3. Recommended Scope of Bridge improvements

3.1 Historical Considerations

In the fall of 2000, an outside consultant, Fraser Design, suggested that the existing 4th St. Bridge is potentially eligible for the National Register of Historic Places (NRHP). Fraser Design was retained by CDOT Staff to perform an historic evaluation of the CDOT bridge inventory. The Historic Bridge Inventory data sheet, created by Fraser Design, is included in Appendix D. This data sheet includes a construction history and significance statement outlining the reasons behind the potential eligibility. CDOT has accepted the recommendation for eligibility made by Fraser Design and thus the existing bridge is being considered as eligible for the NRHP.

Since the existing bridge is considered eligible for the NRHP, every effort will be made to investigate ways to avoid, minimize, or mitigate adverse effects to the structure as a result of the construction project. As such, several construction alternates have been identified for future investigation. These alternates will be studied as part of the Section 106 and 4f processes to determine which alternate best addresses the project goals and critical issues with due consideration to the historic nature of the existing bridge. This historic process will take place in a future phase of the project.

3.2 Construction Alternates

The project goals indicate that reconstruction or replacement of the existing bridge may lead to an adverse effect on the historic nature of the bridge. Several alternates have been conceptualized that address this effect. The alternates include:

1. No-Build
2. **Build a New Structure / Remove the Existing Structure**
3. **Widen the Existing Structure**
4. Build a New 4-lane Structure / Use Existing for Pedestrians Only
5. Rehabilitate Existing Bridge for 4-lanes of Traffic / Build New Pedestrian Bridge
6. Rehabilitate Existing Bridge for 2-lanes of Traffic plus Pedestrians (East Bound) / Build a New 2-lane bridge (West Bound).

This report addresses alternates 2 and 3 which are normally studied for all CDOT bridge projects. As stated above, alternates 1, 4, 5, and 6 will also be studied during the historic process in a later phase of the project. Any of these alternates may ultimately be chosen.

3.3 Alignment Alternatives for New Construction

Both north and south alignment concepts were studied and the north alignment was chosen as the most feasible. Maintaining four lanes of traffic during construction is very

important to the success of the project. SH96A (4th St.) is a major east west corridor through Pueblo. Therefore, it is not practical to build a new structure on the same alignment as the existing bridge due to the disruption it would likely cause. Since there is ample space to each side of the existing bridge, it is possible to build a new structure to the north or the south, transfer traffic to the new bridge, and remove the old structure, with minimal disruption to existing traffic flows.

A north alignment parallel to and slightly offset from the existing structure has been chosen as the most feasible solution for construction of a new bridge. The north alignment follows the location of the previous structure that stood until construction of the existing bridge in the late 1950's. As a result, some CDOT right-of-way likely exists on the east and west ends of the bridge and on the north side. The exact limits of existing right-of-way will be established during preliminary design phase.

Selection of the north alignment allows for an improvement to the substandard curvature at the east end of the bridge and elimination of the double "S" curve on the west end of the bridge. Quick tie-in with 4th St. at each end is also realized, minimizing impacts to right-of-way and the existing 4th St. corridor.

On the east end, the proposed alignment rejoins the existing 4th St. alignment near the entrance to the Midtown Center mall. This quick convergence results in an overlap of the new structure with the existing for half of the existing bridge width in the first span. Considering construction of a new bridge, this requires some minimal construction staging at this location. One concept is that once at least two lanes of new structure are built for westbound traffic, two lanes can be transferred from the existing bridge to the new bridge. Half of the existing bridge in the first span is then removed and the new structure completed. Eastbound traffic can then be transferred to the new bridge. Four lanes of traffic are maintained at all times.

On the west end, the proposed alignment rejoins the existing 4th St. alignment near West Corona Avenue. The south half of the proposed alignment passes through open unused right-of-way. The north half crosses through the existing bluff and a property which will require some right of way acquisition. Figure 3.1 illustrates the North Alignment concept.

Construction of a new bridge on the north alignment and removal of the existing bridge would require disposal of the existing steel girders which are coated with lead-based paint. There are companies that will take the lead painted girders who do not require removal of the lead paint prior to disposal.

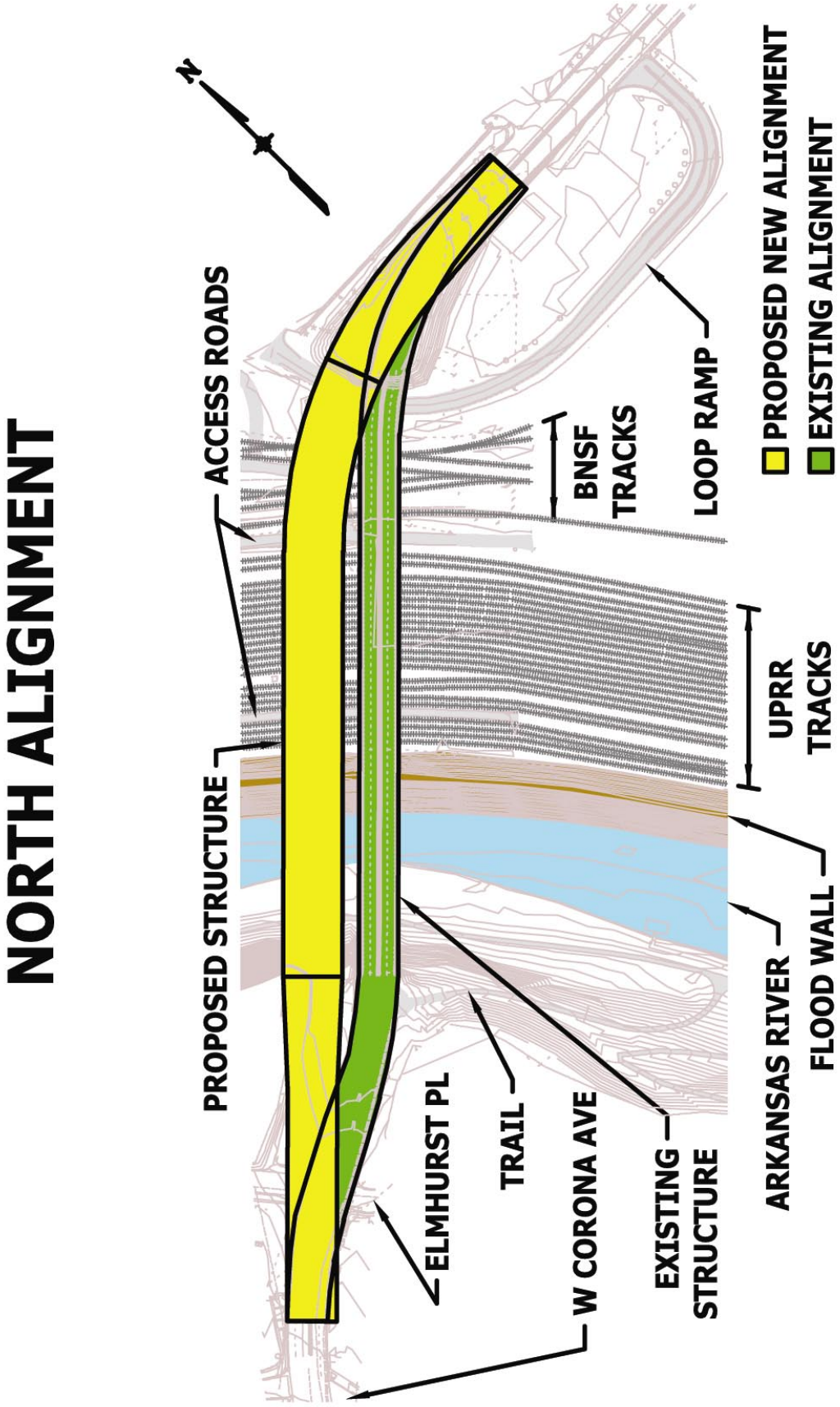


Figure 3.1 North Alignment Concept

3.4 Rehabilitation of the Existing Bridge

If the existing bridge is considered for widening, ways of increasing the load rating and methods of lead paint abatement must be studied. Section 2 describes the current bridge load rating. Increasing the load rating of the existing bridge requires some type of reconstruction including strengthening of the superstructure and possibly the substructure. Abatement of lead paint from bridge components is a complex and potentially environmentally hazardous procedure that can be very expensive.

3.4.1 Load Rating

Analyzing the load rating data for the existing 4th St. Bridge shows that there are two superstructure elements with substandard load ratings. The existing slab is in fair condition, but has an inventory rating of 23.3 tons, approximately equal to an HS12 truck. The steel plate girders are in satisfactory condition, but the girders in spans 3, 4, and 5 have an inventory rating of 27.0 tons, approximately equal to an HS15 truck. These elements rated below the original design criteria of 36-tons and far below current design criteria of 45-tons. Figure 3.2 shows areas of the bridge with substandard load ratings.

In order to make an equal comparison of widening versus new build, improvements to the existing structure should be considered. These improvements will bring the existing bridge load rating up to current design practice. CDOT has adopted the AASHTO LRFD design manual for new bridge construction. The HL-93 loading used in LRFD is approximately equivalent to an HS25 loading under the AASHTO Standard Specifications for a wide range of span lengths. Since the existing ratings are based on the AASHTO Standard Specifications and a design load of HS20-44, an equivalent comparison of alternatives can be made by boosting the deficient elements in the inventory rating of the existing bridge to HS25 loading.

3.4.1.1 Concrete Deck

The concrete deck inventory rating is 23.3 tons, or 52% of HS25. This rating applies to the full length of the deck and is based on the transverse spacing of supporting girders. Except for span 1 where the girders are spaced at 7'-9" center-to-center, the girders are typically spaced 8'-0" center-to-center. The deck thickness is generally 7 ½ inches and 4 to 6 inches of asphalt are recorded as an overlay. Any alternatives considering the use of the existing bridge should include removal and replacement of the existing deck to increase the load rating and provide the necessary reconfiguration. The deck would be redesigned to accommodate the required increase in loading by increasing the thickness and providing adequate reinforcement to span between girder lines. Dead load from overlays would also be reduced. Transverse post-tensioning should be considered for durability.

The existing expansion joint devices are open and leaking. As a result, the supporting concrete piers have deteriorated and there is corrosion of the joint hardware and

surrounding structural steel. When the deck is removed and replaced, the expansion joint devices should be replaced and the deck joint at Pier 1 eliminated.

3.4.1.2 Girders in Spans 3 - 5

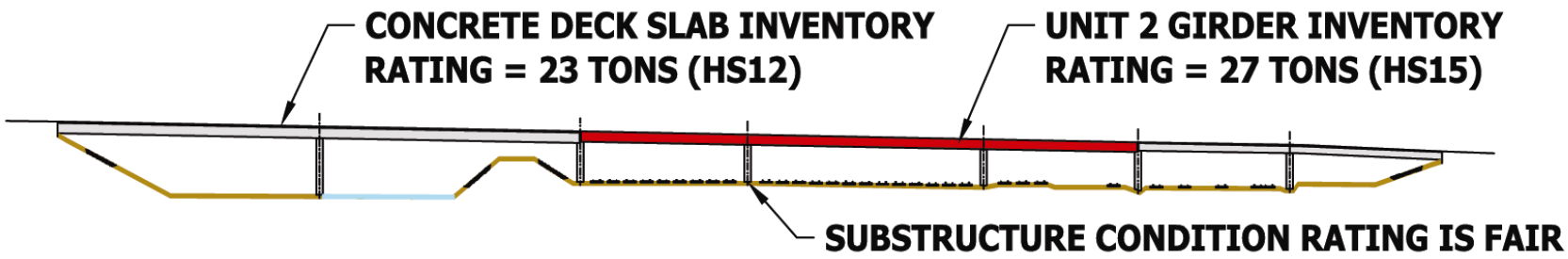
Inventory ratings of 27.0 tons and 31.6 tons, governed by shear, occur in spans 3-5 directly over piers 3 and 4, respectively. The minimum moment inventory rating is 41.6 tons and occurs over Pier 4. These ratings should equal or exceed 45.0 tons, so both the shear and moment strengths of the girders would need to be modified to provide increased capacity.

3.4.2 Lead Paint Abatement

A sampling of paint from the existing bridge girders indicates that lead paint was used for corrosion protection of the girders. Lead paint on bridges is a critical environmental issue. Therefore, removal and abatement of the lead paint is very important. It may be possible to limit the removal to areas where the paint is disturbed or currently flaking or it may be necessary to clean the entire bridge of the paint and re-paint with a lead-free coating. Another option is to encapsulate the lead-based paint with a new paint system.

The removal of lead paint is an expensive and complex process requiring careful execution and protection of workers, the public, the railroads, and the environment. Any modifications to the existing girders will require some amount of removal of lead paint. In the next section, costs for the various alternates have been summarized. Both partial (localized) and full lead paint abatement costs are presented based on data from reputable firms specializing in lead paint removal on bridges. Costs are based on $20/sqft of surface area. The extent of removal will not fully be known until field conditions are encountered. CDOT or another governing agency may require removal of all lead paint if the existing bridge is widened.

ELEMENTS WITH LOW LOAD RATINGS



INVENTORY REPORT SUMMARY

- SUFFICIENCY RATING = 44.5 / 100
- FUNCTIONALLY OBSOLETE DUE TO INADEQUATE HORIZONTAL RAILROAD CLEARANCES AND SUBSTANDARD GEOMETRY
- SUBSTANDARD LOAD CARRYING CAPACITY
- ORIGINAL DESIGN LOAD = 36.0 TONS
  CURRENT DESIGN PRACTICE = 45.0 TONS

Figure 3.2 Elements with Low Load Rating

3.5 Cost Comparison of Alternates

The cost of widening the existing bridge was calculated and compared to the cost of a new structure using an average cost per square foot of deck area for the new bridge. The cost of a new structure will vary depending on the layout and structure type chosen. Therefore, for comparison of costs, an average cost of $100 per square foot was used for new construction considering all site constraints and project objectives. For widening the existing bridge, a quantity based cost estimate was used to account for modifications and rehabilitation. Rehabilitation includes modifying the structure to increase the load rating to current design standards, at the inventory level. Three levels of rehabilitation were studied to allow for flexibility in increasing the load rating and unknown field conditions for lead paint abatement:

1. Without Rehabilitation/No Lead Paint Abatement
2. With Rehabilitation/Partial Lead Paint Abatement
3. With Rehabilitation/Full Lead Paint Abatement

Table 3.1 Cost Comparisons of New Structure and Rehabilitate Existing Structure

Alternate	Without Rehab. & No Abatement	With Rehab. & Partial Abatement	With Rehab. & Full Abatement
New Construction	$11.4 M	-	-
Widen Existing	$4.7 M	$6.8 M	$11.7 M

Costs shown in the above table are for bridge construction only. Other costs such as maintenance of traffic, approach roadway modifications, durability and future maintenance costs, and the cost of future structure replacement of the rehabilitated bridge should also be considered. The cost of widening the existing bridge and the cost of a new structure are similar considering rehabilitation, lead paint abatement, and other qualitative costs. The end result of widening is a substandard bridge with a reduced life expectancy.

3.6 Evaluation of Widening and New Build Alternates

In addition to cost, there are many factors considered in the evaluation of construction alternatives. The project goals and critical issues need to be carefully considered. Each construction alternate is discussed below with regard to the project goals and critical issues. These are listed in Section 1 and are repeated below:

Project Goals

- Improve Safety to Motorists, Pedestrians, and Bicyclists
- Increase Capacity
- Provide a Higher Functioning Level of Service

- Improve Clearances to the Railroad Tracks
- Increase the Load Carrying Capacity
- Integrate Aesthetics and Urban Design
- Integrate Adequate Pedestrian and Bicycle Facilities

Critical issues

- Access and Right of Way Restrictions
- Railroad Coordination
- Environmental Assessment and Mitigation
- Historical Assessment and Mitigation
- CDOT Schedule and Budget Constraints
- Aesthetics and Urban Design
- Community and Agency Involvement
- Maintenance of Traffic
- Alignment and Profile Improvements
- Access to Midtown Center Mall
- Consideration of Arkansas River Floodwall
- Coordination with Other Projects(I-25, Downtown Access)

3.6.1 Build a New Structure / Remove the Existing Structure

This alternate constructs a new bridge facility to carry all vehicle traffic, pedestrians, and bicyclists. With this option, all of the critical issues of the project will be addressed. The width of the new bridge would be such that adequate lane and shoulder widths are provided as well as a multi-use pedestrian and bicycle facility on both sides. All design would be per the latest design standards and the bridge would be designed for a life of 75 to 100 years. In this alternate, the new bridge is offset to the north of the existing bridge and can be constructed without disruption to existing traffic.

Constructing a new bridge on a new alignment addresses the need for improvements to geometry of the existing bridge. Improvements will be made to increase safety for the motorist, pedestrian, and bicyclist. The steep grade and tight curvature of the existing bridge will be eliminated. Similarly, the double “S” curve on the west approach will be removed.

Horizontal clearance from the bridge piers to the adjacent railroad tracks can be improved depending on the layout and structure type selected. It is possible to increase this clearance to meet the minimum requirements required by the railroads. Vertical clearance from the tracks is also addressed to provide what is required by the railroads.

A reduction in the number of piers in the railroad yard is also possible with the new construction alternative. The Union Pacific and Burlington Northern Santa Fe railroads

have expressed concerns that the location of the current piers in the railroad yard have congested their operations and do not meet their minimum safety requirements. Any removal of piers that could be accomplished by the project would be very beneficial and create a safer environment for both the railroads and the traveling public.

Careful selection of pier locations for a new bridge can avoid environmental and recreational concerns associated with the Arkansas River. The City of Pueblo is planning projects that will provide for recreational use on the Arkansas River including kayaking and possibly boating. The Legacy Project, for instance, includes improvements to the river channel and fish and wildlife habitats. Trails, a parking area, and a handicapped fishing pier have already been constructed. These improvements and future plans must be considered when locating piers in or near the Arkansas River.

Providing adequate multi-use pedestrian/bicycle facilities on the new bridge would improve pedestrian and bicycling capacity. The SH96A (4th St.) Bridge is a major east-west pedestrian and bicycling route. Currently there are not adequate facilities on the existing bridge for existing and future projected demands.

The construction of a new bridge would allow for agency and community involvement in the development of bridge concepts that represent the community as a whole. Redevelopment of Pueblo is ongoing and there is a desire to create a visually pleasing structure and urban environment. A new bridge is an opportunity to have a "Gateway to Pueblo," connecting western residential neighborhoods with downtown Pueblo and interstate I-25. Urban design and landscaping features can also be incorporated.

The existing structure would be removed as part of this alternate. Disposal is the most likely result, although, advertisement and relocation are also possible. The City of Pueblo and the Pueblo Conservancy District are involved in redevelopment activities related to trail and recreational improvement. City and county roads often require small overpasses. It is possible that the structure could be re-used in one of these ways. Examples might be supporting elements for short or long trail or roadway crossings, fishing facilities, docks along the Arkansas River, or a river overlook facility utilizing those spans which cross the river. Ownership would then shift from CDOT to the governing agency.

A discussion of various structure options for the new construction alternate is included in Section 4.

3.6.2 Widen the Existing Structure

Figures 3.3 and 3.4 show a plan view and elevation for widening the existing bridge. Widening can be used to achieve the desired cross section. Through widening, the existing structure, lane widths, shoulders, and pedestrian / bicycle access can be improved; however, the alignment, profile, and horizontal clearance to the railroad tracks can not. Therefore many of the project goals are not met regarding improving the safety

to motorists, railroads, pedestrians, and bicyclists. The widened structure also raises concerns with the vertical clearance to the railroad when widening to the low side of the bridge (south side). Widening studies have concluded that widening to both sides results in the narrowest cross section, but maintenance of traffic results in complex construction staging and an increase in the total cross section width.

In order to widen the existing structure, the concrete deck will need to be removed either partially or fully. It is recommended that the entire deck be replaced to provide the best-finished product, accommodate new expansion joint devices, and allow for reconfiguration of lanes, barriers, and sidewalks. Removal of the deck may require partial or full lead paint abatement depending on construction techniques and the status of the girders after deck removal.

The widened structure requires new girders on both sides of the bridge, an extension in both directions of the supporting pier bents, and new columns, footings and foundation elements. The existing substructure and superstructure will need to be rehabilitated to correct deterioration. As stated above, it is also recommended that lead paint be removed and rehabilitation of the superstructure completed in order to increase the bridge load carrying capacity.

A widened structure does not address the urban redevelopment and bridge aesthetics goals of the project. The opportunity for community input and involvement is minimal given the existing conditions. Some enhanced features such as lighting, barrier treatments, and lane improvements are possible.

Environmental impacts are expected to be small since the widening does not change the basic bridge configuration, pier locations, and capacity of the existing bridge. Detrimental effects to a potentially eligible structure for the NRHP are likely due to modifications to the bridge.

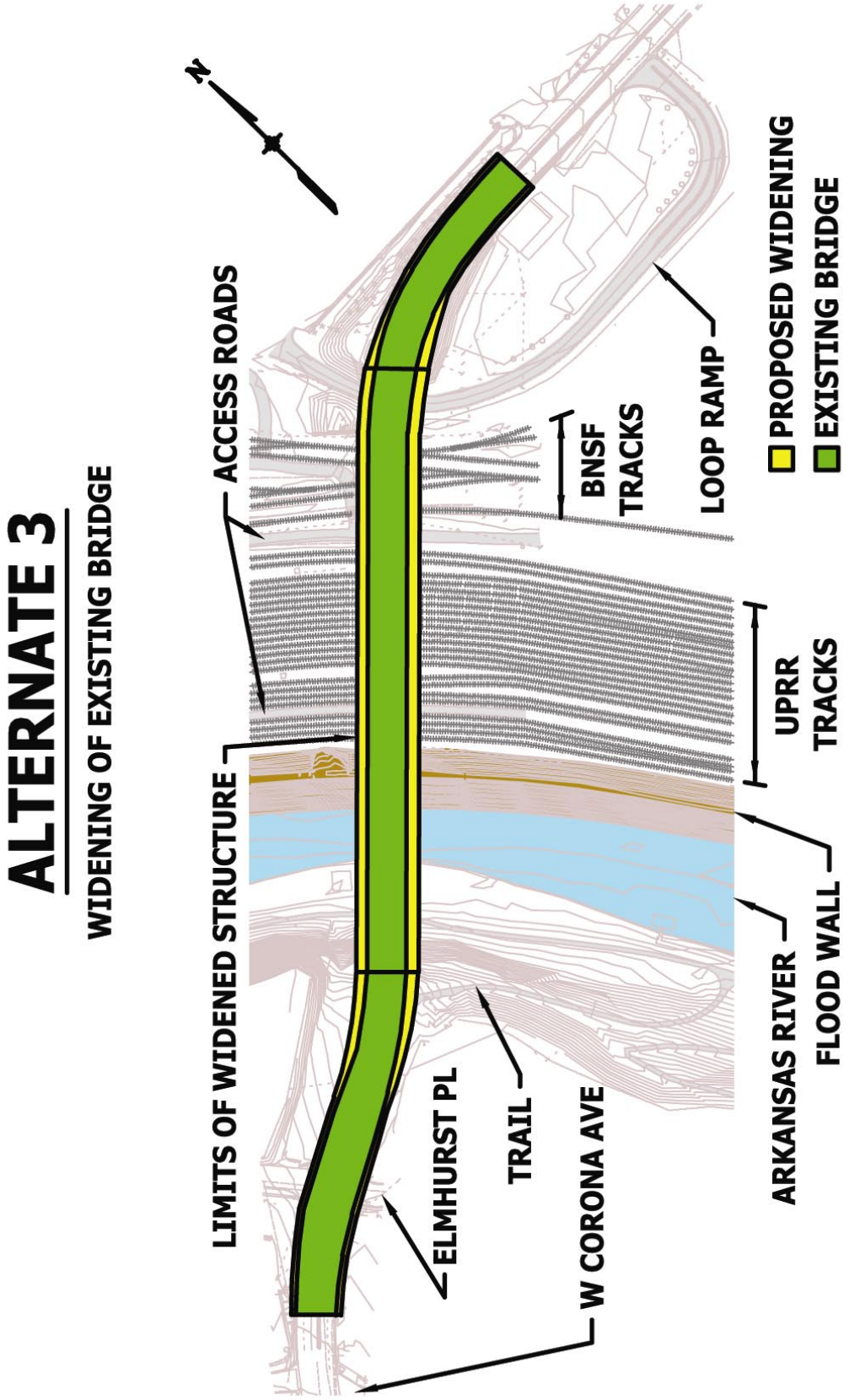


Figure 3.3 Widening Existing Bridge - Plan

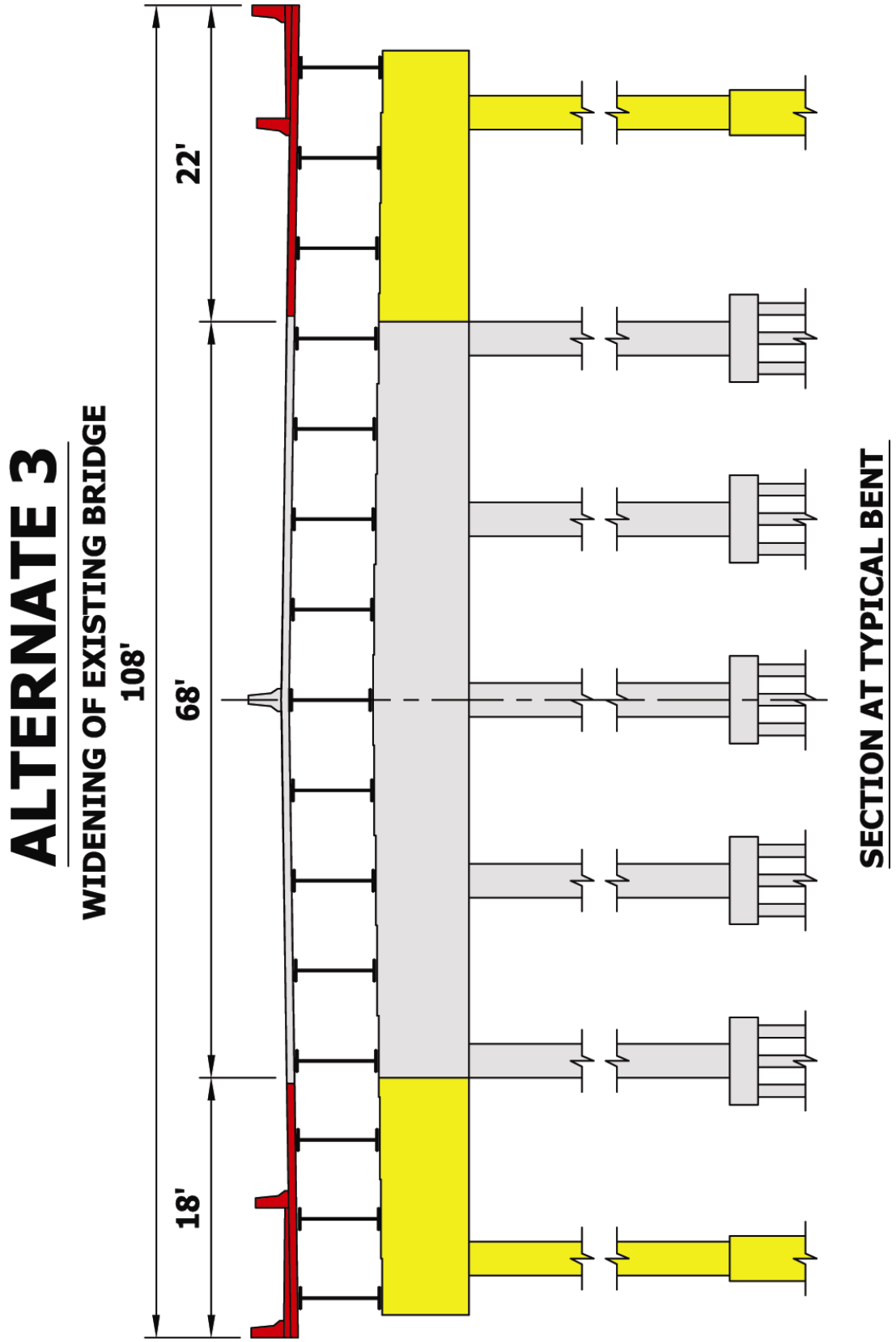


Figure 3.4 Widening Existing Bridge - Section

3.7 Conclusions and Recommended Alternate

The intent of evaluating construction alternatives and selecting a preferred solution is to select that alternate which best satisfies all of the goals and critical issues of the project.

The cost of widening the existing bridge is similar to that of building a new structure. When widening operations are complete, only minor structural improvements are realized and the life span of the bridge is significantly less than that of a new bridge. Substantial maintenance activities and costs are expected to prevent deterioration that exists on the current bridge and that can be expected to continue with the widened bridge.

Construction of a new bridge would address all of the stated goals and critical issues of the project. Therefore, construction of a new bridge and removal of the existing structure is the preferred construction alternate.