



~ LIGHTING FEASIBILITY STUDY ~

The
VETERANS MEMORIAL BRIDGE

Connecting Columbia, Lancaster County and Wrightsville, York County

PREPARED BY BRINJAC ENGINEERING, INC.
FOR RIVERTOWNES PA USA, APRIL 2006



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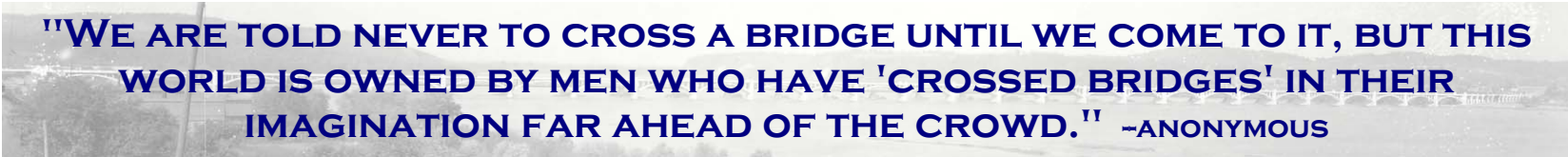
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PREFACE

Time.

Time is continually moving forward. With the passage of time comes change, even to seemingly static objects, like a massive concrete bridge. Over the years, numerous bridges have been built across the Susquehanna River at Columbia and Wrightsville. The form of the bridges has evolved over the years, some more aesthetically pleasing than others. Arguably the most attractive of the bridges to connect these two towns is the Veterans Memorial Bridge. Time has changed this bridge, too—over the years, the toll plazas that punctuated the ends of the bridge have been removed. So, too, have the original decorative light fixtures, replaced with “modern style” highway lighting.

The intent of this study is to determine the feasibility of restoring the historic character of the bridge by installing new lighting and creating plaza improvements. Proceeding in a more or less chronological order, we begin with a brief history of the bridge and description of existing conditions. We then present ideas for improvements to the bridge, including a proposed design, commentary on how the design will affect the bridge, and an opinion of probable installation cost. A design can't implement itself though, so we will discuss the process of getting it constructed, including the parties involved and the roles they play. The report concludes with a section on maintenance, to ensure the installation will look great and function well for years to come.



"WE ARE TOLD NEVER TO CROSS A BRIDGE UNTIL WE COME TO IT, BUT THIS WORLD IS OWNED BY MEN WHO HAVE 'CROSSED BRIDGES' IN THEIR IMAGINATION FAR AHEAD OF THE CROWD." -ANONYMOUS

Acknowledgements

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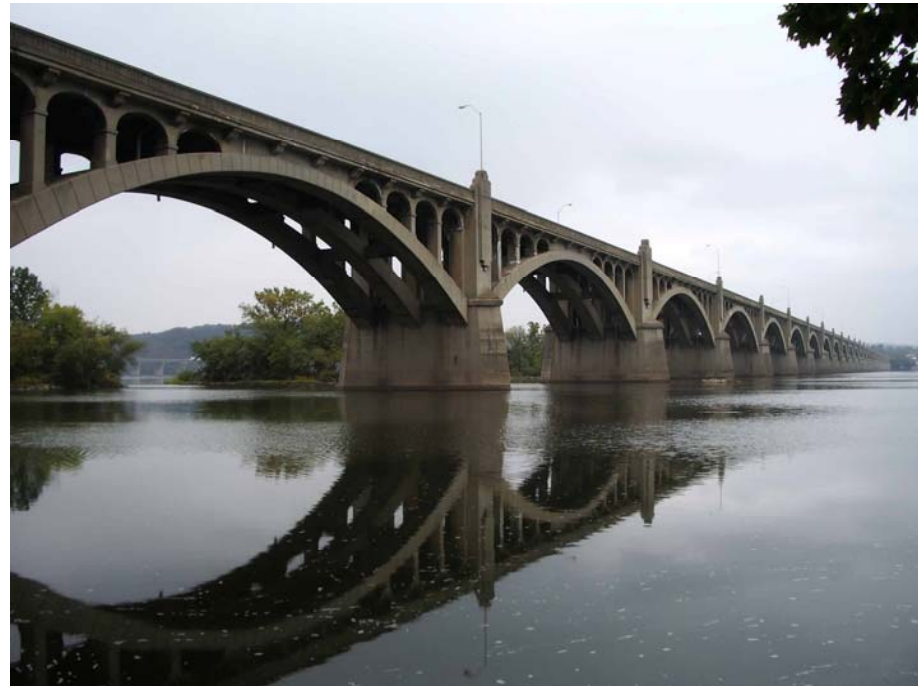


Figure 1 *The Veterans Memorial Bridge, as it appears today*

HISTORY OF THE BRIDGE



Figure 2 *The second bridge was burned during the Civil War*

The communities of Wrightsville and Columbia have been connected by no less than six bridges over the years. Besides carrying goods and people across the Susquehanna River, these bridges also played important roles in the history of our country. During the time of slavery, a bridge served as a gateway to freedom for individuals traveling the Underground Railroad. During the Civil War, a bridge played a strategic role in keeping the Confederate troops from advancing further north. And in the 20th Century, a bridge was part of the Lincoln Highway, America's first transcontinental highway.

The first bridge, opened in 1814, took the place of the river ferry. Although it was the longest covered bridge in the world at 5,690', it was destroyed by ice in 1832. Its replacement was another covered bridge, built in 1834 closer to the centers of the two towns. This bridge carried train and pedestrian traffic until it was burned by Union troops during the Civil War in 1863 (figure 2).

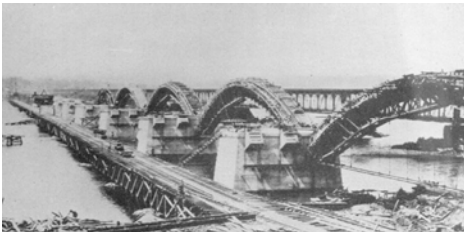


Figure 3 *Veterans Memorial Bridge under construction*

The third bridge was built on the same piers as the previous bridge, but it lasted fewer than 30 years when it was destroyed by a hurricane in 1896. The following year, an open steel truss bridge was built in only 21 working days. It carried cars, pedestrians, and trains all on a single deck, but was torn down in 1963. Both the fifth and sixth bridges remain functional today with state and U.S. routes traversing them.

Completed in 1930 at a cost of \$2.5 million, the Veterans Memorial Bridge was the fifth bridge to be built between Columbia and Wrightsville (figure 3). Built by the Lancaster-York Intercounty Bridge Commission, it is believed to be the



Figure 4 *Toll booths at end of bridge*

longest concrete arch bridge in the world. With 28 arches (each 185' long) plus flat spans, the bridge totals nearly 7,400' in length. Each of the spans between piers consists of three separate concrete ribs connected at five points by horizontal concrete struts. The bridge construction required 100,000 cubic yards of concrete, 8 million pounds of steel reinforcing rods, 5 million board feet of lumber, and 597,000 asphalt blocks—for a total weight of 425 million pounds!

Some original features of the Veterans Memorial Bridge no longer exist, including toll booths and light fixtures. At its opening, there were three toll booths at each end of the bridge (figure 4). Tolls of 25¢ per automobile were collected until January 1943; the booths were removed sometime thereafter.

The original decorative light fixtures that adorned the bridge were removed as well. Cast iron cage style lanterns with suspended teardrop shaped glass were located on top of the piers going across the bridge, as well as attached to concrete columns at the ends of the bridge. Six-sided lantern style fixtures with flat glass panels were located in the plaza area between the toll booths and the towns' roads. All of the original fixtures have been removed. While most of them are unaccounted for, a few have been discovered at local residences and businesses (figures 5, 6, 7).



Figure 5 *Cast iron cage fixture, at John Wright Store & Restaurant*



Figure 6 *Teardrop shaped glass from cast iron cage fixture, at Charles Heim residence*



Figure 7 *Six-sided lantern fixture and pole, at Columbia Historic Preservation Society*

EXISTING CONDITIONS

General



Figure 8 *Graffiti on columns underneath bridge*

The different systems of the bridge have aged at various rates over the years. Some components have been replaced, while some original components are still in use and functioning well. Although a detailed structural analysis was not performed, in general, the bridge seems to be in decent structural condition. The asphalt roadway is 38' wide, split between two lanes of travel. There is a 6' wide concrete pedestrian sidewalk along the south side of the road. Both the road surface and the sidewalk appear to be in acceptable condition. The bridge piers are sound, and should have no trouble supporting the weight of the proposed new light fixtures. The undersides of the bridge appear to be in good condition, although there is graffiti spray-painted onto the piers and support structure near the shores (figure 8).

Lighting



Figure 9 *Existing "cobra head" light fixtures along bridge*

The original light fixtures that once graced the bridge were removed in a 1970's modernization. Their whereabouts are largely unknown, and the ones that have been located are unable to be reused. The only remaining lighting components that are still in their original locations are two of the four concrete columns that once held suspended cage light fixtures, one column at each end of the bridge. Two of these columns remain, but the light fixtures are long gone.

The bridge is now lit with a series of "cobra head" style modern light fixtures (figure 9). These fixtures are owned and maintained by the Pennsylvania Department of Transportation (PennDOT). While they provide adequate light levels for the basic task of visibility, their modern styling does not complement the architectural form of the bridge.

The fixtures utilize high pressure sodium light sources (37 fixtures with 400-watt lamps and eight fixtures with 150-watt lamps), which provide a monochromatic, orangish-yellow blanket of light across the road surface. Under a high pressure sodium source, both visual acuity and color rendering ability are very poor. The light from the high pressure sodium sources, coupled with the lack of aesthetics of the cobra head fixtures, does not contribute towards promoting a good visual environment.

Electrical



Figure 10 *Electrical junction boxes at base of a light pier*

Overall, the electrical system is in fairly decent condition. There appears to be existing conduits from fixture location to fixture location. The conduit stubs into the base of each fixture location, and can be accessed by removal of an existing panel (figure 10). For those piers without a cobra head light fixture, it appears that there is a conduit that penetrates up through the top of the pier that could be used to feed a new fixture.

Besides conduit, there is also existing wiring for the existing fixtures. The wiring appears to be in good condition with no visible cracking of the insulation or general wire brittleness. It may be possible to reuse the existing wiring for the new fixture feeds. It should be noted that not all of the wiring throughout the bridge was inspected, only a small, representative sample. During the design phase, a more complete investigation should be undertaken to determine the condition of the entire wiring system.

In regards to electrical infrastructure, the access panels for the electrical connections are in generally good condition. Several locations will have to be refurbished, which may include new concrete substructure, new security screws, and in some cases, new box covers.

As a side note, there is a large diameter cable, believed to be carrying telephone lines from one shore to the other, attached to the outside face of the bridge, close to the railing. This cable is not a part of the power system for the bridge lights,

and they should remain in place and operational should any work on the bridge take place.

Plazas

Historically, the Wrightsville and Columbia plaza entrances to the Veterans Memorial Bridge consisted of wide, concrete approach areas leading to architecturally distinctive tollhouse structures, pergolas, and small planting areas enclosed by post-and-chain fencing. While these plazas remain in acceptable condition, they now lack most of their original design features, and they are somewhat less successful in serving as memorable gateways as one enters either the Wrightsville or Columbia communities.

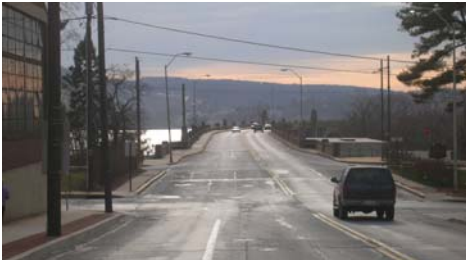


Figure 11 *Eastern approach*

At the eastern terminus to the Veterans Memorial Bridge (figure 11) are two symmetrical open space areas containing lawns, rose gardens, stately pines, and vintage artillery ceremoniously guarding the entrance to Columbia. This landscape visually frames one's westbound approach to the bridge. Two Pennsylvania Historical and Museum Commission (PHMC) markers tell the stories of Columbia's history and of the Lincoln Highway (S.R. 462).



Figure 12 *Western approach*

Meanwhile, the western bridge approach (figure 12) lacks such open space amenities, but benefits from a higher elevation and breathtaking views of the bridge's span over the Susquehanna River toward Columbia.

Route 462 bisects the eastern plaza (figure 13) into two curbed open spaces bordered by 5' concrete sidewalks parallel to Second Street and the bridge. In the southern open space, sidewalks terminate at a concrete plaza and a crumbling railing intended to protect pedestrians from a steep, downward slope

toward Bridge Street and the former US Lock and Steel site, now targeted for a high-rise condominium project. A similar plaza on the north side of Route 462 remains in slightly better condition. The adjacent slope is less severe near this plaza and rises slightly toward Rotary Park, which contains some of the original rose plants from the plaza.

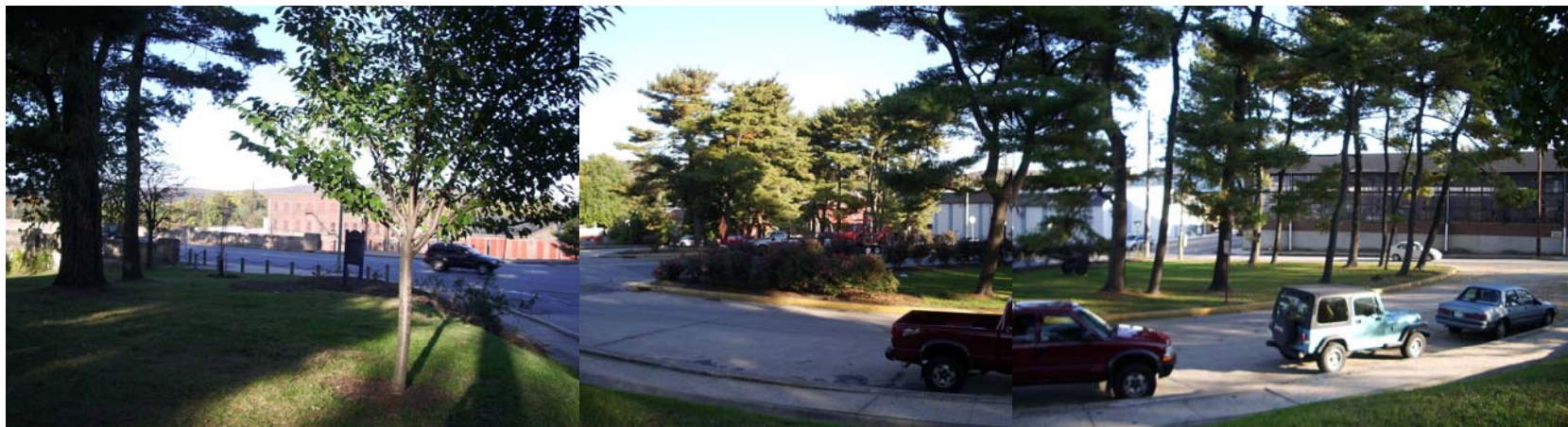


Figure 13 *Eastern plaza*

Surrounding both northern and southern open space areas is a 30' wide loop road with a counterclockwise vehicular circulation pattern. Parking is permissible along this roadway's perimeter. In addition to the previously noted sidewalks, additional walkways combined with curbing, gutters, and drainage inlets are located along the outer edge of this loop road. Original granite curbs have been replaced with concrete curbing now in various states of disrepair. Deteriorating concrete backing for the original granite curbs remains behind the later concrete curbs. The original concrete roadway surfaces and sidewalks remain in fair condition; however, the bituminous approach areas to the loop road from Route 462 are currently in disrepair.

PROPOSED DESIGN

Now that we have looked at the history of the bridge and the current conditions, we present a proposal for one possible design for future enhancements. While these enhancements harken back to the original appearance of the bridge, they will incorporate modern technologies in order to be code compliant and energy-conscious. The following design ideas are schematic in nature, and must be developed fully and documented properly before any construction can take place.

Across the Top of the Bridge

Lighting

The bridge consists of six flat spans at the western (Wrightsville) end of the bridge, 28 arched spans in the middle, and 14 more flat spans at the eastern (Columbia) end of the bridge. At the ends of each pair of adjacent spans is a large pier; many of these piers originally supported lantern style light fixtures that provided light on the roadway surface (figure 14). This proposal recommends the re-creation of these lights—large lanterns for the middle arched spans and smaller lanterns at the flat spans, all in their original locations.

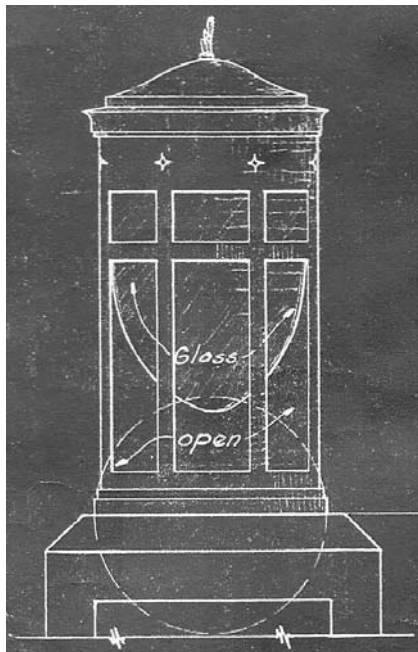


Figure 14 *Lantern light fixture for top of bridge pier*

Each lantern fixture should be made out of cast iron or aluminum from a foundry in Pennsylvania—perhaps Donsco, Inc. in Wrightsville. The top of the fixture will be hinged to allow easy access to the electrical components within. Figure 14 shows a sagging glass lens that is visible through the openings in the lower half of the fixture. In the new *small* lantern fixtures, this lens will actually be part of a standard outdoor light fixture manufactured by Lumec (see catalog cut sheet for fixture type ‘A’ in Reference Material section of this report). The Lumec light fixture has a hermetically sealed optical chamber that eliminates the infiltration of dirt, water, and insects, thereby maximizing light output. This fixture is available with a vertically oriented lamp (light bulb) that can easily be removed from the top while the glass lens stays in place (figure 15). The glass

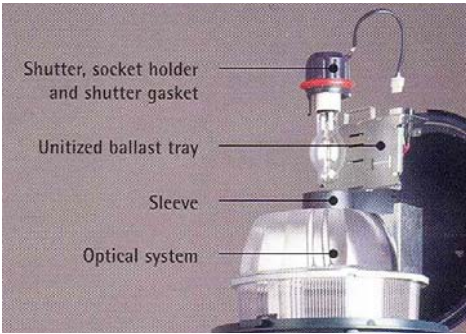


Figure 15 Sealed optical system; lamp access from above

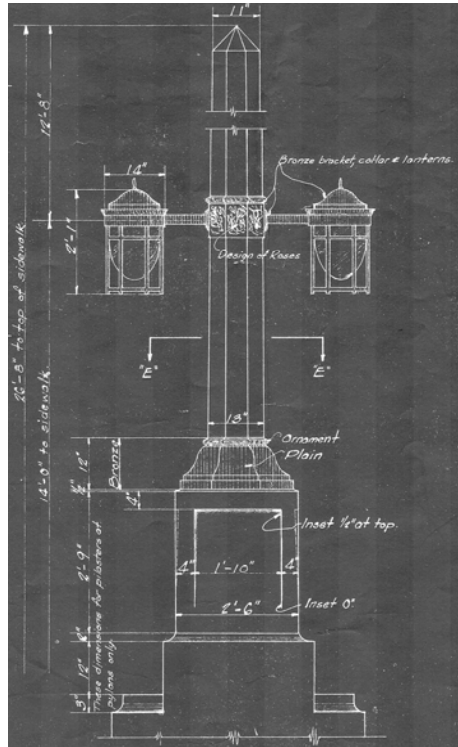


Figure 16 Column and lights at end of bridge

lens has vertical ribbing that has been precisely engineered to optimize light distribution from the fixture, which will aid in lighting the roadway as evenly as possible. The new *large* lantern fixtures will have an identical lens configuration, except at a larger scale. Since the large glass lens is not a commodity item, it will have to be created as a custom piece.

It is recommended to use pulse start metal halide lamping inside this fixture instead of the high pressure sodium found in the existing cobra head fixtures. The crisp, white light of the metal halide will allow for a high level of visual acuity and color rendering. And pulse start metal halide is recommended over standard metal halide due to its higher efficacy, superior lumen maintenance, excellent color uniformity, and faster warm-up/re-strike time. Pulse start gives

the added advantage of longer life than an equivalent standard metal halide. Compared to 10,000 hours for standard metal halide, a 200-watt pulse start metal halide lamp offers an average life of 15,000 hours, which corresponds to a little under 3-1/2 years if operated for 12-hours a night.

At each end of the bridge there were originally two large concrete columns that announced the threshold of the bridge (figure 16). Each column had a bronze base and a bracket and collar, where two hanging lantern fixtures were attached. Today, only one column remains at each end of the bridge, and neither one has the light fixtures still attached.

To restore the bridge entrances to their initial grandeur, it is recommended to return the columns to their original appearance. One of the existing columns should be removed and relocated to the opposite end of the bridge, then two brand new columns installed at the empty end. Relocating one of the columns will let the columns at each end match in appearance, instead of having to try to match a brand new column to an existing, weathered one. Pressure washing the concrete is not necessary (and in fact, may worsen the appearance due to mismatched color with the pier the column sits on), but the bronze collars at the base and middle of the column should be removed and refurbished. While the collars are removed, they can be used to cast new collars for the two new concrete columns.

The original lantern light fixtures should be re-created and attached to the columns. The fixtures, seen in figure 16, are very similar in style to the lights across the top of the bridge, and should be fabricated by the same manufacturer. The column lanterns will have no base, but will be open to below. Like the fixtures across the top of the bridge, the column lights will have a hinged roof, hermetically sealed optical chamber, and pulse start metal halide lamping. While the original lantern fixtures on the columns were slightly larger than the small lantern fixtures across the bridge deck, it is recommended to re-create the column lights so that they are scaled to accept the same size of glass lens that the small bridge lights use. This compromise will save money, by eliminating the need to create tooling for an additional size of glass lens.

THE STYLING OF THE NEW LIGHT FIXTURES WILL COMPLEMENT THE HISTORIC CHARACTER OF THE BRIDGE, BUT MODERN TECHNOLOGIES MEAN BETTER PERFORMANCE AND DURABILITY THAN THE ORIGINAL LIGHTS.

Electrical

From a preliminary observation of a limited portion of the electrical system, it appears that the existing equipment can remain in place and be re-used in the new design. However, further investigation will be necessary during the design phase to fully verify the equipment condition, sizing, and ability to be re-used. Even if the wiring is determined to be inadequate, the conduit appears in good condition; it could remain in place for new wiring to be pulled through it.

One of the most difficult tasks during design and construction will be to find a location for the connection to the service feed. It is recommended to have one service feed at each end of the bridge, each serving half of the bridge lights. The challenge will be to determine the best location for the service feed within the plazas, which will have to be coordinated with Pennsylvania Power & Light (PPL).

Opinion of probable installed cost for lighting and electrical work across top of bridge:

Ranges from \$733,000 (if the conductors can be re-used) to \$857,000 (if the conductors must be replaced)

Underneath the Bridge



Figure 17 *Lighting the arches of a bridge in Harrisburg, PA*

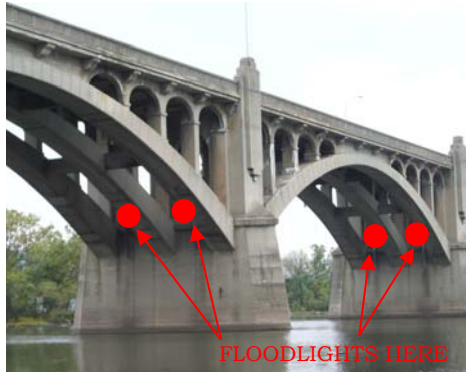


Figure 18 *Proposed location of floodlights under bridge*

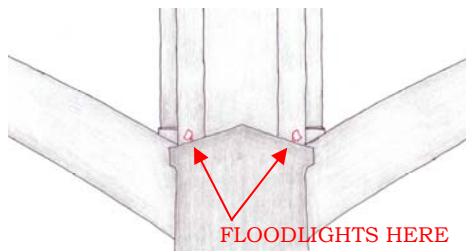


Figure 19 *Section view of pier showing floodlights*

Lighting

Currently, the wonderful concrete arches that span the Susquehanna River go dark every night when the sun goes down. Here we propose to light up the underside of the bridge to highlight the architectural character of this historic structure. A similar effect can be seen in figure 17, which shows the Market Street Bridge in Harrisburg, PA.

As stated previously, 28 of the spans in the middle of the Veterans Memorial Bridge have structural arches. Each span (the distance between two adjacent piers) has three concrete “ribs.” The concept in lighting these elements is to install a floodlight on the pier, in between two ribs, at the spring line of the arch (figures 18 and 19). So most piers would have four floodlights—two fixtures between three ribs, shining in two different directions. The two piers at the ends of the arched spans would only have two floodlights.

By floodlighting the underside of the bridge from “within” the structure, the internal surfaces will be washed with light, almost giving them an appearance of glowing. The external vertical faces of the structure will be much darker, but the contrast between the bright interior and dark exterior will further delineate the form of the structure through silhouette.

The proposed floodlight is very durable and able to stand up to the vibration and water contact that could occur when mounted underneath a bridge. It is suggested to use a flat lens with no additional glare shields or visors, as these items will become places for bugs and dirt to accumulate. A catalog cut sheet of the floodlight is shown in the Reference Material section of this report (fixture type ‘B’).

It is recommended to use the same type and wattage of pulse start metal halide lamp that was suggested for the fixtures on top of the bridge. Not only will it

offer the same benefits mentioned in the previous section, the consistency will also aid in the maintenance of the fixture, by requiring stocking of only one lamp and ballast type.

Electrical

The electrical distribution for the underarch lights would be connected to the same service feeds as the lights on top of the bridge. However, unlike the other lights, the underarch lights will need to be metered, so a location for the meter will have to be determined during design. The floodlights will be controlled by a photocell to turn them on, and a time clock to turn them off. To save energy and money, the time clock can be set to turn the lights off at say, midnight, when few people will be out driving around able to see them.

There is no electrical equipment currently under the bridge, so new conduit and wiring will have to be run to the floodlights. It is recommended to use rigid conduit directly attached to the surface of the bridge structure, but located on the interior surfaces so they are not visible to the casual observer. One money-saving option would be to use PVC conduit instead of rigid. However, since the PVC is not as durable as rigid conduit, it is not recommended for this project.

Opinion of probable installed cost for lighting and electrical work underneath the bridge:

\$756,000

Work in the Plazas

Lighting

In the plazas, the lighting scheme will consist of multiple layers of light. The first layer is a soft wash of light on some of the landscaping in the plaza. Highlighting the trees and larger shrubs will not only show off the flora, it will also help to better define the visual field and create a more inviting nighttime environment. One tool to help create this layer of light is a recessed in-grade fixture by Hydrel, as shown in the catalog cut sheet for fixture type 'C' in the

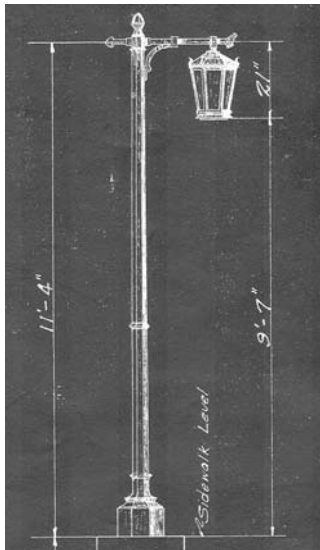


Figure 20 Original plaza light fixture

Reference Material section of this report. Such an in-grade light is unobtrusive physically and visually, and the particular one referenced is extremely durable and maintenance friendly.

The second layer of light is to provide illumination on the driving and walking surfaces. This layer gives an appropriate quantity and distribution of light to allow adequate visibility to see to safely drive or walk.

The third layer of light is a visual element of brightness—a glowing light fixture to provide “eye candy” and enhance the aesthetics of the visual environment. A re-creation of the original light fixture in the plaza will act as the source for both the second and third layers.

The original plaza fixture (figure 20) is a lantern hanging from a decorative arm at the top of an 8-sided pole, all made from cast iron. The light fixture will have eight flat, tempered glass panels and pulse start metal halide lamping similar to the other bridge lights. During design, the exact pole location and lamp wattage will have to be determined so that the requirements for light level and uniformity are met, yet glare is minimized.

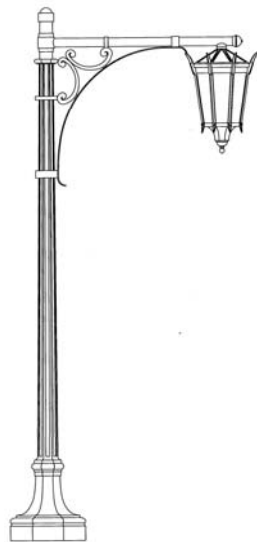


Figure 21 Standard light fixture

As a cost savings measure, it is possible to use a standard light fixture instead of re-creating an exact replica of the original. Standard equipment is available that is similar in size and style to what was originally found in the plaza; however, the result is not an exact duplication. Figure 21 shows an example of a standard pole, arm bracket, and light fixture that could be used in place of a historical reproduction; catalog cut sheets for these items are also found as fixture type ‘D’ in the Reference Material section of this report.

While at first glance the assembly of standard equipment seems similar to the original, closer inspection reveals a number of differences. The final decision of whether to re-create the original fixture or install a reasonable facsimile will rely heavily on the project’s funding. If there is enough budget available to support historical reproductions, it is highly recommended to do so, in order to maintain historical accuracy and to not deviate from the bridge designer’s original design intent.

One word of caution: if there is not enough budget available to re-create the original light fixtures, it may not be advisable to use standard equipment that looks similar to the original, depending on the source of the project's funding. For example, if there is federal money involved, one of the requirements is that the proposed design be reviewed and approved by PHMC. PHMC may feel that since the standard equipment is not an exact duplicate of the original, it creates a "false sense of history." If such a judgment were handed down, then the design would have to be changed to either an exact re-creation of the original lights, or a fixture that is entirely different from the original, yet whose style is still approved by PHMC as being appropriate for fitting with the historic character of the bridge.

Electrical

It is assumed that none of the existing electrical equipment in the plazas can be re-used. It will all be abandoned in place and new equipment will be installed. New concrete foundations for the pole lights will be poured, and new conduit and wiring will be installed to connect all light fixtures. Each plaza will have a panel where the electrical service will be connected, and as mentioned previously, a difficult task will be finding appropriate locations for these panels. For the purposes of the preliminary cost estimate shown in this report, it is assumed that the electrical service is 480 volts, 3 phase, and that the light fixtures will be run at 277 volts, by tapping a hot and a neutral.

Opinion of probable installed cost for lighting and electrical work in the plazas:

\$165,000

[NOTE: This figure is based on re-creating the original light fixture and pole. The price could be reduced to approximately \$108,000 if standard equipment were used instead.]

Landscape Architecture

As with the original 1929 bridge design, current design efforts extend beyond the actual span of Veterans Memorial Bridge to include both the east and west bridge approach areas. Current landscape architectural designs address all site areas extending from the Route 462 intersections with Second Street (in both

Columbia and Wrightsville) toward the bridge's former toll house structures on both the eastern and western shores.

EASTERN PLAZA The 1929 design for Columbia's bridge approach included both formal and informal design elements. For example, low, linear plantings formed geometric patterns, repeating the 'Greek Key' design elements of the concrete bridge structure. Immediately adjacent to these formal and symmetrical plantings, an informal arrangement of pine trees and lawn areas was also established. Three toll plaza structures, adjoining pergolas, and post-and-chain barriers architecturally defined this bridge gateway. Of these design elements, only the pine trees, lawn areas, and the post-and-chain barriers remain today.

During a March 7, 2006 planning session with key project stakeholders, it was determined that all surviving 1929 design elements should be retained. (Refer to figure 22, next page, for an illustration of the proposed design for the eastern plaza.) Remaining pine trees will be evaluated, and only diseased trees will be removed. In recent years, the post-and-chain barrier in an area formerly occupied by the northeast toll house has been supplemented with chain link fencing. To maintain a secure barrier between this plaza and the adjoining steep slope, it is now suggested that a new fence replace the later chain link addition. Such a fence could incorporate concave top railings, which mimic the arcs formed by the original chain barriers. Powder-coated steel fence sections will match other metals used in the original bridge construction, but no attempt shall be made to falsely suggest that these new fence sections were part of the original bridge plans. They will simply serve to provide additional public safety.

Safe and durable roadway paving materials may be used to identify the original location of the central tollhouse structure (since complete restoration of this structure could potentially compromise motorist safety). A paved concrete island (approximately 11' in width) in this exact location would effectively contrast with adjacent bituminous paving. East of the original toll island, a second concrete median (approximately 11' in width) will visually divide the 50' expanse of existing bituminous paving, while maintaining adequate vehicular travel lanes. These linear paving elements will effectively lead the westbound visitor's eye from Second Street toward the bridge gateway, and help to identify the original toll plaza's former location.

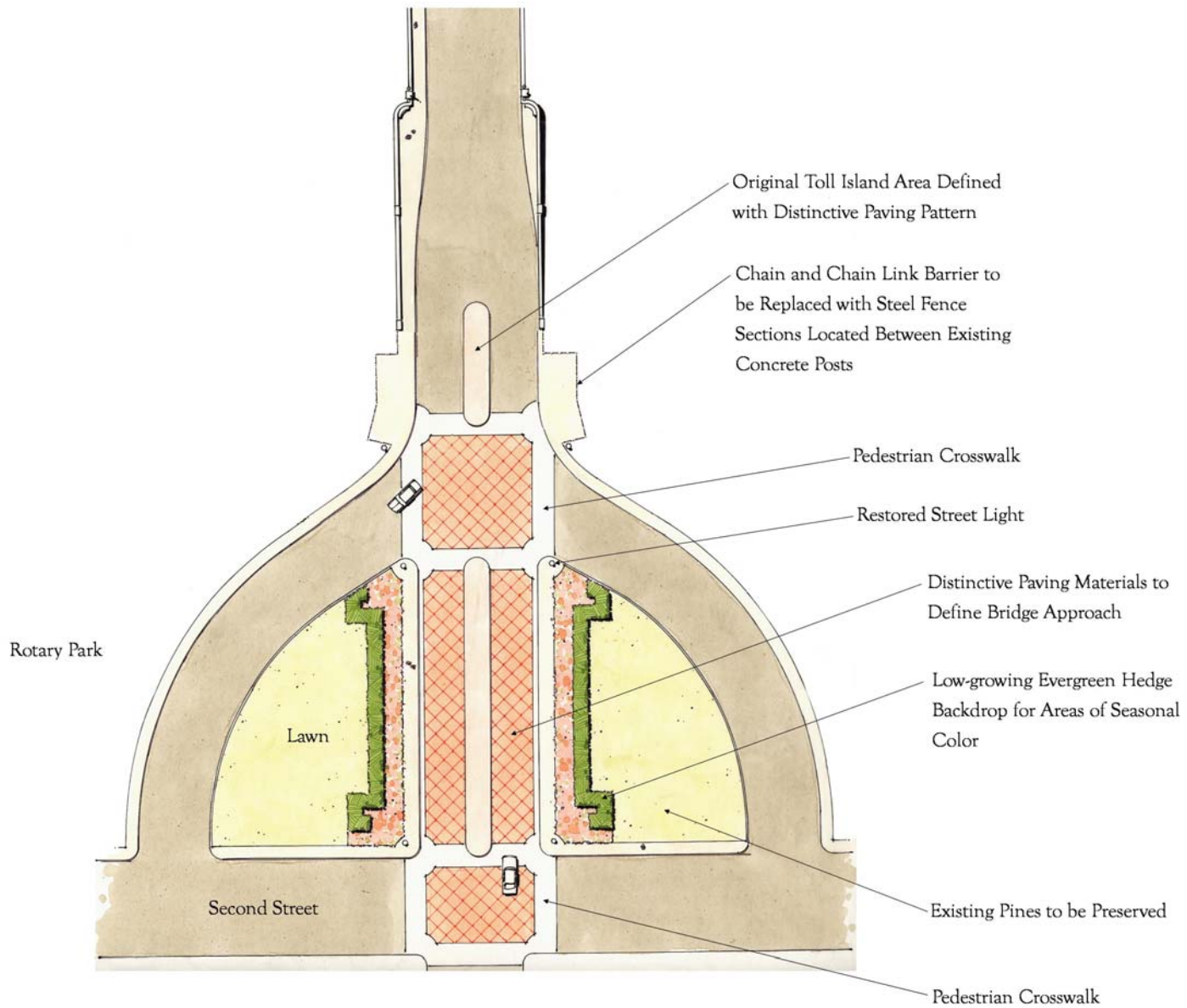


Figure 22 Proposed design for eastern bridge plaza (Columbia)

At present, pedestrian crosswalks within the bridge approach areas are non-existent. Attractively scored concrete might also serve to delineate pedestrian crossings at Route 462's intersections with Second Street and the un-named loop streets. Within roadway areas defined by these concrete crosswalks, a contrasting paving material such as brick pavers set securely on a thick concrete base will further enhance the bridge gateway experience. Recently, the Borough of Columbia has incorporated paving bricks into the new sidewalks east of Second Street. An extension of this same paving material to the bridge approach area will visually unite the bridge gateway with the Borough's new streetscape design. It is assumed that this roadway's storm drainage structures remain in good condition and will be preserved.

Several years ago, an asymmetrical planting of roses was installed immediately adjacent to both sidewalks that flank Route 462. The height of these mature shrubs and their proximity to the sidewalk create very narrow and uncomfortable pedestrian spaces. In place of these 5' shrubs, lower-growing shrubs, perennials, and bulbs that provide an extended season of interest could more accurately replicate this area's original planting design. Symmetrical, evergreen hedges could provide landscape structure throughout the winter months, while serving as yet another visual link between Second Street and the bridge gateway.

Although the 1929 planting plans have not been located, it is our understanding that roses were incorporated into the original planting design. Lower-growing, longer-blooming, and more disease-resistant red rose varieties may be incorporated into the Lancaster County bridge approach, while similar white-blooming plants could be established near the York County bridge terminus. Red-flowering *Rosa* 'Knock Out' and white-flowering *Rosa* 'Sea Foam' represent two vigorous, repeat-blooming rose alternatives that remain under 2-½' tall without requiring extensive maintenance. A few surviving rose plants from the 1929 plantings should also be incorporated into the new planting design.

WESTERN PLAZA Many of the same design elements proposed for the eastern bridge approach could easily be repeated within the Wrightsville bridge approach. (Refer to figure 23, next page, for an illustration of the proposed design for the western plaza.)



Figure 23 Proposed design for western bridge plaza (Wrightsville)

For example, delineation of the central toll plaza with a paved median, inclusion of concrete crosswalks, incorporation of decorative paving materials, and installation of colorful plantings are proposed. Such elements as textured paving and concrete medians also effectively serve a ‘traffic-calming’ purpose while improving pedestrian safety within this heavily traveled corridor.

Unlike the eastern bridge approach, the original toll house plazas on the northwest and southwest edges of Route 462 have been replaced with lawn. Restoration of these original concrete plazas is proposed, and the outline of the original building ‘footprints’ might be identified through the use of creative paving demarcations. Appropriately detailed and educational sign elements may include an image of the 1929 tollhouse structures, along with related text, which notes the history of this bridge, and the communities, which it connects.

Every effort must be made to either eliminate unnecessary signs, and to consolidate essential signs with necessary lighting on shared poles. Such reduction of visual clutter will further enhance the bridge and the Susquehanna River as this landscape’s prized centerpiece.

Although the western approach to Veterans Memorial Bridge lacks the formal symmetry of its eastern counterpart, opportunities remain for incorporation of some of the same planting concepts noted previously. For example, low-growing shrubs and groundcovers, which provide a seasonal succession of landscape interest, could be installed adjacent to restored concrete sidewalks. Low, evergreen hedges will provide year-round structure for these new colorful and low-maintenance plantings. A concrete area at the bridge’s southwest corner should be converted from its current use as a vehicular parking area to additional green space—a warmer, welcoming gesture to Wrightsville visitors.

Opinion of probable installed cost for landscape architecture and civil work in the plazas:

\$600,000

IMPLEMENTATION

It is one thing to merely talk about making enhancements to the bridge, but it is an entirely different story if you want to actually make it happen. Here we discuss what it takes to implement the ideas presented in this study. One person alone can't do it, so in this section we introduce some of the different parties involved in bringing this project to fruition. We also describe the process that is typically followed in a construction project. While it is not the only way to get the project implemented, it has proven to be successful on previous projects of a similar nature.



**IT TAKES MORE THAN ONE PERSON TO IMPLEMENT A BRIDGE
ENHANCEMENT PROJECT. WHO SHOULD BE INVOLVED?**


The Parties Involved

Champion

A Champion is a motivator, someone who tries to drum up support for the project to make it a reality. Perhaps more importantly, a Champion searches out sources of funding. Without proper funding, the improvements certainly couldn't take place. In the case of the Veterans Memorial Bridge, the Champion is the Board of Directors of Rivertownes PA USA (Claire Storm, President) and the Lancaster-York Heritage Region (Mark Platts, Executive Director).

Sponsor

While a Champion is involved early on, a Sponsor may not be brought on board until the design stage of the project. The Sponsor is in charge of the actual implementation of the project. They spearhead the effort to complete it, from



design through construction. Often times a project's Sponsor is the governing body of the municipality in which the project resides. For the bridge project, the Borough of Columbia has expressed interest, and would make an ideal Sponsor. Although for this project there may be separate groups taking on the roles of Champion and Sponsor, sometimes the roles are filled by the same entity.

Owner

The current Owner of the bridge is, and will remain, PennDOT. PennDOT also currently owns and maintains the lighting and electrical system. Part of the process of undertaking this project will be for the Sponsor to purchase the lighting and electrical system from PennDOT. Therefore, the Sponsor will become the Owner of the lighting and electrical system, and will be responsible for its maintenance in the future.

Design Team

The Design Team is made up of all of the different design firms necessary to complete the design work required in a particular project. There are two major components to the bridge project: lighting and plaza renovations. For the lighting portion, a Lighting Designer and Electrical Engineer are needed. The Lighting Designer will ensure that the new lights are historically accurate, properly highlight the structure of the bridge, and provide an appropriate quantity and quality of light for safe passage across the bridge. The Electrical Engineer will see that the lights are powered and controlled correctly and safely.

Lights will also be involved with the plaza renovations, but the majority of the plaza design work will be accomplished by a Landscape Architecture and/or Civil Engineering firm. This organization will provide design services for any sidewalk, curbing, roadway, landscaping, etc. work that is required.

Contractor

A Contractor is the one who does the actual physical construction work. Usually the project is put out for public bid and a Contractor who is qualified and has

one of the lowest bids is selected. The selected Contractor is in charge of seeing that all of the construction is done, but they may not do all of the construction themselves. Often times, the Contractor (referred to as a General Contractor) will hire out Subcontractors to do small portions of the project that the General Contractor cannot do or does not wish to do.

Maintainer

Once the project is constructed, a responsible party will be needed to keep the equipment clean, operating properly, and looking as it was originally intended. There are different ways to keep the equipment maintained (such as a municipality's maintenance crew being responsible for it, or a volunteer organization maintaining it), but only one method will be presented here. It is recommended that the Owner form an agreement with a Contractor to maintain the equipment. This could be done by simply selecting a Contractor, or the Owner could put the maintenance contract out for bid. The maintenance contract would be valid for a certain number of years, then could be renewed upon its expiration. The contract could be a lump sum price, or it could be based on time and materials.

Since the existing lighting and the bridge are owned and maintained by PennDOT but the lighting system is being purchased by the new Owner, PennDOT should be involved in the process as well. A separate agreement could be drawn up between the Owner and PennDOT, whereby PennDOT (if it is so willing) would pay the Owner the same amount of money, or a fraction thereof, that PennDOT had been spending on the maintenance of the existing lighting system. The Owner would then be responsible for paying for any additional costs required for the new system.

Other Players

Other people might want to be involved in the project, but not fit into any of the aforementioned categories. Individuals or organizations could help with fundraising, from a local Cub Scout troop holding a car wash to a Congressman fighting for funding in Washington, DC. Even having someone for public relations could help in raising awareness (and funds) in the community.

The Process

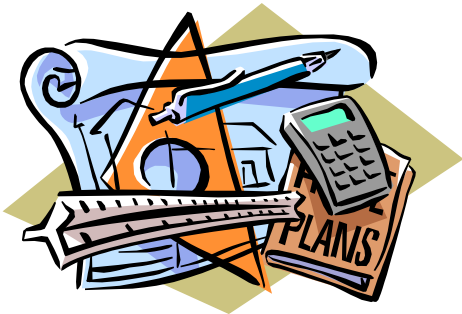
Feasibility Study

A feasibility study is often performed before jumping into a project to determine what resources will be necessary to bring the project to fruition. It presents the reader with an analysis of existing conditions, a proposal for new enhancements to be done, an estimate on how much it will cost, and an idea of what it will take to see the project through construction. The person or organization who requested the feasibility study can then figure out if they have or can obtain the necessary resources.

Opinion of probable time to complete: done

Design

The design phase can be a substantial piece of the process. In general, the Design Team will go through three phases: Schematic Design (SD), Design Development (DD), and Construction Documents (CD). During the Schematic phase, conceptual ideas are discussed and major issues that will change the direction of the project are nailed down. A fairly decent head start into the Schematic phase has been achieved through the Proposed Design section of this feasibility study. In Design Development, the conceptual ideas generated during Schematics are cultivated into a more concrete design. Preliminary drawings and specifications are created, and early calculations and coordination take place. In the Construction Document phase, all of the design work is completely finalized. Plans, details, and schedules are finished, as are specifications and a cost estimate. The final product of design is a set of documents that can be used to bid and construct the project.



Besides the actual creation of construction documents, other activities take place throughout the design process. Such activities include visits to the site to perform an extensive survey of the existing conditions and to see how well the proposed design will fit with those conditions. The designers will need to

coordinate with local utilities, to minimize the number of conflicts that could occur during construction. And the designers will need to attend meetings to review the design at several stages, to coordinate with various parties, and possibly to give presentations to entities such as local municipalities, organizations, or the public.



PROJECTS INVOLVING PENNSYLVANIA STATE ROUTES TAKE EXTRA TIME TO DESIGN, SINCE THEY NEED TO MEET CERTAIN PENNDOT REQUIREMENTS.

An added wrinkle to the design process is that, since the bridge carries a state route, PennDOT will have to be involved. PennDOT has numerous standards and requirements that must be met for any projects involving a state route, even enhancement projects that do not alter the roadway surface. Some of these requirements include meeting certain light levels, showing certain details on the drawings, and using specific terminology and sections of text in the specifications. As the design progresses, certain clearances must be granted by various agencies, including an Environmental Clearance, Pennsylvania Historical and Museum Commission Clearance, Right of Way Clearance, and Utility Clearance. Additionally, PennDOT must review and approve a complete set of the plans, specifications, and cost estimate before allowing the project to be bid. A representative from PennDOT's District 8-0 can help guide the design team through the PennDOT process and make sure all of its requirements are met.

Opinion of probable time to complete: [SD] 1-2 months
[DD] 3-4 months
[CD] 4-6 months

Funding

One of the most important factors in determining whether or not this project can proceed is if adequate funding can be secured. Money can be obtained from a variety of sources, including solicitation of donations from businesses or private citizens, or holding public fundraising activities to drum up community

awareness and gather funds. It may be possible to even persuade local contractors to donate part of their time or materials towards the project. And if local businesses are involved in procurement of materials, such as the castings for the lantern style light fixtures, they may be willing to provide those products at a reduced cost.

Besides pursuing funds on a local level, the Champion can also look to higher levels of government for sources. Monies are available from both State and Federal grant and low-interest loan programs. The following is a list of potential funding sources on the State and Federal level:

Pennsylvania Department of Community and Economic Development
Community Revitalization Program

Phone: (800) 379-7448

Web: www.newPA.com

Supports local initiatives that improve the stability of communities and enhance local economic conditions. Funds may be used to construct or rehabilitate infrastructure; rehabilitate, acquire, and demolish structures; revitalize or construct community facilities; purchase or upgrade machinery and equipment; plan for community assets, public safety, crime prevention, recreation, or training; and acquire land buildings and rights-of-way.



Pennsylvania Department of Transportation
Transportation Enhancements Program

Phone: (717) 783-2258

Web: www.dot.state.pa.us

Provides the opportunity to create or embellish facilities, uses, and activities that enhance the quality of life across the Commonwealth. Plays a key part in the community building process.

Pennsylvania Office of the Budget
Redevelopment Assistance Capital Program

Phone: (866) 466-3972

Web: www.newPA.com

Provides for the acquisition and construction of regional economic, cultural, civic, and historical improvement projects. Preference is given to projects that



display significant potential for improving economic growth and the creation of jobs and new opportunities to a diverse group of communities throughout Pennsylvania.

U.S. Department of Agriculture Rural Development
Community Facilities Grants and Loans

Web: www.rurdev.usda.gov/pa

Grants and loans to reconstruct, enlarge, or improve community facilities for health care, telecommunications, public safety, and public services in rural areas and towns. Available to municipalities, counties, special-purpose districts, nonprofit organizations, and Indian tribes.

U.S. Department of Commerce
Grants for Public Works and Economic Development

Phone: (215) 597-4603

Web: www.doc.gov/eda

Promote long-term economic development and assist in the construction of public works and development facilities needed to initiate and support the creation or retention of permanent jobs in the private sector in areas experiencing substantial distress.

Opinion of probable time to complete: Varies; can be concurrent with Design stage.

Bidding

Once the construction documents are complete and all of the PennDOT requirements have been met, the project can be put out for bid. The bidding process can be administered either by PennDOT or the Sponsor. If bidding is managed by the Sponsor, they will first have to advertise for bids through the local newspaper and/or announce it through PennDOT's electronic ECMS system. Contractors will obtain a copy of the contract documents from the Sponsor and put together a bid and submit it by the due date. A pre-bid meeting, either mandatory or not mandatory, may be held before bids are due, to give contractors a chance to meet with the designers, ask questions, and see the

project site. Answers to questions or changes to the design during the bidding period should be answered via addenda.

On the bidding due date, the Sponsor opens all of submitted bids and spends time reviewing them and deciding which contractor/bid to select. Again, since it is a state route, PennDOT will have to review the bids, verify that the contractors meet the PennDOT requirements, and make a recommendation on which bid to select. Once a contractor is chosen (not necessarily the lowest bid price), the Sponsor awards the contract and construction may begin.

Opinion of probable time to complete: 3-4 months

Construction

This phase of the process is where the existing equipment is removed and the new equipment is installed. An inspector will be on site daily to ensure the installation is performed on time and according to the specifications.



The contractor will be required to install fences in certain areas to prevent pedestrians from wandering into the construction site. Traffic control measures will also be necessary at certain times for the safety of the construction workers. Cones, barriers, signage, and possibly flagmen will be used to divert vehicles away from areas where the contractor is working. One example is the lights across the top of the bridge. When the existing lights are removed and the new lights are installed, the contractor will most likely need to shut down part of the roadway to get the equipment in place necessary to lift the heavy lighting pieces. The Sponsor should provide a schedule of times when lane closures are allowed to take place; this will have to be coordinated with PennDOT.

Typically, meetings will be held at regular intervals throughout the construction period. The contractor, inspector, and Sponsor will attend these meetings and discuss any issues that have arisen. Items such as change orders, shop drawings, and invoices are also sometimes exchanged at these meetings.

One particular construction issue that should be worked out during the design phase is the installation of the floodlights underneath the bridge. It will be



Figure 24 *Underside of bridge is accessible from the shore*

difficult and/or expensive for workers to hang off the edge of the bridge or float below it to make the installation. So it is recommended to climb onto the underside of the bridge from the riverbank. This is a fairly easy task, at least from the Wrightsville shore—figure 24 is a photograph taken from the shore, showing the accessible structure. A contractor can walk out across the concrete arch all the way across the bridge. It is recommended to install a cable attached to the interior side of the vertical columns shown in figure 24. The contractor can wear a safety harness, and clip the harness to the cable, to catch him in case he accidentally slips and falls. An additional cable should be installed at every pier, running parallel to the flow of the river. That way, the contractor can move freely from the arch to the pier to install the floodlights, all while being safely tethered to the bridge. Once the installation is complete, the cables can remain in place, for future maintenance workers to safely access the lights.

At the end of the construction period, the Design Team should perform a final walk-through of the site and create a punch list to make note of anything that was not installed as specified. It is the contractor's responsibility to fix the punch list items, so that the Owner gets what they paid for. Once all punch list items have been addressed, the contractor removes his equipment from the site, gets his final payment from the Owner, and the job is complete.

Opinion of probable time to complete: 9-12 months

MAINTENANCE

Properly maintained equipment results in a functional lighting system that suffers little from wasted power, misaligned light fixtures, or lamp burnouts. When outdoor lighting equipment is operating as designed, it suggests civic pride and a continuing concern about public safety and security.



Figure 25 *Light fixtures need to be cleaned periodically, or else...*



Figure 26 *...equipment failure can result.*

Good maintenance includes more than just keeping the light fixtures clean and relamped (figures 25 and 26). There are important decisions to be made during the design of the system. These decisions affect maintenance, and include selecting the proper fixture, light source, and other system components; accommodating light fixture accessibility; and considering the level of system maintenance that will actually be implemented.

Several steps can be taken during installation to facilitate the future maintenance process. Ground-based equipment should be mounted where it is accessible for easy inspection and maintenance. All control devices, such as circuit breakers, contactors, and switches, should be clearly labeled regarding the circuits and equipment they control. Except under rare circumstances, the light fixture power feeds should be run underground in conduit, avoiding the use of overhead wiring. All fixture components and aiming devices should be securely fastened and tightened. Finally, all equipment should be thoroughly tested to make sure it is operating as specified.

After installation, occasionally cleaning and relamping the light fixtures will keep them operating like new. All light fixtures should be checked on a regular basis after a new installation to establish a cleaning program. Along with routine cleaning of the exterior of the fixture, the interior should be cleaned at every lamp change. The exterior of the fixture should be inspected, and any damage should be repaired immediately.

As suggested in an earlier section of this report, the maintenance can be contracted out to a third party, it could be handled by the maintenance crew

from one of the local municipalities, it could be done by volunteers from the community (at least the upkeep of the landscaping), or some combination thereof.



This report recommends signing a multi-year maintenance contract with a local contractor. The Owner can ask a couple of contractors for prices, then pick one, or the contract can be put out for bid. Either way, once a contractor is selected, it will be their responsibility to check on the bridge and plaza occasionally and attend to regular maintenance of the installation, as well as respond to any calls for broken or malfunctioning equipment. At the end of the contract, the Owner can re-negotiate a new agreement with the same contractor, or put the contract out for bid.

The following information shows a summary of the energy and maintenance costs for the bridge. A more detailed look at the analysis is shown in the Reference Material section of this report. Note that the figures shown below are for maintenance of the lighting and electrical system only; they do not include upkeep of the landscaping or paving materials. It is assumed that the amount of maintenance necessary for the landscaping and paving items will not change when the proposed design is installed. Since the maintenance of the lighting system will increase, only those numbers are shown here.

Average maintenance/energy costs over the past 5 years (existing conditions):
\$10,327 per year

Opinion of probable maintenance/energy costs with the proposed design:

<u>2006:</u>	Top of Bridge	\$9,800
	Underneath Bridge	\$20,752
	Plazas	\$2,823
	<u>Total</u>	<u>\$33,375</u>

<u>2007:</u>	Top of Bridge	\$10,022
	Underneath Bridge	\$21,257
	Plazas	\$2,896
	Total	\$34,175
<u>2008:</u>	Top of Bridge	\$10,250
	Underneath Bridge	\$21,775
	Plazas	\$2,970
	Total	\$34,995
<u>2009:</u>	Top of Bridge	\$10,486
	Underneath Bridge	\$22,311
	Plazas	\$3,046
	Total	\$35,843

Based on these assumptions:

- All lights operated for 4300 hours per year
- Electricity cost of \$0.03730-\$0.03731 per KWH (municipal street lighting rate)
- Group relamping every two years, spot relamping calls in between, and complete cleaning once every two years

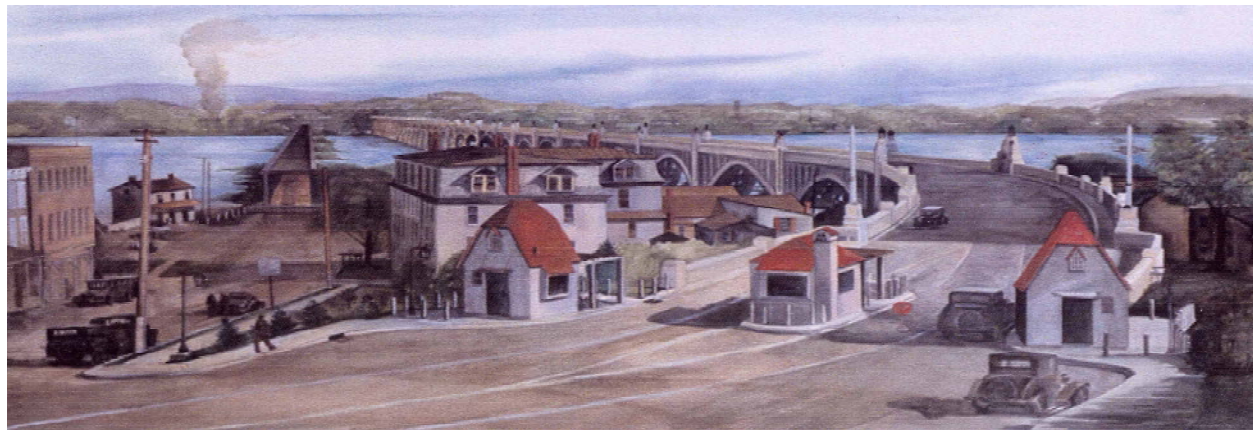


Figure 27 *Painting of the Veterans Memorial Bridge in its early years*

CONCLUDING REMARKS

To highlight this historic structure is to call proper attention to its majesty for visitors and residents alike. Indeed, upgrading the lights and plazas of the Veterans Memorial Bridge is a worthwhile project that should be pursued. The bridge is listed on the National Register of Historic Places and is included in Columbia Borough's Historic District. Following through with the recommendations contained in this report will help restore the bridge to its original splendor, and aesthetically improve the entrances to the boroughs of Columbia and Wrightsville. Enhancements to the bridge can be a source of pride and accomplishment for the surrounding communities, especially if they are involved in fundraising or maintenance programs.

Making these improvements will create a positive focal point to help draw people into the area. Many, many motorists travel across the Susquehanna River on nearby Route 30, which offers a dramatic view of the Veterans Memorial Bridge. For locals, the enhanced aesthetics of the bridge may get them to start using the Veterans Memorial Bridge more often than the Route 30 bridge. For tourists traveling between Lancaster and Gettysburg, seeing the beauty of the illuminated structure may pique their curiosity and get them to drive closer to the bridge, either on that or a subsequent trip. The idea is that as both tourists and locals notice the improved bridge and drive closer to it, they will be more likely to stop and eat, shop, sightsee, etc. in the adjacent towns.

One of the keys to bringing this project from concept to reality will be the ability to secure funding—not only funding for construction, but also for design and ongoing maintenance. Both the Sponsor and the Champion have critical roles in seeing the project to completion; without funding and local support, the project will never get off the ground. Once funding is secured and ownership/maintenance agreements are ironed out, the Veterans Memorial Bridge can shine brightly in the night and thrive as an attractive landmark to the nearby river communities.

IMAGE CREDITS

Background for quotes – from the Lancaster County Historical Society collection
Cover – Derck & Edson Associates and Brinjac Engineering
Figure 1 – Brinjac Engineering
Figure 2 – from the Rivertownes PA USA website
Figure 3 – from the Lancaster County Historical Society collection
Figure 4 – from the Charles Heim collection
Figure 5 – Brinjac Engineering
Figure 6 – Brinjac Engineering
Figure 7 – Brinjac Engineering
Figure 8 – Brinjac Engineering
Figure 9 – Brinjac Engineering
Figure 10 – Brinjac Engineering
Figure 11 – Derck & Edson Associates
Figure 12 – Derck & Edson Associates
Figure 13a – Brinjac Engineering
Figure 13b – Brinjac Engineering
Figure 13c – Brinjac Engineering
Figure 14 – PennDOT District 8-0
Figure 15 – from the Lumec catalog
Figure 16 – PennDOT District 8-0
Figure 17 – Brinjac Engineering
Figure 18 – Brinjac Engineering
Figure 19 – Brinjac Engineering
Figure 20 – PennDOT District 8-0
Figure 21 – Brinjac Engineering
Figure 22 – Derck & Edson Associates
Figure 23 – Derck & Edson Associates
Figure 24 – Brinjac Engineering
Figure 25 – Brinjac Engineering
Figure 26 – Brinjac Engineering
Figure 27 – painting by Suzanne Satterfield

REFERENCE MATERIAL

Opinions of Probable Cost

Installation Cost Analysis

Maintenance Cost Analysis

Light Fixture Catalog Cut Sheets

Fixture Type A

“Teardrop” style fixture to be used inside of historic lantern fixtures

Fixture Type B

Floodlight to be used underneath bridge

Fixture Type C

In-grade fixture to be used in plaza landscaping

Fixture Type D

Standard pole, arm, and light fixture as alternate to re-creating the historical plaza light