VIA EMAIL

August 13, 2015

Jon Crum
Environmental Protection Specialist
Federal Highway Administration / Pennsylvania Division
PH: (717) 221-3735
Email: jonathan.crum@dot.gov

Re: *Headquarters Road Bridge – Headquarters Road Bridge as a 4(f) Property*

Dear Mr. Crum:

The Delaware Riverkeeper Network ("DRN") submits the following comment regarding the Headquarters Road Bridge project. In previous letters DRN has made clear its position that Tinicum Creek is a 4(f) resource, and thereby entitled to any associated protections. It is also DRN's position that Headquarters Road Bridge itself is a 4(f) property. DRN submitted a similar comment to PA DOT in July of 2013. *See* Attachment 1.

In deciding whether Headquarters Road Bridge requires § 4(f) status, the Federal Highway Administration must determine whether the bridge is on or eligible for the National Historic Register. *See* 23 C.F.R. § 771.135(e). To be considered for the National Register a property or site must meet the regulatory requirements promulgated pursuant to the National Historic Preservation Act ("NHPA"). 16 U.S.C.A. § 470a. The criteria for evaluation under NHPA are set forth in 36 C.F.R. § 60.4, which provides, in pertinent part:

> The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> (b) that are associated with the lives of persons significant in our past; or
>
> (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of amaster, or that possess high

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> artistic values, or that represent a significant and distinguishable entity wh
> ose componentsmay lack individual distinction; or
> (d) that have yielded, or may likely yield, information important in
> prehistory or history.

36 C.F.R. § 60.4.

Headquarters Road Bridge meets at least the criteria identified in subsection (a) and (c); as such, the bridge requires 4(f) protection pursuant to any review under the National Environmental Policy Act. *See also Benton Franklin Riverfront Trailway an Bridge Committee v. Lewis*, 701 F.2d 784 (9th Cir. 1983) (finding that a historic bridge met criteria (a) and (c) of 36 C.F.R. § 60.4 and thus was afforded 4(f) protection).

In support of Headquarters Road Bridge qualifying pursuant to these criteria, attached is an expert report titled, "The Bridges of Tinicum Township." *See* Attachment 2. The report explains that "[t]he Bridges of Tinicum Township, when viewed as a collection, warrant greater consideration for preservation," and that as part of this collection, Headquarters Road Bridge represents "the oldest surviving pier-to-pier bridge left in Pennsylvania." *See* Attachment 2, at 2, 3, 13. Therefore, the modification or loss of this bridge, or its unique historical components, would render the collection of historic bridges in Tinicum Township incomplete, thereby reducing their historical value. *See* Attachment 2, at 2, 3, 13. Additionally, Attachments 3-5 provide in-depth evaluation of the historical significance of the bridge, and come to the ultimate conclusion that "the bridge is individually eligible for the National Register." *See* Attachment 5, at 1. Considered together, the expert evidence attached to this letter provides sufficient proof that Headquarters Road Bridge meets the conditions identified in 36 C.F.R. § 60.4 to qualify for 4(f) protection.

To the extent a 4(f) determination has already been made with regard to whether Headquarters Road Bridge itself qualifies pursuant to 36 C.F.R. § 60.4, DRN requests notification and documentation of the decision.

Thank you for your time and consideration.

Regards,

Maya K. van Rossum
the Delaware Riverkeeper

Attachment 1

CULTURAL HERITAGE PARTNERS, PLLC
innovation for preservation

July 30, 2013

Ryan M. Whittington, E.I.T.
Consultant Project Management (HNTB)
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Engineering District 6-0
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VIA EMAIL: c-rwhittin@pa.gov

Re: *Headquarters Road Bridge*

Dear Mr. Whittington:

Cultural Heritage Partners, PLLC is counsel to the Delaware Riverkeeper Network regarding the Headquarters Road Bridge. The Headquarters Road Bridge project requires regulatory review under the National Environmental Policy Act (NEPA), Section 106 of the National Historic Preservation Act (Section 106), and Section 4(f) of the Department of Transportation Act (Section 4(f)). Each of these statutes applies different criteria to project reviews. NEPA requires agencies to consider the environmental impacts of their proposed actions and assess reasonable alternatives to those actions. Section 106 requires agencies to consider the adverse effects of their undertakings on historic resources. Section 4(f) requires agencies to reasonably consider all prudent and feasible alternatives and engage in all possible planning to minimize harm to historic properties. Agencies are strongly encouraged to coordinate these three reviews to achieve better protection for impacted resources, more informed public participation, and a more streamlined process. We write to inquire about PennDOT's progress in carrying out these three regulatory reviews, and to ensure that the consulting parties participating in the Section 106 process are fully aware of the requirements of each statute and of opportunities to inform the agency's progress.

The Headquarters Road Bridge is Subject to NEPA Review

Documents prepared early in the review process suggest that PennDOT may be attempting to classify the Headquarters Road Bridge project as a categorical exclusion and thereby exempt the project from NEPA review. Due to the significance of the Bridge as a contributing resource in the Ridge Valley Rural Historic District and the potential for significant impacts to the Bridge and other cultural, natural, and recreational resources, this project should not be exempted from NEPA review.

Federal Highway Administration (FHWA) regulations provide a list of actions that may be categorically excluded only after FHWA approval at the Division level. 23 C.F.R. § 771.117(d) (2013). Examples of actions include but are not limited to "[b]ridge rehabilitation, reconstruction or replacement." *Id*. § 771.117(d)(3). However, the regulations also specify that

actions may only be classified as categorical exclusions if they "do not have a significant impact on any natural, cultural, recreational, historic or other resources" or "do not involve significant air, noise, or water quality impacts." *Id*. § 771.117(a). Furthermore, projects that are normally classified as categorical exclusions must be reviewed by the FHWA if they involve unusual circumstances, such as "[s]ignificant environmental impacts" or "[s]ignificant impacts on properties protected by section 4(f) of the DOT Act or section 106 of the [NHPA]." *Id*. § 771.117(b).

The Headquarters Road Bridge is a contributing resource to the Ridge Valley Rural Historic District, and Tinicum Creek has received Federal Wild and Scenic and State Exceptional Value Waters designations. Consulting parties in the Section 106 process have indicated that the Bridge replacement will have significant impacts to these resources.

PennDOT Should Coordinate NEPA and Section 106 Reviews

PennDOT should coordinate the NEPA and Section 106 reviews in order to encourage public participation in the Section 106 process and successfully assess the impacts to all cultural and natural resources.

NEPA review ensures that agencies consider the natural, cultural, and historic environment in Federal project planning. Section 106 and NEPA reviews are most effective when agencies coordinate the processes and begin them simultaneously. That way, each process will fully inform the other, and public involvement can satisfy the requirements of both NEPA and Section 106. The Section 106 implementing regulations strongly encourage this coordination (36 C.F.R. § 800.8(a)(1)), and the Advisory Council on Historic Preservation and the Council on Environmental Quality have published a handbook on NEPA and Section 106 integration.[1]

The regulations state, "Agencies should consider their section 106 responsibilities as early as possible in the NEPA process, and plan their public participation, analysis, and review in such a way that they can meet the purposes and requirements of both statutes in a timely and efficient manner." 36 C.F.R. § 800.8(a)(1) (2013). Furthermore, consulting parties should be included early in the NEPA process when the "widest possible range of alternatives are under consideration." *Id*. § 800.8(a)(2).

Because agencies consider a proposed action's effects to historic properties under NEPA review, they may be able to inform the NEPA process through close coordination with Section 106. Resources identified under Section 106 then can be evaluated under NEPA. Additionally, an agency's determination and resolution of adverse effects to historic properties under Section 106 may be considered in determining whether there are any potentially significant effects that require the preparation of an Environmental Impact Statement (EIS) under NEPA.

[1] *See* COUNCIL ON ENVTL. QUALITY & ADVISORY COUNCIL ON HISTORIC PRES., NEPA AND NHPA: A HANDBOOK FOR INTEGRATING NEPA AND SECTION 106 (2013), http://www.achp.gov/docs/NEPA_NHPA_Section_106_Handbook_Mar2013.pdf.

An agency must prepare an EIS "if it is proposing a major Federal action significantly affecting the quality of the human environment." 40 C.F.R. § 1508.5 (2012). During the process of preparing the EIS, the agency must solicit and consider public comment and conduct further analysis as necessary based on the public feedback. The agency should begin coordinating the EIS with Section 106 review early in the process when the agency begins developing the project's purpose and need statement and identifying parties for consultation. Similarly, the processes should be coordinated when the agency engages in the "scoping process," seeking out interested parties and members of the public with whom the agency can consult and solicit comments. Scoping can help fulfill the Section 106 public notification and consultation requirements, and the information obtained from the Section 106 process can help define the project's purpose and needs.[2]

Most importantly, the consultation and public participation components of NEPA and Section 106 should be closely aligned to avoid overlap and to ensure that the agency is considering the full range of potential impacts to historic resources and possible resolutions for those impacts.[3]

PennDOT Should Coordinate Section 4(f) and Section 106 Reviews

PennDOT should coordinate the Section 106 review with the Section 4(f) review, because the Section 4(f) review process provides an added layer of protection to the historic resources considered under Section 106.

Section 4(f) of the Department of Transportation Act requires agencies to reasonably consider all prudent and feasible alternatives and mitigate any potential adverse effects to historic resources. Unlike Section 106, which only mandates a process, Section 4(f) requires agencies to engage in *all possible planning to minimize harm to historic properties*. 23 C.F.R. § 774.3 (2013). As such, Section 4(f) provides an added layer of protection to historic properties assessed under Section 106 review. Agencies should closely coordinate these two processes because the Section 4(f) process can greatly affect the outcome of the Section 106 process.[4] The agency should familiarize participants in the Section 106 process with the mandates of Section 4(f) so that all project participants will understand how 4(f) will influence the project decisions.

Identifying Historic Resources

Section 4(f) resources should be identified as early in the process as practicable. *Id.* § 774.9(a). Historic resources typically will be identified during the Section 106 process. Accordingly, the Section 106 process should be initiated and resources listed or eligible for

[2] *Id*.
[3] *Id*.
[4] *See* AM. ASS'N OF STATE HIGHWAY TRANSP. OFFICIALS, PRACTITIONER'S HANDBOOK: CONSULTING UNDER SECTION 106 OF THE NATIONAL HISTORIC PRESERVATION ACT (2006), http://environment.transportation.org/pdf/PG06.pdf.

listing in the National Register of Historic Places identified early enough in the project planning to determine whether Section 4(f) applies so that avoidance alternatives can be developed and assessed.[5]

Assessing Use of Section 4(f) Properties

Once the Section 4(f) properties have been identified in the study area, the agency can then determine if any of the properties will be "used." *Id.* § 774.17. The most common type of use in 4(f) projects is when land is permanently incorporated into a transportation facility. *Id.* § 774.17(1). A historic bridge will be used when the action will impair the historic integrity of the bridge either through rehabilitation or demolition. However, agencies must also consider constructive use, which involves no *actual* use but considers proximity impacts from the proposed project. A constructive use occurs when "the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired." *Id.* § 774.15(a). Like the indirect effects defined under the Section 106 process, constructive use often results in increased noise, vibrations, and aesthetic impacts to historic resources. *Id.* § 774.15(e).

Obtaining Project Approval

To obtain project approval, PennDOT must find either that: (1) there is no feasible and prudent alternative that completely avoids the use of the Section 4(f) property; and (2) the project includes all possible planning to minimize harm to the Section 4(f) property. *Id.* § 774.3(a).

The agency can use information obtained through the Section 106 process to guide the Section 4(f) analysis of alternatives under the "prudent and feasible" standard and plan for mitigation when avoidance of the 4(f) resources is not possible. The first step in determining whether a feasible and prudent avoidance alternative exists is to identify a reasonable range of project alternatives including those that avoid using the Section 4(f) property.[6]

Once the agency identifies each potential avoidance alternative, it must determine whether the options are feasible or prudent. A feasible and prudent avoidance alternative is one that avoids using Section 4(f) property and does not cause other severe problems of a magnitude that substantially outweigh the importance of protecting the Section 4(f) property. A potential avoidance alternative is not feasible if it cannot be built as a matter of sound engineering judgment. *Id.* § 774.17(2).

An avoidance option is not prudent if: (1) it compromises the project to a degree that it is unreasonable to proceed in light of the project's stated purpose and need; (2) it results in unacceptable safety or operational problems; (3) after reasonable mitigation, it still causes

[5] *See* U.S. DEP'T OF TRANSP. FED. HIGHWAY ADMIN., SECTION 4(F) POLICY PAPER (2012), http://environment.fhwa.dot.gov/4f/4fpolicy.pdf.
[6] *Id*.

severe social, economic, or environmental impacts; severe disruption to established communities; severe or disproportionate impacts to minority or low-income populations; or severe impacts to environmental resources protected under other Federal statutes; (4) it results in additional construction, maintenance, or operational costs of extraordinary magnitude; (5) it causes other unique problems or unusual factors; or (6) it involves multiple factors as outlined above that, while individually minor, cumulatively cause unique problems or impacts of extraordinary magnitude. *Id.* § 774.17(3). The prudence determination requires an analysis of these six factors and documentation that describes the agency's efforts in this regard.[7]

The agency can use information obtained through the Section 106 process to guide the Section 4(f) analysis of alternatives under the "prudent and feasible" standard and plan for mitigation when avoidance of the 4(f) resources is not possible. The September 19, 2012 Section 106 Agency Coordination Meeting Minutes suggest that the alternatives were analyzed before the adverse effects were fully assessed under Section 106. Without a full understanding of the significance of the resources and how the alternatives will impact those resources, the agency cannot reasonably select the best possible outcome. The process of assessing alternatives and selecting the best possible outcome must involve input from the consulting parties.

Purpose and Need Statement

PennDOT should involve the public in drafting the purpose and need statement. Both NEPA and Section 4(f) require a purpose and need statement, which analyzes the proposed alternatives. Based upon information from consulting parties within the Section 106 process, it appears that PennDOT has not involved the public in drafting the purpose and need statement for the Headquarters Road Bridge, as required under both NEPA and Section 4(f), and has developed a statement that drives the analysis of alternatives toward PennDOT's preferred outcome.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) provides additional standards for environmental review of federally funded transportation projects. 23 U.S.C. §§ 101–170 (2012). SAFETEA-LU requires public participation in defining a project's purpose and need, stating that "[a]s early as practicable during the environmental review process, the lead agency shall provide an opportunity for involvement by participating agencies and the public in defining the purpose and need for a project." *Id.* § 139(f)(1). PennDOT presented its purpose and need statement at the June 17, 2013 Section 106 Consulting Party Meeting and focused on objectives already established in the statement.

If the June 17 meeting is merely a continuation of the previous Section 106 meetings that occurred in 2006, the previous Section 106 process should be re-evaluated because

[7] *Id*.

additional consulting parties are now involved and new information is available that may help shape the project's purpose and need.

The purpose and need statement shapes the process of considering, analyzing, and selecting project alternatives. Under Section 4(f), the purpose and need statement is critical in assessing whether or not an alternative is feasible and prudent. Specifically, "[a]n alternative is not prudent if: (i) it compromises the project to a degree that it is unreasonable to proceed with the project in light of its stated purpose and need." 23 C.F.R. § 774.17(3). Furthermore, if the agency determines that there is no feasible and prudent avoidance alternative, it may seek approval for one of the remaining alternatives that causes the least overall harm to Section 4(f) resources. The least overall harm is determined by balancing several factors, one of which is "[t]he degree to which each alternative meets the purpose and need for the project." *Id.* § 774.3(c)(1).

Because the purpose and need statement drives the process of considering, analyzing, and selecting project alternatives, it should be defined broadly enough so that it includes a discussion of a range of reasonable alternatives.[8] PennDOT's purpose and need statement presents a well-defined purpose, but the statements of need indicate that PennDOT assessed the reasonable alternatives and pre-selected its preferred alternative before drafting the statement. For example, the statement that the bridge is "functionally obsolete" ("Purpose and Need, Headquarters Road (SR 1012) over Tinicum Creek") strongly suggests that rehabilitation is not a viable alternative and that replacement is the only option.

PennDOT Should Conduct the Section 106 Process in Good Faith

The Delaware Riverkeeper Network is concerned that PennDOT has not conducted its Section 106 consultation process in good faith. By restarting a process that began in 2006, the current consulting parties have not had the opportunity to participate in decisions that were made during the initial phase; consequently, decisions made during that phase were not in accordance with the law.

Section 106 requires agencies to consider the adverse effects of their undertakings on historic resources. More specifically, Section 106 requires that an agency establish that an undertaking exists, identify historic properties that may be affected by the proposed undertaking, assess the adverse effects of the undertaking on the historic properties, and consult with interested parties in an effort to resolve the adverse effects, a process that results in a Memorandum of Agreement that evidences the agency's compliance with Section 106.[9]

[8] *See* AM. ASS'N OF STATE HIGHWAY TRANSP. OFFICIALS, PRACTITIONER'S HANDBOOK: DEFINING THE PURPOSE AND NEED AND DETERMINING THE RANGE OF ALTERNATIVES FOR TRANSPORTATION PROJECTS (2007), http://environment.transportation.org/pdf/PG07.pdf.

[9] *See Section 106 Regulations Flow Chart and Explanatory Material*, ADVISORY COUNCIL ON HISTORIC PRES., http://www.achp.gov/flowexplain.html (last visited July 29, 2013).

Area of Potential Effects

The Area of Potential Effects (APE) is defined in the Section 106 implementing regulations as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." 36 C.F.R. § 800.16(d). Determining the APE is one of the most critical steps in the Section 106 process and should not be confined to the project area. The APE may be much larger than the project area if the undertaking has the potential to directly or indirectly affect properties located outside this immediate area. In addition to direct physical effects on properties, an agency must also consider the full range of indirect visual and audial effects that may impact these properties. Indirect effects may occur at a later date and may be cumulative. In road or bridge projects, these future or cumulative effects may manifest in increased traffic that causes noise or vibrations to nearby properties.[10]

Identifying Historic Properties and Assessing Adverse Effects

An agency is required to make a "reasonable and good faith effort" to identify historic properties within the APE that may be affected by the proposed undertaking. *Id.* § 800.4(b)(1). An agency makes a reasonable and good faith effort to identify historic properties by reviewing existing information on historic properties within the APE and seeking other information from individuals or organizations that have knowledge of properties within the area. *Id.* § 800.4(a). Section 106 regulations specify that a reasonable and good faith effort may consist of or include "background research, consultation, oral history interviews, sample field investigation, and field survey." *Id.* § 800.4(b)(1). Once the agency has identified historic properties that may be affected by the proposed undertaking, the agency must consult with the State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer (THPO) to assess the adverse effects the undertaking may have on the properties.[11] *Id.* § 800.4(b).

Public Participation

Once the agency has determined that its undertaking will have adverse effects on historic properties, the agency must consult with the SHPO, THPO and other interested parties to resolve those effects. Public involvement is essential to successful Section 106 consultation, and the views of the public should be solicited and considered throughout the process. *Id.* § 800.2(d). At a minimum, an agency must provide an opportunity for the public to examine the results of the agency's efforts to identify historic properties, evaluate the properties' significance, and assess the undertaking's effects on the properties.[12] When an agency finds that the undertaking will have adverse effects on historic properties, it must make that information

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[10] *See* VA. DEP'T OF HISTORIC RES., DEFINING YOUR AREA OF POTENTIAL EFFECTS (2011), www.dhr.virginia.gov/pdf_files/Defining_Your_APE.pdf.

[11] *See* ADVISORY COUNCIL ON HISTORIC PRES., MEETING THE "REASONABLE AND GOOD FAITH" IDENTIFICATION STANDARD IN SECTION 106 REVIEW (2013), www.achp.gov/docs/reasonable_good_faith_identification.pdf.

[12] *See Section 106 Regulations Section-by-Section Questions and Answers*, ADVISORY COUNCIL ON HISTORIC PRES., http://www.achp.gov/106q&a.html (last visited July 29, 2013).

available to the public and provide the public an opportunity to express its views on resolving the adverse effects. As stated in the implementing regulations, "The agency official shall provide an opportunity for members of the public to express their views on resolving adverse effects of the undertaking… and *ensure that the public's views are considered in the consultation*." *Id.* § 800.6(a)(4) (emphasis added). Furthermore, parties who have officially applied and been approved for "consulting party" status have the right to share their views, receive and review pertinent information, offer ideas, and consider possible solutions.[13]

Although Section 106 is a process that does not mandate resolution of all adverse effects, an agency must make a reasonable and good faith effort to consider the public's views. Additionally, the agency must justify its findings to the public so that the public has an opportunity to comment and suggest alternative solutions to any possible adverse effects. If PennDOT fails to consider public input, it will undermine this important component of the Section 106 process.

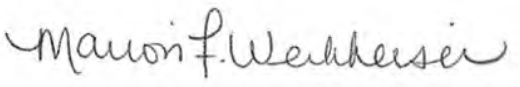
[continued]

[13] *See* ADVISORY COUNCIL ON HISTORIC PRES., PROTECTING HISTORIC PROPERTIES: A CITIZEN'S GUIDE TO SECTION 106 REVIEW (2013), www.achp.gov/docs/CitizenGuide.pdf.

Conclusion

In sum, we write on behalf of the Delaware Riverkeeper Network to inquire about PennDOT's progress in carrying out its obligations under NEPA, Section 106 and Section 4(f). We recommend that PennDOT add to the next meeting agenda an informational session on the intersection of NEPA, Section 106 and Section 4(f), and a discussion regarding how the agency intends to carry out the three reviews. We wish to work with you to ensure that consulting parties and the general public have the opportunity to participate fully in each of these processes.

Sincerely,



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Attachment 2

The Bridges of Tinicum Township

DELAWARE RIVERKEEPER NETWORK

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About the Delaware Riverkeeper Network

The Delaware Riverkeeper Network champions the rights of our communities to a Delaware River and tributary streams that are free-flowing, clean, healthy and abundant with a diversity of life.

The Delaware Riverkeeper Network gives voice, strength and protection to the communities and waterways of the Delaware River. Through independent advocacy, and the use of accurate facts, science and law, DRN works to ensure the rich and healthy future that can only exist with a clean, healthy and free flowing river system.

The Delaware Riverkeeper Network is unique in that it is founded upon the expectation of personal and community responsibility for river protection, as personified by the Delaware Riverkeeper. DRN is the only grassroots advocacy organization that operates watershed-wide and empowers communities with the engaged interaction and information needed to succeed in protecting our River and region now and into the future.

About the Author: Robert W. Reynolds

The principal focus for Robert Reynolds is the documentation and preservation of cultural and historical places and landscapes. The experiences of visits to family in rural Vermont, college alongside the Gettysburg Battlefield, growing up during the summer at a lake resort in a region once known as the Jersey Adirondacks, and setting up homes first in Bucks then in Berks Counties, all occurred in landscapes of historic significance that inspired inquiry, study, photography, and preservation efforts.

Rob lived twice along the watershed of the Tohickon. After joining the Heritage Conservancy in 1989 he and his wife rented a portion of an eighteenth century tavern in Keelersville along Lake Nockamixon. Two years later they bought an 1891 Victorian home in Quakertown. Behind the house ran a tributary that led to the Tohickon and occasionally flooded the alley two feet deep with water up into the back yard. While living in Quakertown Rob led the effort to save the train station and photographed 27,000 historic buildings in Bucks County, including all of Tinicum. While earning a doctorate at Lehigh, he helped grow and establish the Historic Preservation Certificate Program at Bucks County Community College.

At Kutztown University Rob specializes in Pennsylvania History and teaches courses on Local History, Pennsylvania Dutch Culture, and Environmental History. As the Residential Curator for the David Hottenstein Mansion, owned by the Preservation Trust of Berks County, he maintains and preserves a 1783 Georgian house, which some scholars consider the finest Pennsylvania German farmhouse of its era. The woodwork from the master chamber was relocated to the Winterthur Museum in the early 1950s and today serves as the Fractur Room. Periodically, Rob, his wife Jennette, and daughter Reanna live along the east shore of Beaver Lake, New Jersey in a 1909 bungalow still retaining original furnishings and a view that inspires the drive to preserve cultural and historic landscapes that retain uncompromising integrity.

The Bridges of Tinicum Township

Tinicum Township is the home to a unique, complete, and irreplaceable collection of historic bridges. This collection includes a variety of designs on the brink of being destroyed.

The bridges of Tinicum Township may well be the most significant collection of bridges in a single municipality in the State of Pennsylvania. Much of the Tinicum terrain tilts toward the Delaware River serving as a drainage with over three percent of the township made up of flowing water. The interplay of roadways and streams, the Delaware River, large and small bridges, fords and the canal, forest and farmland speckled with farmsteads, and neatly packed villages all retaining remarkable integrity, continue to evoke past eras in the development of the Delaware Valley, which are both locally and nationally significant. The Bridges of Tinicum, as a collection, call to mind a range of historical themes as artifacts of other eras and as contributors to assemblages of significant vernacular architecture and scenic landscapes, that are emblematic of the historical development of the Delaware Valley including settlement by the Scotch–Irish, English, and Pennsylvania Dutch, the development of transportation routes by road and canal to exploit natural resources, deliver the bounty of a productive agricultural area to market, and bring in the finished goods made elsewhere needed as the area prospered. As the age of wood gave way to the age of iron after the Civil War the bridges change from wood to iron, first wrought and then steel, with concrete becoming a new early twentieth century bridge material that now dominates all new bridge projects.

The purpose of this report is to argue for a comprehensive management plan for the Bridges of Tinicum Township that details a strategy for historic bridges with improved maintenance and preservation. The following discussion will place a selection of important bridges into a broader historic context, discuss the excellent bridge preservation efforts already accomplished in Tinicum by the State, note the immediate Tinicum bridge crisis, and advance understanding about why the preservation and attention to historic bridges in Tinicum should become even more commonplace and collaborative.

Bridge Types and their Historic Context in Tinicum Township

Tinicum Township encompasses 17,177 acres in upper Bucks County. The lands offer rolling hills, flats along the Delaware River, and a distinctive ledge rising 75–150 feet above the river paralleling a portion of the Delaware. The Tohickon, Tinicum, and Mill Creeks and their tributaries drain through the area. William Penn knew of the Tohickon area as an Indian Township with rich lands much cleared by the Indians. The lands that would become Tinicum Township in 1738 featured two large tracts combined with other lands. The Pennsylvania Land Company of London bought a 7,500 acre portion of the Manor of the Highlands in 1699 featuring five miles of Delaware River shoreline. The Streeper Tract of 4,448 acres was first surveyed in 1703, but when Johaness Streeper died an alien, having not been naturalized, his heirs could not sell the land. James Logan accepted the surrender of the Streeper Tract in exchange for a like quantity of land near the Durham Iron works allowing the Streeper Tract to be used to supply wood and timber for the furnace. In 1738, the same year Tinicum is organized as a township, the old Streeper Tract lots began to be surveyed to sell to settlers.

The Tohickon Creek attracted the earliest settlers into what would become Tinicum Township. The Creek name is said to mean the stream we cross on driftwood. The Delaware King Teedyuscung stated that the Tohickon was meant to be the northern limit of the white man's country, and that the land to the north of it had been taken from them fraudulently. That deceit was the 1737 Walking Purchase that is considered one of the most notorious land frauds committed in the colonial era. Based on a circumspect deed the Penn heirs laid claim to the greater Lehigh Valley dispossessing several native communities living in the Lehigh and Delaware valleys. Tinicum continued to be the home of a remnant of the Delaware Tribe of Indians for upwards of twenty-five years after it was surveyed, but those natives who stayed usually lost their property and were forced either to settle on poor land or to endure a meager existence working for colonists as farm laborers or servants.

The year following the infamous walking purchase led to the organization of Tinicum Township, but people were already living in the Tohickon Valley. The Scotch–Irish, Lowland Scots that emigrated to Ulster, Ireland in the seventeenth century, faced economic, political, and religious persecution leading them to decide in large clusters to move on to Pennsylvania with a group entering the Tohickon area through the nearby Deep Run settlement in Bedminster Township in the first quarter of the eighteenth century. Other early settlers were English immigrants. German speaking settlers came later with German names rare in the early to mid-eighteenth century public documents.

The first major road project was in 1741 when the road was laid out from the mouth of Tinicum creek, near Erwinna, then known as "London's ferry," to the mouth of Indian cabin run, where it crosses the Tohickon and meets the Durham road, near Hinkletown, in Plumstead Township. This road likely linked the Tinicum Scots–Irish to the Scotch–Irish settlement in the Deep Run. The Tinicum Scotch–Irish settlement was part of a larger cluster of nearby Bucks County settlements that started about 1720 and was particularly strong from 1730–1740 with lands taken up in Tinicum, Bedminster and in Deep Run, Plumstead, and New Britain Townships.

The road to Durham was opened through Tinicum in 1745. About 1750 the inhabitants of Tinicum built, by subscription, a wooden bridge over Indian creek, near its mouth at the river. In 1768 the inhabitants of Tinicum, Nockamixon, Bedminster and Plumstead asked permission of the court to build a stone bridge at their own expense, in place of the wooden one, but it was not granted. This location may be in the vicinity of a 1922 concrete arch bridge on River Road in Point Pleasant. This structure is also known as the Burnt Mill Bridge or the Sheep Hole bridge. The first name was adopted because of a fire that occurred at a mill on a property adjacent to the bridge. The second name refers to a local roadway that intersects with Headquarters Road at the bridge.

A few miles south of the village of Red Hill (Ottsville) travelers crossed the Tohickon Creek at John Orr's Ford. In 1763 residents petitioned for a bridge, raising as much of the funds as they were able with the remainder funded by the County Commissioners. The bridge over the Tohickon, on the Durham road, was built in 1765, at an expense of £283, of which the inhabitants contributed £101 and the balance was taken from the public funds. A large multiple stone arch bridge stood at this location until the mid-twentieth century when the road was widened and the old stone arch bridge replaced by the state. This was the largest stone arch bridge built in Tinicum Township and it has been gone for sixty years. The stone arch bridge as a bridge type, was used for major stream crossings in the 18th century on the most significant major roads often with multiple arches depending upon length, but was also found with frequency in smaller single arch designs on more local roads over smaller stream crossings.

Later eighteenth century roadways include a road laid out from Erwinna to John Wilson's tavern in 1767, about half-way to the Brick church, and in 1774, one from Abraham Johnson's blacksmith shop, on the Durham road, to the Presbyterian burying-ground. In 1786 the River road was extended up the river from Kugler's mill, below Lumberville, to the mouth of Durham creek, where it met the road already laid out from Erwinna down to that crossing. The road from Erwin's mills to the Durham road was opened in 1790. Whenever possible, the perimeter boundaries of the patents and grants became the location of local connecting roads. In this manner, the private properties would be minimally impacted.

Very few bridges existed as Tinicum Township initially attracted frontier settlers. Fords and ferries offered passage through and over waterways providing the most primitive form of creek or river crossings. Today, two fords can still be taken to cross onto Delaware River islands, and three creek fords, located on interior dirt roads retaining a narrow width, serve as clear surviving segments of the eighteenth century roads of the area that would have been known by the pioneer Scotch–Irish and English settlers. In several locations where fords were replaced by bridges, the earlier ford remains intact and the worn cartways that led in and out of the ford remain to be seen although long abandoned. Tinicum Township featured two Delaware River ferry crossings at the London or Erwin Ferry and in Point Pleasant, known earlier as Lower Black Eddy. The former ferry was replaced by a covered bridge and now features a 1930s iron truss bridge.

As settlers shifted from the first phase of initial settlement and survival to a focus on market agriculture, demand for more secure roads and stream crossings increased. Bridges of the eighteenth and early nineteenth century were often wooden beam bridges built on large masonry piers with stone abutments. These bridges were far less expensive than stone arch bridges, but the deck timbers had to be periodically replaced as they rotted. During the auto era, the wooden decks were phased out and replaced by I-beams and concrete decks, but the superstructure of masonry piers and abutments continued in place from the original bridges. Only two bridges remain in Bucks County with the original stone pier substructure for multi-span wooden beam design, both located in Tinicum Township dating 1812 and 1835. Based on an examination of PennDot's statewide bridge survey in 2003, there were only eight working bridges in Pennsylvania built before 1812. All were of the more common stone arch construction design. Based upon this data, the Headquarters Road Bridge is the oldest surviving pier-to-pier bridge left in Pennsylvania. This structure is also known as the Burnt Mill Bridge because of a fire that occurred at a mill on an adjacent property.

Three covered bridges offer travelers a momentary glimpse of the wooden lattice truss that hold up the roadway above the water of creeks and the canal, and that are wrapped in the wooden covering of siding and roofing that give these early American engineering innovations their name. These covered bridges have Town Trusses designed to be built quickly, out of readily available materials with local, relatively unskilled workers. A fourth wooden truss bridge with the trusses covered in siding, but not encased with walls and a roof, stands in Ralph Stover Park. The truss type of this unique bridge is unknown due to the siding covering the wooden trusses. It is not hard to imagine some of the German speaking residents helping to build these wooden truss bridges as they took up the rolling farmland up above the Delaware after migrating into Bucks County from the northwest by traveling up the Schuylkill from Philadelphia to the Perkiomen Creek watershed along branches like the Unami into Bucks County to the Tohickon watershed, overtaking and buying out many of the earlier arriving Scotch–Irish.

Ithiel Town's truss was patented on January 28, 1820. His wooden truss bridge, also known as Town's Lattice Truss, was inspired by the wooden arch truss patent design of Theodore Burr. Town's innovative lattice design provided a new more efficient method of load distribution, which could be achieved with lighter-weight planks of pine or spruce connected with wooden pins. The resulting structure was much lighter and considerably less expensive to build than a Burr arch truss bridge. The light, almost insubstantial, appearance of Town's bridges prompted comparisons to the common trellis found in every flower garden. The lattice truss bridge became so widely used across the eastern states in the 19th century that Town, who received royalties of $1 to $2 dollars per foot for use of his patented design, became a wealthy man. Ithiel Town's lattice truss became common across Bucks County.

While Durham boats carried iron down the Delaware River in the spring when the water ran fast and high, it was the Delaware Division of the Pennsylvania Canal that provided a means to overcome the navigation challenges of the Delaware. In Tinicum Township one can walk the canal towpath for several miles following the trail formed by mules over 180 years ago. In several locations camel back bridges convey vehicles over the canal as they have since 1832.

The canal linked the main Bucks County port at Bristol to Easton where a canal along the Lehigh River provided connection to the rich anthracite coal areas further north in Pennsylvania. The canal in Tinicum Township was operating in 1832 offering a means to move bulk items such as lime and coal, but many new manufactured items could now be cheaply transported distances such as cast iron stoves. Michael Uhler saw the opportunities brought by the canal and set up a series of businesses including a canal boat yard, lime kilns, a hay press, a general store, and a furniture factory as well as worker housing, a hotel, and a mansion overlooking this village all along the canal inland from the Frenchtown-Erwinna Ferry crossing.

A number of the road bridges crossing the canal were replaced in 1932 with through girder or box beam bridges and decorative wood truss side rails. The camelback open wooden truss bridges with wrought iron tie bar components were designed for crossings of the Delaware Division of the Pennsylvania Canal. The design evolved to solve the height requirements needed to allow the mules and bargemen to pass underneath along the towpath with proper head clearance. Commercial canal operations ceased in 1931, when the Lehigh Navigation Company sold the land to the Commonwealth of Pennsylvania to become Roosevelt State Park. A National Historic Landmark, the 60-mile canal that passes through Tinicum Township is among the last fully watered tow-path canals remaining in the United States.

After the Civil War cast iron bridges signaled America's technological shift from the age of wood to the age of iron. During the early twentieth century iron bridges and concrete bridges vied for dominance with concrete wining out. There may be as few as twenty-six metal truss bridges remaining in Bucks County, with at least seven of those closed or out of service. As the rural economy diversified with small scale cigar making, clothing factories, creameries, and shipment of milk, eggs, and vegetables to markets the iron bridges eliminated more fords and minimized wooden deck maintenance on the older wooden beam deck bridges experiencing greater daily traffic as the resident population of Tinicum continued to grow through the 1870s.

The principal time frame for metal truss bridges, particularly those built by medium-sized iron and steel bridge manufacturers from Pennsylvania and Ohio was from the era 1876–1900. The earlier iron bridges, might be through or pony trusses, and were constructed utilizing light-sized components, and generally assembled with pin connections. A second wave of metal trusses occurred during the New Deal of the Great Depression in the 1930s. These pony trusses utilize much beefier steel components, connected with welded plates. During the depression John Wexley, a Hollywood screen writer, directed the application and construction with local residents of two circa 1935 iron truss bridges that still stand in the Ridge Valley Historic District on Sheep Hole Road.

Tinicum Township features a grouping of early twentieth century bridges designed by Bucks County Engineer A. Oscar Martin. Martin designed or improved over 100 bridges in Bucks County through circa 1923. His work is important to the Tinicum collection for he improved older bridges by adding decks using concrete and steel while still preserving and maintaining the superstructure and abutments that were historic. Martin's imprint on the bridge collection of Tinicum is significant and impressive.

Trained as both an architect and engineer at Drexel Institute, A. Oscar Martin offered cost effective modern rehabilitations of existing bridges using new materials, and he created new designs that often utilized the colonial era arch shape only with concrete instead of coursed stone as the construction material. The cement industry was pioneered in the vicinity of Tinicum at locations in Lehigh and Northampton Counties, making the new concrete easily available for Martin's bridge designs. On primary roads and with long spans Martin offered innovative and agile open and closed spandrel arch designs. For short spans he worked with a variety of reinforced concrete deck solutions, many utilizing encased I-beams to replace former wooden beams and retaining the existing stone substructure, or in some new designs, entirely reinforced abutments, deck or reinforced beams. He is also credited with several plate-girder designs over the Delaware Division of the Pennsylvania Canal, a strategy developed to resolve approach heights as well as the under-clearance headroom for passing bargemen. His bridge projects were simple, direct, practical and easily affordable by the county, and transformed the vocabulary of county bridges to the new combinations of concrete and steel.

During the 1930s, the Pennsylvania Department of Highways created a more standardized approach to bridge design. Bridges on major roads were more likely to be replaced than bridges on less traveled roads, and by the 1950s larger scale bridges became common on the major through roads. The largest bridge in Tinicum is the 1931 steel Warren Truss bridge that features six spans measuring 951 feet to link Frenchtown, New Jersey to Uhlerstown, Pennsylvania. The stone piers and abutments once supported a massive covered bridge.

The Uhlerstown- Frenchtown bridge crosses the Delaware River and is considered National Register eligible.

These above mentioned bridges are among the upper tier of the township's fifty-two bridges listed on the Tinicum website. The Lichtenstein study for Tinicum enumerates twenty-eight bridges of interest, but the database software is no longer supported by Microsoft making the online database useless, there are no photos of the bridges accessible through the database, and text boxes with meaty entries cannot be fully read. In 1997 the Lichtenstein Study found ten bridges eligible and one potentially eligible for the National Register. The lack of a fully functional comprehensive inventory means that a comprehensive bridge survey must be made in order to speak definitively about the full collection in Tinicum Township. No doubt, there are more stellar bridges awaiting recognition on the roadways of Tinicum, and challenges to be made to some determinations of eligibility.

Preservation of the Bridges of Tinicum Township

When the historic resources of Tinicum Township were documented by the Heritage Conservancy from 1989-1990, nearly every bridge was historic. Over the past quarter century, some bridges have been preserved, but others have been demolished, are slated for replacement, or are threatened. Nationwide, a precipitous loss of historic bridges has occurred with an estimated decline of twenty-five percent of America's historic bridges in just two decades. In Tinicum Township, this national trend has been challenged with several protracted clashes occurring over the fate of historic bridges. A grass-roots effort to preserve the bridges of Tinicum Township has received tremendous local attention and support in the community and from non-profit organizations. Federal historic designations for bridges and districts, in concert with designations protecting streams, as well as the protection inherent in establishing the Delaware Canal Heritage Corridor, and the setting aside of natural areas for public parks, may well represent the most spirited effort in the Commonwealth to advocate for historic bridge retention and bridge restoration projects instead of bridge replacements.

Tinicum Township is a place where historic bridges stand as vital experiences within landscapes and viewsheds that still tell the story of how America was transformed from a wilderness to a pastoral landscape that epitomizes the draw of Bucks County's rural beauty to residents and visitors alike. The Bucks County countryside has attracted renown since the turn of the twentieth century, but today that heritage is at risk with large expanses of rural Bucks County countryside with minimal or limited new development rapidly diminishing, and worthy of more proactive and innovative bridge management. Tinicum Township is at risk to lose rare surviving examples of bridge types that are nearly extinct state-wide despite the efforts of residents to plead for bridge conservation rather than replacement. With no up-to-date functional database or publicly available systematic management plan, the State is not able to place deteriorated historic bridges into a context that truly evaluates rarity and significance, and unfortunately, bridge battles usually entrench both sides. Successful oversight of the historic bridges of Tinicum Township calls for a new type of management approach that gives voice to historical significance and repair options earlier in the bridge project analysis process, and bridge repair needs to become an acceptable means to manage historic bridges by the State of Pennsylvania. Before turning to a few key bridge preservation challenges, it will prove useful to look at several excellent bridge preservation outcomes in Tinicum Township.

It is absolutely clear that the State of Pennsylvania can repair certain historic bridges quite well. There are several excellent bridge preservation success stories in Tinicum Township. Three Town Truss covered bridges remain in service today, the Frankenfield, Erwinna, and Uhlerstown bridges, thanks to deck replacements that made the bridges safe, and a regular program of maintenance for this specific bridge type. Most residents would agree that the covered bridges are the most significant bridges in the area as they certainly evoke the horse-drawn transportation of the nineteenth century. This bridge type has benefited from popular public support resulting in a special state-wide covered bridge program that has saved most of the 219 surviving Pennsylvania covered bridges. Bucks County once had thirty-six covered bridges, but two-thirds have been lost leaving twelve, of which three remain in Tinicum.

In Ralph Stover Park an open wooden truss bridge survives as the last bridge of its type in Pennsylvania. The bridge is actually a covered bridge without the walls or roof, in other words there are wooden trusses, but they have been sided and protected from the weather but the deck is open to the weather. This last of its kind bridge in Pennsylvania has been closed to traffic for decades and is in poor condition and at risk of continued deterioration.

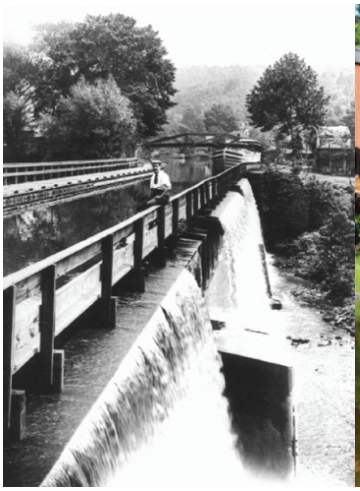
The Frankenfield Covered Bridge.

Bridges crossing the canal have also fared well and the basic design of the bridge sidewalls has been preserved over time. The Delaware and Lehigh Canal National Heritage Corridor features a common camel-back bridge design for road crossings over the canal that despite repairs and rebuilding, have retained their character defining sides forming the camelback profile. In looking at all of the camelback canal bridges along the sixty mile canal, only six fully original camelback bridges still exist. Most are newer beam bridges that replicate the wooden trusses as the side railings. One bridge is of the camelback design, but made entirely of metal pipe. Another replicates the engineering features, with wood and metal components, but is much heavier in appearance, being designed for heavy modern loads. Other types of crossings include metal Pratt pony truss, concrete arch, I-beam, box beam and concrete, pipe and pre-stressed arch culverts.

Pony Truss 1877 bridge crossing the canal—restored.

A representative example of a camel-back canal bridge.

The 1877 Pratt Pony Truss bridge over the canal recently underwent disassembly, repair, and restoration. The bridge was cast by the Murray Dougal and Company in Milton, Pennsylvania. The 1948 concrete canal aqueduct in Point Pleasant was replaced recently with a more authentic wooden structure that ensures that the canal flows over the Tohickon Creek.



While not a true reconstruction, the new canal aqueduct over the Tohickon Creek is a remarkable renewal of a key linkage in the canal system.

An 1887 pony truss bridge at Geigel Hill and Sheephole Roads was struck by a truck, closed, and its replacement was held up by public pressure because the Geigel Hill Road Bridge was the only bridge made by Nelson & Buchanan and/or the Pittsburgh Bridge Company that was located within a potential or listed historic district in Pennsylvania, that district being the Ridge Valley Rural Historic district.

The covered bridges, the canal bridges, and the restoration of the iron canal bridge and the compromise on the iron Geigel Hill Road bridge prove that in particular situations, the State of Pennsylvania has taken the path of preserving and enhancing the historic bridges of Tinicum Township or rebuilding, under historic bridge size constraints with the reuse of character defining features, in a manner that has complemented the settings in which those bridges operate.

There are three bridges currently at risk in Tinicum Township that do not appear to be receiving the consideration their historic significance would seem to dictate. Currently in Tinicum Township, a 1922 concrete arch bridge in Point Pleasant designed by county engineer A. Oscar Martin, which contributes to a historic district, is about to be demolished, and the last two multi-span stone supported beam bridges in Bucks County have replacement studies underway. The 1812 Burnt Mill (Sheephole) Bridge on Headquarters Road is the eleventh oldest bridge remaining in Pennsylvania and contributes to a historic district while the 1835 Creamery Road Bridge contributes to a Lower Tohickon Creek Historic District for which a determination of eligibility is being pursued.

Although the 1887 bridge was demolished, the one lane width, trusses, abutments and the right of way remained virtually unchanged.

The 1933 concrete arch bridge in the Point Pleasant Historic District was demolished this spring.

The Point Pleasant bridge replacement is underway with a temporary crossing being put in place to allow for the demolition of the historic bridge. The removal of this bridge is a significant loss as it is a central feature in the Point Pleasant Historic District. With the powerful Tohickon Creek flowing under its concrete arch, this bridge is a focal point especially from the second floor porch of the Point Pleasant Hotel, a location attracting visitors that came to the area for the quaint architecture and natural beauty seen at this bridge location. That this bridge is not being repaired calls into question the historic designations of the Point Pleasant Historic District and the National Landmark canal designation and how the State honors historic designations. Are these designations not designed to preserve the historic resources of an area? It is especially discouraging for the State to use tax-payer funds to demolish a structure that contributes to a historic district in the most significant part of Tinicum Township.

The significance of A. Oscar Martin as a county bridge engineer has been debated but not resolved making it impossible to determine how significant this particular bridge in Point Pleasant may be in the measure of his large body of early twentieth century bridge projects. Martin pioneered the use of concrete in bridge designs and this bridge is a significant example of his work that recalls the older tradition of stone arch bridge building in this region, yet by utilizing a new material that presented cost savings over stone masonry a traditional arch form could be formed to allow the passing through of the Tohickon Creek, a major tributary of the Delaware River. As the number of A. Oscar Martin bridges is diminished piecemeal, how many more of his projects will be lost before his contributions are competently and finally evaluated?

The 1812 Burnt Mill Bridge (above) and the 1835 Creamery Road Bridge (below) are the last two multi-span stone supported beam bridges left in Bucks County.

The 1812 Burnt Mill Bridge and the 1835 Creamery Road Bridge are the last two bridges of their type remaining in Bucks County. Is that fact not a reason to repair rather than replace the spans? It is the superstructure of the original bridges that remains since the decks were both originally wooden planks that had to be replaced periodically. The significance of both remains challenged by twentieth century auto era improvements that left both bridges one lane wide with the superstructure intact. Both are monumental with the earlier bridge spanning two supports and the latter stretching 199 feet across seven piers. In the auto age both bridges received concrete decks and pipe railings. The early auto era renovations extended the life of both bridges and are reflective of an older approach of repairing rather than replacing bridges in Pennsylvania. The Burnt Mill Bridge forms a squirrelly intersection with Sheephole Road and Headquarters Road that will likely force a bridge realignment if a new two lane bridge is mandated. A new span will have a significant negative effect on the Ridge Valley Historic District.

The Creamery Road Bridge forms the context for the Harpel Farmhouse that stands nearby in site of the bridge. The Harpel Farm was examined for National Register eligibility and denied, yet the researcher never gained entry to the property to evaluate the interiors. The farmhouse may well have one of the most intact interiors of any stone farmhouse in all of Tinicum Township. The house was abandoned during the depression, and after thirty-five years of being vacant a family purchased the farm and built a very sensitive addition leaving the original house interiors vacant and largely untouched since the 1930s. The second floor chamber that overlooks the Creamery Road Bridge features all of its original woodwork, plaster, hardware, and paint colors from the eighteenth century. The interiors of the farmhouse and the Creamery Road bridge have traveled through time together and as of today both still exist complementing each other. Will all three of these currently threatened bridges be lost? If so, what exactly is being lost if new bridges go in and the context of the bridge sites is altered?

Historic bridges, remaining in service, offer those traveling on the road an experience of crossing a stream or creek on an engineered structure that has remained unchanged for generations. Bridges offer users a brief moment to experience the crossing of a body of water. That experience can often be one of natural beauty as seen over the railing looking up or down stream at the views. The stream, creek, or canal below often only momentarily comes into view before the crossing is completed. Where the lands abutting the crossing are wooded the span offers a momentary rush of light, and when the lands are open the views can provide brief but distant images of scenery and buildings that have been part of that view since the bridge first opened. Historic bridges make those crossings a significant historical experience that enriches the traveling experience of residents and visitors alike. Historic bridges are living history serving as direct physical connections to a period in the past.

The bridges of Tinicum Township are a remarkable collection of structures that offer a rare and unusual variety of bridge designs meeting a variety of transportation needs over a broad sweep of time. The bridges are significant due to their design, but even more so for their context and the manner in which those brief moments of experiencing the crossing of the bridge connect the residents and visitors of Tinicum to the rhythms of the past. The historic bridges in Tinicum lay within surroundings that are natural, architectural, archeological, or a combination of all three that evoke the broader Delaware Valley story of settlement and pastoral development in a single municipality.

With immediately threatened bridges and no publicly available management plan for the bridges of Tinicum Township, it is not possible to know what the fate will be for the remainder of the municipality's historic bridges. Modern spans fail to equal the beauty and context sensitivity of historic bridges. Replacement bridges meeting modern standards often cause the redesign of the bridge location changing the appearance of adjacent intersections and requiring right of way acquisitions that negatively affect historic resources. When historic bridges are lost the impact of a new span is nearly always far greater than the loss of the bridge itself. The materials, size, design, alignment and impact to frontage can greatly undermine the historic integrity that once existed. "What is lost in the calculated costs of replacing or rehabilitating a historic bridge is the intrinsic value of the bridge itself," argues the Historic Bridge Foundation, "Somehow we must elevate the importance of our historic bridges in the stories that identify the communities of our nation and say "this bridge is part of who we are and it must be saved."

In researching professional responses to the nationwide issue of significant losses of historic bridges a workshop held twelve years ago in Washington, D.C. offers important lessons that have yet to become standard operating procedure in bridge replacement discussions. The workshop was sponsored by Eric DeLony, of the Historic American Engineering Record, and Terry Klein, of the SRI Foundation. A noble effort was made to address the loss of historic bridges in America by bringing together transportation professionals from across America to develop a fresh strategy for bridge preservation. Several of their findings are helpful in this discussion of preserving a rich and significant grouping of historic bridges in Tinicum Township. The stated goal of the workshop was to "articulate and define efficient and economical strategies for historic bridge preservation and management." A questionnaire was sent out to all fifty state DOTs, selected State Historic Preservation Officers (SHPOs), several consulting engineers experienced in historic bridge rehabilitation, a couple of civil engineering educators interested in the subject, and several non-engineering preservationists and historic bridge scholars. Thirty-seven DOTs responded, including the District of Columbia.

The number one recommendation was to mandate historic bridge management plans. The group recommended that every attempt should be made to identify those bridges where rehabilitation and/or preservation is appropriate and feasible, and to develop specific treatments for these bridges. Such efforts would result from bridge inventories. Two other topics have bearing on our topic. One question asked "Speaking with individuals in state DOTs, there is concern of a "disconnect" between environmental and engineering interests and disciplines. Could you characterize the relationship between these two disciplines in your agency? This is a touchy issue confirmed by many equivocal responses from the state DOTs. Though many states indicated that relationships were improving, eight states responded that there was a "disconnect." In some states, environmental and preservation interests were still perceived as "scapegoats," something extra and not necessary. Other respondents cited different value systems between the two disciplines as one of the reasons for this disconnect. Despite the prevalence of engineering interests and the lack of interest to pursue alternative or non-traditional methods, many respondents said that relationships were improving because of better understanding of the respective disciplines. Some of the reasons for improvement included the intervention or mediation by the FHWA division office, change of leadership within the agency, the attitude of individual project managers, context sensitive design, and the integration of environmental and engineering disciplines within the same office. Vermont claimed that its historic bridge program helped instill a measure of pride among the engineers on staff."

The other question asked "What has been the fundamental reason(s) that historic bridges have been saved? By far, community interest was the primary factor, noted by thirty-one (31) of the states. Thirteen (13) cited flexible design standards and three mentioned adopt-a-bridge programs. Nine (9) states cited their historic bridge management plans as the reason bridges were saved. Many states cited the Section 106 compliance process. One reason cited for successful rehabilitation involved someone on the DOT staff or a focused, passionate citizen or citizen's group willing to make a conscience effort to save a bridge. Other reasons mentioned included SHPO interest, the availability of transportation enhancement funding, and the obvious cost effectiveness of rehabilitation."

The last perspective to offer in this report is evidence of a changing attitude among professional engineers about applying their expertise to preservation and rehabilitation efforts with historic bridges rather than continually asserting that every deteriorated older bridge must be replaced. The American Society of Civil Engineers developed a policy in support of the rehabilitation of historic bridges that shows professional recognition of the viability of repairing rather than replacing historic bridges that reads "The American Society of Civil Engineers (ASCE) supports the maintenance, repair and rehabilitation of historic bridges preferably in continued vehicular use, and when that is not possible, some alternative transportation means such as a pedestrian or bike bridge." In their rationale the ASCE offers "Historic bridges are important links to our past, serve as safe and vital transportation routes in the present, and can represent significant resources for the future. Rehabilitation maintains these important engineering structures in service and can represent significant cost savings." There is professional pride to be found in saving bridges, "bridges are the single most visible icon of the civil engineer's art. By demonstrating interest in the rehabilitation and reuse of historic bridges, the civil engineering profession acknowledges concern with these resources and an awareness of the historic built environment." By planning to maintain historic bridges with management plans, "Many historic bridges can still serve the nation's transportation needs given appropriate repair, maintenance and flexibility in interpreting transportation standards as suggested by national transportation policy. Due to perceived functional obsolescence, lack of cyclical maintenance, and any funding priority, historic bridges are a heritage at risk."

The ASCE places the loss of historic bridges at a much higher rate than seen in other sources stating "Over half the historic bridges of the United States have been destroyed during the last twenty years—a startling and alarming statistic." In considering how this high rate of historic bridge loss might affect the ASCE's view of the threatened bridges in Tinicum Township consider, "Certainly no one can argue that outstanding and representative examples of the nation's historic bridges shouldn't be preserved. The ASCE policy calls on engineers to play a leadership role in bridge preservation, "Citizens groups throughout the country are working to save historic bridges. We, as civil engineers, need to help lead and support these efforts. Bridges are engineered resources thus requiring the skills of engineers. There is little chance that the historic bridges of the United States can be saved without the interest and skills of engineers, until they become part of everyday transportation policy, receive the support of transportation officials at all levels, and the continued interests of citizen groups."

In conclusion, the Bridges of Tinicum Township, when viewed as a collection, warrant greater consideration for preservation. The bridge collection in Tinicum tells a remarkable story of Scotch-Irish, English and Germanic settlement and economic development. A Tinicum Township management plan with input from the local community that forecasts the options for future treatment of all township bridges would be of great benefit to all of the various entities seeking to conserve and preserve Tinicum's historical and natural environments in which bridges play a highly visible role in how residents and visitors experience the nationally significant layers of Delaware Valley history still evident in the environs of the Bridges of Tinicum Township.

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Attachment 3

BURNT MILL BRIDGE HAER DOCUMENTATION SUMMARY
Prepared by Kathryn Ann Auerbach, Preservation Consultant and Instructor for Bucks County Community College Historic Preservation Certificate Program. @ 2012

Overview:

The Burnt Mill Bridge, aka Hockman's Bridge, aka Headquarters Road Bridge near Sheephole Road in Tinicum Township, Bucks County, PA carries Headquarters Road (LR 1012, section BRC) over the Tinicum Creek. The creek is designated as Exceptional Value under the Pennsylvania system and also is included in the Federal Wild & Scenic listing for the Delaware River. The resource is within and contributes to the Ridge Valley Rural Historic District listed in the National Register of Historic Places on July 24, 1992. The bridge's individual register status was further confirmed by letter from Patrick Andrus, Keeper of the National Register on April 28, 2006.

The bridge maintains two components of interest, first, the stone substructure that retains integrity and engineering features from its initial construction in 1812. The PennDOT Lichtenstein survey of historic bridges lists this as 4th oldest in Bucks County and 11th oldest in Pennsylvania. Second is the 1919 superstructure replacement of the original three-span wooden beam and plank deck with the documented "repairs" of steel I-beams and concrete deck designed by celebrated county bridge engineer A. Oscar Martin.

The one-lane (16 foot inside curb) bridge has served the township for nearly 200 years, only recently (March 2011) being closed to vehicular traffic due to deferred maintenance concerns. A large stone buttress was placed against the northerly side of the west wing wall ca. 1930-40 by the county or Pennsylvania Department of Highways to counter the prevailing action of the stream during flood stage. The bridge retained its 1919 pipe railing until ca. 1990 when the Pennsylvania Department of Transportation removed the pipe and installed modern galvanized W-type rail, drilling into the concrete curbs to set the posts. This introduction of holes and cracks into the concrete surface exacerbated freeze-thaw and spalling action that has caused the railing to become dislodged and to fall off. In the last decade moveable concrete "Jersey" barriers have been placed on the deck inside of the railing, diminishing the traveling lane from 16 feet to less than 11 feet.

Other work that has been in place over ten years include a concrete flange, or angled addition to the eastern downstream deck above the abutment to ease the turning radius as well as the placement of metal plates at several locations on the deck near the east and west abutments to cover erosion holes in the deck surface. Overall deferred maintenance, improper masonry techniques and failure to address water drainage has caused deterioration of the concrete deck. The stone abutments and piers were repointed, most comprehensively ca. 1919, and in the last several years concrete "cushions" or pillows were poured at the base to attempt stream scour remedy around the foundations of these features. Up until the last six years there was no weight restriction placed on the bridge. Since 2002 PennDOT has been exploring plans for full replacement of the bridge.

Historical Background & Context:
Headquarters Road is an early path that lead travelers through Tinicum township from the major road to Philadelphia and the Durham Furnace to the crucial Delaware River crossing at London's or Erwin's Ferry. It also was placed through this section to provide access for local farmers to the Christian Fretz (first Henry Myers) grist mill, the earliest and most successful of the "internal" gristmills within the large rural township of Tinicum. The immediate path of the road leading to and crossing the creek at the present bridge location has been confirmed as the original course verified by the county courts in 1747. (Bucks County Road Book A, Return #80, p.35, 38, microfilm, Spruance Library, BCHS). The narrow two-lane Headquarters Road follows a winding path along streams and geologic outcrops that define the character of the township and meets the easterly end of the bridge at the terminus of Sheephole Road. The bridge wing walls are noted as property corners in land surveys from the 1823 (BC Orphans' Court Survey, BCHS). The westerly approach from Ottsville passes the 18th century stone farmhouse of Christian Fretz, the associated stone barn and the site of the pre-1747 grist mill at Red Hill Road (opened 1812) then passes through level meadows with flanking fencing to lead up to the bridge. The mill suffered a fire in the late 19th century, at a time when outside commercial forces were challenging the economic viability of local grist mills and was never rebuilt. The bridge in county records assumed first the appellation of "Burnt Mill Bridge" due to the visible presence of the local landmark in ruin, then that of the adjoining owner "Hockman" at the time of its reconstruction by Adam Oscar Martin in 1919. (BC Bridge Records, microfilm & Martin Bridge Collection, Spruance, BCHS).

Substructure Background:
The substructure of the bridge, i.e. the stone abutments and piers which date from 1812, exhibit character defining features of the Federal period, as well as subtle engineering features that have proven sound over the bridge's 200 year history. Account books of William Erwin, son of Col. Arthur Erwin and landholder of substance along the river in Erwinna, document his work to oversee the "Building of a bridge at the mouth of the Tinicum Creek" (Erwin, William, *Account Book, 1799 & 1800 (-1804), with Bucks County Commissioners*… MSC. 193, Fol. 3, 1 v., Spruance Library, Bucks County Historical Society, Doylestown, PA). This bridge, along the Delaware River, was the only other bridge crossing of the Tinicum Creek, a large, strong stream that cuts through a major portion of the township. It carried the first road leading from Philadelphia to London's Ferry, replacing a stream ford crossing in place since before 1740. The majority of the abutments and pier, as well as the deck, of this bridge were completely replaced in the 1970's, only remnants of the stone wing walls remain.

Erwin's account book documents the local participation in the construction of a county bridge, namely the supervision by local resident William Erwin and the listing of "mechanics" or skilled carpenters and masons. The following names are included: Masons: John Neice (also listed as mason on a deed), George Neice, Moses Lauder, John

Helwick and Mark Wismore, and carpenters: Joshua Opdyke, Charles Thompson, John Vancamper, Thomas Curtis, Thomas Lott and Barnet Hillpot (documented carpenter in other records) (Ibid.). John Neice and Barnet Hillpot were known property owners in Tinicum at the turn of the 19th century. (Adams, Harry, Federal Direct Tax of 1798, *Tinicum Township*. Bedminster, PA: Adams Apple Press. 1994, pp. 225, 228)

There would be a strong likelihood that some of these artisans participated in the construction of the Burnt Mill bridge a decade later under supervision of the Fretz family. The Early Republic aka Federal period witnessed an interest by township residents for public and private improvements, including William Erwin's brother Joseph investigating with the DuPont's of Delaware the potential to harness the power of the Delaware River for milling and manufacturing purposes. (Fackenthal, B. F. Collection, 1801-1939, Fol. 80, Erwin. Joseph, *Letter to Geo. Wall of Solebury, Erwinna, Sept. 10, 1801*. ALS 2pp., Spruance Library, Bucks County Historical Society). (Note: above materials found in unpublished report: Steffe, Michael J., Historical Research Report Erwin-Stover House, prepared for Bucks County Parks & Recreation Department, December 31, 2004).

Refined stonework technique mirrored the maturation of Bucks County communities settled for nearly a century, benefitting from established economic base and second or third generation stability. The "building boom" of the post Revolutionary era was primarily an upgrade of established farms, transportation networks and crossroads communities with larger houses, barns and public buildings celebrating the autonomy and prosperity through solid, permanent stone construction. New county buildings, first at Newtown, then at the new county-seat of Doylestown in 1812, as well as the large county almshouse coupled with the county's sponsorship of bridges to improve transportation all featured stone construction primarily of cut and fitted ashlar technique. Houses and barns demonstrated dramatic cut corner quoins and jack arches to achieve an artistic strength, while wall ranges were skillful rubble ensembles in horizontal bed lines.

Bridges of county construction on principal interstate roads featured dramatic stone arches inspired by renewed interest in Roman government and building achievements. Only a handful of these remain today in Bensalem (Philadelphia Road) 18th century, Newtown (Center Street) 1794, Nockamixon (Old Easton Road) 1804, Springfield (Old Bethlehem Road) and in Warwick (Old York Road) 1808. Road improvements of the mid-20th century, such as along Easton Road (Route 611) eliminated several significant stone arch bridges, including one of nine-arches entering Tinicum Township across the Tohickon Creek. For important roads within townships, bridge improvements came after numerous petitions and, as noted, often with the help of local work force and supervision. Thus the construction engineering preferences and technique were a reflection of local capabilities of skill, materials and economic support. For rural and somewhat remote communities such as Tinicum, wooden beam bridges on stone substructures were acceptable and serviceable solutions. Coupled with enhanced knowledge of and belief in

wooden construction mastered by the local German heritage populations (the above John Neice & Barnet Hillpot), wooden beam bridges were achieved with ease and competency.

Several petitions were submitted to the county from 1805-1811 for the construction of a bridge by Fretz's mill, approved in 1812. (BC Bridge File #83, docket 2, ps. 4, 85; File #104, docket 2 ps. 294-307; File #112, docket 2, ps 360, 364) In 1805 the committee to view the site for a bridge described "that the width of the said Creek at the place where the bridge is wanted is about eighty-five feet that it would require a Bridge of ten feet High to be above the Highest Freshet in said Creek…" (Ibid.) County budgets printed in the *PA Correspondent & Farmers' Advertiser* 2/28/1814 and 1/30/1815 list George Snyder (local resident) as overseeing the construction of a "bridge over Tinicum Creek" and 1815 bridge account book shows Christian Fretz paid $21.75 for 175 bushels of sand. (BM B-20, p.8, Spruance Library) An undated county bridge index (ca.1887–1919) lists "Burnt Mill" bridge "spans Tinicum Creek on road from Red Hill to Erwinna, 80 ft. long and 16 ft. wide, open wooden structure." (BC Bridge records, microfilm, Spruance Lib.).

Further information on the appearance of the open wooden beam bridge design is found in the Oscar Martin bridge drawings collection (Spruance Library, BCHS) for a span over the Contrary Creek in Rockhill Township. This is the only multiple span wooden beam bridge within the Martin collection of over 100 bridge drawings. Only one other open wooden bridge, in Milford Township, is documented in the Martin drawings, but this has covered sides and long spans, and would be similar to the open wood Pony truss bridge over the Tohickon in Ralph Stover Park. The Rockhill township untrussed bridge has a deck width of 16 feet carried by six - one foot square wooden beams upon which 2 ½ inch thick wooden planks are set. The wooden railings are held with 4" x 4" wooden posts, spaced at approximately five foot intervals and anchored into the wooden beams with wrought iron spikes. The top rail is also 4" x 4" and one side plank 1" x 9" is placed at midway of the 3'3" height above the 3"x 6" toe curb. This bridge had four total spans with stone piers appearing of similar dimension to Burnt Mill, i.e. nearly five feet wide with rounded upstream noseings. The water flow favored under one of the spans close to one abutment. Martin's repairs included stonework repairs, as well as a change in the deck grade. While no other specific information is available about this bridge, it appears to be in the vicinity of State Road and the Route 309 bypass, thus no longer in existence.

It would be over sixty years before another bridge crossed the Tinicum Creek in the township, the Frankenfield Covered Bridge (carrying the combined Hollow Horn & Cafferty Roads), underscoring the importance of and the proven capability of the Erwin River Road Bridge and the Burnt Mill Bridge to serve the needs of Tinicum travelers. In contrast to other "repairs" undertaken by A. Oscar Martin during his twenty-four year service as county bridge engineer, he did not call out any specific repairs to the existing 1812 stone work of the Burnt Mill ("Hockman's") Bridge in 1919. He did order concrete caps to the abutments and piers to receive the new I-beams and integrate with the new concrete deck, as well as new coping on the stone wing walls. (*A. Oscar Martin*
KAA/2012

Collection of Drawings, Bridge folders (3), drawer G, Spruance Library, Bucks County Historical Society, Doylestown, PA). This stands in contrast to other bridges he repaired, where he specified pointing repairs, or complete concrete "jackets" to cover and seal existing abutments.

Not only was the stone substructure sound 107 years after its initial construction and has continued to support a functioning bridge for nearly 200 years, but, of the long span (over 70 feet) bridges in the county, this is the oldest and best preserved example of stone abutment and pier substructure to serve a open wooden bridge. The size of the stones, the "batter" or splay of the wall and angled or concave facades demonstrate knowledge of stone engineering and performance. In particular the placement and arrangement of the very large cut rough ashlar stones are largest in the lower third of the stone features, diminishing in height & precision with increase in elevation. The west abutment, the area that requires the most strength against the prevailing stream flow, contains the largest stones, some measuring four feet by two feet and two feet deep. These stones are neatly fitted in horizontal bed lines, the largest favoring the north corner, most susceptible to downstream water flow. In addition, these large corner "quoins" are cut in a trapezoid plan, to follow the angled northerly façade of the abutment, serving to deflect high water.

The mass and shape of the piers, featuring rounded upstream noseings, served as a prototype for the Creamery-Fretz Valley Road (Harpel's) wooden beam bridge of 200 foot span over the Tohickon Creek built twenty years later. With the advent of wooden truss technology in the 19th century, however, difficult streams could be spanned without multiple piers, thus the covered bridge eclipsed the open wooden beam bridge as the popular travel solution. By the late 19th century metal truss, followed by concrete and I-beam technology offered engineering solutions that could meet the spans with materials less susceptible to weather elements and continuous maintenance supervision. The few early wood beam spans were replaced, not only the superstructure, but commonly the substructure as well, leaving Burnt Mill Bridge as perhaps the oldest remaining example of the stone substructure for multiple-span wooden beam bridges in the county and state.

Within the Ridge Valley Rural Historic District the Burnt Mill Bridge is a significant contribution to the understanding of the evolution of transportation and stream crossings, echoes and compliments the surrounding natural stone outcrops, as well as the character, craftsmanship, feeling and association with the neighboring rural historical buildings. It documents the earliest road path through the district and the earliest constructed stream crossing within the district (there are still two natural stream fords in the district). The importance of the stone substructure as an educational document has been elevated since the destruction and removal of the historical stone abutments of the upstream Geigel Hill Road Bridge (1887) within the district. The superstructure 1919 Adam Oscar Martin "repair" is a valuable compare and contrast to the upstream 1917 crossing by Martin over the Rapp Creek within the district. The organic and historical character of the bridge,

coupled with its high visibility within the district, is an important landscape feature that demonstrates a successful union of historical engineering and dramatic natural and historical features each serving to enhance the other. The bridge provides continuity of the historical experience, critical to the value of the rural historic district.

Superstructure Background:

The early 20th century saw a change in bridge maintenance policy by the County of Bucks with the installation of Adam Oscar Martin as county engineer by 1902. This newly created position came at the advent of new engineering technology as well, that of the use of steel I-beams and reinforced concrete for load bearing construction. Martin (1873-1942), a Bucks County native, trained in architecture and engineering from Drexel Institute, and benefitting from architecture experience in Buffalo as well as Philadelphia, embraced the opportunity to establish a practice in his home county by ca. 1897. By 1900 he offered designs for two stone arch bridges to the county, ironically possibly serving as county commissioner as well (an Adam Martin is listed as commissioner on bridge placques from 1900-1902). As the county's first bridge engineer, serving from 1900 – ca. 1923, Martin directed the repair and new construction of over 100 bridges throughout the entire county. A collection of Martin's bridge drawings (as well as many of his other architectural designs) is held at the Bucks County Historical Society's Spruance Library. This collection provides unique insight into the emerging technologies of the early 20th century, Martin's practical and sensitive approach to design, and a record of bridges and bridge types that no longer exist.

Martin's Pennsylvania German background guided him in a conservative and practical solution to design challenges. His architectural training and personal aesthetic combined many philosophies of the Arts and Crafts, Colonial and Spanish Revivals with a keen knowledge and sensitivity to scale, patterns and settings of Bucks County's building traditions. As a result, his pleasing designs consistently won favor with clients throughout the county. This attentiveness to scale and setting, surface textures and affinity for the heritage of local wood and stone craftsmanship comes through in Martin's collective body of bridge work. Nearly one half of the bridges documented in the BCHS collection were "repairs", incorporating elements of existing bridges, maintaining road alignments and widths, using existing stone abutments and piers and repairing or replacing the superstructure. Martin rehabilitated open wooden beam and truss bridges, covered wooden truss bridges, metal truss and stone arch bridges.

Martin's new designs for either deck replacement or entire new construction included metal plate girder bridges, reinforced concrete deck, concrete encased I-beam and concrete deck, reinforced concrete beam and deck, concrete arch and stone arch constructions. Many of his "repairs" were simply replacing wooden beam and deck components in I-beam and concrete, while maintaining the footprint and profile

elevations of the existing bridge. Concrete decks were macadamized to blend with the approach roads and open wooden railings were replaced with open pipe rail. Martin designed well over fifty concrete bridges of various types from 1906-ca.1923. This "modern" phenomenon was worthy of note at the time, as seen in the *Trenton Evening Times*, August 19, 1914 "Concrete Bridges are Erected in Bucks" "Bucks County's reinforced concrete bridges are justifying the faith of the County Commissioners, who first introduced the plan of substituting them for old-fashioned iron and wooden bridges. The assurance is given by County-Engineer A. Oscar Martin, of Doylestown, who designed all of them."

Martin's work with concrete and steel beams appears first in 1906 with designs for a single arched span at Auchey's Mill in Milford Township. He had designed a stone arch approach to the mill, but changed to concrete and steel with success. That same year he designed two longer spans, the first with two arches on Dark Hollow Road at Stover's Mill over the Tohickon Creek from Bedminster into Tinicum Township and the second with a single 72-foot span on Allentown Road at Campbell's Mill over the Unami Creek in Milford Township. (Both latter bridges recently destroyed, Campbell's Mill featured in an article "What Makes a Bridge Great?", Stidger, Ruth W., ed. *Better Roads*, 2/2005). Martin continued to design closed and open spandrel arch spans, although not as prolific, into the 1920's, the large two-span bridge in Point Pleasant being among his last in1921.

Martin developed a concrete substitute for wooden bridge decks by ca. 1908. These were primarily encased steel I-beams replicating the wooden beam spans of approximately 25 feet. He used eight I-beams for a 16 foot wide deck (wooden beams used only six), the standard bridge width, and used a raised square concrete curb and end concrete pylons to receive the 2" or 2 ½" pipe railing. Occasionally he raised the approach and deck slightly to increase the hydraulic opening. Quite often he made repairs to the existing stonework, even to entire encasement in concrete "jackets". Concrete "caps" or diaphragm seats for the I-beams were placed on top of the stone features, and concrete coping was used on the wing walls. Date stones (generally marble) were nearly always incorporated to commend the county's interest in its bridges. Martin also built some bridges with full reinforcements, either an integrated deck, or with reinforced concrete beams (four for 16' width) depending on the span and circumstance.

The majority of I-beam bridges through the 1920's were replacements of mostly wood beam bridges, labeled as "repairs" with 16' wide deck of 8-beams averaging 15" high & 25' in length (29'-30' spans used 18" I-beams). These I-beam bridges were mostly shorter, of one or two spans to about 50+ feet. While some beam bridges used new abutments and a single pier of concrete, Martin commonly used existing stone piers, abutments and wing walls, although often with repairs, concrete refacing and coping on the top surface. The new concrete deck was always covered with macadam or stone grit with a center crown. The concrete itself contained rough, pebbly aggregate and was a

medium-tan color that eased its harshness. Martin attempted to maintain historical features, existing path, stone walls, arches and setting and took a conservative approach to utilize what was there and make minimal overall changes.

Burnt Mill Bridge appears to be among the longest of the "Repairs" (another over the Mill Creek in Rushland was nearly identical, age unknown and since replaced) with three spans approaching 75 feet. There is no notation on repairs to the stonework, just to add a concrete cap to receive the new beams and seal into the deck. Occasionally Martin corrected the creek channel to better align under the bridge, and changed the approach over the creek to skewed (especially with new concrete arched bridges) to achieve the design and connect the road path. This is not the case at Burnt Mill. Martin's "repairs" to rural bridges were nearly exclusive to 16-foot width and replaced the wooden decks of shorter span bridges. Longer spans were either repairs to covered bridges (120-180' spans) or repairs and widening of stone arch bridges. Spans of 50 to 75 feet were often new concrete arch spans, the retention of the stone substructure of Burnt Mill further demonstrates it was sound and capable of reuse. The use of galvanized pipe railing of 2" to 2 ½" diameter was common with Martin's beam bridges. The marble date stone was often placed slightly recessed in the bridge pylon or at the inside face of solid parapet walls at crown of arch. Burnt Mill's 1919 date placque is in the north pylon.

Thus Burnt Mill Bridge demonstrates the quality and engineering of the 1812 stone substructure and its minimal alteration in 1919 to accommodate the new concrete deck of A. Oscar Martin. The superstructure not only illustrates Martin's engineering formula for the replacement of wooden beam spans, but his stylistic treatments as well. This formula became a prototype copied by subsequent county engineer John S. Roberts and into the mid-1930's with early Pennsylvania Department of Transportation bridge improvements. Perhaps most importantly, through Martin's documentation drawings, the suitability of the stone substructure is verified, not only by virtue that he called out no repairs to the stone, but also in that his choice to "repair" the deck, rather than to place a new concrete arch span at this location, answers to the quality of the existing stone.

Historical Background & Context Summary:

- 1812 substructure
  - 4th oldest bridge in Bucks County, 11th oldest in PA
  - oldest documented stone supports for multi-span open wooden beam bridge in PA
  - demonstrates characteristics of Federal era stonework, local craft and engineering
  - only remaining of its type within a rural historic district in Bucks County.
- 1919 superstructure
  - work of pioneering master county engineer A. Oscar Martin
  - design decisions & preservation of substructure verified by Martin's drawings
  - demonstrates prototype for "repair" of wooden beam bridges with I-beams & concrete deck, copied by subsequent bridge projects over the next 30 years.

Kathryn Ann Auerbach/2012

Documentation Project:

In order to document this very early surviving example of the substructure of a wooden beam bridge of multiple spans and to provide a greater understanding of the character of the 1812 stonework as well as the sensitive repair treatments of A. Oscar Martin, the Historic Preservation Department of the Bucks County Community College undertook Historic American Engineering Record (HAER) level field documentation of the bridge during 2009-2011. The HAER field study used standard HABS/HAER measuring techniques to measure and draw to scale the Burnt Mill Bridge with principal focus on the 1812 substructure of the bridge and the 1919 deck construction characteristics. Field datums included a horizontal level line established across the entire length of the bridge from abutment to abutment at approximately 4.5 feet below the I-beams of the deck, and vertical plumb datums at corners. Approximately 1/3 of the stones were measured, primarily those on corners and lower portions of the substructure that are demonstrative and consciously fashioned. The beams under the deck were measured for height and placement. The deck surface was measured from a second datum (7', 10" above 1st datum) stretched the length & beyond onto the approach path. Wing walls and the buttress were plotted. The 1919 concrete pylons, datestone, curbs, evidence of pipe railing and location of ca. 1990 guiderail were documented. Diagonals were used between piers to confirm the lateral geometric placement of the bridge on the landscape. Documentation was conducted around the bridge while the bridge was open to traffic. In spite of very large trash and PennDOT line-painting trucks crossing overhead, no evidence of stress was exhibited by the bridge or any of its components.

Draft pencil drawings made to scale (elevations ½" – 1') were produced by the students. These were reviewed by the project director Kathryn Ann Auerbach against the extensive field notes and photos and a draft pencil on velum organization set was prepared with hand written notations and dimensions to facilitate further study and evalulation of the bridge and assist with the section 106 process. This documentation project was not undertaken with any contract, it was an educational offering by the Bucks Historic Preservation Certificate Program under the Historic American Building Survey Workshop. Previous workshops lead by instructor Auerbach have garnered the Bucks program national recognition with 1st, 3rd, 4th and Honorable Mention awards in the prestigious Charles Peterson Prize competition among national universities, sponsored by the National Park Service-Historic American Building Survey, the Athenaeum of Philadelphia and the American Institute of Architects.

N.B. To commemorate the 200th birthday of Burnt Mill Bridge, the Bucks County Community College assisted with the production of a poster featuring scanned images of the HAER drawings, as well as elements of Oscar Martin's drawings. This poster is not to exact scale, nor a final HAER product and was produced solely to celebrate the engineering and quality stonework characteristics of this unique bridge.

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Substructure Observations:

The high quality of the cut stones is evident in the lower ½ of the abutments and piers, and is most visible on the east face of the west abutment. The stones may be deep bed Brunswick and Lackatong shale, primarily of a dark brown color, and having strength qualities approximating red argillite quarried today from Blooming Glen quarries in Hilltown Township (less than 10 miles distance). They echo the stone piers built during the same period (ca. 1812) to carry subscription toll bridges over the Delaware River, specifically at New Hope (1814) and Centre Bridge (1813). (MacReynolds, George, Place Names in Bucks County. Doylestown, PA: Bucks County Historical Society, 2nd ed. 1955. pp. 74, 273). The principal bed stones approximate four feet in length, two feet high and two feet deep and are laid in horizontal courses with diminishing size at increasing vertical height. Due to elevation changes from the east side to the west, the size, character and design of the abutments vary.

Abutments:
East Abutment:
The east abutment is barely five feet in height with cut stones at the corners and along the west face, with more random, rubble masonry blending directly into the wing walls that retire quickly into the hill behind. The west face of the abutment has a width of 18', 2" to the corners. Nearly centered in this façade is a large stone that appears round due to extensive applications of pointing and surface gunnite, but may actually be almost 2 feet square. Its conscious placement suggests a function greater than decoration, perhaps intended as a date stone, although there is no evidence of incised numbers. The corner blocks or quoins are large, some four feet in length, and fairly consistent in height, averaging one foot high.

The downstream corner blocks are of an obtuse angle in plan to begin the extended wing wall that carries 24 feet along the shoulder of the road. The first 12 feet of the wing wall have been dismantled above grade to accommodate the angled cantilevered concrete deck flare that runs on top of the wing wall. A survey post was noted 20 feet to the east of the end of the actual bridge deck. Portions of the north wing wall by the Sheephole Road intersection have been broken down as well. The marble datestone placque from 1919 is placed in the concrete pylon on the north corner directly above the corner of the abutment/ wing wall. It is obscured by application of the W-guiderail directly in front of and on the pylon. The south pylon was removed as a part of the deck flare enhancement, although the footprint of the 1919 curb is visible in the deck in this area.

A natural spring in the hillside on the east side of Headquarters Road, immediately east of the abutment tends to overflow onto the road and then onto the bridge, due to the blockage of adjacent drains and gutters. This additional water, coupled with inadequate deck drainage caused by the placement of the Jersey barriers, appears to have contributed

to the hole in the deck near the face of the abutment. Water was observed traveling down the surface of the wall, as well as some water infiltrating through a masonry crack below the hole. This is approximately four feet from the north corner.

The vertical plumb of the north corner appears to cantilever out past the base stone by two inches. This appearance is partly due to the build-up of applications of gunnite closer to the deck. The variation is exacerbated by the evidence of erosion wear and spalling from surface water running against the abutment onto the corner of the base stone, thus diminishing the width of the west face at the very base datum to 18 feet. Stones behind the face stone are sound with no evidence of displacement. With the exception of a loss-of-mortar crack beneath the deck hole, there is minimal evidence of any other associated cracks or stress elements in the masonry, although heavy gunnite applications conceal the stone and mortar edges. The standard "batter" of approximately 2" splay to a wider base is preserved and evident on the downstream south corner.

All of the deck beams are at nearly the same height above the datum, averaging 4'- 4", with variation of about one inch due to original or resurfaced concrete encasing, or exposed iron. The southernmost beam is slightly higher than the others, possibly due to its incorporation into the newer deck flange construction. Important to note is that the primary west façade of this east abutment is slightly concave in plan, curving in towards the center and out towards the corners (average 2 ½" difference from the corners to the center). The consistency of this subtle curve suggests this is an intentional original construction to further provide strength of the abutment against the earthen hillside.

Summary of Features of East Abutment:

- -consistent and gentle concave west façade as originally built, no evidence of movement
- -consistent beam heights, variation due to spalling concrete encasement of I-beams
- -large stones in horizontal bed lines, largest at base
- -typical vertical wall batter on south corner
- -nearly intact north pylon with 1919 marble date placque
- -early or original stone wing walls, intact at ground level & below, broken or rebuilt in portions of both upstream & downstream walls above ground.
- -survey stake adjacent downstream wingwall, wall as survey point noted ca.1823 deed.
- -mid-late 20th century concrete cantilevered deck flange added on downstream side, original deck curb, pylon and wingwall location evident in deck surface.
- -poor drainage of surface and adjacent spring water causing deck deterioration and unattended water infiltration issues.
- -original 1812 stone and massing intact

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West Abutment:
The west abutment is the most remarkable, by size, stonework and sophistication. It stands roughly ten feet above the stream bed, although the main channel of the stream runs close to this abutment, creating a deeper channel within several feet of the east face. Very large rectangular stones are laid in conscious horizontal courses, the lower two courses exhibiting stones of four feet long, two feet high and two feet deep. The vertical face of the walls exhibit a slight "batter" or taper to greater width at the base, with about a 2"-3" variation from base to top. Again there is a very slight concave plan to the east face along its 19'2" length. A distinct stone footer or "water table" was noted, slightly beneath prevailing water heights during the fall season. Although the top edge of the footer had evidence of broken edges, thus no longer of an even height, it has a consistent projection of 6 ½" along the entire face, verifying the intact condition of the wall mass.

The south façade retires quickly into the earthen bank behind, similar to the east abutment, with random rubble stone in horizontal courses making up the south wall as it blends into the wing wall. At approximately 10 feet west of the abutment face the stonework is above the road surface and is made up of smaller, more rubble stone, possibly with portions of the wall rebuilt. There is a thin concrete cap applied on the top of the wall (not the several inch squared coping called for in 1919). The 1919 concrete pylon at the east terminus of this wall is relatively intact but with top corners broken off.

The approach road from the west has a distinct upward slope as it nears the bridge within this wall area. There are no scuppers evident for road drainage. The length of the south wing wall is nearly 36 feet, with the adjoining earth crowned to the deck height, then dropping quickly down in the easterly direction to below water level within 10 feet of the east façade and the creek edge. A measuring gauge is fixed to the wall near this southeast face corner. A galvanized pipe is also attached here, likely as a hand hold for anyone reading the gauge or working on the bridge on this side.

The north façade contains some of the most interesting features of the bridge, including the largest stones, masterfully angled at the northeast corner to match the trapezoid plan and a unique large stone buttress set at an angle against the western bank of the land and wing wall. The prevailing channel and main force of the stream favor this north corner, evident even in the 1919 Martin drawings. The stonework on both the north and east sides of this northeast corner of the west abutment is the best cut and fitted on the bridge, designed in 1812 for maximum strength against the stream. The large corner quoins are cut at an obtuse angle to incorporate the angled approach of the road from the west, and perhaps to help divert any flood waters more easterly back to the stream. The two stones at the base, one 4 feet the other 3.5 feet, appear locked with lap joint, with a very fine mortar space in-between. While this may have been an installation crack of the once nearly 8 foot long stone, its tight fit indicates virtually no movement of the base stones over 200 years and essentially integrates the stones together.

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As with the east façade, large stones in horizontal courses characterize the lower half of the north façade and on the corner roughly five feet above the base. The upper portion of the wall (another 4.5 feet) contains roughly rectangular stones that decrease in size to blend into the rubble wing wall that stands at an 8 foot height above the datum. Evidence of mortar and stonework repairs that appear in this upper portion tends to follow at an angle just below the road surface, suggesting infiltration from surface drainage water, again without scuppers. The concrete pylon at the east terminus of the wing wall has been diminished in height by at least one foot and the north exterior face of the concrete broken off, exposing the reinforcing rebar. Built-up applications of gunnite cover and alter the stone surfaces under the pylon to compensate for added exposure resulting from the loss of the pylon face. Additional gunnite, deflection and cracks in this top NE corner demonstrate water damage from the surface deck hole directly above (note, some damage noted also on east façade, approx. 5' square area in top NE corner). From the east abutment face the wing wall extends westerly about 22 feet, being substantially broken down at the last several feet at the road surface just above and west of the buttress.

A large stone buttress is built against this wing wall into the earthen bank starting 13 feet from the east face of the abutment and extending west for six feet. The buttress is nearly 10 feet high and begins six feet to the north of the abutment wing wall, with an angled face diminishing back to 3.5 foot projection at the top. This is made up of much smaller stones, although matching mortar repairs allow the feature to blend with the 20th century repointing to the original 1812 stone construction. At the base of the buttress and along the north face of the abutment is a recently poured (within the last five years) concrete cushion or pillow with a slightly convex top surface, at nearly water level. Three additional cushions are poured in staggering projections and lower depths eastward of the east façade of the abutment, within the prevailing stream channel. While the original, 6.5" projecting stone footer measures approximately five feet below the datum line, the stream channel may exceed seven feet below the datum near mid-span of the western bay, just east of these cushions.

Summary of Features of West Abutment:

- -largest and best fitted stones, especially near the NE corner
- -slight concave east façade plan and typical "batter" to vertical profile verifies built-in strength features of 1812 construction for solid, secure wall.
- -original stone work in-situ below road & surface grade
- -consistent stone footer projection across entire east face of wall shows no movement
- -consistent height of I-beams
- -portions of 1919 concrete pylons and attendant stone wing walls in-situ
- -large stone buttress, ca. 1930-40, on north façade for strength reinforcement
- -concrete cushions/pillows poured at base to protect abutment foundation from scour
- -measuring gauge and handrail fixed on south façade
- -over ¾ of stonework and overall massing of very good integrity from 1812

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Stone Piers:

The two stone piers are significant, not only as an integral part of the current engineering, but in clearly demonstrating the type of bridge built here in 1812. They demonstrate the accepted capability of an untrussed wooden span, namely approximately 25 feet, and the accepted width of a solid stone pier of about five feet. Rounded upstream noseings extend two feet beyond the rectangular footprint of the load bearing portion of the pier, the curve to deflect the stream flow. They are also a character defining feature of the Federal era bridge, being easier to construct than a sharp pointed nose used with late-19th and early-20th century bridges. They provide verifiable comparison to the nearby Creamery Road Bridge attributed to an associated Fretz family member.

Both upstream and downstream facades of the piers contain large cut stones, the upstream stones cut on a curve to echo the pier's footprint profile. The south façades are square, with demonstrative stone corner quoins. The nearly ten foot high walls are again battered with a roughly 2 to 4 inch splay although the taper accelerates inward at the top foot of the pier on the ends. Horizontal I-beam placement varies slightly from the east pier to the west pier, due to the angled path of the roadway across the creek over the bridge. Thus the I-beam on the south end of the east pier is nearly flush with the south façade, the corresponding beam on the west pier is set in several inches. Again, vertical I-beam heights are relatively consistent as seated on the piers, height variations generally from separating and spalling surface concrete applications to the beams themselves. A medium size tree is growing out of the creek bed close to the south end of the east pier, but without any evidence of impact to the stonework. The USGS stream measuring gauge, a metal cylinder with protective square observation hood on the top, is fixed with metal bars to the south façade of the west pier, blocking visibility of some stones.

Poured concrete cushions surround the upstream noseings and run along the east and west facades of the piers, again to deflect scour waters. Where the cushion ends on the east pier east façade, a backwash action is occurring, with slight erosion along on several base stones. Nothing else is showing cracking or deflection suggesting that simple repairs and cushion extension can remedy this. A variety of pointing, patch pointing repairs and gunnite applications are evident throughout both piers, in particular on the north rounded noseings. For measuring purposes this treatment obscured surfaces of the stones, although some of the original stones could be discerned through these less-than- artful applications. The piers are capped with concrete to receive the I-beams, as well as a protective feature on the top surface of the rounded north ends, although the latter has broken off in portions over the years.

The piers in their overall massing appear remarkably secure and consistent in height, vertical splay and façade evenness. One stone at the base of the west pier on the west face, roughly in the middle appears set out slightly (3-4") from its neighbors. While this may indicate a former slippage from overhead deck water leakage, there are no

indications of recent movement. The adjacent downstream stone appears slightly weathered, actually enhancing the appearance of the projection, and thereby minimizing the veracity of this slight bulge. Likewise, stones on the noseings, especially the west pier, that became dislodged or lost mortar over the years, may have not been reset properly, giving these profiles an irregular appearance. I-beam heights, however, run very consistently, confirming overall firmness of the piers under deck and load bearing weight strains.

Pier Summary:
- -character defining round noseing upstream profile
- -number and placement of piers of engineering significance
- -vertical splay and smooth running facades demonstrate soundness over 200 years
- -dressed square and rounded stones on ends and larger squared stones in lower half character defining of construction technique, time period and engineering
- -I-beam placement of consistent height, no movement
- -cushion treatment may be enhancing scour where missing
- -variety of pointing, including scored ribbon pointing and broad surface application of gunnite
- -minimal evidence of modern stress or cracking

Superstructure Observations:

Deck:
A horizontal datum was extended the length of the bridge beginning near the east pylon and extending past the west abutment with vertical measurements down to the deck surface taken roughly every 12 feet. The readings demonstrated a deck that is remarkably even, basically level but with a consistently graduated descent to the west approach. The concrete deck surface was covered with macadam as per Oscar Martin's specifications in 1919, although macadam reapplication was likely done within the last 40 years. Lateral cracks in macadam parallel with the stream flow were noticed over the expansion joint areas, namely the area of approx. 18" between the I-beams atop of the piers and at the deck termini over the abutments. No other significant cracks were noticed, just wear and weatherizing effects on the surface.

Several holes in deck surface were found near the abutments and have the appearance of being in existence for a long time. These holes are nearly one foot in rough diameter and were simply "repaired" or covered with application of heavy metal plate over top. The resultant water seepage has infiltrated concrete encasement of beams, adjacent deck areas, as well as stonework beneath, although the holes themselves occur over spaces between the floor beams and had minimal direct structural impact. One hole is at the deck terminus on Erwinna side near northeast pylon. It is between the 2nd & 3rd beams from the side and is allowing water to filter down onto the east abutment. The two holes on

Ottsville side likewise are found where deck meets abutment, both again between the 2nd & 3rd beams from each side, the northwest hole again causing water infiltration onto the abutment. These locations appear to have become susceptible from the thin deck surface above the ends of the I-beams coupled with traffic friction. Associated damage to the deck and stone mortar appears to have been ongoing for a long time, with gunnite repairs applied more than once over the affected areas.

The 1919 pipe railing installed with the Oscar Martin repairs was removed ca. 1990 and modern W-guiderail applied to the bridge. This application has caused significant damage to the deck along the curb sides. The posts for the railing were mounted with bolts drilled into the concrete curb, thus allowing fracture and water seepage. The concrete curbs spalled at the bolt lines causing most of the curbs and railings to fall off of the bridge (significant debris was noticed on the ground around the bridge). This exposed the interior aggregate of the concrete, as well as the end I-beams. Heavy concrete "Jersey barriers" have been placed along the sides of the roadway for remedial protection. The barriers have restricted water drainage on the deck, snow removal and have caused collection of debris. Modern guiderail has been affixed to the barriers, as well as over the flange and retaining wall remnants on the Erwinna side. The earlier W-rail was applied over the marble datestone on the northeastern pylon, obscuring the date information and again damaging the pylon. The location of the original concrete curb is imbedded and visible in the road deck of the newer flange on the south east corner toward Erwinna.

Deck Summary:

-the deck horizontal profile is exceptional in its consistent evenness and graduated descent toward the lower Ottsville approach. There is no obvious displacement
-large holes occur at the deck terminus on both ends, in place for a long time & covered with metal plate
-remnants of the concrete curb, pylons, pipe railing from 1919 are still visible
-Northeast pylon most intact and holds the marble date placque from 1919
-application of modern W-guiderail has significantly damaged the curb, side surfaces of the deck and I-beams and end pylons
"jersey barrier" placement has restricted water drainage, snow removal &c
-these barriers have introduced significant "dead weight" to the deck, perhaps 30 tons, Although no strain exhibited on the deck or substructure
-surface treatment is macadam, as per 1919 specifications, deck underneath is reinforced concrete that integrates with concrete casings around I-beams beneath
-expansion joint lateral cracks predictably occur above piers and at abutments
-concrete exposed on sides of deck show large pebble aggregate.

Landscape Conditions

The prevailing landscape surrounding the bridge is natural, stream banks lined with trees, adjoining fenced pastures to the west and the rugged impression of shale cliffs to the north. Road and bridge features are minimal and blend completely into the rural setting, reinforcing the visual expression of the logical progression of this site from 18th century stream ford to bridged crossing of the Federal period and easy transition to motor vehicle traffic of the modern era. The stone substructure echoes the stone outcrops on Sheep Hole Road, as well as the masonry technique demonstrated in many of the Federal era farm buildings in the historic district. It represents the most basic of principles of vernacular architecture that characterizes the area, namely to utilize the materials at hand and incorporate the skills and traditions of the resident population to provide a solution to transportation. Jersey barriers and modern guiderail installed on the deck of the bridge and the approach from the east detract from the historic presentation of the bridge with open railings and stone parapet wing walls. The stone substructure still retains its integrity of form, material, craftsmanship and connection to the earth, creek and surrounding landscape.

Generally 18th and 19th century bridge alignments were perpendicular in relation to the watercourse they were crossing. This allowed for the shortest span at the crossing location and allowed for abutments and piers to be in line with the flow of the water. Placement on a slight skew to the creek was far less common. The Burnt Mill Bridge is somewhat unusual in demonstrating this feature in use in the early 19th century. Thus placement and width of the abutments and piers at a slight skew is significant in the understanding of evolving bridge engineering and construction of the early Federal period. The west abutment is roughly 19 feet wide, the two piers are over 20 feet and the east abutment is slightly over 18 feet, all to accommodate a deck of 16 feet plus curbs and railings.

The strong land rise to the east of the bridge defines the sharp curve path of Headquarters Road as it leaves the bridge towards Erwinna. It is partially wooded and grassy yard with a stone wall and historical home positioned with an easterly view. Banks of this property have natural vegetation and seasonal flowers. While not obviously noticeable, a small spring filters out of this bluff very near to the east approach of the bridge. Historically a small drain allowed this water to flow under the road toward the creek, but at times is blocked, causing water to cross the road and run onto the bridge deck. This may have exacerbated the deck hole and erosion conditions adjacent the north side of the east abutment.

The Tinicum Creek has a broad presentation at this location, and exhibits the character of its early ford function. Collections and islands of stream cobble tend to order the course of the water flow. Such build up over time has increased from the Sheep Hole side, in

part due to falling trees from the steep banks that subsequently gathered stones and encouraged water to flow around. As such the stream has migrated away from the Sheep Hole side toward the pasture side. At the bridge the cobble island build-up has created a stronger flow towards the west abutment. While this prevailing channel was shown in the 1919 Martin drawings, it may have increased since then. Likewise, build-up downstream from the bridge is causing an eddy effect, and is now sending water back to the bridge and around the west pier in a broad S-curve path. Natural stream bank vegetation, including trees, brush and grasses, is serving well to protect the adjoining pasture and road landscapes while absorbing water flows.

While outside the basic scope of actual measurement documentation, observations made in the field of conditions that may be remedied to increase the longevity of a structure are of value to the preservation of the resource. Simply maintaining a clear drain for the spring water to flow under the road can greatly resolve water issues on the east side of the bridge. Likewise, a redistribution of the stream cobble that sits atop the stream bed, in order to redirect the stream flow under the spans of the bridge, as well as to ease the damming effect downstream of the bridge, would greatly diminish erosion and scour effects. Removal of the jersey barriers and reinstallation of the 1919 deck railings would eliminate substantial dead load, as well as improve snow placement, surface drainage and debris removal. An open railing would also bring the resource closer to its historical appearance and allow the beauty of the landscape to prevail over the structure. Inclusion of scuppers in new curbing would enhance removal of standing water from the deck surface. Of course, deteriorated conditions of the deck itself would suggest an in-kind replacement of the beam and concrete features to best maintain the historical appearance.

Summary of History and Documentation:

-bridge substructure dates to 1812 and is among the oldest resources in the historic District, the first bridged crossing within the district and contributed to the enhancement of the economy and lifestyles of the residents within the district.

-bridge as a verification of the 1812 engineering is significant as the oldest documented stone supports for a multi-span wooden beam bridge in PA

-Stone substructure represents the efforts and craftsmanship of local citizens, no bridge companies or known bridge builders or the region were involved. Nearby residents of Christian Fretz and Barnet Snyder are recorded participants in the construction- descendants of these families still reside in the area today.

-stone substructure represents engineering with splayed or battered walls, consistent water table footer on the west abutment, rounded upstream noseings on the piers.

-abutments constructed with a concave face towards the stream to offer strongest resistance to the earthen bank behind.

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-stone sizes are relative to strength requirements of the features, largest and most dressed stones on the lower portions of the bridge, and at the corners, smaller, less fashioned stones in the upper 1/3 of the walls and in the interior ranges. Stones, while not strictly ashlar in size and construction, are placed in horizontal bed lines and are of similar heights in respective ranges

-bridge placement in landscape, namely on a slight skew, adds to the understanding of bridge construction of the time

-bridge contributes to the understanding of stream crossings within Tinicum township, namely it was the first of the major interior bridged crossings in the township and continued as the only bridge for another 60 years. It contributed to intercounty and interstate travel in upper Bucks County, as well as to facilitate the local population's ability to access a dependable grist mill.

-bridge contributes to the rural landscape presentation of this section of the Ridge Valley Rural Historic District, a section that is the most visible and frequently traveled of the areas within the district.

-bridge demonstrates the qualities of vernacular architecture, namely the blending of local materials and engineering knowledge and craft into a structure of substance and duration.

-as a product of its own time, the substructure clearly offers insight into bridge and stone construction of the Federal period in Bucks County. The superstructure represents the unique approach of A. Oscar Martin, county bridge engineer, to respecting historical stone craft and engineering, earlier bridge types and landscape amenities even with a new deck replacement in "modern" materials of 1919. The concrete pylons, pipe railings and marble placque are character defining features of the 1919 changes.

-the consistent measurements and solid evenness of the stone substructure attest to its continued strength. No major displacement was observed.

-the consistent measurements and evenness of the deck surface likewise attests to the soundness of the overall bridge. No major displacement was observed.

-damage to the concrete deck due to inappropriate guiderail applications, water drainage & neglected repairs are noted. Water damage to I-beams and concrete encasements will require remedy or replacement.

-issues of water drainage are noted. While potentially damaging in the long term, these issues can be effectively corrected at this stage.

-integrity of the surrounding landscape is significant to the overall presentation of the historic district as well as the bridge, the experience of travelers through the district, as well as to the understanding of this early 18th century creek crossing site. Diligent maintenance of this delicate environment will continue to offer the future such understanding and appreciation of the history encapsulated in this valley.

Kathryn Ann Auerbach/2012

Ed Rodgers
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

June 14, 2013

Dear Mr. Rodgers,

The following letter is written in response to your request to review the potential impact of replacing the Headquarters Road Bridge as well as the effects of rehabilitating the existing span, historically known as the Burnt Mill Bridge, in Tinicum Township, Bucks County, Pennsylvania. The Delaware Riverkeeper Network is a consulting party in the Section 106 process for PennDOT's proposal to replace the historic Headquarters Road Bridge and this correspondence is written in support of those efforts. As the researcher and preparer of the Ridge Valley Historic District nomination some twenty years ago my remarks and observations are offered here with the hope that a fair and reasonable outcome can be reached by all parties that maintains the historic integrity of this rare and significant historic resource, and that has no adverse impact on the Ridge Valley Historic District or the exceptional value of the Tinicum Creek.

In preparing this letter, a review was made of several documents that were provided. In 2006 the Army Corp of Engineers sought a determination of National Register Eligibility for the Bridge on Headquarters Road. Although the bridge was already listed as a contributing structure to a listed National Register Historic District, the State Historic Preservation Officer determined the bridge to be not eligible. This finding appears contrary to fact and no explanation is given as to how the SHPO could determine a National Register listed historic resource not eligible. However, the determination of eligibility also went to the Secretary of Interior who indeed determined the bridge eligible under criterion A for architecture and criterion C for agriculture. It is my opinion that the determination of eligibility should be sent back to the State Historic Preservation Officer with a letter outlining the importance of this bridge to review again, with the hope that reconsideration might yield a supportive determination.

In a document written to call for support in preserving the bridge, the rarity of the pier-to-pier design of the Headquarters Road Bridge was made clear. Based on an examination of PennDOT's statewide bridge survey in 2003, there were only eight working bridges in Pennsylvania built before 1812. All were of the more common stone arch construction design. Based upon this data, the Headquarters Road Bridge is the oldest surviving pier-to-pier bridge left in Pennsylvania. This bridge was modernized in 1919 during the early automobile era with a new concrete deck with railings, designed by noted engineer and architect Oscar Martin, replacing the earlier wooden deck that once spanned the piers. While this was an open bridge and not a covered bridge, the design of the surviving 1812 abutments and piers mirrors the designs used on covered bridges particularly the numerous Delaware River crossings between Pennsylvania and New Jersey. In 1992 when the Ridge Valley district was first placed on the National Register it was not known that this bridge was of such an early date. If those facts were known, more significance would have been given to the bridge in the nomination.

The Headquarters Road Bridge is the point of convergence for one major portion of the district. The bridge ties together four roadways that follow creeks and drop down in elevation to a relatively flat plain where Christian Fretz built his grist mill in the eighteenth century. A bird's eye view of the road pattern converging at the bridge looks like two back to back parentheses)(. Two of the legs are Headquarters Road, one is Red Hill Road, and the fourth is Sheep Hole Road, which is the most significant roadway in the district because of its dirt surface. Approaching the bridge from any of these roads is dramatic. The loud sounds of water flowing down the Tinicum Creek and its tributaries, combined with a sense of dropping down to the lower elevation of the bridge and mill site, creates a sense of place, a feeling of arrival, and with the convergence of four roadways the bridge, in its current alignment and one lane configuration, provides the visitor with a bridge experience little changed in over 200 years.

Removing the Headquarters Road Bridge and building a modern two lane bridge would cause significant damage to the historic integrity of this portion of the Ridge Valley Historic District. One of the key themes of the Ridge Valley Historic District was the interplay of man-made roadways and natural waterways. The district is mostly a series of narrow, twisting, rising and falling roads following creeks. There were six bridges and two fords in the district. The Headquarters Road Bridge is the oldest in the district as all nearly all the other bridges were built in the auto era to replace fords. In terms of significance, the Headquarters Road Bridge is the most significant in the district due to its age, design, and rarity. The ninety degree turns onto Sheep Hole Road and Headquarters Road on the one side of the bridge would likely lead to a change in bridge alignment that could impact the archeological remains of Fretz's Mill. Changes in bridge alignment would also ruin the relationship of the bridge to the mill site and the road network that has remained intact for over two centuries. The intrusion of a modern two lane replacement bridge would significantly diminish the integrity and the feeling of the Fretz Mill portion of the Ridge Valley Historic District. The existence of this bridge in a listed historic district provides good cause to sensitively renew this span with a new deck as detailed in the engineering report submitted in 2011 by McMullan & Associates.

The Headquarters Road Bridge brought farmers to Fretz's mill from four directions and the house and bridge are sited in view of each other. As a miller, Christian Fretz was a significant man in the local farming community and he accrued some wealth as seen in the Georgian architecture of his fine home. Fretz's standing in the community and his status are apparent in the way that his stone house, the bridge, and the mill site serve as a central axis to the roads that converge at this rural agricultural industrial site. Christian Fretz's stone farmhouse stands at the junction of Headquarters and Red Hill Road which combine briefly in a straight approach to the bridge and then split after the bridge with ninety degree turns onto Sheep Hole and Headquarters Road.

The bridge plays a critical role in defining the central axis of this part of the historic district and the bridge alignment, use of red shale for abutments and piers, and one lane scale tie the bridge into the landscape and are in sync with the winding, narrow, and scenic roadways that meet at the bridge. Perhaps the most interesting travel leg in this area is the approach made on Sheep Hole Road, a narrow dirt road barely two lanes wide that follows the Tinicum Creek to the bridge. Traveling down this road along the creek under a dense tree canopy and at the end glimpsing the red shale lozenge shaped bridge piers that date back to 1812 is truly a journey that

engenders a sense of traveling back in time into the nineteenth century. Such remnant surviving road landscapes in Pennsylvania are extremely rare, and to imagine the change that would come from finding a realigned modern concrete span at the end of the dirt Sheep Hole Road seems an avoidable tragedy in the management of the Commonwealth's historic resources and National Register listed rural landscapes.

The Tinicum Creek is a federally listed Wild and Scenic River and a state listed Exceptional Value watershed. To my knowledge, no written discussion has occurred about the potential impact of a bridge replacement and/or realignment on the exceptional value of the Tinicum Creek. The Wild and Scenic Rivers Act (WSRA) requires the National Park Service to evaluate whether a "water resources project," which includes bridge replacement projects, will have an adverse effect on a wild and scenic river or tributary. The requirement is found at 16 U.S.C. section 1278(a) and is referred to section 7 of the WSRA. In addition, The WSRA contains several provisions designed to protect designated rivers and their environments. Foremost among these is Section 7 which provides that "no department or agency of the United States shall assist by loan, grant, license, or otherwise in the construction of any water resources project that would have a direct and adverse effect on the values for which such river was established, as determined by the Secretary charged with its administration." When a water resources project, which includes bridge construction projects, is found to have a "direct and adverse effect" on a wild and scenic river, the project cannot be authorized or funded absent congressional intervention. The most significant historic resource associated with the Tinicum Creek is the Headquarters Road Bridge.

I would argue the this district is nationally significant for it encapsulates the rise of upper Bucks County from a farming region with distinctive English and Quaker vernacular architecture into a region colonized by artists and celebrities in the 1930s. The Ridge Valley district featured sculptor Charles Rudy and screenwriter John Wexley. Tinicum Township was also home to actress Miriam Hopkins, song writer Jerome Kern, humorist Dorothy Parker, playwright S.J. Pearlman, and writer James Michener. All were attracted to the rustic rural landscapes of this region. Beyond Tinicum there were artists colonies in Solebury Township at Philips Mill and the small town of New Hope became an artistic sanctuary of international renown. Wexley and Rudy lived on Sheephole Road near the Headquarters Bridge and along the Tinicum Creek. In an interview with Charles Rudy's widow the rural beauty and simple living at a modest price was the main impetus for buying their farm and moving out of New York City. Lorraine Rudy spoke about how the rural countryside of the Ridge Valley Historic District allowed a lifestyle that informed and made possible her husband's creative endeavors.

Bucks County has a national reputation as a sanctuary for artists and the Ridge Valley Historic District is the single best example of a surviving remnant landscape that continues to look and feel like the Bucks County landscape of nearly one hundred years ago that attracted creative people to settle on the back roads of a rural area rich in stone vernacular architecture and a landscape of fields and forests and streams and roadways. The Headquarters Road bridge with its associated roadways and the motorist experience that can still be had traveling through that portion of the Historic District still retains the integrity needed to reveal the power of place that much more of Bucks County was once known for. Take out that one lane bridge that has stood since 1812 and the historic associations of water and roadways would be irreparably damaged.

The Geigel Hill Road Bridge, which also resides within the Ridge Valley Historic District, witnessed many years of effort to achieve a replacement design that all parties could accept. The character defining pony trusses were preserved and integrated into a new one lane design and red shale was integrated into the abutments. The character defining features of the Headquarters Bridge are the abutments and lozenge shaped piers as well as the alignment. Maintaining those features, keeping the bridge one lane and replacing the deck would result in a new bridge that continues to contribute to the historic district. Keeping the alignment and maintaining the scale of the existing bridge would surely have less impact on the wild and scenic Tinicum Creek than a realigned larger two lane span would have.

Thanks for the opportunity to provide this information to you and it is my hope that a sympathetic outcome results from the Section 106 process. Please contact me if there is anything more I am able to do to help in this matter.

Sincerely,

Robert W. Reynolds

Robert W. Reynolds

Attachment 5

June 18, 2013

Post Office Box 39
Erwinna, PA 18920

Maya K. van Rossum, the Delaware Riverkeeper
Delaware Riverkeeper Network
925 Canal Street, Suite 3701
Bristol, PA 19007

RE: BURNT MILL BRIDGE, aka Headquarters Road
Bridge @ Sheephole Road over Tinicum Creek
SR 1012, Section BRC, Tinicum Township, Bucks Co.

Dear Ms. van Rossum,

I am enclosing as an attachment an Assessment of the Historical Significance of the above Burnt Mill Bridge. While the bridge has been affirmed by the Keeper of the National Register to be a contributing resource to the Ridge Valley Rural Historic District (NR- 1992), it is my professional opinion that the bridge is individually eligible for the National Register.

Under Criterion A the Burnt Mill Bridge is important for its critical role in the early development and economy of Tinicum Township as the only internal bridge crossing for 60 years and for its strategic place in the early 20th century image and travel-facilitation which attracted a significant influx of nationally known artists, writers and celebrities.

Under Criterion C Burnt Mill Bridge holds a critical place in the national bridge inventory for its ability to represent a very rare historic bridge type, a multi-span timber beam bridge on substantial stone supports and for the engineered design of the 1812 abutments and free-standing pillars. The bridge served as a prototypical design for medium and large stream crossings utilized by the founding German heritage families, whose members carried cultural, architectural and engineering ideas through migrations throughout the United States and Canada. It is significant to demonstrate the cultural preference and acceptance of open timber bridges on stone supports by the local German heritage builders as a permanent and durable bridge accomplishment. The 1919 deck replacement by renown engineer A. Oscar Martin likewise demonstrates the prototypical "repair" utilized thereafter by counties and even the Pennsylvania Department of Highways decades later. Martin's engineering drawings, both of the deck repair of this bridge and the measured recorded design of a similar timber beam bridge (now gone), provide verifiable period evidence of early stringer engineering, both timber and concrete encased steel I-beam.

KAA/2013 continued…

Burnt Mill Bridge and its later companion Harpel's Bridge serve as the only known examples of stone supports for multi-span timber beam crossings in upper Bucks County and, with Burnt Mill, the earliest example in the Commonwealth of Pennsylvania. Both are critical components of several rural bridge collections of national importance for engineering: the Tinicum Township wooden bridge collection and Tinicum Township rural historic bridge collection. Both collections contain a very broad spectrum of historic bridge technology that contributed to the building of the nation, including rare, earliest, prototypical and one-of-a-kind historic bridge types.

That Burnt Mill Bridge is located in a nearly pure historical context of setting and historical association within the National Landmark potential Tinicum Township and the National Register listed Ridge Valley Rural Historic District, coupled with its placement over a PA designated Exceptional Value Stream, demonstrates its crucial role in the Federal designation of the Lower Delaware in the Federal Wild and Scenic Rivers program.

Any significant alteration or destruction of the Burnt Mill Bridge would significantly impact the nation's body of knowledge on rural bridge technology and quality of life.

Sincerely,

Kathryn Ann Auerbach
Historic Preservation Consultant
610-294-8035
kauerbach@frontiernet.net

attachment

BURNT MILL BRIDGE aka HEADQUARTERS ROAD BRIDGE
OVER TINICUM CREEK, TINICUM TOWNSHIP, BUCKS COUNTY, PA

Historical Assessment Summary

Prepared by Kathryn Ann Auerbach, Historic Preservation Consultant, June 2013

Resource: Multi-span, rural highway, beam bridge spans 80' over medium sized stream.
Stone sub-structure: **Built 1812**, stone buttress reinforcement west wing wall ca. 1935.
Super-structure: Timber stringer, wooden deck, wooden plank rails 1812 – 1919.
Concrete encased steel I-beams, concrete deck & pylons, pipe rail **1919**.
W-guiderail replaced pipe rail ca. 1990.
Jersey barrier replaced W-guide rail ca. 2001.

Designations: -Ridge Valley Rural Historic, contributing resource listed in the **National Register of Historic Places-** applied 1990, listed 1992.
-Lower Delaware **Wild & Scenic River**, contributing resource, 2000.
-Tinicum Creek, PA **Exceptional Value Stream** Designation

Affirmation: Keeper of the National Register's letter of April 26, 2006 states:
"Both its (Burnt Mill Bridge) original construction and alteration occurred within the historic district's defined Period of Significance (1790-1940). The bridge is **historically significant** in the context of the development of the township, regional transportation, and the operation of local mills, and IS OF **ENGINEERING SIGNIFICANCE** BOTH FOR ITS EARLY 19TH CENTURY CONSTRUCTION AND ITS SENSITIVE MODERNIZATION IN 1919. Although the concrete deck shows signs of considerable deterioration and the deck has been altered with the removal of the 1919 railings, the bridge **RETAINS SUFFICIENT HISTORIC INTEGRITY** TO CONTINUE TO CONTRIBUTE TO THE RIDGE VALLEY RURAL HISTORIC DISTRICT."

PA Historic Bridges: Based on the PA Historic Bridge Inventory conducted in 1993 by Lichtenstein & Associates, Burnt Mill Bridge is the
- **4th oldest bridge in Bucks County** and the
- **11th oldest bridge in Pennsylvania**.

Stone Arch bridges are the only older bridge type.

Bridge Type: Stone supports for a multi-span timber stringer wooden bridge.
- **Burnt Mill Bridge is the oldest documented stone supports for a Multi-span timber-stringer bridge in Pennsylvania.**

While once a fairly common rural bridge type in some areas, timber stringer and deck bridges of the 18th & 19th centuries have nearly disappeared from the entire inventory of historic bridges and often do not even appear as a bridge type. Only one other multi-span stone supported beam bridge is currently known in Bucks County, that of ca. 1835 Harpel's or Creamery Road Bridge over the Tohickon.

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Additional Historical Context Categories:
NATIONAL: *Tinicum Township Writer & Artist Enclave of early to mid-20th century*

The majority of Tinicum Township is currently being evaluated for eligibility as a **National Historic Landmark**. Initiated with correspondence with the National Landmark office in 2008, studies are underway to document the area's **unique role as a home to many writers, artists and notables of national caliber during the early to mid-20th century**. **Tinicum Township retains the integrity of historical landscape and buildings and structures** that were in place during the first half of the 20th century.

Bordering the Delaware River, Tinicum is characterized by a rugged natural beauty secured with historical roots extending back nearly 300 years and evidenced through the handiwork of substantial structures created by the founding families. Building on the framework of ancient roads and buildings of the early Scot-Irish and German families, the agriculturally poor township transitioned into an area of resort and respite by the late 19th century.

The advent of the automobile encouraged writers and artists to settle within the hills and valleys and seek inspiration and quiet renewal, and in some cases to live the thrill of the pioneer lifestyle. With leading names such as S. J. Perelman, Nathaniel West, Dorothy Parker, John Wexley, Artie Shaw, Josephine Herbst and later James Michener, Tinicum became host to a unique blend of generational residents, serious artists and New York sophisticates. The resultant preserved landscape and collection of historical resources is a demonstration of the economic symbiosis between cultures and universal appeal and respect for the natural and historic settings that Tinicum offers. The uniqueness of Tinicum is that the handmade local quality and connection to heritage was retained and sustained, even as artists, notables and sophisticates were added to the demographic.

Headquarters Road is a principal avenue through the township to view and experience this district, and was the visual image that captured the desire of this nationally significant collection of artists to settle here. It retains many of the character defining features of this image, such as winding narrow roads and one-lane bridges.

Burnt Mill Bridge is a critical element of the ability of the township to convey this early 20th century image. It demonstrates both the heritage building traditions and natural stone materials that blended this resource to the landscape, as well as the modest yet effective upgrades in steel and concrete by recognized architect/ engineer A. Oscar Martin to carry modern motorized traffic. It retains evidence of the 1919 appearance wiat was in place upon the arrival of this bohemian trend. Burnt Mill Bridge joins with nearly ten other bridge upgrades (several recently destroyed) Martin executed during this era of renewed prosperity for the township and reinforces the complete physical picture of the 20th century phenomenon.

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Additional Historical Context:
NATIONAL: *Architecture & Engineering: Cultural Preferences, Earliest Example*

Burnt Mill Bridge represents a **cultural preference** acceptance of **timber super-structure and stone masonry substructure as a permanent and valid bridge** engineering type by the **predominant German** founding families of Tinicum and upper Bucks County. As a source region for significant westward migrations by the descendants of immigrant first settlers, southeastern Pennsylvania became the trying ground for pure cultural expression, as well as the first cultural blends to both other groups and local landscape offerings of geology and climate. Designs that evolved and design choices made often reflected cultural preferences that ultimately **contributed to the national fabric of construction heritage and practice**. Early examples of building and bridge engineering methods and designs are highly significant to the understanding of the national vocabulary that followed as the 19th century progressed.

Burnt Mill Bridge represents **character defining features of stone masonry supports** that saw principal sourcing and refinement in the early Republic period. Referred to as "pillar bridges" the stone features include large, rough ashlar stone blocks on horizontal courses, diminishing to random stones in height, battered walls to provide the most stable "Pylon" or Pillar, rounded pier noseings to deflect water flows, slightly concave inside facades of abutments to deflect the earthen force of the approach ramps, water tables or a stepped foundation feature. Abutments and piers were placed at roughly 25 foot intervals to support the untrussed wooden timber spans. The Burnt Mill bridge stone supports exhibit these character defining features of this formative period of engineering for these free standing stone support structures.

Burnt Mill Bridge provides **information on the combination of stone and wood** to provide a lasting bridge crossing for over one hundred years until the deck replacement in 1919. Burnt Mill Bridge 1812 provides **the earliest documented evidence of bridges that became commonplace throughout the nation**, design ideas and preferences carried by the very family members of German founding families of this source region. While beam bridges are seemingly "un-engineered", Burnt Mill demonstrates engineering in the stone supports and the understanding of the design capabilities of wooden beams, thus an **engineered choice with regard to span and placement of piers and abutments.** That this design is repeated in greater scale within 20 years with Harpel's (Creamery Road) Bridge reinforces both the bridge type and its acceptance as a valid and permanent method of stream crossing. Wooden beam bridges on solid stone supports appear to have been built with more frequency in areas of Bucks County/ southeastern Pennsylvania that contained higher density of German immigrants and their successive generations, areas that sustained a relatively pure cultural imprint even into the 20th century, thereby showing cultural preference in bridge type.

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Additional Historical Context:
NATIONAL: *Architecture & Engineering: Cultural Preferences,continued…*

Southeastern Pennsylvania retains pockets of intact settlement areas that represent the variety of cultural groups who arrived to settle under William Penn's Holy Experiment. This event, perhaps the first in the history of civilization that peoples from around the world were invited to live together under a loose Frame of Government, resulted in **successful permanent communities of different cultures** with different architectural and building traditions existing side-by-side.

German migration into Tinicum, to join earlier arrivals of Dutch and Scot-Irish, is verified by requests **in 1738 to form a township**. First and second generation immigrants brought a solid tradition of heavy timber construction and faith in wood as a material of substance and strength. Equally skilled in stone masonry, Germans in Tinicum and other upper Bucks communities accepted timber superstructure bridges on quality, permanent stone supports. This is in contrast to English preferences in southeastern Pennsylvania for full stone, thus the frequency of stone arch bridges in landscapes to the south and southeast, or on major interstate routes. Local artisans John Niece and Barnet Hillpot likely joined with **documented Barnet Snider and Christian Fretz in the construction of Burnt Mill Bridge, adding a true signature of cultural handiwork to the physical bridge**. Local stone and wood artists continued to contribute during technology changes that brought wooden truss covered bridges by the third decade of the 19th century.

While seemingly of local or regional importance, it is these **first permanent expressions of building art and engineering that established the nation's building traditions as well as provided the physical underpinnings of the creation and growth of the nation**. Only one other stone supported multi-span timber-beam bridge (again with ca. 1935 concrete deck) known to exist in upper Bucks County is the nearby 200 foot Harpel's aka Creamery – Fretz Valley Road Bridge. This bridge shares regional, cultural, engineering and familial associations with Burnt Mill Bridge. To view period historic bridges side-by-side with the stone homes of these founding families (in this case the Fretz's, Christian & Abraham and the Harples) gives a rare and unique glimpse of the very basic foundation of our nation.

A national bridge assessment study "A Context for Common Historic Bridge Types" prepared in 2005 (Parsons Brinckerhoff and Engineering and Industrial Heritage, National Cooperative Highway Research Program &c), while well-written and very comprehensive on truss types, provides minimal information on the timber stringer with stone supports, generally focusing on timber bridges with timber pylon supports and 20th century picturesque park-type timber bridges (representative examples given are of the latter). It does acknowledge the commonality and frequency of the type, especially for short, single spans, and the duration of use into the 20th century.
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Additional Historical Context:
NATIONAL: *Architecture & Engineering: Cultural Preferences,continued…*

The report notes that **timber bridges were among the earliest**, as "stone bridges were expensive and time-consuming". It infers that these "bridges were all of a temporary nature". This misunderstanding comes perhaps from a lack of information about these very early bridges, due in part to their rarity today, as well as a lack of understanding of the significance of the stone supports to verify the existence of a wooden structure and the local achievement to build a bridge. The report does qualify the limitations of its study and the need to gather more information on timber bridges.

The Burnt Mill Bridge, as the oldest documented bridge of its type in Pennsylvania, along with Harpel's Bridge demonstrate sophisticated design of the stone supports, application for county assisted funds to construct the stonework, and acceptance of a timber beam deck as a permanent bridge by the locally dominant German population. The study does state that "very old (pre-twentieth century) examples would possess significance as an early representative example of the type if they retain integrity. In the case of Burnt Mill, the stone substructure retains very good integrity from its original engineered design, and clearly demonstrates the span capability of the wooden beam, namely 25 feet. Even without the original timber beams, the number and spacing of the stone supports provides clear evidence of the design and span. Documentation drawings rendered by A. Oscar Martin in the early 20th century (collection @ Bucks County Historical Society) for a similar bridge, now destroyed, provide measured specifications for the wooden super structure, including the wooden beams, board deck, wood railing and wrought iron nails to attach the railing. These drawings "complete the picture" of the design of the wooden superstructure assuming similarities within the same county, geographic setting and cultural group. **Thus Burnt Mill Bridge stands as a significant verification of a forgotten bridge type, and by age and size, may have provided a prototype for migrating cultural groups from Bucks County to repeat as settlement moved across North America.**

NATIONAL: *Engineering: Wooden Bridge Technology*
Burnt Mill Bridge contributes to a unique collection of wooden bridges in Tinicum Township that is exemplary on a national scale in representing some of the **oldest and most diverse variety of bridge types.** Burnt Mill 1812 and Harpel's Bridge ca. 1835 verify wooden beam technology, there is one ca. 1835 Queen Truss pony bridge over the NHL Delaware Canal, one ca. 1867 Howe open pony wooden truss of multi-span, three ca. 1850-1880 covered Town or lattice trusses and one ca. 2005 Burr truss replication of the original 1832 Delaware Canal aqueduct over the Tohickon Creek. The majority of these bridges are located either in National Register Historic Districts, over National Landmark designated canal or within State Park boundaries, designations which help to reinforce the physical context for understanding the choice of wooden bridges.
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Additional Historical Context:
NATIONAL: *Engineering: Collection of Rural Bridge Types*

Tinicum Township's collection of bridges (including those crossing the Tohickon into other townships) is one of **the most comprehensive in the state** and **represents all major rural bridge types**. Included are natural stream fords (three active), supports for wooden beam spans (two active), stone arch (one active), covered wooden Town truss bridges (three active), open wooden Howe truss (one), open wooden Queen post pony (NHL-one pedestrian), metal truss (one active King Iron Company bow string, four active Pratt pony), concrete deck girder arch- 1909 (one active), early concrete encased I-beam (five active), early solid concrete deck (at least three active), early concrete barrel arch long span- 1922 (one active), ca.1930 balustraded concrete T-beam long span (one active), ca. 1930 paneled parapet concrete T-beam single span (two active), mid-20th century early park-era crossings of the Delaware Canal (NHL) (four active). Additionally of interest is the reconstructed timber Burr truss aqueduct for the canal over the Tohickon Creek. This collection has rare wrought iron, one-of a kind open wooden truss designs, as well as some of the earliest examples of concrete technology. Burnt Mill is critical by both age and type to complete the full picture of rural bridge technology that this remarkable collection represents.

Unfortunately, a significant steel plate girder bridge- 1921 over the Delaware Canal, was recently completely destroyed and replaced. Likewise several early 20th cent., single span, one-lane concrete and I-beam spans were inappropriately replaced with intrusive modern bridges that altered stream characteristics, natural setting and serenity and historic road paths and degraded NR historic districts. In spite of these recent mistakes, this collection of nearly 34 historic bridges of all types (except plate girder) provides perhaps the most comprehensive representation of rural bridge solutions in preserved visual and historical context in the country. **The Burnt Mill Bridge is a critical component as the oldest bridge and representing the oldest type (save natural ford) of engineered crossing in this collection.**

REGIONAL AND LOCAL: *Patterns of History, Development & Transportation*:

Burnt Mill Bridge verifies by its placement the original path of the ca. 1747 Headquarters Road as a critical path to the only internal mill in the township, first Henry Myers' then Christian Fretz', as well as the regional path for travelers coming across from the Perkiomen (Goshenhoppen) Region to the Erwin's ferry crossing to New Jersey on the Delaware. Once the bridge was build in 1812, connecting roads, Red Hill and Sheep Hole were confirmed to facilitate this critical transportation artery.
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Additional Historical Context:

REGIONAL: *Community Development: Bucks County in the Early Republic*

Burnt Mill Bridge represents the significant growth and maturity of the County of Bucks during the Early Republic period, namely the capability of the young government to fund major construction projects including inter-state bridges, the county almshouse and a new set of county buildings built in conjunction with the relocation of the county seat from Newtown to Doylestown 1812. By its remote location 12 miles from the county seat in Doylestown Burnt Mill Bridge represents the effective outreach of the county system to meet the needs of its rural populations. It also represents the ascension of cultural groups that had been in the political minority, but now who were playing strong roles in the growth of the county, including the Stovers and the Fretz families, both very instrumental in the county court house and almshouse building projects.

REGIONAL: *Community Development: Local Craftsmen to carry out Public Projects*

Burnt Mill Bridge represents the southeastern PA approach to bridge building projects, namely that bridges were built by the local population of artisan and property owners, with an account of funding placed in charge of a neighbor to the chosen bridge site. Thus Bridges take on a hand-made quality with distinctive characteristics of the stone masons and carpenters who also constructed the houses and barns in the community.

NATIONAL/ REGIONAL: Architecture/ Engineering, significant AOM

(detailed discussions)

NATIONAL- *Architecture & Engineering: Cultural Preferences*.
Southeastern Pennsylvania retains pockets of intact settlement areas that represent the variety of cultural groups who arrived to settle under William Penn's Holy Experiment. This event, perhaps the first in the history of civilization that peoples from around the world were invited to live together under a loose Frame of Government, resulted in successful permanent communities of different cultures with different architectural and building traditions existing side-by-side. German migration into Tinicum, to join earlier arrivals of Dutch and Scot-Irish, is verified by requests in 1738 to form a township. First and second generation immigrants brought a solid tradition of heavy timber construction and faith in wood as a material of substance and strength. Equally skilled in stone masonry, Germans in Tinicum and other upper Bucks communities accepted timber superstructure bridges on quality, permanent stone supports. This is in contrast to English preferences in southeastern Pennsylvania for full stone, thus the frequency of stone arch bridges in landscapes to the south and southeast, or on major interstate routes. Local artisans John Niece and Barnet Hillpot likely joined with documented Barnet Snider and Christian Fretz in the construction of Burnt Mill Bridge, adding a true signature of cultural handiwork to the physical bridge. Local stone and wood artists continued to contribute during technology changes that brought wooden truss covered bridges by the third decade of the 19th century.

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NATIONAL: *Tinicum Township 20th century Writers' & Artists' Enclave, National Historic Landmark*

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