2012

SR 167 - Puyallup to SR 509

Puyallup River Bridge Preservation Strategy

Brenden Clarke, PE

WSDOT

2/10/2012

SR 167 Puyallup to SR 509

Puyallup River Bridge Preservation Strategy

Executive Summary

Background

The SR 167 Puyallup River Bridge is designated Bridge Number 167/20E by the Washington State Department of Transportation (WSDOT) and it is located at milepost 6.40 just outside the City of Puyallup. The existing steel truss bridge, built in 1925, is structurally deficient; the steel members are exhibiting severe corrosion and the concrete deck and piers are delaminating. In January of 2011, WSDOT implemented a load restriction requiring vehicles larger than 10,000 pounds gross vehicle weight to use the right lane only. This was due to floor beam deterioration detected during a routine bridge inspection. In addition, the width of the bridge does not meet current standards for lane and shoulder widths, which is problematic due to the high volume of truck traffic that utilizes the bridge. The bridge was on the P2 Program Bridge Replacement List for replacement during the 2013-2015 biennium when the Legislature made the bridge a priority by funding the project for the 2011-2013 biennium. In addition the Legislature mandated a Design-Build process for project delivery in hopes of expediting construction.

The goal of this project is to provide bridges and a roadway profile compatible with the SR 167 Puyallup to SR 509 Freeway Construction project, which is currently in the preliminary engineering stage and for which new right-of-way has been acquired. The steel truss bridge provides two lanes for northbound SR 167 traffic, while an adjacent concrete bridge that was constructed in 1970 provides two-lane capacity for southbound SR 167 traffic. While two lanes are sufficient for current and future traffic volumes southbound, the northbound route (within which the present bridge stands) will require a new bridge with additional lanes to provide necessary capacity for forecasted traffic volumes. The five lanes will include two left-turn, one through, and two right-turn lanes connecting to the new SR 167 / SR 161 interchange that will be built a relatively short distance north of the bridge. In order to allow traffic to weave/merge into the appropriate lanes in advance of the interchange, the new five-lane bridge must be constructed over the footprint now occupied by the historic steel truss bridge.

Existing SR 167 Puyallup River Bridge

The existing 86 year old steel truss bridge has been found to be historically significant and is eligible for listing in the National Register of Historic Places (NRHP). M.M. Caldwell is credited with the design for the structure, which utilizes a modified Warren through truss design. The SR 167 Puyallup River Bridge is believed to be unique in that it utilizes some design features found in the patented “Turner Truss.” There are a modest number of Warren trusses, including various modified versions, remaining on the WSDOT highway system.

The Puyallup River Bridge is 371 feet long. The traveled lane width on the bridge is 21 feet from curb to curb with an 8 foot wooden sidewalk structure attached to the right side of the bridge. The structure is rated as “Structurally Deficient” based on the floor beam deterioration. The most recent Structure Inventory and Appraisal Report (SI & A) was completed in January,

2011 and resulted in an Operating Rating (63) and Inventory Rating (65) of 1, with a Sufficiency Rating of 2.00 SD. Due to the magnitude of deterioration of the structure, annual maintenance costs will begin to rise unless major rehabilitation of the structure occurs.

Since original construction of the bridge in 1925, two major projects have taken place to lengthen the life span of the bridge. The first occurred in 1951 when new timber trestle structures replaced the original approach spans. In 1991 new horizontal members were added to the main steel truss structure, end bearings were replaced, and the expansion joints were replaced and the slab overlaid. Since then, routine maintenance has included replacing sheared rivets and repairing spalled concrete.

In addition to the bridge's Structural Deficiency rating, the two-lane, one-direction bridge has sub-standard lane and shoulder widths. As a result, the bridge is consistently damaged due to traffic impacts to the barriers and sides of the structure. The floor beams also experience damage due to high vehicular loads. Because the structure spans the Puyallup River from behind the levee on each side, scour is not a major issue, except for stormwater runoff on the south side of the bridge.

Exhibit 1

Existing Puyallup River Bridge – Concrete Spalling

Exhibit 2

Puyallup River Bridge – Typical rust in beams

Exhibit 3

Puyallup River Bridge – Typical broken Rivet

Delivery Strategy Identified in SR 167 – Puyallup to SR 509 EIS

The delivery strategy identified in the SR 167 – Puyallup to SR 509 EIS was to replace the steel truss Puyallup River Bridge with a new five-lane structure and to perform a seismic retrofit and a small taper widening to the existing (1970) concrete bridge. This was to be done by utilizing a detour structure (see Figure 1) (H/Env/Delivery Plan) to shift northbound traffic off of the steel truss, and far enough to the east to allow a five-lane structure to be constructed. The next step was to remove the steel truss and construct the new five-lane structure. Northbound traffic would then be shifted onto the new five-lane bridge, and the temporary detour structure would be removed. The final stage was to be seismic retrofit of the existing concrete bridge and a taper widening of the north end to match into the new SR 161 / 167 Interchange. This configuration of five northbound lanes across the Puyallup River is necessary to allow traffic to weave into the correct lane and for storage capacity. Due to the close proximity of the new SR 161 / 167 Interchange to the Puyallup River, there is not sufficient room between them to provide adequate storage area for the traffic signal and for safe weaving to occur to the north of the river (see Figure 2).

Two key decisions were made that led to the decision to construct a new five-lane bridge to the east of the (1970) concrete bridge and to retrofit that bridge for use by southbound traffic. The first determination made was that the concrete bridge could be seismically retrofitted economically. The second decision was that the access from Levee Road to northbound SR 167 would be cull-de-sacked and a new connection road would be built between Levee Road and Valley Avenue to provide access to the business in the northwest corner of the project. In addition, during a review of historic-era properties, the steel truss bridge was not identified as historically significant (i.e., it had earlier been determined not eligible for inclusion in the NRHP).

Since the EIS was completed, seismic standards have been revised to render retrofitting of the (1970) concrete bridge unfeasible economically. In addition, in the process of updating the status of the steel truss bridge, WSDOT determined the bridge eligible for listing in the NRHP.

Figure 1 – Original Detour Plan

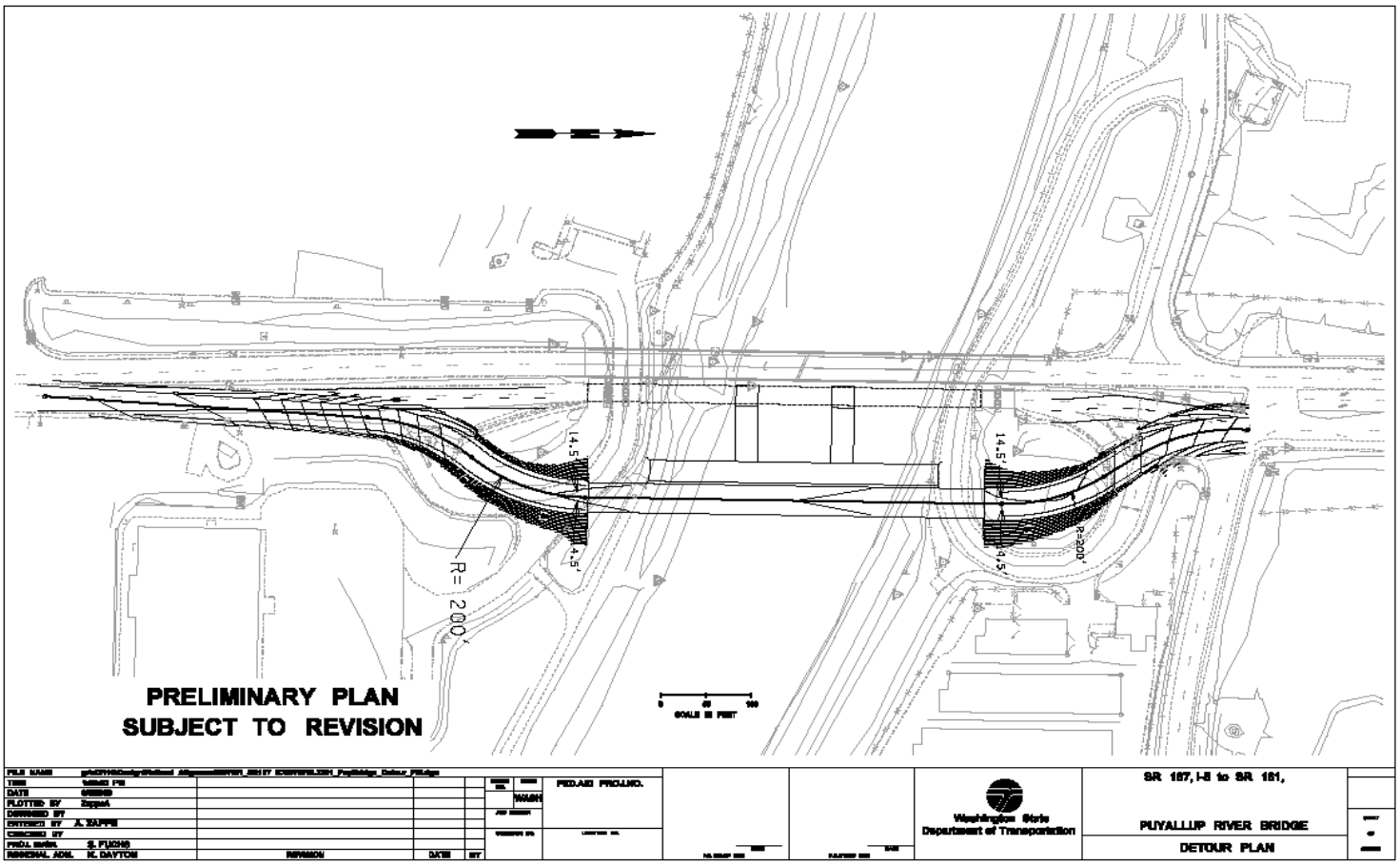
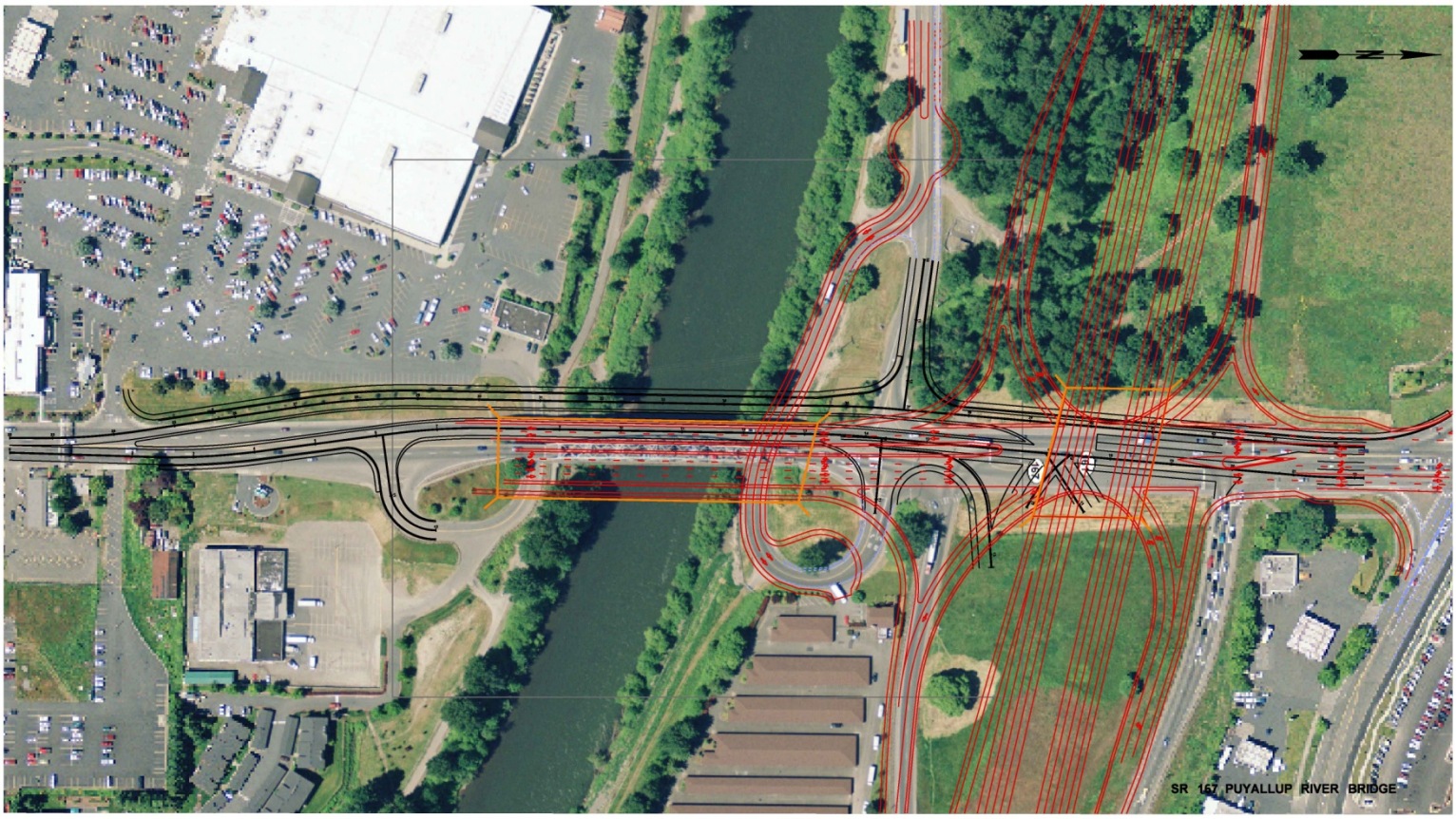


Figure 2 – SR 167 / 161 Ultimate Interchange



Proposed Delivery Strategy for SR 167 Puyallup River Bridge Preservation Project

Funding for the current stage of the SR 167 Puyallup to SR 509 Project is limited to providing a two-lane structure built to current design standards. This funding limitation required the design team to come up with a revised delivery strategy to reduce costs and the duration of the project. To deliver a new or retrofitted structure utilizing a detour east of the historic steel bridge (as identified in the corridor strategy) would not only result in temporary right-of-way impacts, but would permanently impact access to the business located immediately northeast of the bridge (see Figure 3). To eliminate impacts to business access and to reduce right-of-way acquisition, the project team investigated alternate alignments for a new structure. While examining alternative alignment options, the design team took into consideration that the existing (1970) concrete structure would be rebuilt during the ultimate corridor construction because it can no longer be economically retrofitted to meet seismic code.

With the above issues taken into consideration, the design team found that constructing a new structure to the west of both the existing concrete and steel structures would best address staging and right-of-way concerns (see Figure 4). By constructing a new two-lane bridge to the west, the need for a detour structure east of the historic steel bridge is eliminated since the structure can be built “off line”. Once the new bridge is complete, southbound traffic would be moved onto the bridge with a new approach alignment. In addition, by moving to the west impacts to the roads accessing the business northeast of the bridge are eliminated and permanent impacts to right-of-way are greatly reduced by constructing a retaining wall to preserve the parking lot southwest of the bridge (see Figure 5). Another benefit to eliminating the need for a detour structure is that the project duration will be greatly reduced, minimizing impacts to traffic and the environment.

Building a bridge to the east, adjacent to the steel truss, would require construction of a substantial temporary work platform across the river due to the fact that materials and equipment cannot be staged from the truss structure because of its overhead truss beams and limited load capacity. Constructing a new bridge to the west of the existing concrete bridge will allow materials and equipment to be staged off of the existing concrete bridge with a much smaller work trestle required for access to the in-water pier. This will greatly reduce the environmental impacts from the project.

Building a two-lane bridge to the west will accommodate the ultimate configuration of the new interchange and lane configuration. The ultimate configuration requires two southbound lanes, which the new bridge will provide. Five lanes are needed in the northbound direction. The next project stage will be able to utilize the footprint of the steel truss to construct the first two lanes of the five-lane northbound bridge. Once this part of the bridge is built, northbound traffic will be moved off of the existing concrete bridge, the concrete bridge will be removed, and the remaining three lanes of the northbound bridge will be constructed.

The project team investigated the surrounding area to determine if the steel truss could be moved upstream and utilized as a pedestrian facility. There are no pedestrian facilities or destinations on the north side of the river, so it is not likely the bridge would be utilized by pedestrians in the vicinity of its present location.

The option for maintaining the steel truss in place until such time as the next construction phase takes place was also evaluated. WSDOT determined that it would be more efficient use of funds and environmental permitting to utilize the contractor constructing the new bridge to also dismantle and remove the steel truss. In addition, if the steel truss is not relocated as a part of this phase of the project, the opportunity for preservation of the structure via transfer of ownership may not be available when the next phase of construction takes place.

Knowing that dismantling and relocating the bridge would result in a Section 106 "adverse effect" determination, WSDOT will be required to develop and evaluate alternatives that could avoid, minimize or mitigate adverse effects per 36CFR800.6(a). With the goal of minimizing and mitigating the adverse effect, the project team has been actively pursuing opportunities to preserve the NRHP-eligible steel truss structure off-site. The initial plan was to advertise the availability of the structure to be refurbished and relocated to a new location early, and continue through project completion. While researching potential uses for the steel truss, the project team found that the Foothills Trail between Enumclaw and Buckley is in need of a structure to span the White River. The project team met with King and Pierce Counties to discuss the potential for use of the Puyallup River steel truss on the Foothills Trail across the White River. King and Pierce Counties were very receptive to the potential preservation of the truss on their trail system, and they are currently proceeding with further engineering analysis to confirm the structure can be successfully refurbished and relocated to the trail crossing. It is expected that the engineering analysis will be complete May of 2012, at which time the Counties will be in a position to commit to preserving the steel truss on the Foothills Trail. The project team is advocating that relocating the Puyallup River steel truss to the Foothills Trail for preservation and use as a pedestrian facility would be a positive result of the project.

Relocating the steel truss to the Foothills Trail as a part of this project as opposed to preserving it at its present location is preferred for a number of reasons. The first is that when funding becomes available for the SR 167 Corridor, the current location of the steel truss will not allow a five lane northbound bridge to be built without relocating the steel truss. Another issue is that it would be more efficient to relocate the steel truss during this project when a bridge contractor is on site and available to perform the work, considering that bid prices are currently the lowest they have been in decades. The most compelling reason to relocate the bridge at this time is that King and Pierce Counties are in need of a structure for their Foothills Trail and are prepared to contribute toward the relocation of the steel truss. Relocating the steel truss to the Foothills Trail would not only preserve the structure, but it would provide a unique opportunity for people interested in viewing the bridge to not only see the structure but walk across it in a scenic setting. If WSDOT does not relocate the steel truss to the Foothills Trail at this time, there may not be an opportunity as beneficial to multiple parties with exceptional pedestrian access when the future SR 167 Corridor Project is constructed.

Figure 3 – Original Right-of-Way Plan

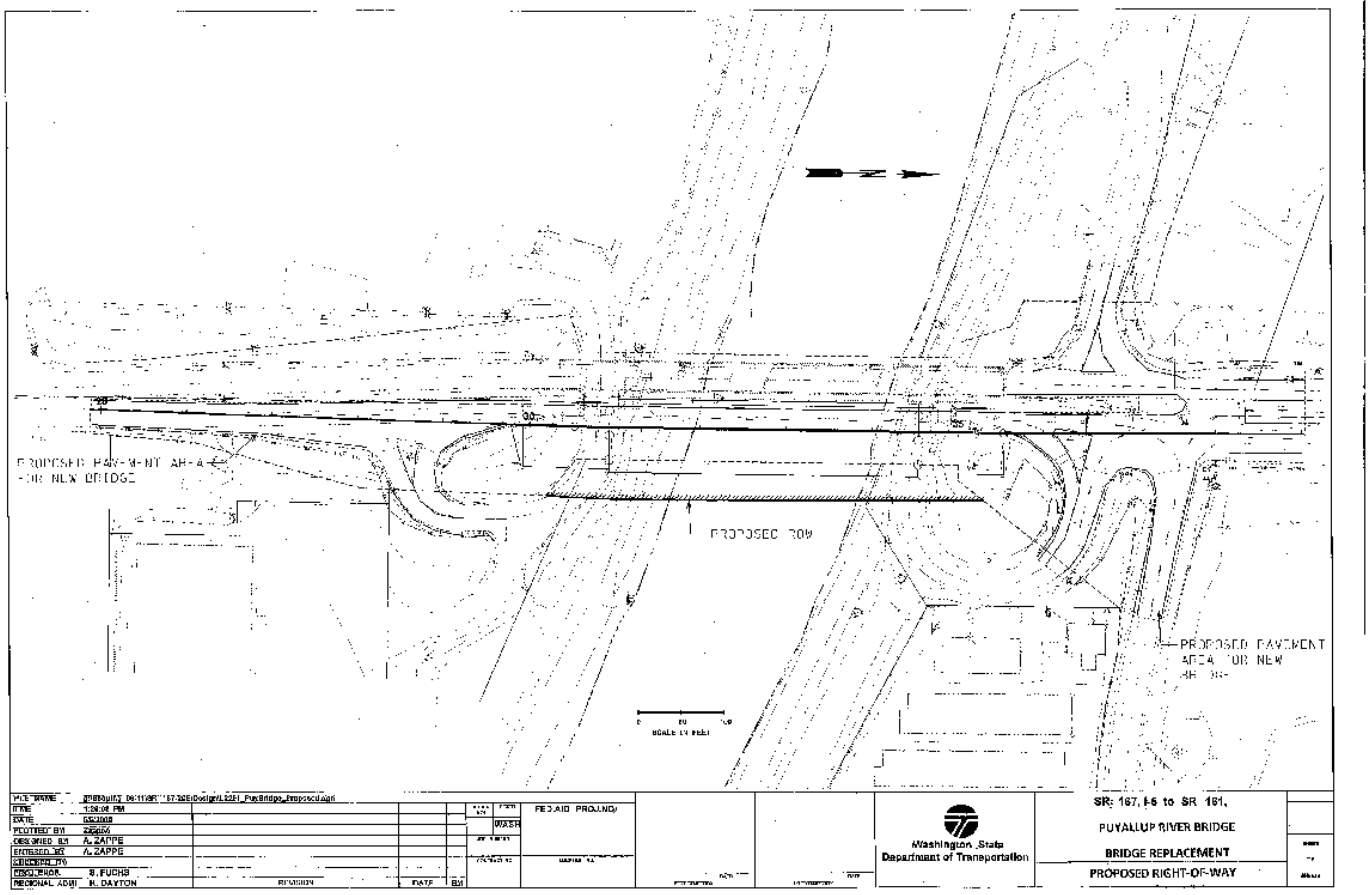
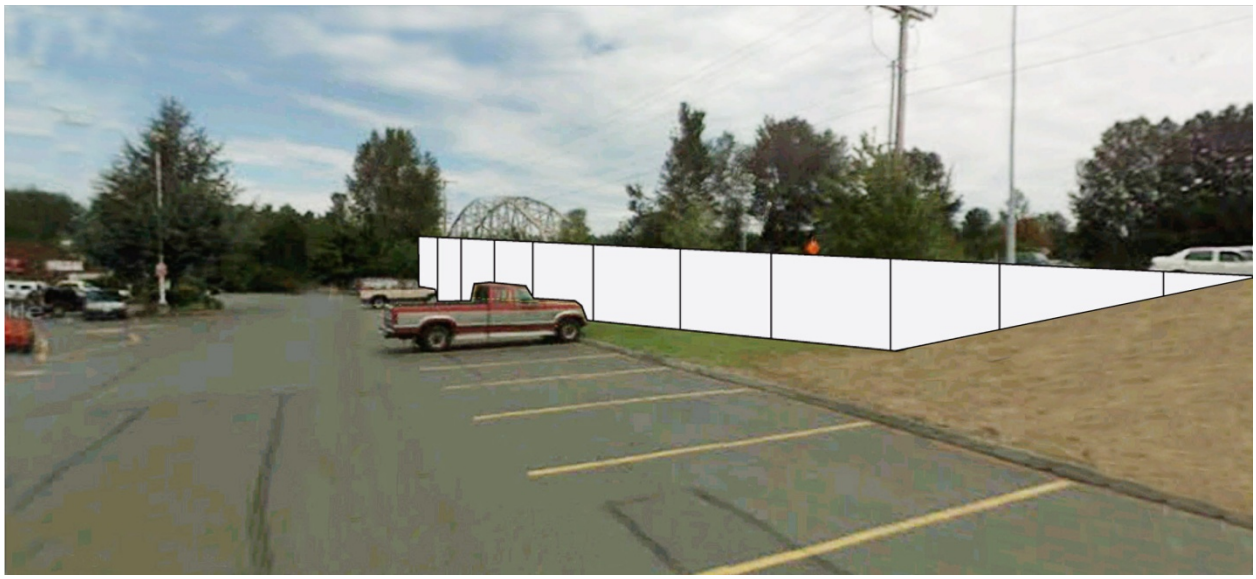


Figure 4 – Proposed New Bridge Alignment

Figure 5 – Proposed Retaining Wall



Conclusion

WSDOT will continue working with King and Pierce Counties to relocate and preserve the steel truss structure as a part of the Foothills Trail between Enumclaw and Buckley as the preferred delivery strategy. WSDOT is seeking funding opportunities for completion of the SR 167 Puyallup to SR 509 corridor, and has purchased more than 70% of the right-of-way needed for the project. The SR 167 corridor project is one of two projects the Governor's office is advocating in the current funding package in Olympic Region. By utilizing the proposed delivery strategy of constructing a new two-lane southbound structure to the west of the existing bridges and relocating the steel truss to the Foothills Trail, WSDOT will be in a position to successfully deliver the SR 167 Puyallup to SR 509 freeway corridor while minimizing and mitigating impacts to the environment, traffic, and the historic steel truss bridge.

In the event WSDOT is not successful in relocating and preserving the steel truss on the Foothills Trail, other potential sites are also being considered. WSDOT has contacted the Bridge for Kids organization in Orting to determine if the crossing over the Carbon River may be a location where the steel truss could be preserved. The project team will continue to conduct research and contact other groups to ascertain if other opportunities exist to preserve the structure.

If a new location is not found upon the completion of this project, WSDOT is prepared to preserve the steel truss off site for potential re-use and preservation at a new location. There are a number of potential locations where the steel members of the bridge could be stored within current WSDOT right-of-way and other local agencies' right-of-way. Due to the current economic climate, WSDOT is not in a position to maintain the structure in perpetuity, but will commit to maintaining the steel members as long as funding and storage space is available.