Comments on the PennDOT Determination of Effects Report on the Headquarters Road Bridge

A report prepared for the Delaware Riverkeeper by:

Mark L. Stout, PhD
Mark L. Stout Consulting

14 December 2015

The Determination of Effects report asserts that there is a "site-specific safety problem" at the Headquarters Road Bridge. This is a critical assertion – one that leads the authors to conclude that the bridge fails a critical test in the AASHTO Design Policy: "AASHTO states that existing bridges can remain in place without widening unless there is evidence of a site-specific safety problem related to the bridge." The evidence cited for a site-specific safety problem is "the existing design deficiencies and statistically high crash rates related to these deficiencies." The report refers the reader to a previous PennDOT document, the Bridge Width Evaluation report, for a summary of reported crashes.

The PennDOT "site-specific safety problem" argument, as set out briefly in the DOE report and discussed in more detail in the Bridge Width Evaluation report, has four main components:

1. There are many geometric deficiencies in the existing bridge design and its approach roadways, which could induce more frequent crashes,
2. The crash rate in the vicinity of the bridge is higher than at comparable locations,
3. There is a history of crashes which is consistent with these findings, and
4. A one-lane bridge impedes emergency vehicle access.

These arguments will be addressed in turn.

1. Geometric deficiencies

The report states that a one-lane bridge at this location does not meet PennDOT design standards and implies that this "design deficiency" contributes to a site-specific safety problem. Although a design manual is a useful and important document for establishing standards, it is not a substitute for site-specific design and does not guarantee the "safest" outcome in a particular set of circumstances. In fact, as we have argued in a previous report (*Tinicum Township and the Headquarters Road Bridge: Planning the Future*, 14 April 2014), it is by no means certain that a two-lane bridge is safer than a one-lane bridge in all cases:

> A literature review was conducted to see if there was previous research and/or analysis of roadway safety at one-lane bridges and research and/or analysis of one-lane versus two-lane bridges. No applicable specific research was found on either subject, but some anecdotal information about the traffic calming effects of one-lane bridges was found. It was asserted that due to the narrowing of the roadway to one lane, traffic naturally slows down. An analogy would be the installation of a one-lane "choker" and/or a neck-down. A choker narrows the width of a roadway, generally at mid-block locations, to "allow travel in only one direction at a time, operating similarly to one-lane bridges." Neck-downs are similar in nature but are at intersections. The Institute of Transportation Engineers (ITE) estimates that speed is reduced by 14% when one-lane chokers are implemented for roadway

widths under 20 feet and greater than 17 feet. Speed reduction can enhance safety and, if a crash does occur, severity has a tendency to be reduced at the lower speeds. The same ITE reference also states that one-lane chokers can have a traffic volume reduction of 20%. A reduction in volume also decreases the risk of a crash and can enhance the safety of the location.

The DOE report does not explicitly address other potential design deficiencies in the area, but it should be presumed that the "deficiencies" referenced here include those addressed in the Bridge Width Evaluation report. These include sight distance, horizontal curves, and approach grades (turning radius will be discussed below in connection with emergency vehicle access). This is, in fact, a rural area, with wooded slopes and steep and winding roads. The report notes that "many" of the alternatives analyzed "are not able to fully address these existing substandard criteria." There is no discussion of how or to what extent the preferred alternative (presumably Alternative 6) addresses these issues. All of these alternatives, including Alternative 6, would likely require design exceptions to address the real issues of designing a project in this type of environment. In fact, a STOP sign in advance of the bridge on the western approach would resolve the sight distance issue, while improved road markings and signage should reduce the incidence of run-off-the-road events and other problems that might be associated with horizontal curves and grades near the bridge.

2. Crash rate

The DOE report refers to "statistically high crash rates," which is presumably based on the safety discussion in the Bridge Width Evaluation report. The BWE report provides a summary of crash data and argues that both the accident rate and crash intensity rates are "well above the statewide average." It is important to note that this analysis is based on a total of 10 crashes reported over 10-year period. It seems excessive to base significant conclusions on such a small sample. Indeed, even the BWE report states that no "crash clusters" could be identified because the small numbers could not meet the minimum threshold for that status. And although the statistics cited by PennDOT provide a minimal control for the overall level of development (rural) and traffic counts, these do not account for the local terrain (steep slopes and winding valleys) or the status of the roadway network (shifting bridge closures and attendant detours). A statistical analysis, in fact, provides only a general look at an area and should be subordinate to an analysis of the actual crashes at the location.

3. Crash history

As the Determination of Effects report notes, a narrative summary of the crash history for the area in the last 10 years before the bridge was closed is provided in the BWE report. The BWE narrative is based on another report, the "PennDOT Crash History Summary," which is listed as Attachment 7 to the BWE report. Portions of this document have been made available to us to review, but the actual crash records have not.

We were able, however, to review 10 crash reports which were supplied by Tinicum Township for the period 2003 to 2010 in the area of the bridge. A comparison of the 10 records supplied by Tinicum Township and the summary analysis in the "PennDOT Crash History Summary" suggests that the two lists may not be identical, although without seeing the actual records reviewed by PennDOT it is impossible to be certain.

Our review of the crash records received from Tinicum Township yields a very different conclusion from the one set out in the BWE and DOE reports.

Of the 10 crash reports reviewed, 3 are located on or at the Headquarters Road Bridge, 1 is nearby, and 6 are unrelated.

Following are the reported crashes on or at the bridge:

- 24 October 2003 – A vehicle driving westbound on Headquarters Road attempted a left turn onto the bridge and slid on an icy road surface on the bridge, resulting in contact with the bridge wall (see figures 1 and 2).
- 1 April 2006 – An unregistered, uninsured vehicle left the scene of the crash while the driver and passengers were out for a "joyride." Details of the crash are minimal but do indicate that contact was made with the Jersey barrier on the bridge.
- 7 May 2006 – A motorcyclist reported losing control of his eastbound motorcycle on loose gravel as he entered the bridge (see figures 3 and 4).

While the width of the bridge (a 10-foot cartway at the time) may have been a minor factor in these crashes, it does not appear that bridge width was the primary causal factor in any of these crashes.

The partial "PennDOT Crash History Summary" also identifies only 3 crashes at the bridge, a fact which was not included in the summary discussions in the BWE and DOE documents.

A fourth crash, on 6 July 2007, appears to have been near the bridge. A vehicle driving westbound was reported as having made contact with a fence or wall near the bridge. Based on the limited description and the police sketch (figure 5), the vehicle probably made contact with the fence on the western end of the bridge (figure 6).

Of the 6 remaining crashes, 1 occurred on Sheephole Road (10 February 2003), as two vehicles collided under icy conditions. The remaining 5 were all associated with the curve located approximately 250 feet east of the intersection of Headquarters Road and Sheephole Road:

- 24 May 2005
- 26 September 2008
- 21 January 2009
- 5 May 2009
- 16 March 2010

Of the crashes at the curve, 3 occurred when the road surface was wet and all 5 involved a westbound vehicle crossing the centerline (see figures 7 and 8). These crashes are all well beyond the influence of Headquarters Road Bridge, but do indicate a "hotspot" where PennDOT should consider upgrading such safety measures as signing and striping.

Our conclusion from reviewing the crash history in the vicinity of the Headquarters Road Bridge is that this history provides no evidence of a site-specific safety problem at that bridge.

4. Emergency vehicle access

The DOE report repeats PennDOT's assertion, made in previous documents, that one of the needs of the project is the fact that the existing structure "cannot safely and effectively accommodate current and future traffic needs including emergency response vehicles." With a curb-to-curb width of 16 feet, the bridge "cannot accommodate Tinicum Township's largest fire response vehicle, a 41.5-foot ladder truck." In fact, this ladder truck – Ladder 49 of the Ottsville Volunteer Fire Company – operated across the Headquarters Road Bridge when it had a 10-foot cartway. In an interview (a summary of which is attached), the fire chief of the Ottsville Fire Company confirmed that Ladder 49 could operate on a 16-foot bridge, although it would need to back up once to make the left turn into Sheephole Road, a common procedure in the township. He would also find a cutback of the embankment on the east side of the bridge desirable.

A wider bridge is <u>not</u> necessary to accommodate fire company operations. A traffic engineering analysis conducted for us by MBO Engineering in 2013 found the following:

> MBO Engineering has reviewed the 2009 turning radius study done by Urban Engineers for the Headquarters Road Bridge, discussed the possible scope of

work of a bridge rehabilitation project with McMullan Engineering, and undertaken multiple field visits in the vicinity. Based on this work, MBO Engineering believes that it is possible to satisfy the turning radius needs identified by Urban within the scope of a bridge rehabilitation project that includes some reconstruction of the wingwalls at the eastern end of the bridge, some reduction of the slope in the northeast quadrant of the bridge, and possibly some adjustment of the curb-to-curb width of the proposed new bridge deck.

Figures

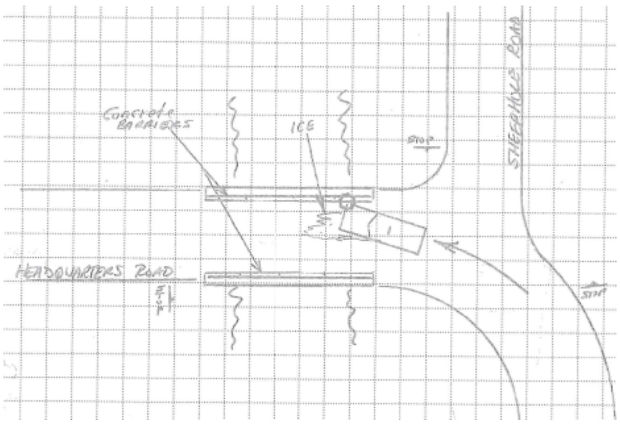

Figure 1
Police sketch of 24 October 2003 crash, vehicle skidding
on icy surface into Jersey barrier

Figure 2
Jersey barrier on Headquarters Road Bridge, showing impact scrapes,
possibly resulting from the 24 October 2003 crash

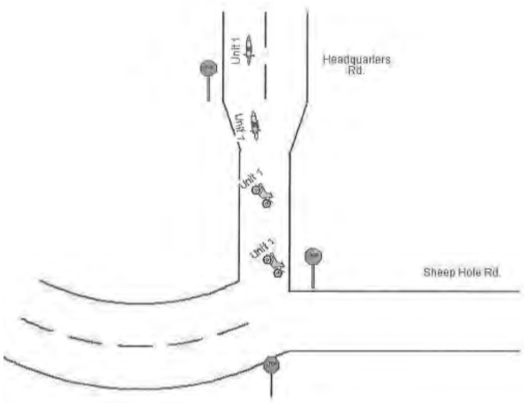

Figure 3
Police sketch of 7 May 2006 crash, motorcyclist losing control
on loose gravel

Figure 4
Eastbound view of Headquarters Road Bridge in
the area in which the motorcyclist lost control in the
7 May 2006 crash

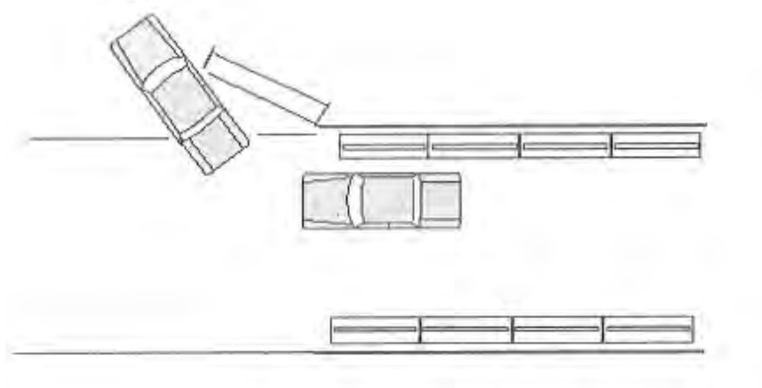

Figure 5
Police sketch of 6 July 2007 crash, impact on the fence to the west of the bridge

Figure 6
The fence to the west of the bridge, the apparent site of impact in the 6 July 2007 crash

Figure 7
Westbound view of the curve on Headquarters Road located 250 feet east of the intersection with Sheephole Road, the site of 5 crashes within the reporting period

Figure 8
Guiderail along the Headquarters Road curve, showing signs of multiple impacts

Attachment A
Meeting with Ottsville Fire Chief Bill Shick
14 October 2015

Bill Anderson and Mark Stout met with Bill Shick, Fire Chief of the Ottsville Volunteer Fire Company, at the Ottsville Firehouse on October 14 for approximately one hour. Following the meeting, he took us on a tour of local roads on Ladder 49, the Company's longest truck.

Key points:

- Chief Shick stated that as fire chief, he has no preference whether a one-lane or a two-lane bridge is built; his priority is to get a bridge opened as soon as possible. He thinks it is important to inject a sense of urgency into the discussions. I explained that in my view, the rehabilitation option would be completed more quickly.
- Ottsville will soon open a second firehouse in the northern portion of the district. The equipment being relocated to the new firehouse will not include Ladder 49 or Rescue 49, the two vehicles identified as having turning radius issues.

Chief Shick discussed in detail the routing issues associated with the Headquarters Road Bridge:

- With the closing of the Headquarters Road Bridge, the main detour route for Ladder 49 from the Ottsville Firehouse to Sheephole Road is Geigel Hill Road – Tankhannen Road – Ridge Valley Road – Headquarters Road. The detour route takes 3 minutes longer than the route over Headquarters Road Bridge. Since Tankhannen Road is unpaved, with tight curves and steep grades, Chief Shick explained that individual drivers of Ladder 49 may choose a slightly longer detour route (Geigel Hill Road – Ridge Valley Road – Headquarters Road) if they feel it is safer. The longer detour route adds another 2 minutes.
- Ladder 49 cannot enter or exit Sheephole Road at Geigel Hill Road. This means that the vehicle must reverse direction in a private driveway on Sheephole Road (a time consuming maneuver) in order to leave Sheephole Road the way it arrived, via Headquarters Road.
- Rescue 49 is a shorter vehicle but with a long wheelbase, so it also has turning radius challenges, although not as serious as Ladder 49. Rescue 49 can enter Sheephole Road via the Geigel Hill Road intersection, but needs to exit via Headquarters Road.
- The jurisdiction of the Ottsville Company extends to the east along Headquarters Road as far as Municipal Road, where Del Val company (based in Erwinna) assumes primary coverage. Even with the detours related to Headquarters Road Bridge, the Ottsville Company can reach this area of Headquarters Road faster than equipment from Erwinna.

We spent some time onsite at the Headquarters Road Bridge and talked about structural and geometric options:

- Chief Shick repeated that he would be happy with any width bridge that allowed the connection to reopen, even though some Ottsville equipment picked up “scrapes and bangs” when the bridge was open and the Jersey barrier was in place.
- With a 16-foot wide bridge, Ladder 49 needed to back up once to make the left turn onto Sheephole Road. Chief Shick does not consider that to be a problem, as the same situation exists in a number of places within the fire company’s coverage area.
- Chief Shick would welcome a cutback of the embankment on the east side of the Bridge. He estimated that a 5-foot cutback would enable the largest fire apparatus to make the left turn without a backup.
- Chief Shick would be happy with a 16-foot wide bridge, although he thinks 18 feet would be better. He sees no benefit for his trucks in widening to 24 feet.

Attachment B
Mark L. Stout Consulting team qualifications

Mark Stout is an independent transportation consultant and is principal of Mark L. Stout Consulting. His consulting practice addresses a wide range of transportation policy issues, including state and federal funding challenges, climate change, organizational transformation, and Smart Growth planning. His clients include state transportation departments, national and state nonprofit and advocacy groups, and metropolitan planning organizations. His recent work includes providing strategic planning advice to a state DOT; directing a regional multimodal strategic land development plan for a local government; coaching a medium-sized MPO in setting up a Smart Growth transportation program; providing policy support for a national transportation reform group, including making recommendations for supporting state DOT transformation in reauthorization legislation; helping state DOTs to collaborate with environment and energy agencies on a regional basis in addressing transportation and climate change issues; and coaching several state advocacy groups in the skills needed to engage state DOTs in project selection and capital programming.

Mark Stout's experience in Pennsylvania has included work with 10,000 Friends of Pennsylvania, the Lancaster County MPO, the Delaware River Joint Toll Bridge Commission, and extensive collaboration with PennDOT and DVRPC. He was co-manager of the development of the joint PennDOT/NJDOT *Smart Transportation Guidebook: Planning and Designing Highways and Streets that Support Sustainable and Livable Communities.*

Dr. Stout previously served more than 25 years with the New Jersey Department of Transportation. As Assistant Commissioner for Planning and Development he was responsible for the divisions of planning, capital programming, project development, local aid, freight services, aeronautics, and environmental resources. His accomplishments included leading the development of new Smart Growth planning tools, developing and implementing a performance-based capital planning and programming system, leading organizational transformation, leading the Department's response to climate change and energy policy challenges, managing major legislative initiatives, and developing a new statewide long-range transportation plan. He was previously Director of Capital Investment Planning and Development, where he managed the development of the Department's $1.5 billion annual capital program for transportation, as well as managing the flow of federal and state funding for projects. He has also served as a legislative assistant in the U.S. Congress.

Dr. Stout is a nationally recognized expert in transportation and land use planning, transportation and climate change, and transportation policy and legislation. He has published and spoken widely on transportation issues and produces his own "Smart Transportation Blog" (at www.mlstoutconsulting.com). He holds a BA in political science from Washington University in St. Louis and a PhD in political science from the London School of Economics.

William E. Anderson is a traffic engineer who had a 31-year career at the New Jersey Department of Transportation involving traffic engineering and traffic safety. He managed statewide highway safety programs and led a multi-disciplinary team responsible for reviewing high-profile crash locations. He served as Manager of the Bureau of Traffic Engineering and Safety Programs from 1993 to 2001, responsible for approval of all traffic control devices on state, county, and municipal roadways.

At Stantec Consulting he was the project supervisor for NJDOT planning and for operational review of task order assignments. He developed Traffic Impact Statements and Access Permits for private developer projects in New Jersey, Pennsylvania, and Virginia. He also conducted analyses of road-off-road crashes for the New Jersey Turnpike Authority on the Turnpike and Garden state Parkway.

He has been a member of the Adjunct Faculty of the Rutgers University School of Government Services, where he developed and taught two courses: Traffic Engineering for Police Officers and Advanced Traffic Engineering for Police Officers. These courses provided training in the application of the Manual on Uniform Traffic Control Devices and the identification and analysis of traffic safety problems.

He is currently a member of the National Committee on Uniform Traffic Control Devices and the New Jersey Governor's Highway Traffic Safety Policy Advisory Committee.