BREVARD BRIDGE
Spanning Westland Run at Ullom Road, about one-third mile west of State Route 519
Export Vicinity
Washington County
Pennsylvania

HAER No. PA-215

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

HISTORIC AMERICAN ENGINEERING RECORD
BREVARD BRIDGE

HAER No. PA-215

Location: Brevard Bridge along Ullom Road, approximately one-third mile west of State Route 519. The bridge spans Westland Run, a tributary of Chartiers Run. Export vicinity, Chartiers Township, Washington County, Pennsylvania.

USGS Midway, Pennsylvania Quadrangle,
UTM: 17.4456916.562300

Engineer: Chaney & Armstrong

Builder: William Pickett & Company, Contractors

Date of Construction: 1913

Present Owner: Washington County Commissioners

Present Use: The single-lane bridge presently is open to vehicular traffic. The structure is scheduled for demolition and replacement.

Significance: The single-span Brevard Bridge represents an unusual example of early reinforced concrete bridge construction and reflects a certain degree of experimentation with mechanical stress management. This was achieved, in part, by incorporating a longitudinal series of six corrugated iron arch reinforcements into the base of the bridge. Additional structural solidity was provided by seven parallel I-beam stringers and a series of perpendicular tie rods. The structure is an unusual example of the type of many small-scale bridges that were built throughout Pennsylvania and other states during the first half of the twentieth century to facilitate automotive transportation and the movement of goods and raw materials between rural and urban sectors. The construction of these bridges contributed to the integration of small rural communities like Export within the region's expanding economic system.

Project Information: This documentation was conducted on behalf of the Washington County, Pennsylvania Planning Commission, Washington, Pennsylvania, in October and November, 1991. The recordation was conducted as a mitigative measure, prior to the demolition and replacement of the existing Brevard Bridge.

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PART I
HISTORY OF THE BREVARD BRIDGE
EXPORT, WASHINGTON COUNTY, PENNSYLVANIA

The Brevard Bridge is located along Ullom Road near State Route 519 in Chartiers Township, Washington County, Pennsylvania, and spans Westland Run, a tributary of Chartiers Creek (see attached location map). As recorded on the manufacturer's plaque, the bridge was constructed in 1913, during the era of early automotive transportation, at a time when local coal resources were being developed. Euroamerican settlement in the vicinity of the bridge dates back to the late eighteenth-early nineteenth century and comprises part of the early historic immigration into Washington County and Chartiers Township at that time. This early settlement occurred in locations favorable to agriculture, and self-sufficient farms comprised the main form of settlement during the late eighteenth century. These early agrarian settlers arrived in the region mainly via the Braddock and Forbes Roads; these colonial roads were established along ancient aboriginal trails which had previously served to connect spatially-diverse aboriginal groups and resource procurement zones. Early historic settlement in the vicinity of the Brevard Bridge is attested by the nearby LeMoyne House, situated several hundred feet to the east of the bridge, near the junction of Ullom Road and State Route 519. Apparently dating to the eighteenth century, this two-story dwelling was owned by Dr. Julius LeMoyne, a prominent Abolitionist, during the 1870s (Washington County History and Landmarks Foundation 1975, 69). Like many other portions of Washington County, the area near the Brevard Bridge remained largely agricultural throughout most of the nineteenth century. By 1910, Export, then known as Brevard Station, consisted of the LeMoyne House and six additional dwellings (McFarland 1910, 298).

With the increasing number and size of farms and the concomitant clearance of forest land throughout Washington County, lumber mills and shipbuilding operations were established along major rivers and tributaries; such riverine locations were important avenues for transportation and movement, and for powering the saw and grist mills which were established during the Colonial Period. One such early grist mill was established in 1847 at nearby McConnells Mills, situated a mile southeast of Export (McFarland 1910, 297). The lumber and grist products from such mills provided the economic stimulus to improve the overland access between farmland and mills and contributed to the emergence of stores and other non-agricultural enterprises. This process contributed to the establishment of a viable land-based transportation network throughout the region.

The need for improved land-based transportation in Washington County intensified with the emergence of the coal mining industry during the forty-year period from 1881 to 1919. Some of the world's most productive coal fields of that era were situated in Washington County. In response to World War I fuel and manufacturing requirements, the output from these fields reached 22 million tons in 1918 (Forest 1926, 551). The economic incentives for exploiting the region's rich coal reserves led to the establishment of the Export Coal Company in 1910. Situated near the junction of Ullom Road and State Route 519, the company conducted both daylight coal mining of shallow deposits as well as deeper shaft mining. The Export Mine was subsequently acquired by a Pittsburgh banking concern in 1912 and was operated by various individuals until circa 1959, when the deposit was depleted and the last coal was shipped via rail. According to a local informant, coal from the Export Mine was loaded onto rail cars at Brevard Station, situated in the general vicinity of the Brevard Bridge (Marotta 1985, 159; Wargo, personal communication 1991).

The Brevard Bridge was constructed in 1913, at a time when coal mining and agriculture comprised the main economic foci in the vicinity of Export. Although the bridge was probably not directly involved in the movement of coal to market, its construction in 1913 by William Pickett & Company was related to planning efforts aimed at improving accessibility between the mine and the area traversed

by Ullom Road. Since its construction in 1913, the bridge has facilitated the movement of goods and people between rural locations and the communities of Houston, Westland, and Hickory, Pennsylvania. No evidence of bridges predating the present structure was found during the Brevard Bridge HAER literature review.

ENGINEERING INFORMATION

The single-span Brevard Bridge represents an unusual example of early reinforced concrete bridge construction and reflects a certain degree of experimentation with mechanical stress management. This was achieved, in part, by incorporating a series of six longitudinal corrugated iron arch reinforcements into the base of the bridge. Additional structural solidity was provided by seven parallel I-beams and a series of perpendicular tie rods which were embedded within the bridge, as well as additional external (non-encased) reinforcement rods which intersect the six iron arches The bridge is an unusual example of the many small-scale bridges that were built throughout Pennsylvania and other states during the early decades of the twentieth century in response to the nation's increasing reliance on automotive transportation. It represents a relatively early implementation of reinforced concrete bridge-building technology during the era when small, low-maintenance and cost-effective bridges were needed to facilitate the movement of people and economic goods across the region's innumerable small streams. The construction of these small bridges contributed to the integration of rural areas like Export within the emerging regional economic network.

The development of modern reinforced concrete bridge technology arose from a general evolutionary trend in bridge design that emphasized reduced material requirements and stronger, improved weight-bearing capabilities. The Brevard Bridge employs a series of seven I-beam stringers and embedded and external tie rod members to achieve torsional strength. Steel-reinforced concrete bridges, of which the Brevard structure is a relatively early and atypical example, gradually replaced many of the nation's all-metal truss bridges which had been favored during the mid-nineteenth and early twentieth century. The previous popularity of these all-metal truss bridges was due to the fact that they could be constructed easily, cheaply, and required no specialized skills. Their cost and simplicity were especially attractive to small municipalities (Pennsylvania Historical and Museum Commission 1986, 9; 109; 126). Similar factors contributed to the subsequent popularity of concrete bridges; these advantages included (initially) low maintenance costs, the availability of local construction materials, such as sand and gravel, the relative permanence of concrete, and the fact that these structures could be built by relatively unskilled workers (Jackson 1988, 37;Plowden 1974, 299).

The nation's first plain (unreinforced) concrete arch bridge was constructed in Prospect Park, Brooklyn in 1871. Like bridges made of stone, plain unreinforced concrete bridges possess great compressive strength but exhibit poor tensile characteristics (Plowden 1974,297-8). In 1889, reinforced concrete was first employed in an effort to increase the structural solidity and the weight-bearing capacity of a concrete arch bridge in Golden Gate Park, San Francisco (Pennsylvania Historical and Museum Commission 1986, 157; herein cited as PHMC). The use of embeded steel reinforcements represents an historical engineering response to the inherent tensile weakness of plain cement/concrete bridges. In Pennsylvania, a relatively early reinforced concrete bridge was built along Frankford Avenue over Poquessing Creek in Philadelphia in 1904 (PHMC 1986, 178). Although the Brevard Bridge is an aesthetically much more humble structure than the Frankford Avenue Bridge, both bridges represent an early twentieth century effort to develop the use of reinforced concrete in response to the region's increasing transportational requirements.

The Brevard Bridge consists of an asphalt-covered reinforced concrete deck and concrete parapet which rest on a series of six corrugated iron arch reinforcements. Additional structural support is provided by seven parallel I-beam stringers, a series of embeded steel reinforcing rods, and several exposed perpendicular tie rods which cross-cut the iron arch reinforcements. A 1912 design drawing prepared by Chaney & Armstrong Engineers shows that the bridge deck was originally surfaced with laid brick or concrete blocks (see attached photographic copy). Although no historic photographs of the bridge or records of structural repairs or modifications were located during the Brevard Bridge HAER literature review, a field inspection of the structure suggests that the bridge retains most of its original architectural integrity. Field measurements of the structure do not fully accord with the dimensions shown on the 1912 drawing. The bridge measures 50 feet in length, measured from the opposite ends of the reinforced concrete wing-wall abutments, and 18 feet in width from outer edge of both parapets. It has a cartway width of approximately 17 feet. The single span between both abutments measures approximately 31 feet in length. The abutment wingwalls are approximately six feet in length and 3.75 feet in width. The reinforced concrete parapets measure 14 inches in thickness. The seven I-beam stringers each measure 33 feet in length and are spaced three feet apart. Traces of the wooden molds used during the pouring of concrete are visible along the wall of the southern bridge elevation. The southern elevation retains a series of five iron fixtures which are spaced at approximate intervals of three to four feet. These fixtures are oriented along a uniform horizontal plane and are positioned about 3 feet below the upper edge of the southern parapet. The function of these elements is uncertain, but they clearly reflect a lack of uniformity and standardization; two of the members are iron rings, two are perforated flat iron brackets, and one is a cylindrical vertically-oriented socket. The concrete fractures surrounding the westernmost iron ring suggests that it may have been driven into the wall sometime after the construction of the bridge. Although the two iron rings resemble mooring hardware, the stream is presently unnavigable.

Although the general condition of the bridge appears to be good, closer inspection of the underside of the bridge reveals that several supportive tie-rods are badly corroded. Other damage includes the deterioration of the concrete coating which was used to seal and protect the corrugated iron arch reinforcements beneath the bridge.

In summary, the Brevard Bridge represents an unusual example of early concrete bridge construction and reflects early twentieth-century technological efforts to design strong and cost-effective small-scale bridges. In the case of the Brevard Bridge, this was achieved, in part, by incorporating a longitudinal series of six corrugated iron arch reinforcements into the base of the bridge. Additional structural solidity was provided by seven parallel I-beam stringers and a series of perpendicular tie rods. The growing popularity of concrete bridges during this period was due in part to (initially) low maintenance costs, the availability of local construction materials, such as sand and gravel, and because these structures could be built by relatively unskilled workers. The Brevard Bridge is an unusual example of the many small-scale bridges that were subsequently built throughout Pennsylvania and other states during the first half of the twentieth century to facilitate automotive transportation and the movement of goods and raw materials between rural and urban sectors. The construction of these bridges contributed to the integration of small rural communities like Export within the region's expanding economic system.

SOURCES OF INFORMATION AND OTHER REFERENCES

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Note: No historic photographs were found during this recordation.

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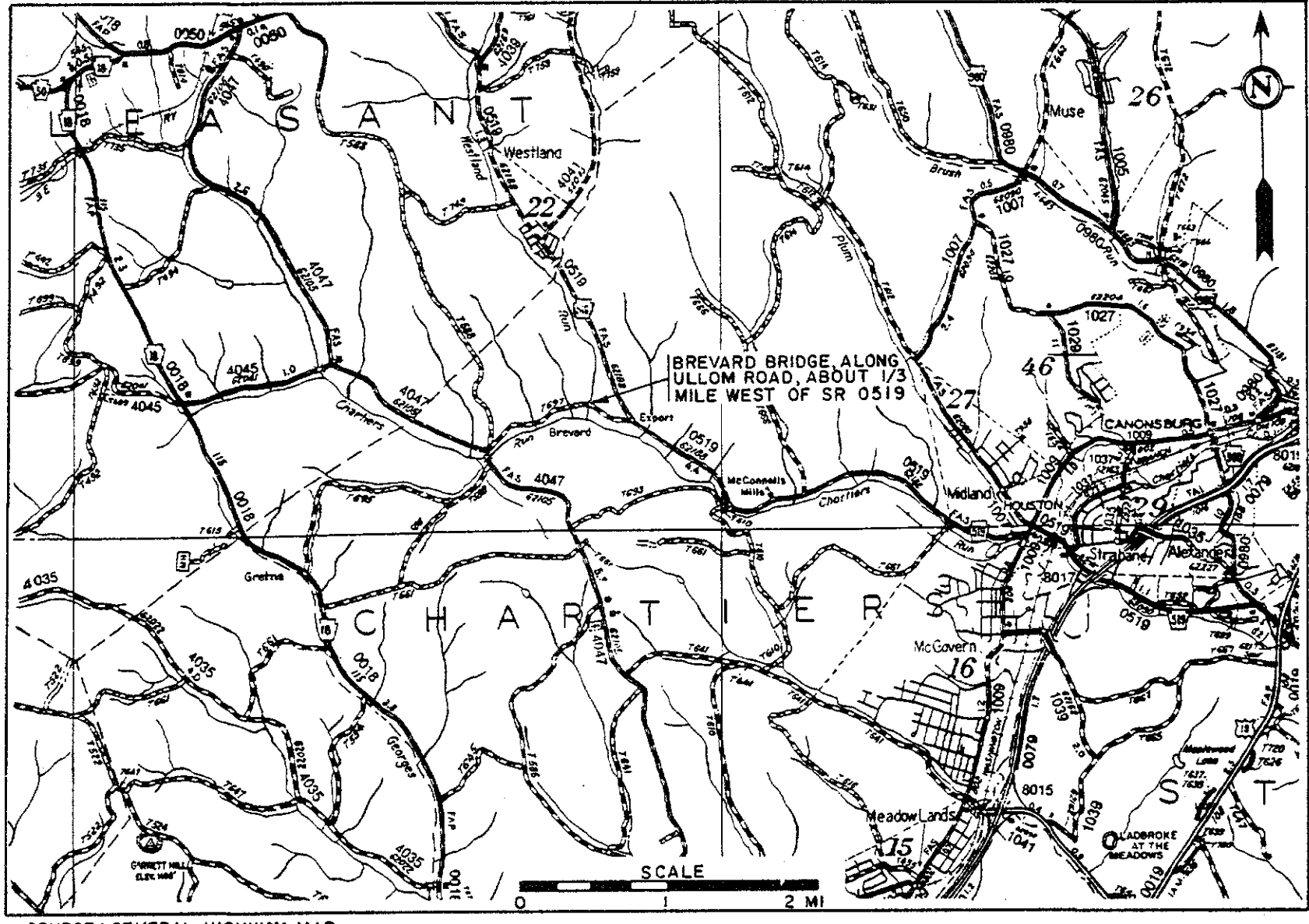

SOURCE: GENERAL HIGHWAY MAP, WASHINGTON CO., PENNSYLVANIA, PA-DOT 1990.

BREVARD BRIDGE
HAER No. PA-215 (PAGE 7)

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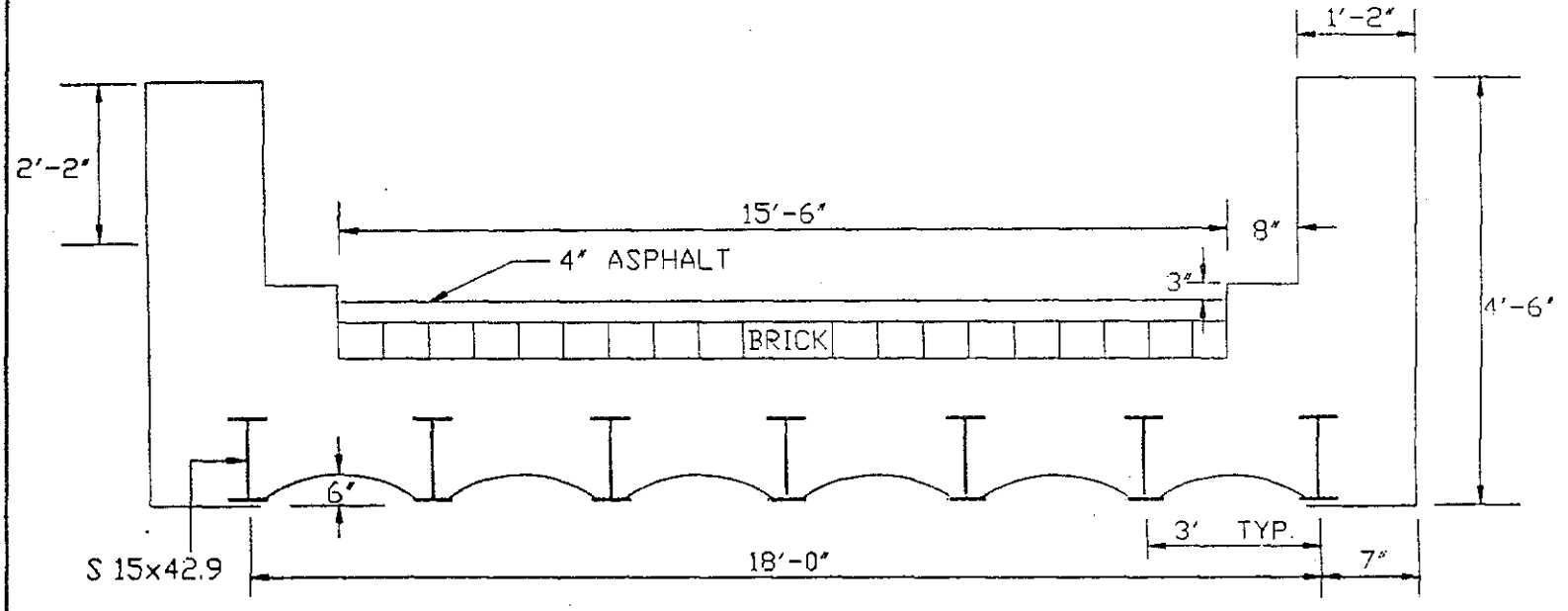

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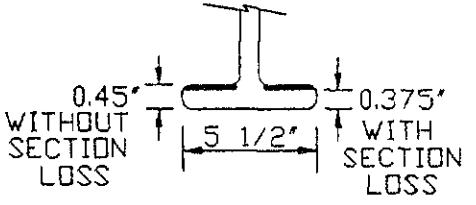

BREVARD BRIDGE OVER WESTLAND RUN
CHARTIERS TWP., WASHINGTON COUNTY

DATE 6/28/90	SCALE: N.T.S.	SH. 1 OF 2

SOURCE: ADAPTED FROM BRIOGE SURVEY DRAWING,
McDONALD ASSOCIATES ENGINEERS, CHARLEROI, PA.

BREVARD BRIDGE
HAER No. PA-215 (PAGE 8)

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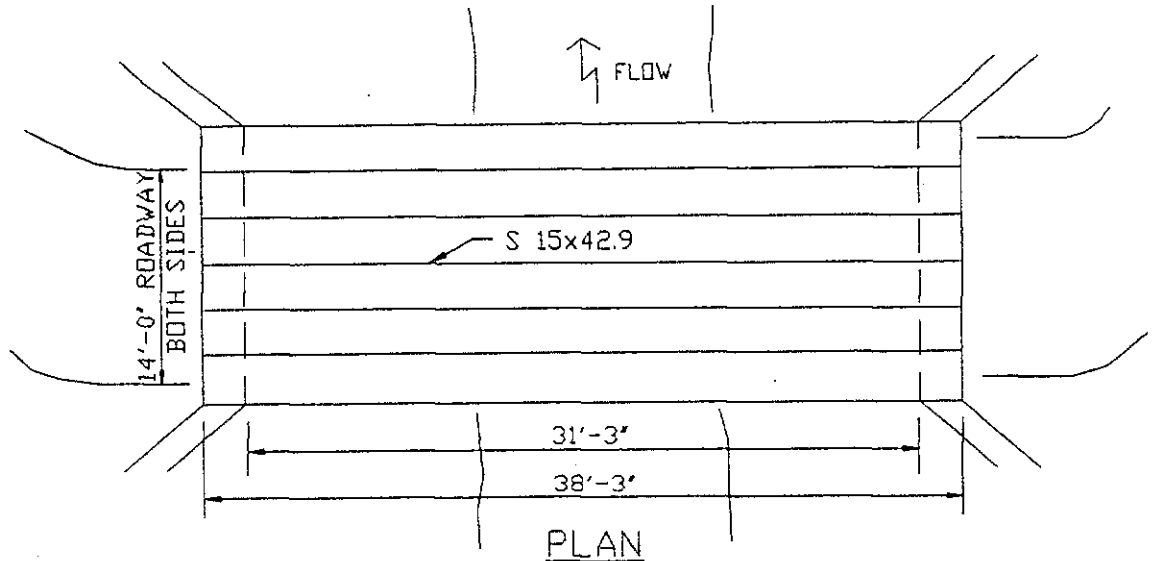
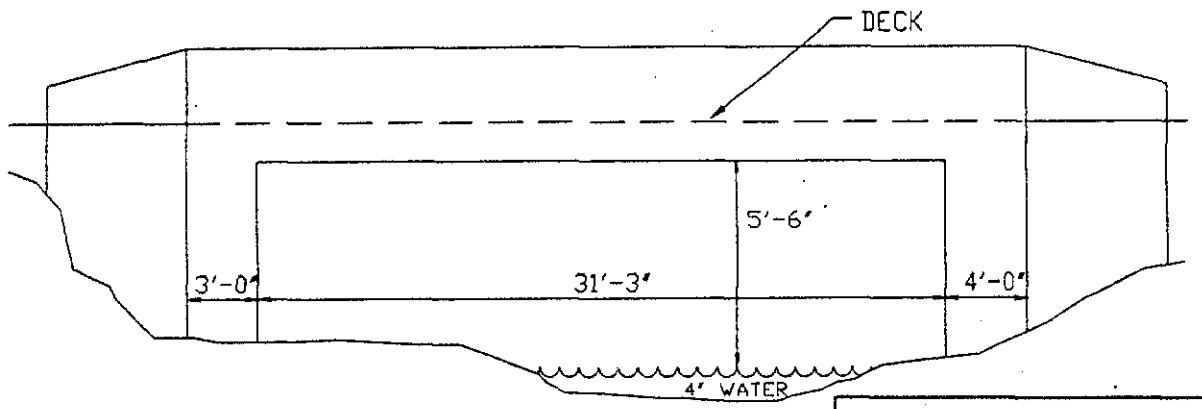


PLAN



ELEVATION

BREVARD BRIDGE OVER WESTLAND RUN
CHARTIERS TWP., WASHINGTON COUNTY

DATE 6/28/90	SCALE: N.T.S.	SH. 2 OF 2

BREVARD BRIDGE
HAER No. PA-215 (PAGE 9)

SOURCE: ADAPTED FROM BRIDGE SURVEY DRAWING,
McDONALD ASSOCIATES ENGINEERS, CHARLEROI, PA.