Table 4-2. Spring Valley Studied Alternatives Summary

Alternative Studied	On Alignment	Offset Alignment	New Concrete Spandrel Arch Bridge	New Haunched Steel Girder Bridge	Rehab. Bridge	Concrete Girder Approach Spans	Haunched Steel Girder Approach Spans	2-Lane Temp. Bridge
Alternative 1A	X		X			X		X
Alternative 1B	X		X				X	X
Alternative 2	X			X				X
Alternative 3A		X	X			X		
Alternative 3B		X	X				X	
Alternative 4		X		X				
Alternative 5A	X				X	X		X
Alternative 5B	X				X		X	X

5 Alignment Alternatives Studied

All offset alignments over the Current River, both temporary and permanent, contain a shift to the east of the existing highway or downstream of the existing bridge. The proximity of Carr's Store and a known archeological site west of the highway limits the ability to shift the alignment to the west and was not further considered in this study. Similarly, all offset alignments over Spring Valley, both temporary and permanent, contain a shift to the west of the existing highway or upstream of the existing bridge. Round Spring is located east of the highway and just north of the existing Spring Valley Bridge and limits the ability to shift the alignment east and was not considered further in this study. Additionally, all new temporary or permanent alignments offset from the existing roadway will require clearing the land and will impact trees and vegetation in the area. Restoration of the area after construction can be included in the project but will take several years to match the existing condition.

5.1 Existing Roadway Conditions

The existing Route 19 highway is a two-lane rural highway classified as a Minor Arterial. The existing highway has two 11 foot lanes with 2 foot shoulders. Current traffic volume along Route 19 through the study area is approximately 400 AADT, with approximately 15% trucks. The highway has a posted speed limit of 45 MPH through the study area. There are four horizontal curves located within the study area. Two of the curves have approximately 450-foot radii, one curve has a radius of approximately 400-feet and the northernmost curve has a radius of approximately 500 feet. None of these existing horizontal curves meet the design criteria for 45 MPH. In addition, no warning signs of an approaching sharp curve with advisory speed plaques are in place in advance of any of

the curves. The curves meet horizontal design speed criteria for 40 MPH. Crash data was not analyzed for this concept study, but should be taken into consideration during the next phase of the project.

5.2 General Roadway Design Parameters

Given the rural and scenic nature of the study area and the popularity of recreation near Round Spring, it was determined that maintaining a posted speed limit of 45 MPH through the study area after rehabilitation or replacement of the bridges was warranted. The use of temporary shooflys would maintain the existing horizontal curves along Route 19. Alternatives that shift the roadway to an offset alignment have improved geometrics by slightly increased radii where obtainable, but the radii were not increased enough to raise the design speed to 45 MPH. It is recommended that advanced warning signs for approaching curves with advisory speed plaques be added before the four curves in the study area. Vertical curves for the offset alignments have also been designed to meet the existing 40 MPH design speed.

Temporary shoofly alignments were generally designed to meet a 25 MPH design speed. Because these are temporary alignments, superelevation on the horizontal curves was not provided. Most of the shoofly horizontal curves have a minimum radius of 350-feet, except for the two curves on the north side of Current River for the downstream alignment alternative.

The minimum roadway width set for the project is 26 feet, including the roadway over the rehabilitated or replaced bridges. The curves before and after the Current River Bridge are reversed creating an “S” shape with travel way widening needed on the inside of both curves. The width transition for both curves will extend onto bridge requiring additional bridge deck width beyond the 26 foot minimum. To avoid opposite hand flared spans at each end of the Current River, the roadway width over the bridge has been set to 28 feet throughout. The curves near the bridge over Spring Valley are further away and the travel way width transitions do not impact the bridge. The design roadway width of 26 feet is adequate over the Spring Valley Bridge.

The stated purpose of the study is to examine the various alternatives for rehabilitating or replacing the existing bridges. It is not the intent of the project to substantially improve the roadway geometrics through the study corridor and the proposed design parameters reflect the general approach of maintaining the current level of service. This approach will create a project that improves the safety of the route while maintaining the character of the roadway through the culturally sensitive region. The design parameters used may require design exceptions during future phases of the project. Possible design exceptions include design speed, horizontal and vertical curve geometry and shoulder width as well as design spread for bridge drainage due to narrow roadway.

5.3 Current River - Temporary Shoofly with Pedestrian Bridge Removal (Alternatives 1, 2 & 5)

This alignment alternative consists of a temporary shoofly located approximately 45 feet east of the existing Current River Bridge centerline which would provide approximately six feet of separation between the widened bridge and temporary bridge. Because of this

shoofly location, the existing pedestrian bridge would need to be removed which would result in no pedestrian crossing during reconstruction or rehabilitation of the Current River Bridge. In addition, the removal of the pedestrian bridge would require relocation of the existing utilities located below the bridge deck prior to construction. Two alignment options were evaluated for a temporary bridge across the Current River that removes the pedestrian bridge. The first alignment is for a two-lane bridge and is depicted in Figure A-1. The second alignment is for a single lane bridge to temporarily carry both directions of traffic and is depicted in Figure A-3. Traffic over the single lane structure will be controlled by temporary traffic signals on either end of the bridge to alternate between northbound and southbound traffic. After completion of the new highway bridge, the narrower single-lane bridge would be converted to a permanent pedestrian crossing allowing the alignment for the single lane alternative to be approximately 10 feet closer to the existing bridge. See Section 6.1 for more discussion on the bridge aspects of the temporary bridge.

The shoofly alignment would be constructed with 400-foot minimum radius curves. On the north side of the river, reverse curves or an S-curve would shift traffic from existing Route 19 to the shoofly alignment. On the south side of the river, a single curve would connect the temporary shoofly with Route 19 which would provide for more area at the south end of the existing Current River Bridge for construction staging and/or storage

5.4 Current River - Temporary Shoofly Downstream of Pedestrian Bridge (Alternatives 1, 2 & 5)

Another alignment option can be seen in Figure A-2 consisting of a temporary shoofly located approximately 80 feet east of the existing bridge centerline. This shoofly location is downstream of the existing pedestrian bridge and may avoid removal of the pedestrian bridge and the attached utilities. The pedestrian bridge may remain in service throughout the construction of the Current River Bridge but it will be on the west side of the temporary roadway and an allowance will be needed to safely move trail users across Route 19 at both ends. The temporary bridge across the Current River could be constructed as either a two-lane temporary bridge or a single-lane bridge controlled by traffic signals on either end allowing alternating traffic to cross the bridge. Only the two-lane option is presented in this study report. See Section 6.1 for more discussion on the bridge aspects of the temporary bridge.

The shoofly alignment would be constructed with north side reverse curves and a south side single curve similar to the Current River Temporary Shoofly with Pedestrian Bridge Removal options, except this option would have smaller 200-foot radius curves on the north side to minimize the roadway impacts to the areas along Route 19. Even with sharper curves, the impacts to the areas along Route 19 would increase compared to the options that remove the pedestrian bridge since there would be more lateral shifting of Route 19 traffic from the existing alignment to the temporary shoofly alignment.

5.5 Current River - New Offset Bridge with Pedestrian Bridge Removal (Alternatives 3 & 4)

This alignment alternative can be seen in Figure A-4 and consists of a new offset alignment located approximately 35 feet east of the existing bridge centerline which would provide

approximately 10 feet of separation between the existing bridge and new bridge. The new alignment would be a permanent shift allowing the existing Current River Bridge to carry traffic while the new bridge is constructed. The new alignment location would require the removal of the existing pedestrian bridge and result in no pedestrian crossing during reconstruction of the Current River Bridge. The removal of the pedestrian bridge would require relocation of the existing utilities located below the bridge deck prior to construction. Since this alternative has a new mainline alignment, new flatter curves with shoulder widening and transitions would be constructed for both of the curves along the alignment. The new Current River Bridge would be widened to account for this additional roadway width and the curve transitions near the bridge ends would be extended onto the bridge. With the removal of the existing pedestrian bridge, a 10-foot mixed use path would be included on the east side of the new bridge. See Sections 6.4 and 6.5 for more discussion on the bridge aspects of the new bridge.

5.6 Current River - New Offset Bridge Downstream of Pedestrian Bridge (Alternatives 3 & 4)

Similar to the Current River Temporary Shoofly Downstream of Pedestrian Bridge option, this alternative would consist of a new mainline alignment located approximately 80 feet east of the existing bridge centerline and can be seen in Figure A-5. The new alignment would be a permanent shift allowing the existing Current River Bridge to carry traffic while the new bridge is constructed. Similar to the alignment options that remove the pedestrian bridge, a new mainline alignment further downstream would use flatter curves with shoulder widening and transitions would be constructed for the curves on both sides of the river. The new Current River Bridge would be widened to account for this additional roadway width and the curve transitions near the bridge ends would be extended onto the bridge. Sections 6.4 and 6.5 for more information on the bridge aspects of the new bridge.

As compared to the Current River New Offset Bridge with Pedestrian Bridge Removal option, this alternative would result in additional impacts to the areas along Route 19 due to increase lateral shifting of traffic from the existing alignment to the new permanent alignment. The impacts will be greatest on the east side of the highway north of the river. Construction limits for the proposed alignment extend into a significant portion of the hillside when 3:1 side slopes are assumed possibly impacting the NPS utilities and specifically the water storage tank. No geotechnical investigation was performed for this study but rock stable enough to support an open face is expected in the hillside. If further analysis confirms the existence of rock the impact of the alignment shift could be reduced.

5.7 Current River - Phased New Bridge near Existing Alignment (Alternatives 6 & 7)

This alignment alternative can be seen in Figure A-6 and consists of a new alignment offset approximately 20 feet east of the existing bridge centerline. The permanent alignment shift would allow for the phased construction of a new bridge. The existing bridge would be used for one-lane traffic while the new bridge is being constructed. Since this alternative has a new mainline alignment, new flatter curves with shoulder widening and transitions would be constructed on both sides of the river. The new Current River Bridge would be widened to account for this additional roadway width and curve transitions that

extend onto the bridge would be included. Section 6.7 has more detailed discussion on the aspects of the new bridge.

5.8 Spring Valley - Temporary Shoofly Upstream (Alternatives 1, 2 & 5)

The alignment alternative shown in Figure A-7 presents a temporary shoofly located approximately 35 feet west of the centerline of the existing Spring Valley Bridge and would provide approximately 10 feet of separation between the existing bridge and temporary bridge. The temporary bridge across the Spring Valley could be constructed as either a standard two-lane temporary bridge or a single-lane bridge controlled by traffic signals at each end allowing alternating traffic to cross the bridge. Either temporary bridge option would be constructed from standard MoDOT temporary spans which have to be installed level limiting the ability to lower the profile and reduce bridge length. Only the two-lane bridge option is presented in this report. See Section 7.1 for more discussion on the bridge aspects of the temporary bridge.

The shoofly alignment would be constructed with 300-foot minimum radius curves. On the south side of the valley, reverse curves or S-curve would shift traffic from existing Route 19 to the shoofly alignment. On the north side of the valley, a single curve would connect the temporary shoofly with Route 19 and provide more area at the north end of the existing Spring Valley Bridge for construction staging and/or storage. The existing NPS access onto Route 19 at the south end of the Spring Valley Bridge would be extended to connect with the temporary shoofly. A shoofly alignment would not impact the existing NPS buildings.

5.9 Spring Valley – New Offset Bridge Upstream (Alternatives 3 & 4)

A new permanent alignment offset approximately 35 feet west of the existing bridge centerline is presented in Figure A-8 and would provide approximately 10 feet of separation between the existing bridge and new bridge. The new alignment would be a permanent shift and would allow traffic to be maintained on the existing Spring Valley Bridge while the new bridge is constructed. Since this alternative has a new mainline alignment, new flatter curves with shoulder widening and transitions would be constructed on each side of the valley. The new Spring Valley Bridge would be widened to account for the additional roadway width but the travel way transitions do not extend onto the bridge limiting the new roadway width over the bridge to 26 feet instead of 28 feet required over the Current River. Details of the new offset bridges are included in Sections 7.4 and 7.5.

The alignment shifted west toward the existing NPS buildings would require a retaining wall or a reinforced side slope steepened to 2:1 to avoid impacts to NPS buildings. If a retaining wall were constructed, it would be approximately 300 feet long and vary in height from approximately five to seven feet. If a reinforced side slope is selected along the west side it would extend from the south end of the Spring Valley Bridge approximately 400 feet past the southernmost NPS building. Either option of a retaining wall or a reinforced side slope will alter the appearance of the roadway embankment adjacent to the NPS facility.