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TRAFFIC DESIGN MEMORANDUM
PROJECT 23558/23559
M-22-U: US 350
OTERO COUNTY, COLORADO

Submittal: December 15, 2020

Prepared for:

Colorado Department of Transportation – Region 2
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Project Description

The CDOT Region 2 Bridge Bundle Design Build Project consists of the replacement of a total of nineteen (19) structures bundled together as a single project. These structures are rural bridges on essential highway corridors (US 350, US 24, CO 239 and CO 9) in southeastern and central Colorado. These key corridors provide rural mobility, intra- and interstate commerce, movement of agricultural products and supplies, and access to tourist destinations. The design build project consists of seventeen (17) bridges and two (2) Additionally Requested Elements (AREs) structures.

The fourteen (14) of the structures in this design build project are jointly funded by the USDOT FHWA Competitive Highway Bridge Program grant and the Colorado Bridge Enterprise (Project No. 23558). The remaining five (5) structures are funded solely by the Colorado Bridge Enterprise (Project No. 23559). These projects are combined to form one design-build project. The two ARE structures are part of the five bridges funded by the Colorado Bridge Enterprise.

The nineteen bridges identified to be included in the 'Region 2 Bridge Bundle' were selected based on similarities in the bridge conditions, risk factors, site characteristics, and probable replacement type, with the goal of achieving economy of scale. Seventeen of the bridges being replaced are at least 80 years old. Five of the bridges are Load Restricted, limiting trucking routes through major sections of the US 24 and US 350 corridors. The bundle is comprised of nine timber bridges, four concrete box culverts, one corrugated metal pipe (CMP), four concrete I-beam bridges, and one I-beam bridge with corrugated metal deck.

Project Site

Structure M-22-U is at US 350 milepost 69.817 in Otero County, Colorado, and crosses the Otero Ditch. The Otero Ditch is a historic ditch. Categorized as a R-B Rural Highway in the CDOT State Highway Access Code, US 350 traverses rolling terrain with a 65 mph posted speed limit. In the area of the structure, the highway is approximately 30 feet wide, with two 12-foot lanes and no separation of opposing traffic. US 350 is also a Colorado Scenic & Historic Byway known as the Santa Fe Trail. **Figure 1** shows the project area.

Traffic Data

This segment of US 350 has a 2020 Annual Average Daily Traffic (AADT) of 580 vehicles per day, and a projected 2040 AADT of 714 vehicles per day, according to CDOT's Online Transportation Information Systems (OTIS). Of these daily traffic volumes, 7% are heavy vehicles. This roadway has the capacity to accommodate 2,400 vehicles every hour, resulting in a volume to capacity ratio of 0.03. In the year 2040, the volume to capacity ratio results in 0.04.

A total of six crashes were recorded in the vicinity of the structure location (mileposts 69.25 to 70.39) between January 1, 2015 and December 31, 2019. No crashes occurred at the structure itself. There does not appear to be any pattern of crash type, contributing factors, or impairment of drivers. The lack of any crash related pattern results in no specific modified design features.

Construction Phasing Alternatives

Three construction phasing alternatives have been identified to complete the construction of the proposed replacement structure.

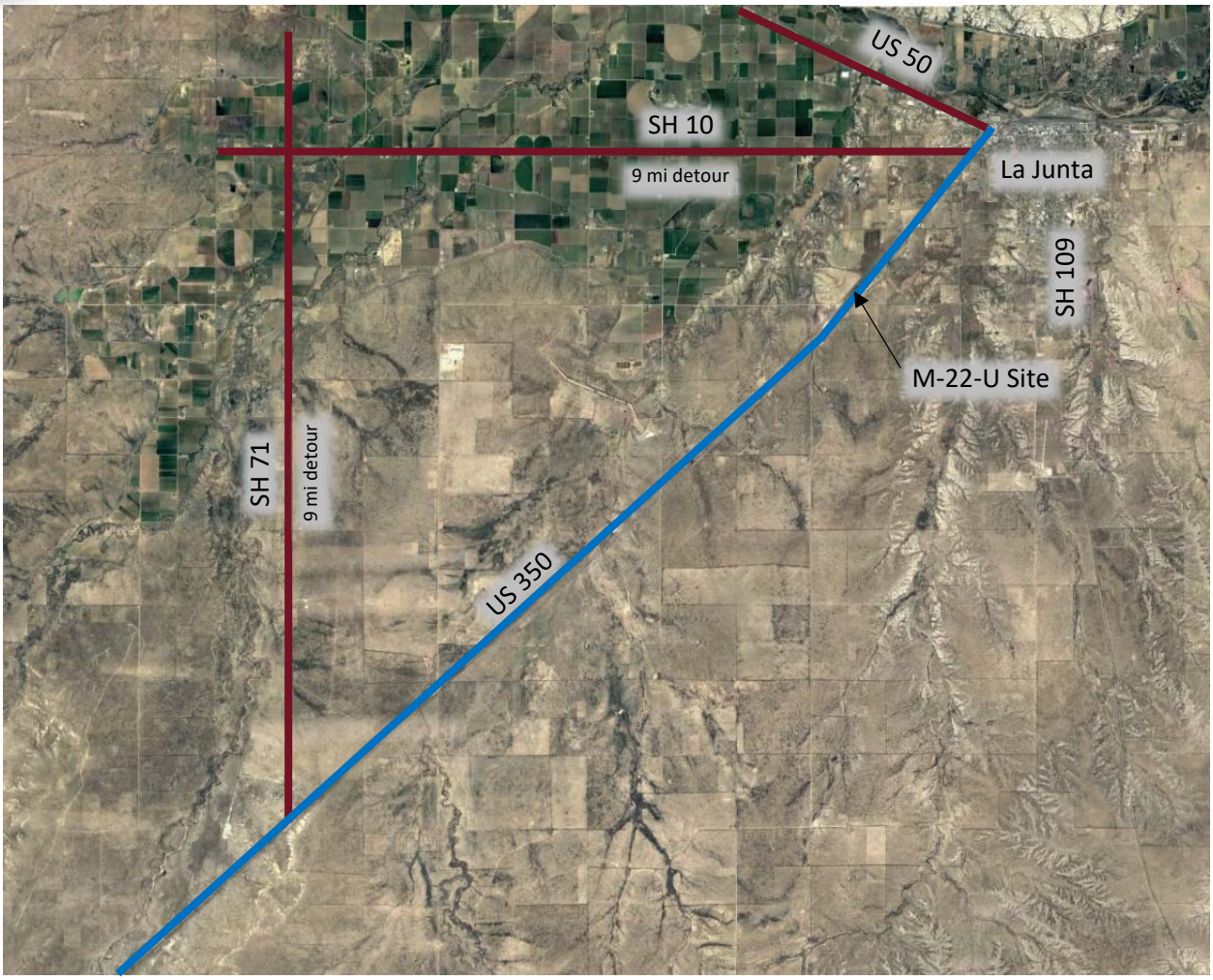

Figure 1: Vicinity Map

Complete Closure with Detour Route

The grant application states that the roadway should not be closed during construction due to the lengths of the detour routes. If a complete closure were allowed, this could be accommodated by utilizing State Highways 10 and 71 as a detour route. Utilizing this detour route will add approximately 8 minutes (5.6 additional miles) to the average trip between La Junta and communities southwest along US 350 to Trinidad. Local drivers may choose local roads to shorten their delay; however, those routes will not be officially marked. The Contractor must analyze the potential impacts to traffic operations along the detour route, and other information to provide the necessary data for CDOT to complete the three-step full closure decision process outlined in Section III of the CDOT Region 2 Lane Closure Strategy.

Single Lane – Two Way Traffic Operations

Phasing the construction to accommodate a single lane of traffic operations along the route at all times appears to be feasible at this structure location. CDOT's Region 2 Lane Closure Strategy allows for a single lane closure at all hours of the day at this structure location, so long as the lane closure does not exceed ¼ mile. Structure M-22-U is currently a two-lane bridge. Preliminary structural and hydraulic analysis have determined that this structure may be replaced with a single box culvert or a single span bridge. In Phase 1, the culvert can be constructed beneath the existing structure without impacting the existing structure or existing traffic operations outside of a roadside activity warning. Once in place, two additional phases

would be anticipated to get traffic onto the new structure. These phases would remove the existing structure in halves. **Figure 2** illustrates the phasing suggested to accommodate the alternative. By accommodating traffic operations in the current alignment, two-way traffic would utilize a single lane, likely by use of temporary traffic signals. Standards and guidance from Typical Application 12 of the Manual on Uniform Traffic Control Devices shall be followed. The use of temporary traffic signals must follow the 630 Traffic Signal (Portable) special provision. Preliminary traffic analysis indicates an acceptable level of service (LOS) of less than 55 seconds of delay (LOS D or better) on average, given the roadway traffic volumes, length between traffic signals, and speed limit. An acceptable level of service indicates the use of this alternative as feasible.

For the preliminary evaluation we are assuming the following variables: 1000-foot maximum distance between stop bars, speed limit of 40 mph, and a timing plan that uses a 45 second all red and enough green in each direction to clear the queue each cycle. The timing plan we are using for the evaluation is conservative to evaluate the worst-case scenario. The Contractor will be required to submit a traffic control plan to CDOT with a proposed timing plan for evaluation before implementation.

Shoofly

A shoofly alternative was evaluated at this structure location. Given that the Otero Ditch is considered a historic structure the impacts of a temporary shoofly would be greater than the two-way phasing option previously identified and would require additional consultation with the State Historic Preservation Office (SHPO). The parallel alignment of the ditch relative to US 350, a shoofly design may require additional shoring or other items which would increase the cost and feasibility of the shoofly alignment.

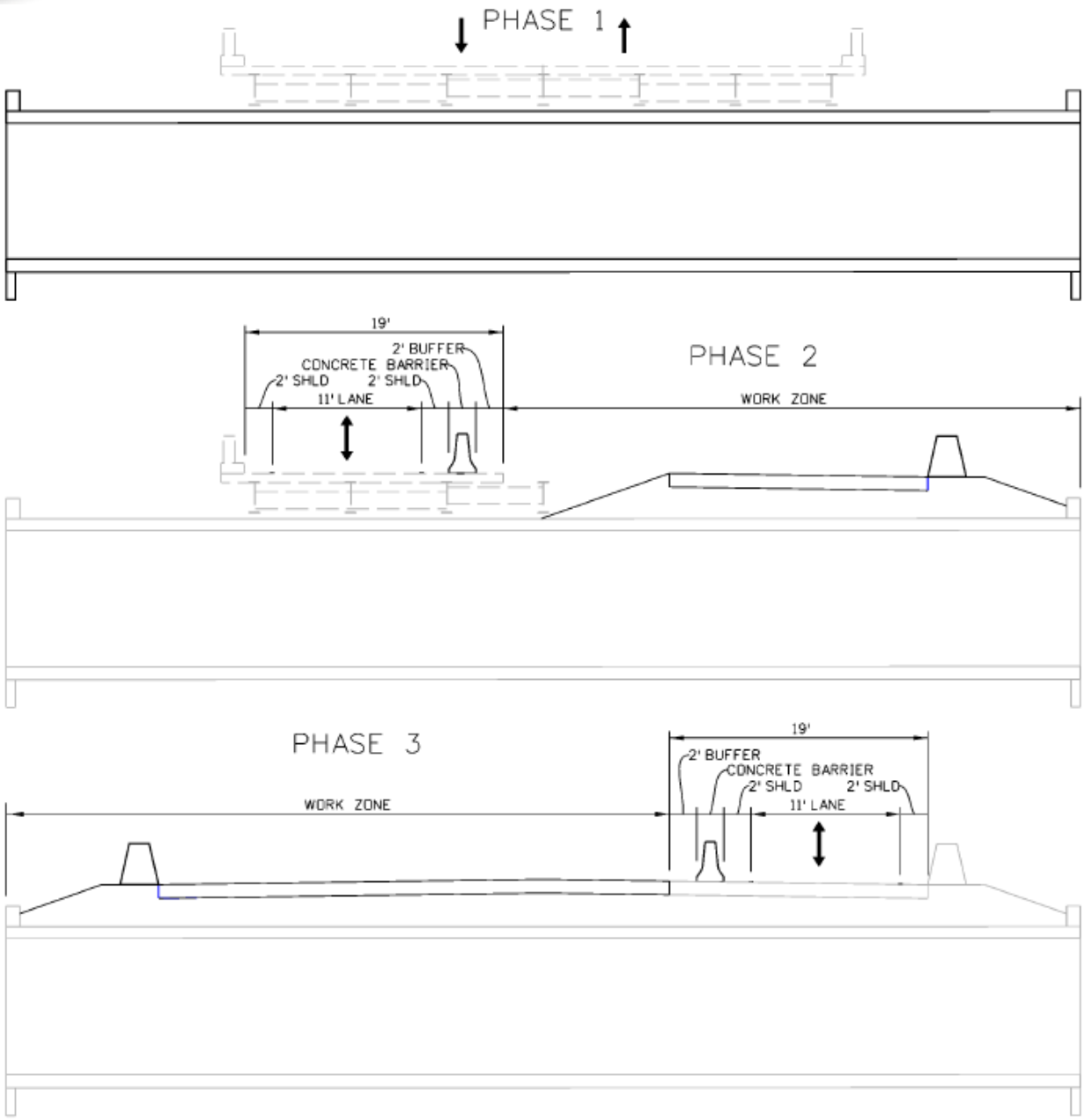

Figure 2: Single Lane – Two Way Phasing

Conclusion:

The recommended traffic control at this structure location, is a single lane, two-way operation. A shoofly is more impactful to the historic Otero Ditch. Although a detour is feasible, the detour route is long (approximately 18 miles), adding approximately 8 minutes to the trip. Given that the new structure can be constructed under the existing bridge, traffic impacts will be shortened in duration. When implemented, temporary traffic signals will cause less disruption than a detour option.