

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 3

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STA 092A-018
SH 92 Austin to Hotchkiss Corridor
Project Code 14934

Date: December 10, 2010

To: Kelly Abaray – Manager Industry & Public Works

From: Dwight Burgess – CDOT Region 3 Utility Engineer

RE: Conceptual Submittal and Variance Request

The Colorado Department of Transportation (CDOT) is engaged in a program of highway improvements on a 14-mile segment of State Highway 92 (SH 92) between the towns of Austin and Hotchkiss in western Colorado. The purpose of these improvements is to enhance safety for both the roadway and its interface with the adjacent railroad, and to improve highway traffic operations.

Through previous phases of work, seven miles of SH 92 have been reconstructed east of Austin, as indicated in **Figure 1**. The work included upgrading of shoulders, new pavement, passing lanes and other related features. The next phase of these corridor improvements will address an existing grade crossing on the Union Pacific Railroad (Railroad) North Fork Subdivision, Denver Division line at its Milepost 67.8. It is CDOT's objective to create a grade separated condition between the highway and railroad at this location as part of this next phase of work.

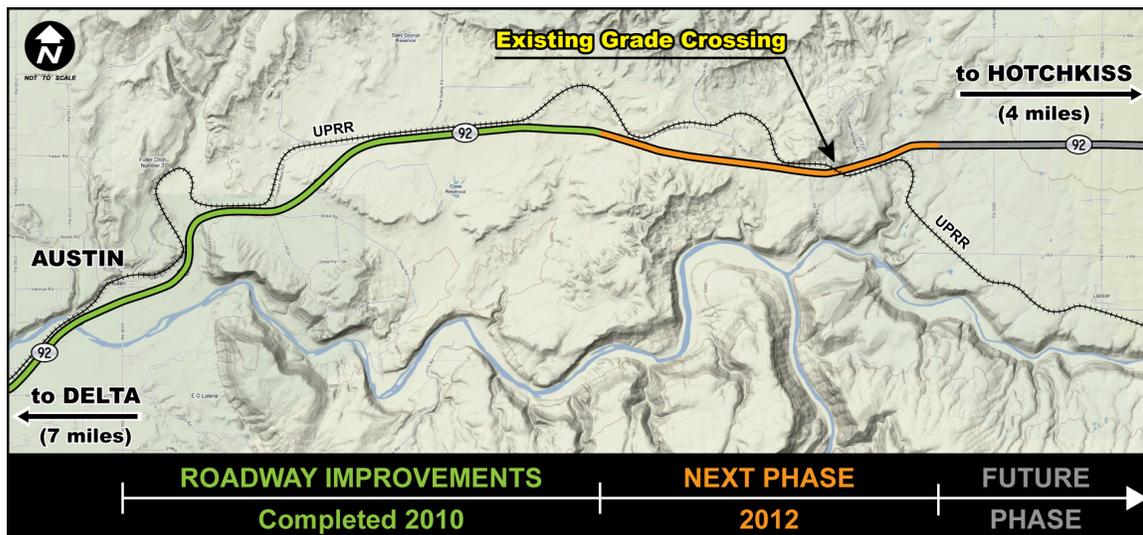


Figure 1. Project Location

This letter describes two concepts that have been developed for a grade separated railroad/highway crossing:

Option 1 – Railroad over Highway – In this option, depicted in **Figure 2**, approximately 3,800 feet of the rail line would be realigned to cross over SH 92 on a bridge located 2,600 feet west of the current at-grade crossing.

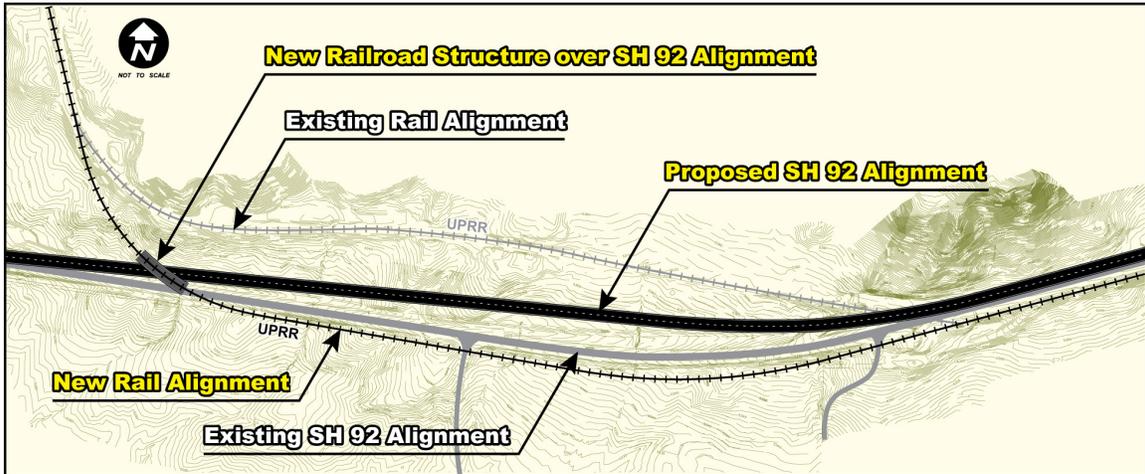


Figure 2. Option 1 – Railroad Over Highway

Option 2 – Highway over Railroad – Under this alternative, the railroad would remain on its current alignment as shown in **Figure 3**. SH 92 would be reconstructed generally on its existing alignment, but on a new profile that would carry the highway over the railroad with a new bridge near the location of the current at-grade crossing.

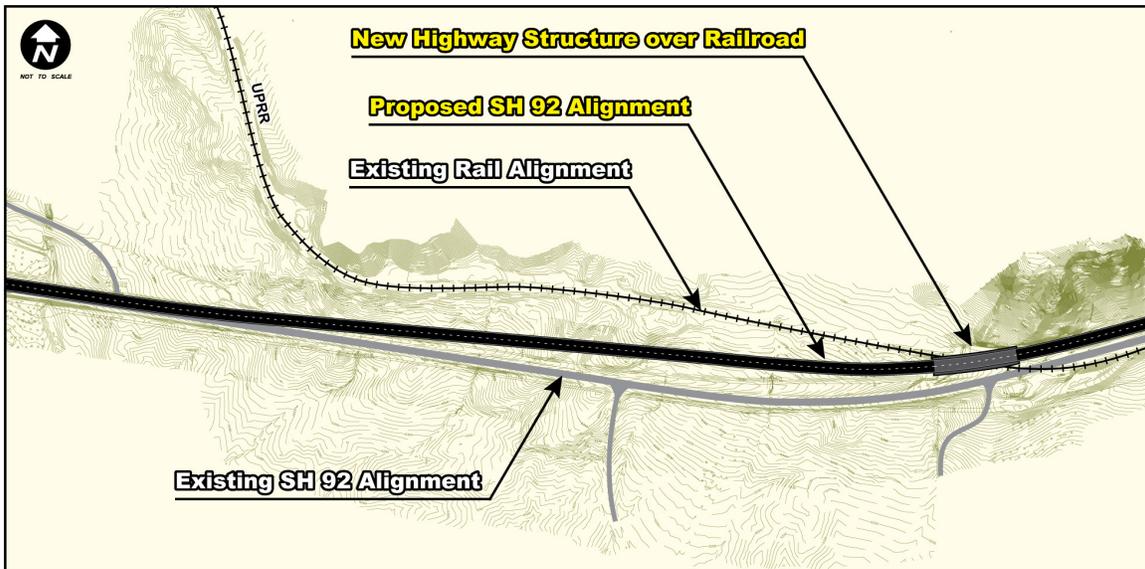


Figure 3. Option 2 – Highway Over Railroad

In the vicinity of its crossing with the railroad, SH 92 will consist of two 12-foot lanes with 8-foot shoulders each side (**Figure 4**). The highway alignment will be adjusted to meet design standards and to reduce, to the greatest extent practicable, the skew at the railroad crossing.

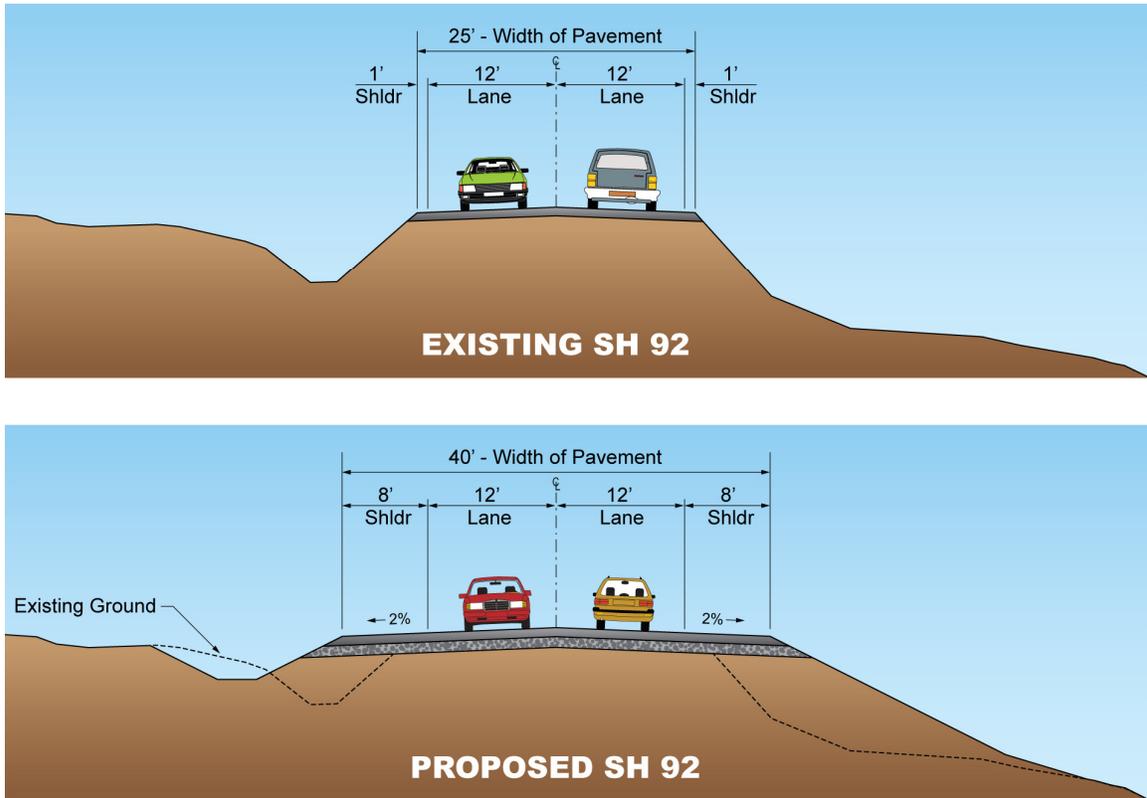


Figure 4. SH 92 Typical Section

Future Track

With respect to the railroad features, the existing railroad consists of a single track with no maintenance road. Recent coordination with Railroad staff has identified a potential requirement to design for a railroad typical section consisting of two tracks (existing plus future) and a maintenance road.

In the development of the crossing options, consideration was given to the feasibility and likelihood of a second track being added at some future date. This review was conducted in response to Section 4.1.3 Future Track, contained in the Railroad guidelines¹. The following items were noted:

- Capacity of the existing rail line has proven sufficient to meet production capacity of the three coal mines being served in the Somerset area. If additional capacity

were needed in the future, options such as adjusting train operations, adding one or more passing sidings or installing a Centralized Traffic Control system may prove to be more cost-effective than continuous double-tracking. Further details on our understanding of the rail line are included in **Attachment A**.

- According to a BLM source, coal reserves at the three mines will be exhausted by year 2020. Long term demands for the existing track are dependent on future exploration and development. Demand for a second track seems unlikely.
- As a matter of practicality, a second track or an additional siding on the current alignment in the vicinity of the grade crossing would be problematic due to terrain and physical constraints. **Attachment B** contains photos and notes that are representative of existing conditions. From these, it can be seen that the area within the project limits is poorly suited for a second track.
- A highway or railroad grade separation structure sized for two tracks would add significant project costs.

In light of these considerations CDOT suggests the prudent course of action is to design for a railroad typical section that would accommodate the existing single track with provisions for a maintenance road.

Assessment of Design Options

As noted above, two options for the new grade separation have been investigated at the concept level. Key features of each option are itemized below.

Option 1 – Railroad over Highway - **Attachment C** provides concept plans in the vicinity of a new underpass structure. For this concept, a single span, welded steel plate through girder bridge is envisioned with a span of 158 feet. Vertical abutments would be employed with retaining walls extending away from the abutments as indicated.

- The railroad would be re-aligned for a distance of approximately 3800 feet.
- Radius of the railroad curve leading into the west end of the bridge would be increased from approximately 625 to 715 feet.
- The crossing location takes advantage of the existing 40-foot vertical differential between railroad and highway profile grades (Refer to Photo 2, Attachment B).
- Walls and abutments would be positioned to meet highway clearance requirements.
- Under Option 1 the railroad alignment would shift south, outside its existing right-of-way onto BLM land managed as a National Conservation Area (NCA). Based on previous discussions with BLM staff, it is believed Congressional approval may be required to allow this type of facility to encroach into the NCA. In the event all required federal approvals are obtained to permit the Railroad's encroachment into the NCA, the Federal Land Policy Management Act (FLPMA) will require the Railroad to lease rather than obtain a ROW grant for the encroachment. Per FLPMA, the lease would be for a term of 30 years with

renewal provisions. Additionally, the lease would require the Railroad to pay annual rents to the BLM.

- The railroad may be eligible as a historic resource. If so, consultation with the State Historic Preservation Office would be required.
- During construction, it would be necessary to temporarily disrupt service on the railroad to make connections with the realigned section of track.
- To facilitate access to the approach on the South side of the railroad alignment near the existing at-grade crossing (Day approach), an at-grade railroad crossing for the approach is the best engineering solution. If that cannot be resolved, the approach road would need to be constructed across the BLM National Conservation Area possibly requiring Congressional approval. Either of these solutions would require additional expense of permitting, annual assessments and insurance be passed on to the land owner.
- Concept-level construction phasing envisioned for Option 1:
 1. Construct structural portion of the railroad overpass
 2. Construct temporary roadway starting from Sulfur Gulch to the existing at-grade crossing along the final roadway alignment.
 3. Construct embankment for the new railroad alignment as it approaches the existing highway.
 4. Build rail bed and rails along the new rail alignment but stopping just short of both connection ends.
 5. Rail movements would be halted for short duration to make connections to new rail alignment on both ends.
 6. Rail traffic would shift to new alignment while new highway construction is completed.

Option 2 – Highway over Railroad - Attachment D provides concept plans at the location where SH 92 would cross over the railroad. In this concept, a pre-cast concrete girder bridge is depicted. Retaining walls would extend away from the abutments, providing lateral clearances from the track centerline, as noted.

- Option 2 conforms with the Railroad’s recommendation to use an overhead structure, minimizing interruptions to rail operations, per Section 4.1 of the Railroad’s guidelines¹.
- The railroad would remain on its current alignment, and within its existing right-of-way and BLM grant.
- The process for new grant of railroad right-of-way with FLPMA requirements from BLM would be avoided. Terms of the existing Railroad right-of-way would remain in place.

- The potential historic issue associated with Option 1 would be minimized or avoided.
- Walls would have 25-foot horizontal clearance from the rail centerline, per Railroad guidelinesⁱ. One bridge column would be set at the minimum 18-foot clearance but would be “heavy construction” to meet Railroad standards for construction inside the 25-foot clearance envelope.
- Construction impacts to the railroad would be fewer compared to an underpass structure, as outlined in Section 4.1 of the Railroad guidelinesⁱ.
- To facilitate access to the Day approach, a drive would need to be constructed up the overpass grade and a landing be developed. However this would not require encroachment on the NCA and would not require an at-grade railroad crossing to access.
- Concept-level construction phasing envisioned for Option 2:
 1. Build concrete highway bridge abutments, piers and extended retaining wing walls.
 2. Construct temporary sacrificial MSE walls along sides of existing highway to allow for grade separation.
 3. Construct Embankment for highway overpass
 4. Coordinate structural overpass construction with rail traffic movements.
 5. Fully complete highway pavement and striping of roadway new alignment.
 6. Move highway traffic to new alignment
 7. Finish embankment fill over sacrificial MSE walls to toe out onto the existing highway alignment.

Cost Comparison – Concept-level project cost estimates have been prepared for each option as follows:

Option 1 – Railroad over Highway	\$11.0 Million
Option 2 - Highway over Railroad	\$ 9.0 Million

Summary of Anticipated Variances

Based on the concept-level study performed to date, and a review of Railroad guidelinesⁱ, anticipated variances for each option have been tabulated in **Table 1**.

Table 1
Anticipated Guideline Variances

Variance	Ref.	Option 1 - Railroad over Highway	Option 2 - Highway Over Railroad
Future track expansion not accommodated	4.1.3	As discussed in text, anticipated future demand and site constraints suggest the need for a second track is unlikely at this location.	As discussed in text, anticipated future demand and site constraints suggest the need for a second track is unlikely at this location.
Non-railroad structures within railroad right-of-way	4.3, 4.7, 5.2.2	N/A	Railroad and highway rights-of-way are generally parallel and overlapping. Highway cannot span railroad right-of-way.
Horizontal clearance to highway pier less than 25 feet	4.3, 5.2.2, 5.5.1, 5.5.2	N/A	In Option 2, one pier would have clearance of 18' from track centerline. Pier would be designed as heavy pier construction under Section 5.5.2 of guidelines.
Skew less than allowable under Section 6.3	6.3	Track and roadway alignments for Option 1 have been optimized in consideration of right-of-way, physical constraints and operations. The resulting skew angle at the crossing is 34 degrees.	N/A

Conclusions

Based on the foregoing, CDOT's preferred solution is Option 2 in which SH 92 would be carried over the existing railroad alignment. CDOT's preference is based on the following:

- Option 2 employs an overhead structure, conforming to Railroad preferences for grade separation projects. This configuration is preferred because it can be constructed with the least interruption to railroad operations.
- Option 2 entails fewer railroad right-of-way concerns. If the railroad remains on its current alignment, then the potential elevated approval process envisioned under Option 1 can be avoided. The Railroad's existing rights/grants would remain intact.
- Option 2 offers better solutions for the Day approach that do not require an at-grade railroad crossing.
- Option 2 raises fewer concerns over the railroad as a historic resource and would avoid associated consultation.
- Option 2 is less costly than Option 1.

We are requesting your consideration and concurrence on this approach to the project.

CDOT is appreciative of Union Pacific Railroad's ongoing interest and communications on this important safety project. We welcome the opportunity to discuss further at your convenience.

ⁱ BNSF Railway & Union Pacific Railroad. *Guidelines for Railroad Grade Separation Projects*, January 2007.

ATTACHMENTS

Attachment A – Rail Line Capacity Assessment

Attachment B – Site Photos

Attachment C – Concept Plans - Option 1

Attachment D – Concept Plans - Option 2

Attachment A – Rail Line Capacity Assessment

Union Pacific North Fork Subdivision (Grand Junction to Hawksnest)

The track between Grand Junction and Hawksnest Colorado is ex Denver & Rio Grande Western, ex Southern Pacific Transportation Company, and is now owned by the Union Pacific Railroad. The line is known as the North Fork Subdivision of the Denver Division. The line is 95.2 miles in length and is single track with passing sidings and is “dark Territory” (no signaling system) which is dispatched utilizing Track Warrant Control (TWC). There are three passing sidings located at a frequency of 20 to 25 miles. The sidings are located at Bridgeport, Milepost 25.5 (6355 feet in length), Roubideau, Milepost 46.4 (7206 feet in length), and Rogers Mesa, Milepost 70.1 (7100 feet in length). The maximum operating speed is 25 mph with segments of 20 mph and 10 mph speed limits. The line is essentially upgrade from Grand Junction to Hawksnest with approximately 1,400-foot difference in elevation. The railroad grade varies with the maximum gradient being between 1% and 2%. A round trip takes approximately 10 hours (if all goes well, but crews do reach their 12-hour limit before getting back to Grand Junction) with 4 hours to the mines, 2 hours for loading, and 4 hours back to Grand Junction. The line serves three coal mines; Bowie #2, Elk Creek, and West Elk.

Since the Union Pacific and Southern Pacific merger in 1996, average daily train counts (empty and loaded trains) have varied from 8 to 12 trains per day. While data from the Railroad website indicates average car loadings of 50 and 60 tons per car, actual, observed train movements currently consist of 100 to 115 cars of at least 100 tons capacity each. For the purpose of this paper, an average of 90 tons of coal per car is assumed. This allows the capacity of the line to be estimated on a somewhat conservative basis.

Given the current annual production capacity for each mine from the Railroad website, 90 tons of coal per car and 100 to 115 car trains, and the loading of coal 7 days per week for 50 weeks per year (350 days per year), the following average daily train counts result:

<u>Consideration</u>	<u>Bowie #2 Mine</u>	<u>Elk Creek Mine</u>	<u>West Elk Mine</u>
Annual Production Capacity (tons)	6,000,000	6,000,000	7,000,000
Cars per Train	100	115	110
Coal Capacity per Train (tons)	9,000	10,350	9,900
Loaded Train Movements/Year	667	580	707
Loaded Train Movements/Day	2	2	2
Total Train Movements/Day	4	4	4

Even if the loading of coal occurred five days per week for 50 weeks per year (250 days per year), the train counts would be 6, 5, and 6 respectively for a total of 17 average train

movements per day. The current capacity of the line is at least 12 train movements per day. The additional 5 trains could be accommodated by either: 1) adjusting train operations, 2) adding one or more new passing sidings, or 3) installing Centralized Traffic Control (CTC) signaling system. These options would be significantly more cost effective than double tracking the line.

Even if the North Fork Subdivision were to be equipped with double track, the Moffat Tunnel route between Grand Junction and Denver likely could not accommodate the additional traffic as it would remain limited to approximately 25 train movements per day due to the existing restrictions in the Moffat Tunnel ventilation system.