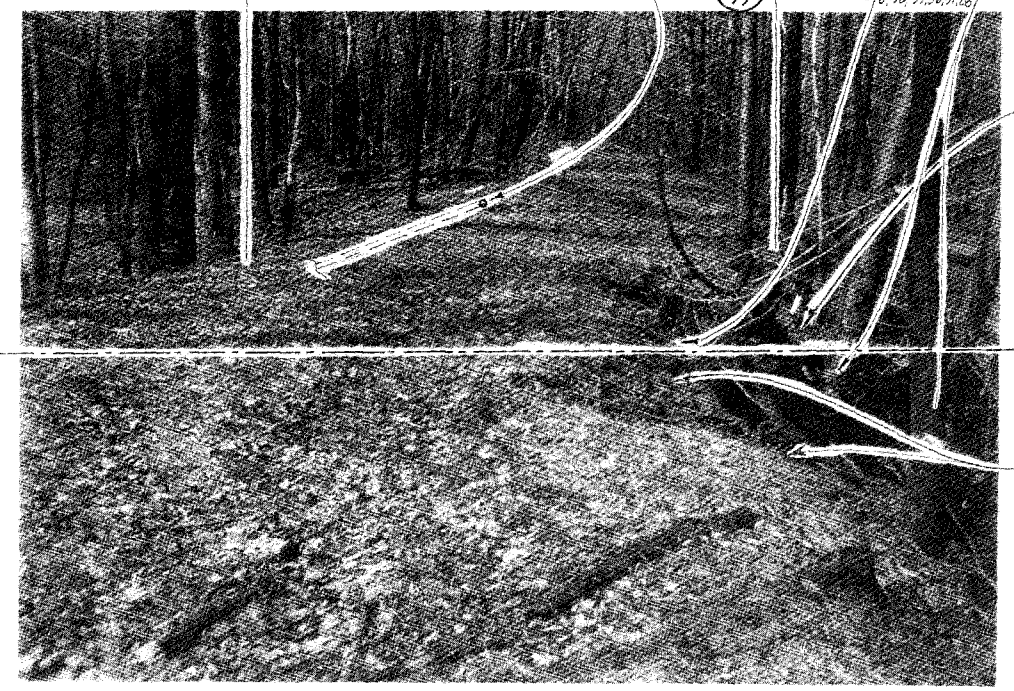
MAKE HISTORIC DRAIN FUNCTIONAL

1. EXCAVATE INLET AND EXPOSE CULVERT.
2. MAKE RECOMMENDATIONS ON RECONSTRUCTION.
3. INSTALL INSITUFORM IN CULVERT. SEE DETAIL C, SHEET 9.
4. REMOVE BY-PASS DRAIN SYSTEM (ITEM 5 ABOVE) OR USE AS BACK-UP.

8 0 8 16
SCALE OF FEET

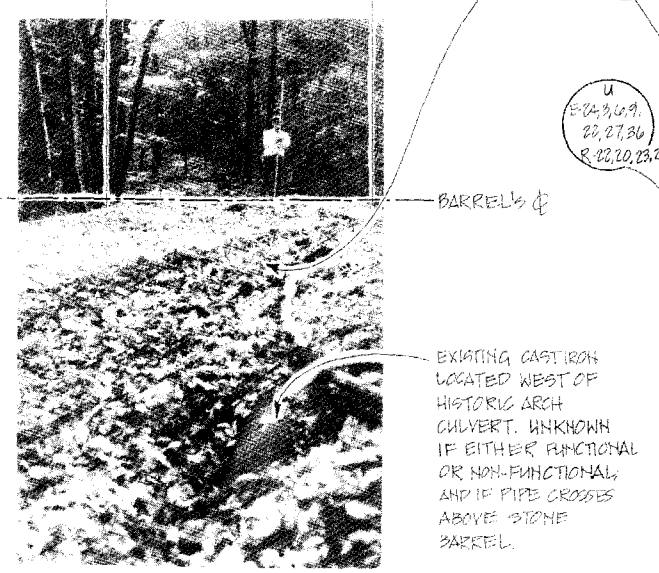
DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
L. GRIDLEY		CULVERT 1503 STRUCTURAL RECOMMENDATIONS INCLINED PLANE NO.8 ALLEGHENY PORTAGE RAILROAD N.H.S.	423 25,005
RACED SC.			PKG. NO. 104
B.BODNAR			SHEET 34
TECH. REVIEW: M. PAUL			— OF 54
DATE: 11/90			

/PROJ/ALP0104/ARCH/CULVERT_1503.DG



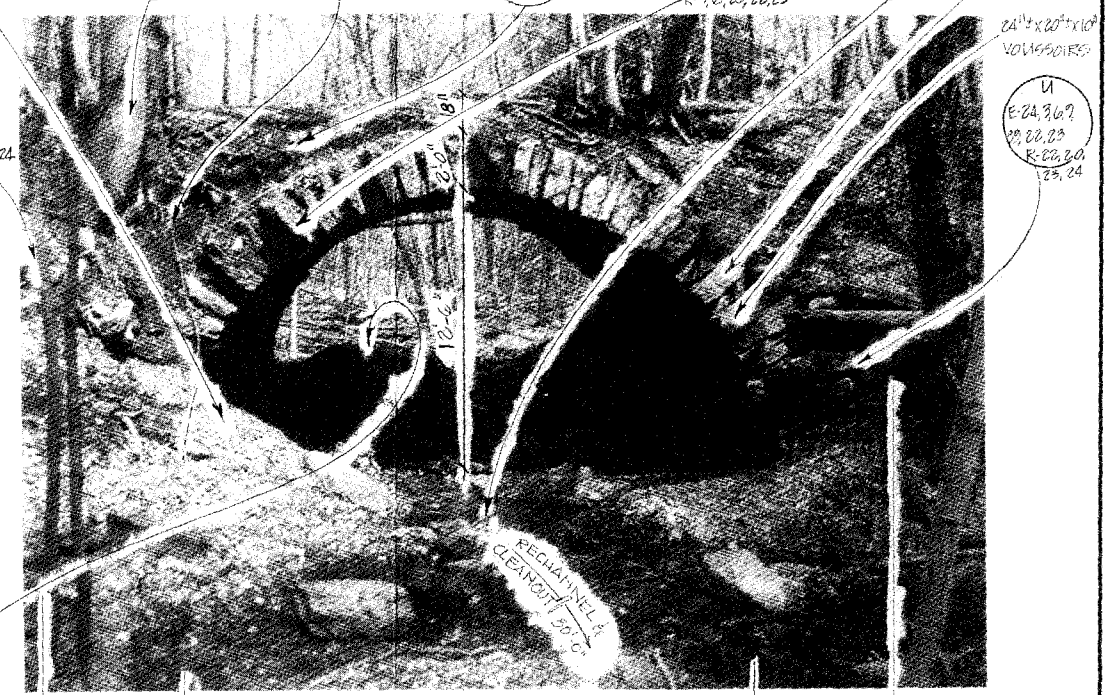
TRACE - WEST VIEW (A)

NOT TO SCALE



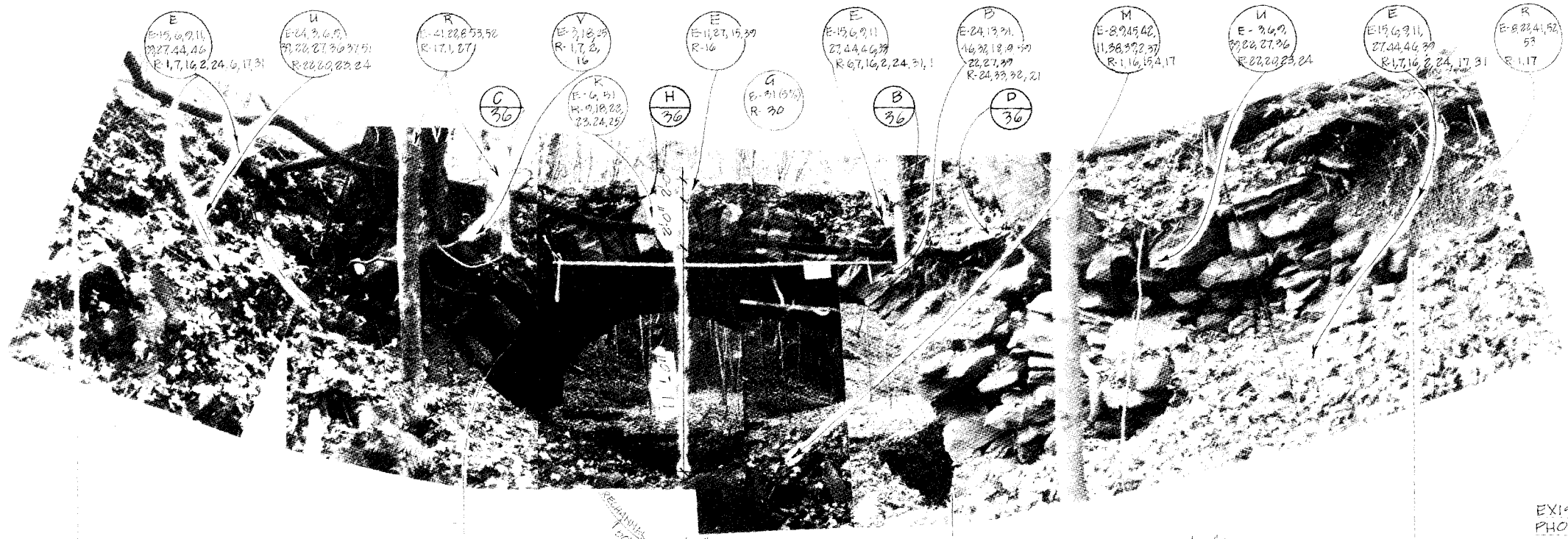
TRACE - EAST VIEW (B)

NOT TO SCALE



INLET - SOUTH EL. (C)

NOT TO SCALE



OUTLET - NORTH EL. (D)

NOT TO SCALE

EXISTING CONDITIONS PHOTOS TAKEN 1989

ON MICROFILM

REFER TO KEY WORK SCHEDULE FOR INTERPRETING DRAWN CIRCLED LETTERS AND NUMBERS SHOW ON DRAWING SHEET NUMBER 1.

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
DRAWN: N. CAMARENA		CULVERT 1532 ELEVATIONS AND TRACES	423 25,005
TECH. REVIEW: H. LA FLEUR		LEVEL NO. 9	PKG. NO. 104
DATE: 1/91		ALLEGHENY PORTAGE RAILROAD N.H.S.	SHEET 35 OF 54

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INLET - SOUTHEAST ELEVATION (A)



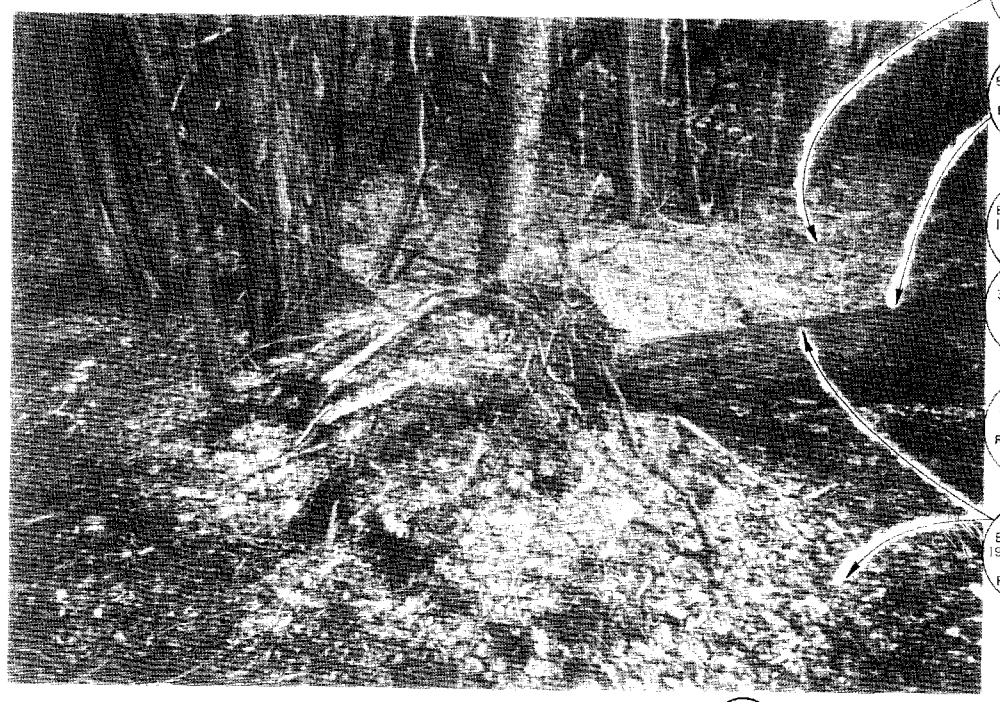
OUTLET - NORTHEAST TOP VIEW ELEVATION (B)



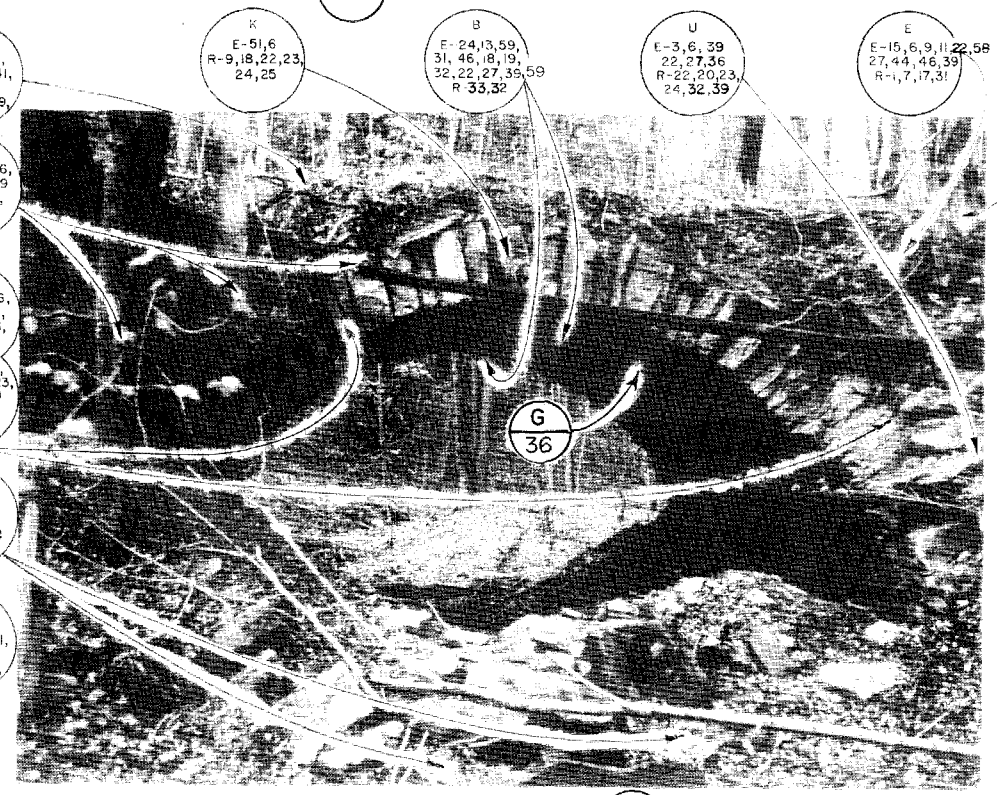
OUTLET - NORTHWEST TOP VIEW ELEVATION (C)



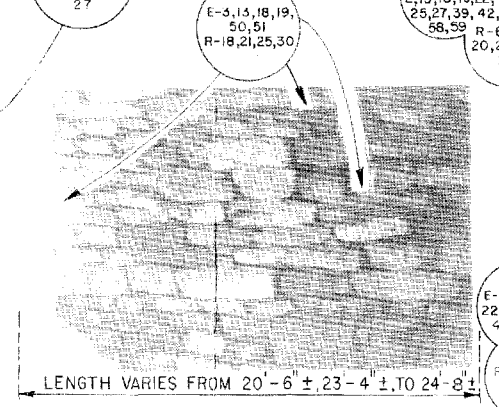
OUTLET - NORTHWEST BOTTOM VIEW ELEVATION (D)



TRACE - NORTHEAST ELEVATION (E)



OUTLET - NORTH ELEVATION (F)



BARREL'S INTERIOR-WALL DETAIL
(EXISTING 5% REPOINTING) (G)



ARCH TOP DETAIL
OUTLET - EAST ELEVATION (H)

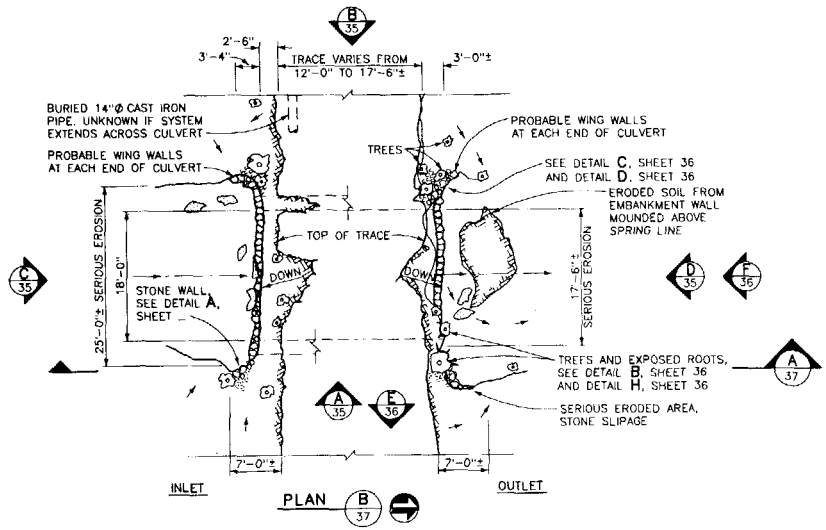
EXISTING CONDITIONS
PHOTOS TAKEN IN 1989

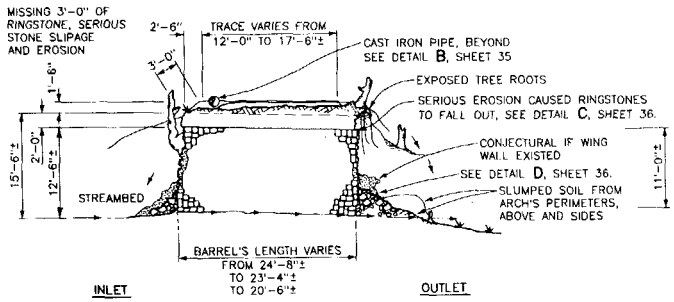
NO SCALE

DESIGNED: EXISTING DRAWN: N. CAMARENA TECH. REVIEW: H. LAFLEUR DATE: 1/91	SUB SHEET NO.	TITLE OF SHEET CULVERT 1532 NORTH ELEVATION, TRACE, AND DETAILS LEVEL NO. 9 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 36 OF 54

U.S. GOVERNMENT PRINTING OFFICE: 675-100

ON MICROFILM





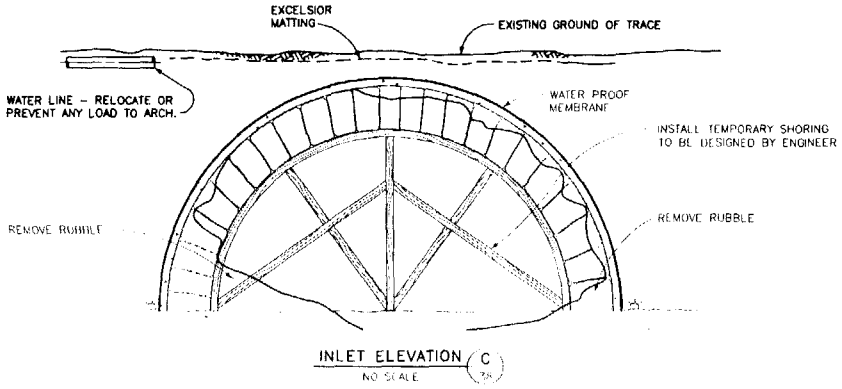
8 0 8 16
SCALE OF FEET

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
CAMARENA, GADDOCC, JB		CULVERT 1532 PLAN & CROSS-SECTION LEVEL 9	423 25,005
TECH. REVIEW: H. LaFLEUR		ALLEGHENY PORTAGE RAILROAD N.H.S.	PKG. NO. 104 SHEET 37
DATE: 11/90			OF 54

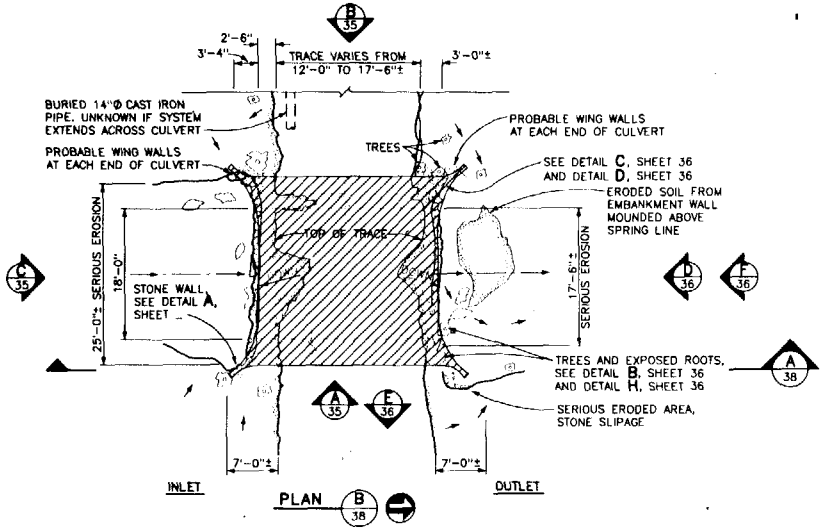
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ON MICROFILM

ON MICROFILM



INLET ELEVATION (C/35)
NO SCALE

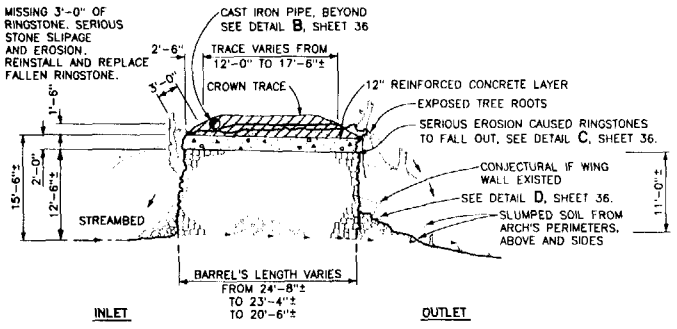


PLAN (B/38)

STABILIZATION RECOMMENDATIONS

(MINIMUM EFFORT TO AVOID CULVERT FROM COLLAPSING)

1. CONSTRUCT TEMPORARY SHORING AND UNIFORMLY REMOVE EARTH FILL
2. REMOVE TREES
3. REMOVE CHANNEL RUBBLE
4. RECONSTRUCT MISSING ARCH USING ORIGINAL MATERIALS FOUND ON SITE.
5. PLACE 12-INCH REINFORCED CONCRETE BACKING LAYER ON EXTERNAL OF STONE MASONRY BARREL.
6. WATER SEAL 12-INCH CONCRETE LAYER.
7. REPLACE EARTH FILL (GRADE TO ORIGINAL LOCATION).
8. ADD "EXCELSION MATTING" TO STABILIZE SOIL
9. PLACE PLAQUE AND MONUMENT

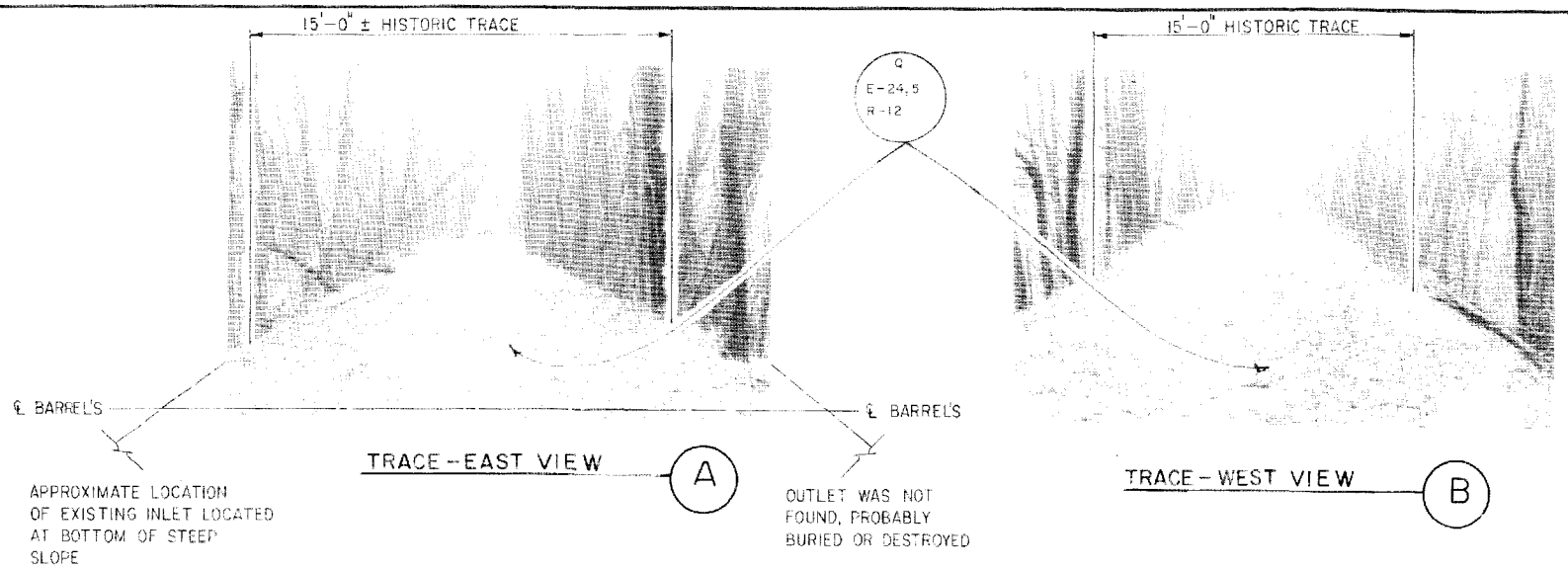


CROSS SECTION (A/38)

8 0 8 16
SCALE OF FEET

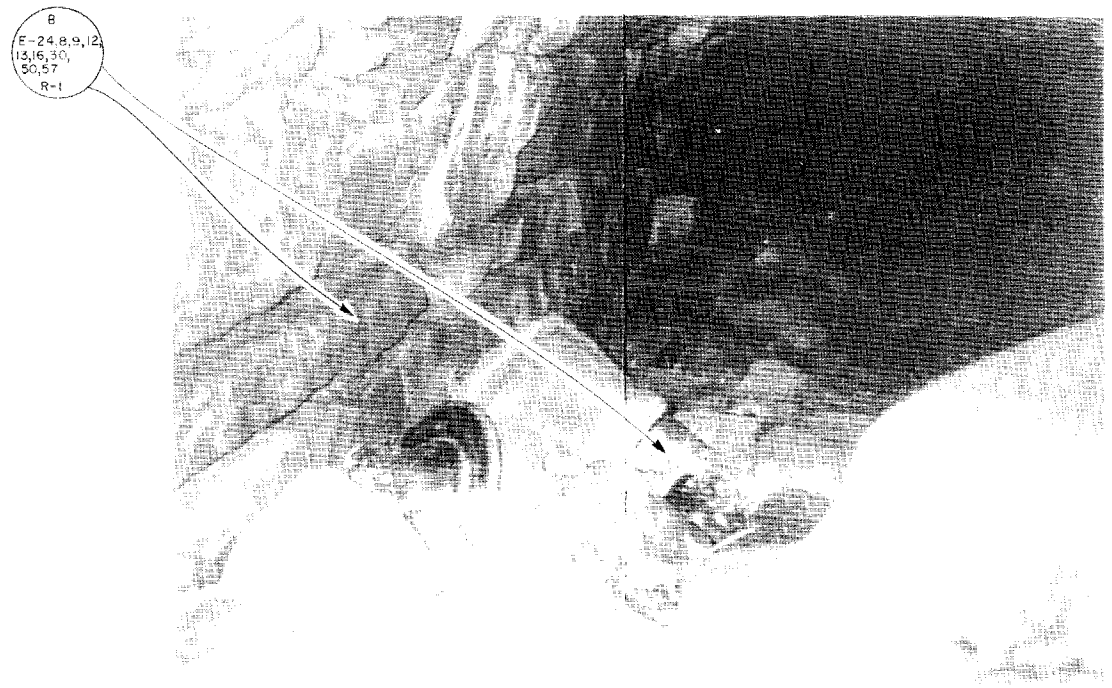
DESIGNED:	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
L. GRIDLEY		CULVERT 1532 STRUCTURAL RECOMMENDATION LEVEL 9	423 25,005
CARD J.B.			PKG. NO. 104
L. RUEDA			SHEET 38
TECH. REVIEW:			OF 54
M. PAUL		ALLEGHENY PORTAGE RAILROAD N.H.S.	
DATE: 11/90			

/PROJ/pgs104/dgn/col_1532.00

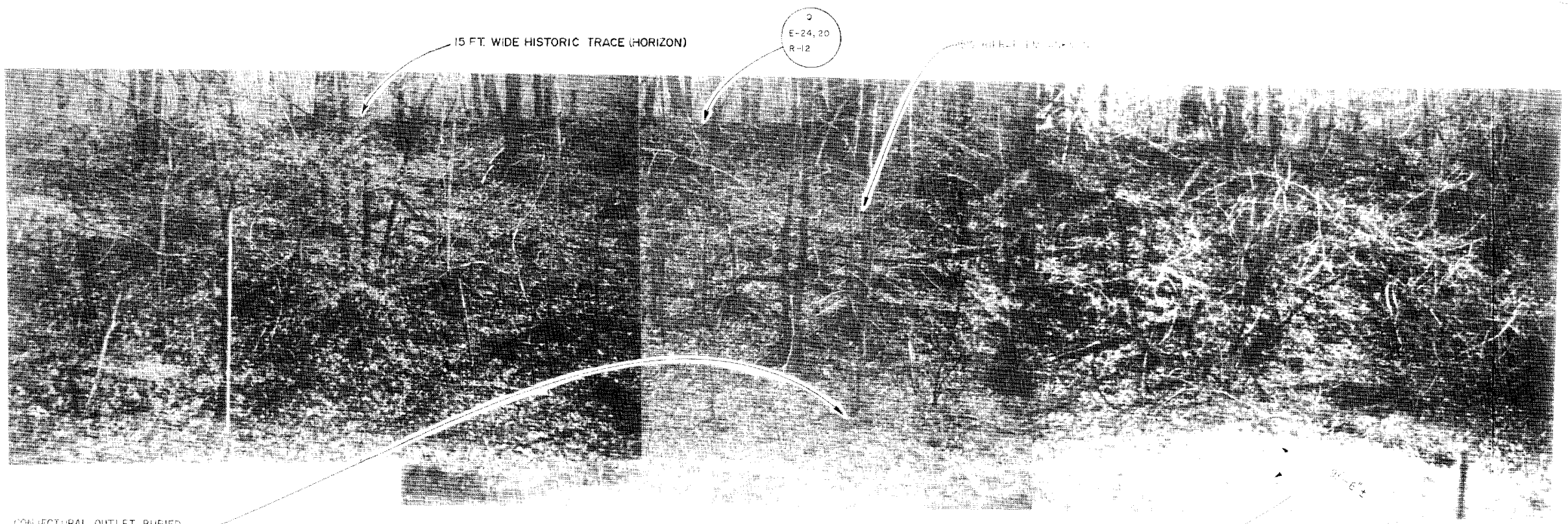


TRACE - EAST VIEW (A)

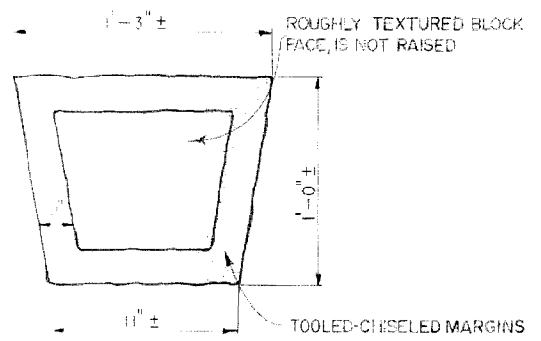
TRACE - WEST VIEW (B)



[illegible] (C)



EMBANKMENT - NORTH ELEVATION (D)



VOUSSOIR DETAIL (E)

EXISTING CONDITIONS PHOTOS TAKEN IN 1989

NO SCALE

ON MICROFILM

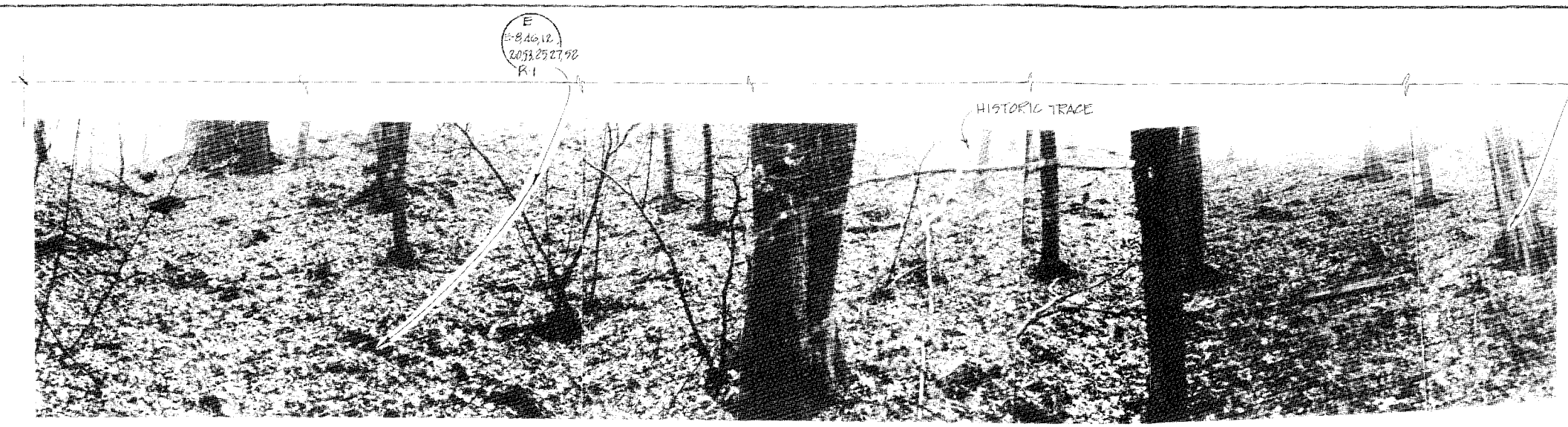
DRAWN: N. CAMARENA
TECH. REVIEW: H. LAFLEUR
DATE: 1/91

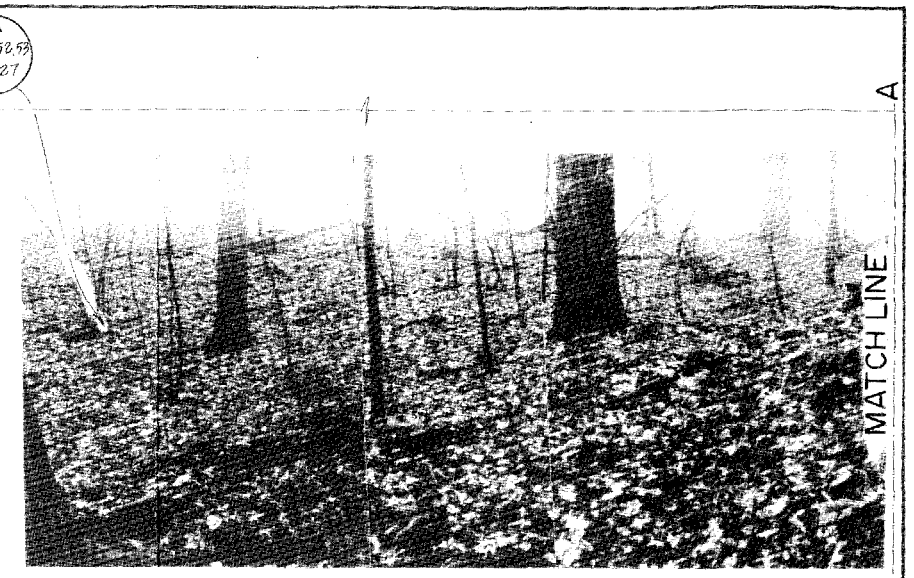
CULVERT 1586 TRACES, ELEVATION, AND DETAILS

LEVEL NO. 9

ALLEGHENY PORTAGE RAILROAD N.H.S.

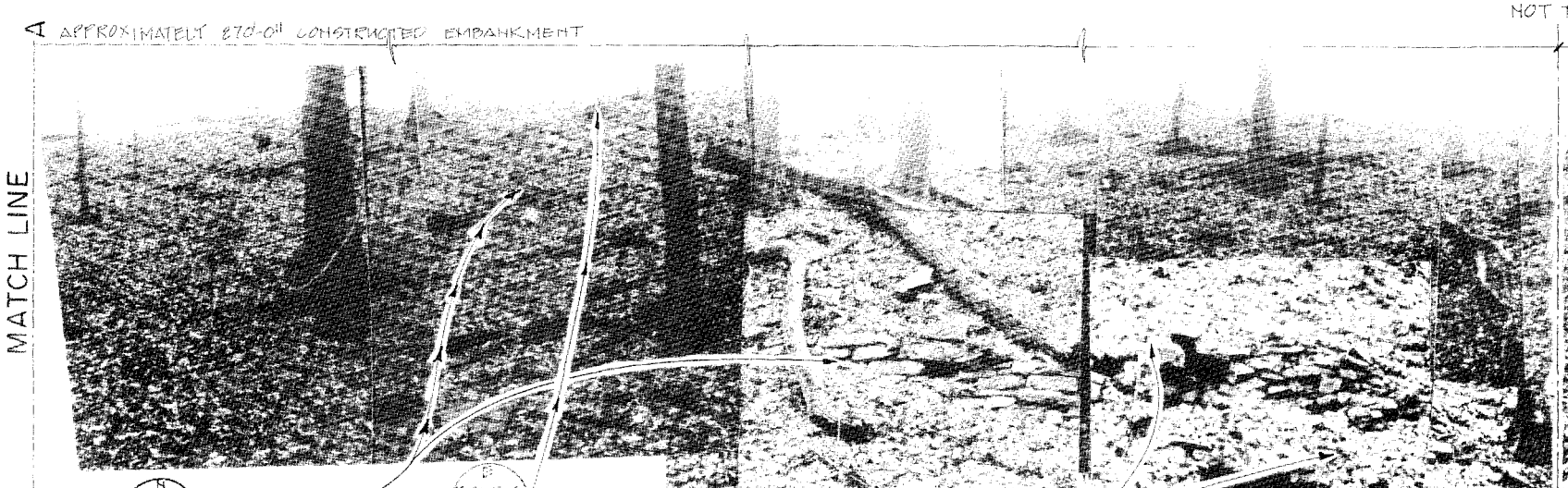
DRAWING NO. 423 25,005
PKG. NO. 104
SHEET 39 of 54

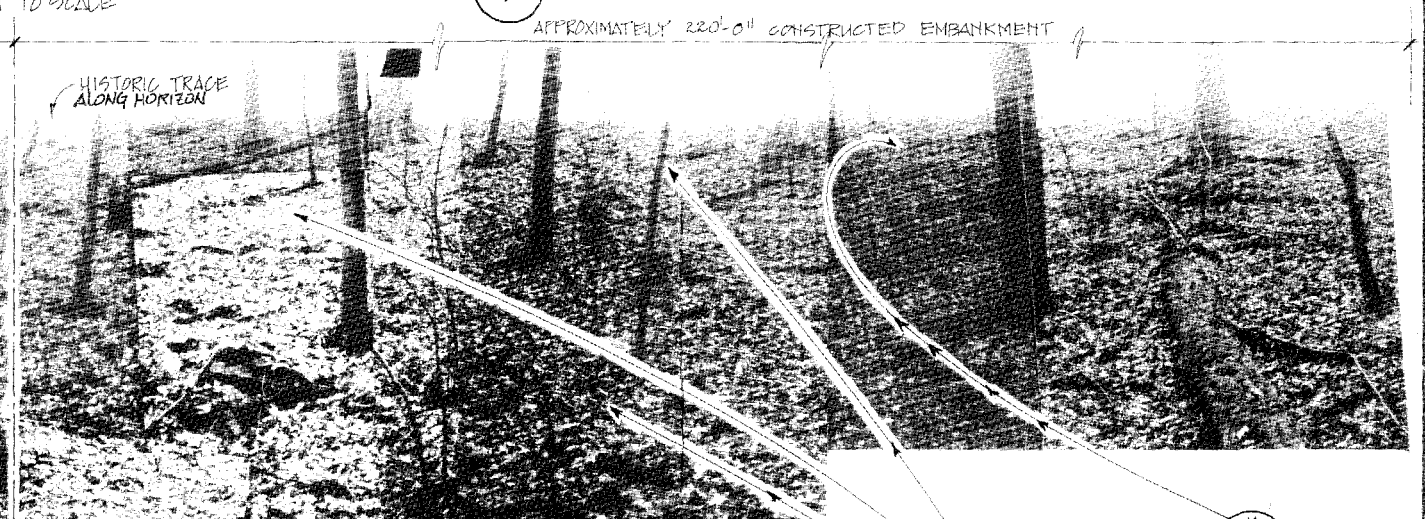


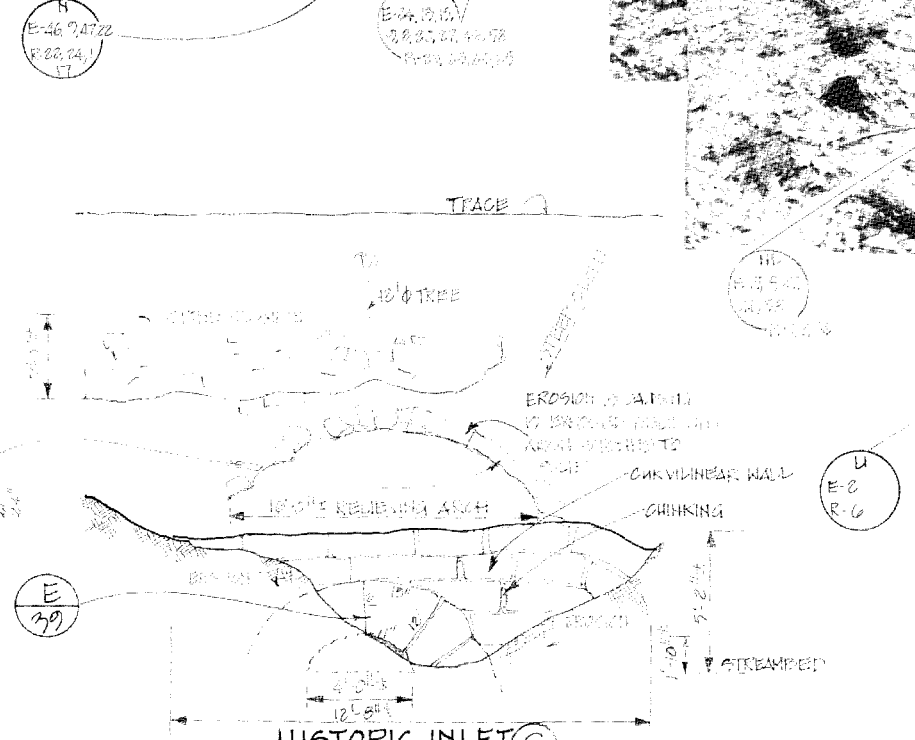


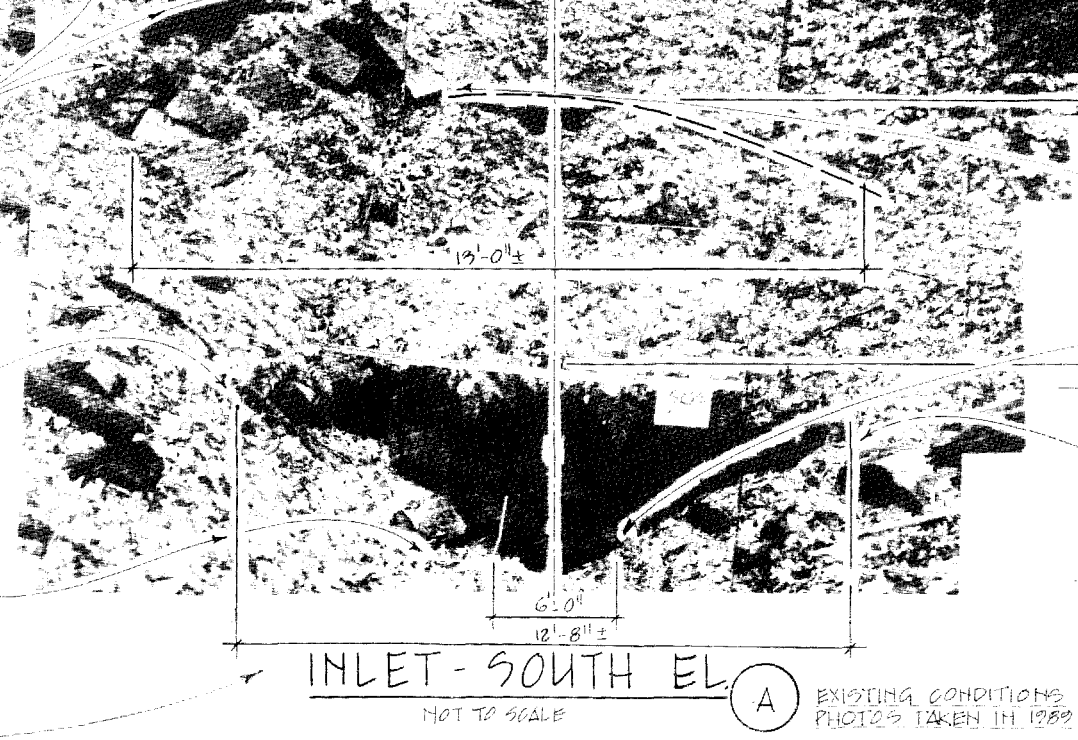
WEST END OF EMBANKMENT - SOUTH EL. (B)

NOT TO SCALE









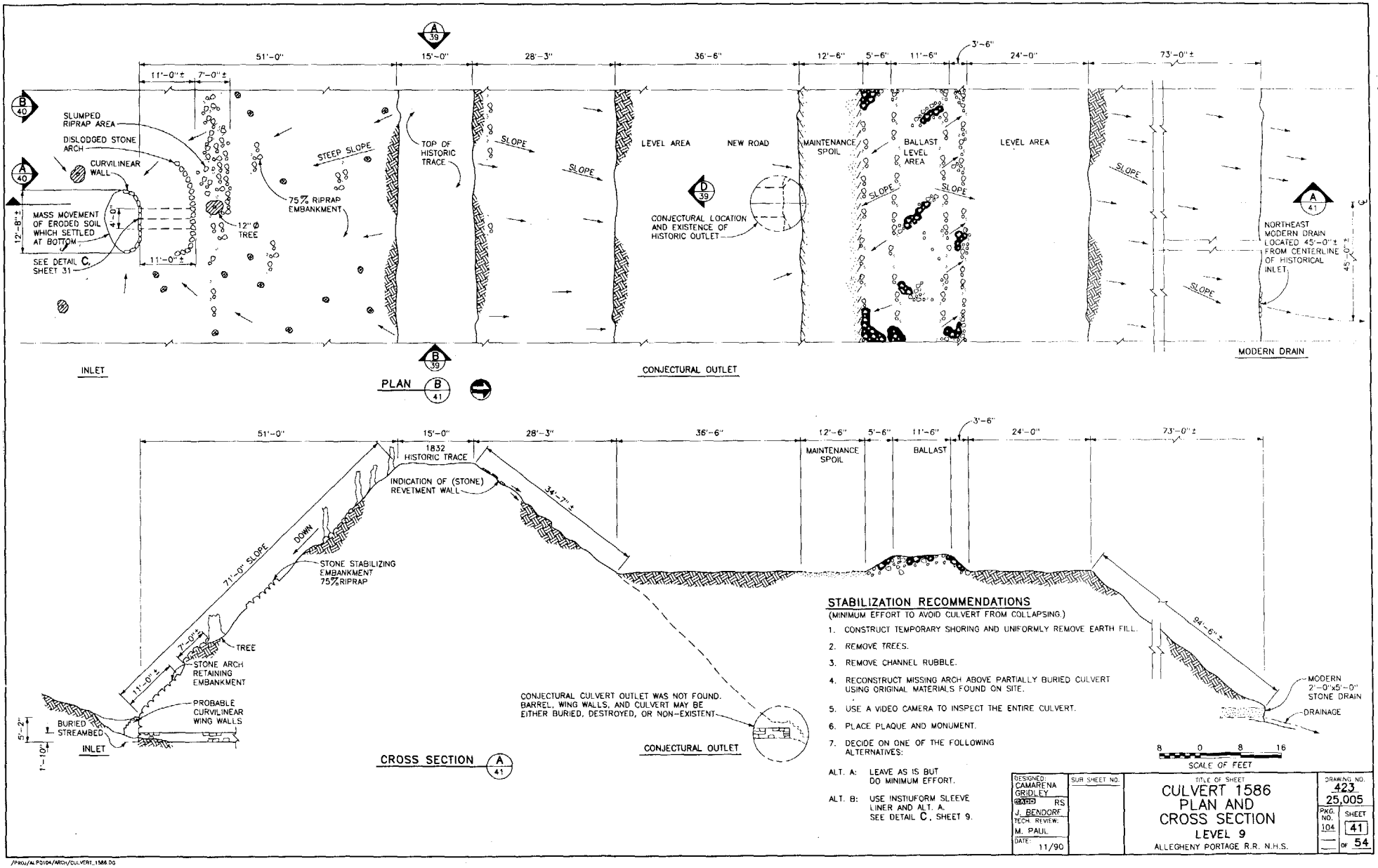
INLET - SOUTH EL. (A)

NOT TO SCALE

EXISTING CONDITIONS PHOTOS TAKEN IN 1989

ON MICROFILM

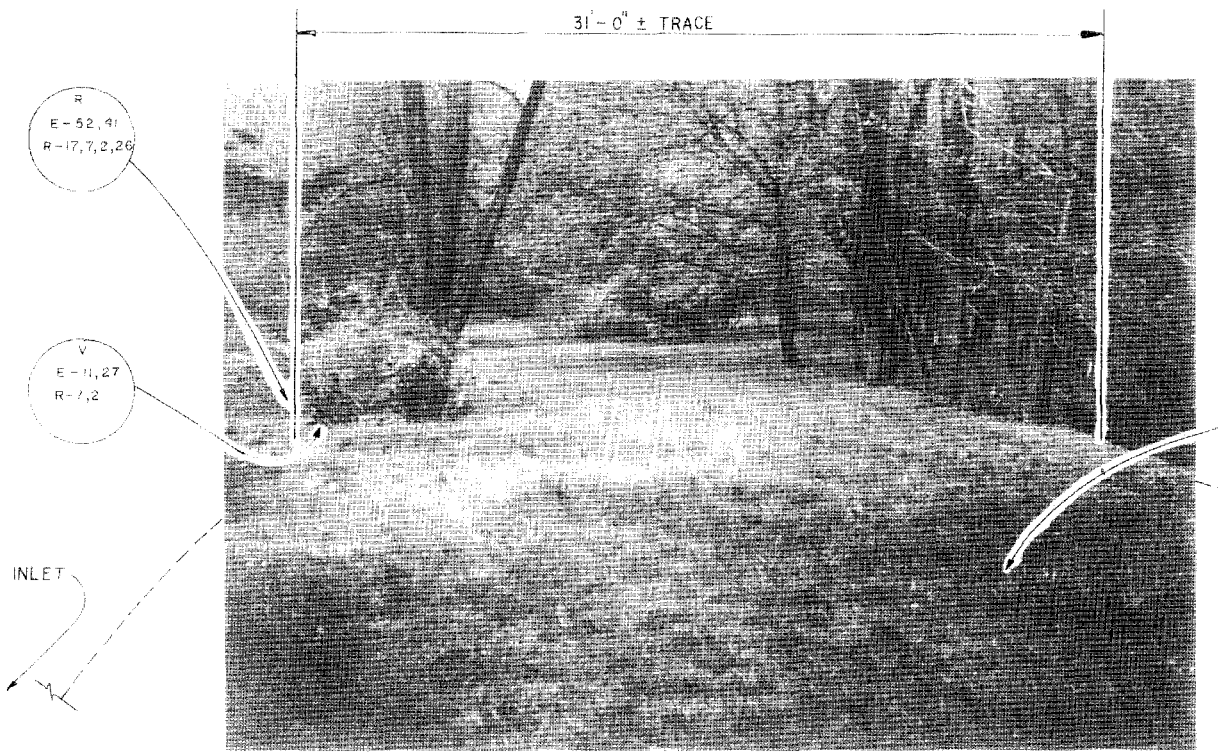
DESIGNED	TOP SHEET NO.	TITLE OF SHEET: CULVERT 1586 ELEVATIONS	DRAWING NO. 123 25,005
DRAWN N. CAMARENA		LEVEL NO. 9	PKG. NO. 104
TECH. REVIEW H. LAFLEUR		ALLEGHENY PORTAGE RAILROAD N.H.S.	SHEET 40 of 54
DATE 1/91			



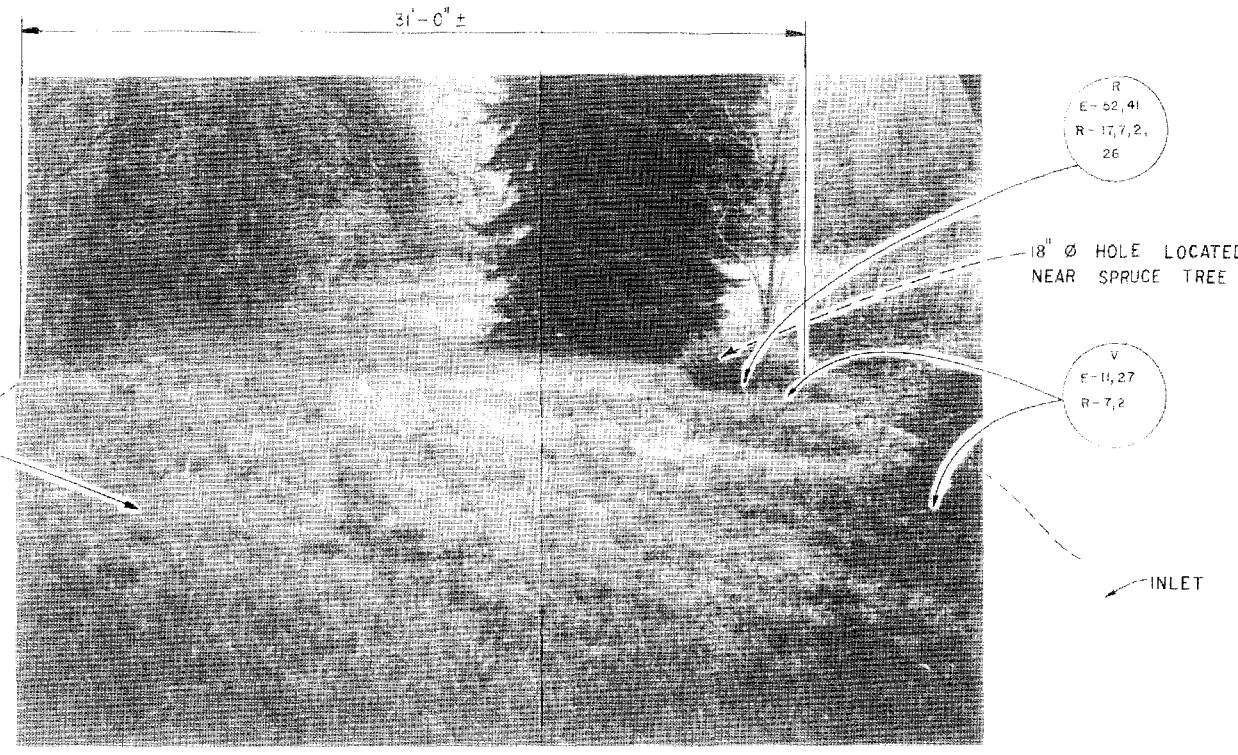
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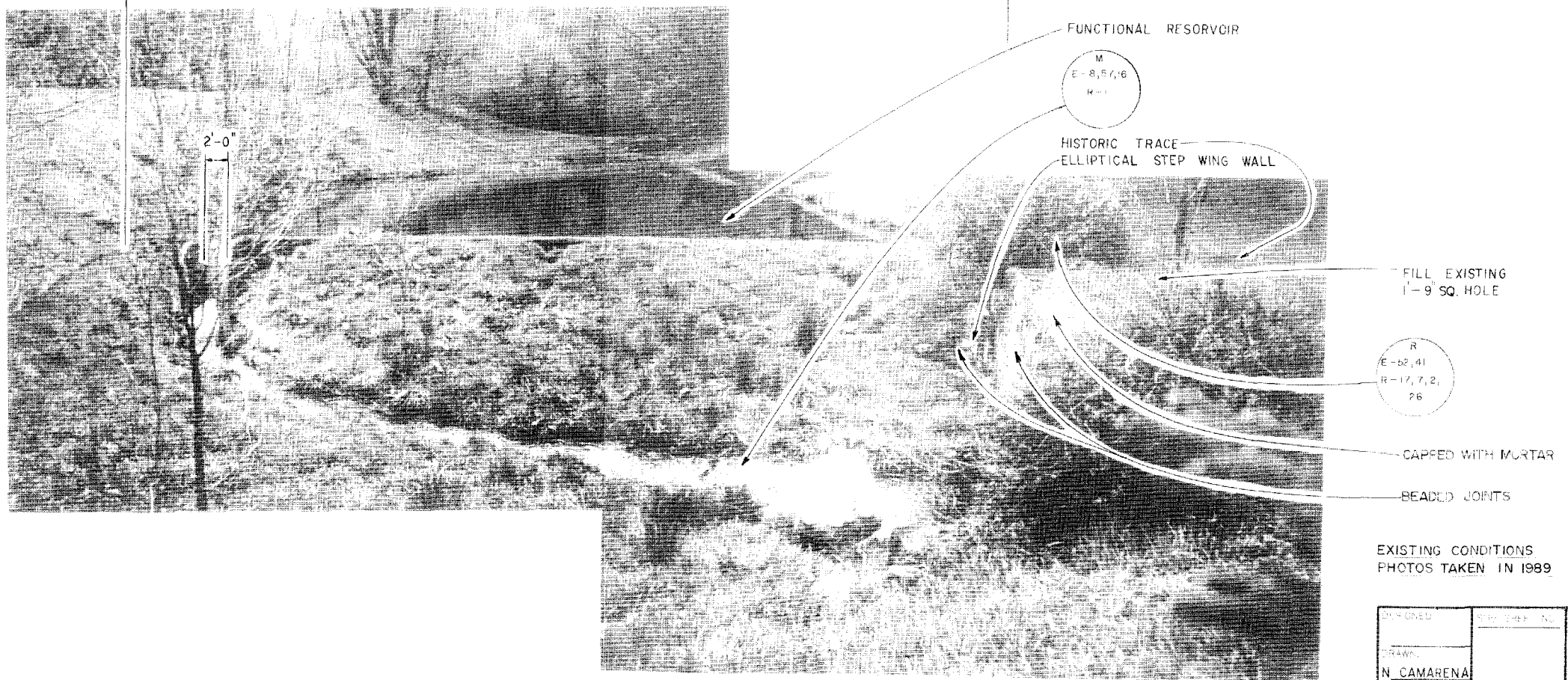
ON MICROFILM



TRACE VIEWING WEST ELEVATION (A)



TRACE VIEWING EAST ELEVATION (B)



INLET - NORTHWEST VIEW (C)

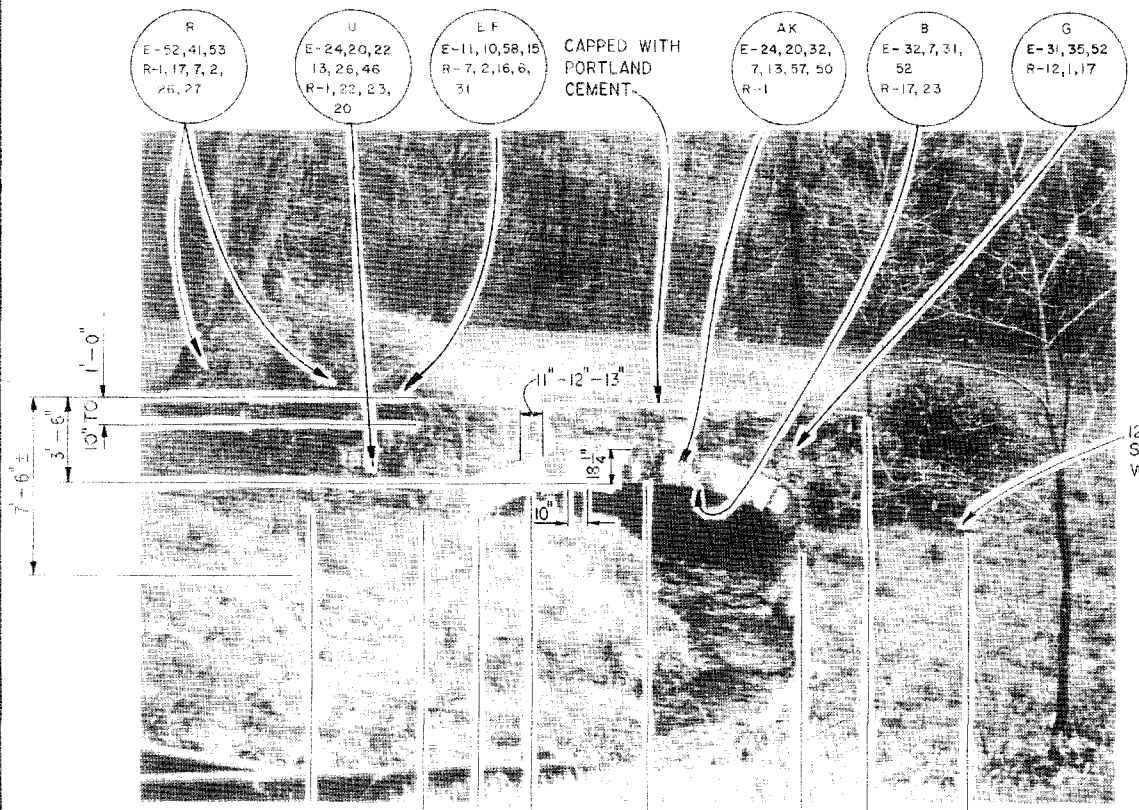
EXISTING CONDITIONS
PHOTOS TAKEN IN 1989

ON MICROFILM

SCALE NO SCALE

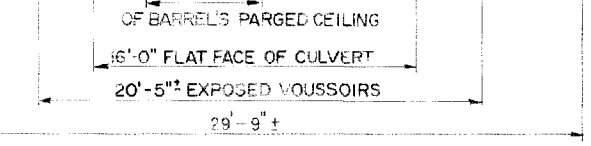
DESIGNED	SURVEY SHEET NO.	TITLE OF SHEET: CULVERT 1624 TRACE VIEWING WEST & EAST ELEVATIONS & NORTHWEST ELEVATION LEVEL NO. 10 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005
DRAWN N. CAMARENA			PKG. NO. 104
TECH. REVIEW H. LA FLEUR			SHEET 42 OF 54
DATE 1/91			

GPO 875-1010

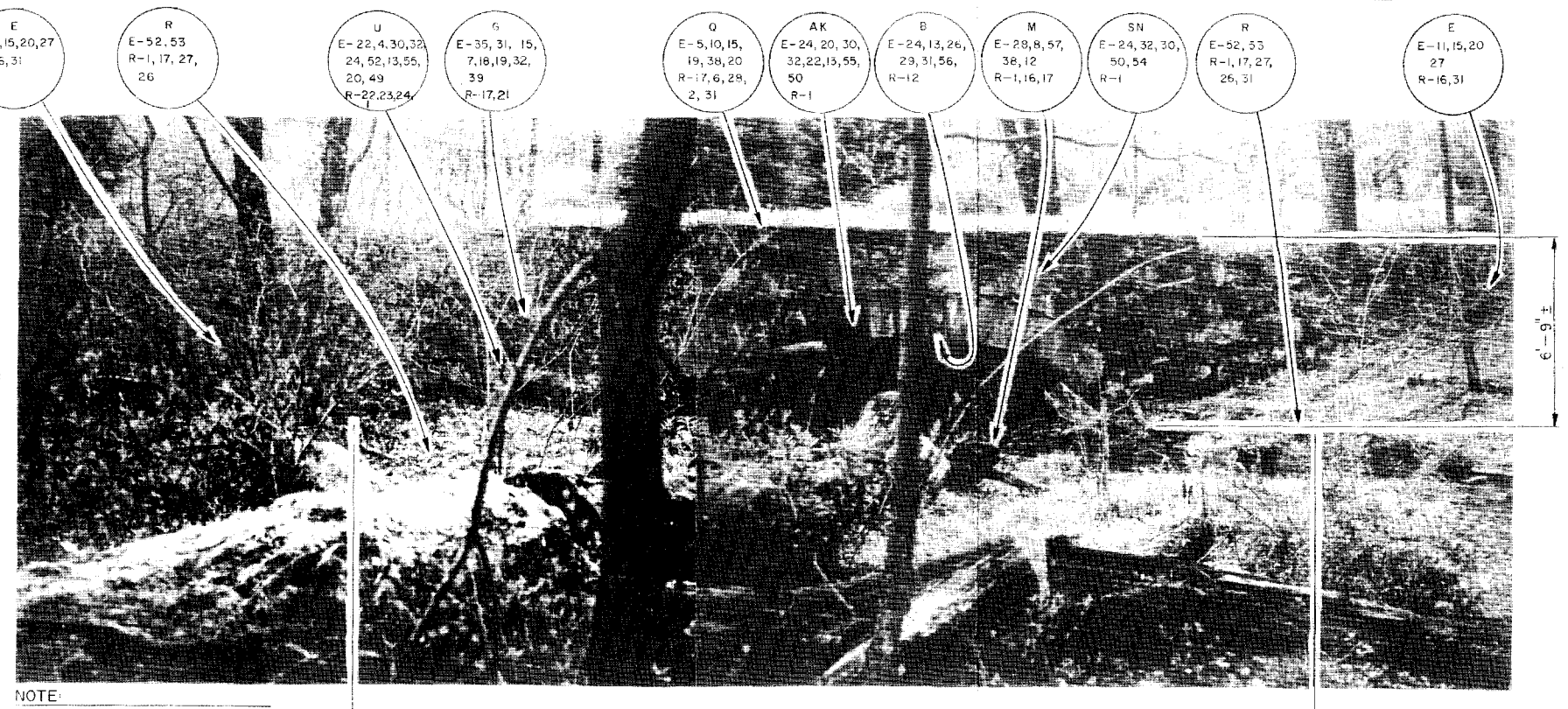


MORTAR BEADED JOINT
DIMENSIONS VARIES
FROM 3/8" TO 1/4" TO 3/16"

TOP OF STONE CULVERT
IS SEAL COATED



INLET – SOUTH ELEVATION (A)



NOTE:
STONE CULVERT IS DRY LAID, NO
MORTAR JOINTS.

THERE ARE 23 EXPOSED VOUSSOIRS.

PORTLAND CEMENT CAPS TOP OF
STONE CULVERT.

OUTLET – NORTH ELEVATION (B)

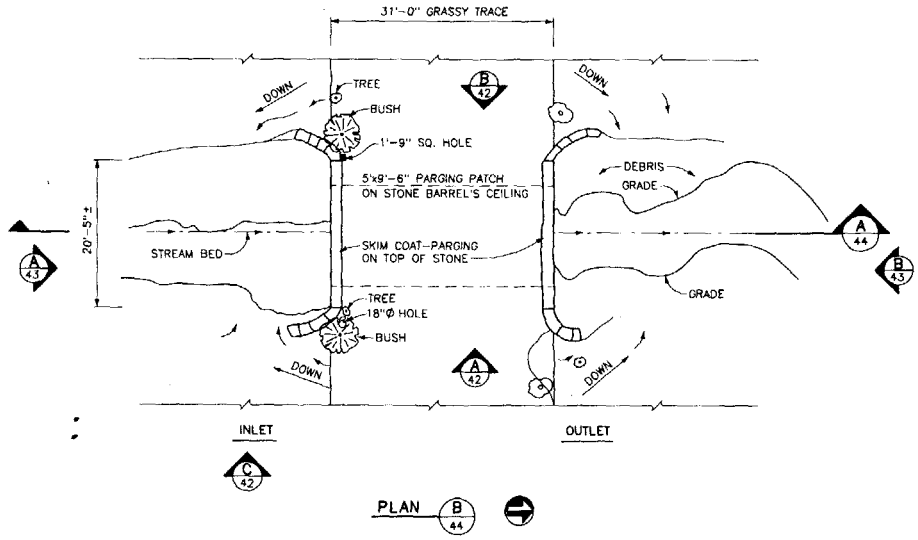
30'-0"±

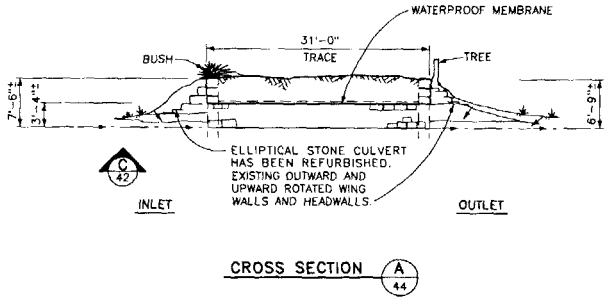
EXISTING CONDITIONS
PHOTOS TAKEN IN 1989

NO SCALE

ON MICROFILM

DESIGNED	SHEET NO.	TITLE OF SHEET: CULVERT 1624 ELEVATIONS LEVEL NO. 10 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005
DRAWN: N. CAMARENA			PKG. NO. 104
TECH. REVIEW: H. LAFLEUR			SHEET 43 OF 54
DATE: 1/91			





STABILIZATION RECOMMENDATIONS

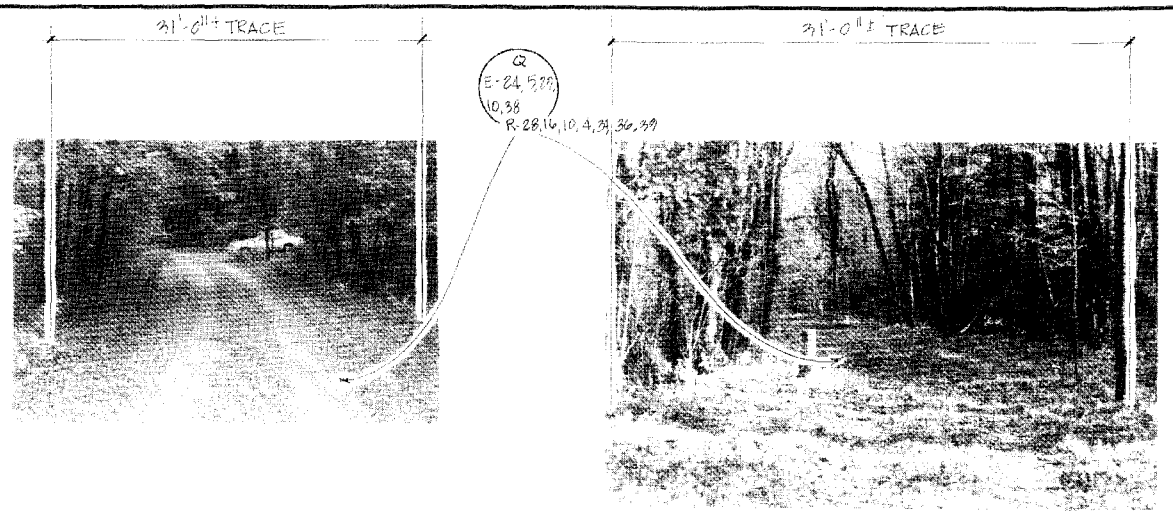
1. STRIP TRACE OF ALL MATERIAL AND SEAL THE ROADBED WITH A WATERPROOF MEMBRANE.
2. REPLACE SOILS AND COMPACT AND RESEED.

8 0 8 16
SCALE OF FEET

DESIGNED: GRIDLEY CAMARENA; DRAWN: RS; S. MOORE; TECH. REVIEW: M. PAUL; DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1624 PLAN & CROSS-SECTION LEVEL 9 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005; PKG. NO. 104; SHEET 44 OF 54

/PROJ/alpo104/acm/CULVERT_1624.DG

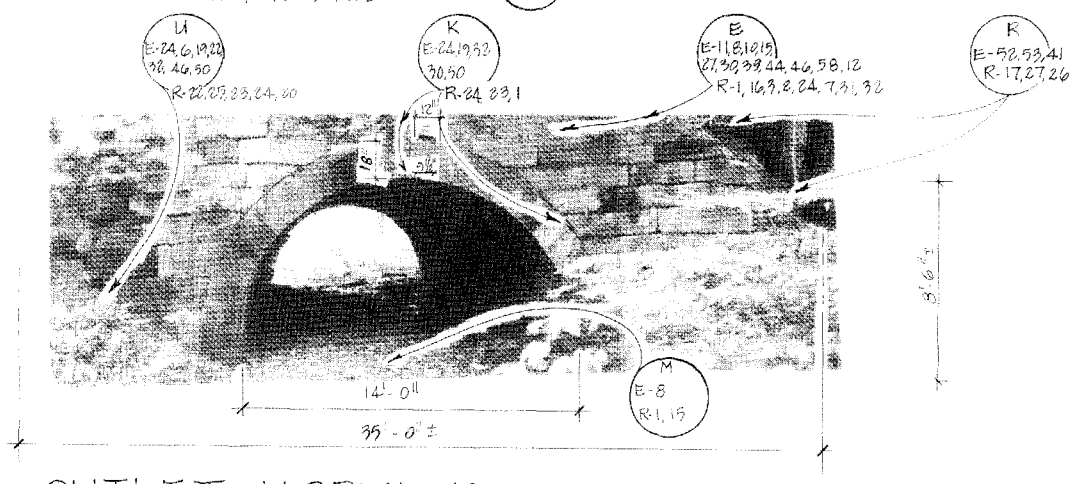
ON MICROFILM



TRACE - WEST VIEW (A)

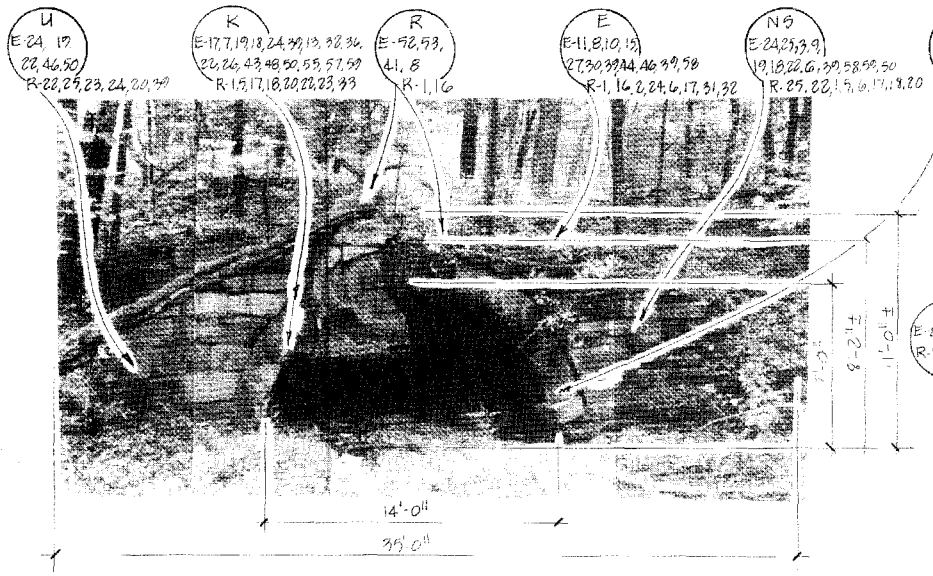
NOT TO SCALE

TRACE - EAST VIEW (B)



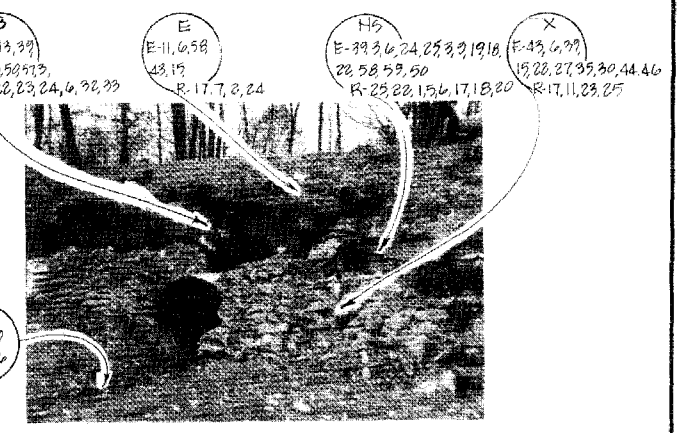
OUTLET - NORTH EL. (1984 CONDITIONS) (E)

NOT TO SCALE



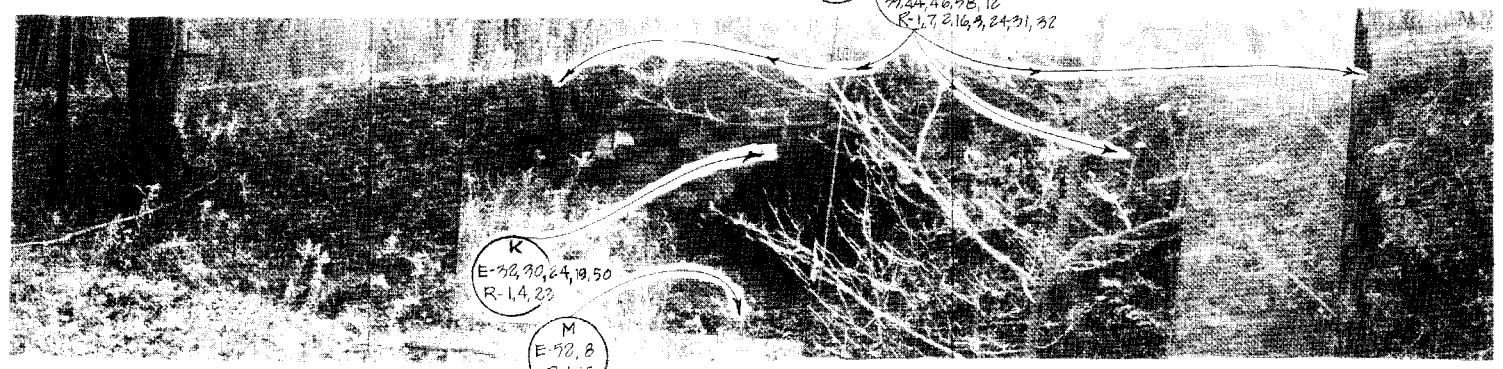
INLET - SOUTH EL. (1984 CONDITIONS) (C)

NOT TO SCALE



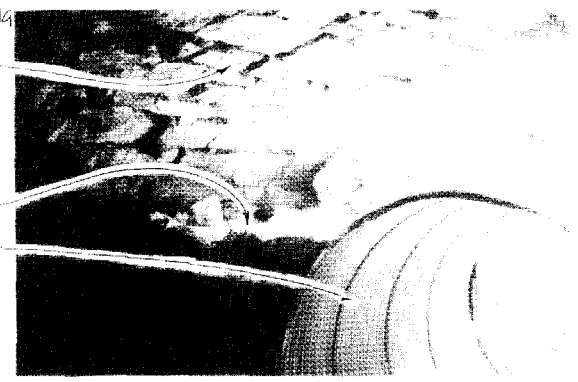
INLET - SOUTH EL. (1989 CONDITIONS) (D)

NOT TO SCALE



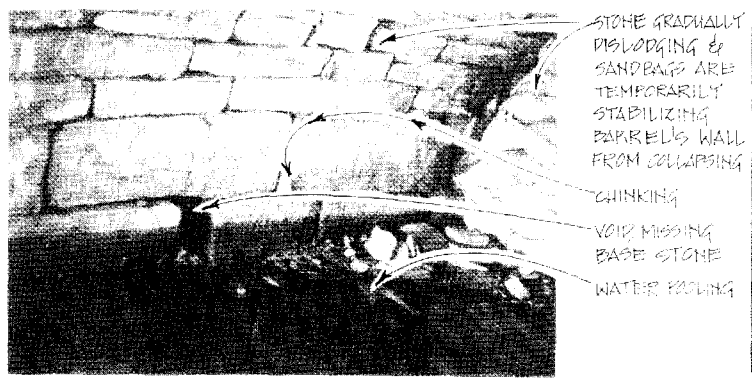
OUTLET - NORTH EL. (1989 CONDITIONS) (F)

NOT TO SCALE



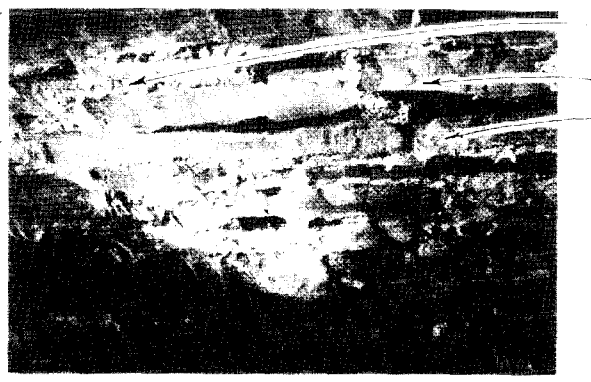
BARREL'S INTERIOR CEILING DETAIL (G)

NOT TO SCALE



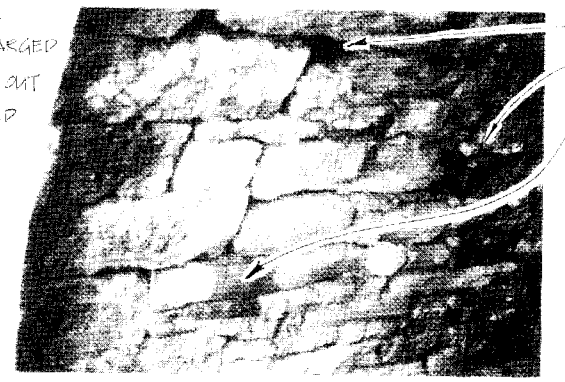
BARREL'S INTERIOR WALL & BASE DETAIL (H)

NOT TO SCALE



BARREL'S INTERIOR CEILING DETAIL (I)

NOT TO SCALE



BARREL'S INTERIOR WALL DETAIL (J)

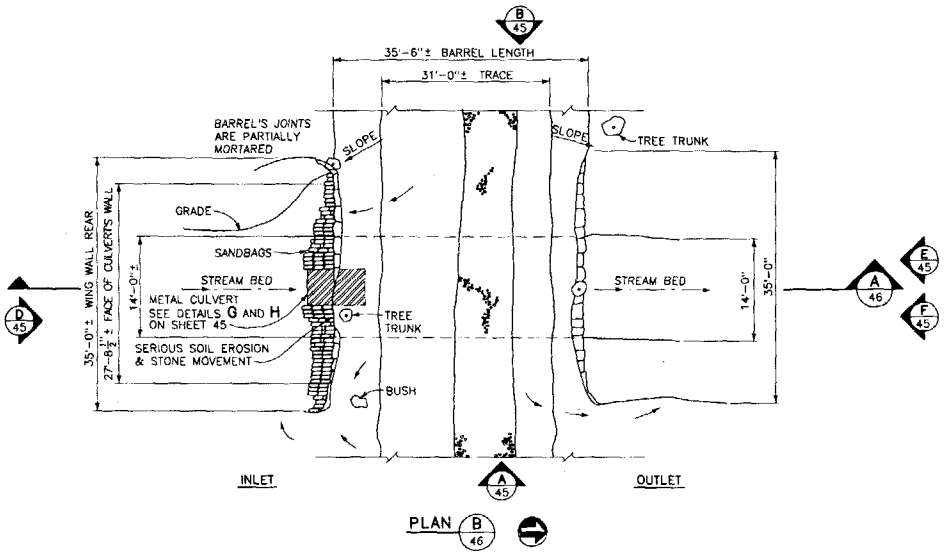
NOT TO SCALE

EXISTING CONDITIONS
OTHER PHOTOS TAKEN IN 1989

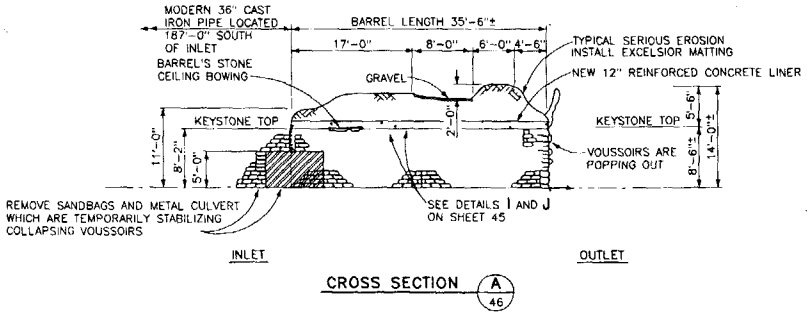
DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
DRAWN: N. CAMARENA		CULVERT 1635 TRACES ELEVATIONS & DETAILS	423 / 25,005
TECH. REVIEW: H. LA FLEUR		LEVEL NO 10	PKG. NO. 104
DATE: 1/91		ALLEGHENY PORTAGE RAILROAD N.H.S.	SHEET 45 OF 54

ON MICROFILM

☆ U.S. GOVERNMENT PRINTING OFFICE: 676-100



PLAN B 46



CROSS SECTION A 46

STABILIZATION RECOMMENDATIONS

MINIMUM EFFORT

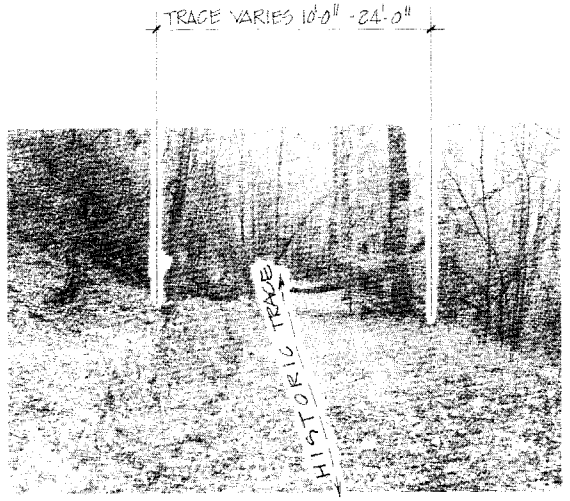
1. CONSTRUCT TEMPORARY SHORING TO PREVENT ANY FURTHER COLLAPSE OF THE CULVERT AND UNIFORMLY REMOVE EARTH FILL. SEE SHEET 38, DETAIL C
2. REMOVE SANDBAGS AND METAL CULVERT WHEN CULVERT IS STABLE.
3. CONSTRUCT REINFORCED CONCRETE LINER ON EXTERIOR OF CULVERT.
4. WATER SEAL CONCRETE, REPLACE FILL, REGRADE TRACE AND RESTORE TO ORIGINAL ELEVATIONS.

8 0 8 16
SCALE OF FEET

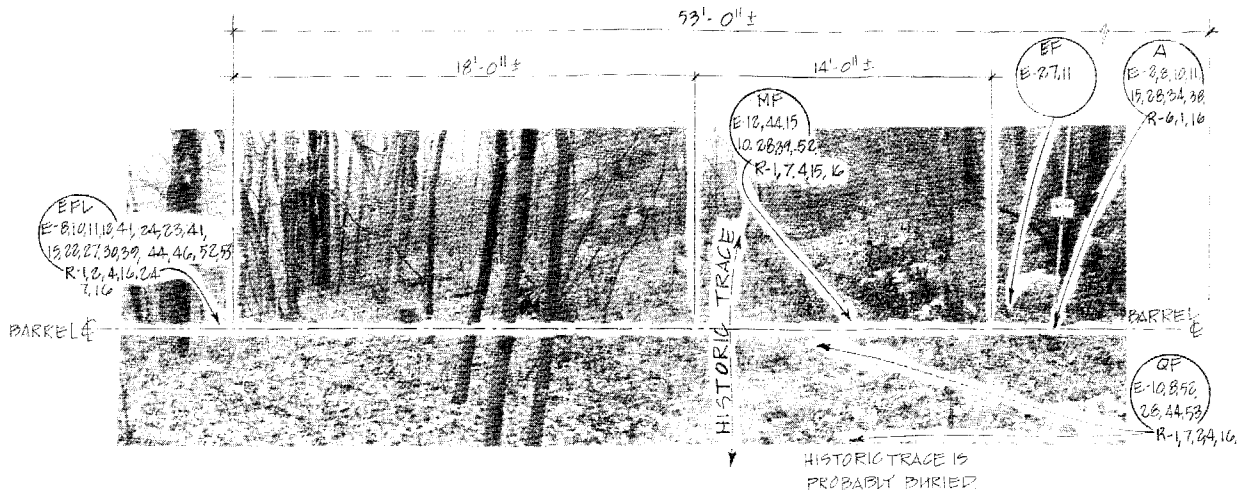
DESIGNED: CAMARENA GRIDLEY CADD HEDRICKS TECH. REVIEW: M. PAUL M. LOFLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1635 PLAN & CROSS-SECTION LEVEL 9 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 46 OF 54

/PROJ/pbp104/arch/CULVERT_1635.DG

ON MICROFILM



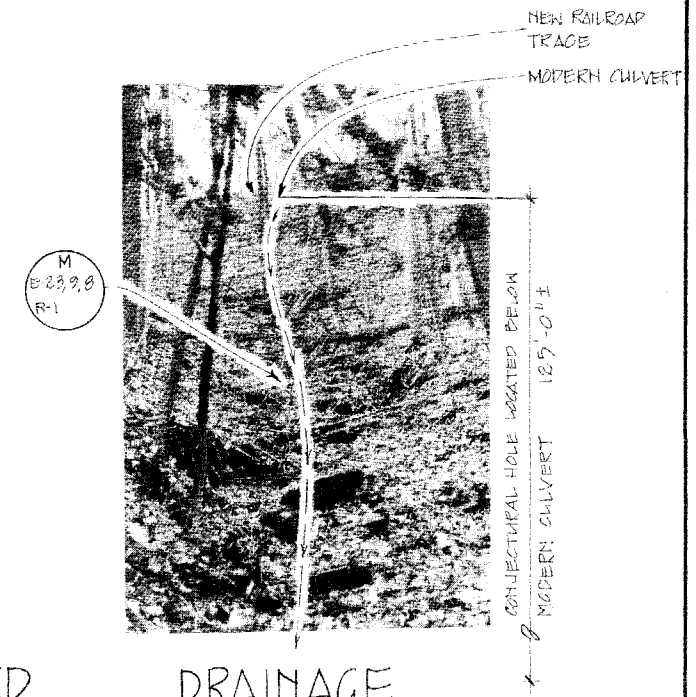
TRACE - WEST VIEW (A)



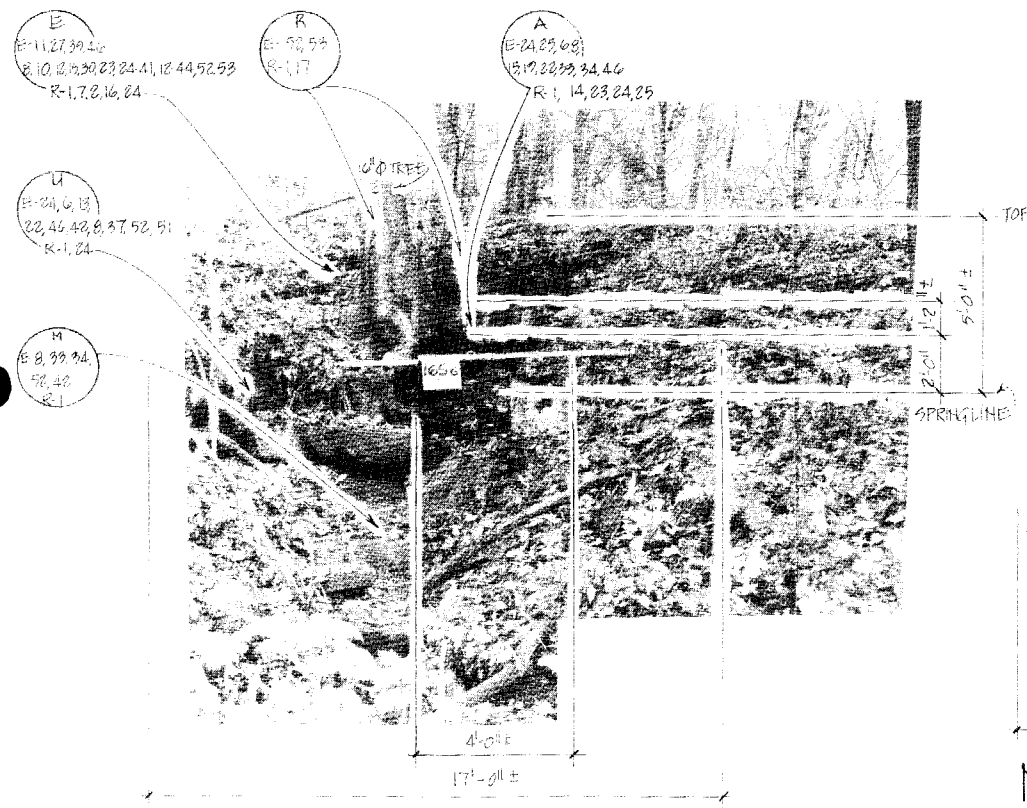
TRACE - EAST VIEW (B)



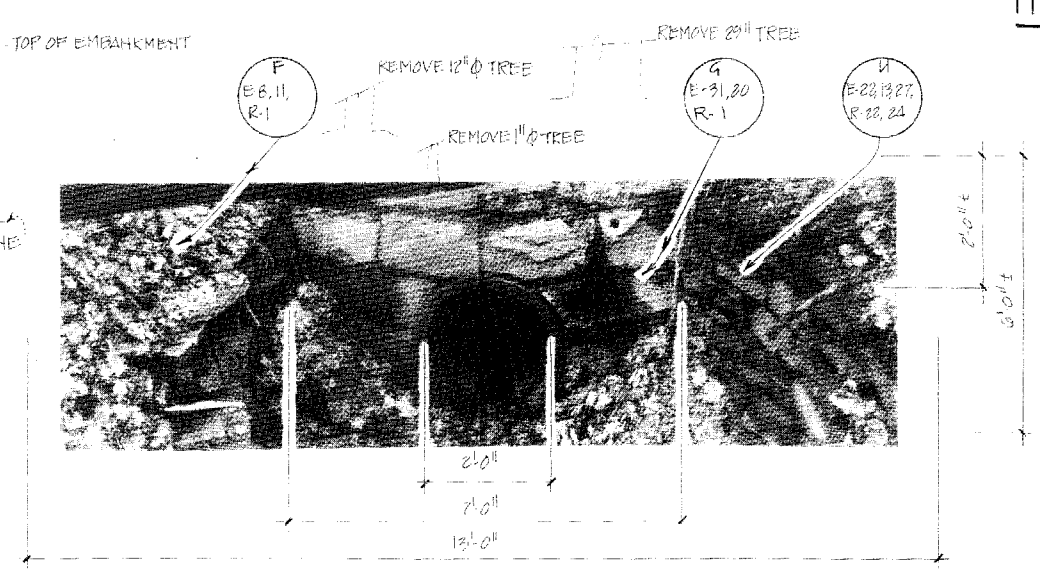
CONJECTURAL BURIED INLET - SOUTH EL (C)



DRAINAGE LOOKING SOUTH EL (D)



OUTLET - NORTH EL (E)



MODERN CULVERT - OUTLET - NORTH EL (F)

NOTE: PHOTOGRAPHS WERE TAKEN NOVEMBER 1989 BEFORE CLEARING AND FINAL GRADING, CLEANING AND REHANDLING HAS BEEN DONE IN 1991.

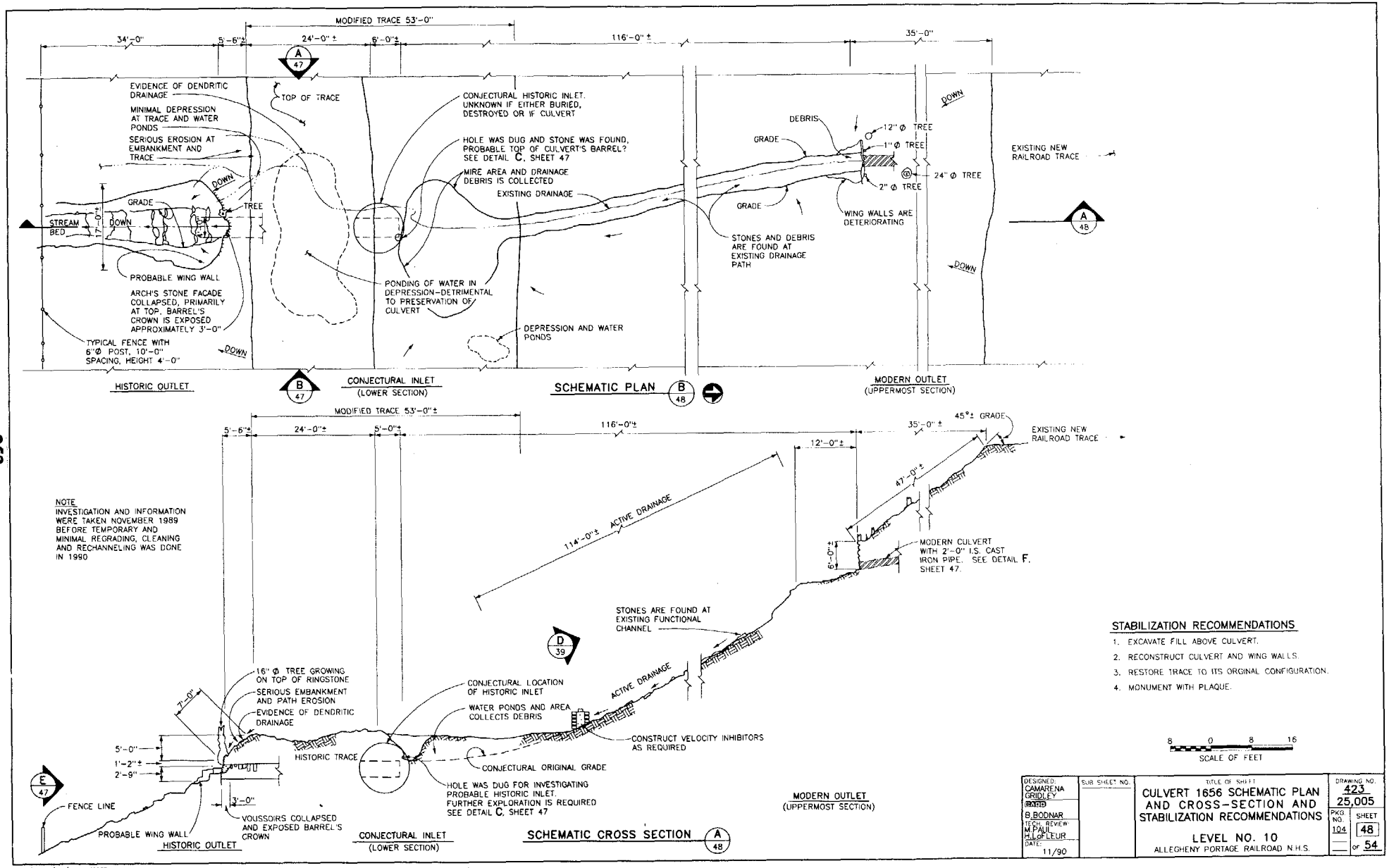
TO INTERPRET CIRCLES, REFER TO SHEET 4 "LEGEND" THE LIST WILL IDENTIFY & EXPLAIN THE MEANING OF GIRLS, LETTERS & NUMBERS.

ON MICROFILM

NOT TO SCALE

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
DRAWN: N. CAMARENA		CULVERT 1656 TRACES, ELEVATIONS & DETAILS	423 25,005
TECH. REVIEW: H. LAFLEUR		LEVEL NO. 10	PKG. NO. 104
DATE: 1/91		ALLEGHENY PORTAGE RAILROAD N.H.S.	SHEET 47 OF 54

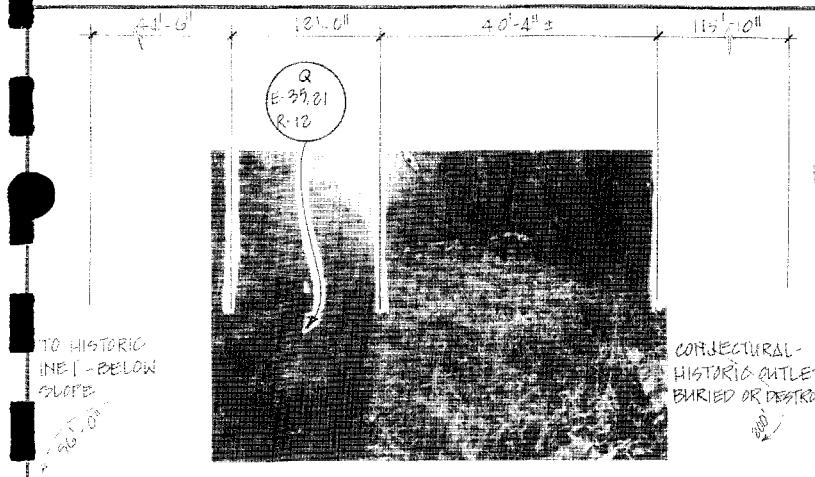
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253

/PROJ/aap104/arch/culvert_1656.dgn

ON MICROFILM



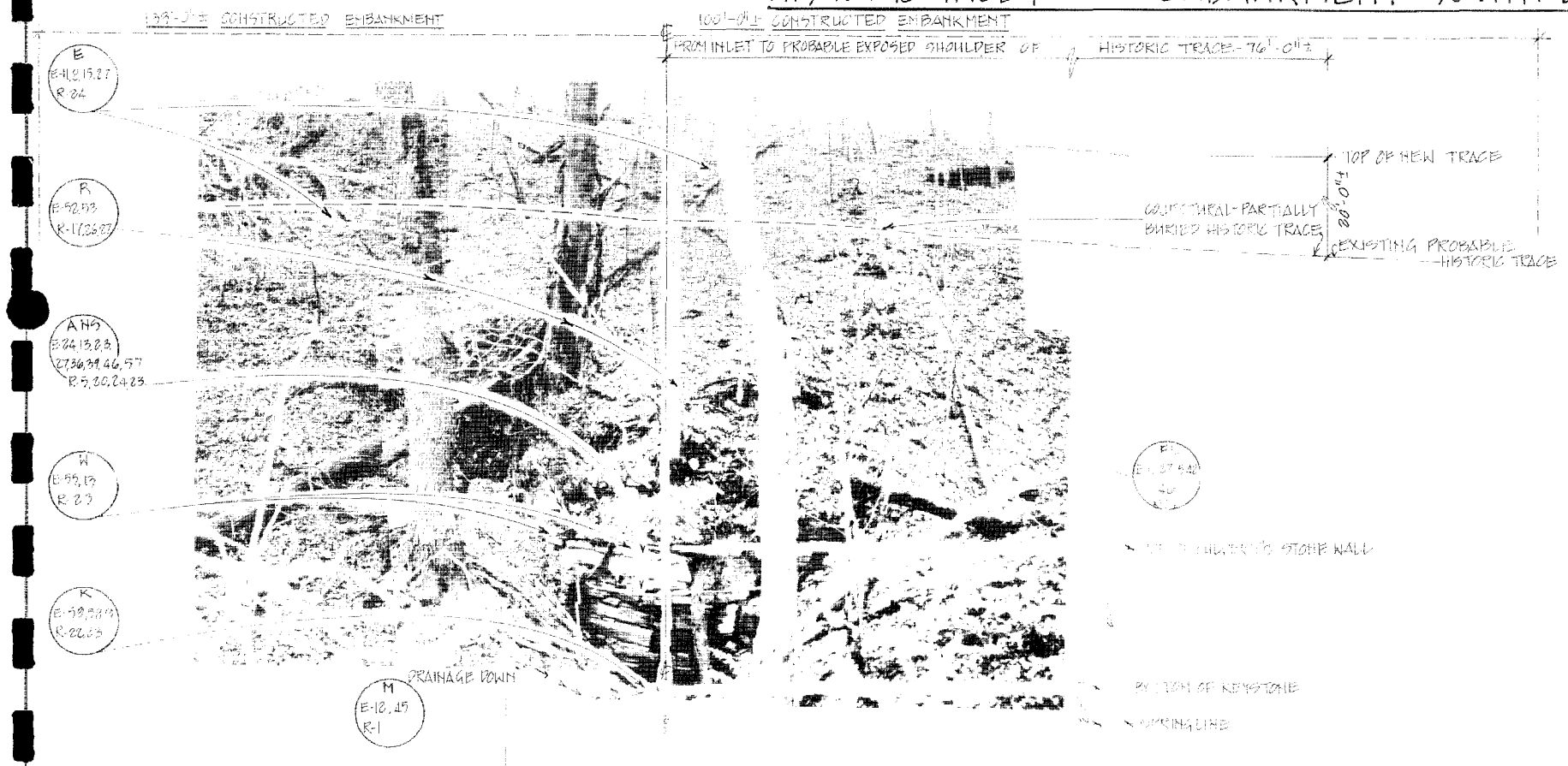
A NEW TRACE - WEST VIEW

NOT TO SCALE



OUTLET AT NORTH ELEVATION WAS NOT LOCATED PROBABLE HISTORIC STONE CULVERT MAY HAVE BEEN OBLITERATED

HISTORIC INLET EMBANKMENT - SOUTH EL. HISTORIC TRACE B



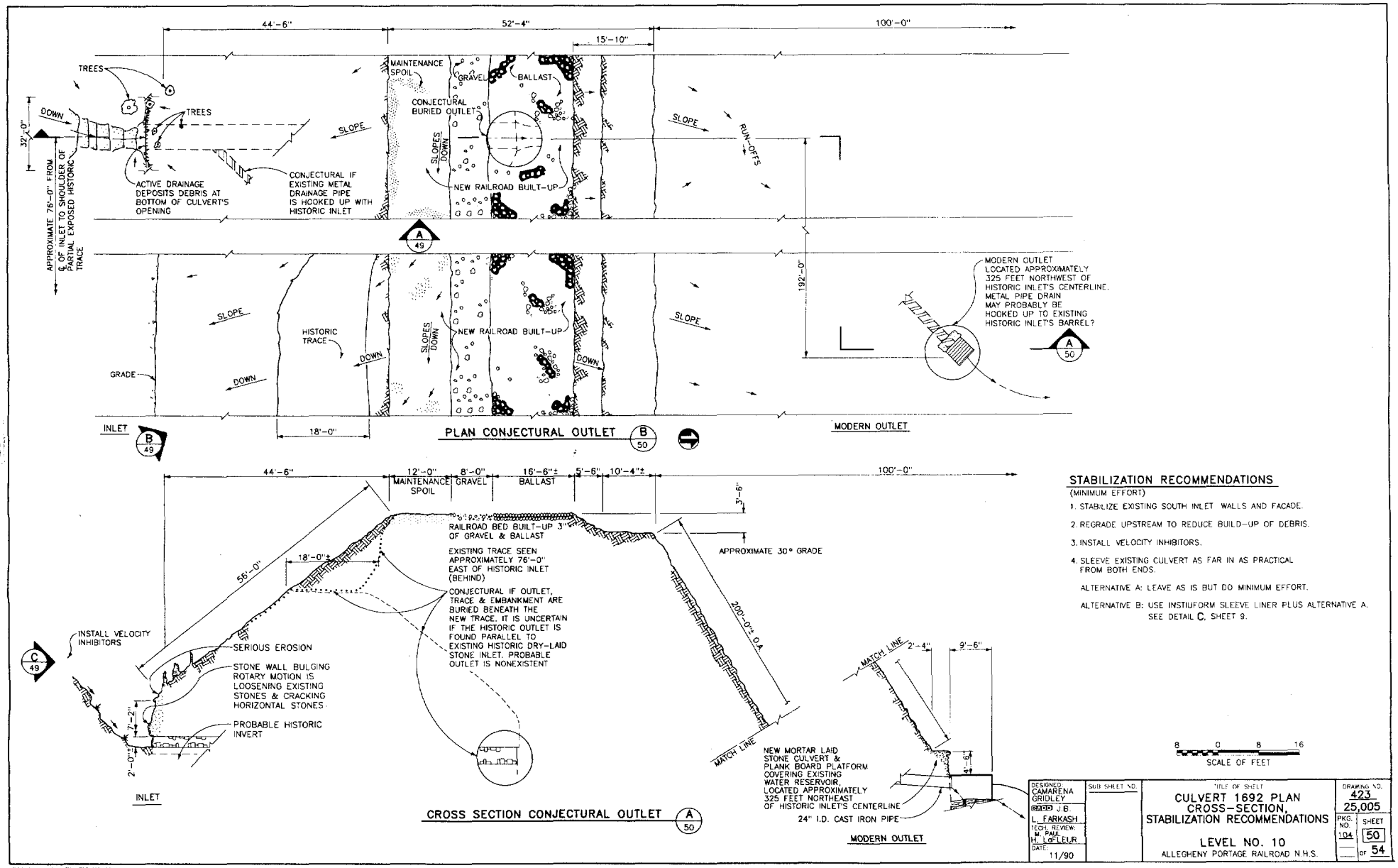
INLET - SOUTH EL C

EXISTING CONDITIONS
PHOTOS TAKEN IN 1989

ON MICROFILM

NOT TO SCALE

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1692 TRACE, ELEVATION AND DETAIL LEVEL NO. 10 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005
DRAWN: N. CAMARENA			PKG. NO. 104
TECH. REVIEW: H. LAFLEUR			SHEET 49 OF 54
DATE: 1/91			



STABILIZATION RECOMMENDATIONS

(MINIMUM EFFORT)

1. STABILIZE EXISTING SOUTH INLET WALLS AND FACADE.
2. REGRADE UPSTREAM TO REDUCE BUILD-UP OF DEBRIS.
3. INSTALL VELOCITY INHIBITORS.
4. SLEEVE EXISTING CULVERT AS FAR IN AS PRACTICAL FROM BOTH ENDS.

ALTERNATIVE A: LEAVE AS IS BUT DO MINIMUM EFFORT.

ALTERNATIVE B: USE INSTIUFORM SLEEVE LINER PLUS ALTERNATIVE A. SEE DETAIL C, SHEET 9.

8 0 8 16
SCALE OF FEET

DESIGNED: CAMARENA GRIDLEY	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1692 PLAN CROSS-SECTION, STABILIZATION RECOMMENDATIONS	DRAWING NO. 423 25,005
DRAWN: J.B. L. FARKASH		LEVEL NO. 10	PKG. NO. 104
TECH. REVIEW: M. PAUL H. LaFLEUR		ALLEGHENY PORTAGE RAILROAD N.H.S.	SHEET 50 OF 54
DATE: 11/90			

/PROJ/alpe104/arch/CULVERT_1692.DG

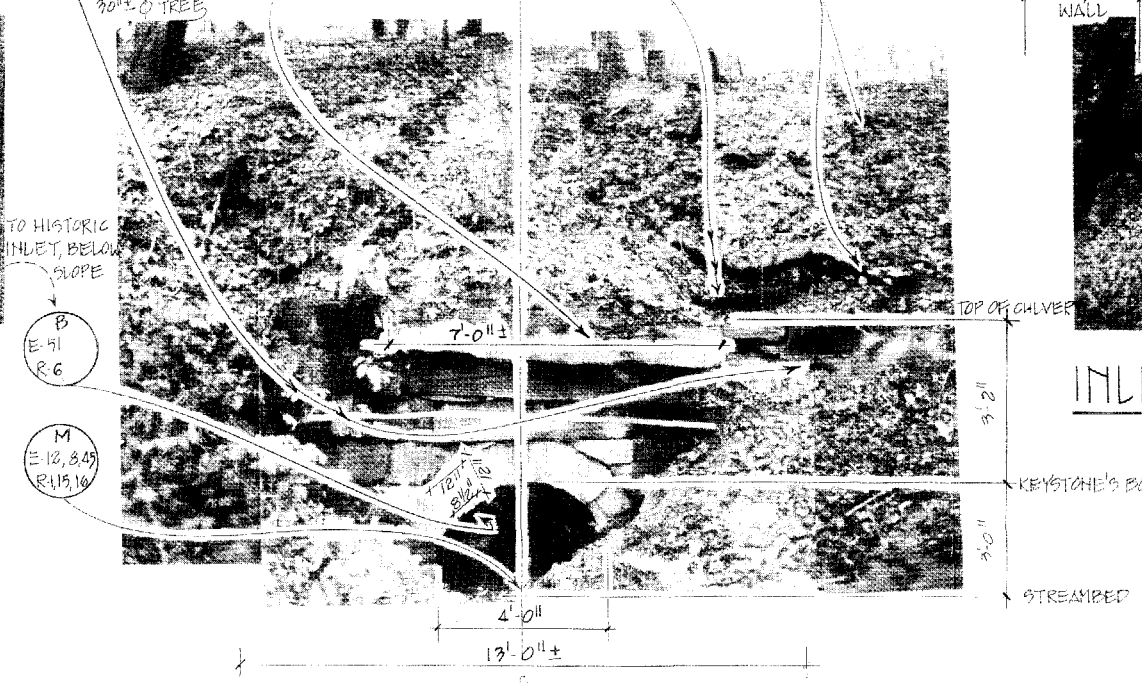
257

ON MICROFILM

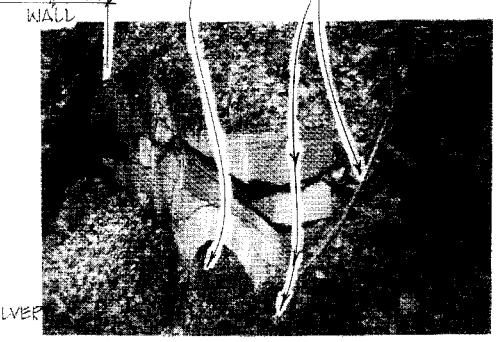
NORTH ELEVATION, OUTLET PROBABLY DESTROYED SINCE CULVERT WAS NOT FOUND



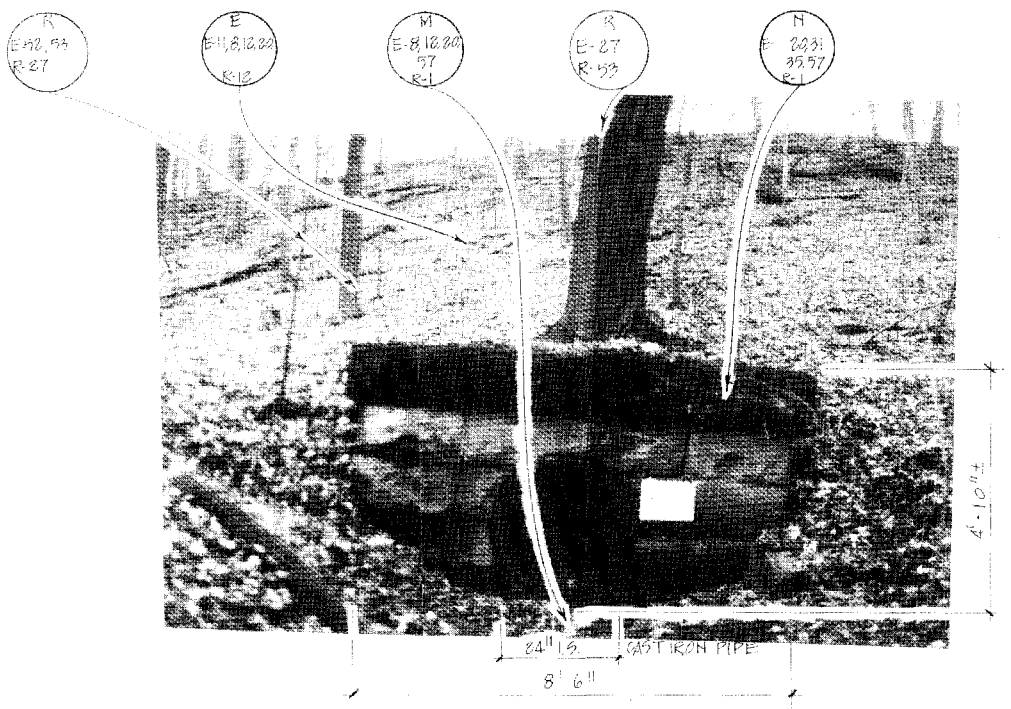
EMBANKMENT & HISTORIC TRACE SOUTH EL (A)



INLET - SOUTH EL (B)



INLET - SOUTHEAST EL (C)



MODERN CULVERT - OUTLET - SOUTH EL (D)

HISTORIC CULVERT'S NORTH EL. OUTLET WAS NOT FOUND PROBABLY DESTROYED OR BURIED?

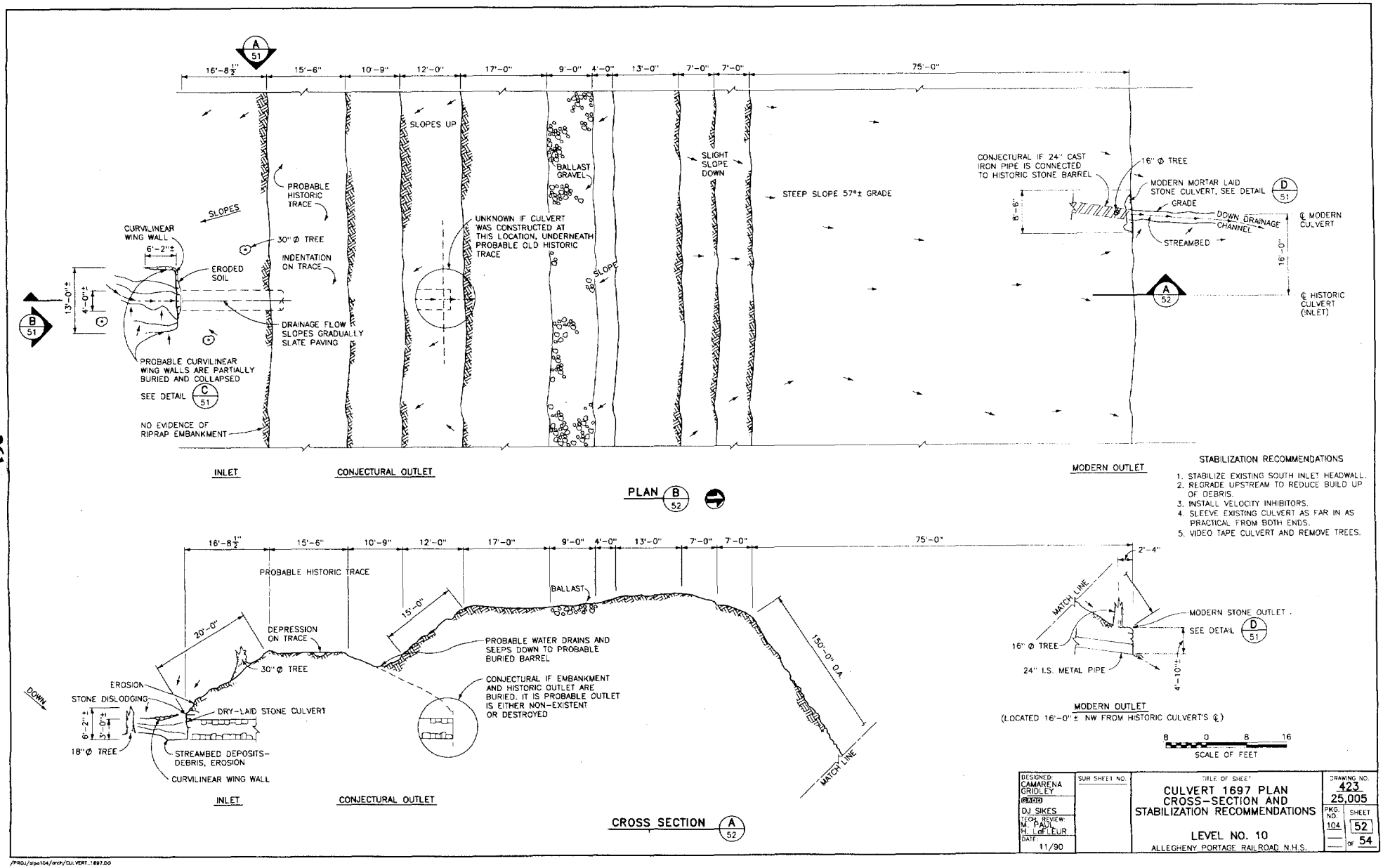
EXISTING CONDITIONS
PHOTOS TAKEN IN 1989

ON MICROFILM

NOT TO SCALE

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
DRAWN: N. CAMARENA		CULVERT 1697 TRACE AND ELEVATIONS	423 25,005
TECH. REVIEW: H. LAFLEUR		LEVEL NO. 10	PKG. NO. 104
DATE: 1/91		ALLEGHENY PORTAGE RAILROAD NHS	SHEET 51 OF 54

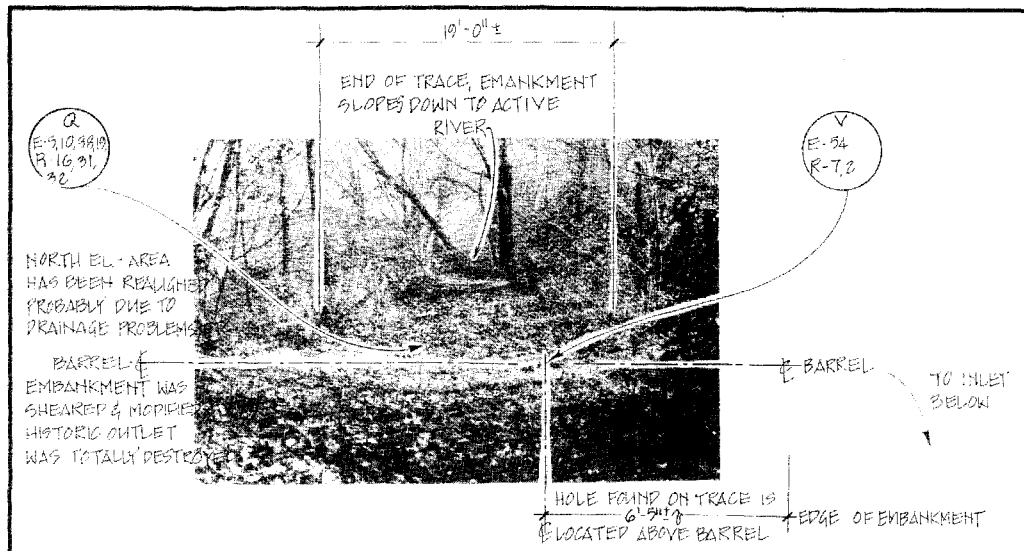
☆ U.S. GOVERNMENT PRINTING OFFICE: 676-100



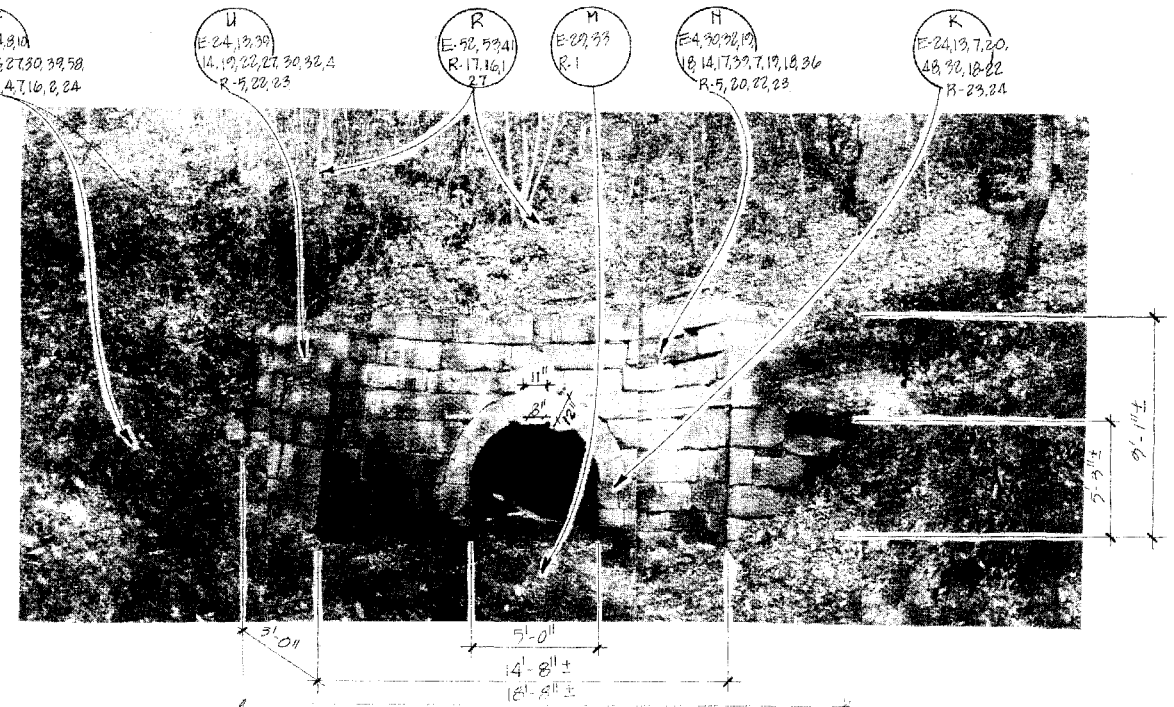
DESIGNED: CAMARENA GRIDLEY	SUB SHEET NO.	TITLE OF SHEET: CULVERT 1697 PLAN CROSS-SECTION AND STABILIZATION RECOMMENDATIONS	DRAWING NO. 423 25,005	
DRAWN: DJ SIKES			PKG. NO. 104	SHEET 52
TECH. REVIEW: M. PAUL H. LOFLEUR		LEVEL NO. 10		OF 54
DATE: 11/90		ALLEGHENY PORTAGE RAILROAD N.H.S.		

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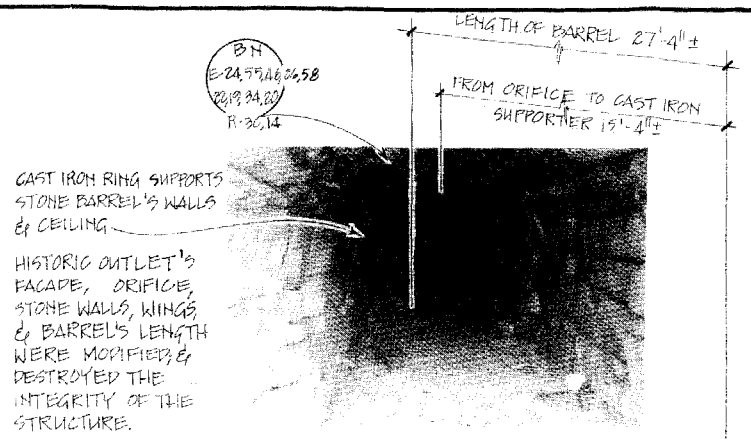
ON MICROFILM



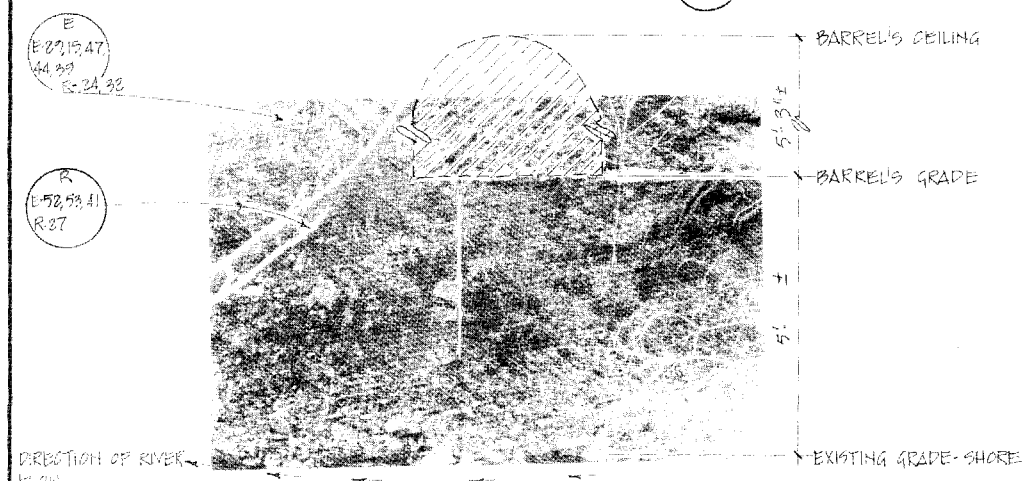
TRACE - EAST VIEW (A)



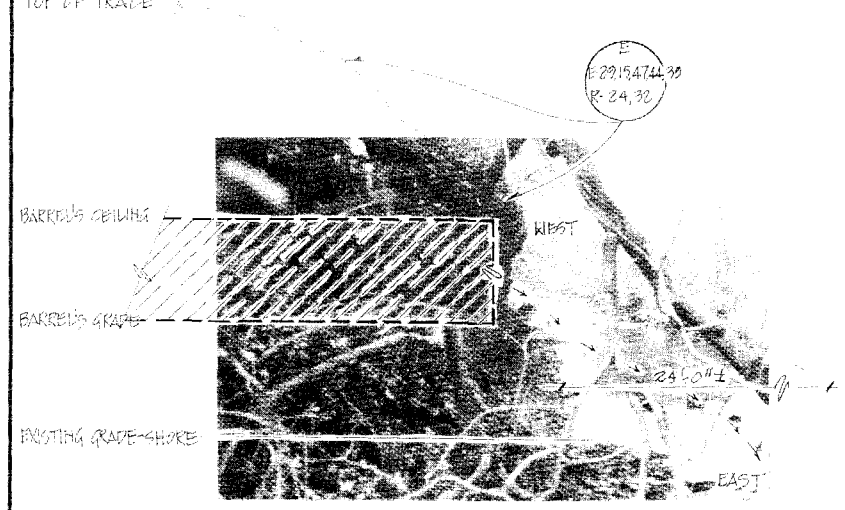
INLET - SOUTH EL (B)



BARREL'S INTERIOR SOUTH EL (C)



DESTROYED OUTLET - NORTH EL (D)



DESTROYED OUTLET - VIEWING WEST EL (E)

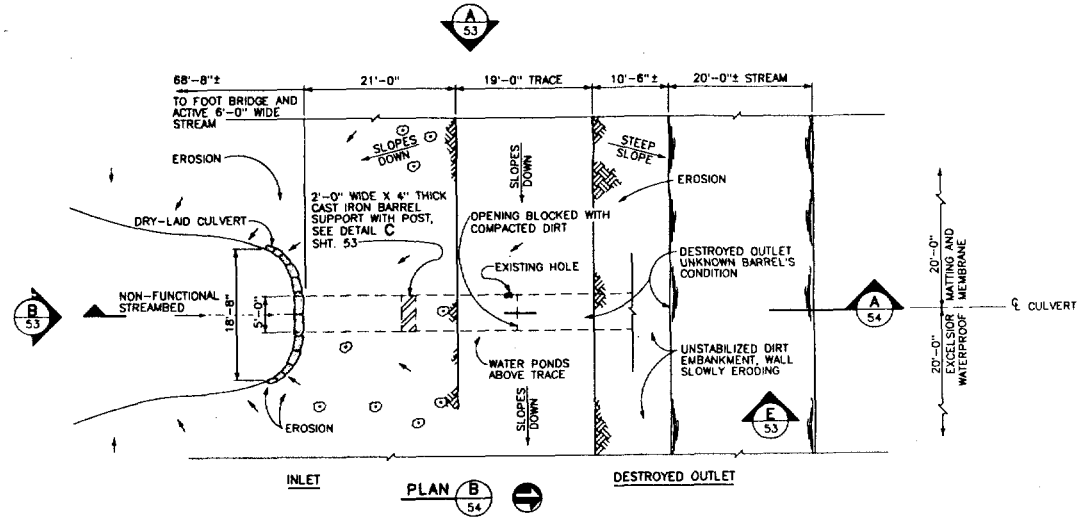
EXISTING CONDITIONS
PHOTOS TAKEN IN 1989

ON MICROFILM

NOT TO SCALE

DESIGNED: N. CAMARENA DRAWN: N. CAMARENA TECH. REVIEW: H. LAFLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET CULVERT 1733 TRACE, ELEVATION AND DETAIL INCLINED PLANE NO. 10 ALLEGHENY PORTAGE RAILROAD NHS	DRAWING NO. 423 / 25,005 PKG. NO. 104 SHEET 53 OF 54

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STABILIZATION RECOMMENDATIONS

1. REMOVE EXISTING BANK MATERIAL.
2. INSTALL MEMBRANE TO REDUCE WATER INFILTRATION.
3. STABILIZATION OF BANK FOR EROSION.
4. REVEGETATE WITH NATIVE PLANTS.
5. SEAL OFF CULVERT AT COLLAPSED END WITH STONE MASONRY OR CONCRETE WALL.

NO SCALE

DESIGNED: GRIDLEY CAMARENA DRAWN: D. SHULL TECH. REVIEW: M. PAUL, H. LAFLEUR DATE: 11/90	SUB SHEET NO.	TITLE OF SHEET CULVERT 1733 PLAN CROSS-SECTION AND STABILIZATION RECOMMENDATIONS INCLINE PLANNED NO. 10 ALLEGHENY PORTAGE RAILROAD N.H.S.	DRAWING NO. 423 25,005 PKG. NO. 104 SHEET 54 OF 54

/PRO.//dpw104/ARCH/CULVERT_1733.DG

ON MICROFILM

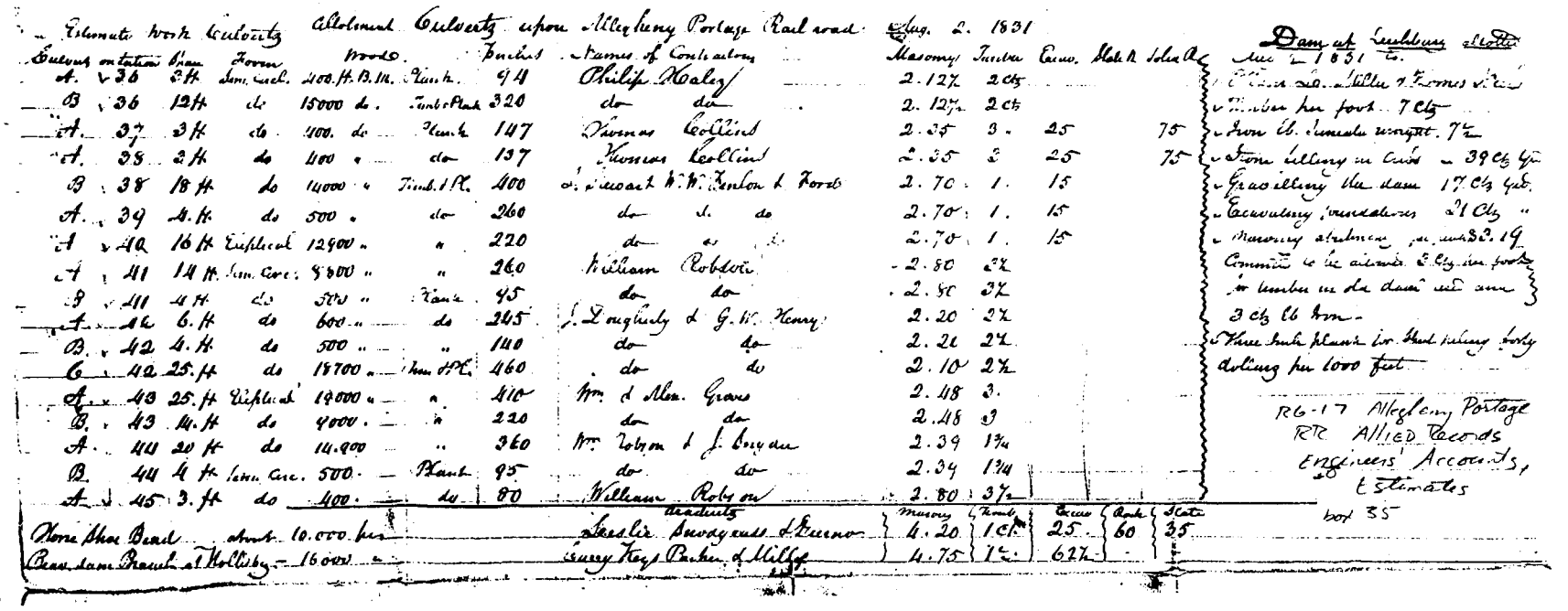
APPENDIXES
GLOSSARY
SELECTED BIBLIOGRAPHY

Culverts on 2d Division

Nr of Culvert	Nr of Section	Length	Span	Versed Sine	Height of Embankt on crown of arch	Thickness of ring
20	58	50 feet	6 feet	3 feet	10·25 ft	1·58 ft
21	56	79 "	6 "	3 "	19·25 "	1·58 "
22	60	59 "	14 "	7 "	13· "	1·83 "
23	61	68 "	14 "	7 "	16· "	1·83 "
24	62	60 "	50 "	14 "	14·85 "	2·50 "
25	64	56 "	12 "	6 "	12· "	1·83 "
26	65	54 "	24 "	8 "	11·50 "	2·25 "

Source: Wilson, "Notebook, 1831"

APPENDIX B: ALLOTMENT CULVERTS UPON ALLEGHENY PORTAGE RAILROAD, AUGUST 2, 1831



Estimate work Culverts Allotment Culverts upon Alleghany Portage Railroad Aug. 2. 1831

Culverts	on station	Diam	Form	Wood		Perches	Names of Contractors	Masonry	Timber	Earth	Rock	Solid Rock
A.	36	2 Ft	Semi Circl.	400 Ft. B.M.	Plank	94	Philip Haley	2.12½	2 Cts			
B	36	12 Ft	do	15000 do.	Timber Plank	320	do do	2. 12½	2 Cts			
A.	37	3 Ft	do	400. do	Plank	147	Thomas Collins	2.35	3.	25	75	
A.	38	2 Ft	do	400 "	do	137	Thomas Collins	2.35	3	25	75	
B	38	18 Ft	do	14000 "	Timb. & Pl.	400	Sheward & W. Fenton & Forst	2.70	1.	15		
A.	39	4 Ft	do	500 "	do	260	do do	2.70	1.	15		
A	40	16 Ft	Elliptical	12900 "	"	220	do do	2.70	1.	15		
A	41	14 Ft	Semi Circ.	8800 "	"	260	William Robbins	2.80	3½			
B	41	4 Ft	do	500 "	Plank	45	do do	2.80	3½			
A	42	6 Ft	do	600 "	do	245	J. Dougherty & G. W. Henry	2.20	2½			
B.	42	4 Ft	do	500 "	"	140	do do	2.21	2½			
C	42	25 Ft	do	18700 "	Timb. & Pl.	460	do do	2.10	2½			
A	43	25 Ft	Elliptical	19000 "	"	410	Wm & Alex. Graves	2.48	3.			
B.	43	14 Ft	do	9000. "	"	220	do do	2.48	3			
A.	44	20 Ft	do	14.900	"	360	Wm Robyn & J. Boyden	2.39	1¾			
B	44	4 Ft	Semi Circ.	500	Plank	95	do do	2.34	1¾			
A	45	3. ft	do	400.	do	80	William Robyn	2.80	3½			

Deductions

		Masonry	Timber	Earth	Rock	Slate
Stone Shoe Board	short 10.000 ft	Sheesley Snodgrass & Brennon	4.20	1 Ct.	25	60	35
Bridge dam Board at Holliday	16.000	Emery Kay Parker & Miller	4.75	1½	62½		

Dam at Culvert sheet

Aug 2 1831

Plank do Miller & Thomas Acct

Timber per foot 7 Cts

Iron Ct. Semicircle wrought 7½

Stone Cellars in Culv 39 Cts Yd

Gravelling the dam 17 Cts Yd.

Excavating foundations 21 Cts "

Masonry abutments per rod 32.19

Common to be allowed 3 Cts per foot for timber in the dam and same 3 Cts Ct from

Three inch plank for shoe pulling body driving per 1000 feet

RG-17 Alleghany Portage RR Allied Records Engineers' Accounts Estimates Box 35

Source: RG-17, Allegheny Portage RR, Allied Records, Engineers' Accounts Estimates, Box 35.

APPENDIX C: DESCRIPTION OF ROAD SECTIONS

Section No. 30 – 3600 feet long

The line passes over sloping ground favourable for the constructing of the road 900 feet to Beav Rock Creek. – There over a low flat 300 feet to the foot of Inclined plane No. 4. – Then up the hill nearly at right angles to the direction of its base. At this point, 2100 feet to the head of the plane – then over level ground 100 feet to the end of the Section. The work will consist of

Embankment
Common Excavation
Hard pan
Solid rock
Grubbing
Slate rock &c
1 Culvert
4 Drains

Section No 31 – 4400 feet long

The line passes over ground favorable for the road along the whole length of the section – very large timber. The work will consist of

Embankment
Common Excavation
Grubbing
Solid rock
4 Drains
1 Culvert

Section No. 32 – 4900 feet long

The line passes over ground, very favourable for the road. Very large timber. The work will consist of

Common Excavation
Embankment
Grubbing
9 Drains
4 Culverts

Section No. 33 – 3400 feet long

The line passes over ground highly favourable for the road. The angle of inclination of the surface is from 1 to 3 degrees – very large timber. The work will consist of

Common Excavation
Embankment
Grubbing
Detatched rock, small quantity
5 Drains
3 Culverts

Section No. 34 – 4300 feet long

The line passes over level ground 400 feet, whence across the valley of Adams Run 300 feet. – to the foot of Inclined Plane No. 5 then obliguely up the hill on the north side of Adams Run 2500 feet to the end of the

plane – thence over ground nearly level. 1000 feet to the end of the Section. The line crosses the turnpike at this point. The work will consist of

Embankment
Common Excavation
Drubbing
Solid rock
1 Drain
1 Culvert

Section No. 35 – 5100 feet long

The section commences at the north side of the turnpike road. The line passes over ground the transverse slope of which is from 2 to 4 degrees 1600 feet – then 200 feet over a deep ravine – then to the end of the section over ground the transverse slope of which is from 10 to 15 degrees. The work will consist of

Embankment
Common Excavation
Drubbing
Solid rock
4 Drains
1 Culvert

Source: Reports and Misc. Documents 1829-1843 box 8, vol. 1, item 58, W2-f16, APRR, Div. Rec., BCC, RG-17, PHMC. Description of sections 29-35 (missing from Toogood, HRS, p. 127).

APPENDIX D: ABSTRACT OF VALUE OF WORK, 1832

Abstract of the value of work done upon the Allegheny Portage Rail Road, agreeably to Estimates of Engineers made 4th April 1832 – also the amount paid to the severall Contractors and the percentage retained by the Superintendent.

Number of Culvert				Names of Contractors	Amt of Estimates	Amt Paid	Amt Retained
Culvert	B	on Sec	36	Philip Haley	212.50	180.00	32.50
"	A	"	37	Groves, Pollard & Groves	408.50	350.00	58.50
"	B	"	38	Stewart, Fenlon & Ford	81.00	70.00	11.00
"	A	"	39	" " " "	217.50	185.00	32.50
	A	"	40	" " " "	500.00	425.00	75.00
"	A	"	41	William Robson	427.00	365.00	62.00
"	B	"	41	" " " "	196.00	165.00	31.00
"	A	"	42	Henry & Dougherty	462.00	395.00	67.00
"	B	"	42	" " " "	154.00	130.00	24.00
"	C	"	42	" " " "	1632.00	1390.00	242.00
"	D	"	42	" " " "	370.00	310.00	60.00
"	A	"	43	Wm & A. K. Groves	682.00	575.00	107.00
"	B	"	43	" " " "	657.00	560.00	97.00
"	A	"	44	Jacob Snyder	75.25	50.00	25.25
"	B	"	44	" " " "	95.60	80.00	15.60
"	A	"	45	William Robson	182.00	155.00	27.00

Source: Reports and Misc. Documents, 1829-1843, box 8, vol. 1, item 59, APRR, Div. Rec., BCC, RG-17, PHMC.

APPENDIX E: REVISED ESTIMATE OF THE COST OF GRADING AND MASONRY, MAY 16, 1832

Engineers Office, Portage Rail Road May 16th, 1832

To James Clarke Esq. President of the Board of Canal Commissioners of Pennsylvania

Sir – in compliance with two resolutions of the Board of Canal Commissioners dated April 11th, 1832 directing the the [sic1] Engineer of the Portage Rail Road "as soon as practicable, to report to the Board an estimate in detail of the amount of money that will be required to complete the several contracts now existing on the said Portage Road, ". . . I have the honor to transmit the required estimates,. . ."

Revised Estimate of the Cost of Grading and Masonry including all contracts made prior to the 5th of March 1832

SECTIONS 35 THROUGH 46

Section No. 35.	9435	C. yds.	Excav.	a	10c	943.50	
	15000	" "	Embt.	"	12½	1912.50	
	5880	" "	Slate	"	15c	882.00	
	1200	" "	Rock	"	43,	516.00	
	3300	" "	H. Pave	"	14	462.00	
	500	per m	Slope Wall	"	50c	250.00	
	160	"	Wall in Drains	"	162½	260.00	
			Grubg & Clearing		750.	750.00	
			Extra Ditto		100	100.00	6076.00
Section No. 36.	11250	C. yds	Excav.	a	11c	1237.50	
	21700	" "	Embt.	"	13,	2821.00	
	3450	" "	Slate	"	20,	690.00	
	950	" "	Rock	"	50c	475.00	
	27870	" "	H. Pave	"	16,	4459.20	
	1800	per m	Wall in Drains		150,	129.00	
			Grubg & Clearing		200	200.00	
			Add est? cost of Work by O'Hanlan & M'Carth.			1735.75	12647.45
							356.434 3 5/4

				Brought forward			£356.434 30
Section No. 37.	8010	C. yds	Excav.	@	10c	801.00	
	15490	" "	Em.	,	16	2478 40	
	11080	" "	Slate	,	20	2216 00	
	8320	" "	Rock	,	40	3328.00	
	11790	" "	H. Pan	,	16	1886.40	
	6440	per.	Slope Wall	,	50	3220.00	
	140	"	Wall in drains	,	150	210.00	
			Cut & Clearing	,	300	200.00	
			add Cost of work done by Giblin Daly &Co.			3821.32	22.961.12
Section No. 38.	8470	C. yds	Excav.	@	6c	508.20	
	34530	" "	Em.	,	8	2761.60	
	17970	" "	Slate	,	15	2695 50	
	12100	" "	Rock	,	28	3388 00	
	4850	" "	H. Pan	,	13	630 50	
	35500	per.	Slope wall	,	10	2695 00	
	141	"	Wall in Drains	,	150	210.00	
			Cut & Clearing	,	1757	775 30	13.664.30
Section No. 39.	11360	C. yds.	Excav.	@	9c	1046.40	
	44300	" "	Em.	,	9	4006.00	
	3260	" "	Slate	,	30	1575 00	
	6200	" "	Rock	,	40	2480.00	
	10300	" "	H. Pan	,	25	2575.00	
	2300	per.	Slope wall	,	35	805.00	
	1100	"	Vertical wall	,	45	495 00	
	180	"	Wall in Drains	,	150	270.00	
			Cut & Clear	,	900	900 00	14.108 40
Section No. 40.	8830	C. yds	Excav.	@	11c	973.50	
	17500	" "	Em.	,	8	1400.00	
	6300	" "	Slate	,	17	1071.00	
	2700	" "	Rock	,	40	1080.00	
	8360	" "	H. Pan	,	14	1170 40	
	140	per.	Wall in Drains	,	150	210.00	
			Cut & Clearing	,	225	225.00	6.129.90
							413.338 07½

36/4

				Brought Forward			413.338.07½
Section No. 41.	9880	c.Yds	Excav.	@	8¾c	864.50	
	8660	" "	Em.	"	10¾	930.95	
	9530	" "	Slate	"	19¾	1882.17½	
	2690	" "	Rock	"	44	1183.60	
	12000	" "	H. Pan	"	15	1800.00	
	250	Per.	Slope wall	"	30	125.00	
	3400	"	Vertical wall	"	45	1530.00	
			Grub'g & Clear'g		199+150	349.00	8.665.22½
Section No. 42.	7525	c.Yds	Excav.	@	7c	526.75	
	45760	" "	Em.	"	12	5491.20	
	14960	" "	Slate	"	18	2692.80	
	7170	" "	Rock	"	30	2151.00	
	7230	" "	H. Pan	"	18	1315.00	
	2200	per.	Slope wall	"	32	704.00	
	50	"	wall in Drains	"	130	75.00	
			Grub'g & Clear'g	"	800	800.00	13.665.75
Section No. 43.	6900	c.Yds	Excav.	@	8c	552.00	
	19180	" "	Em.	"	13	2493.40	
	100	" "	Slate	"	17	17.00	
	12800	" "	H. Pan	"	14	1792.00	
	100	per.	Wall in Drains		162½	162.50	
			Grub'g & Clear'g		70	70.00	5.086.90
Section No. 44.	3200	c.Yds	Excav.	@	8c	256.00	
	28800	" "	Em.	"	17c	4896.00	
	1100	" "	H. Pan	"	10c	110.00	
	40	per.	Wall in Drains	"	162½	65.00	
			Grub'g & Clear'g	"	75	75.00	5.402.00
Section No. 45.	5600	c.Yds	Excav.	"	8c	448.00	
	42270	" "	Em.	"	8	3381.60	
	6130	" "	Slate	"	17	1042.10	
	3500	" "	Rock	"	45	1575.00	
	7050	" "	H. Pan	"	17	1198.50	
	110	per.	Wall in Drains	"	150	60.00	
			Grub'g & Clear'g	"	250	250.00	7.955.20
							454.093.14½

Brot. f'w'd 454.093.14¾

Section No. 46.	1180	c. yds	Excav.	a	9c	1106.20
	14750	" "	Exc.	"	18c	2655.00
	160	" "	Slate	"	20,	32.00
	190	" "	R. Rock	"	15,	28.50
	130	lin. ft.	wall in drains	"	150,	195.00
			Culv'ts & Cat.		20,	20.00
	Add cost of work done by Wm. Brady				911.91	3948.61
						458441.75¾

CULVERTS 35A THROUGH 45A

Culvert A. on Sect. No. 35	130	Per.	Masonry	a	256	332.80
	360	fet	B.M. Timber & Plank	3c	9.00	341.80
Culvert A. on Sect. No. 36.	100	Per.	Masonry	a	2.12½	212.50
	480	fet	B.M. Tim'r & Plank	2c	9.60	222.10
Culvert No. on Sect. No. 36.	370	Per.	Masonry	a	2.12½	786.25
	17500	fet	B.M. Tim'r & plank	a	2c 350.00	1136.25
						480.370.06¾

				Brought Forward			480 370.06¼
Culvert A.	150	per.	Masonry	a	2.35	352 50	
Sect. No 37.	300	feet	B.M. timber & plank		3c	9 00	
	600	C. Yds	Ex. in pit	@	25c	125.00	
	60	" "	Solid Rock in do	@	75c	45.00	531 67
Culvert A.	130	per.	Masonry	a	2.35	305.50	
Sect. No. 38.	300	feet	B.M. timber & Plank	a	3c	9.00	
	550	C. Yds	Ex. in Pit	a	25c	137.50	
	50	" "	Solid Rock	a	75c	37 50	489. 50
Culvert B	360	Per.	Masonry	@	2.70	972 00	
Sect. No. 38	13.500	ft.	B.M. Timber & Plank		1c	135.00	
	350	C. Yds	Ex. in Pit		15c	52.50	1159. 50
Culvert A.	220	Per.	Masonry	a	2.70	594.00	
Sect. No 39.	300	Feet	B.M. Timber & Plank		1c	3.00	
	300	C. Yds	Ex. in Pit	@	15	45.00	642.00
Culvert A	220	Per.	Masonry	@	270c	594 00	
Sect. No. 40	11000	feet	B.M. Timber & Plank	a	1c	110.00	704.00
Culvert A.	270	Per.	Masonry	a	2.80	756.00	
Sect. No 41	11.000	feet	Plank & Timber B.M.		3½	385.00	1141.00
Culvert B.							
Sect. No. 41	104.77	Per.	Masonry	@	2.80	293.35½	293.35½
Culvert A.	220	Per.	Masonry	@	220	484.00	
Sect. No. 42	400	ft.	B.M. Timber & Plank		2½	10 00	494.00
Culvert B	125	Per	Masonry	a	2.20	275.00	
Sect. No. 42	300	ft.	B.M. timber & Plank		2½c	7.50	282.50
Culvert C.	560	per.	Masonry	a	2.80	1176.00	
Sect. No. 42	33.850	ft.	B.M. Timber & Plank		2½	846 25	2.022.25
							488 129. 67½

			Brought Forward				488.129. 67½
Culvert D.	110	Per.	Masonry	@	2.50	275 00	
on Sec. No. 42	9.500	ft.	B.M. Timber & Plank	"	2c	190 00	465. 00
Culvert A.	452	Per.	Masonry	@	2.48	1120 96	
on Sec. No. 43	34.000	ft.	B.M. Timber & plank		3c	1020. 00	2140 96
Culvt B	190	per.	Masonry	a	2.48	471. 20	
on Sec. No. 43	11.000	feet	B.M. Timber & Plank	a	3c	330. 00	801. 20
Culvert A.	270	per.	Masonry	a	2.39	645 30	
on Sec. No 44	20.000	ft.	B.M. Timber & Plank	@	1¾	350. 00	
			Add cost of work done by Said Sugar			75. 25	1070. 55
Culvert B	75	per.	Masonry	a	2.39	179. 25	
on Sec. No. 44	300	ft.	B.M. Timber & Plank		1¾	5. 25	184. 50
Culvert A.							
on Sec. No. 45	65. 26	per.	Masonry	a	2.80	182. 73	
	240	feet	B.M. Plank		3¼	8. 40	191. 13

MASONRY

Culverts.	Estimated Cub.	Estimated Amt.	Amount required of work done and to be done May 10th 1832.
Brought up	20,628.16	8485.95	12,142.21
a on 35	341.80	——	341.80
a on 36	222.10	95.62½	126.47½
b on 36	1136.25	297.50	838.75
a on 37	531.50	408.50	123.00
a on 38	489.50	161.25	328.25
b on 38	1159.50	81.00	1078.50
a on 39	642.00	474.00	168.00
a on 40	704.00	500.00	204.00
a on 41	1141.00	651.00	490.00
b on 41	293.33½	293.33½	——
a on 42	494.00	462.00	32.00
b on 42	282.50	154.00	128.50
c on 42	2022.25	1779.00	243.25
d on 42	465.00	370.00	95.00
a on 43	2140.96	682.00	1458.96
b on 43	801.20	706.00	95.20
a on 44	1070.55	620.25	450.30
b on 44	184.50	95.60	88.90
a on 45	191.13	191.13	——

All which is respectfully submitted.

Sylvester Welch
Engineer

Source: Reports and Misc. Documents, 18291843, box 8, vol. 1, item 60, APRR, Div. Rec., BCC, RG-17, PHMC.

APPENDIX F: JOURNAL 1831-35

Date	Culvert	Work Done	Contractor
August 3, 1832	Culvert A on Section 35	Work done and materials materials furnished Equal 110 Perches Masonry	Colvin & Fitzpatrick
September 1, 1832	" " "	728 ft. B .M. of Plank 122.65 Perches of Masonry	" " " FINAL
May 10, 1832	Culvert A on Section 36	Work done and materials furnished equal 45 Perches masonry	Philip Haley
June 7, 1832	" " "	Work done and materials furnished equal 80 Per masonry	" " "
August 3, 1832	" " "	102.15 Perches Masonry digging ditch for Sheet piling 320 ft. B.M. Plank for Sheet piling	" " " FINAL
February 1, 1831 [1832?]	Culvert B on Section No. 36	Work done and materials furnished, equal 50 per. of masonry	Philip Haley
March 7, 1832	" " "	Work done and materials 70 Perches of masonry	" " "
April 4, [1832]	" " "	Work done and materials furnished equal to 100 Per Masonry	" " "
May 10, 1832	" " "	Work done and materials furnished equal 140 Perches Masonry	" " "
August 3, 1832	" " "	Work done and materials furnished Equal 216 Perches masonry	" " "
September 1, 1832	" " "	13,500 ft. B.M. Timber and Plank Work done and materials furnished equal to 170 Perches of Masonry	" " "

Date	Culvert	Work Done	Contractor
October 1, 1832	Culvert B on Section No. 36	14,100 Ft. Bd Timber and plank Work done and materials furnished equal 290 Perches Masy	Philip Haley
October 25, 1832	" " "	14,100 feet B.M. Timber and plank laid Work done and materials furnished equal to 350 Perches Masonry	" " "
December 10, 1832	" " "	409.40 Perches of Masonry 17,132 ft. B.M. of Plank	" " " CONTRACT COMPLETED
December 31, 1831	Culvert A on Section 37	290 c.y. Excavation 30 c.y. Solid Rock	Groves Pollard & Groves
April 4, [1832]	" " "	450 c yds Excav 50 " " Solid Rock Work done and material furnished equal to 100 Per masonry	" " "
September 1, 1832	" " "	469.72 c yds of Excavation 60.00 c yds Rock 154.19 Perches Masonry	" " " FINAL
April 4, [1832]	Culvert B 450 c yds Excav Section 37	50 c yds Solid Rock Work done and materials furnished equal to 100 Per masonry	Groves Pollard & Groves
May 10, 1832	Culvert A on Section 38	350 c. yds Excav 20 c. yds Solid Rock Work done and materials furnished equal 25 Perches masonry	Groves, Pollard & Groves
June 7, 1832	Culvert A on Section 38	520 c. yds. Excav. 30 " " Solid Rock Work done and materials furnished equal 25 Per masonry	Groves, Pollard & Groves

Date	Culvert	Work Done	Contractor
July 5, 1832	" " "	650 c. yds. Excavtion 50 " " S. Rock Work done and materials furnished equal to 95 Perches masonry	" " "
August 3, 1832	" " "	650 c. yds. Excavation 50 " " Solid Rock Work done and materials furnished Equal 120 Perches Masonry	" " "
September 1, 1832	" " "	124.45 Perches of Masonry 653.89 c. yds. of Excavation 74.00 c. yds. of Rock	" " " FINAL
December 1, 1831	Culvert B on Section 38	Work done and materials, equal 30 perches of masonry	Stewart, Fenlon & Co.
June 7, 1832	" " "	350 c. yds Excavation Work done and materials furnished equal 30 Per Mas Y	" " "
July 5, 1832	" " "	460 c. yds. Excavation Work done and materials furnished equal 20 perches mas Y 11.500 ft. B.M. Timber and Plank	" " "
September 1, 1832	" " "	13000 ft. B.M. Timber and Plank Work done and materials furnished equal to 90 Perches of Masonry 460 c. yds of Excavation	" " "
October 25, 1832	Culvert B on section 38	13000 feet B.M. Timber and Plank Work done and materials furnished equal to 290 Perches Masonry 460 c. yds. Excavation	Stewart, Fenlon & Co.

Date	Culvert	Work Done	Contractor
December 10, 1832	" " "	345.00 Perches of Masonry 13327 ft B.M. Timber and Plank 467.53 c. yds. Excavation in Pit	" " "
			CONTRACT COMPLETED
March 7, 1832	Culvert A on Section 39	280 c. yds. Excavation Work done and materials furnished 63 Perches of masonry	Stewart, Fenlon & Co.
May 10, 1832	" " "	280 c. yds. Excav. Work done and materials furnished equal 160 Perches masonry	" " "
June 7, 1832	" " "	301.29 c. yds. Excav. 217.57 Per masonry 216 ft. B.M. Timber and Plank	" " "
			FINAL
November 1, 1831	Culvert A on Section 40	Work done and materials furnished equal 52 perches of masonry 4.100 feet B.M. Timber and plank	Stewart, Fenlon & Ford
December 1, 1831	" " "	Work done and materials equal 120 perches of masonry 9500 ft. B.M. Timber and plank	" " "
December 31, 1831	" " "	9500 ft Board Measure Timber and plank laid Work done and Material Furnished Equal 150 per Masonry	" " "
June 7, 1832	Culvert A on Section 40	Work done and materials furnished equal 190 Per ms 9500 ft B.Ms Timber and Plank	Stewart, Fenlon & Ford
July 5, 1832	" " "	202.13 Perches Masonry 10355.33 ft B.M. Timber Plank laid	" " "

Date	Culvert	Work Done	Contractor
November 1, 1831	Culvert A on Section 41	Work done and materials furnished equal 50 perches of masonry	William Robson
December 1, 1831	" " "	Work done and materials, equal 7,500 feet B.M. Timber and plank	" " "
February 1, 1831 [1832]	" " "	9,000 ft. B.M. Timber and plank laid Work done and materials, equal 40 per of masonry	" " "
July 5, 1832	" " "	248.11 Perches Mas Y 10659.33 ft. B.M. Timber and Plank 7 Per broken Stone	" " "
April 4, [1832]	Culvert B on Section 41	Work done and material furnished equal to 70 Perches masonry	William Robson
May 10, 1832	" " "	104.77 Per masonry laid	" " " FINAL
November 1, 1831	Culvert A on Section 42	Work done and materials furnished equal 60 perches of masonry	Henry Dougherty
December 1, 1831	" " "	Work done and materials furnished, equal 180 perches of masonry	" " "
December 31, 1831	Culvert A on Section 42	Work done and mats furnished equal 210 per Masonry	Henry Dougherty
June 7, 1832	" " "	257.78 Perches Masonry 288 ft. B.Ms Timber and plank	" " " FINAL
April 4, [1832]	Culvert B on Section 42	Work done and materials furnished equal to 70 Perches masonry	Henry & Dougherty
June 7, 1832	" " "	123.04 Per. masy 216 ft. lad ms Timber and Plank	" " " FINAL

Date	Culvert	Work Done	Contractor
September 1, 1831	Culvert C on Section 42	Work done and materials furnished equal 20 perches of masonry	Henry & Dougherty
October 1, 1831	" " "	Work done and Materials furnished equal 40 perches of Masonry 30.000 ft. B.M. Timber in foundation	" " "
November 1, 1831	" " "	Work done and materials furnished equal 245 perches of masonry 30.000 ft. B.M. Timber and Plank	" " "
December 1, 1831	" " "	Work done and materials furnished equal 330 perches of masonry 30,000 ft. laM. timber of plank	" " "
March 7, 1832	" " "	Work done and materials furnished equal to 420 Perches of Masonry 30,000 Feet Board measure of timber and Plank	" " "
May 10, 1832	Culvert C on Section 42	30.000 ft. B.M. Timber and Plank laid Work done and materials furnished equal 490 Perches masonry	Henry & Dougherty
June 7, 1832	" " "	Work done and materials furnished equal 510 Per masy 30000 ft. lB.Ms Timb and Plank	" " "
August 3, 1832	" " "	550 30 Perches Masonry 32018 ft. B.M. Timber and Plank	" " " FINAL
November 1, 1831	Culvert D on Section 42	Work done and materials furnished equal 30 perches of masonry 8,500 ft B.M. Timber and plank	Henry & Dougherty

Date	Culvert	Work Done	Contractor
December 1, 1831	" " "	Work done and materials furnished, equal 80 per of masonry 8,500 feet B.M. Timber and plank	" " "
September 1, 1832 p. 182	" " "	8124.58 ft laM. Timber and Plank 112.15 Perches of Masonry	" " " FINAL
October 1, 1831	Culvert A on Section 43	Work done and Material furnished equal 40 perches of Masonry	Wm & AMcK Groves
November 1, 1831	" " "	Work done and materials furnished equal 190 perches of Masonry	" " "
February 1, 1831 [1832?]	" " "	Work done and materials, equal to 275 perches of masonry	" " "
October 1, 1832	Culvert A on Section 43	30300 ft. Bd Ms timber and plank Work done and materials furnished equal 175 Perches Masonry	Wm & AMcK Groves
October 25, 1832	" " "	30500 feet B.M. Tim. and plank Work done and materials furnish'd equal to 350 per Masonry	" " "
December 10, 1832	" " "	30500 ft. B .M. Timber and Plank Work done and materials furnished equal to 410 Perches Masonry	" " "
November 1, 1831	Culvert B on Section 43	Work done and materials furnished equal 80 perches of masonry 9500 feet B.M. Timber and plank	Wm & AMcK Groves
December 1, 1831	" " "	Work done and materials furnished, equal 150 perches of masonry 9,500 ft. B.M. timber and plank	" " "

Date	Culvert	Work Done	Contractor
May 10, 1832	" " "	9,500 ft. lBo Ms Timber and Plank Work done and materials furnished equal 170 Perches masonry	" " "
August 3, 1832	" " "	194.00 Perches Masonry 10083 ft. B.M. Timber and Plank	" " " FINAL
September 1, 1831	Culvert A on Section 44	Work done and Materials furnished equal 25 perches of masonry	Snyder & Robson
October 1, 1831	" " "	Work done and Materials furnished equal 31.44 Perches Masonry	Jacob Snyder
November 1, 1831	Culvert A on Section 44	Work done and materials furnished 38 perches of Masonry 10,000 ft. B.M. Timber and Plank	O Connor & Griffin
December 1, 1831	" " "	Work done and materials furnished, equal 100 perches of masonry 17,500 ft. B.M. Timber and plank	" " "
July 5, 1832	" " "	18,000 ft. b.M. Timber and Plank laid Work done and materials furnished equal 140 Per Masonry	" " "
August 3, 1832	" " "	18000 ft b.M. Timber and Plank Work done and materials furnished Equal 220 Perches Masonry	" " "
September 1, 1832	" " "	19500 ft. B.M. Timber and Plank Work done and materials furnished equal to 240 Perches of Masonry	" " "
October 1, 1832	" " "	29975 Ft. Bd Ms Timber and Plank 256.19 Perches Masy	" " " FINAL

Date	Culvert	Work Done	Contractor
April 4, [1832]	Culvert B on Section 44	Work done and materials furnished equal to 40 Per Masy	O Connor & Griffin
October 1, 1832	" " "	63.67 Perches Masy	" " " FINAL
December 1, 1831	Culvert A on Section 45	Work done and materials furnished, equal 50 perches of masonry	Wm Robson
April 4, [1832]	" " "	Work done and materials furnished equal to 65 Per masonry	" " "
May 10, 1832	" " "	65.26 Perches Masonry 240.00 feet B.M. Plank sheet piling	" " " FINAL

Source: Journal 1831–35, 1 vol., MG-2, PHMC.

APPENDIX G: CONSTRUCTION SPECIFICATIONS AND ESTIMATED COSTS OF CULVERTS

Section.	Letter.	Span. (ft.)	Length. (ft.)	Perches.	Price.	Ft. B. M. timber & plank.	Price.	Cub. yds. excava-tion.	Price.	Cub. yds. slate.	Price.	Cub. yds. rock.	Price.	Cost of culvert.
35	a	3	94	130	$2.45	480	1½							325.70
36	a	3	64	100	2.12½	480	2							222.10
36	b	12	76	360	2.12½	17000	2							1105.00
37	a	3	80	116	2.35	480	3	300	25c					362.00
38	a	3	86	130	2.35	480	3	350	25					407.40
38	b	18	31	364	2.70	13500	1	500	15					1192.80
39	a	4	135	200	2.70	530	1	450	15					612.80
40	a	16	31	220	2.70	11000	1							704.00
41	a	14	37	270	2.80	11000	3½							1141.00
41	b	4	36	90	2.80	530	3½							270.55
42	a	6	93	250	2.20	740	2½							568.50
42	b	4	63	120	2.20	530	2½							277.25
42	c	25	31	580	2.10	33850	2½							2064.25
42	d	5	62	110	2.50	9 00	2							465.00
43	a	25	31	452	2.48	34000	3							2140.96
43	b	14	31	199	2.48	11000	3							823.52
44	a	20	31	307	2.39	20000	1¾							1083.73
44	b	4	31	60	2.39	530	1¾							200.47½
45	a	3	31	71	2.80	480	3½							215.60
		506	319450	11755		289,060								$34564.88½

Source: PHJ, Vol II, 1831–32, p. 190.

APPENDIX H: LIST OF CULVERTS 1832–33
Sections 35 – 45

	Present estimated cost.	Original estimated cost.	Remarks
Culvert marked A on section 35	317.82	325.70	
A 36	226.47	222.10	
B 36	1,210.00	1,105.00	
A 37	524.78	362.00	
A 38	511.43	407.40	
B 38	1,192.80	1,192.80	
A 39	634.79	612.80	
A 40	649.35½	704.00	
A 41	1,077.54	1,141.00	
B 41	293.35½	270.55	
A 42	554.32	568.50	
B 42	276.09	277.25	
C 42	1,956.08	2,064.25	
D 42	442.86¼	465.00	
A 43	2,140.96	2,140.05	
B 43	783.63	823.52	
A 44	1,212.10	1,083.73	
B 44	1,156.95	200.47½	
A 45	191.13	215.60	
	$34,486.62½	33,782.23½	
Bridge on Section 36	2,057.05	764.65	Culv'ts not built.
	36,543.67½	34,546.88½	
Add for contingences on work not done 7 per cent.	2,558.00	2,418.28	Contingencies 7 per cent
		36,965.16½	Original estimate.
		1,284.00	Bridge on Sec. no. 36
Present estimated cost of culverts and bridges	39,101.67½	38,249.16½	Culverts & bridges

Note: Totals are for all culverts on the Allegheny Portage Railroad.

Source: PHJ, App to Vol II, 1832–33, p. 78.

APPENDIX I: TABLE OF LABOR DONE AND MONEYS PAID ON CULVERTS

No. 3.—Tabular statement of labor done and moneys paid on Culverts, with original estimates, &c.—Allegheny Portage Rail-road

Culv't	Sec.	CONTRACTORS' NAMES.	Feet Span	Masonry, Perches	Price	Feet B.M. tim. & plank	Price	MISCELLANEOUS.	Total value	Total amount paid	Am't of Forfeiture	Original estimated cost	Amount due
A	35	Colvin & Fitzpatrick,	3	122.65	2 56	128.	3		317.82	317.82		325.70	
A	36	Philip Haley,	3	102.15	2 12½	320.	2	Excavation for sheet piling $30	226.47	226.47		222.10	
B	"	Do.	12	409.40	2 12½	17132.	2		1212.62	1212.62		1105.	
A	37	Groves, Pollard & Groves.	3	154.19	2 35			469.63 c.yds. com.ex.at 25 cts., 60 c.y. rock at 75	524.78	524.78		362.	
A	38	Do. Do. Do.	3	124.45	2 35			453.89 " at 25, 74 " at 75	511.43	511.43		407.40	
B	"	Stewart, Fenlon & Ford,	18	345.01	2 70	13327.	1	467.58 c.yds. excavation at 15 cents.	1134.93	1134.93		1192.80	
A	39	Do. Do. Do.	4	217.57	2 70	216.	1	801.29 " at 15 "	634.79	634.79		612.80	
A	40	Do. Do. Do.	16	202.15	2 70	10355.33	1		649.35½	649.35½		704.	
A	41	William Robson,	14	248.11	2 80	10659.33	3½	7 perches broken stone at 75 cts	1077.54	1077.54		1141	
B	"	Do.	4	104.77	2 80				293.35½	293.35½		270.55	
A	42	Henry & Dougherty,	6	257.78	2 20	288.	2½		574.32	574.32		568.50	
B	"	Do. Do.	4	123.04	2 20	216.	2½		276.09	276.09		277.25	
C	"	Do. Do.	25	550.30	2 10	32018.	2½		1956.08	1956.08		2064.25	
D	"	Do. Do.	5	112.15	2 50	8124.58	2		442.86½	442.86½		465.	
A	43	William & M'K. Groves,	25	459.18	2 48	33826.	3		2153.55	2153.55		2140.96	
B	"	Do. Do.	14	194.00	2 48	10083.	3		783.63	783.63		823.52	
A	44	J. Snyder,	20	31.44	2 39			Forfeited	75.25	50.	25.25		
A	"	O'Connor & Griffin,	20	256.19	2 39	29975.	1¾		1136.85	1136.85		1083.73	
B	"	Do. Do.	4	65.67	2 39				156.95	156.95		200.47½	
A	45	William Robson,	3	65.26	2 80	240.	3½		191.13	191.13		215.60	
			506	11,755.00		287,060.00			$34,319.89¾	$34,231.72¼	$76.19	$34,546.88½	$11.48½
	36	SKEW BRIDGE, Fenlon, Darlings & Co.	20	611.14	3 74	—		up & relaying mas'y, in consequence of alt. in plan, $20 81.11 c.y. broken stone in found'n $21 78, taking MASONRY COMPLETED.	$2,327.44	$2,327.44		$1,284.00	

Source: Table 3, PHJ, App to Vol II, 1834–35, p. 69.

APPENDIX J: TABLE OF GRADES, 1832–33

From Station No. to	No.	Ascent per 100 feet	Ascent per mile	Distance in miles.	Distance from Johnstown	Ascent from Johnstown	Remarks
1	9	0.00	0.00	0.19	0.19	0.00	
9	138	0.05	26.40	2.44	2.63	64.50	
138	215	0.48	25.344	1.46	4.09	101.46	
215	217	0.00	0.00	0.04	4.13	101.46	Level.
217	233			0.30	4.43	251.46	Inclined plane No. 1.
233	234	0.00	0.00	0.02	4.45	251.46	Level.
234	409	0.20	10.560	3.31	7.76	286.46	
409	602	0.40	21.120	3.66	11.42	363.66	
602	676	0.15	7.920	1.40	12.82	374.76	
676	897	0.28	14.784	4.19	17.01	436.64	
897	919	0.20	10.560	0.42	17.43	441.04	
919	922	0.00	0.00	0.06	17.49	441.04	Level.
922	939½			0.33	17.82	573.44	Inclined plane No.2
939½	942½	0.00	0.00	0.06	17.88	573.44	Level.
942½	1015	0.20	10.56	1.37	19.23	587.94	
1015	1018	0.00	0.00	0.06	19.31	587.94	Level.
1018	1033			0.28	19.59	718.44	Inclined plane No. 3.
1033	1036	0.00	0.00	0.06	19.65	718.44	Level.
1036	1130	0.20	10.56	1.78	21.43	737.24	
1130	1133	0.00	0.00	0.06	21.49	737.24	Level.
1133	1155			0.42	21.91	925.10	Inclined plane No. 4.
1155	1158	0.00	0.00	0.06	21.97	925.10	Level.
1158	1287	0.20	10.56	2.44	24.41	950.90	
1287	1290	0.00	0.00	0.06	24.47	950.90	Level.
1290	1316			0.49	24.96	1152.54	Inclined plane No. 5.
1316	1319	0.00	0.00	0.06	25.02	1152.54	Level.
1319	1387	0.28	14.784	1.29	26.31	1171.58	
1387	1401	0.00	0.00	0.27	26.58	1171.58	*Summit Level.*

From Station No. to	No.	Descent per 100 feet	Descent per mile	Distance in miles.	Distance from Johnstown	Descent from Summit	Remarks
1401	1428			0.51	27.09	266.50	Inclined plane No. 6.
1428	1436	0.00	0.00	0.15	27.24	266.50	Level.
1436	1463			0.51	27.75	527.00	Inclined plane No. 7.
1463	1466	0.00	0.00	0.06	27.81	527.00	Level.
1466	1495	0.20	10.56	0.51	28.32	532.40	
1495	1498	0.00	0.00	0.06	28.38	532.40	Level.
1498	1529			0.58	28.90	840.40	Inclined plane No. 8.
1529	1532	0.00	0.00	0.06	29.02	840.40	Level.
1532	1592	0.20	10.56	1.13	30.15	852.40	
1592	1595	0.00	0.00	0.06	30.21	852.40	Level.
1595	1622			0.51	30.72	1041.90	Inclined plane No. 9.
1622	1625	0.00	0.00	0.06	30.78	1041.90	Level.
1625	1712	0.34	17.952	1.64	32.42	1071.48	
1712	1715	0.00	0.00	0.06	32.48	1071.48	Level.
1715	1738			0.43	32.91	1252.00	Inclined plane No. 10.
1738	1741	0.00	0.00	0.06	32.97	1252.00	Level.
1741	1836	1.00	52.80	1.80	34.77	1346.00	
1836	1902	1.67	3 .376	1.25	36.02	1390.22	
1902	1907	0.00	0.00	0.09	36.10	1390.22	Level.
1907	1920	0.67	35.376	0.25	36.36	1398.71	
1920	1935	0.00	0.00	0.29	36.65	1398.71	Level.

Source: PHJ, App to Vol II, 1832–33, pp. 80–81.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Suite 322
315 South Allen Street
State College, Pennsylvania 16801

June 27, 1988

Mr. Donald Falvey
U. S. Department of the Interior
National Park Service
Denver Service Center
12795 W. Alameda Parkway
P.O. Box 25287
Denver, CO 80225-0287

Dear Mr. Falvey:

This responds to your letter of May 27, 1988, requesting information concerning the presence of federally listed or proposed endangered and threatened species within the area affected by the proposed Allegheny Portage Railroad National Historic Site (Juniata River corridor) located in Blair and Huntingdon Counties, Pennsylvania.

Except for occasional transient species, no federally listed or proposed threatened or endangered species under our jurisdiction are known to exist in the project impact area. Therefore, no Biological Assessment or further Section 7 consultation under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) is required with the Fish and Wildlife Service. Should project plans change, or if additional information on listed or proposed species becomes available, this determination may be reconsidered. A compilation of federally listed endangered and threatened species in Pennsylvania is enclosed for your information. Requests for information regarding State-listed endangered or threatened species should be directed to the Pennsylvania Game Commission (wildlife), the Pennsylvania Fish Commission (fish, reptiles and amphibians) and the Pennsylvania Department of Environmental Resources (plants).

This response relates only to endangered or threatened species under our jurisdiction, based on an office review of the proposed project's location. No field inspection of the project area has been conducted by this office. Consequently, this letter is not to be construed as addressing other Service concerns under the Fish and Wildlife Coordination Act or other legislation.

The Service is not aware of any natural resource surveys or reports for this area. The old canal along the Juniata River has slowly filled in over the years, and is not a wetland area. Please be advised that any work in wetlands in Pennsylvania would require permits from the Corps of Engineers and/or the Pennsylvania Department of Environmental Resources.

If we can be of further assistance, please contact us.

Sincerely,

Edward W. Perry
Acting Supervisor

Enclosure

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN PENNSYLVANIA

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIBUTION
FISHES:			
Sturgeon, shortnose*	Acipenser brevirostrum	E	Delaware River and Other Atlantic Coastal waters
REPTILES:			
NONE			
BIRDS:			
Eagle, bald	Haliaeetus leucocephalus	E	Entire State
Falcon, American peregrine	Falco peregrinus anatum	E	Entire State - re-establishment to former breeding range in progress
Falcon, Artic	Falco peregrinus tundrius	E	Entire State migratory - no nesting
MAMMALS:			
Bat, Indiana	Myotis sodalis	E	Entire State
Cougar, Eastern	Felis concolor cougar	E	Entire State - probably extinct
MOLLUSKS:			
NONE			
PLANTS:			
Pogonia, small whorled	Isotria medeoloides	E	Berks, Centre, Chester, Greene, Monroe, Montgomery, Philadelphia & Venango Counties

* Principal responsibility for this species is vested with the National MA. Fisheries Service.

Region 5 6/3/85 - 1 p.

APPENDIX L: HISTORIC MATERIALS RELATING TO ENGINE HOUSES

REQUEST FOR BIDS, *EBENSBURG SKY*, MARCH 1833

The clipping reads as follows:

"THE E"
PORTAGE RAIL ROAD SEALED PROPOSALS
Will be received by the Superintendent at his office in Ebensburg, until sunset of MONDAY the first of APRIL next, for doing the following on the Portage Rail Way:

For excavating pits at heads of each inclined plane, and building stone walls of hammer-dressed masonry, and for erecting thereon a FRAME ENGINE HOUSE and BOILER SHED; for constructing FRAMES and WAY for Horizontal wheel & putting up FRAME FOR ENGINE if required. There will be TEN Engine Houses, and the proposals must be made for each House including all the work at the same time, as above stated. The bids for Excavation will be by the CUBIC YARD; for masonry, by the perch of 25 cubic feet; for the Engine House and Boiler Shed, a specific sum, and for the frames and wood work connected with the machinery, by the foot.

For building a FRAME HOUSE at the head of each inclined plane, for the residence of the Engine tender.

For building a FRAME HOUSE at the foot of each plane.

For building a FRAME SHED or covering for machinery at foot of each plane. Of the several kinds of Frames to be proposed for, as above, there will be TEN of the first class; TEN of the second; and TEN of the third. The bids will state a specific sum for each.

For Hanging & fitting the small sheaves on the several planes; for hanging and fitting the larger sheaves at the foot of each plane, and for making and putting up the necessary frames, ways, &c.

For digging & boring WELLS, which may possibly be required at planes No. 2, 3, 4, 5, 6, 9 and 10, and

For furnishing and laying down wooden WATER PIPES and CISTERNS.

All the materials required for the several items of work to be furnished by the contractors.

Proposals will also be received on the first of April for any other work which may be then ready for letting.

Plans, models and specifications of the various kinds of work to be done may be seen at the Rail Road office, any time of

At this point the clipping was broken off. Incidentally, in 1833, the first of April fell on a Monday, so the advertisement was probably from an issue of the Ebensburg Sky in March of 1833 or thereabouts. Also, the last sentence from the clipping proves that there existed "plans, models and specifications" at one time, but so far no one has been able to recover them.

General Specification for a Locomotive Engine House

Specification

of the manner of building a Locomotive Engine House, Machine Shop, Smith Shop, Coal House and Boiler Shed, yard walls, etc.

The pits are to be dug for all the foundation walls to such depth as the Engineer may deem necessary to obtain a good foundation. They will generally be from two to three feet below the surface of the ground. The pits in the Locomotive Engine House are to be dug to the depth represented in the drawing marked No 1. The Excavation for all the foundations will be paid for by the cubic yard.

The foundation walls for the Locomotive engine house, Machine Shop, smith shop, boiler shed and coal house & yard wall are all to be two feet thick. They are to be of the kind and quality called uncoursed Rubble Masonry, except a course 1 foot thick on the top which is to be cut smooth on the face. The Stones for the wall are to be of good form & of large size. After the wall is built the joints are to be pointed with mortar made of white lime and sand. The Stones which form the upper course (ashlar) are to have at least one foot bed. The walls which surround the Locomotive Engine pits are to be two feet thick, and are to be built in the same manner as the foundation walls, except that no ashlar will be required. The foundation walls, pit walls, etc., are all to be laid in mortar. They will be measured & paid for by the perch, each perch to contain 25 cubick [sic.] feet of masonry.

The dimensions of each building, wall, etc., are marked upon the drawings, all the walls (Brick Walls) are to be of the same thickness, viz equal to the length and half the length of a brick, or thirteen inches. The pilasters and cornice on the front of the Locomotive Engine House, and the pilasters and pediment at the end of the Locomotive Engine House & of the Machine Shop which front the main track of the Railway, are to be made of brick laid up with the main wall, except the capitals of the pilasters which are to be of Sand Stone. The key of the arch over each door in the Locomotive engine house & over the large door in the machine shop is to be made of sand stone.

There are to be four doors in the front of the Locomotive Engine House of the dimensions represented in the drawings and one door of the same dimensions in the back of the building through which the branch Railway will pass into the enclosed yard.

There are to be three windows in the side of the Engine House fronting the enclosed yard at the points represented in the plan, each with 24 lights of 10 by 12 inch glass. There will be four windows in each end of the building of the form represented in the end view on the drawing No. 2 each lower window will have 24 lights of 10 by 12 inch glass & each upper window will have 12 lights of 10 by 12 inch glass.

The Roof will be supported with 6 pair of principal Rafters, purlines for the support of the common Rafters will be notched into these at the points shown in the drawings.

The Common Rafters will be 4 by 5 inches square and they will be placed in the roof at intervals of two feet and a half measuring from centre to centre. The ends of tie-beams are to rest upon the wall plates Z. The lower end of the Common Rafters are to be supported by the pole plates Y, which rest upon and are to be secured to the tie-beams N. The common rafters are to be covered with inch white pine boards laid close together and well nailed to the Rafters. The boards are to be of a quality suitable to receive a tin or copper covering for the roof. The Shingles are to be white or yellow pine, and jointed at the edges: They are to be laid in courses of not more than four inches. A gutter is to be formed along the lower part of the roof on each side to convey the water to the spouts on each corner of the building. The gutters will descend from the middle of the house towards each end. The Spouts and gutters are to be made of thick tin, painted.

Scantling 3 by 10 inches square are to run lengthwise of the building, are to be placed between the end walls and the contiguous tie beams--and between the remaining tie beams, at intervals of not more than two feet from centre to centre, the end of these scantling are to be framed into the tie beams with a tenon.

The Engine room is to be well plastered with three coats of the best quality of common plastering mortar, the lath for the ceiling shall be at least half an inch

thick. A Chimney of Sheet-iron, to be furnished by the Commonwealth, is to be placed over the centre of each of the two middle pits.

The pilasters, the Cornice in front, and the pediment at each end of the building, are to be covered with Stucco made of such materials as the Engineer may direct to be furnished by the Commonwealth. The Stucco is to be mixed and put on by an experienced workman, and is to be finished in the best manner.

The pits in the Engine room will be four feet deep measured from the top of the sail. The steps at each end will be of sand stone cut smooth, or of such other strong stone as the Engineer may approve. They will be of the size and form represented in the drawing, the bottom of the pits will be paved with bricks. The timbers alongside of the pits and upon which the iron plate rails are fastened are to be 12 by 12 inches square and forty five feet long. They are to be white or yellow pine.

The wall between the Locomotive engine house and the Machine Shop is to be coped with sand stone cut smooth. The coping will project on each side four inches. The thickness at each edge will be four inches and in the middle 7 inches. The gate-way in the wall is to be nine feet wide. The gates will be made of 1-1/2 inch pine plank placed double and rivitted [sic.] together. They are to be hung with strong strap hinges. They will be fastened by a bar placed horizontally across the middle of the gates and secured in such manner as the Engineer may direct.

The machine shop will be divided into two stories. The frame for supporting the lower floor will be made with three girders 10 by 10 inches placed so as to divide the spaces between the ends of the building into four equal parts. Joists 3 by 10 inches square placed lengthwise of the building are to be framed into the building at intervals of two feet or less, measuring from centre to centre, except over the part occupied by the pit. The floor is to be made of white oak or white ash plank 1-1/2 inches thick and not more than eight inches wide. They are to be jointed at the edges. Short joists are to be put in between the girders and the timber to which the plate rail is fastened.

Each girder is to be supported in the middle by a pillar of stone or brick wall. The frame for second

floor will consist of 3 girders 10 by 10 inches placed across the building as in the frame of the lower floor into these--joists to run in the same direction as in the lower floor are to be framed. They are to be placed at intervals of two feet measuring from centre to centre. The floor is to be made of plank white oak or white ash 1-1/2 inches thick, they are to be jointed at the edges and put together with a tongue and groove. A post 10 by 10 inches is to be placed under the middle of each girder. It will stand upon the lower girder and over the pillar which supports it. The frame will consist of the tie beams of the three pair of principal Rafters, which will serve as girders. Two timbers 5 by 10 inches square are to be framed in between & into each end wall and the contiguous tie & between and into each two tie beams--These timbers are to be placed each one foot from the centre of the tie beams. Joists 3 by 10 inches are to be placed between and parallel to the tie beams of the principal Rafters. These joists will be placed at intervals of not more than two feet measuring from centre to centre, one end of these joists will be framed into the 5 by 10 in. timber, the end will rest upon the wall plates.

The board for the other floor (garret floor) may be either pine or oak one inch thick, they are to be jointed and put together with a tongue & groove.

The Roof is to be supported by three pair of principal rafters placed so as to divide the building lengthwise into four equal spaces. In each of the spaces there are to be five pair of Common Rafters supported at the foot and resting upon the 3 by 10 inch joists. These rafters are to be 4 by 6 inches square at the foot and 4 by 4 inches square at the top. The rafters are to be covered with inch pine or hemloc [sic.] board laid close. The shingles are to be of pine jointed at the edge and laid in courses of not more than 4 inches.

The Sidewalls of both stories are to be well plastered.

The windows and door are to be of the dimensions represented in the drawings. There is to be a window in the second story over each window or door in the lower story the glass will be of the same size as those of the Engine House. The pit is to be of the same depth as those in the locomotive Engine house. It will have step at one end of cut stone--

The Blacksmiths Shop, Coal House, & Boiler Shed will be under one roof, this will be a shed roof. The water will be turned from the yard. The Rafters will be 4 by 6 inches square. These will be covered with inch pine or hemloc [sic.] board upon which the shingles are to be laid. The Shingles are to be of pine jointed at the edges and laid in courses of not more than four inches. For the number and size of the doors & windows (see the drawings).

The partitions which separate the smiths shop Coal House and boiler house are to be made of bricks the walls to be nine inches thick. The Stack of the boiler furnace will be about 20 ft. high. It will have the form and dimensions represented in the drawings.

The yard will be filled with Embankment to the height of the floor of the locomotive Engine house, it will be finished so as to be level and smooth. The Embankment will be paid for by the cubic yard.

From: Contracts, 1851-55, Box 2, Vol. 4, A.P.R.R., Div. Rec., BCC, RG 17, Pa. A.

APPENDIX M: HISTORIC STRUCTURE REPORT, ENGINE HOUSE 6 BY CARNEGIE-MELLON UNIVERSITY
(Excerpt)

I. Description of Engine House 6 Based on Existing Conditions

A close examination of available data pertinent to the proposed reconstruction of the Engine House at the head of Plane 6 of the Allegheny Portage Railroad, enables us to approximate the conditions of the original structure. The exact location of the Engine House was revealed in 1970 by the excavation conducted by Jacob W. Gruber.[1] The machinery originally installed is concisely described in the report made in 1833 by Sylvester Welch, the chief engineer of the Portage Railroad.[2] Further specifics of the structure and operation of the Engine House are unclear due to missing or contradictory information. When data is indefinate or when discrepancies prevail, it has been necessary to make assumptions in order to assemble a complete image of the Engine House.

The reconstruction of Engine House 6 necessitates two primary assumptions. First, that the structure was symmetrical about the center-line of the inclined plane. Despite discrepancies in the excavation, which would indicate that the shed was asymmetrical, early drawings and paintings suggest that the structure was symmetrical. Furthermore, the mechanical operations of the Engine House would imply equal or equivalent functions on either side of the track, thereby demanding a symmetrical shed enclosure.

Secondly, discrepancies in the proportions and details of the shed among early paintings and drawings indicate that the original structure was altered or added to. A painting, currently hanging over the mantel in the nearby Lemon House (still intact), depicts what was probably the original Engine House completed in 1834.[3] The proportions of the east

and west faces of the shed are considerably stockier, and the relative positions of stacks, door and window openings are different from those depicted in the later drawing.[4] The broader proportion implies the addition of space at the north and south ends of the structure. The excavation does suggest two parallel foundation walls running in the east-west direction, about nine or ten feet apart, at the north end. Although the southernmost wall has not yet been excavated, the symmetry of the structure would imply that such a wall did in fact exist.[5]

Historical accounts of structural and mechanical changes to the Engine House over its twenty year life help to clarify the character of the machinery and the nature of alterations made to the shed. In 1836, two years after the initial construction, the boilers were damaged due to an insufficient water supply. The boilers were repaired and a fourth unit was added to the three initially specified.[6] It is likely that the addition to the structure occured at this time to accomodate the expansion of the boiler complex. It is possible that a completely new shed was erected in 1850[7] and that this shed is that depicted in the later drawing.[4] However, the later shed may be the initial structure added to, rather than a rebuilt structure, as the drawing shows that the pitch of the roof reduced the ceiling height to a very shallow dimension within the northern and southernmost portions of the interior space and this characteristic is not likely for a shed built from scratch. We may assume that the later drawing was done between 1837 and 1849.

The relative positioning of the machinery and related spaces is only roughly apparent. As previously noted, the locations, dimensions and workings of the horizontal sheave room are clear and those of the vertical

sheave room may also be approximated. Far less evidence remains, however, regarding the specific characteristics of the engine rooms and the locations of boilers, stacks, furnaces and flues.

The Horizontal Sheave Room

Both sheave rooms were located in a pit beneath the track with sufficient headroom for access to and operation of the machinery. The horizontal sheave room consisted primarily of a huge cast iron wheel, 9'-7" in diameter, fixed on a moveable carriage.[8] The rope, 8" in circumference,[9] reversed direction of this huge sheave. The carriage was attached to a weight suspended in a well, enabling the carrage to move and take up slack in the rope. The excavation has revealed a packed earth floor, with a drain leading to the weight well, about 9'-0" below grade.[10] The heavy stone walls of the horizontal sheave room enclose an area 12'-9" x 32'-0" on three sides.[11] The fourth side, to the west of the space, is adjacent to the vertical sheave room where a lesser wall, probably of timber construction, separates the two spaces. Although no trace of this wall remains, it is certain that a wall did exist here, as Sylvester Welch refers to it in his report: "The rope passes through an opening in the wall which separates the pits."[12]

The Vertical Sheave Room

The mechanics of the vertical sheave room are accurately reconstructed in a drawing done by Fred R. Conlacher, based on the Sylvester Welch report.[13] Two 8'-0" cast iron sheaves are positioned vertically, tangent to the top of the track rail in section, to receive the rope from the

centerline of each track. The road as completed showed a width of track between rails of 4'-9" and a distance between tracks of 5'-0".[14] This would indicate a space of about 9'-9" between the vertical sheaves, two inches more than the diameter of the horizontal sheave to account for the thickness of the rope. The vertical sheaves were apparently staggered 4'-0" to accomodate the gearing mechanisms which translated the power generated by the engines to the rotation of the sheaves.

The north-south dimension of the vertical sheave room is assumed to be confined to the 12'-9" dimension of the horizontal sheave room, which would, in fact, be adequate. (The parallel east-west walls of the horizontal sheave room do not, however, extend to enclose the vertical sheave room.) The east-west dimension is 18'-0" assuming a one-foot timber wall between the two sheave rooms and a smilar wall supporting the track above along the western edge of the vertical sheave room. This would permit a 4'-0" passage bound by the vertical sheave room and retaining wall at the west of the pit, enabling passage within the pit between the north and south engine rooms. The floor of the vertical sheave room is raised above the earth floor of the horizontal sheave room by heavy 8" x 12" timbers laid on the floor to a level approximately 8'-4" below grade.

The Engine Rooms

Each of the two engines has two cylinders, the pistons of which work the crankshafts which drive the vertical sheaves. The distance the piston moves is 5'-0".[16] The engine rooms flanking the sheave room floors are of flagstone and assumed to be located approximately 8'-0" below grade.[17]

Although their functioning does not require the location within the pit, their functional relationship to the vertical sheaves and the absense of any foundation walls enclosing the vertical sheave room, clearly suggest a location below grade. Furthermore, in the specifications for Engine House 6, it is noted that excavation of 860.77 cubic yards is required for the structure. This volume would include the engine rooms.[18] The two engines were probably staggered 4'-0" as indicated on the Connacher drawing[13] due to the staggered locations of the vertical sheaves. Access from grade is provided by steps at the western end of the north engine room and toward the eastern end of the south engine room. Though it is possible that platforms covered the engine rooms, enabling the loading and unloading of passengers within the shed, the early painting[3] indicates that this occurred east of the Engine House in front of the Lemon House.

The total interior dimensions of the pit area are therefore assumed to be roughly 40' wide by 39'-4" in the north engine room, 43'-4" in the south engine room, and 51'-0" across the sheave rooms.

The Boiler Complex

Very little concise information pertaining to the boilers, stacks, furnaces and flues is available. The boilers themselves are known to have been cylindrical, 2'-6" in diameter and 20'-0" in length.[19] Three such boilers were initially provided for each engine, but proved inadequate, and a fourth was added in 1836.[6] As previously mentioned, this may have been the cause for the addition to the structure. Apparently these boilers were located above grade. Their connection to the engines which they fed may have been by a single pipeline, which could easily have made the drop

into the pit. The boilers continued to function with minor repairs until 1849 when they had to be replaced. The brick stacks were adjacent to the boilers, toward the western end of the structure. These stacks had to be repaired frequently, and were rebuilt in 1849.[20] Apparently they were poorly designed and constructed, so details of their dimensions and positioning can only be approximated from the early drawings of the engine house.

The Shed Enclosure

Specific descriptions of the dimensions, materials and structural conditions of Engine House 6 are not available, but the structure is assumed to have been symmetrical and expanded as noted earlier. For evidence of the exact plan dimensions we are dependent upon the remaining foundations revealed in the excavation conducted in 1970. Ambiguous conditions which prevail may best be explained by the fact that the original foundations were inadequate, as extensive repairs were made in 1836, 1838 and 1844.[21] Foundation walls are exceptionally heavy and disorderly along the northernmost wall of the structure and in the southwest corner of the south engine room.[22] The outer edge of the northernmost foundation wall, presumedly that which supported the wall of the addition, lies parallel to the centerline about 43' away. If the structure were, in fact, symmetrical, the width of the later shed would have been approximately 86'. The inner face of the south wall of the south engine room runs 20' south of the centerline, marking the edge of the pit which was apparently 40' wide. 15' south of this wall (34' from the centerline) lie the remains of another foundation wall, assumed to be that of the south wall of the

earlier shed. The width was therefore 68'. This 14' wide area (which grew to 23') provided the minimum area within which the boilers could be, and probably were placed. The remains of the north wall, again, provide the only clear indication of the length of the structure which was approximately 60'.

There is no detailed information pertaining to the superstructure of the simply constructed shed. The support of the roof is unclear. There was no room for column support below the ridge without obstructing the path of cars moving along the track. Large trusses, the configuration of which is unknown, were most certainly used to support the center span and probably extended 40' over the entire pit area. The columns would then have been supported along the north and south engine room foundation walls. The columns could not have been supported by the walls of the horizontal sheave room, as these walls already supported the outermost track rails, leaving insufficient clearance for two cars to pass. It is possible, however, that these walls came down within the engine rooms about 10' to either side of the centerline of the structure, thereby reducing the span of the trusses from 40' to 20'. This situation, however, is unlikely due to the probable interference of the columns with the operation of the engines. Further understanding of the vertical dimensions and the materials of the shed can only be attained from a careful analysis of the proportions and renderings of the structures depicted in the early drawings and paintings.

This data is assembled in the two accompanying drawings, the first of the earlier shed and the second of the later shed with its additions.

Footnotes

1. Gruber, Jacob W. "The Allegheny Portage Railroad, Cresson, Pennsylvania. Figures 2 and 4.

2. "Sylvester Welch's Report on the Allegheny Portage Railroad, 1833" (excerpts).

3. Souder, Norman M. "Lemon House: Allegheny Portage Railroad National Historic Site." Illustration 25 (earlier shed).

4. Leuba, Walter and Robert McCullough. "The Pennsylvania Main Line Canal", p. 87 (later shed).

5. Gruber, p. 65, plates 2B, 3A, figure 6. The archeological excavation was not complete at the time of the study. Completion of the excavation may be useful for further information.

6. Toogood, Anna Coxe. "Historic Research Study: Allegheny Portage Railroad National Historic Site, Pennsylvania", p. 82.

7. Toogood, "Historic Research Study", p. 83.

8. Welch, p.9.

9. Leuba, p. 63.

10. Gruber, p. 67.

11. Gruber p. 69, figure 5.

12. Welch, p. 10.

13. Welch, see back cover fold out.

14. Baumgardner, Mahon J. and Floyd G. Hoenstine, "The Allegheny Old Portage Railroad 1834-1854", p. 53.

15. Gruber, p. 67.

16. Welch, p. 10.

17. Gruber, p. 67, see figure 5.

18. Gruber, p. 67.

19. Welch, p. 11.

20. Toogood, "Historic Research Study", p. 83.

21. Toogood, "Historic Research Study", pp. 83-84.

22. Gruber, see figure 6.

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Baumgardner, Vahon J. and Floyd G. Hoenstine, "The Allegheny Old Portage Railroad 1834-1854: Building, Operation and Travel between Hollidaysburg and Johnstown, Pennsylvania". 1952.

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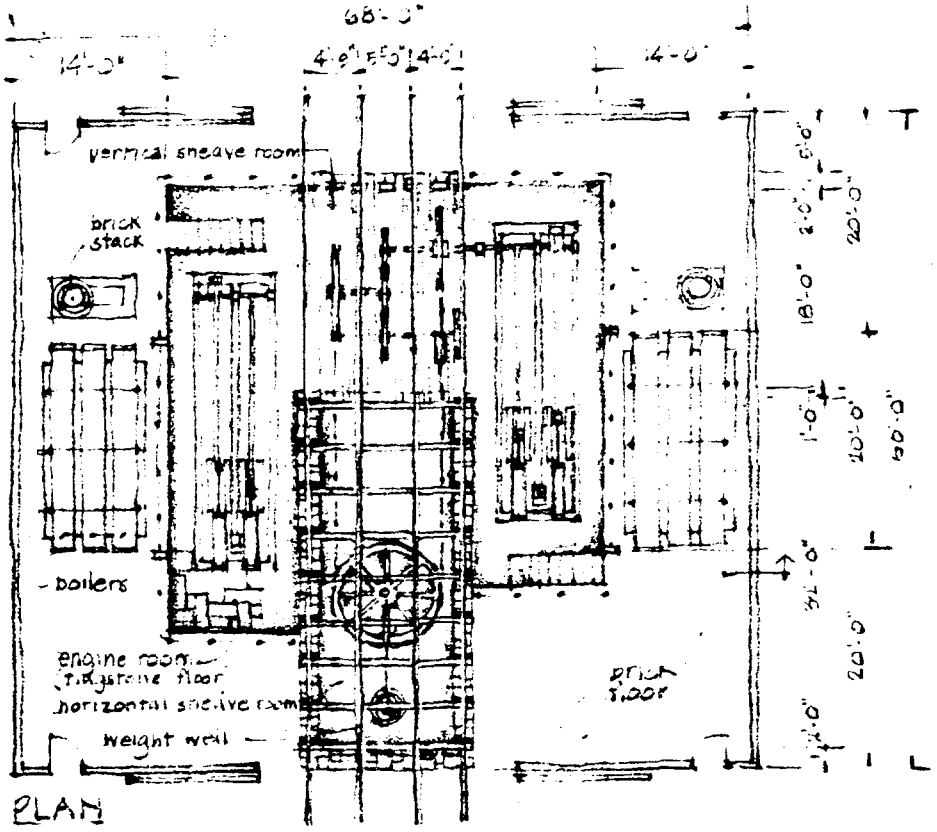
Souder, Norman M., Architect. "Lemon House: Allegheny Portage Railroad National Historic Site". U.S. Department of the Interior, National Park Service.

Toogood, Anna Coxe. "Historic Research Study: Allegheny Portage Railroad National Historic Site, Pennsylvania". Denver Service Center, Historic Preservation Team, National Park Service, U.S. Department of the Interior, Denver, Colorado, May 1973.

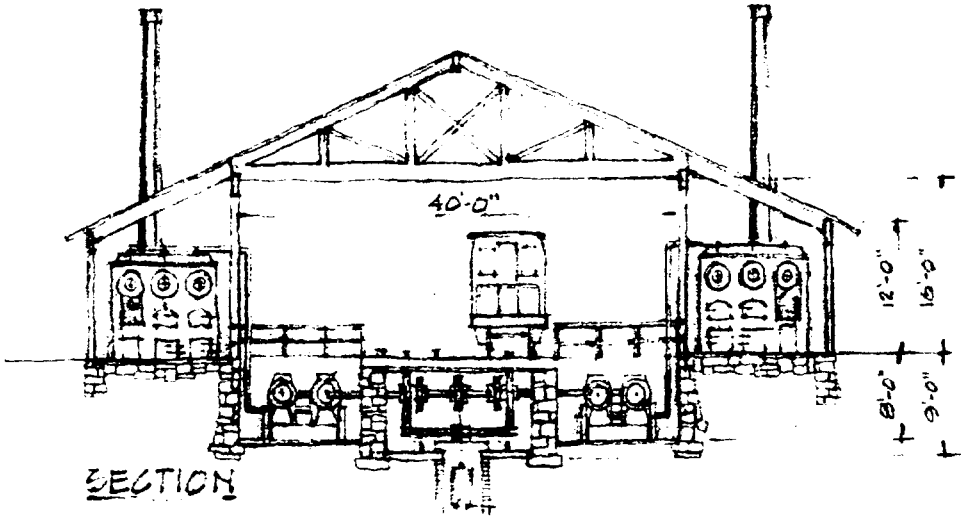
_____ "The Lemon House: Historical Structure Report, Allegheny Portage Railroad National Historic Site". February 1972.

Welch, Sylvester. "Sylvester Welch's Report on the Allegheny Portage Railroad, 1833". American Canal Center, 1973.

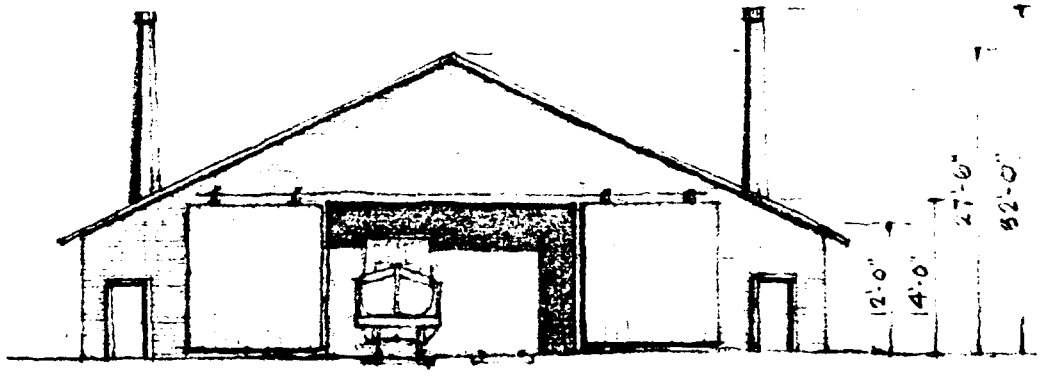
Material prepared by illustrator of slide exhibit.



PLAN

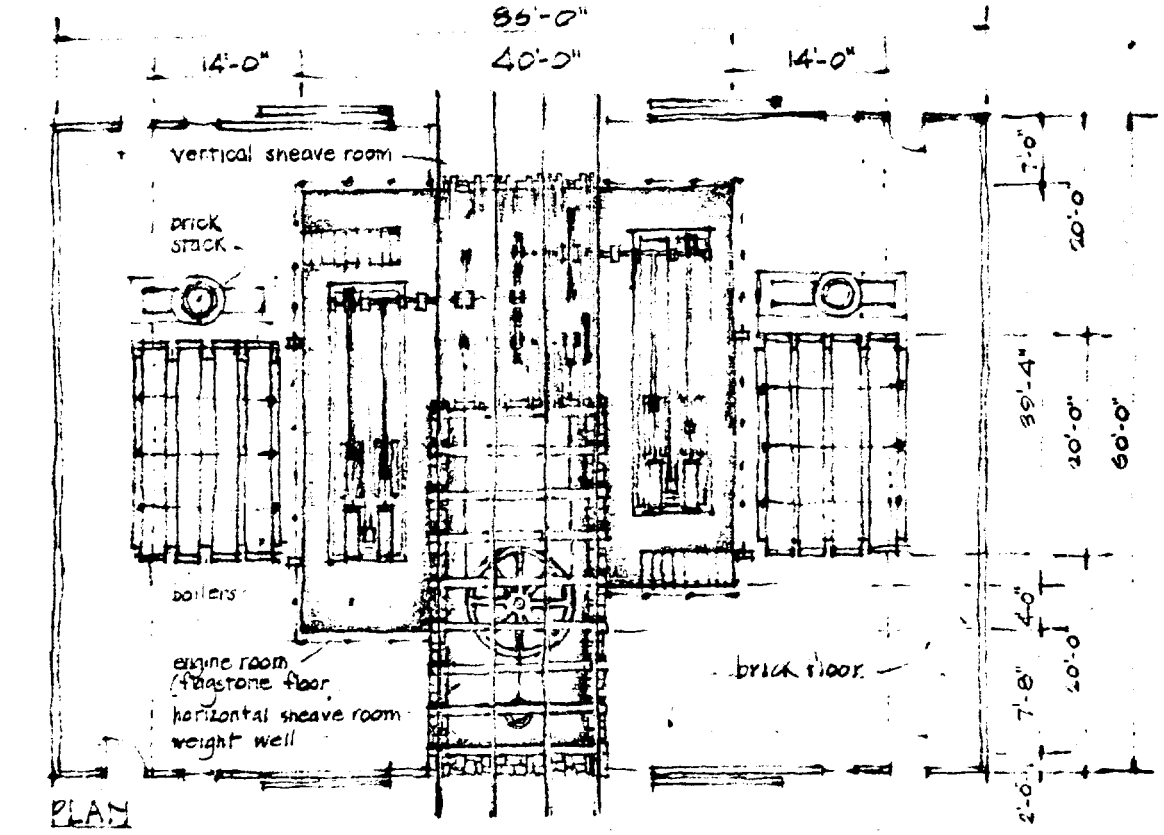


SECTION

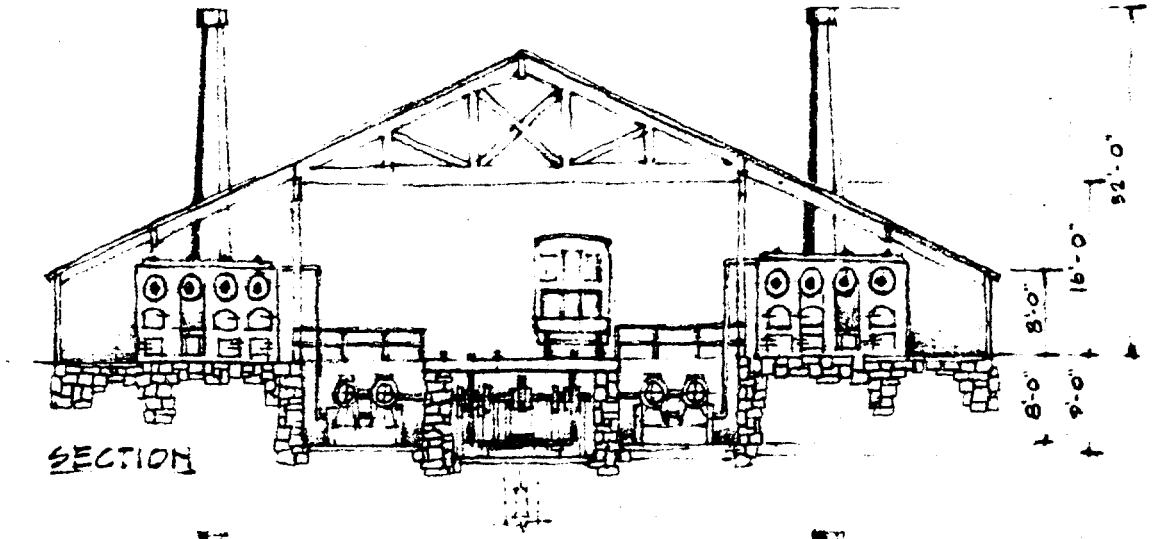


ELEVATION

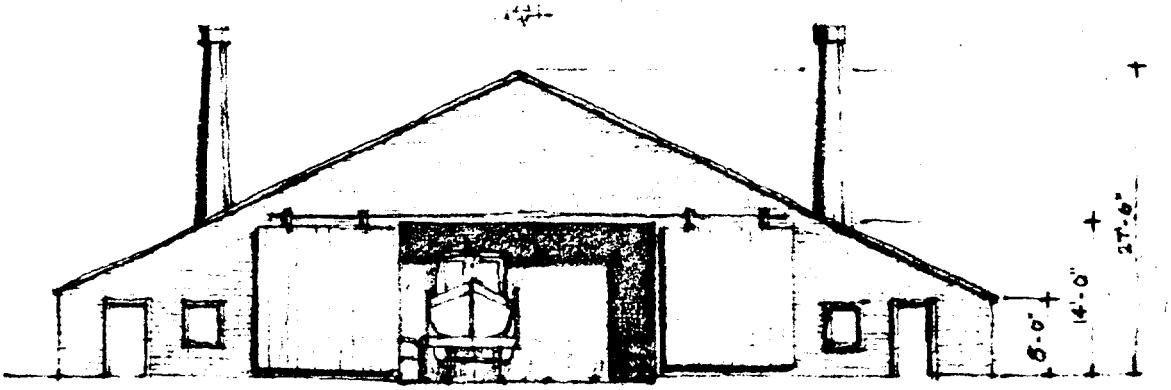
ENGINE HOUSE 6 (1894) SCALE 1/16" = 1'-0"



PLAN



SECTION



ELEVATION

ENGINE HOUSE 6 (1837) SCALE 1/16" = 1'-0"

II. Alternatives and Recommendations

This section is divided into two parts:

Short Term Alternatives and Recommendations
Long Term Alternatives and Recommendations

A. Short Term - Engine House 6

1. Complete the excavation of the Engine House.

The preliminary stages of the archeological work were completed in 1970 by Jacob W. Gruber from Temple University, clearly revealing only the remaining foundation walls within the central portion of the pit area. The north boundary is visible in part and should be excavated to a greater depth. What ought to be the southern part of the foundation, assuming that the building is symmetrical about the centerline of the inclined plane, has not been excavated.

Whatever the course of future development, it will be necessary to expose the entire Engine House foundation in order to accurately determine the original conditions of the Engine House.

Upon completion of the archeological work, we recommend that each stone be precisely plotted on a scaled plan grid and that critical elevations be recorded, for example, ends of walls and all isolated stone and stones with irregular elevations. It is necessary to record current conditions should further dislocation and/or deterioration occur before the remains can be properly stabilized.

2. Stabilization of excavation. Several options should be mentioned:

a. Fill in the pit area anticipating protective construction at a later date.

b. Reconstruct the Engine House on top of the exposed foundations which would be rebuilt to support the structure.

c. Fill in the pit area with bails of hay each winter for insulation from freezing and thawing, and drape a tarpaulin over the area to keep moisture out. Remove for each spring-summer-autumn season.

d. Erect a new enclosing structure over the exposed ruins to protect them from deterioration from the elements. The enclosure might be a large greenhouse or have large glass openings in the roof, allowing natural light to flood the ruins anticipating use for exhibition purposes. The proportions of the new structure might reflect those of the original Engine House.

e. Treat the foundation essentially as it is now, or rather as it will be after the additional excavation recommended above. Special attention should be given to drainage from low parts. All surface water from areas adjacent to the foundations must be diverted away from the foundation.

3. Recommendation

Keep the foundation in its exposed state as recommended in option e. above. Samples of the sandstone used in the foundation and for rail supports have been tested. The stone is quite dense and should stand many seasons of freeze and thaw. The high elevation is an advantage in that the snow cover remains for a longer time than at lower elevations. There are less freeze-thaw cycles per season. A protective coating is not recommended. Salts, of course, should be kept away from all foundations and track stones. The greater problem for the short term will be dislocation rather than deterioration. For this reason the recommendation to record the location of stones precisely is very important.

B. Long Term Plan

1. Regardless of the approach taken toward the restoration of the area around the Lemon House and Inclined Plane number 6, several steps ought to be taken.

1. The Parking Lot immediately west of the Lemon House is too close and must be relocated as a part of any long range plan.

2. The barn across the road to the east of the Lemon House should be removed. Equipment and storage located here should be relocated in the existing service area located about 1/2 mile west of the site.

3. Inclined Plane Number 6 should be extended and restored through the Skew Arch Bridge and past the monument to its original length. This, of course, must wait the rerouting of State Highway 22.

4. The road separating the Lemon House from the remains of Engine House Number 6 should be relocated or possibly eliminated as a through road from the north to Route 22.

2. Alternatives

A New Visitors Center

There are several questions raised in connection with any decision to build a new visitors center:

Location

There are advantages to locating a visitors center close to the Lemon House and Engine House Number 6. This would result in a compact plan with simplified circulation and control. On the assumption that

Engine House Number 6 foundations should be preserved and protected from the elements, the new center might conceivably be placed over the foundation remains, making these remains part of the interior exhibit. These assumptions reflect the position that recreating the known architectural environment of 1836–1856 in reasonable isolation from anything new is not important. A point can be made that the technology of the system: inclined planes, track, engines (stationary and locomotive), sectional canal boats, etc., is the important exhibit. The Lemon House would remain. The Engine House was a simple shed. In a sense it had no architectural distinction and in some ways, if reconstructed could obscure viewing of the machinery.

On the other hand, it makes sense to locate a new visitors center some distance to the west near the present picnic area and close to the tracks. This would effectively separate the new and the old. Visitors would walk, or better ride in a replica train, to the Lemon House and restored Engine House Number 6. In this case recreating the whole physical environment of 1836–1856 becomes important.

The Lemon House

In any case involving a new visitors center the Lemon House should be restored to its condition at some time between 1836 and 1856. It probably makes sense to keep the addition of 1849 since it is useful and falls within the allowable time span of operation.

An Outdoor Museum

An outdoor museum involving a minimum of new building construction should be seriously considered. It is possible to concentrate on an

exhibition of the Portage Railroad as a transportation system only. Under this option the Lemon House would continue as a visitors center with administration continuing there or moved to a non-public place when and if necessary.

Future energies and resources would then be directed to replication or simulation through present technology, of a sample of the system in operation. Full scale working locomotives, sectional canal boats on trucks, the inclined plane, would form the outdoor working museum. When necessary for repairs or because of weather, the equipment would be moved to a maintenance and storage area added to the existing service area west of the site.

The reconstructed Engine House Number 6 would include replicas of the machinery which operated the original system. The horizontal and vertical sheaves would be operable. Concealed electric motors might drive them.

3. Recommendation

Although other alternatives might need to be considered, including a decision not to expand the present operation, we recommend the alternative involving essentially an outdoor working exhibit.

The Portage Railroad was too unique and important an episode in the developing technology of transportation in our country to ignor or to explain inadequately. And it is the transportation technology that ought to be the main feature in any expanded presentation. There are few exciting museums relating the importance of technology to the development of our nation. In particular, the Portage endeavor as an

example of the technological development of the early 19th century needs to be told well.

New Visitors Center, Preliminary Program

An attempt has been made to specify needs independent of the location.

1. Exhibition Area - 6200 sq.ft.
   - —Model of Section Boat and Locomotive. . . . . .2500 sq.ft.
   - —Scale Model of the APTR at 1"=400'. . . . . .1200 sq.ft.
   - —General Exhibition of relics and details of system. . . 600 sq.ft.
   - —Small Theater . . . . . 900 sq.ft.
   - —Storage and Preparation Area. . . . . .1000 sq.ft.

2. Service Area - 800 sq.ft.
   - —Sales Area. . . . . 400 sq.ft.
   - —Rest Rooms and Cleaning Equipment . . . . . 400 sq.ft.

3. Administrative Area - 1600 sq.ft.
   - —3 private offices . . . . . 600 sq.ft.
   - —1 secretarial office. . . . . 300 sq.ft.
   - —Library, "Archives" . . . . . 300 sq.ft.
   - —Lounge Area, Changing Rooms . . . . . 400 sq.ft.

4. Equipment and Additional Circulation. . . . . .1400 sq.ft.
5. Parking for 100 visitors

TOTAL 10,000 sq.ft.

Preliminary cost estimate for the building only:

10,000 sq.ft. @ $40/sq.ft. = $400,000

APPENDIX N: THE ALLEGHENY PORTAGE RAILROAD, CRESSON, PENNSYLVANIA
BY JACOB W. GRUBER
(Excerpt)

Engine House 6

The Engine House at the head of Plane 6 overlooks the first of the steep inclines leading to the eastern terminus of the portage at the Hollidaysburg basin. It is sited just below the highest portion of the Cresson Ridge of the Allegheny chain at an altitude of 2240 feet some 1380 feet above the level of the basin and 1137 feet above the higher basin at Johnstown on the Conemaugh. Although neither by distance nor travel time the mid-point of the Portage, its position

at the crest of the ridge and the availability of rest and food facilities at the Lemon House just at the eastern end of the Summit level, i.e. at the head of plane 6 just west of the Engine House, made this area an ideal stopping place along the route. Contemporary accounts mention such a stop-over.

From the top of Plane 6 to Hollidaysburg, the planes are long and steep with short levels between them. This configuration reflects the steepness of grade on the eastern slope of the mountain. It was at the bottom of Plane 6 that the Portage intersected the old National Turnpike -- and where it is now abruptly terminated by the new auto highway #22. The intersection required that the Turnpike cross the Portage. The present relic of that crossing is the Skew Arch Bridge the courses of whose single arch are aslant, the result of the peculiar engineering required for the road to cross at an angle of grade. Plane 6 is now heavily overgrown with weeds and brush; its once smooth surface is pocked with holes and piled with debris. Although trees have now been cut from its right of way, a fair amount of cleaning and grading is required to recreate its original functional character.

While the Lemon House is still extant, the remains of the engine house had been effectively buried by the fill and landscaping operations at the head of the Plane. Although portions of the structure were still visible until about twenty-five years ago, the troublesome hole then still remaining was filled with trash and rubbish to complete the obliteration which occurred only partially through the robbing of building stone and the occasional fill of ashes, rocks, and highway sweepings. Both the Plane, the Lemon House and the small portion of roadbed exposed to the west, however, defined the area of the engine-house so that it was unnecessary to

search for its location through the usual means of archaeological testing.

The nature of the problem demanded that the engine house -- or what still remained of its foundations under ground -- be entirely exposed so that some adequate information be obtained as to the nature of its construction and use. Since the location of particular parts of the engine house were unknown, it was necessary to open exploratory trenches in order to locate some feature to serve as a reference point for the preliminary definition of the ground plan which then could dictate subsequent archaeological activity. Because there were no indications of sub-surface features even when the overlying sod had been removed, an east-west and a north-south exploratory trench were arbitrarily located and excavated by hand. The nature of the fill -- recent trash, stones, ash, and large boulders from rock-slides on the highway -- made the excavation of these trenches difficult; and the relative narrowness of the trenches made it difficult to define putative features so that a great deal of time was invested in the close examination of what proved to be elements of the fill. The remains of a north wall were encountered. These defined an initial excavation unit whose exploration exposed and traced this fixed feature so that it could be used as a reference location in predicting the position of other portions of the structure.

The excavations of the two exploratory trenches made it obvious that power equipment would have to be used -- at least to remove the fill -- if any progress were to be made within the limited time available in the archaeological season in the exposure of any significant portion of the engine house. It was determined, therefore, to engage a back-hoe with operator to remove the interior debris. The

results were very satisfactory so that by the end of the first season, a major portion of the western half of the engine house comprising most of the vertical sheave room was cleared to its stone floor approximately nine feet below grade. As the back hoe operated, it was constantly observed and directed by an archaeological assistant to insure that the walls themselves were not damaged and that artifacts were not lost. Under such observation, power machinery can function as an extremely effective archaeological tool especially in those cases where large amounts of fill or overburden must be moved and moved from inconvenient locations or excessive depths.

Only a portion of the outer walls were located and explored. The best preserved was the north wall which is extant along the whole of what was the originally excavated area. Its preservation in fact does permit the solution of the problem relating to the placement within the engine house of the boiler-furnace complex. Apart from this, there is the massive southwest corner and portions of the south wall along the engine room.

The north wall (A on Fig.) is curiously constructed. Its primary component is a 2' wide, shallow construction running from the northwest corner to clearly marked corner 56' to the east, where it connects with a cross-wall (B) of similar construction which runs some 12' to the south where it disappears. Another partial north-south cross-wall (C) intersects this wall at a point 40' east of its western beginning. What we have here is clearly the original north wall with a small room certainly 12' wide and at least 12' long -- but certainly not longer than 15' -- at its eastern end. For 27' at its western end, however, a wider, three

feet, wall (D) has been added abutting directly onto the outer wall. While the inner and outer wall appear to be a single unit, it is likely that they were constructed at different times. The eastern terminus of the second wall is on a line with the eastern end of the wheel room (see below). Just north of the eastern end of this double wall is a small area of brick forming the fragment of what probably was a brick pavement. A similar brick paving (E), five feet wide of which eleven rows are still extant, exists along the outer wall just north of cross wall C. This brick flooring lies between 35 and 40 feet south of the western end. This is probably the flooring for an entrance way leading into the east end of the engine room. What supports the interpretation that the inner wall and outer wall represent different periods of construction is the fact that the bricks of the two floored areas also differ. The whole area between the eastern termination of the inner wall and the first cross wall, a distance of 13 feet, suggests a portal area which provided access to the engine room, the timbered track-way and the putative office mentioned above. The outer wall probably served as the foundation for the shed structure which was built over the entire area.

What is surprising on this northern edge is that the wall does not continue to the east to enclose that area which was certainly occupied by the boilers, for which we found no evidence in the archaeology, and the furnace of which there remain now only some brick and three very large flat boulders which may have served as its foundation. Extant drawings of the engine house shed suggest that the shed walls did in fact contain the furnace and boilers. The absence of a defined foundation wall does not provide the evidence for that portion of the shed. The northeastern corner, however, is definitely set off from the rest of the structure plan

by an eastwest wall (F) extending 15'8" to the east, seventeen feet south of the outer edge of the wall. This wall probably abutted onto the cross-wall which formed the eastern wall of the office room mentioned above. This eastwest wall probably served as the boundary between what may have been the enclosed trackway leading from the plane and the furnace/boiler complex. (Contrast with that of Engine House 8 below.)

We were not able to find a corresponding wall on the south side. What we did find, however, was a very heavy wall construction at the southwest corner, similar perhaps to that which may still lie unexcavated at the northwest. This wall too, primarily of dry laid masonry but with an internal facing of large wall blocks, gives evidence of having been rebuilt and strengthened. Running east from this corner there is still the poorly preserved but probably originally relatively massive wall which forms the southern wall of the south engine room.

If the structure was symmetrical, there should be an area approximately 12' wide south of the engine room enclosed by a shallow wall as foundation for the south wall of the shed. Except for slight equivocal evidence for such a wall at its putative position at the southwest corner, the area south of the south engine room appears to have left no present trace although I am not satisfied that we were able to test that area sufficiently. On the north side the area between the outer wall and the engine room was apparently at ground level with probably only a wooden floor over the uneven ground surface. In addition to the well-defined room at the eastern end, the northern portion may also have been used as an office, work, or storage area. Subsequent excavation of the north engine room, buried by the wash from this surface

area, may clarify the problem not only of the construction but also the use of the northwestern corner.

Only the foundation of the west wall remains extant; and this subsided below its original level probably as the result of the collapse of the underlying mine galleries (Plate 2b). What remains suggests that it, like the other walls of the VSR and HSR was carefully constructed of well cut and squared stones ca. 16" x 16" x 24".

We were able to expose the vertical sheave room, the horizontal sheave room, and the southern engine room (Plate 1). While the appended plans and plates will provide a visual and diagramatic view of these features after exposure, it would be useful to make the following descriptive and interpretative notations:

1) The foundations in the vertical sheave room to which the framing for the sheaves was fastened exists as only a single course of well laid, cut, and mortared stone over a carefully laid flag stone floor. This feature will be seen to contrast with that in Engine House 8 where these pedestals exist in their full height of five feet. Although it is possible that this difference can be accounted for by stone robbing I believe that in its final state, at least, the framing must have been either of timber or of iron bolted or spiked to these foundations by means of the regularly placed holes which still exist there. (Extant patches of mortar indicate that at some time, something was cemented here). At this time too the stone wall which may originally have divided the vertical sheave room from the horizontal sheave room (and which is still extant in Engine House 8) may have been removed since no trace of it still remains.

2) The horizontal sheave room did not possess a stone floor but rather one of packed earth. Its most interesting feature is the well preserved drain leading into the weight well. It was by means of this drain that run off water coming into the depression of this subterranean structure could be led off. The northeast corner of this room is collapsed, again through the subsidence of the area subsequent to a collapse of the underlying gallery (Plate 3b). The walls of the horizontal sheave room are extremely heavy and well made as are the walls generally which enclosed the central subterranean area over which timbering and track were laid.

3) Still extant and in place in both the vertical sheave room and the engine room are the remains of 12" x 8" timbers laid on the floor through which at regular intervals, where observed, large square headed (8" x 8") iron bolts were placed (Plate 1). I believe that these were the foundations of a heavy timber framing which provided not only the support for the machinery but also additional support for the timber roofing of this central complex. They reflect the modifications noted in the engineer's report for 1836 which reads as follows:

> At all these planes the foundations under the old engines are in a shattered and dangerous condition and will have to be taken up and laid anew. At 6, 7, and 8, it will be necessary to bind the pit walls together with strong timbers and bolts. The timbers for that purpose are engaged...

4) The engine rooms, as illustrated by the excavation of that on the south, like the VSR, also had well laid flagstone floors. The flooring here was one foot above the level of the VSR.

5) In constructing this engine house, a large pit, with sloping sides, was excavated. In the contractor's specifications for the construction of Engine House 6, it is noted that 860.77 cubic

yards of excavation was required for this structure. This pit roughly approximated the dimensions of the walled subterranean rooms. The engine rooms and vertical sheave room were carefully floored. The walls were built within the pit and fill tamped into the space between wall and the unexcavated surrounding soil. In at least one case (Plate 4) on the east wall of the horizontal sheave room an interesting use of stretcher and header was employed possibly to provide additional stability to that wall against the pressure borne upon it by the weight of the cars above. Similarly the north wall of this room seems to have been protected by a battering against the slope behind it. The stone work was, of course, extensive. It required 273.33 perches of stone (5 1/2 yards x 1 1/2 feet x 1 foot) for the support of engines and machinery and 46.08 perches for the foundation walls.

6) The area of collapse observed in the horizontal sheave room (Plates 3b, 4) complicates the explanation of construction procedures. Behind the north wall of this room and behind its northwest corner, the slope of the surrounding soil base of the boiler area is supported by a crudely constructed retaining wall. The area between this batter and the wall itself was filled with dirt and stone. This fill contains some occasional fragments of cultural debris which is apparently of the period and quite obviously different from the late fill which covered over much of the site. I had thought that this relatively crude form of construction may have been the result of the crisis attendant upon the subsidence of the area. That some later reconstruction did take place is indicated, I think, by the fact that the east wall of the horizontal sheave room and the slumped north wall appear to be tied together by a mortar and stone repair. In

the main, however, the battering behind the walls seems to me a part of the original structure. It was the means by which the pressure against the walls of the area surrounding the excavation was relieved. Such battering occurs behind the east wall here as also at engine house 8; and a more massively constructed stepped retaining wall seems to have formed the north wall of the north engine room. So far, however, the archaeology has been insufficient to describe the history of alteration of the building during the twenty odd years of its existence.

7) Although some of the terminal features of the structure could not be located, the following measurements provide some idea of the magnitude of the structure (cf Figure):

a) Although there are discontinuities in the excavation, the overall external dimensions of the structure -- presumably that enclosed by the simply constructed shed -- can be stated. The distance between the exposed northwest corner and that at the southwest (which is however only the corner of the south engine room) is 74 feet; this is the distance across the two engine rooms, the vertical sheave room, and the "office" area on the north. If the structure was symmetrical, as it probably was, the addition of an "office" area on the south would bring the total width of the structure to some 86 feet. The length (east-west measurement) of the total structure from west wall to the end of the wall along the trackway at the east end of the structure 120 feet.

b) The interior dimension of the vertical sheave room was 24' (north-south) x 18'; that of the engine rooms 12' (n-s) x 34'; that of the horizontal sheave room, 12'9" (n-s) x 32'.

Engine House 8

The location of Engine House 8 was much more favorable to its preservation. At the head of plane 8, the longest of the planes, difficult of access even when it was first built, this structure has since been isolated by the railroad construction of the Muleshoe Curve and the present auto route 22. Thus, it served neither as a quarry nor as a rubbish dump. Natural erosion from the neighboring bluff and forest growth, however, covered the remains leaving only sections of the walls exposed. Although primary stress in the archaeology was placed upon engine house 6, I thought it useful to probe engine house 8 in order to develop some comparative information which might aid in the interpretation of engine house 6 whose extant remains were less complete. (In retrospect and with the advantages of hindsight, I think that I would have reversed the priorities.)

Initially, after a brief survey and preliminary measurement of the parts of the structure which, it was hoped, would aid in the development of excavation plans for engine house 6, the trees and vegetation were removed -- to the extent that this could be done without collapsing the walls. In this work, as in the subsequent clearing, power equipment and aid provided by Site personnel, as well as the back hoe which was later engaged, were invaluable although slow. It was possible, however, to remove most of the organic debris from the interior of the structure. Over the years since the abandonment of the building, a washed fill of two to five feet has accumulated. Most of this consists of ash which was apparently washed in from what must have been a relatively large pile of furnace waste which had accumulated between the south wall and the bluff of the adjoining hill which had been cut into in order to form the platform on which the engine house was built. Some

tree stumps still remain along the walls of the building but these will have to be removed as part of the process of stabilization.

Although clearing was accomplished over most of the structure, most effort was directed to the exposure of the two rooms along the central axis, i.e., the horizontal and vertical sheave rooms.

Included in the fill of the former, was a tumble of large stone blocks from the adjoining walls. Like those of the other walls, they are essentially of two kinds: the one is the large well-cut block of stone which, as in engine house 6, formed the massive ashlar walls of the room; the others are smaller, un-cut stones which went into the construction of a kind of rubble wall -- sometimes mortared and sometimes not -- which was generally a curtain rather than a bearing wall. The fall between the horizontal sheave room and the south engine room was such that it indicates that such rubble construction served as a kind of filling between two walls of ashlar masonry. The horizontal sheave room has internal dimensions of 13'2" (n-s) x 32'. Like its analogue in engine house 6 it has a weight well at its eastern end. There is a shadow, formed either by deteriorated or burned wood, along the midline of the room which may have been the track on which the carriage of the horizontal sheave moved. To the south of this shadow are the remains, still incompletely exposed, of what may have been the drain; and to the north there seems to have been a lining of stone. A charred beam rests at the base of the south wall; its association with the structure and function of this room is not known. Although somewhat unclear in engine house 6, the terraced retaining wall behind the east wall is well preserved here. The fact that most of the blocks of the ashlar walls have

been preserved, whether in situ or not, will make it possible to rebuild these walls.

Between this room and the vertical sheave room to the west, there is a complex although much collapsed wall, about 4' thick, which, unlike anything extant in engine house 6, clearly separated the two rooms while yet providing the openings necessary for the continuous rope to move.

Although it was possible to do a fair, or at least preliminary, clearing of the horizontal sheave room -- little more than superficial clearing and a single depth probe were possible in the vertical sheave room. Enough was done, however, to indicate that the construction of this room was quite different from that of its analogue in engine house 6. It was narrower and the arrangements for the support of the vertical sheaves were apparently different. Here there are only two support walls of stone which separate three channels, the center one of which, 18" wide, lies on the midline of the room, i.e. between the tracks. The two support walls are 62" high set on a flanged foundation which adds an additional 17" (Figure). There appears to be no flagged flooring as in the vertical sheave room of engine house 6. The channel between these support walls and the outer walls of the room are 23" wide; their position indicates that the vertical sheaves were set in and thus revolved in these channels. The southern one is in line with an opening in the east wall. The support walls themselves are of well cut stone blocks and measure 36" across with a length of 15'; they seem to be tied into both the west and the east walls. Figure describes their surface and the mounting cuts in their top course. These cuts may have served to mount the horizontal gear by which the two vertical sheaves were joined. When the north wall of this room is cleared (the south wall is collapsed) it is

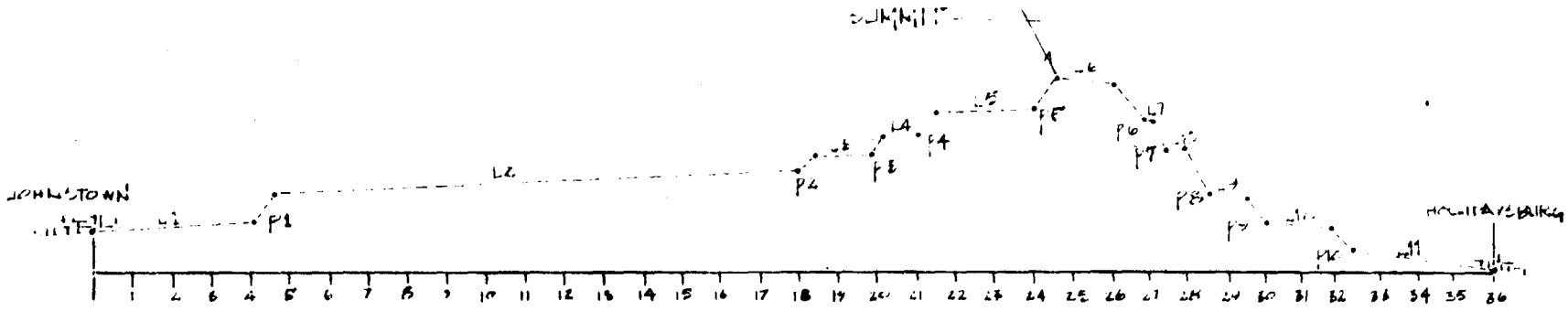
possible that evidence may be found there for the mounting of the sheaves themselves.

Little was possible in the engine rooms. The south engine room is, I think, too much disturbed to provide useful architectural information. The north room, however, is I think, still in relatively good condition. Its excavation can provide the model for the general reconstruction of the engine rooms in both structures. The collation of the cuttings used for the mounting of the engines on the stone foundation blocks still extant can provide useful engineering details.

Engine House 8 was narrower than that of 6. Its width comprises only the vital components of engine rooms and sheave rooms without the extra width, the "office space", which we find in engine house 6. In all probability the conservation of space in this structure was dictated by the lack of available area. On the south, the terrace had to be extended by cutting into the hillside; and on the north the terrace had to be assured through the construction of a high retaining wall. Lateral space was then at a premium. What we find is that ancillary space was built into the structure either between the boiler room and the engine room -- as seems to be the case certainly on the north side -- or at the furnace end of the structure. On the north wall, there is a clearly defined indentation, ten feet in extent, between 47' and 57' from the northwest corner. The indentation itself, the stone threshold and the narrower brick paving inside, clearly mark this as an entrance way into an area just east of the engine room. Like the similar although not so clearly apparent area in engine house 6, this may have been an entranceway providing access to engine house, track, and boilers. Another patch of laid brick, which may have

been part of hall-stairway, leads into the boiler room area on the south side, just east of the eastern end of the horizontal sheave room. This entrance was from the track side however; I believe that given the position of the furnace with its pile of cinder waste, there probably was no access from the south into the structure. At the eastern end of the south section, i.e. to the east of the position of the furnace, there is cross wall which, with that at the end, forms a small room 4'6" wide. I do not know what purpose it could have served.

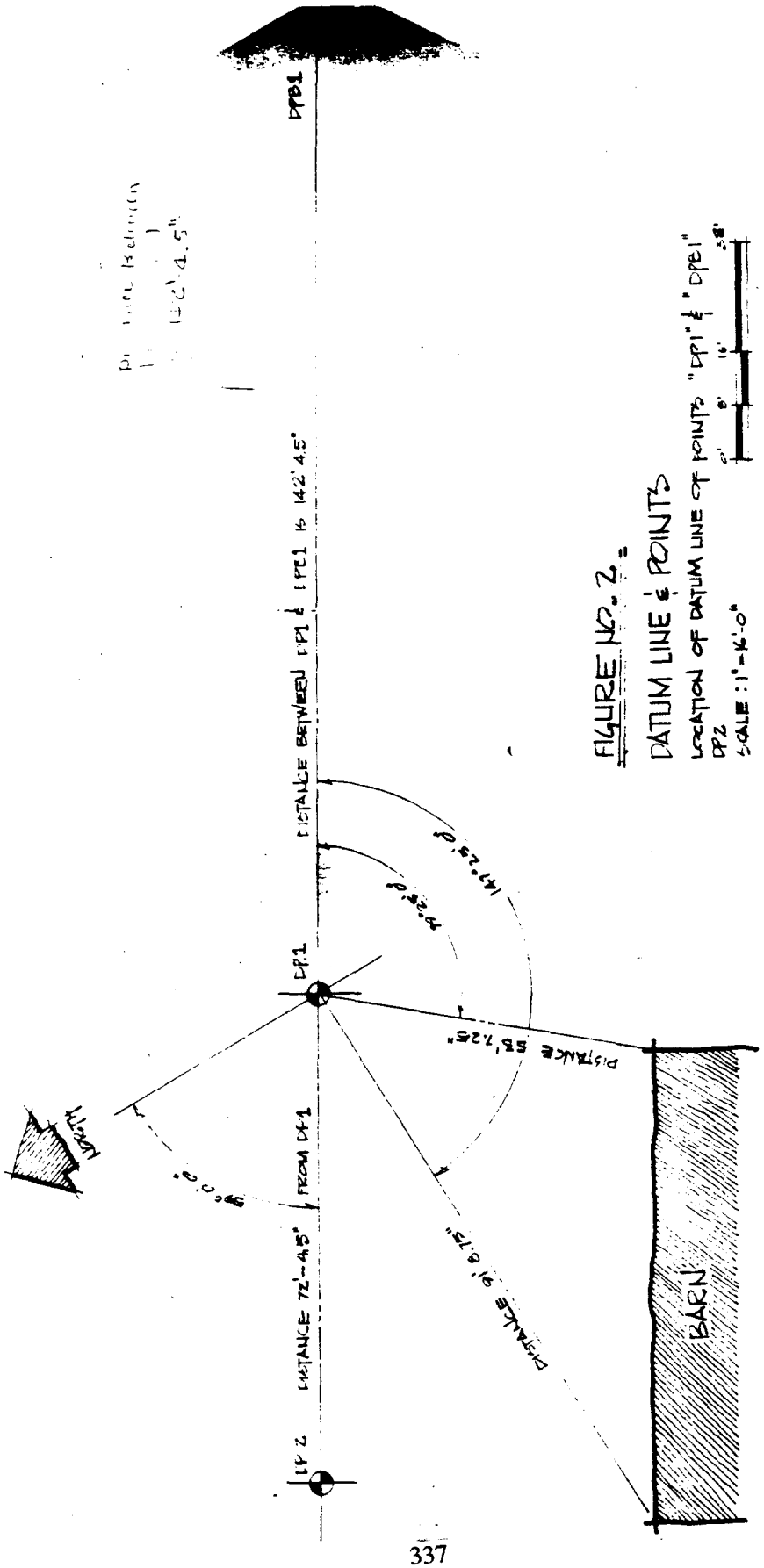
The rough plan of figure will indicate the placement of the feature in engine house 8. Its overall external measurements, assuming a shed which would have enclosed everything, was some 65' x 104'.



HORIZONTAL SCALE 1/4" EQUALS ONE MILE
VERTICLE SCALE 1/4" EQUALS 300' [THREE HUNDRED FEET]
TEN POINT PLAN PROFILE OF MOUNTAIN

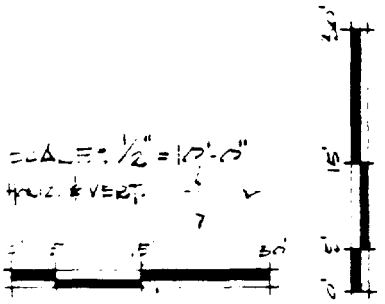
CHANGES IN ELEVATION & DISTANCE BETWEEN JOHNSTOWN AND HOLLIDAYSBURG ON THE ALLEGHENY PORTAGE RAILROAD

FIGURE NO. 1


DPB1
DISTANCE BETWEEN DP1 & DPB1 IS 142' 4.5"
DP1
DISTANCE 72'-4.5"
FROM DP1
DP 2
DISTANCE 58'1.25"
DISTANCE 91'6.75"
BARN
FIGURE NO. 2 =
DATUM LINE & POINTS
LOCATION OF DATUM LINE OF POINTS "DP1" & "DPB1"
DP2
SCALE : 1'-0"

PROFILES OF CUTS #2 THRU #9 [EIGHT OF-WAY WEST OF ENGINE HOUSE SUMMIT LEVEL]

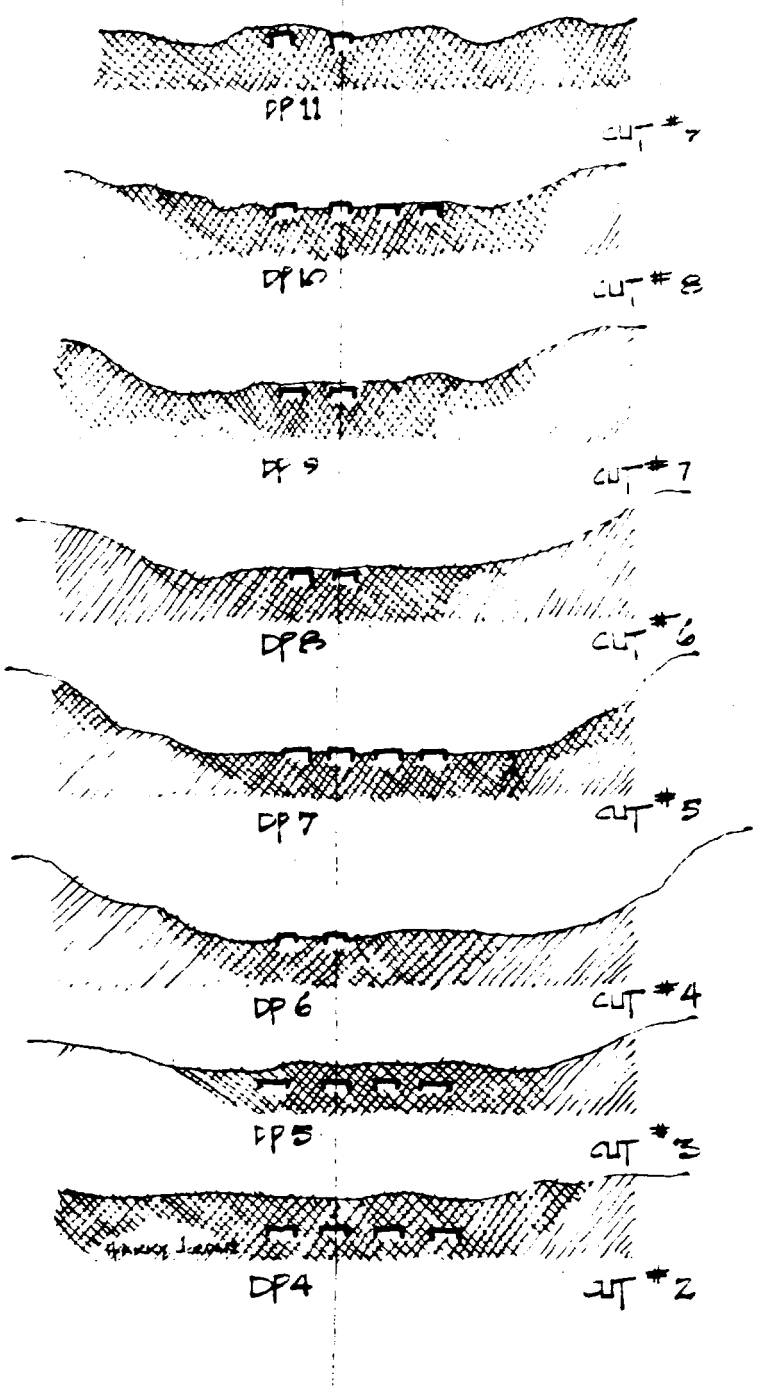
FIGURE NO. 3



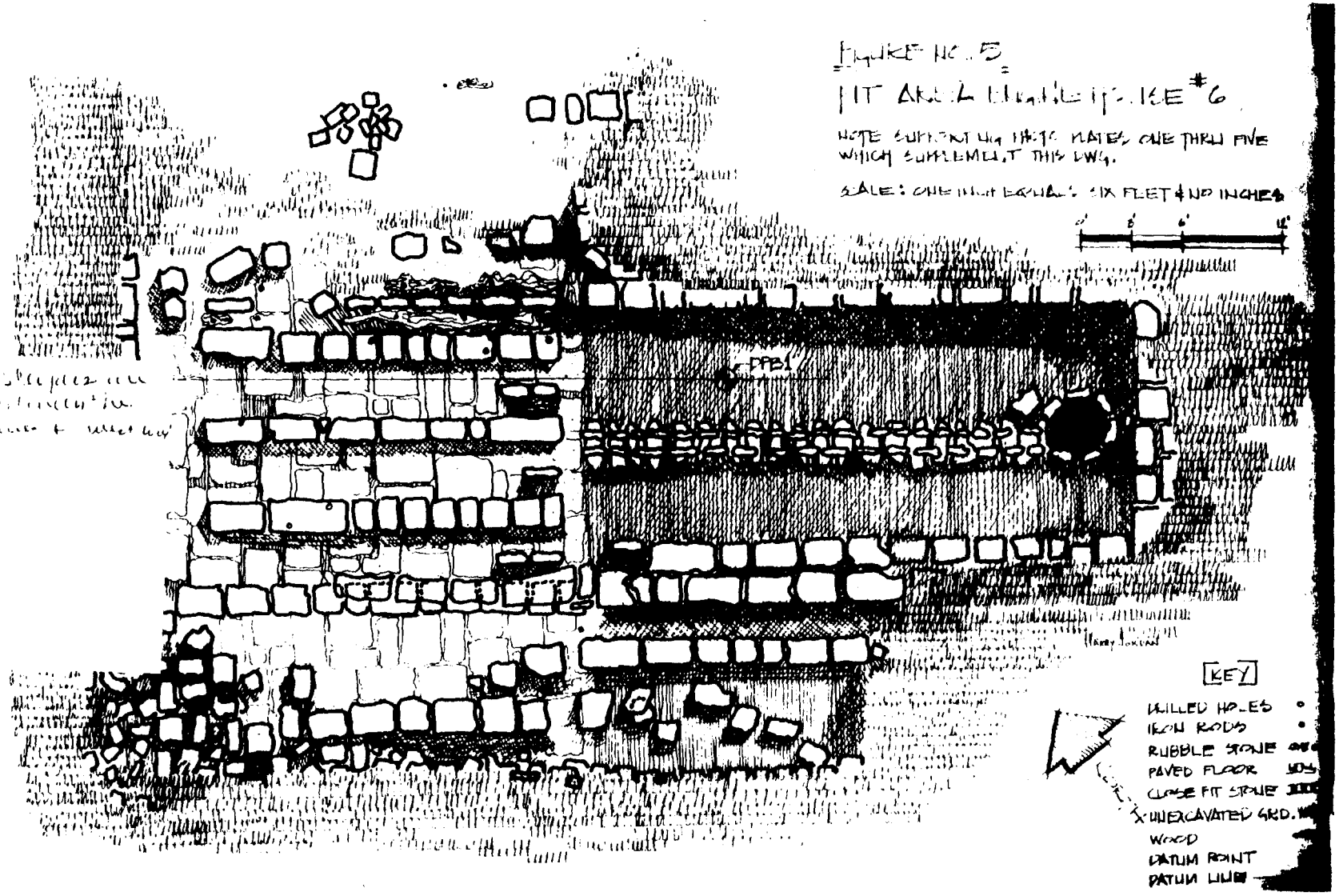


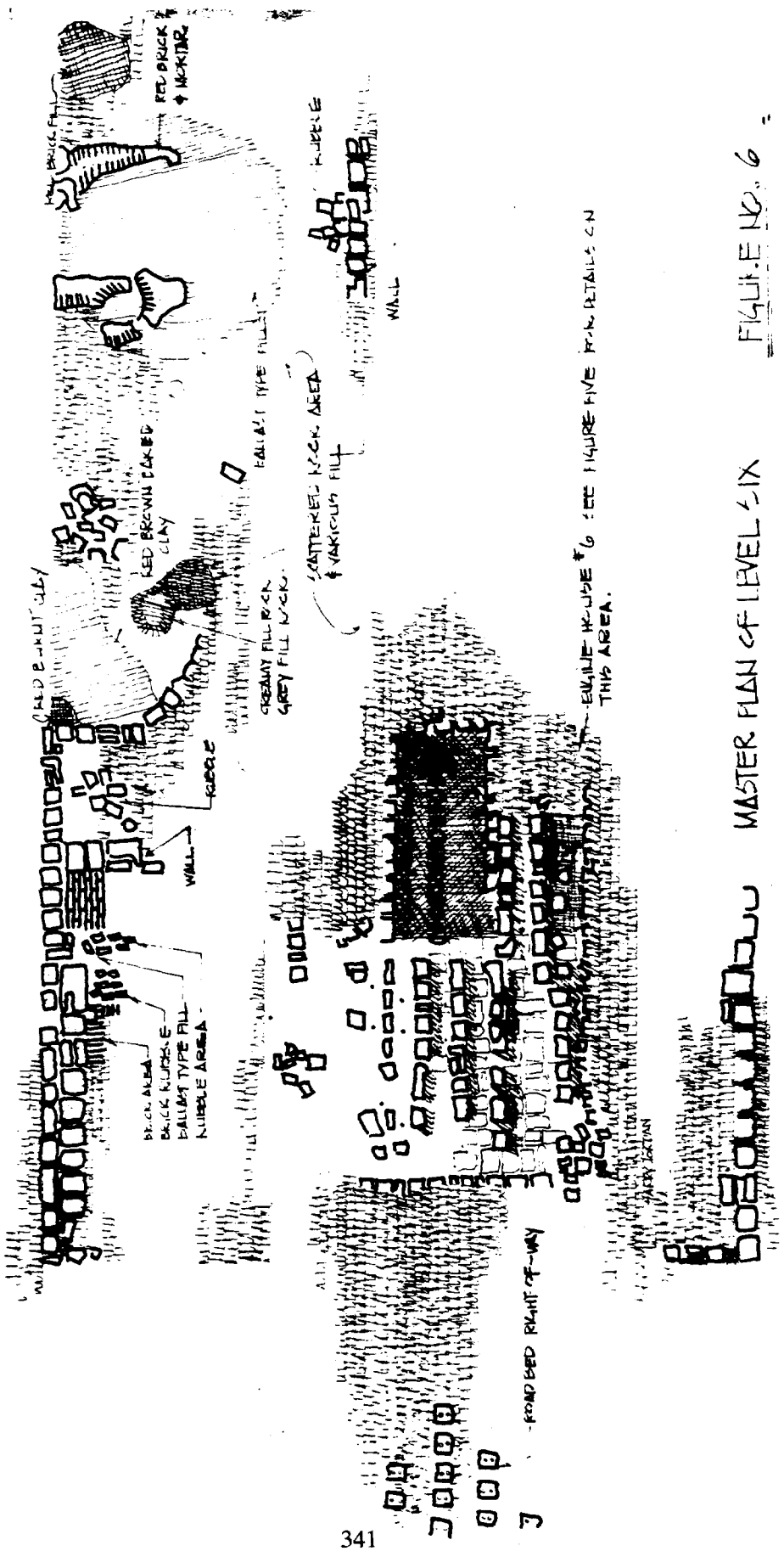
DISTANCE FROM DP 1

DP 2	72'-4.5"
DP 3	135'-8.5"
DP 4	239'-9.5"
DP 5	536'-0.5"
DP 6	782'-11.5"
DP 7	899'-0.5"
DP 8	1025'-2.5"
DP 9	1094'-2.5"
DP 10	1130'-4.0"
DP 11	1340'-8.0"



ROADBED RIGHT-OF-WAY NORTHWEST OF PIT AREA
FIGURE NO. 4.


FIGURE NO. 5
PIT AND DRILLHOLE NO. 6
NOTE SUPPLEMENTING THESE PLATES ONE THRU FIVE WHICH SUPPLEMENT THIS DWG.
SCALE: ONE INCH EQUALS SIX FEET & NO INCHES
KEY
DRILLED HOLES
IRON RODS
RUBBLE STONE
PAVED FLOOR
CLOSE FIT STONE
UNEXCAVATED GRD.
WOOD
DATUM POINT
DATUM LINE


MASTER PLAN OF LEVEL SIX
FIGURE NO. 6
RED BROWN CLAYED CLAY
CREAMY FILL ROCK
GREY FILL ROCK
SCATTERED ROCK AREA & VARIOUS FILL
WALL
RUBBLE
BALLAST TYPE FILL
ROAD BED RIGHT OF-WAY
THIS AREA.

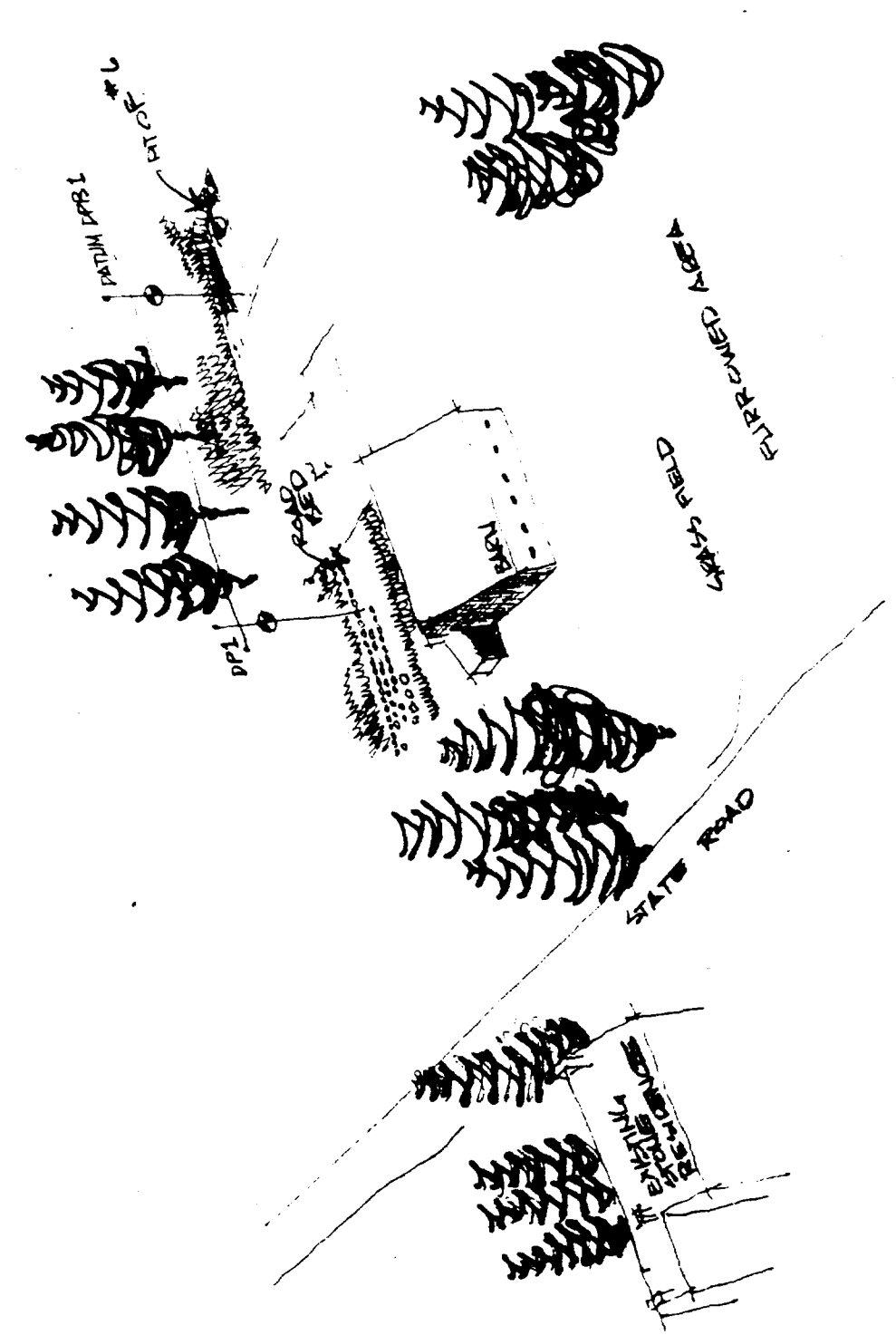


FIGURE NO. 7

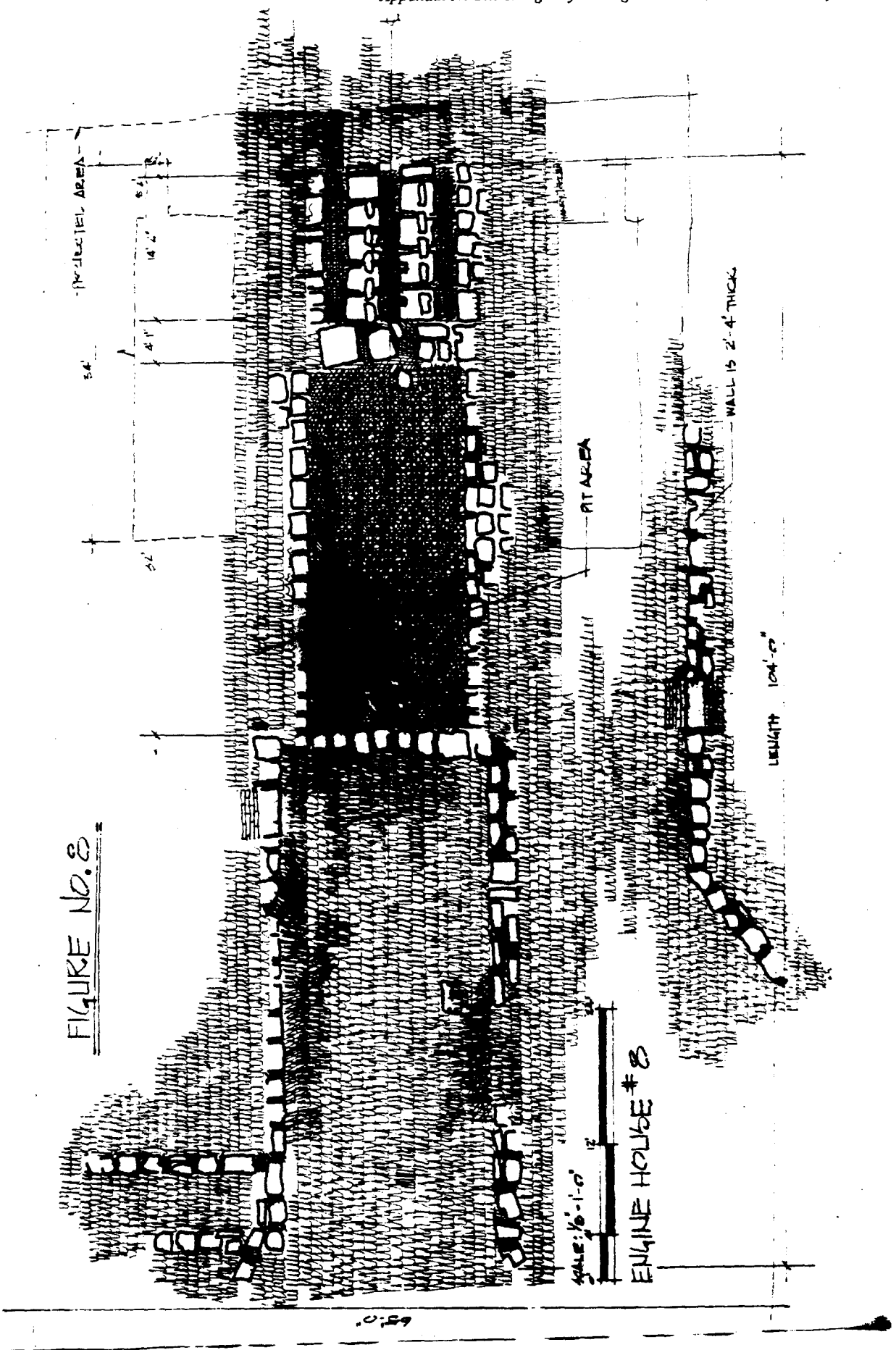
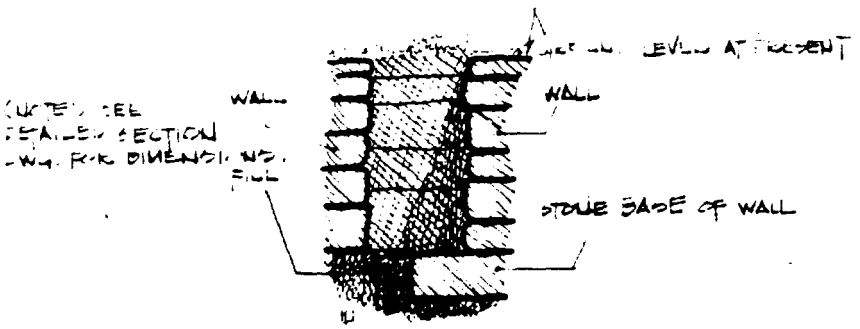

FIGURE NO. 8
ENGINE HOUSE #8
SCALE: 1/8"-1'-0"
PIT AREA
WALL IS 2'-4' THICK
LENGTH 104'-0"

FIGURE NO. 9.
ENGINE HOUSE NO. 8 WHEEL ROOM

MUCH MORE REMAINS HERE THAN AT #6, ALTHOUGH ONE CANNOT BE CERTAIN THAT THE SAME PLAN PREVAILED IN BOTH PLACES. AT NO. 8 THE FOLLOWING MAY BE NOTED:

1. THE WALLS WHICH SUPPORTED ONE SHEAVE-MECHANISM WERE FULLY BUILT UP OF STONE TO A LEVEL OF 5'-0" ABOVE THE BASE THUS PROVIDING THE SPACE FOR THE OPERATION OF THE SHEAVE.

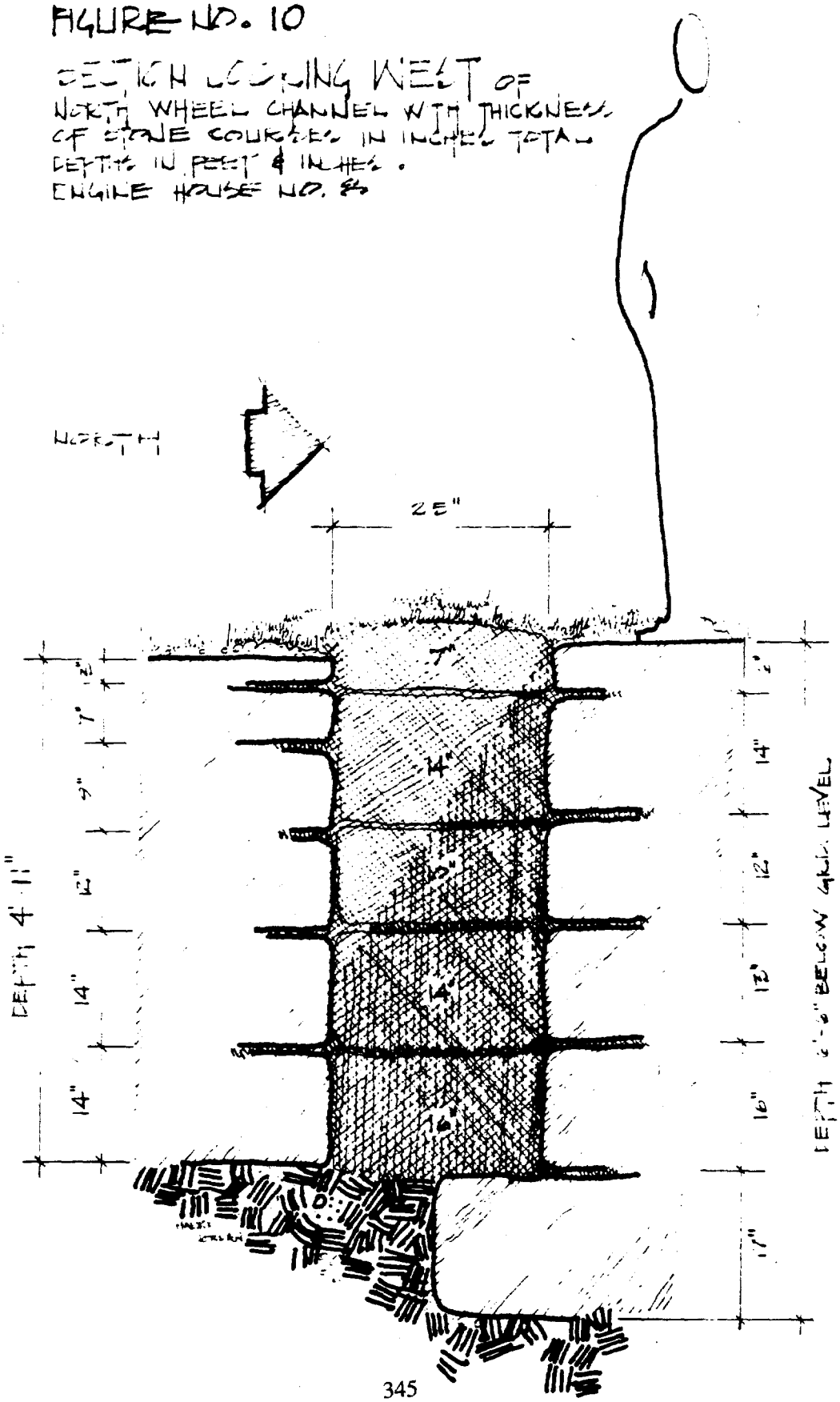


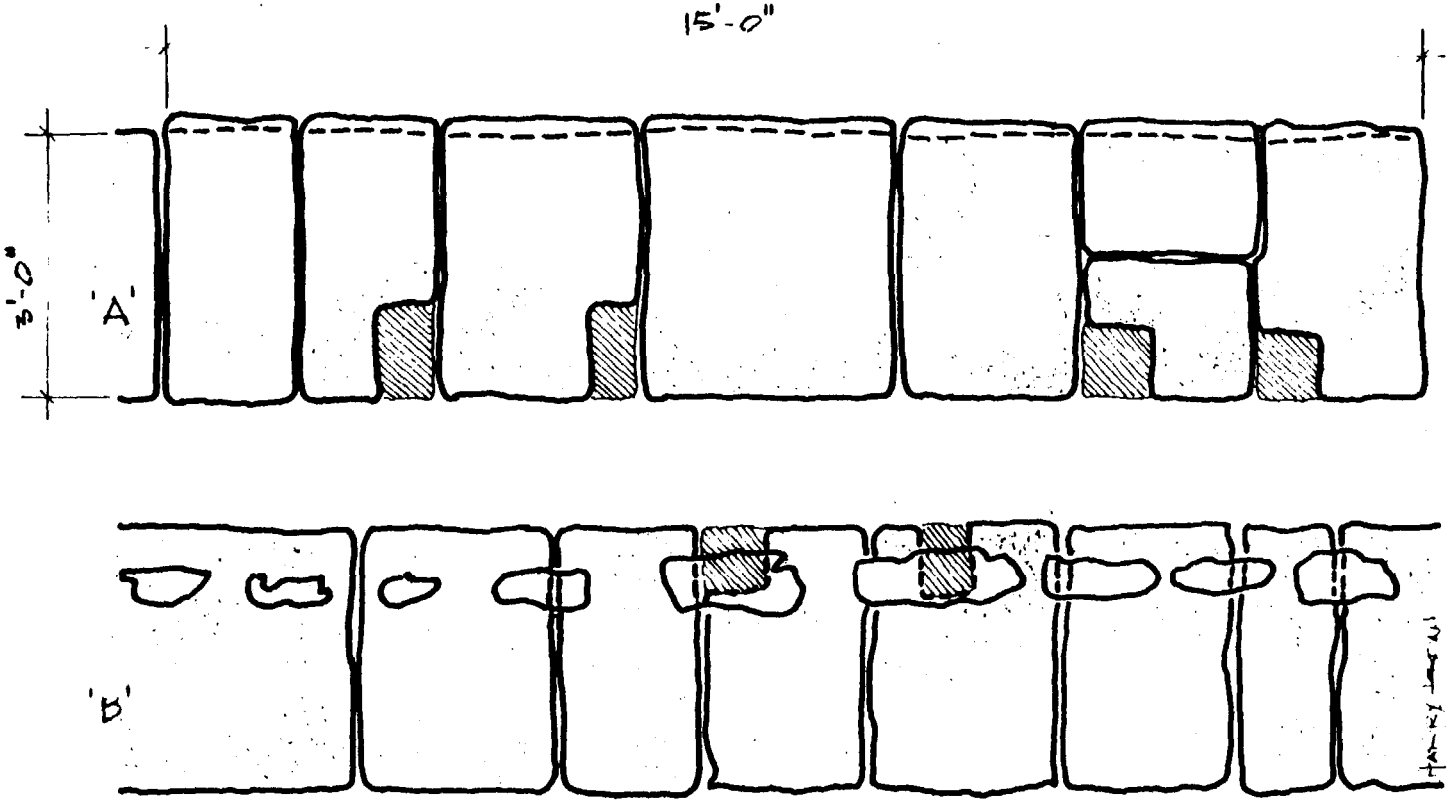
2. THIS LEVEL WAS ALSO THAT OF THE "WALKWAY" BETWEEN THE SHEAVE ROOM & THE NORTH ENGINE ROOM. [EXCEPT FOR CLEANING IN TWO AREAS AS TESTS, THIS ENGINE ROOM REMAINS TO BE DONE. WHEN DONE, IT WILL PROVIDE THE BEST AND MOST COMPLETE PLAN FOR AN ENGINE ROOM LAYOUT.]

3. THE TWO WALLS WHICH SUPPORTED THE COUPLING MECHANISM, HAVE CUTTINGS ON THEIR SURFACES FOR THE EMPLACEMENT OF WHATEVER SUPERSTRUCTURE WAS REQUIRED. [SEE PLAN]

FIGURE NO. 10

SECTION LOOKING WEST OF NORTH WHEEL CHANNEL WITH THICKNESS OF STONE COURSES IN INCHES TOTAL DEPTH IN FEET & INCHES. ENGINE HOUSE NO. 8





NOTE

AT PRESENT A ROW OF FLAT ROCKS FORM A TOPPING ON ROW "B" AT 6" FROM NORTHERN EDGE. TWO OF THESE COVER THE CUTTINGS IN THE STONE. THE POSITION OF THE OTHERS SUGGEST THAT SOME KIND OF FRAMING RAN ALONG ONE EDGE. A SIMILAR SUPERFICAL LAYER IS ON ROW "A" BUT ON THE NORTHERN EDGE ALSO.



ENGINE HOUSE NO. 8 SHEAVE ROOM, COUPLING SUPPORTS

SCALE: 1" = 2'-0"

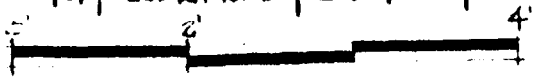


FIGURE NO. 11

APPENDIX O: ARCHEOLOGICAL MANAGEMENT REPORT, SUMMIT LEVEL

ARCHEOLOGICAL MANAGEMENT REPORT

ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE

SUMMIT LEVEL

February 1989

1. **Package Identification**

ALPO 104, Stabilize, Rehabilitate Foundations, Historic Structure Report, Archeological Data Section.

2. **Project Description and Location**

Planned development includes the construction of a new visitor center, a scale model of the engine house and interpretive displays. Exact construction locations have not been determined at this time (Site Concept Study 1987).

3. **Dates of Archeological Fieldwork**

September 7 - November 18, 1988

4. **Personnel**

Project Director, American University: Paula Zitzler

Crew Chief, American University: Karen Orrence

Crew, American University: Kimberley Becker

Luke Chen

Sandra Nigh

Robert Noel

TABLE 1

RESEARCH AREA	RESEARCH OBJECTIVE	TESTING METHODOLOGY
Engine House 6	Locate south wall	Excavation units and backhoe trenches
Foundation SW of Engine House 6	Define and date	Excavation units and shovel tests
Feature east of Engine House	Define and date	Excavation units and backhoe trenches
Incline 6	Define historic grade; document existing condition; identify drainage features/problems	Backhoe trench
Foot of Incline 6, below Skew Arch Bridge	Test for presence of historic structures/impact of highway construction	Surface inspection and streambank cuts
Lemon Coal Mine	Locate entrance and associated features	Surface inspection
Proposed Visitor Center	Locate and identify any cultural resources	Shovel tests

5. **Purpose and Location of Archeological Investigations**

The location of archeological testing at the Summit Level and along Incline No. 6 are shown in Figures 1 and 2. The archeological work was designed to provide information to architects and designers regarding the location and extent of the cultural resources present at the site. Research questions were proposed for specific areas, and several testing methods were employed. These are summarized in Table 1.

6. Results and Interpretations

A. Fieldwork

An area of approximately 589 square feet was excavated, including hand excavated units totalling 250 square feet and 339 square feet of backhoe trenches. Excavation depths averaged 4 feet in the hand excavated units and 5 feet in the backhoe trenches. In addition, 22 shovel tests were dug and three streambank cuts were examined.

B. Artifacts

Approximately 932 artifacts were collected. Labwork is currently underway. Less than 14 percent of the assemblage dates to the Portage Railroad era (1825 to 1855). The types of artifacts found include ceramics, glass, railroad spikes and spike fragments.

C. Features

Several significant features were uncovered which date to the Portage Railroad era. These are described below.

1. Features associated with the original track were located between the Engine House and the head of Incline No. 6 in Excavation Units 4, 5 and 7. Two badly decomposed wooden cross-ties and in-situ track ballast were recorded (Figure 3).

2. Two original incline stringers were recorded in the streambed below the Skew Arch Bridge (Figure 4). The stringers were 4 feet apart (inside edge to inside edge). Approximately 20 feet of the northernmost stringer (an 11.5-foot-long segment and a 9-foot-long segment) and 30 feet of the southernmost stringer were exposed. These are the only original stringers known to exist, and are the only absolute evidence of the original grade of the plane (see item 7 below).

3. The entrance to the Lemon Coal Mine was discovered by the DSC surveyors during the topographical mapping of the summit area. It is located southeast of the engine house and south of the incline. The entrance appears to be totally collapsed, but a small concrete feature and an earthen ramp are still visible at the mouth.

4. The French drain surrounding the engine house was uncovered in Backhoe Trenches 4a and 4b and in Excavation Unit 9. This gravel drain was installed by NPS personnel during the 1970s(?), after reconstruction of the south half of the engine house. There was no reported archeological investigation or monitoring associated with its construction.

5. The excavation of two backhoe trenches and two units failed to produce any evidence of the south wall

of the engine house. There are two possible conclusions: 1) there never was a south wall at this location (the engine house was not symmetrical) or 2) the wall was destroyed by post-Portage Railroad era construction or landscaping.

6. Two excavation units, one on either side of the stone wall near the southwest corner of the Engine House, failed to yield any evidence of a construction trench. Instead, an extensive 20th century disturbance, related to landscaping after the 1984 fire that destroyed the structure, was noted. Artifacts from a construction trench might have provided an approximate date for the construction of this building.

7. Inconclusive evidence of the historic grade of the incline was found in Backhoe Trench 5. However, a stone-lined drainage ditch was examined on both sides of the incline. Clearing these ditches may improve drainage on the incline.

8. Construction of old Route 22 has either destroyed or buried the foot of the incline. The presence of the wooden stringers below the Skew Arch Bridge and the fact that they are still intact adjacent to the roadfill, suggests that the foot of the incline, and remains of any associated structures, may be buried under the

roadbed. This also raises the question of the condition of Incline 7, which is also under the roadbed. If Incline 6 has been preserved by the roadway, is it possible that Incline 7 may also be intact?

9. No cultural resources were located while shovel testing the proposed site of the new visitor center.

7. **Evaluation of the Discovered Resources**

Significant archeological data was collected that is important in the interpretation of the Portage Railroad. The presence of original track at the head and near the foot of the incline demonstrates that, despite extensive modern disturbances, the integrity of the site is better than had been expected. This is encouraging, and suggests that a re-evaluation of the trace throughout the park may yield additional significant data. For example, other sections of the original grade of the trace and associated features such as stringers, cross-ties and turn-outs may be discovered.

The artifactual data, for the most part, is representative of 20th century activities. Those 19th century artifacts that were recovered are not expected to provide significant information about Portage Railroad era activities. This was also the case with artifacts recovered during excavations in and around the engine house in 1984. The discovery of structural remains, such as walls, floors, construction trenches and other features, yielded more meaningful information than the primarily 20th

century artifacts recovered from the excavation. While these artifacts provide data about post-railroad activities and may help in the identification of later features, it is not cost-effective to process and curate them. If additional archeological work is ever planned for Engine House 6, consideration should be given to implementing a "non-collection" or "sample-only" strategy.

8. **Impact of Project on the Resource**

The original grade of the trace will be adversely impacted by any ground disturbance 1) between the engine house foundation and the head of the incline and 2) on the incline below the Skew Arch Bridge.

The cultural resource below the Skew Arch Bridge is presently being adversely affected by continued erosion in the streambed: the stringers are being exposed and destroyed.
This is historic fabric and should be preserved.

9. **Recommendations**

1. **The exposed stringers below the Skew Arch Bridge should be STABILIZED AND CONSERVED IMMEDIATELY.** Minimally, these features should be reburied. Enclosing or re-routing the stream should be considered, with provision for archeological mitigation.

2. The area between Engine House 6 and the top of the incline contains a significant subsurface resource that

should be **AVOIDED** by construction.

3. The original, undisturbed foundation of the engine house should be **AVOIDED** by construction.

4. Removal of the sidewalk or other construction on the south side of the engine house should be **MONITORED** by an archeologist, since testing for the original south wall was inconclusive in this area.

5. The stone foundation near the southwest corner of the engine house should be **AVOIDED** by construction pending the recovery of more conclusive historical or archeological data. This may be the remains of a structure associated with the Portage Railroad.

6. **CLEARANCE** for construction is tentatively recommended for the proposed visitor center site.

7. The historic quarry area near the proposed visitor center should be **AVOIDED**.

8. Significant resources may be buried under old Route 22. The National Park Service should **INFORM PENNDOT**, and request that any plans to alter or remove the existing highway take this possibility into account.

Prepared by Karen Orrence and Paula Zitzler, American University.

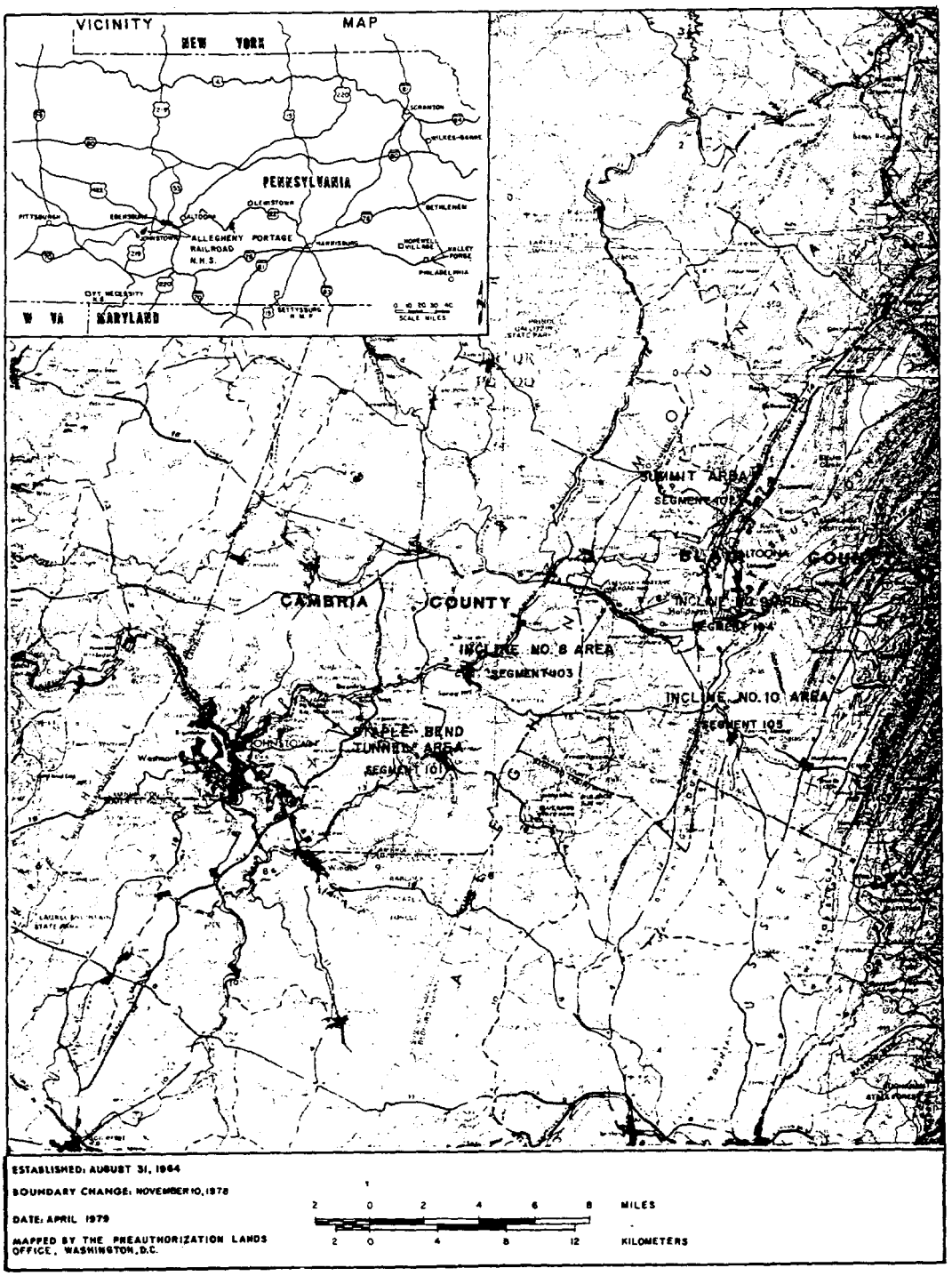


Figure 1. Vicinity Map

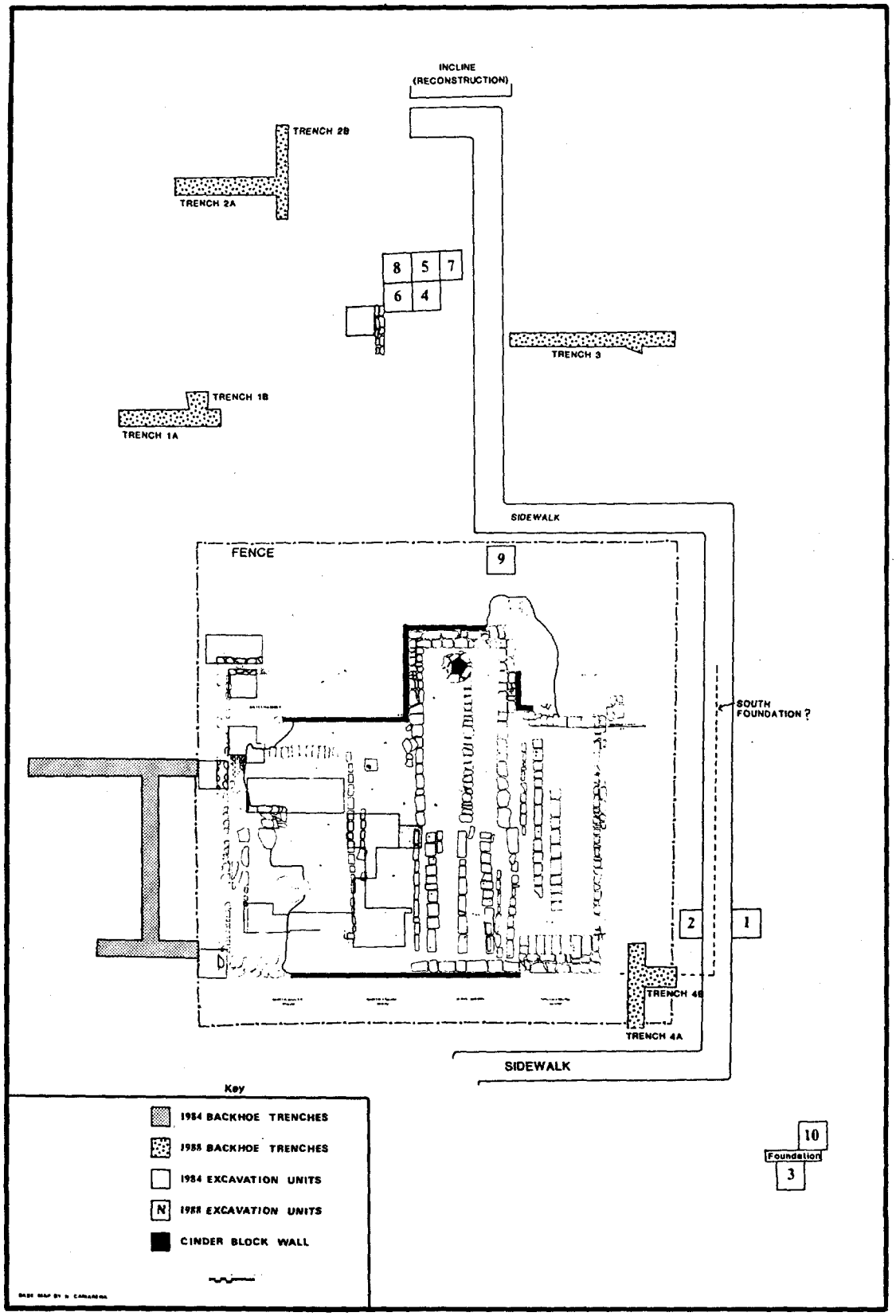


Figure 2. Location of Archeological Tests, Summit Level

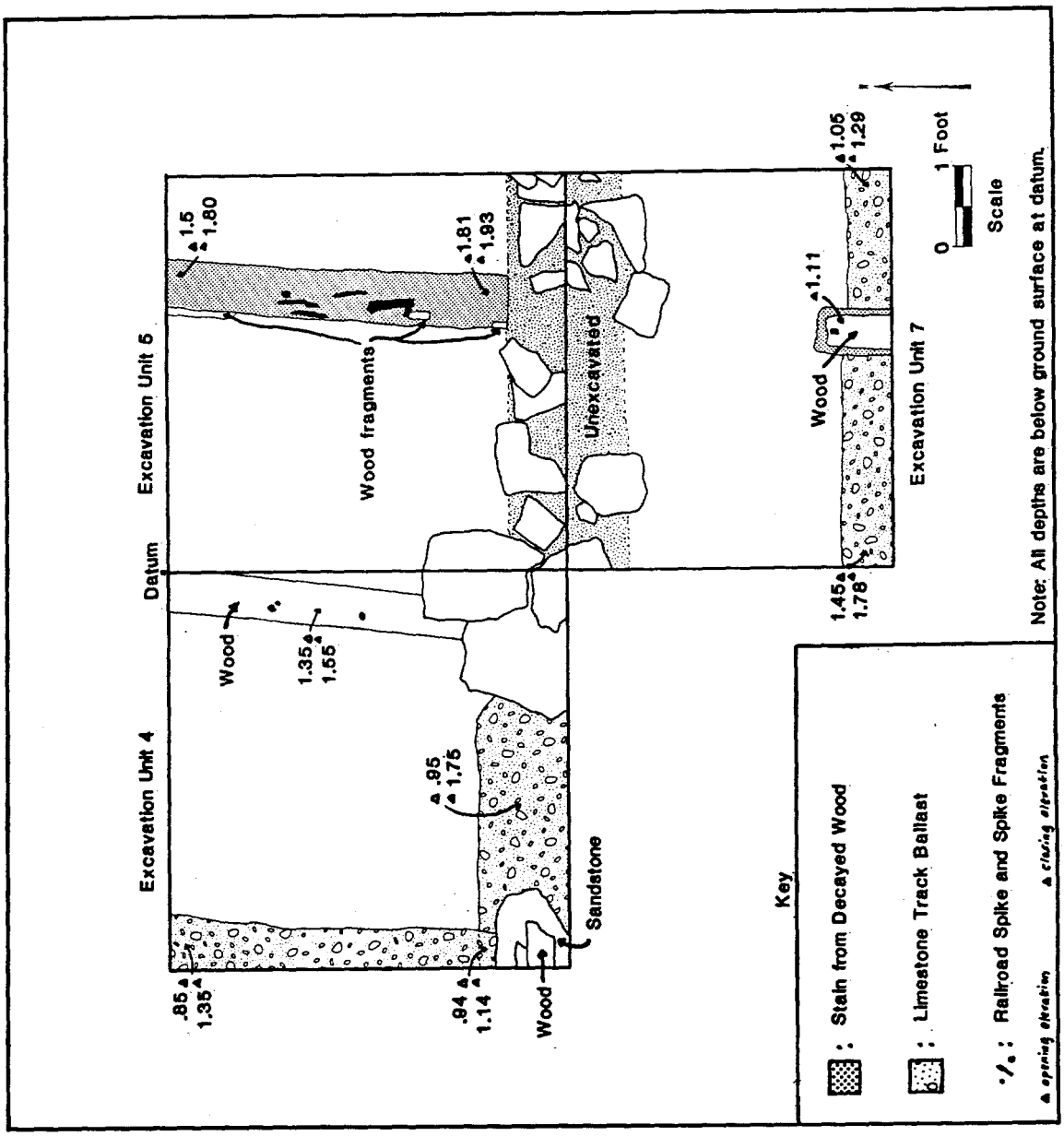


Figure 3. Plan View, Excavation Units 4, 5 and 7.

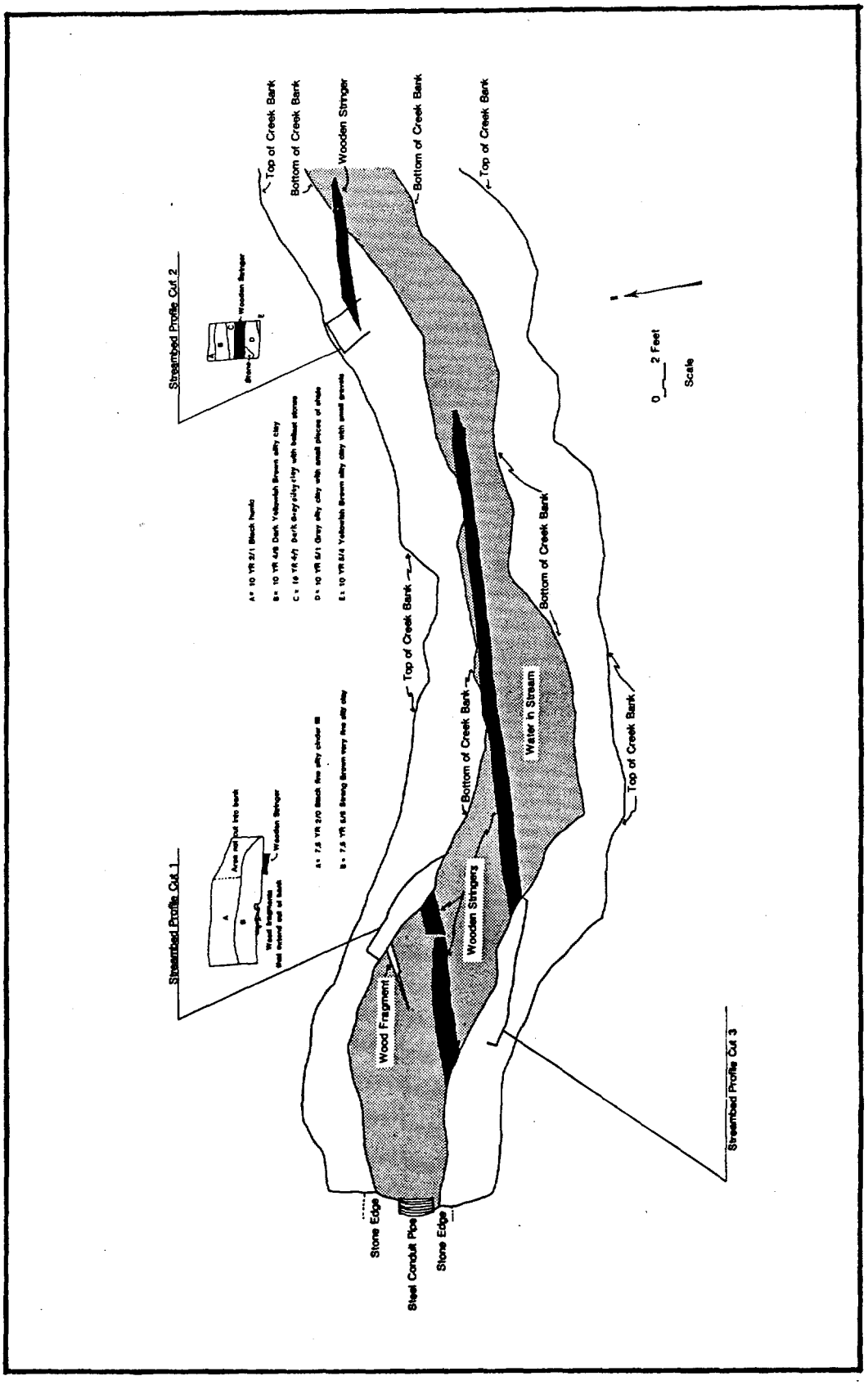


Figure 4. Plan of Stringers in Streambed Below Skew Arch Bridge

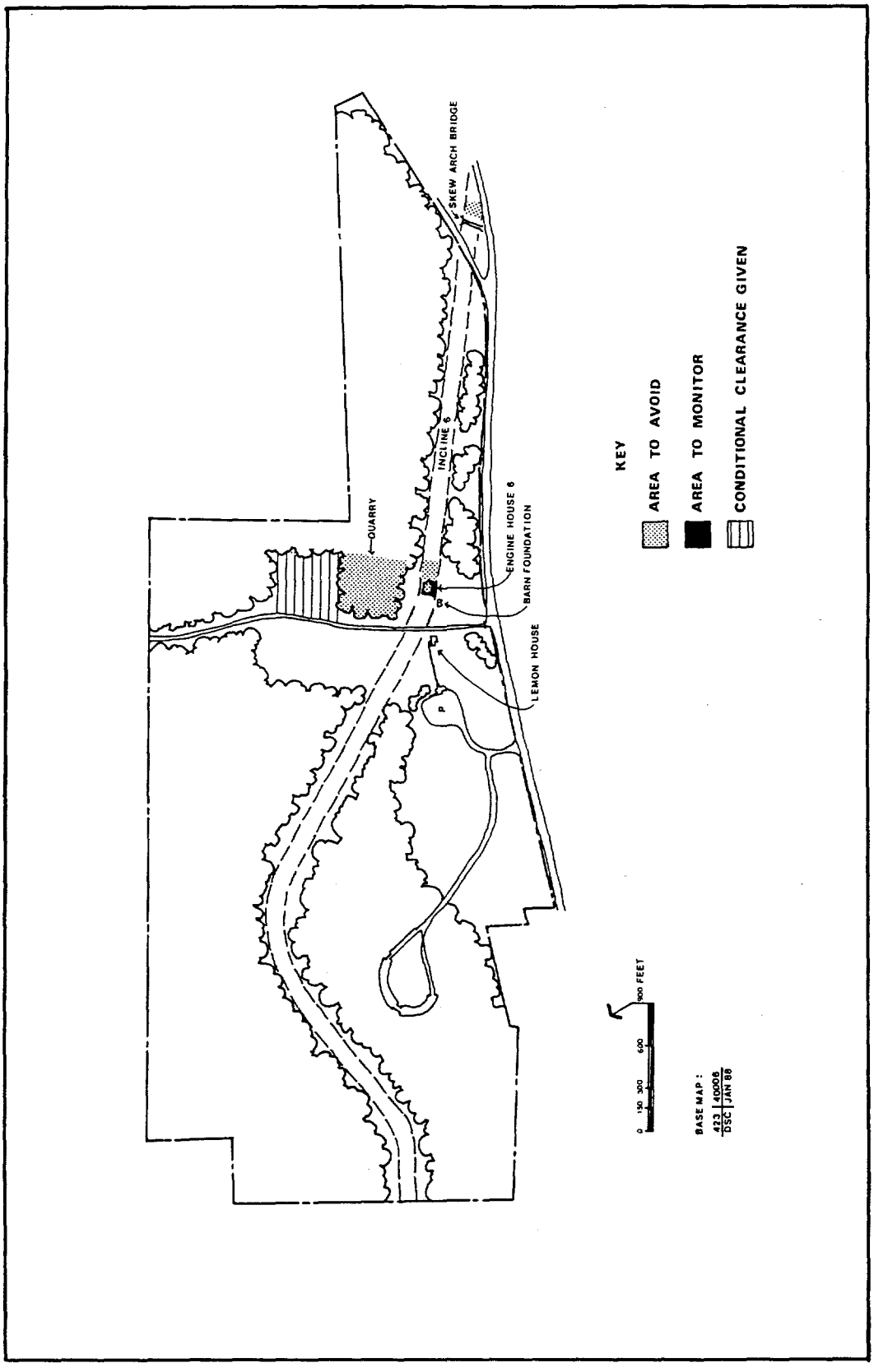


Figure 5. Map of Archeological Recommendations

DRAFT

DRAFT FINAL REPORT

ARCHEOLOGICAL TESTING AT ENGINE HOUSE 6 ALLEGHENY PORTAGE RAILROAD NATIONAL HISTORIC SITE PENNSYLVANIA

PACKAGE ALPO 104 42A

By

Karen L. Orrence, Paula A. Zitzler, and Michael L. Alterman

Prepared for the National Park Service by:

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Under Contract CX-2000-8-0011
Work Order No. 44

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March 1991

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I. INTRODUCTION

This report describes archeological testing at the site of Engine House 6, Allegheny Portage Railroad National Historic Site, Blair and Cambria counties, Pennsylvania (Figure 1). Engine House 6 is located at the Summit Level of the old portage railroad that operated from 1834 to 1855 in association with the Pennsylvania Mainline Canal (Figure 2). The Summit Level represents the highest elevation in the Allegheny Mountains along the route of the portage railroad, approximately 2335 to 2350 feet above mean sea level. Other historic features in the vicinity of Engine House 6 include the Allegheny Portage Railroad trace and the Lemon House, an early nineteenth-century tavern and passenger station (Figure 2).

Archeological testing was undertaken on the south side of the Engine House 6 building to determine if any significant cultural resources would be affected by proposed construction. In addition, it was anticipated that recovery of data on the historic engine house could be used by the NPS in the development of design alternatives for visitor facilities and interpretive exhibits.

The archeological investigation was conducted by the Cultural Resource Group of Louis Berger & Associates, Inc. (LBA), under Work Order No. 44 of an indefinite quantities contract with the National Park Service, Denver Service Center, CX-2000-8-0011. Archeological testing was conducted according to a scope of services prepared by the NPS Eastern Applied Archeology Center. Paula A. Zitzler of LBA served as Co-Principal Investigator with Jed Levin of the NPS Denver Service Center. Karen L. Orrence was the Field Supervisor for the project. The field crew included Jeffrey Laubach and Edward Miller, Jr. Dr. Michael L. Alterman was the Project Manager for LBA. This report was written by Ms. Orrence, Ms. Zitzler and Dr. Alterman, and Jacqueline L. Horsford prepared the graphics.

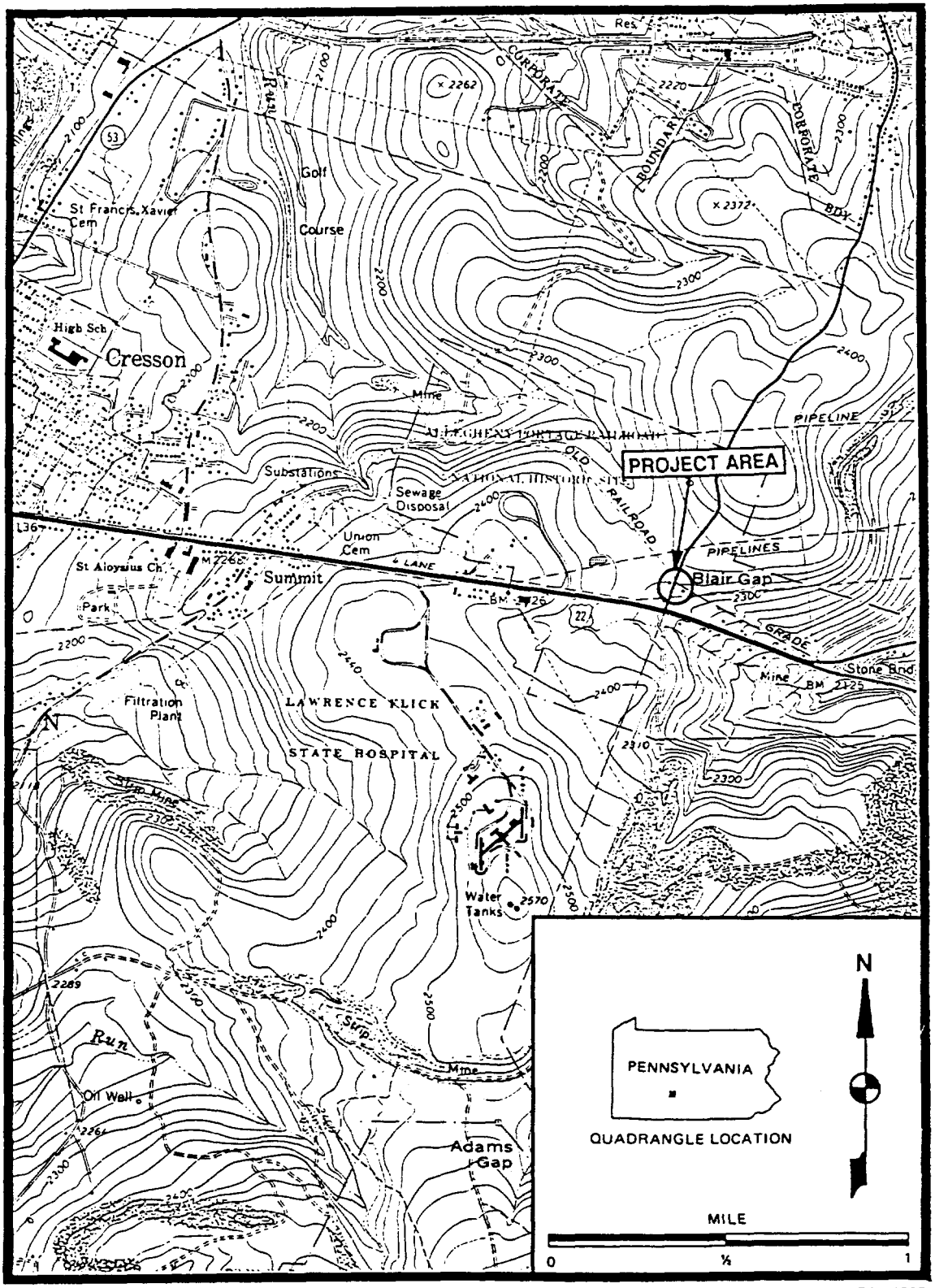


FIGURE 1 Vicinity Map

SOURCE U.S.G.S. 7.5 Minute Quadrangle, Cresson, PA., 1965 (Photorevised 1981)

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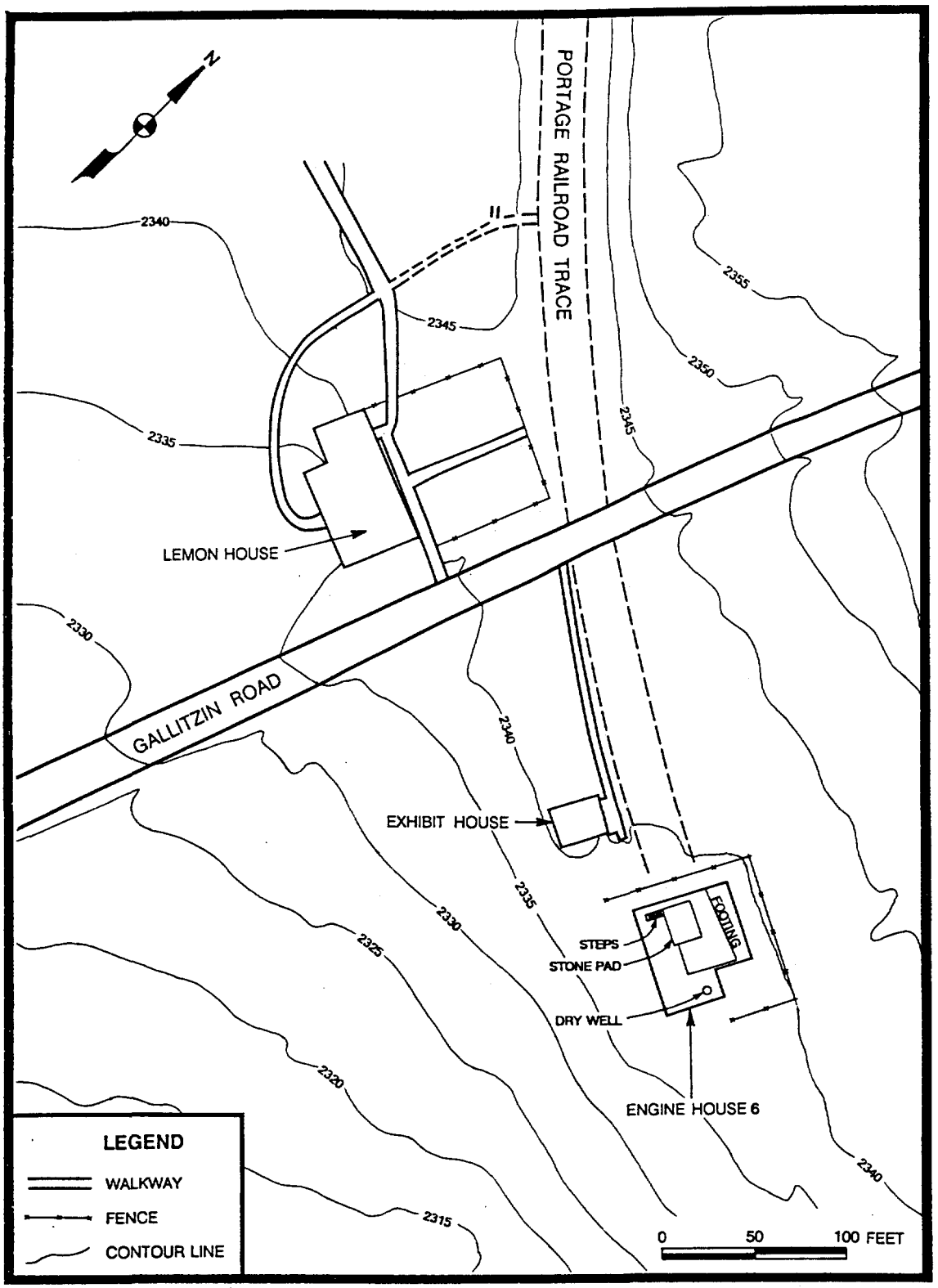


FIGURE 2 Site Location

II. HISTORICAL BACKGROUND

The Allegheny Portage Railroad was constructed between 1831 and 1834 as part of a 394-mile transportation route between Philadelphia and Pittsburgh, Pennsylvania. Although east-west transportation systems in the state had been proposed as early as 1760, the idea was not taken seriously until 1823 when sections of the Erie Canal in New York began operation. The following year, the Pennsylvania State Legislature enacted a mainline canal bill that authorized a Board of Canal Commissioners to design and construct canal systems across the state. A 36-mile railroad section, the Allegheny Portage Railroad, was designed to traverse the Allegheny Divide in western Pennsylvania and thereby connecting canal systems that terminated in Johnstown and Hollidaysburg. The portage railroad consisted of 10 planes and 11 levels. From the Johnstown basin, 5 levels and 5 planes were constructed to surmount a vertical rise of 1172 feet. Planes 6 through 10 and Levels 7 through 11 between Summit Level and the eastern canal basin in Hollidaysburg overcame a nearly 1400-foot rise (Toogood 1973:4-12, 35).

From its inauguration in 1834, the Allegheny Portage Railroad was plagued with problems that made it unprofitable, including structural weaknesses and natural hazards that resulted in untenable maintenance costs (Toogood 1973:23). In addition, mismanagement, frequent accidents and resulting legal suits, and disruption of service, led to decreasing public confidence in the system. By 1855, the Allegheny Portage Railroad had been supplanted by two new rail lines, the Pennsylvania Railroad and the state sponsored New Portage Railroad. The abandoned old portage railroad was largely dismantled for scrap and local building needs.

In its conception and undertaking the Allegheny Portage Railroad was a major technical achievement. A technology of stationary steam engines and continuous cables was utilized at the head of each plane to hoist and lower canal barges loaded onto railroad "safety cars." The stationary engines and machinery were placed in shed type structures, such as Engine House 6 at the head of Plane 6 that is the subject of this report.

The frame engine house at Plane 6 sheltered two engines and machinery for the ropes that together controlled the ascent and descent of railroad cars. In 1833, the Pennsylvania Canal Commission granted a contract for the construction of a building to house one steam engine at the summit of Plane 6 and the following year, the structure was expanded to accommodate a second steam engine (Toogood 1973:81-82).

III. FIELD INVESTIGATIONS

A. METHODS

Archeological testing at Engine House 6, which was conducted from October 9 to 19, 1990, consisted of a series of machine excavated trenches and limited hand excavation on the south side of the present engine house. The goals of the archeological investigations were:

1) to determine the exact location, configuration and construction details of the original south wall of Engine House 6;

2) to identify any associated features; and

3) to assess the integrity and condition of any archeological remains identified through testing.

The use of a backhoe was necessary to remove the large amounts of overburden above historic features. The site was divided into seven trench areas, designated A through G (Figure 3). Each area was gradually stripped by machine to the level of undisturbed subsoil. A total area of approximately 4,230 square feet was excavated in this manner (Table 1). Limited hand-excavation was utilized to clear features and profiles. Soil profiles were drawn for each area, except for G, using standard soil texture descriptions and Munsell soil colors.

TABLE 1
SUMMARY OF ARCHEOLOGICAL TESTING

TRENCH	LENGTH (ft)	WIDTH (ft)	AVERAGE DEPTH (ft)	AREA (sq ft)
A	40	3.5	2.7	378
B	49	7.5	3.1	1,139
C	30	4.0	2.5	300
D	20	6.5	3.5	455
E	45	6.5	4.1	1,199
F	15	6.5	2.3	224
G	23	7.5	3.1	535
				4,230

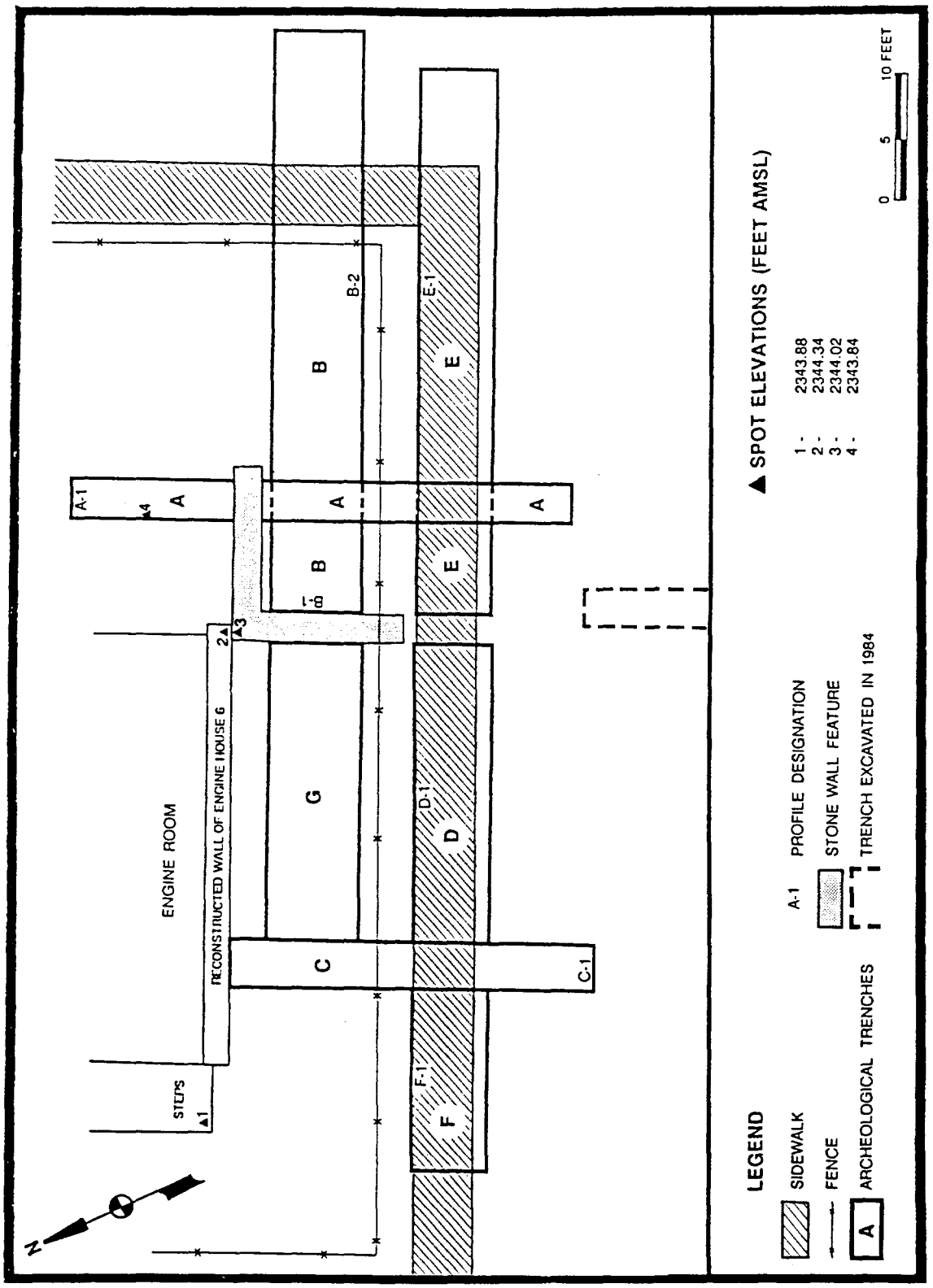


FIGURE 3 Excavation Plan

Fieldwork began with machine removal of the asphalt sidewalk and gravel underbase in the vicinity of the south wall of the engine house, as projected from historical documents (Toogood 1973). The area was then flat-shovelled to look for features. The test area was extended about 10 feet to the east, slightly beyond the limits defined in the scope of work, to examine a reddish stain that appeared under the sidewalk.

B. RESULTS

No archeological evidence of the original south wall of the engine house was found. Assuming that the brick boiler room floors on the two sides of the engine house were at the same elevation, it appears that the south-side boiler room was removed at some time after the railroad closed. The elevation of the brick boiler room floor on the north side of the engine house is 2.82 feet above the base of the sidewalk near the south side of the engine house.

Stratigraphic information from this and previous excavations confirms this interpretation. Figure 4 provides a representative soil profile from Area E. Stratum A is a layer of dark brown humus underlying the sod. Stratum B is a yellowish brown clayey silt and Stratum C is a thin layer of organic material. Underneath this organic band was a naturally occurring layer of stones, ranging from 0.5 to 4 feet across, which appears to be derived from the natural bedrock. The stones are imbedded in an undisturbed subsoil, labelled Stratum D. Similar stratigraphy was encountered during archeological excavations in 1988 between Engine House 6 and the head of Plane 6. In each of these units (Excavation Units 4 through 9), a thick deposit of silty clay with naturally weathered shale (channery) overlaid the organic layer. This may conform to Stratum B in Figure 3. This thick channery deposit was found below the in situ remains of the portage railroad track in EU 4, and is probably the undisturbed subsoil. No artifacts were recovered from this stratum.

The remains of two stone walls were uncovered adjacent to the southeast corner of the reconstructed wall (Figure 5). These walls form a corner for an unidentified structure/feature. The east-west wall was 2.3 feet wide and 14.4 feet long; the north-south wall was 2.3 feet wide and 14 feet long. The walls were composed of dry-laid sandstone, one to two courses high, and were in poor condition (Figure 6). The walls rested on a yellowish brown clay silt. The size and function of this structure could not be determined, although it probably post-dates the portage railroad.

A French drain was found in Area E. This drain was installed by park personnel in 1970s. The trench was 2.3 feet wide and 5.4 feet deep; the perforated plastic drainpipe had a diameter of 6 inches.

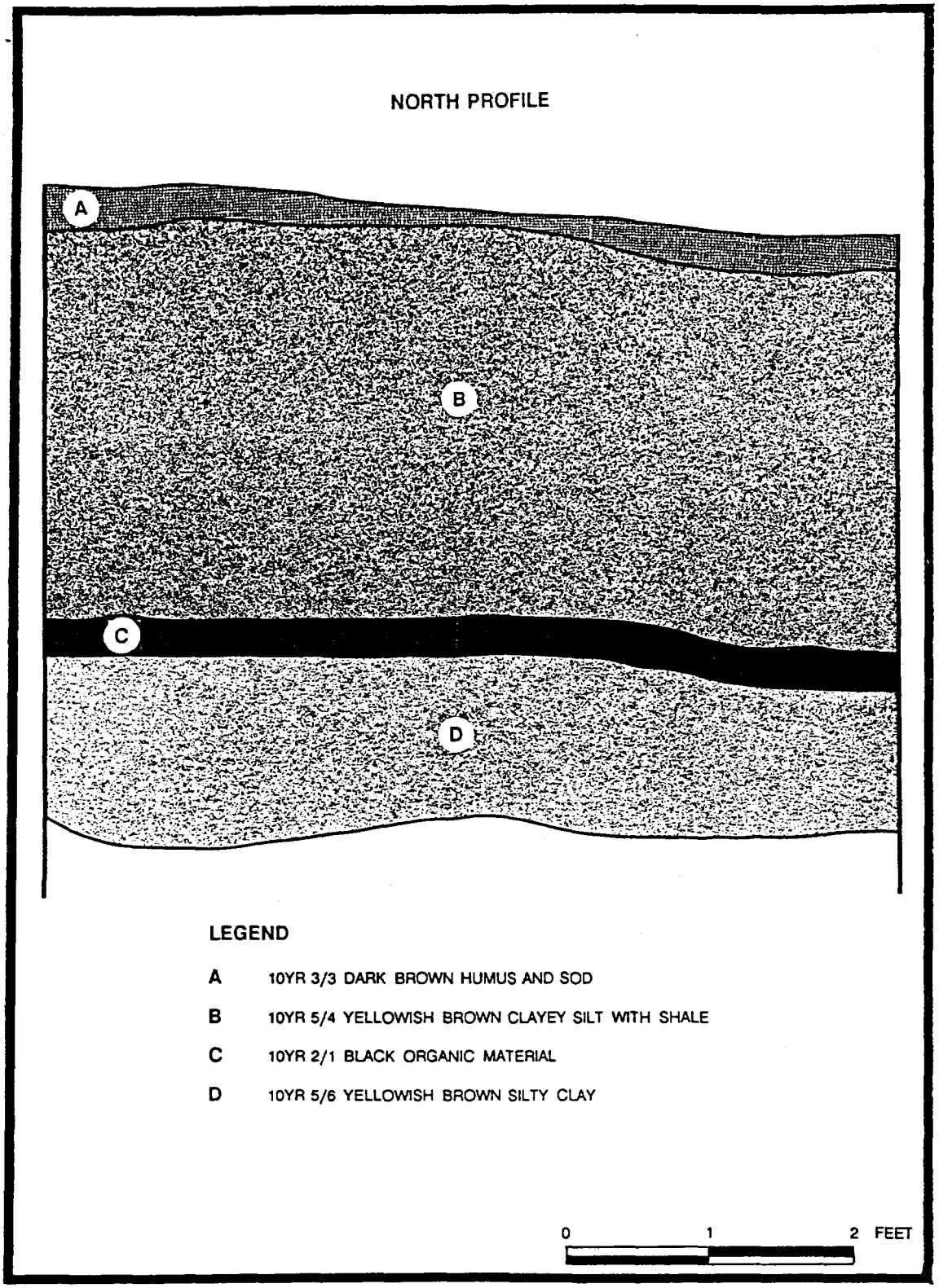


FIGURE 4 Profile E-1, Representative Section

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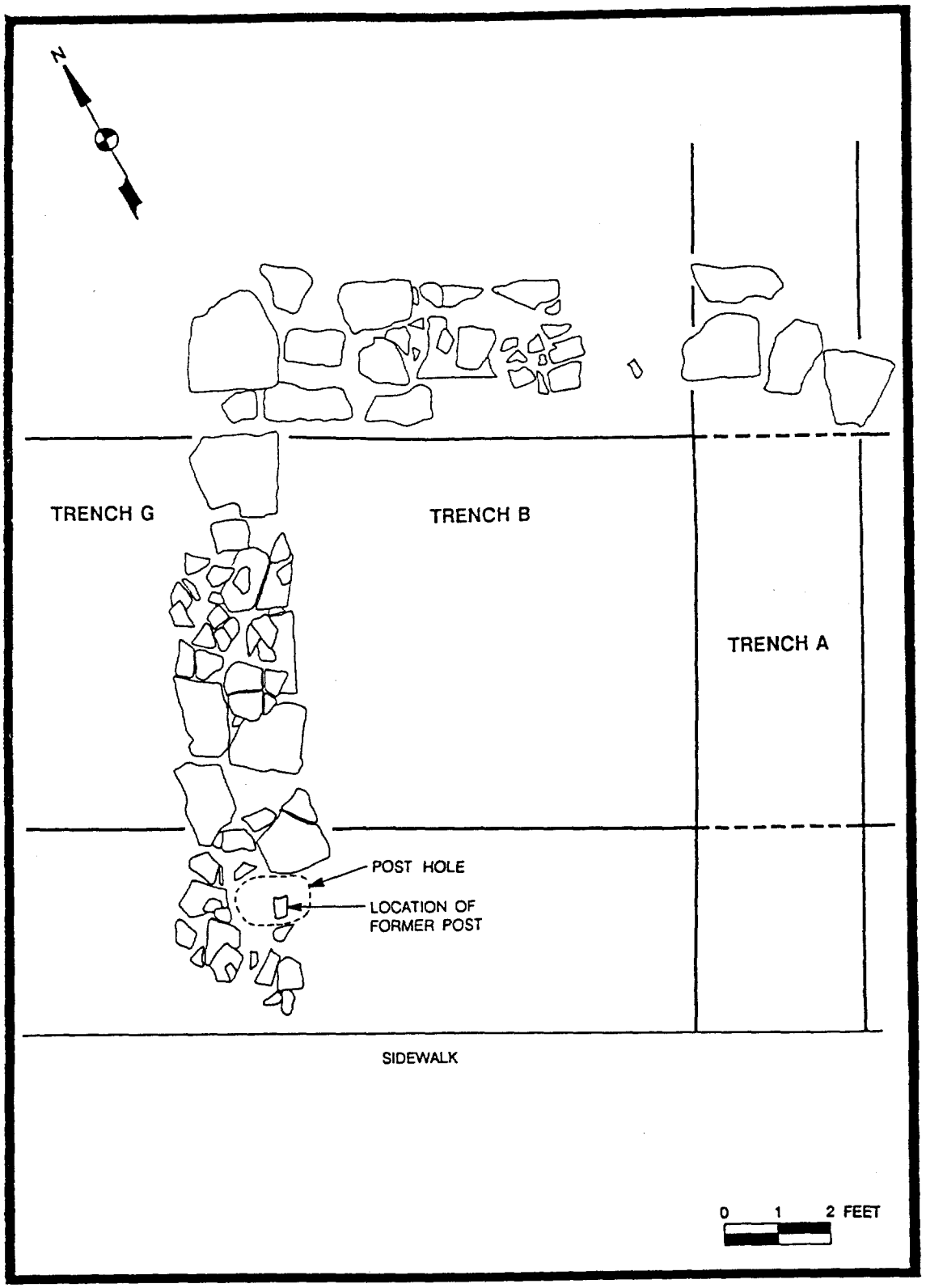


FIGURE 5 Plan View of Stone Wall Feature

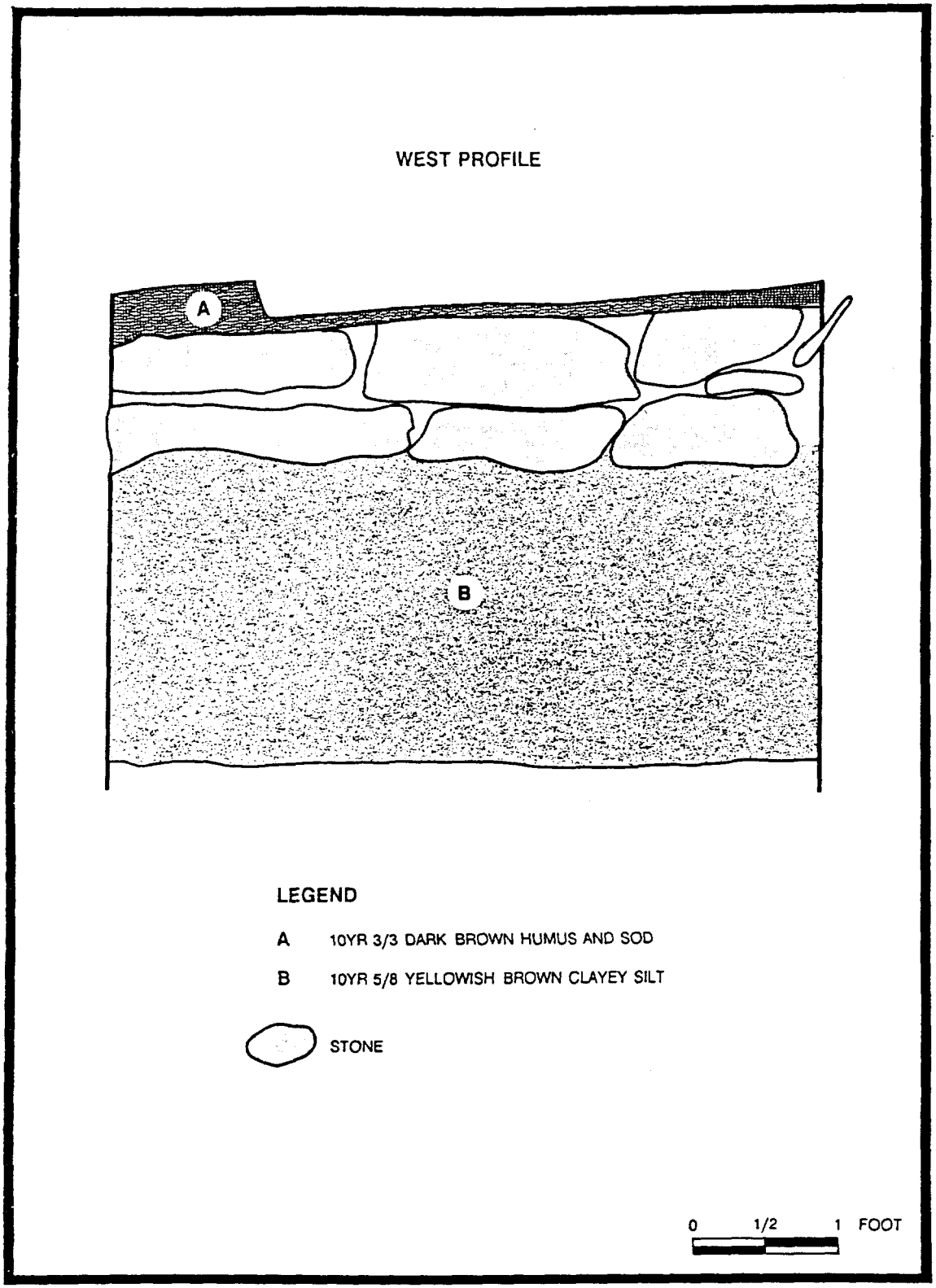


FIGURE 6 Profile B-1

IV. CONCLUSIONS AND RECOMMENDATIONS

The area has been obviously disturbed, and any evidence of the south boiler room that may have existed is gone. The two stone wall remnants that were uncovered do not appear to be associated with the engine house or to be associated with the portage railroad. These cultural resources have been fully documented.

The construction of the exhibit shelter over the engine house remains will have no impact on significant cultural resources on the south side of the engine house. It is recommended that no additional excavation is warranted in this area.

Archeological excavation at other engine houses, especially those that were not as intensely used, occupied, or rebuilt during the twentieth century may provide information regarding site plan. The plans of engine houses 9 and 10 on the portage railroad appear to be similar to Engine House 6. Therefore, excavation at one or both of these structures may provide archeological data on engine house construction. Additional information is available in the draft Historic Structure Report, Allegheny Portage Railroad, Eastern Slope (Zitzler 1991).

V. REFERENCES CITED

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Zitzler, Paula
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APPENDIX Q: REVIEW OF ARCHEOLOGICAL WORK PLAN

EASTERN APPLIED ARCHEOLOGY CENTER
ARCHEOLOGICAL WORK PLAN
ALLEGHENY PORTAGE NATIONAL HISTORIC SITE
ENGINE HOUSE 6 ARCHEOLOGICAL TESTING
August 22, 1990

I. Park/Pkg. No
ALPO 104-42A STABILIZE REHAB FOUNDATIONS

II. Archeological project title
Engine House 6 Archeological Testing.

III. Archeological personnel
a) Jed Levin - DSC-Eastern Applied Archeology Center (EAA), Archeologist.
b) Other archeological personnel will be supplied by the project contractor. The EAA will review contractor supplied personnel for compliance with qualifications set forth in the Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation.

IV. Coordination personnel
a) Park: Peter K. Nigh, Superintendent, Allegheny Portage National Historic Site (NHS).
b) Mid-Atlantic Regional Office: David Orr, Regional Archeologist.
c) Denver Service Center: Kenneth Bennett, Team Captain, Eastern Team.

V. Compliance
a) Native American consultation
The project area has been subject to an extensive amount of development in the nineteenth century, it is unlikely that any previously undetected Native American burials will be encountered during the execution of this project. Should human remains, however, be uncovered such discoveries will be immediately reported to the Regional Archeologist for purposes of establishing procedures for determining ethnic origin and for alerting the responsible Native American and/or law enforcement agencies.

b) Section 106
Completion of this project will provide archeological support necessary to insure compliance with Section 106 of the National Historic Preservation Act (16 U.S.C. 470) and its implementing regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800).

VI. Purpose of proposed archeological project
The NPS is currently developing design alternatives for the development of visitor facilities and interpretive exhibits at Allegheny Portage Railroad NHS. The archeological services specified in this document will provide information to the design team at DSC involved in the development of these facilities.
The focus of the specified testing is the remains of an engine house, and adjacent related features, constructed by the state of Pennsylvania in the second quarter of the nineteenth century as part of a portage railroad associated with the Pennsylvania Mainline Canal. The goals of the project are: (1) to determine the exact location, configuration and construction details of a portion of the engine house and associated features, and (2) to assess the integrity and condition of the archeological remains.
The resulting information will insure accurate interpretation of historic features. In addition, the specified archeological work will provide a basis for siteing the portions of proposed new construction which fall within the tested area in locations which are free of significant archeological deposits.

VII. Description of proposed archeological project

a) Historical Background

The Pennsylvania Mainline Canal system, of which the Allegheny Portage Railroad was a key link, represents an important example of the network of transportation arteries constructed during the late eighteenth and early nineteenth centuries. Part of a general interest in internal improvements, the turnpikes, canals and, increasingly, railroads contributed to a veritable transportation revolution (cf. Taylor 1951). These new routes served as paths for migration and population expansion as well as facilitating a tremendous increase in the flow of commodities between the seaboard population centers and the vast rural hinterland.

A canal link between western Pennsylvania and the eastern part of the state was proposed as early as 1790 (Clemensen nd:1). However, it was competition for the lucrative western trade posed by New York State's construction of the Erie Canal which sparked development of the Pennsylvania Mainline Canal system. By 1824, with New York's canal partially functional, and the remainder nearing completion, the Pennsylvania legislature established a Canal Commission to begin planning in ernest for the construction of a canal system, of almost 400 miles in length, to traverse the state (Toogood 1973:1).

The topographic difficulties, including the extreme elevation of the Allegheny front, led the Canal Commissioners to eventually settle on a design involving a combination of river improvements, canal cuts, railroad segments and incline planes. In 1833 the Canal Commission granted a contract for the construction of a structure to house the first of two steam engines required to provide the motive power to haul cargo, passengers, and eventually canal boats themselves, up incline plane number 6. The following year the structure was expanded to accommodate a second engine (Toogood 1973:81-82).

Engine House 6, like others in the system, was beset with problems almost from the start. In 1836 structural alterations were made to the building and plant at the engine house, including rebuilding of the foundations. Additional foundation work and partial rebuilding of the stacks were required a short two years later. The years 1840, 1844, 1846, 1849 all saw additional repairs to the structure or equipment; in 1850 the foundations and superstructure of Engine House 6 were rebuilt. A catastrophic explosion in the north engine room in 1852 killed three and caused damage requiring repairs to both the equipment and structure. By 1855, when the Portage Railroad shut down, Engine House 6 had witnessed numerous phases of repair and rebuilding (Toogood 1973:82-83).

b) Archeological Background

Previous archeological work at Engine House 6 is summarized in the Archeological Data Section of the Historic Structure Report for the eastern slope of the Allegheny Portage Railroad NHS (Zitzler 1990).

c) Project Methodology (see Figure 2)

The goals of the project are to 1) assess the nature and degree of historic and recent disruption to the remains of the southern portion of Engine House 6, and 2) to determine, if possible, the location, configuration and construction details of the south wall of the engine room and the south wall of the engine house.

Both machine assisted and hand excavation techniques will be employed. Machine excavations, using a backhoe directed by project archeologists, is required in order to remove the large amounts of overburden above historic features. Archeological features are expected to be encountered at a depth of between 2 and 8 feet below current grade. Hand excavation will be utilized to provide final clearing of features to insure that no damage is done to archeological remains by heavy equipment.

The artifact recovery strategy employed during excavation will include selective artifact recovery within fill deposits covering the archeological features and full recovery of primary deposits. Twenty gallon samples from each fill strata will be screened through 1/4" mesh, during excavation of the remaining material from these strata diagnostic artifacts will be retained on a

selective basis. All soil from intact primary deposits will be screened during excavation, and the artifacts retained.

Cross trenching in Area A will be conducted first, employing a backhoe. The six trenches will be placed as indicated on Figure 2, and will be excavated to a depth sufficient to identify undisturbed subsoil, or until primary archeological deposits are encountered. The network of cross trenches will establish stratigraphic control for the site and allow the recordation of stratigraphic profiles.

After establishment of stratigraphic control, machine stripping will be employed to remove overburden in Area A. Machine assisted excavation will be carried out to a depth sufficient to expose, but not to disturb, primary archeological deposits and features, if such deposits are not encountered excavation will continue to subsoil.

If Archeological features are exposed by the stripping operation they will be mapped and photographed. A five foot grid will then be established and a minimum of four five foot square excavation units will be hand excavated to subsoil.

VIII. Location and areal limits of the project

Allegheny Portage Railroad National Historic Site is situated in the counties of Blair and Cambria in the state of Pennsylvania (Fig. 1).

IX. National Register information

The Allegheny Portage Railroad is listed on the National Register of Historic Places. Where appropriate the results of this study will be used to update the National Register form.

X. File search results and previous research

Numerous small archeological projects have been conducted at Allegheny Portage NHS (Aivazian 1978, Biermann 1977 and 1978, Gruber n.d., Fiero et. al. 1984, Larrabee 1967, Manfredo 1967, Orrence and Zitzler 1989, Parrington 1980, and Zitzler 1985). The finding of this project will supplement this body of work, as well as addressing specific questions not answered by these earlier excavations.

XI. Collections management and conservation

All notes, photographs, drawings and other project documentation, along with any artifacts recovered, will be delivered, by hand, to the Allegheny Portage NHS upon completion of the project. All field documentation returned to the park will be supplied in a form acceptable for long term archival storage. Paper records will be supplied on acid free and lignin free stock.

Artifacts will be conserved and curated according to National Park Service standards, and cataloged according to the Automated National Catalog System (ANCS). A paper copy of the ANCS catalogue, on standard ANCS Museum Record cards, and a machine readable copy of the catalogue will be provided with the collection, at the Parks request.

All recovered artifacts will be delivered to the Park in corrugated, vented, boxes. The boxes will be of an acid free composition. Artifacts within the boxes will be packaged in vented zipper sealed plastic bags, and will be packaged separately by ANCS catalogue number, with an acid free label in each bag carrying the appropriate catalogue number.

Project funds amounting to twenty percent of the total budget for archeological investigation have been reserved for the cataloging, stabilization and storage of the recovered artifact assemblage in compliance with Special Directive 87-3, July 16, 1987, "Conservation of Archeological Resources".

XII. Project schedule

Archeological excavations will require 3 to 4 weeks. A management report summarizing project findings will be distributed within six weeks of the completion of fieldwork. A draft of the technical report for this phase of the project will be distributed for review within 12 month of the completion of the fieldwork.

Project fieldwork will commence approximately one week after approval of this Work Plan.

XIII. References

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XIV. Cost estimate:

Funds in the amount of $35,000 have been allocated for the completion of this project.

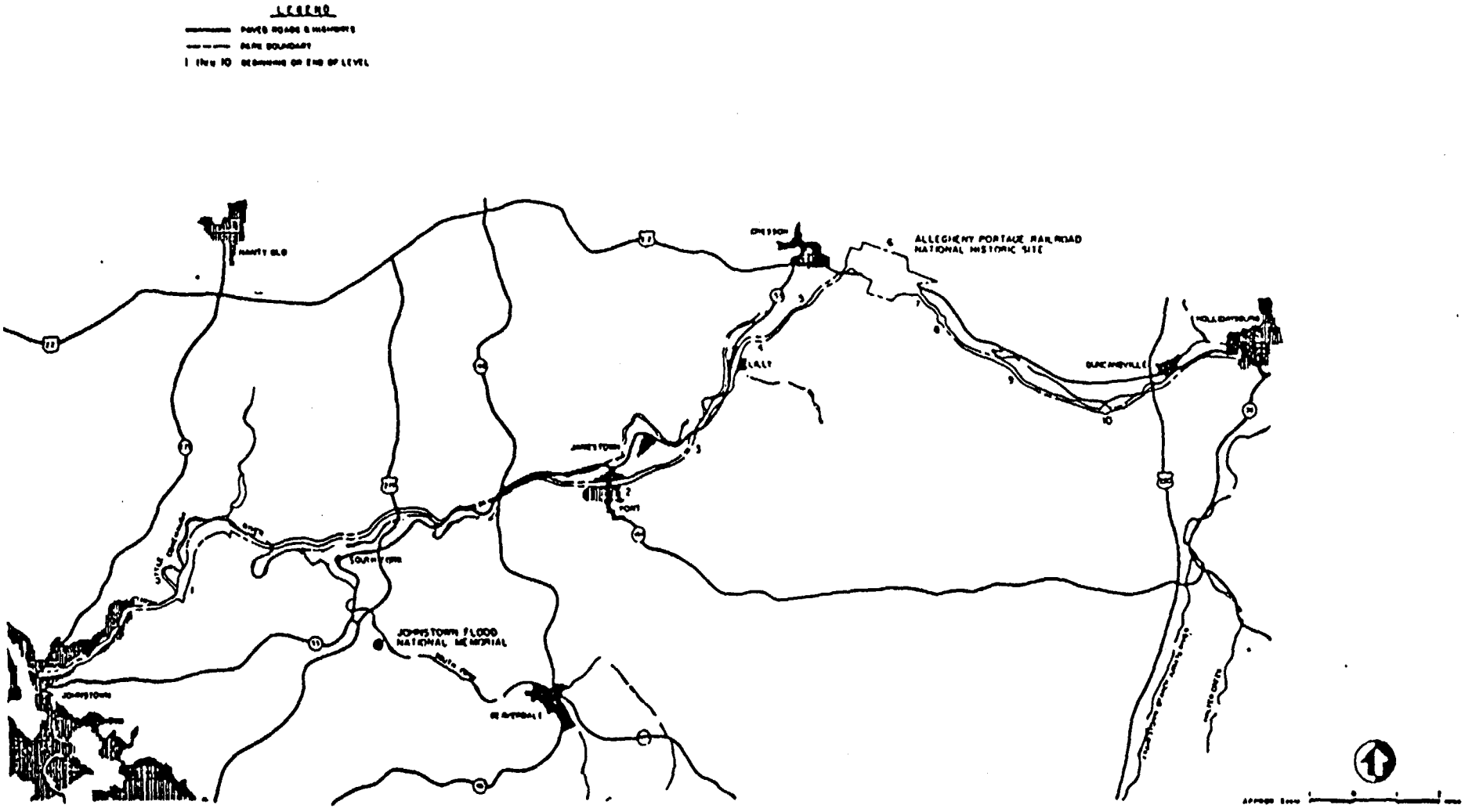


Figure 1. Location of Allegheny Portage Railroad National Historic Site.

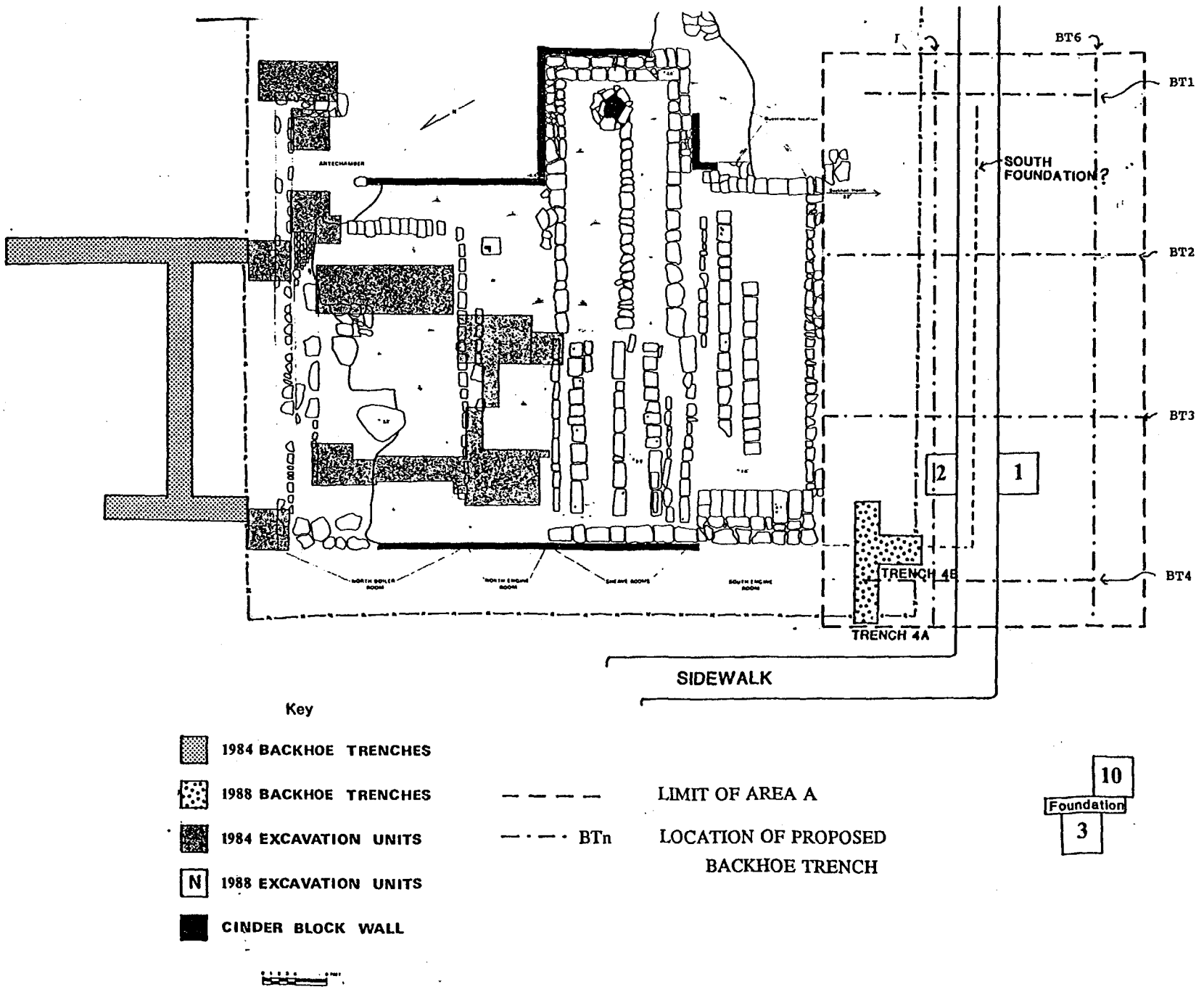

BT6
BT1
SOUTH FOUNDATION?
BT2
BT3
2
1
TRENCH 4B
BT4
TRENCH 4A
SIDEWALK
Key
1984 BACKHOE TRENCHES
1988 BACKHOE TRENCHES
1984 EXCAVATION UNITS
N
1988 EXCAVATION UNITS
CINDER BLOCK WALL
LIMIT OF AREA A
BTn
LOCATION OF PROPOSED BACKHOE TRENCH
10
Foundation
3

FIGURE 2

APPENDIX R: EXHIBIT COST ESTIMATES AND REPORT ON THE PLACING AND CONFIGURATION OF THE ORIGINAL MACHINERY, ENGINE HOUSE 6 BY F. R. CONNACHER

COST ESTIMATE SUBMITTED BY F. R. CONNACHER
OF THE FULL-SIZE STATIC EXHIBITS TO BE PLACED
IN THE SUMMIT LEVEL NO. 6 EXHIBIT SHELTER
STRUCTURE AT THE ALLEGHENY PORTAGE RAILROAD
NATIONAL SITE, CRESSON, PENNSYLVANIA

Item 1 - One full scale static exhibit of a two cylinder stationary steam engine complete as shown on drawing E-1 by F. R. Connacher, finished-painted and in place but not including the Glu-Lam support or the steel support under the Glu-Lam support.

Labor cost:	
900 hrs. @ $30.00 per hr.	$27,000.00
Materials:	
Construction materials including misc. construction materials	6,092.00
Total if N.P.S. furnishes the materials	$33,092.00
If builder supplies the materials the following to be added:	
Loan interest on $6,092	1,436.00
Pennsylvania state sales tax	366.00
Total	$34,894.00

Item 2 - One full scale static exhibit of the Vertical and Horizontal Sheave area as shown on drawing E-2 by F. R. Connacher consisting of two (2) 8' 6" outside diameter vertical sheaves, three (3) 48" P.D. spur gears, thirteen (13) pillow blocks, two (2) box couplings, two (2) alignment couplings, one (1) horizontal 10' 3" outside diameter sheave, one (1) horizontal sheave carriage, one (1) chain sheave support with bearings, sheave, and with sufficient chain to enter and disappear in the weight well, 200' of 2" diameter rope finished and in place with tension weights, one (1) 48" diameter friction brake wheel with brake band and operating lever* and one (1) complete water brake unit. Item No. 2 does not include the Glu-Lam and steel support under the above named items.

Labor cost:	
838 hrs. @ $30.00 per hr.	$25,140.00
Materials:	
Construction materials including misc. construction materials	7,725.00
Total if N.P.S. furnishes the materials	$32,865.00
If builder supplies the materials the following to be added:	
Loan interest on $7,725	1,844.00
Pennsylvania state sales tax:	464.00
Total	$35,173.00

* Not shown on Drawing E-2

Item 3 - One full scale static exhibit of a steam boiler unit complete with chimney to the inside roof line of the Exhibit Shelter Structure complete as shown on drawing E-3 by F. R. Connacher and including steam piping to the engine exhibit, item No. 1.

Labor cost:	
403 hrs. @ $30.00 per hr.	$12,090.00
Materials:	
Construction materials including misc. construction materials	6,377.00
Total if N.P.S. furnishes the materials	$19,032.00
If builder supplies the materials the following to be added:	
Loan interest on $6,377	1,529.00
Pennsylvania state sales tax	417.00
Total	$20,978.00

A REPORT EXPLAINING THE CONCLUSIONS REACHED BY
F. R. CONNACHER REGARDING THE PLACING AND CONFIGURATION
OF THE ORIGINAL MACHINERY ONCE LOCATED IN THE ENGINE
HOUSE OF LEVEL NO. 6 OF THE ALLEGHENY PORTAGE RAILROAD.

Subject: The full size static exhibits of the Engine, Vertical amd Horizontal Sheave Area and the Boiler as shown on drawings E-1, E-2, and E-3 to be built and installed by F. R. Connacher in the proposed Engine House Exhibit Shelter of Level No. 6 at the Allegheny Portage Railroad National Historical Site, Cresson, Pa.

In response to a request by Mr. Ken Bennett of the National Park Service that I document how I established the information that I show on my drawings, E-1, E-2, and E-3 depicting the machinery once used in the No. 6 Engine House, I submit the following:

Although much research has been done relating to the Engine House No. 6 and its contents by myself and others, it is my conclusion that the most accurate description of the machinery in question was presented by Mr. Sylvester Welch, Chief Engineer of the Allegheny Railroad, to Mr. Samuel Jones, Superintendent of the Western Division Canal in a report dated Nov. 1, 1833. This in its entirety is presented in a booklet published by the American Canal Center titled Sylvester Welch's Report on the Allegheny Portage Railroad.

During the early 1970's shortly after the No. 6 Engine House foundation excavation, I did an extensive study of the foundation site and at that time realized that Mr. Welch's description of the machinery and its placement fit perfectly. From Mr. Welch's description and my findings at the foundation pit, I made a drawing which may be seen on the rear fold-out flap of the above mentioned booklet.*

The Vertical and Horizontal Sheave Area

The information given by Mr. Welch and the measurements I took

* See illustration 40.

at the Vertical and Horizontal Sheave area left little doubt in my mind as to the arrangement, details, and size of all the equipment located in this area of the structure. My Exhibit drawing E-2 shows this in detail.

The South Hoist Engine

As for the Engine Area of the South Engine, my at the site measurements located and sized the engine base and many of the other important components were sized and described by Mr. Welch's report such as the piston diameter of 14 inches and a stroke of 60 inches, two cylinders, no flywheel, the two cranks placed 90 degrees to one another, the speed of 14 revolutions per minute and etc. All this was helpful but much of the detail such as the steam chest location in relation to the cylinders, the type of valve train mechanism, the actual length of the connecting rods and etc., was unanswered and to this date no one has provided, to my knowledge, drawings or any further information regarding these details of the engine.

The fact that my father serviced and adjusted stationary steam hoist engines and left me with a wealth of information and books on the subject, I believe the Engine Exhibit drawing E-1 is as near as I can come to presenting an acceptable facsimile of the original.

It is my consensus, and as indicated by the drawing E-1, that the engine was a self-contained, double-acting, non-condensing steam engine with 2 cylinders having 14 inch diameter pistons and a 60 inch stroke with cranks positioned 90 degrees apart and with a cast iron Box-Bed frame 7 feet wide and 28 feet, 10 inches long.

Because of the 2 cylinder arrangement on a single Box-Bed frame,

I believe the steam chests were side-mounted between the cylinders and had a common steam inlet pipe and a common exhaust outlet. This arrangement facilitated a less complicated valve operating mechanism. The horizontal crosshead shown on my Exhibit Engine drawing E-1 is the type most commonly used on the Box-Bed engines of this period.

I show a 15 feet center of wrist pin to center of crank pin connecting rods which is the maximum of the suggested 4 to 6 times the crank distance center to center (2.5 ft.). The longer connecting rod, because of connecting rod angularity would lessen the difference in the points of cut-off which was probably considered by the original designer.

The size of the steam port and the steam pipe supplying the engine was established by the following formula:

b = area of exhaust port and pipe in sq. inches

c = area of steam pipe leading to engine

d = piston speed in feet per minute

e = area of piston in sq. inches

$$c = \frac{d\ e}{6,000}$$

$$c = \frac{140 \times 154}{6,000}$$

$$c = 3.59 \text{ sq. inches}$$

Two (2) cylinders being supplied equals 3.59 x 2 = 7.18 sq. inches. Area of a 3" pipe equals 9.62 sq. inches - use a 3" pipe.

The size of the exhaust pipe was established by the formula:

$$b = \frac{d\ e}{4,000}$$

$$b = \frac{140 \times 154}{4,000}$$

$$b = 5.39 \text{ sq. inches}$$

Two (2) cylinders exhausting the steam chest equals 5.39 x 2 equals 10.78 sq. inches. Area of a 4" pipe equals 12.57 sq. inches - use a 4" pipe.

The steam distributing valves (one for each cylinder) are assumed to be the simple "D" type direct acting slide valves commonly used in the early 19th century. I believe the slide valves were designed to provide the cylinders full steam pressure for the entire stroke (giving maximum power with a loss of efficiency) in lieu of early cut-off and the use of expanding steam.

My reasons for this line of thought are the following:

1. The engines were slow turning (14 r.p.m.) and they required unchanging power for the entire length of the incline.
2. The engine was required to run only seven or eight minutes at a time unlike an engine required to run for long periods with varying power requirements.
3. The time lapse between hauls would allow for steam pressure build-up in the boilers.

As there is no information regarding the type of valve operating mechanism, I am of the belief that there was one (1) eccentric for each cylinder and a grab hook type valve linkage arranged for stopping and for allowing steam into the opposite end of the cylinder for

braking or reversing.

The main shaft (crank) bearings shown are a type and configuration of larger bearing blocks used on Box-Bed steam engines of this period.

It is evident that some of these opinions are conjecture on my part but for lack of more explicit information I feel the engine shown on drawing E-1 would be a working steam engine if built with materials for that purpose.

The South Boiler

In Mr. Welch's report (mentioned previously) the boiler unit for each engine was comprised of three cylindrical boilers each 30 inches in diameter and 20 feet long. The boilers were made of one-quarter inch rolled plate.

There is no mention in this report of these boilers having tubes and it is my opinion that they were simple cylindrical boilers with flat, thick, cast iron heads. The boilers were enclosed by side walls of brick. The boilers were supported by means of hooks from channel beams laid across the brick sidewalls. The side walls are supported and kept from buckling by buckstaves with two bolts each reaching the entire width of the boiler unit (four buckstaves on each side.)

Another reason for believing that the boilers were the simple non-tube type is the location of the smoke chimneys shown on most illustrations as being on the west end of the engine house. A tube type boiler would have the chimney most usually on the fire door end of the unit which would have placed the chimneys on the east end of the structure.

The outside dimensions of the Boiler Exhibit are shown on drawing E-3 and a sectional view on my drawing on the rear fold-out flap of the previously mentioned booklet.

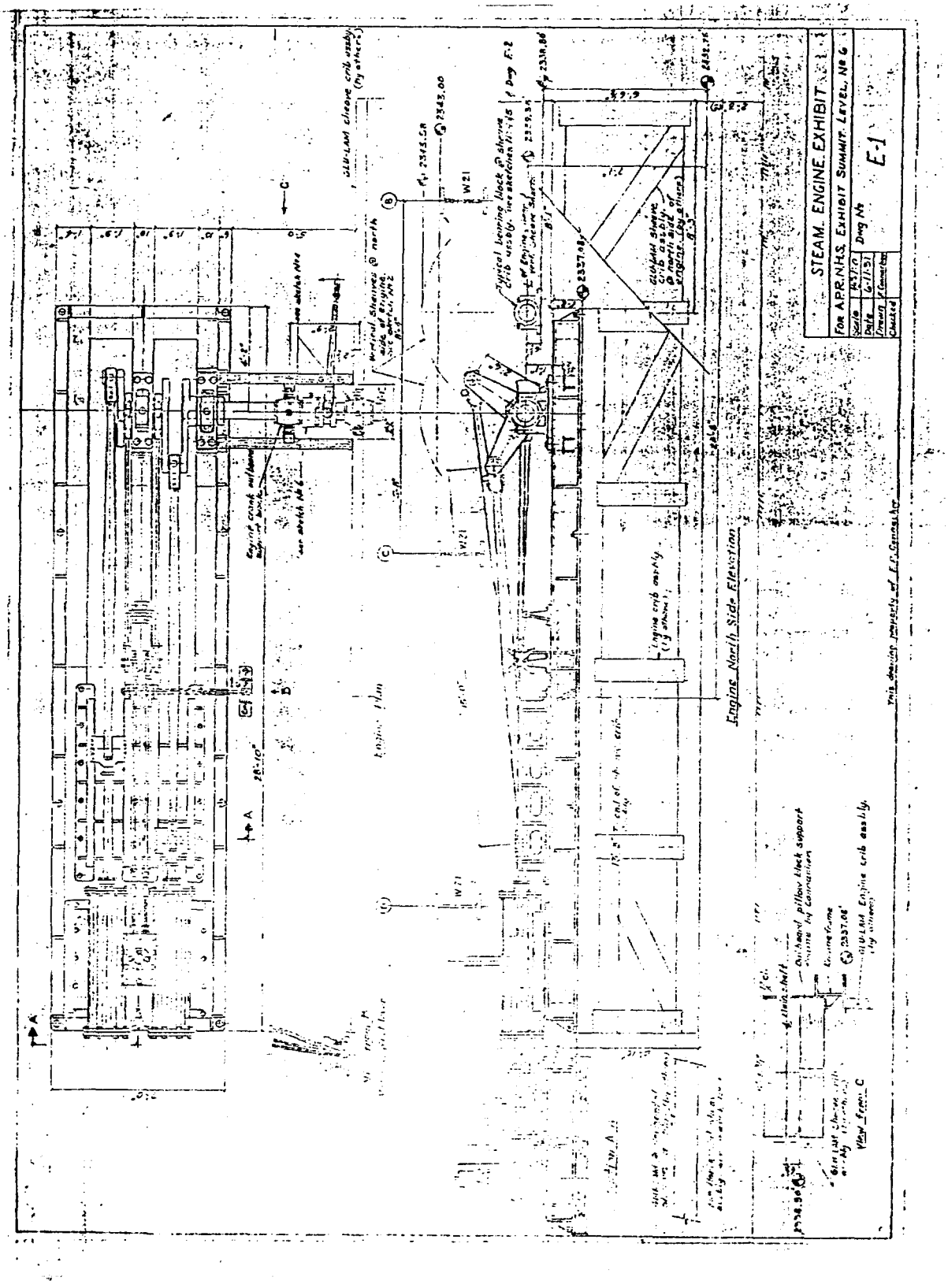
Steam domes, safety valves, piping to the engine (sized in the engine description) valves, gauge-cocks, manholes, pressure gauge, fire and ashpit doors all of the type used in the early 1800's will be depicted on the boiler exhibit as shown on drawing E-3.

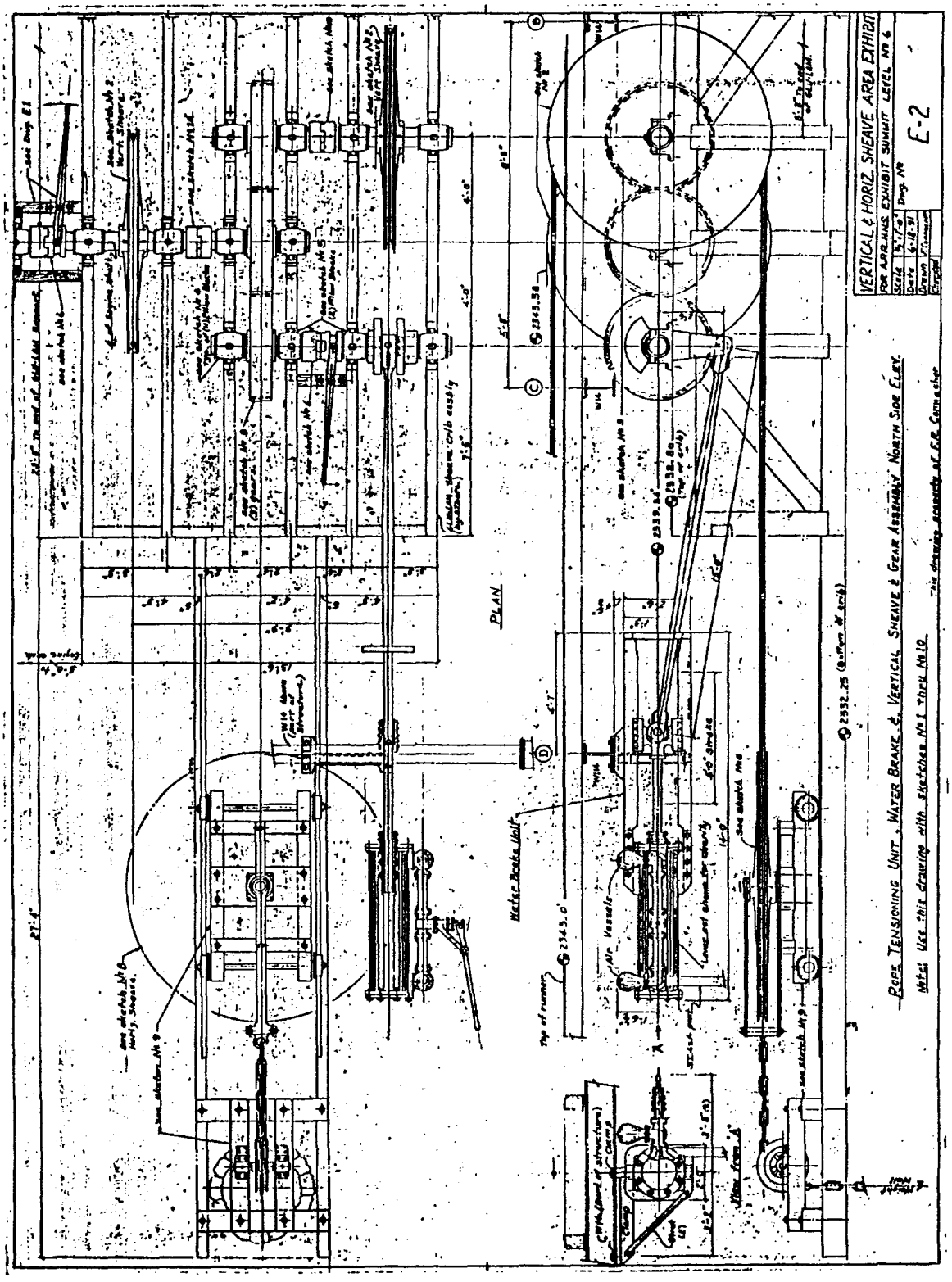
In submitting this report up to the time of construction I would be willing to make changes necessitated by findings of anyone who would furnish verified information pertaining to the actual configuration ie., original drawings, written information, etc., concerning any part of the exhibits in question.

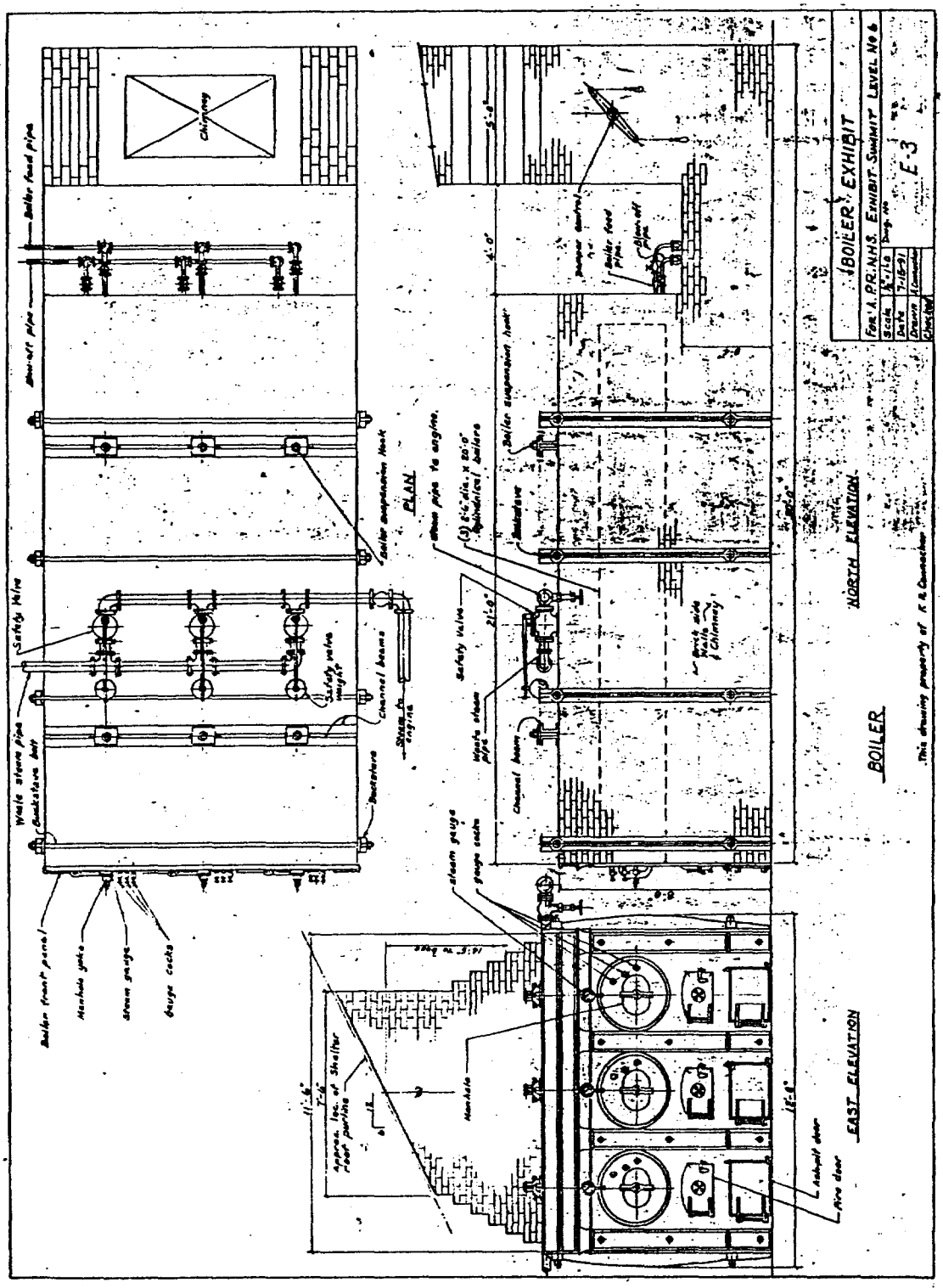
F. R. Connacher

F. R. Connacher

Builder of Exhibits


STEAM. ENGINE. EXHIBIT
For A.P.R.N.H.S. Exhibit Summit Level, No 6
Engine North Side Elevation
E-1


VERTICAL & HORIZ SHEAVE AREA EXHIBIT
FOR ARB-HAS EXHIBIT SUMMIT LEVEL No 6
E-2
PLAN
ROPE TENSIONING UNIT, WATER BRAKE & VERTICAL SHEAVE & GEAR ASSEMBLY NORTH SIDE ELEV.
Water Brake Unit
Air Vessels
Top of runners
2343.0
2339.84
2338.80
2332.25
2343.38


BOILER EXHIBIT
For A.P.R.N.H.S. Exhibit Summit Level No 6
E-3
PLAN
NORTH ELEVATION
EAST ELEVATION
BOILER
Chimney
Safety Valve
Steam gauge
Gauge cocks
Manhole
Boiler front panel
Waste steam pipe
Channel beams
Boiler suspension hook
Safety valve weight
Steam to engine
Waste steam pipe
Brick wall of Chimney
Ashpit door
Fire door
This drawing property of P.R.R. Association

APPENDIX S: ENGINEERING COST ESTIMATES FOR MINIMUM TREATMENT

All costs are class C estimates and are figured in 1991 dollars.

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
CULVERT 1342					
1.	Archeological monitoring	20	HRS	$ 200	$ 4,000
2.	Structural engineering investigation	20	HRS	200	4,000
	Subtotal				$ 8,000
Inlet (South)					
1.	Remove trees (100′ × 54′)	0.124	ACRE	12,000	1,490
2.	Excavate and reopen buried culvert (15′ × 8′ × 5′)	23	CY	100	2,300
3.	Remove debris, regrade drainage (42′ × 20′)	840	SF	2	1,680
4.	Replace void areas with riprap	150	SF	5	750
5.	Stabilize dislodged voussoirs	30	LF	100	3,000
	Subtotal				$ 9,220
Trace					
1.	Crown trace (3% slope)				
	a. Install membrane fabric to seal (30′ × 100′)	3,000	SF	2	6,000
	b. Regrade	3,000	SF	1.17	3,500
	c. Add fill	15	CY	20	300
	d. Reseed and add excelsior matting (40′ × 150′)	6,000	SF	0.50	3,000
	Subtotal				$12,800
Outlet (North)					
1.	Remove trees (100′ × 54′)	0.124	ACRE	12,000	1,490
2.	Remove existing swale	20	CY	20	400
3.	Regrade (20′ × 25′)	60	SY	10	600
4.	Excavate buried culvert (15′ × 8′ × 5′ = 600 SF)	23	CY	100	2,300
5.	Stabilize dislodged voussoirs	30	LF	100	3,000
6.	Regrade drainage path (30′ × 20′ = 600 SF/9 SF)	70	SY	10	700
7.	Remove debris and vegetation (61′ × 32′ = 1,355 SF)		LS		400
8.	Stabilize and clean well, relay stone masonry	25	SF	25	625
	Subtotal				$ 9,515
	Total – Culvert 1342 (minimum treatment)				**$39,535**
CULVERT 1356					
1.	Archeological monitoring	20	HRS	$200	$4,000
2.	Structural engineering inspection	20	HRS	200	4,000
	Subtotal				$8,000
Inlet (South)					
1.	Remove trees (20′ × 50′/43,560 SF)	.023	ACRES	12,000	275
2.	Remove rubble	10	CY	50	500
3.	Remove vegetation and debris (25′ × 17′)	425	SF	2	850
4.	Regrade channel (20′ × 20′)	400	SF	5	2,000
5.	Dismantle and relay headwall (15′ × 5′)	75	SF	25	1,875
	Subtotal				$ 5,500

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
Trace					
1.	Crown trace (3% slope)				
	a. Membrane fabric to seal (30′ × 50′)	1,500	SF	2	3,000
	b. Regrade	1,500	SF	2	3,000
	c. Add fill (1,500 SF/27 CF)	56	CY	20	1,120
	d. Reseed and add excelsior matting	2,000	SF	3	6,000
	e. Install modern culvert bypass with headwalls	70	LF	100	7,000
	Subtotal				$20,120
Outlet (North)					
1.	Remove trees (20′ × 50′/43,560 SF)	.023	ACRES	12,000	275
2.	Remove rubble and refuse	72	SF	25	1,800
3.	Remove debris and vegetation (30′ × 32′)	960	SF	2	1,920
4.	Excavate and open culvert	3	CY	100	300
5.	Regrade channel (15′ × 10′)	150	SF	5	750
	Subtotal				$ 5,045
	Total – Culvert 1356 (minimum treatment)				**$38,665**
CULVERT 1382					
1.	Archeological monitoring	20	HRS	$200	$ 4,000
2.	Structural engineering investigation	20	HRS	200	4,000
	Subtotal				$ 8,000
Inlet (South)					
1.	Dismantle and relay stone culvert (24′ × 6′ × 2′)	288	CF	25	7,200
2.	Construct new concrete retaining wall and footings (26′ × 12′ × 1′)	12	CY	500	6,000
3.	Clean stone, remove moss (24′ × 6′)	144	SF	5	720
4.	Remove and regrade fill behind retaining wall (6′ × 6′ × 20′)	27	CY	50	1,350
5.	Clean and remove drainage (35′ × 10′ × 1′)	13	CY	25	325
6.	Clean embankments, remove debris (19′ × 45′)	855	SF	2	1,710
7.	Remove trees, vegetation (20′ × 50′/43,560 SF)	0.02	AC	12,000	240
	Subtotal				$17,545
Trace					
1.	Crown trace (3% slope)				
	a. Install membrane fabric to seal (30′ × 100′)	3,000	SF	2	6,000
	b. Regrade	3,000	SF	2	6,000
	c. Add fill (3,000 SF/27 CF)	110	CY	20	2,200
	d. Reseed and add excelsior matting (30′ × 100′)	3,000	SF	0.50	1,500
2.	Bury sleepers on trace with wood chips	1.5	CY	300	450
	Subtotal				$16,150
Outlet (North)					
1.	Dismantle and relay stone culvert (24′ × 6′ × 2′)	288	CF	25	7,200
2.	Construct new concrete retaining wall and footings (26′ × 12′ × 1′/27 CF)	12	CY	500	6,000
3.	Clean stone, remove moss (24′ × 6′)	144	SF	5	720
4.	Remove and regrade fill behind retaining wall (6′ × 6′ × 20′/27 CF)	27	CY	50	1,350
5.	Clean and remove drainage (35′ × 10′ × 1′ = 350 CF/27 CF)	13	CY	25	325
6.	Clean embankments, remove debris (19′ × 45′)	855	SF	2	1,710
7.	Remove trees, vegetation (20′ × 50′/43,560 SF)	0.02	AC	12,000	240
	Subtotal				$17,545
	Total – Culvert 1382 (minimum treatment)				**$59,240**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
	SKEW ARCH BRIDGE				
1.	Complete interim repairs; reset steps; conduct repointing tests; investigate best way to waterproof		LS		$ 10,000
2.	Reopen barrel's top, remove loose materials (wood chips, soil, gravel, clay, etc.)	30	CY	$25	$ 750
3.	Replace materials above barrel (25′ × 16′ × 2′)	30	CY	25	750
4.	Remove trees, cut flush (6 small, 4 large)	10	EA	500	5,000
5.	Remove vegetation and debris	600	SF	2	1,200
6.	Repair stone bridge and stairs	5,720	SF	15	85,800
7.	Clean, rake, and repoint masonry joints	5,820	SF	15	87,300
8.	Regrade and provide new drainage (88′ × 55′ × 1′)	4,840	CF	5	24,200
9.	Install matting	600	SY	4	2,400
10.	Install French drain	1,400	LF	20	28,000
11.	Install new culvert with head wall (24″)	600	lf	40	24,000
12.	Install water-proof membrane or plastic liner (60′ × 40′)	2,400	SF	3	7,200
13.	Complete installation of 6″ PVC as recommended in 1979 contract documents	200	LF	40	8,000
	Subtotal				284,600
14.	Contingency (15%)				42,690
	Total – Skew Arch Bridge				**$327,290**
	CULVERT 1464				
1.	Archeological monitoring	20	HRS	$200	$ 4,000
2.	Structural engineering investigation	5	HRS	200	1,000
	Subtotal				$ 5,000
	Inlet (South)				
1.	Clean out existing debris (2-man crew, 20 hrs)	40	HRS	50	$ 2,000
	Trace				
1.	Crown trace (3% slope)				
	a. Install membrane fabric to seal ([25′+18′] × 25′)	1,075	SF	2	2,150
	b. Replace 6 inches of existing topsoil	1,100	SF	1	1,100
	c. Reseed and add excelsior matting	1,200	SF	0.5	600
	Subtotal				$ 5,850
	Outlet (North)				
1.	Remove trees, vegetation, debris		LS		5,250
2.	Video inspection	3	HRS	200	600
3.	Clean drainage path and channel	100	SF	2	200
4.	Relay stone culvert	37	SF	25	925
5.	Use Instituform to stabilize culvert	20	LF	300	6,000
	Subtotal				$12,975
	Total – Culvert 1464 (minimum treatment)				**$25,825**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
CULVERT 1490					
1.	Archeological monitoring	8	HRS	200	$ 1,600
Inlet (South)					
	No Evidence - Leave in present state				
Trace					
1.	Light regrading to remove ruts	16	HRS	100	1,600
2.	Reseed (40′ × 40′)	1,600	SF	0.5	800
	Subtotal				$ 2,400
Outlet (North)					
1.	Remove trees (25′ × 50′/43,560 SF)	0.029	AC	12,000	345
	Total - Culvert 1490 (minimum treatment)				**$ 4,345**
CULVERT 1503					
1.	Archeological monitoring	20	HSR	$ 200	$ 4,000
2.	Structural engineering investigations	20	HSR	200	4,000
	Subtotal				$ 8,000
Inlet (South)					
1.	Construct new drain system to bypass historic culvert; drop inlet with graded rock cover (24″ PVC pipe × 150′)	1	EA	3,000	3,000
2.	Stabilize culvert and dislodged stones in embankment (6′ × 13′)	78	SF	25	1,925
3.	Reset loose embankment stones	25	SF	25	625
	Subtotal				$ 5,550
Trace					
1.	Crown trace (3% slope)				
	a. Install membrane fabric to seal (25′ × 100′)	2,500	SF	2	5,000
	b. Regrade 3,000 SF	3,000	SF	2	6,000
	c. Add fill (3,000 SF)	110	CY	20	2,200
2.	Remove vegetation (93′ × 25′)	2,325	SF	2	4,650
	Subtotal				$17,850
Outlet (North)					
1.	Remove trees (40′ × 100′)	0.09	AC	$ 12,000	$ 1,100
2.	Remove debris, relay loose riprap (14′ × 15′)	25	SY	50	1,250
3.	Remove vegetation	210	SF	2	420
4.	Clean and regrade drainage (30′ × 5′)	150	SF	5	750
5.	Excavate, shore, and construct headwall and footing				
	Excavate (20′ × 6′ × 10′):	45	CY	100	4,500
	Shoring:		LS		1,000
	Concrete (26′ × 1′ × 12′):	12	CY	500	6,000
6.	Relay original stone masonry head/wing wall as veneer	120	LF	25	3,000
	Subtotal				$18,020
	Total - Culvert 1503 (minimum treatment)				**$49,420**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
CULVERT 1532					
1.	Archeological monitoring	20	HRS	$ 200	$ 4,000
2.	Structural engineering investigation	20	HRS	200	4,000
	Subtotal				$ 8,000
Trace (First Priority)					
1.	Construct temporary shoring: 80 crew hrs (3 men @ $30/hr.); materials (lumber, etc.)		LS		10,000
2.	Uniformly remove earth fill (16′ × 16′ × 30′)	285	CY	100	28,500
3.	Remove 14″ cast-iron pipe	200	LF	50	10,000
4.	Redirect cast-iron pipe	200	LF	50	10,000
5.	Place 8″ reinforced concrete backing line (0.67′ × 55′ × 56′)	76	CY	500	38,000
6.	Water seal		LS		200
	Subtotal				$96,700
Inlet (South) and Outlet (North)					
1.	Remove vegetation and debris:				
	Remove trees	12	EA	200	2,400
	Clean area (15′ × 28′)	420	SF	5	2,100
2.	Remove and relay 50 voussoirs (24″ × 20″ × 10″)	5.5	CF	100	550
3.	Reconstruct wing walls (7′ × 14′ × 4′)	400	CF	25	10,000
4.	Repoint barrel (25′ × 13′)	325	SF	15	3,400
5.	Replace void area with stone	36	SF	25	3,400
6.	Remove eroded soil from streambed (16′ × 6′ × 3′)	10.7	CY	100	1,100
7.	Clean streambed (309′ × 18′ × 2′)	1,080	CF	5	5,400
	Subtotal				$28,350
	Total – Culvert 1532 (minimum treatment)				**$133,050**

CULVERT 1586					
1.	Archeological monitoring	30	HRS	$200	$ 6,000
2.	Structural engineering investigation	20	HRS	200	4,000
	Subtotal				$10,000
Inlet (South)					
1.	Remove all trees (500′ × 80′)	0.92	AC	12,000	11,100
2.	Install shoring at inlet to prevent further collapse		LS		5,000
3.	Remove vegetation, debris, rubble at inlet (26′ × 10′ × 30′)	280	CY	25	7,000
4.	Remove debris, vegetation above culvert (50′ × 30′)	1,500	SF	5	7,500
5.	Clean debris from 4′ barrel	15	LF	100	1,500
6.	Install upstream velocity inhibitors		LS		10,000
7.	Relay dislodged stone arch and riprap face with original materials (50′ × 50′)	2,500	SF	25	62,500
8.	Video inspect culvert	8	HRS	300	2,400
	Subtotal				$107,000
Trace					
1.	Crown trace (3% slope)				
	a. Install membrane fabric to seal (20′ × 100′)	2,000	SF	$2	$ 4,000
	b. Regrade	2,000	SF	1	2,000
	c. Add fill ((0.5′ × 20′ × 100′)	37	CY	20	740
	d. Reseed and add excelsior matting	2,000	SF	0.5	1,000
	Subtotal				$ 7,740
Outlet (North)					
1.	Video inspect modern culvert	8	HRS	300	2,400
	Total – Culvert 1586 (minimum treatment)				**$127,140**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
CULVERT 1624					
1.	Archeological monitoring	10	HRS	$200	$ 2,000
Inlet (South)					
1.	Remove vegetation, debris	320	SF	5	1,600
2.	Cut trees flush with grade	4	EA	200	800
3.	Remove moss by washing with clear water and brushing from stone (7′ × 30′)	210	SF	3	630
4.	Remove parging and repoint (7′ × 30′)	210	SF	15	3,150
	Subtotal				$ 6,180
Trace					
1.	Excavate existing sod and soil (30′ × 30′ × 1′)	35	CY	25	875
2.	Install moisture barrier (35′ × 50′)	1,750	SF	2	3,500
3.	Reseed (35′ × 50′)	1,750	SF	0.5	875
	Subtotal				$ 5,250
Outlet (North)					
1.	Clean out moss, remove vegetation;	1,000	SF	5	5,000
	remove debris in channel	320	SF	5	1,600
2.	Cut trees	2	EA	200	400
3.	Remove moss by washing with clear water and brush from stone	210	SF	3	630
4.	Remove parging and repointing from stone culvert	210	SF	15	3,150
5.	Relay dislodged step wing stone		LS		2,200
	Subtotal				$12,980
	Total – Culvert 1624 (minimum treatment)				**$26,410**
CULVERT 1635					
1.	Archeological monitoring	20	HRS	$200	$ 4,000
2.	Structural engineering investigation	20	HRS	200	4,000
	Subtotal				$ 8,000
Trace (First Priority)					
1.	Construct temporary shoring (40′ × 35′)		LS		15,000
2.	Excavate trace	200	CY	25	5,000
3.	Construct 8″ reinforced concrete backing liner (0.67′ × 40′ × 35′)	35	CY	500	17,500
4.	Install moisture barrier (40′ × 40′)	1,600	SF	2	3,200
5.	Compact and regrade	200	CY	25	5,000
6.	Resod	200	SY	9	1,800
	Subtotal				$47,500
Inlet (South) and Outlet (North)					
1.	Remove debris, vegetation (40′ × 20′ × 2′)	1,600	CF	5	8,000
2.	Remove debris from streambed (35′ × 35′ × 2′)	2,450	CF	2	4,900
3.	Remove sandbags	450	CF	2	900
4.	Remove 5′ corrugated metal pipe	8	LF	50	400
5.	Relay dislocated voussoirs		LS		2,000
6.	Relay dislocated stone walls	200	SF	25	5,000
7.	Reinstall dislodged barrel stone and void areas	50	SF	50	2,250
	Subtotal				$23,450
	Total – Culvert 1635 (minimum treatment)				**$78,950**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
CULVERT 1656					
1.	Archeological monitoring	10	HRS	200	2,000
Inlet (South)					
1.	Reconstruct arch and wing walls	70	SF	50	3,500
2.	Rechannel drainage system	1,000	LF	5	5,000
3.	Clean debris and vegetation from streambed	1,000	LF	3	3,000
4.	Add velocity inhibitors to protect culvert inlet		LS		2,000
5.	Provide overflow and bypass drainage system		LS		3,000
6.	Rechannel drainage area	1,000	SF	5	5,000
7.	Clean debris and vegetation from streambed	1,000	SF	3	3,000
	Subtotal				24,500
Trace					
1.	Excavate fill above culvert	68	CY	100	6,800
2.	Install moisture barrier	32	SY	50	1,600
3.	Reopen, clean out, and reconstruct barrel (2′ × 25′ × 2′)	100	CF	100	10,000
	Subtotal				$18,400
Outlet (North)					
1.	Preserve and stabilize stone culvert		LS		2,200
2.	Reconstruct wing walls	50	SF	50	2,500
3.	Clean out channel	170	SF	25	4,250
4.	Carefully remove 16″ tree	1	EA	400	400
5.	Remove vegetation and debris	280	SF	5	1,400
6.	Fill and compact	11	CY	20	220
	Subtotal				$10,970
	Total – Culvert 1656 (minimum treatment)				**$55,870**
CULVERT 1692					
1.	Archeological monitoring	30	HRS	$200	$ 6,000
2.	Structural engineering investigation	20	HRS	200	4,000
	Subtotal				$10,000
Inlet (South)					
1.	Remove all trees (500′ × 80′)	0.92	AC	12,000	11,100
2.	Install shoring at inlet to prevent further collapse		LS		5,000
3.	Remove vegetation, debris, rubble (at inlet) (26′ × 10′ × 30′)	280	CY	25	7,000
4.	Remove debris, vegetation above culvert (50′ × 30′)	1,500	SF	5	7,500
5.	Clean debris from 4′ barrel	15	LF	100	1,500
6.	Install upstream velocity inhibitors		LS		10,000
7.	Relay dislodged stone arch and riprap face with original materials (50′ × 50′)	2,500	SF	25	62,500
8.	Video culvert	8	HRS	300	2,400
	Subtotal				$107,000
Trace					
1.	Crown trace (3% slope)				
	a. Install membrane fabric to seal (20′ × 100′)	2,000	SF	2	4,000
	b. Regrade	2,000	SF	1	2,000
	c. Add fill (0.5′ × 20′ × 100′)	37	CY	20	740
	d. Reseed and add excelsior matting	2,000	SF	0.5	1,000
	Subtotal				$ 7,740
Outlet (North)					
1.	Video modern culvert	8	HRS	300	2,400
	Total – Culvert 1692 (minimum treatment)				**$127,140**

ITEM NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL AMOUNT
	CULVERT 1697				
1.	Archeological monitoring	10	HRS	$200	$ 2,000
	Inlet (South)				
1.	Remove debris	700	SF	5	3,500
2.	Remove trees, cut flush with grade	3	EA	200	600
3.	Excavate	12	CY	100	1,200
4.	Regrade, fill, compact	24	CY	25	600
5.	Remove debris and clean barrel	40	SF	50	2,000
6.	Video inspect barrel		LS		1,500
7.	Clean and remove debris	500	SF	5	2,500
8.	Remove soil from culvert	20	CY	100	2,000
9.	Dismantle and relay stone wall	85	SF	50	4,250
	Subtotal				$18,150
	Trace				
1.	Crown trace (3% slope)				
	a. Install membrane fabric to seal ([25′+18′) × 25′)	1,075	SF	2	2,150
	b. Remove 6″ of existing topsoil and replace	1,100	SF	1	1,100
	c. Reseed and add excelsior matting	1,200	SF	0.5	600
	Subtotal				$ 3,850
	Outlet (North)				
1.	Remove trees from modern culvert	3	EA	200	600
	Total – Culvert 1697 (minimum treatment)				**$24,600**
	CULVERT 1733				
1.	Archeological monitoring	10	HRS	$200	$ 2,000
	Trace				
1.	Excavate trace, install waterproof membrane, fill, compact, and regrade		LS		5,000
	Inlet (South) and Outlet (North)				
1.	Remove and clear debris		LS		$ 2,500
2.	Cut trees		LS		1,000
3.	Excavate and install moisture barrier; fill, regrade, and compact		LS		3,000
4.	Rechink installed stone	25	SF	50	1,250
5.	Reposition dislodged stones	25	SF	50	1,250
6.	Reinstall dislodged headwall and wing walls	171	SF	50	8,550
7.	Patch broken stones with mortar	3	EA	100	300
8.	Remove moss efflorescence and vegetation	115	SF	15	1,725
	Subtotal				$19,575
	Total – Culvert 1733 (minimun treatment)				**$26,575**

SUMMARY OF ESTIMATED COSTS FOR MINIMUM TREATMENT

ITEM	TOTAL AMOUNT
Culvert 1342	$ 39,535
Culvert 1356	38,665
Culvert 1382	59,240
Skew Arch Bridge	327,290
Culvert 1464	25,825
Culvert 1490	4,345
Culvert 1503	49,420
Culvert 1532	133,050
Culvert 1586	127,140
Culvert 1624	26,410
Culvert 1635	78,950
Culvert 1656	55,870
Culvert 1692	127,140
Culvert 1697	24,600
Culvert 1733	26,575
Total	**$1,144,055**

GLOSSARY

The definitions of the following words is based on the *Dictionary of Architecture and Construction,* edited by Cyril M. Harris.

Barrel Vault. A masonry vault of plain, semicircular cross section, supported by parallel walls or arcades and adapted to longitudinal area.

Copping. A protective cap, top, or cover of wall, parapet, pilaster, or chimney; often of stone, terra-cotta, concrete, metal, or wood. May be flat, but commonly sloping, double-beveled, or curved to shed water so as to protect masonry below from penetration of water from above. It is most effective when extended beyond wall face and cut with a drip.

Crown. The top of an arch, including the keystone, or of a vault.

Culvert. A passage under a road, railway embankment, or canal which allows for the flow of water.

Cut and Fill. An operation common to road building and other rock and earth-moving operations in which the material excavated and removed from one location is used as fill material at another location.

Drainage. The process by which water is dispersed.

Dry-laid Stone. Stone work laid without mortar; dry masonry.

Exfoliation. Peeling, swelling, or scaling of stone or mineral surfaces in thin layers; caused by chemical or physical weathering or by heat.

Grading. The act of remolding the landform.

Inlay. A shaped piece of one material embedded in another as a part of a surface ornamentation.

Invert. In plumbing, the lowest point or the lowest inside surface of a channel, conduit, drain, pipe, or sewer pipe.

Intrados. The inner curve or face of an arch or vault forming the concave underside.

Haunch. The middle part between the crown and the springing of an arch.

Keystone. In masonry, the central, often embellished, voussoir of an arch.

Lintel. A horizontal structural member (such as a beam) over an opening which carries the weight of the wall above it; usually of steel, stone, or wood.

Orifice. A mouthlike aperture, as of an opening, pipe, tube.

Quarry-faced. Descriptive of the freshly split face of ashlar, as it comes from the quarry, squared off only for the joints, usually used in massive masonry work.

Retaining Wall. A wall, either freestanding or laterally braced, that bears against an earth or other fill surface and resists lateral and other forces from the material in contact with the side of the wall.

Revetment. A retaining wall or breast wall; a facing on an embankment to prevent erosion.

Riprap. An irregularly broken, large piece of rock, used for foundations and revetments.

Springer. The lower voussoir, or bottom stone of an arch, which lies immediately on an impost.

Springing Line. The imaginary horizontal line at which an arch or vault begins to curve; the line in which the springers rest on the imposts.

Velocity inhibitor. A device or obstacle placed in the streambed and designed to reduce the velocity of flow.

Voussoir. A wedge-shaped masonry unit in an arch or vault whose converging sides are cut as radii of one of the centers of the arch or vault.

The *Cultural Resources Management Guideline (NPS-28),* release no. 3, was used to define the following terms:

Preservation. Maintaining the existing form, integrity, and materials of a structure. Substantial reconstruction, restoration of lost features, or removal of accretions are not included in a preservation undertaking. Preservation includes techniques of arresting or retarding deterioration through a program of ongoing maintenance. Use of destructive techniques such as archeological excavation shall be limited to providing sufficient information for preservation.

Reconstruction. The National Park Service does not endorse, support, or encourage the reconstruction of historic structures, and it does not permit the reconstruction or replication of prehistoric structures. In those limited circumstances when reconstruction will be considered, the following standards shall apply:

All proposed reconstruction projects shall receive formal approval from the director.

Partial reconstruction or a historic structure shall be considered only when surface or subsurface remains will not be destroyed; the reconstructed structure must be full scale and on the original site.

Reconstruction shall be undertaken only such work is essential for public understanding and only if the subject structure is associated with a site's primary theme. In addition, all prudent and feasible alternatives to reconstruction must be considered; reconstruction also must be demonstrated to be the only alternative permitting appreciation to the historical or cultural association for which the park was established

Archeological, historical, and architectural data must be sufficient to permit accurate reproduction of both the mass and detail with a minimum of conjecture; archeological work must include sufficient field investigation followed by detailed analysis and report preparation.

The reproduction of missing elements accomplished with new materials shall duplicate the composition, design, color, texture, and other visual qualities of the missing element. Reconstruction of missing architectural features shall be based upon accurate duplication of original features substantiated by physical or documentary evidence rather than upon conjectural designs or the availability of different architectural features from other structures.

Reconstruction to simulate ruined structures is not permitted; neither is reconstruction of prehistoric structures.

Rehabilitation. A treatment that improves the utility or function of a structure and often involves life safety and other code improvements. Rehabilitation does not apply to prehistoric structures, ruins, monuments, statuary, or buildings that serve as historic house museums. Its use should be limited to structures that are being adaptively used and that do not play a primary role in a park's interpretive program. In instances where preservation tax credits may be claimed, the *Secretary of the Interior's Standards for Rehabilitation* will be the minimum requirement.

Contemporary design for alterations and additions to historic structures shall not be discouraged when such alterations and additions do not destroy significant historic, architectural, or cultural material and such design is compatible with the size, scale, color, material, and character of the structure, neighborhood, or environment.

Whenever possible, new additions or alterations to historic structures shall be done in such a manner that if such additions or alterations were removed in the future, the essential form and integrity of the structure would be unimpaired.

Restoration. Restoration is a major intervention and may include the destruction of later period accretions having some cultural value in themselves. The criteria for "need of restoring for understanding" and "information to restore without conjecture" must be rigorously applied. There should be no restorations of prehistoric or historic ruins (*Management Policies,* ch. V, p. 16).

Restoration may take place only when essential for public understanding and appreciation of the park's historical or cultural associations, and when adequate interpretation cannot be imparted through other means.

Archeological, historical, and architectural data must be sufficient to permit accurate restoration with minimum conjecture.

Every restoration shall be preceded by a detailed historic structure report containing study and documentation of the structure. Changes made during restoration shall be carefully documented.

Fabric shall be safeguarded during and after restoration.

Important structural and architectural features, samples of paint, mortar, plaster, and other elements of the structure removed during research and restoration and important to a technical understanding of the structure shall be promptly accessioned and preserved.

Reinforcement required for structural stability or the installation of protective or code-required mechanical systems (HVAC, electrical, security, fire protection, etc.) shall be concealed whenever possible so as not to intrude or detract from the property's aesthetic and cultural qualities, except where concealment would result in the alteration or destruction of culturally significant materials or spaces.

Restoration work such as the demolition of non-contributing additions that will result in ground or structural disturbance shall be preceded by sufficient archeological investigations to determine whether significant subsurface or structural features or artifacts will be affected. Recovery, curation, and documentation of archeological features and specimens shall be undertaken in accordance with appropriate professional methods and techniques.

Stabilization. Stabilization shall re-establish the structural stability of a structure through the reinforcement of load-bearing members or by arresting deterioration leading to structural failure. Stabilization shall also re-establish weather-resistant conditions for a structure.

Stabilization shall be accomplished in such a manner that it detracts as little as possible from the structure's appearance and significance. When reinforcement is required to re-establish structural stability, such work shall be concealed wherever possible so as not to intrude upon or detract from the aesthetic and historical or archeological quality of the property, except where concealment would result in the alteration or destruction of historically or archeologically significant material or spaces. Accurate documentation of stabilization procedures shall be kept and made available for future needs.

Stabilization work that will result in ground disturbance shall be preceded by sufficient archeological investigation to determine whether significant subsurface features or artifacts will be affected. Recovery, curation, and documentation of archeological features and specimens shall be undertaken in accordance with appropriate professional methods and techniques.

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A search of Record Group 17, Land Records, failed to produce any of the original architectural drawings or engineering specifications for structures located along the portage railroad, with the exception of William M. Roberts' rendition of the Hollidaysburg Skew Arch Viaduct.

Records utilized for this report include:

RG-17, Board of Canal Commissioners Divisional Records, Allegheny Portage Railroad

Contracts, 1851–55, six volumes in boxes 1-3

These contracts were between the superintendent of the Western Division of the Pennsylvania Canal and Portage Railroad, Samuel Jones, and the many contractors providing construction, repair, supply and other services for the railroad. The contracts contained the contractor's name, date of agreement, prices for work done and very general and brief descriptions of the service rendered.

Damage Claims, 1831–68, 10 volumes in boxes 4-7.

Several sketches of portions of the railroad line were found in these claims filed by contractors seeking monetary compensation for extra work or damage to property. The drawings of lots at Planes 8, 9, and 10 were found in these claims.

Reports and Miscellaneous Documents, 1829–57, seven volumes in boxes 8-10.

Descriptions of the road sections and limited information on culvert construction were found in these documents.

Accounts, Allotments and Bids, 1831–32, box 35

A listing and description of culverts on sections 36-45 was found in these accounts.

Reports and Resolutions, 1819–58, box 1

The William Strickland text was located under this listing.

Engineering Records, 1825–52 in box 2
Surveys of Property, 1842–47, 1 vol.

These surveys depicted the size and shape of lots located at the head and foot of several of the planes.

Manuscript Group-2 Business Records Collection, 1681–1963

C. Transportation Accounts, 1795–1923
Allegheny Portage
Journal 1831–35

This journal provided data on the railroad's construction. Names of contractors, the section where work was being done, description of work and costs were entered month by month for the years 1831–35.

Manuscript Group-263. George A. Richardson Collection, 1869–1974, Book #5.

These photographs of the railroad trace were taken in 1922.

Manuscript Group-327. Ira J. Stouffer Photographs, ca. 1910.

The Stouffer collection contains views of the railroad from planes 1–10.

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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