Project of the Year Submissions

Date Received 12/1/2021 ☑ Files submitted **Score:** _____

Title: **Kenmawr Bridge Replacement**

Company / Owner: PennDOT (Design and Construction)/Allegheny County (Future Owner)
PennDOT Engineering District 11-0, 45 Thoms Run Road
Bridgeville, PA 15017

Category

☐ Commercial	☐ Education	☐ Energy	☐ Environment
☐ Industrial	☐ Innovation	☐ Medical	☐ Modernization
☐ Sustainable	☑ Transportation	☐ Water / Wastewater	Other:

Lead Agents

Chery Moon- Sirianni (PennDOT D-11)/Stephen Shanley (Allegheny County DPW)

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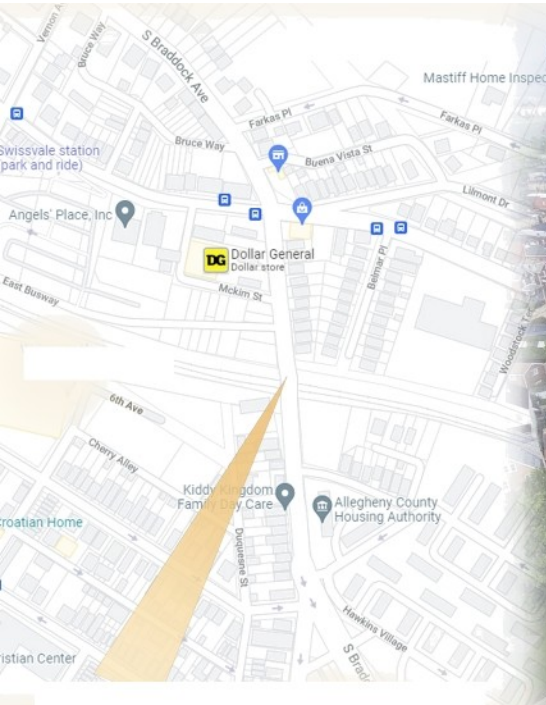
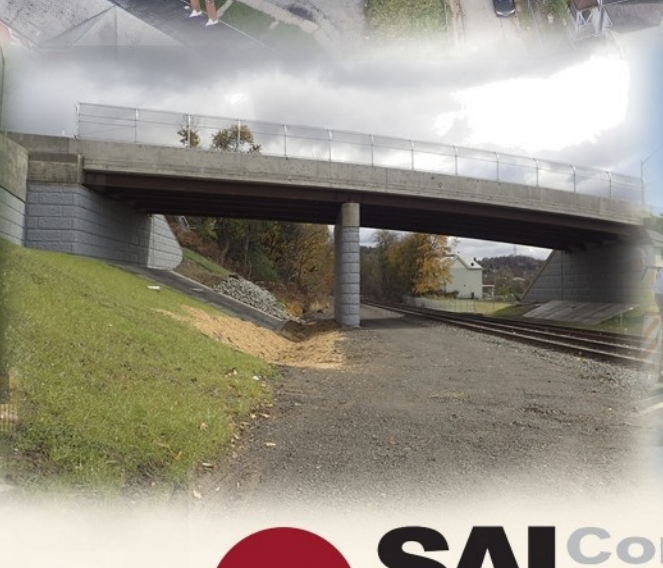
2021 ESWP Awards

Kenmawr Bridge Replacement

Category : ESWP Project of the Year





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The Kenmawr Bridge – Reconnecting Communities and their Transportation Assets

Project Description:

The Kenmawr Bridge was built in the early 1900s by the Pennsylvania Railroad Company (PRC) to connect the two urban communities of Swissvale Borough and Rankin Borough in Allegheny County, just outside the City of Pittsburgh limits. The bridge spans the two mainline tracks of the Norfolk Southern Railroad Company (NSRC), which carry people and goods through the Monongahela and Ohio River valleys on their way from the east coast to the Midwest. Except for a few necessary repairs, the bridge remained unchanged for over a century, aging, and deteriorating until it became severely structurally deficient, resulting in a massively reduced weight restriction. South Braddock Avenue, the roadway that crosses the Kenmawr Bridge, is an important regional connector between SR 0376, (known locally as the Parkway East) and SR 0837, which runs parallel to the south bank of the Monongahela River. The reduced weight restrictions on the bridge meant that the communities to the north of the Monongahela River (Swissvale, Rankin, Edgewood, Braddock, and the City of Pittsburgh) and the communities to the south (Homestead, West Mifflin, Whittaker, Duquesne, and McKeesport) experienced impacts to commerce and transit. In addition to serving as a connector between communities, the bridge is also the eastern terminus of the Port Authority of Allegheny County's (PAAC) Martin Luther King, Jr. East Busway facility. The reduced weight restriction on the bridge, meant that the PAAC could no longer efficiently serve the surrounding communities as buses could not safely cross the bridge. The bridge also provided only 18'-4" of vertical clearance above the railroad which did not meet their needs.

New Kenmawr Bridge over Norfolk Southern Rail Lines

Technical:

The original bridge, constructed in the early 1900s, did not meet the vertical clearance over the NSRC main line tracks. Recognizing that this was a huge issue, the SAI design team worked with the NSRC to determine what vertical clearance over the railroad could be achieved to accommodate the current and future needs of the railroad while at the same time minimizing the amount of vertical raise to the roadway profile. An increase of three to four feet in the vertical clearance was required to meet the railroad's needs. Raising the height of the bridge on both ends created a severe impact to the approach roadways and the adjacent residences and businesses in both Rankin and Swissvale Boroughs. Approximately 500 feet of approach roadway in both directions required total reconstruction utilizing retaining walls, realignment of side roads, and some property acquisition to accommodate the new profile of the approach roadway.

The project required an extensive amount of utility coordination and relocation. The project corridor is the main north-south route of many utilities, particularly overhead utilities. These numerous utilities were located on extremely old wooden poles placed adjacent to the curb line and crossing the NSRC corridor running adjacent to the existing structure. All overhead utilities required permanent relocation to a parallel roadway as well as the development of new crossing agreements through coordination with the NSRC and PAAC to ensure safe crossing above their facilities. The project site featured complex underground public utilities as well, which required a complete replacement either prior to or in some cases concurrent with the project. It also required comprehensive right of way coordination, as every property parcel adjacent to the

project site was impacted in some way. Over 30 of these adjacent parcels required either temporary or permanent right of way acquisitions, including some impacts to the NSRC and PAAC's limited access corridors.

Yet more challenges arose when considering the construction of the new structure. Even with its severe weight restriction, the original bridge still serviced an ADT of nearly 17,000 vehicles per day. With traffic volumes that high, no viable detour route could be found that was usable during the long construction period. Further complicating the process, the original bridge was the only pedestrian connection across the NSRC corridor to the PAAC's East Busway Station, which is used by many residents of Rankin Borough. The construction period involved both replacing and raising the bridge at its current location as well as raising the adjacent roadways to align with the new bridge grade, a process that could have taken some time. It was vital to the communities of Rankin and Swissvale Boroughs that pedestrian and vehicular traffic continue uninterrupted throughout the construction duration; therefore a temporary vehicular and pedestrian bridge; including temporary roadway approaches, was erected adjacent to the new structure.

Utilization of Temporary Bridge During Construction

While the Kenmawr Bridge was, and still is, the eastern terminus of the PAAC's Martin Luther King Jr. East Busway, it was not intended to be the final terminus. The SAI design team worked closely with the PAAC Engineering Department to add a second span to accommodate future expansion of the busway to the east. The new bridge was lengthened into the adjacent Swissvale Borough hillside, which required the addition of a center pier and extensive grading and sewer relocations.

Innovative Technical Features:

Available space in the project area was a big issue that needed to be considered during the design. To reduce the footprint of the construction area and to save time, reduce property impacts, and reduce construction costs, SAI designed the temporary bridge with temporary abutments that could be converted into the wing walls of the new bridge once the temporary bridge was removed. Much consideration was also given to the problem of providing enough physical space to efficiently construct the project while also maintaining access to the businesses and residences of the community. To reconcile these needs, SAI developed comprehensive construction sequencing for the project which would allow passage across the NSRC corridor, therefore enabling access to the homes and businesses.

Use of Wing Walls as Temporary Abutments

The necessity of raising the roadway to accommodate the raised elevation of the new bridge threatened to require demolition of homes that were adjacent to the project site in Rankin Borough. To prevent this impact to the community, SAI designed a bifurcated section using a toe wall and moment slab which would allow the roadway to be raised while keeping the sidewalk adjacent to the impacted properties at the same elevation, thereby preventing acquisition of those homes. Impacts were also anticipated from raising the approach roadways while still providing the appropriate agreed to vertical clearance over the railroad, which were dealt with by utilizing vertically cambered steel girders.

Schedule/Budget:

The final construction costs of the project were $12.4 million, slightly under the total bid, with no significant additional costs incurred during construction. The project proceeded on time and with no major redesigns or incidents, despite the congested urban nature and complexity of the construction. The project was originally scheduled for completion in October of 2021 and was finished one month later, in November 2021, even after being impacted by COVID-19 construction requirements. This success is not only attributable to the SAI design team, but also to the general contractor, Golden Triangle Construction, their subcontractors, PennDOT, and the CM/CI team of RIG Consulting, Inc. and Michael Baker International who all worked diligently to finish this important project for the region.

Public Relations Activities Associated with the Project:

A coalition of stakeholders spearheaded by the Pennsylvania Department of Transportation's District 11-0 Engineering Offices, was assembled to address the potential loss of this vital community transportation link due to the increasingly rapid deterioration of the structure. Although the main project area was not a state route, PennDOT assumed the responsibility of managing the design and construction of the new structure. The main goal of the project was to successfully replace the aging structure with a new bridge that would meet the transportation needs of today with room to adapt to the transportation needs of the communities of tomorrow while providing additional vertical clearance over the railroad. Such a complicated project required complex coordination of the many community stakeholders to ensure success. SAI Consulting Engineers, Inc. (SAI) and our team of subconsultants were selected by PennDOT's District 11-0 to develop the design of the replacement bridge and to assist the District with this complex stakeholder coordination.

Existing Kenmawr Bridge

The major stakeholders assembled to both facilitate and fund this project were:

- The Pennsylvania Department of Transportation – Engineering District 11-0
- The Federal Highway Administration (FHWA)
- The Allegheny County Departments of Public Works, Real Estate, and Housing Authority
- The Port Authority of Allegheny County (PAAC)
- The Norfolk Southern Railway Company (NSRC)
- Swissvale Borough
- Rankin Borough
- The impacted utilities: Duquesne Light Company, Verizon Communications, Comcast, DQE, Level 3, Lumen, Wilkinsburg-Penn Joint Water Authority, and Peoples Natural Gas

These major stakeholders each contributed significantly to the complex problems of funding the project, design review, administration, and taking responsibility for the eventual future ownership and maintenance of the new facilities.

Sustainability (Benefit to the Regional Community and Beyond):

"This project highlights what collaboration and great partners can accomplish in the transportation world. PennDOT is proud that we could deliver this key transportation project that is not only vital for the local communities and motorists in the east suburbs, but critical for the Port Authority of Allegheny County and the Norfolk Southern Railroad, all while minimizing traffic impacts during construction." Cheryl Moon Sirianni – District Executive of PennDOT District 11-0.

The Kenmawr Bridge is the only physical connection between several communities: Swissvale and Edgewood and Rankin and Braddock. These communities, which are severed by the railroad corridor, rely on one another for many services such as fire, police, EMS, and road maintenance, among others. By restoring this vital connection to its full capacity, the design team helped to continue enabling the sharing of these vital services and encouraging the use of the bridge by vehicles and pedestrians. The bridge is an indispensable link between communities, allowing citizens to take advantage of the commerce and economic opportunities each individual community has to offer.

"This has been an important project for the eastern part of the county. Thank you to all of the stakeholders who came together to ensure this project got done, Its disrepair impacted residents, commuters, the Port Authority and the railroad. Finally, we have a structure that not only meets all of our existing needs, but also plans for the future." – Rich Fitzgerald - Allegheny County Executive

Revitalizing this connection for both buses and pedestrians ensures that the usage of the public transportation system provided by the PAAC is not only continued but enhanced. The original bridge's weight restriction, which had been in place for decades, meant that the PAAC's busses could not reliably and efficiently access the regions to the south. This interruption in public transportation severely impacted residents who counted on this service for reliable transportation to and from work, educational opportunities, and access to the City of Pittsburgh's world class health care systems. The new bridge removes this weight restriction, thereby restoring easy access to the region for the PAAC busses. The new bridge also includes improvements to the pedestrian facilities by providing (2) 5-foot-wide sidewalks on the bridge. This provides access to the PAAC's East Busway Station which will encourage the increased use of this valuable transportation resource to and from downtown Pittsburgh and the surrounding communities. The lengthening of the new bridge represents a future-oriented design with an eye for sustainability that will allow for future extension of the PAAC's East Busway to the communities to the east in Allegheny and Westmoreland Counties. The new, longer bridge will provide ease of access for enjoyment of all the economic and social benefits the eastern counties have to offer by future generations.

Ribbon Cutting Ceremony with Stakeholders

"Our Martin Luther King Jr. East Busway is among the most important transit corridors in western Pennsylvania, Through this collaboration, we've protected future opportunities to connect this asset with more communities and riders." Katharine Kelleman – Chief Executive Officer of the Port Authority of Allegheny County.

Benefit to Society:

One of the main goals of the project was to create a design that would allow for an increase in future use and expansion without requiring the time, money, and environmental impact that building another new bridge would necessitate. This goal was obvious in many of the unique features of this design. For example, using the temporary bridge abutments as permanent wing walls for the new structure not only saved time and money, but it also reduced impacts to railroad traffic and the East Busway operations. Informed and advanced planning by the SAI design team about how to physically construct the entire project in a very tight geographical area, which could have had far reaching and disruptive effects on the community, resulted in minimal changes to the traffic control and sequencing during construction. The plan that was presented to public officials and in many public meetings prior to construction was carried out with extremely minimal changes and therefore very little went unanticipated by the public, resulting in increased public acceptance of the project. To the public, the design came across as well thought out, easy to understand, while appreciative of their communitie's needs (which is a goal of the SAI design team for every project we work on). The future benefit of the Kenmawr Bridge project for the engineering community as well as the general public was the value of cooperation. This complex project highlighted the absolute necessity of identifying and establishing contact with all significant stakeholders early in the design process. By working together and hearing concerns and needs from all interested parties, the SAI design team was able to avoid major delays. There is great benefit to working with the stakeholders of any future project that may be like the Kenmawr Bridge on a consistent basis through initial development, the design process, and final construction. By continuing these relationships throughout the entire process, the design team can ensure that all mutual goals are achieved.

"I'm glad that I was able to bring stakeholders together to address the concerns that Rankin and Swissvale had with the disrepair of the bridge and roadway, Because everyone came to the table to help determine the best path forward, we have a new bridge and roadway that better serve our communities and the residents who live here and travel this way. That cooperation also led to the entities sharing the cost of the project as well as future maintenance responsibilities. This is just one more example of the successes we see when we work together." PA Senator Jay Costa