ALTERNATIVE 1: RELOCATING I-70 OVER NORFOLK SOUTHERN RAILROAD

Proposed Improvements:

I-70 Mainline:

In order to improve safety and to allow for an increase in the number of eastbound and westbound traffic lanes, HDR investigated the relocation of I-70 approximately 250 feet to the southwest, see **Figure 4**. Relocated I-70 will span over the existing NSRR alignment, providing a minimum 23'-0" of vertical clearance. This alternative requires an extensive amount of MSE walls, or similar earth retention systems, to accommodate the substantial grade raise (50 feet plus) over the existing I-70 alignment. The overall improvements will extend from just east of the Wentzville Parkway interchange to the termini of the eastbound I-64/ Route 40/61 on ramp to eastbound I-70. The westbound off ramp to Wentzville Parkway will be partially reconstructed and the two western ramps of the Route Z interchange will be completely reconstructed. An auxiliary lane will be constructed connecting the Wentzville Parkway and Route Z on and off ramps. The I-70 Bridges (A4320 and A4323) over Route Z will also be widened with an additional lane and new shoulders in each direction to accommodate the new I-70 template. I-70 will be restriped between Route Z and the eastbound I-64/ Route 40/61 on ramp to accommodate the additional lane work. There is existing pavement in place to accommodate the restriping work.

Figure 4 - I-70 Mainline Realignment (Over)

The proposed typical roadway section of I-70 consists of a 12' inside shoulder, 3-12' through lanes, a 12' auxiliary lane between Wentzville Parkway and Route Z, and a 12' outside shoulder. This template is applicable for both the eastbound and westbound directions, see **Figure 5**.

The MSE walls and I-70 bridges over the NSRR will be located to accommodate an additional 12' of horizontal clearance in each direction beyond the roadway template described above. This additional clearance is noted in the I-70 EIS document to account for a possible lane addition in the future. With the expected life span of the new railroad crossing and the close proximity to the I-70/I-64 Interchange, it was prudent to look beyond the typical 30 year design time frame when setting the structure limits. This will allow for construction of a future lane without having to reconstruct MSE walls and allow widening of the proposed bridges over the NSRR and still meet the current minimum vertical clearance requirements.

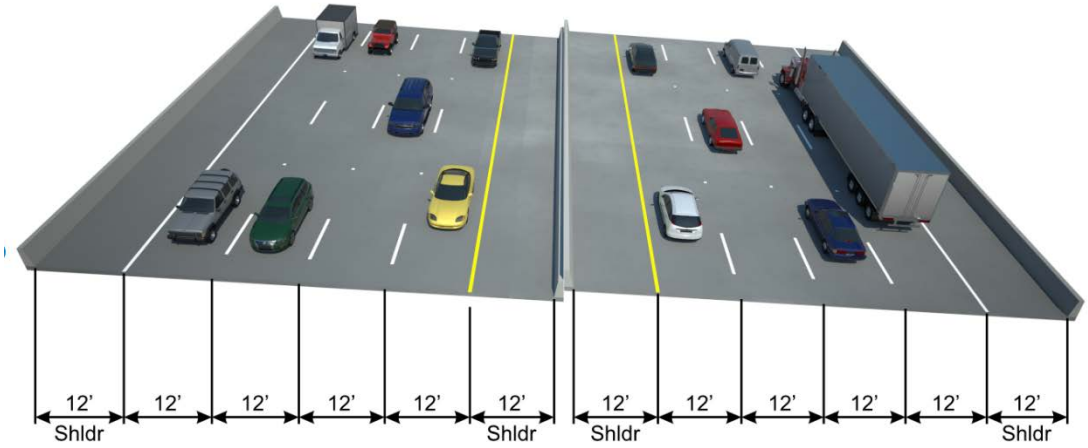


Figure 5 - I-70 Mainline Template

I-70 Mainline Bridges over NSRR:

The center bridge span is set to provide adequate room for a second mainline track at 14 feet spacing, along with 22 and 26 feet clearance (maintenance road) per NSRR guidelines, see **Figures 6 and 7**. This results in a 3 span bridge with a span arrangement of roughly (73'-80'-72'), with the end spans providing for 2:1 spill slopes.

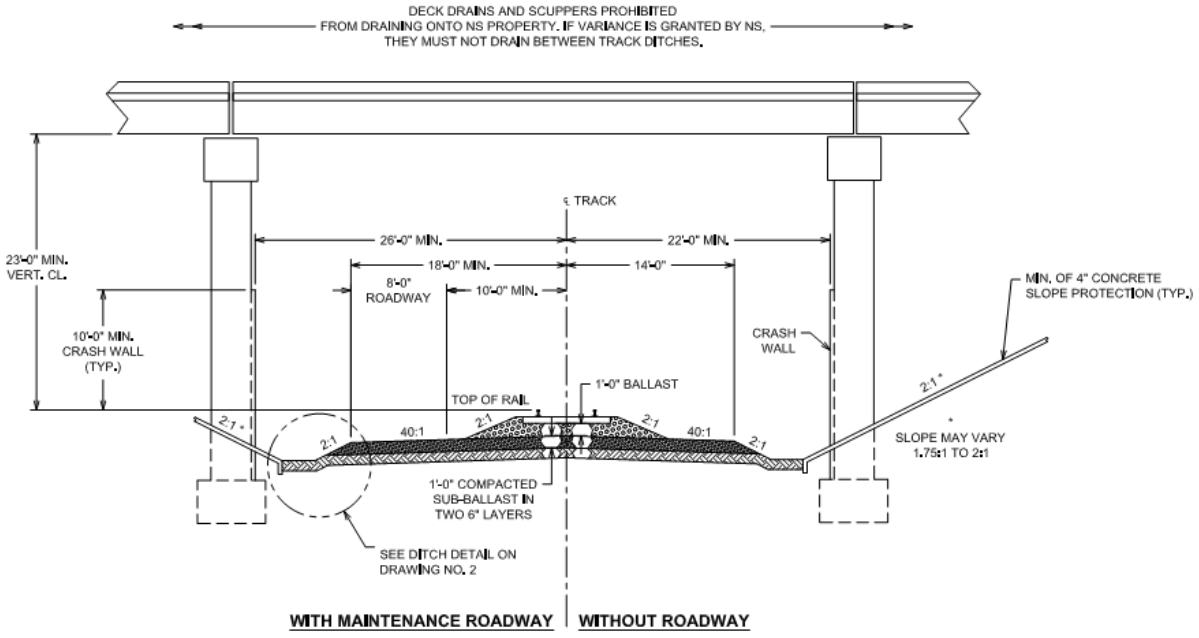


Figure 6 - NSRR Overpass Requirements

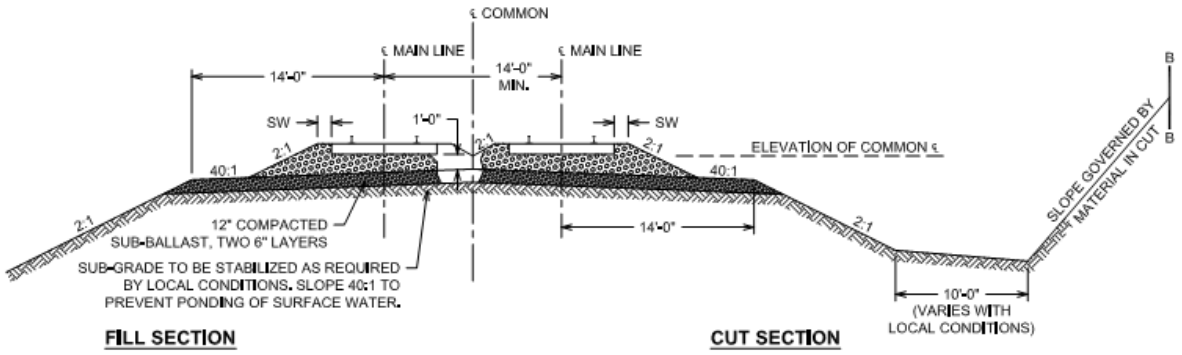


Figure 7 - NSRR Standard Double Track Cross Section

The bridge widths were set to match the roadway and accommodate the following template in each direction, see **Figure 8**:

- 12’ inside shoulder
- 3-12’ through lanes
- 12’ auxiliary lane (required due to steep profile grade)
- 12’ outside shoulder

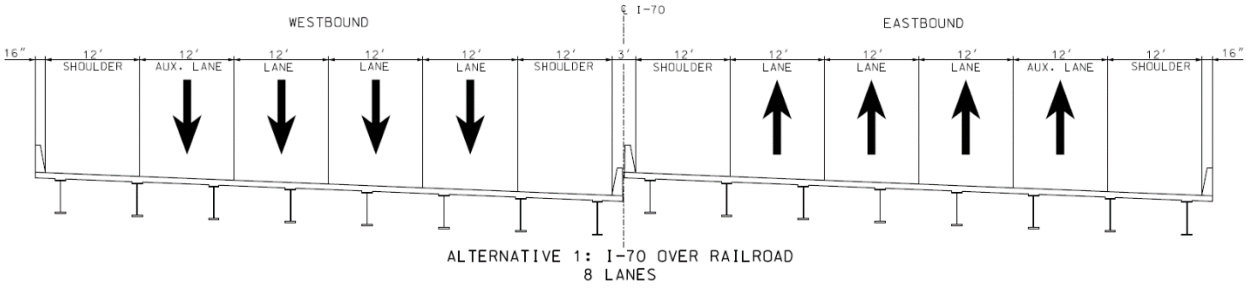


Figure 8 - I-70 Mainline Bridges Typical Section

As previously mentioned, the bridge layout will also accommodate a future widening to accommodate the possible addition of a fourth through lane to the outside and still provide the required 23’-0” minimum vertical clearance over the NSRR alignment at the low side of the superelevated deck. In order to limit the amount of approach fill, the eastbound and westbound lanes will follow offset vertical alignments. As a result of this, along with the wide (84’ clear) nature of both the eastbound and westbound lanes, two independent superstructures will be required.

Due to the combination of the span lengths, skew (approx. 33 degrees LA) and the curved horizontal alignment, curved steel plate girders were the clear choice for superstructure type. The girders will support a full depth 8 ½” thick cast-in-place concrete deck. The superstructure will be supported on cast-in-place open multicolumn intermediate bents founded on drilled shaft foundations with rock sockets and integral end bents founded on steel H-piling driven to rock. For areas where the horizontal clearance is less than 25 feet, the intermediate bents will be protected by crash walls meeting AREMA design requirements.

Per NSRR direction, the new I-70 overhead structure(s) are located a minimum of 60 feet away from west abutment of the existing NSRR bridge to facilitate future craning operations, see **Figure 9**.

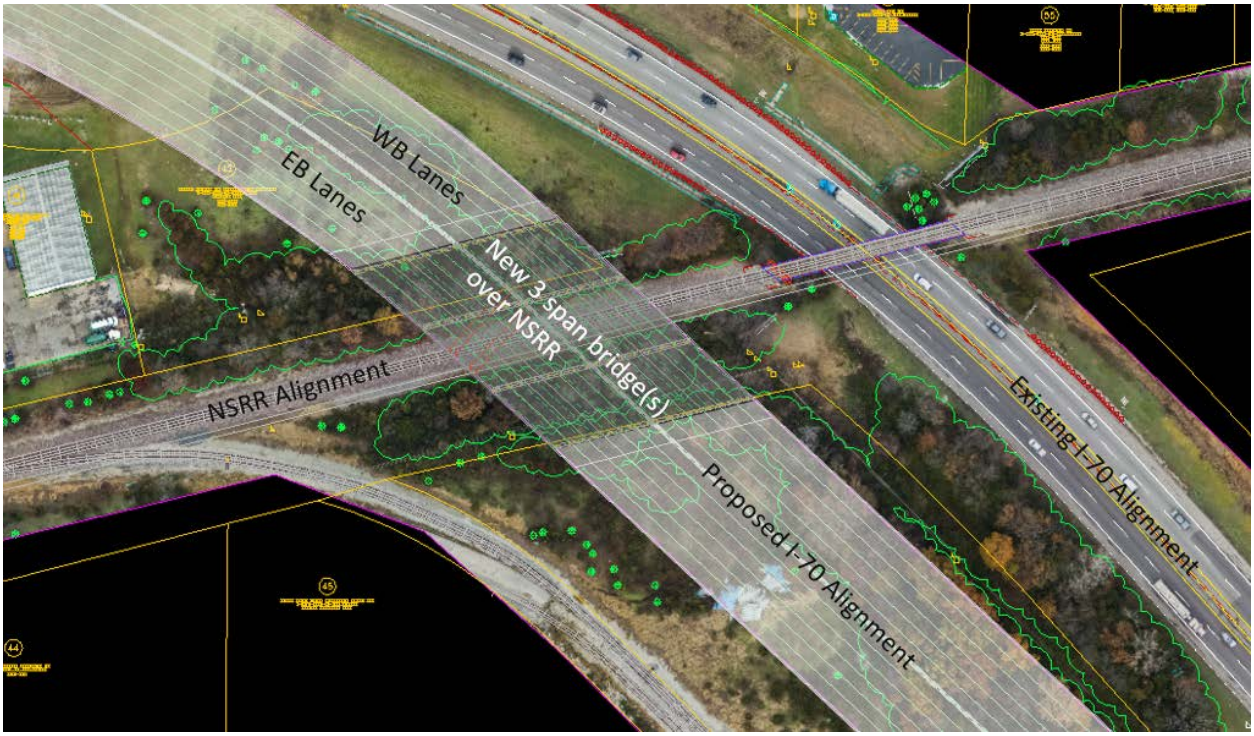


Figure 9 - I-70 Mainline (Realigned) Bridges over NSRR

West Pearce Boulevard:
This option will require the realignment of approximately 2200' of West Pearce Boulevard. The road will be located approximately 24' to the north. Approximately 6 parcels will be affected by this relocation. West Pearce Boulevard will be separated from I-70 by retaining wall or concrete traffic barrier. West Pearce Boulevard will have 2-12' lanes, a 12' center turn lane, and a 2'-6" curb and gutter. There will be 6' sidewalk located on north side of the relocated roadway and West Pearce Boulevard will be signed for 35 mph.

North Outer Road (Future):
The existing NSRR Bridge will be maintained to accommodate a future outer road which can be constructed along the existing I-70 westbound alignment. This north outer road is noted in the original I-70 EA document. This outer road will connect to the south side of existing West Pearce Boulevard, near Patricia Court, and traverse under the existing railroad bridge to the available quadrant near Mar-Le Drive. The exact location as yet to be determined. It is assumed that the outer road will be posted for 35 mph and consist of 2-12' lanes and 2-4' shoulders. Since construction of the north outer road is considered a future project, costs are not included in the project cost estimates.

Staged Construction:
Since the proposed bridges are constructed along a new alignment, staged construction is not required. Traffic will be maintained on the existing I-70 alignment until the new structures and

approaches are ready for traffic. The majority of impacts will be for the tie-ins of relocated I-70 to existing mainline.

Concerns/Benefits:
The following are some concerns and benefits of this option.

Concerns:

- Settlement issues due to extreme fill heights which may increase construction time.
- Significant cost for embankment and MSE walls.
- Site distance concerns on the crest vertical curve for I-70 mainline.
- Long up-grade movements to access I-70 from Route Z interchange.
- Superelevation requires that bridge layout be set up now for future template as widening of the eastbound lanes will result in reduced vertical clearance over NSRR.
- May require the reconstruction of segments of West Pearce Boulevard and Mar-Le Drive to accommodate the full I-70 template.
- Right of way may be required along West Pearce Boulevard and Mar-Le Drive, impacting several commercial businesses

Benefits:

- The new I-70 alignment can be constructed without significant traffic impacts.
- Provides an increase in the horizontal radii of I-70 which improves sight distance.
- Relocated I-70 can be constructed without additional right of way as MoDOT already owns the property along the south side of I-70.
- Interstate bridge over NSRR right of way simplifies RR review and approval process
- An extra lane has been added in the area of the Route 61/I-64 on ramp which will help driver merging.
- Standard construction methods
- Does not require new or temporary NSRR alignments/bridges. Eliminates need to invest limited funds in transportation systems that are owned and maintained by others.

Conceptual Strip Maps and Profiles Sheets for this alternative can be found in Appendix B.

For Typical Sections of Alternate 1 and the Route Z Bridge widening, see Appendix C.

The estimated cost of Alternate 1 is **$58,170,000**. For a detailed breakdown of the anticipated costs see Appendix D.

ALTERNATIVE 2: RELOCATING I-70 UNDER NORFOLK SOUTHERN RAILROAD

Proposed Improvements:

I-70 Mainline:

This option involves relocating the existing I-70 alignment approximately 65’ to the southwest in the vicinity of the NSRR Bridge, see **Figure 10**. This realignment calls for the proposed westbound lanes to occupy the entirety of the existing eastbound and westbound lanes, while the proposed eastbound lanes will be constructed immediately to the southwest. Proper phasing of this construction will allow for the maintenance of two lanes of traffic in each direction throughout construction. This approach is discussed later in more detail. The existing horizontal curves in this corridor of 1926’ and 2491’ will be upgraded to 2090’ and 2580’ respectively. This new geometry allows for additional site distance and requires lower superelevation rates which is beneficial due to the reverse curvature within this corridor. There will be a need to lower the I-70 profile grade through the NSRR crossing approximately four feet to accommodate the wider pavement, required superelevation, and additional structural depth needed for longer bridge spans on the proposed NSRR structure.

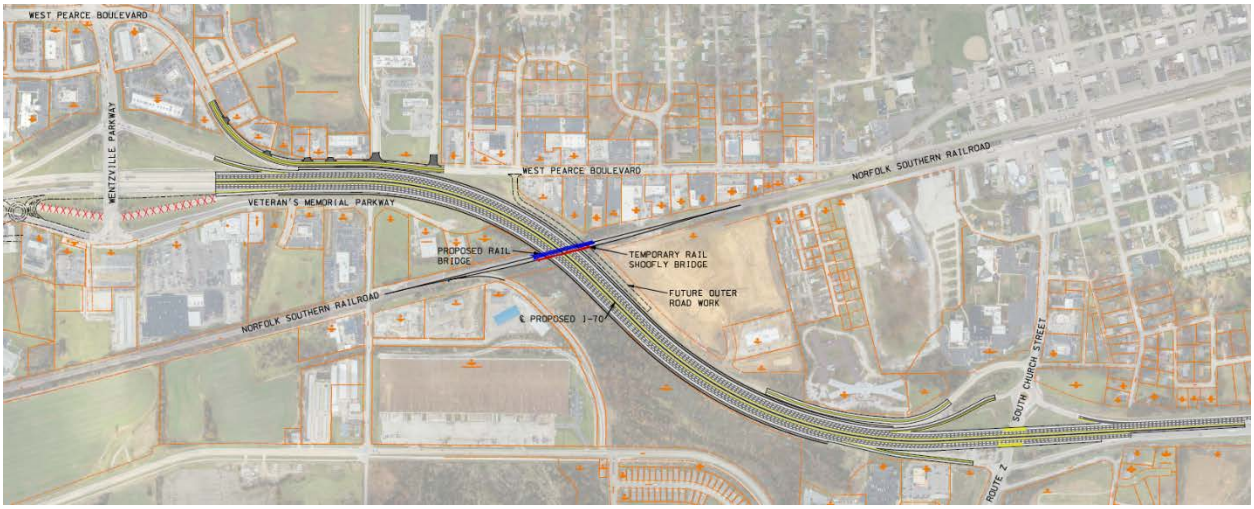


Figure 10 - I-70 Mainline Realignment (Under)

Similar to Alternative 1, the proposed typical section of I-70 will consist of a 12’ inside shoulder, 3-12’ through lanes, a 12’ auxiliary lane between Wentzville Parkway and Route Z, and a 12’ outside shoulder. This template is applicable for both the eastbound and westbound directions, see **Figure 11**.

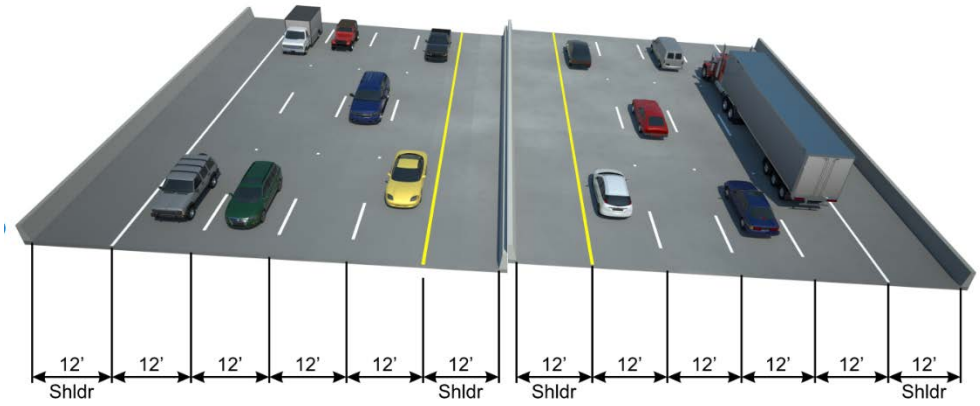


Figure 11 - I-70 Mainline Template

The overall improvements will extend from just east of the Wentzville Parkway interchange to the termini of the eastbound I-64/ Route 40/61 on ramp to eastbound I-70. The westbound off ramp to Wentzville Parkway will be partially reconstructed and the two western ramps of the Route Z interchange will be completely reconstructed. The auxiliary lane will be extended to connect to the new EB on-ramp from Wentzville Parkway that is being constructed within a separate project. The existing I-70 bridges over Route Z will be widened with an additional lane and new full 12' shoulders added in both directions. I-70 will be restriped between Route Z and the southbound Route 61 on ramp to accommodate the additional lane work.

The reconstructed NSRR Bridge will accommodate a future north outer road extension, as well as the main spans have an additional 12' of horizontal clearance in each direction beyond the roadway template described above. This additional clearance will account for a possible lane addition in the future. With the expected life span of the new NSRR Bridge and the close proximity to the I-70/I-64 Interchange, it was prudent to look well beyond the typical 30 year design time frame when setting the bridge opening. This will allow for construction of a future lane beneath the NSRR Bridge and will require limited interaction with NSRR.

<u>Norfolk Southern Bridge over I-70 Mainline:</u>
The project will involve the replacement of the existing 4 span NSRR Bridge with a new 4 span structure (see **Figure 12**) to accommodate the widening of I-70. The proposed bridge layout will be developed to span the roadway urban template depicted in the I-70 EIS as set for Section of Independent Utility (SIU) No. 7. This template accommodates 4-12' traffic lanes with 12' inside and outside shoulders and an additional 12' clearance, in each direction.

Replacement of the existing NSRR Bridge will require construction of a temporary shoofly and railroad bridge (see **Figures 13 and 14**) south of the existing railroad alignment. This portion of the NSRR track serves as the mainline connection to downtown St. Louis and more locally services the GM auto plant in Wentzville and must remain operational at all times. NSRR has noted that this location has up to 15 trains per day that operate on a 24 hours schedule, 7 days a week. Limited 4 hour closure windows will be allowed for the tie-ins of the temporary shoofly to the existing track. NSRR is requiring that this temporary shoofly be designed for train operating speeds of 60 mph. Approximately 2400' of track, centered about the existing NSRR Bridge, will be required to maintain a 60 mph operating speed. One track switch will be required along the temporary track, approximately 700' south of the existing NSRR Bridge.

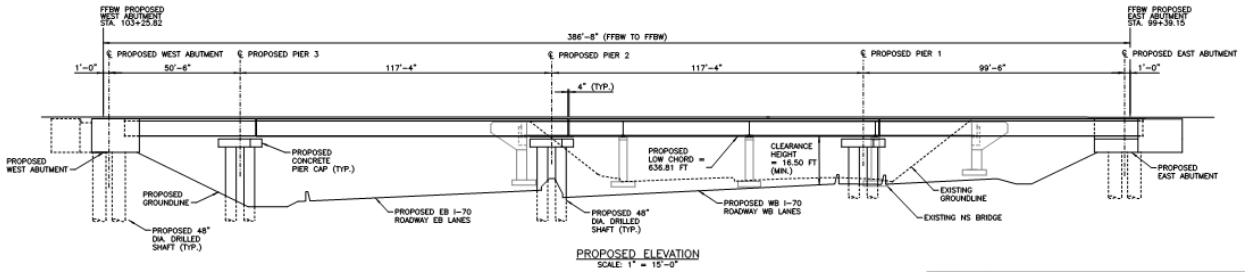


Figure 12 - Proposed 4 Span NSRR Bridge

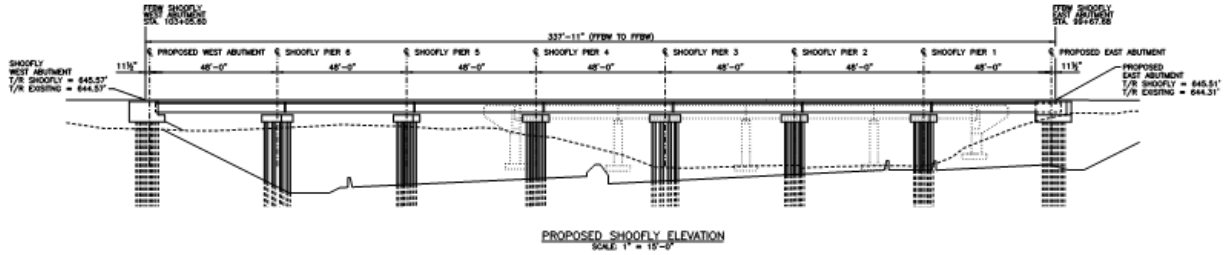


Figure 13 - Proposed 7 Span Temporary Shoofly Bridge

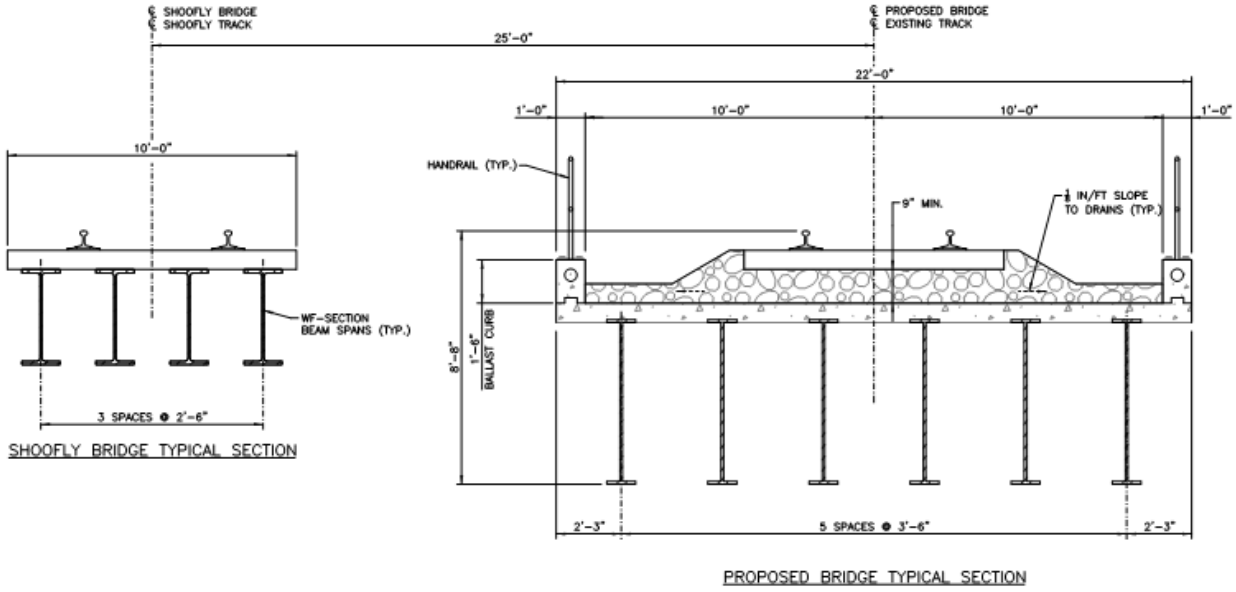
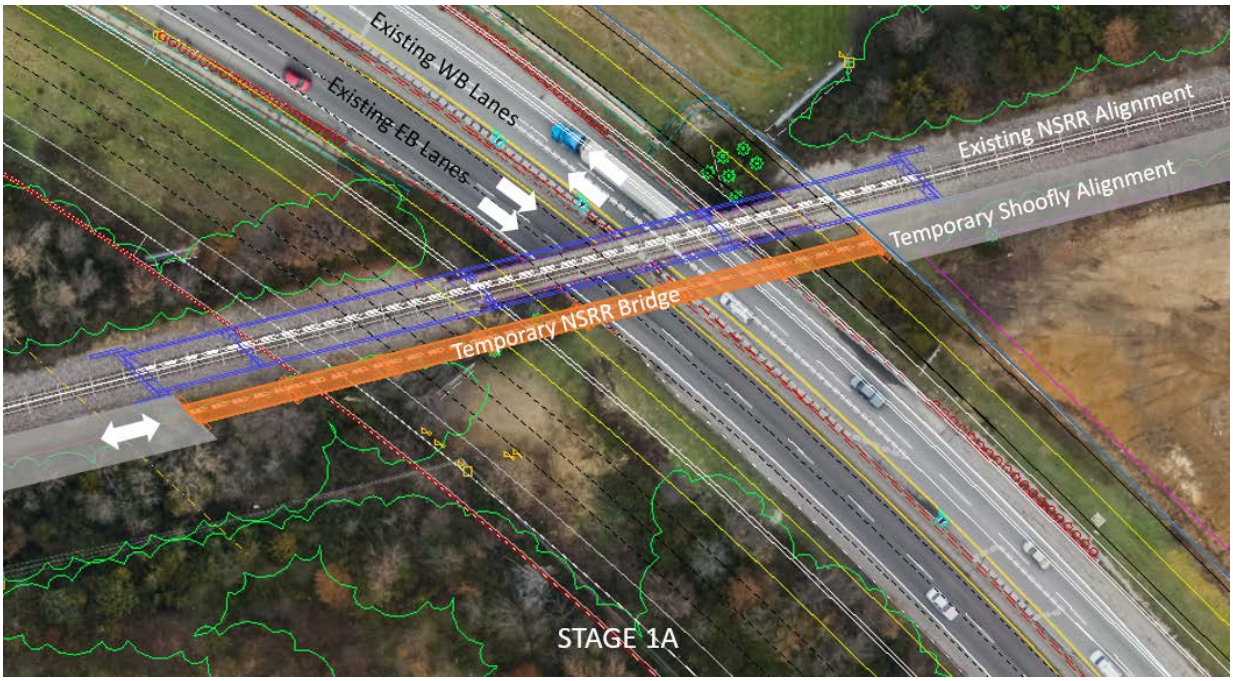


Figure 14 – Typical Section thru RR Bridge and Shoofly

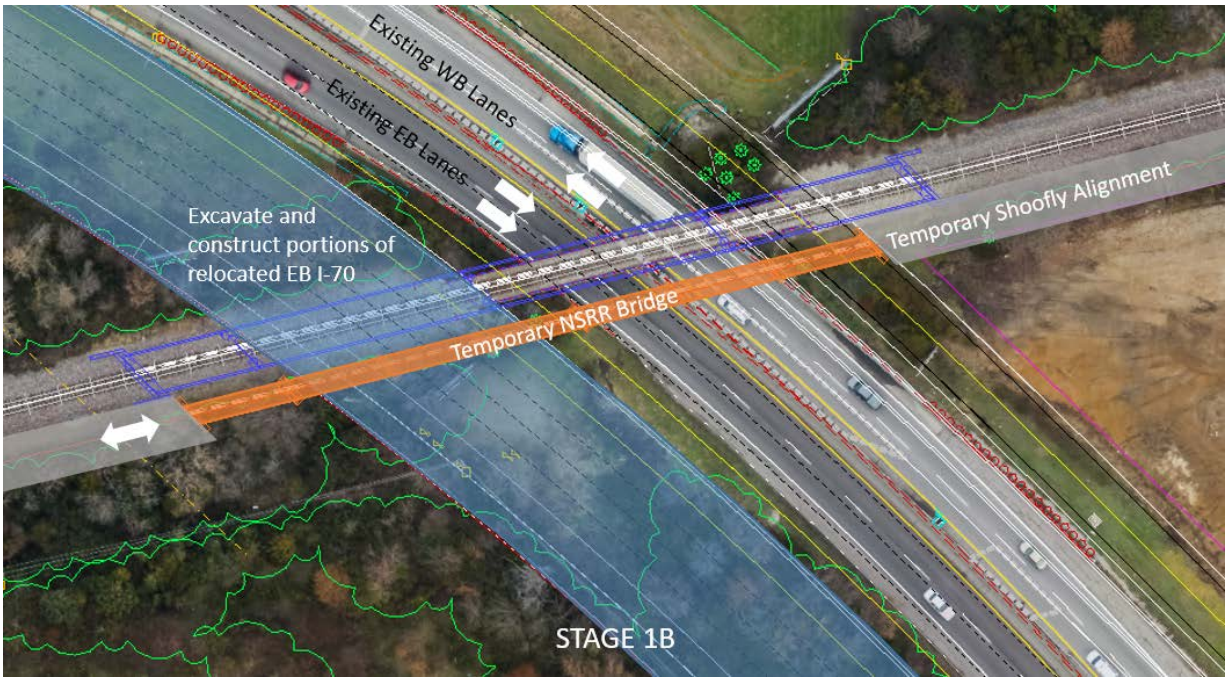
Construction Staging:

The basic premise for this I-70 relocation option is to maintain two lanes of eastbound and westbound I-70 traffic at all times during construction (with the exception of potential short term overnight or weekend lane closures) and utilize a temporary shoofly track alignment with a temporary rail bridge over I-70 to maintain rail traffic. The following is a brief description of the proposed traffic/train staging plan:

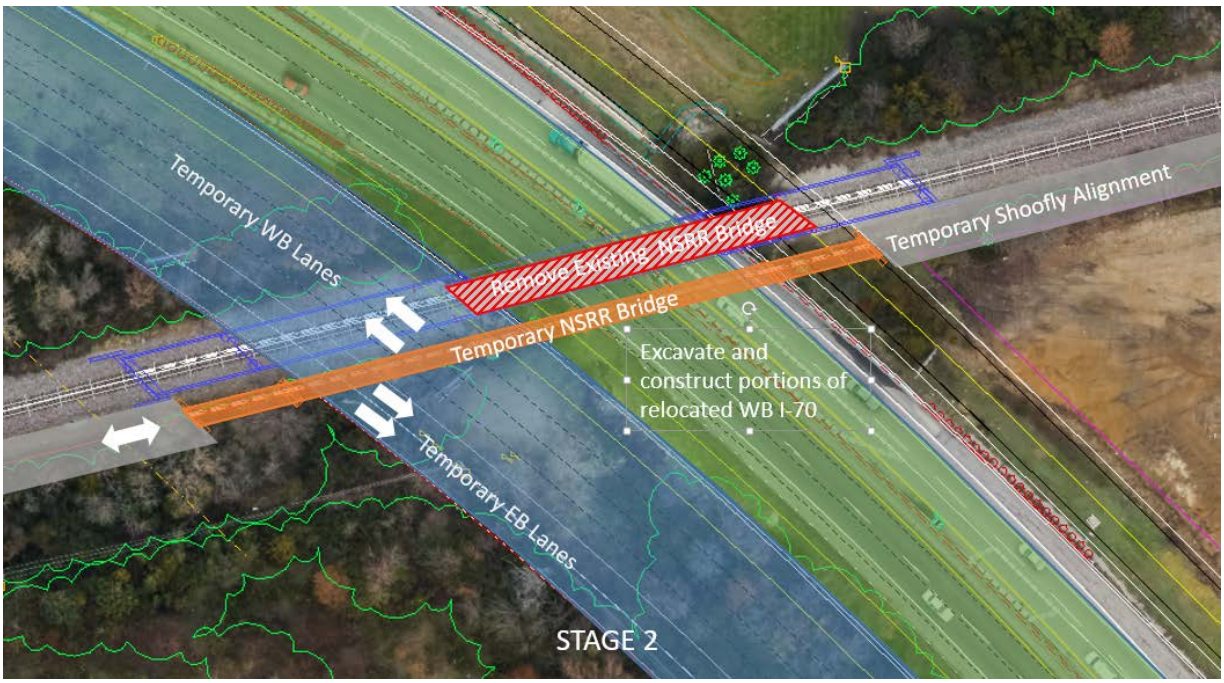
Stage 1A: Construct the temporary railroad shoofly alignment and bridge 25 feet south of the current NSRR tracks. The temporary bridge will be at approximately the same grade as the existing structure and will consist of seven spans, which will accommodate both the existing I-70 and temporary roadway alignments. This bridge layout will require a temporary support be constructed between the existing concrete traffic barriers along the median of existing I-70. Construction of this median support will require that this work be completed at night, with a single lane closure in either direction. Discussions with local MoDOT staff have found this approach to be acceptable. Upon completion of the temporary shoofly and bridge, NSRR rail traffic will be shifted to the temporary railroad alignment.



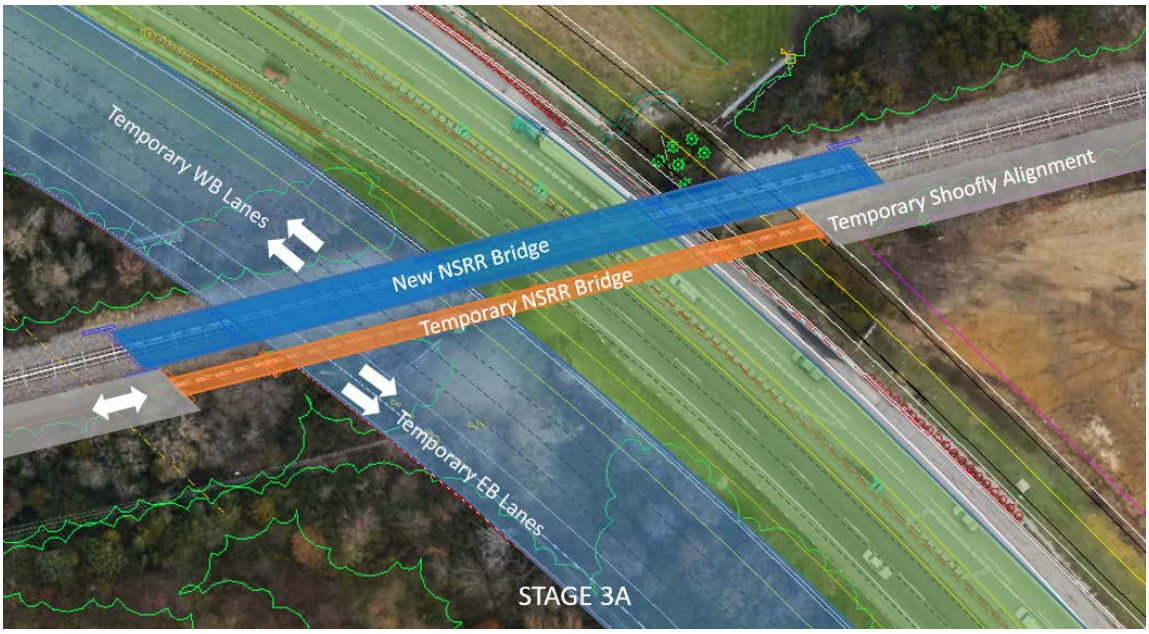
Stage 1B: The proposed eastbound lanes of relocated I-70 will be fully excavated, to include the west embankment of the NSRR alignment. Usable portions of these lanes, at the contactor's option, will be paved such that two temporary lanes in each direction can be maintained during the next construction stage. Due to the span arrangement of the temporary bridge, some of the proposed lanes will not be fully paved as their locations are occupied by temporary railroad piers.



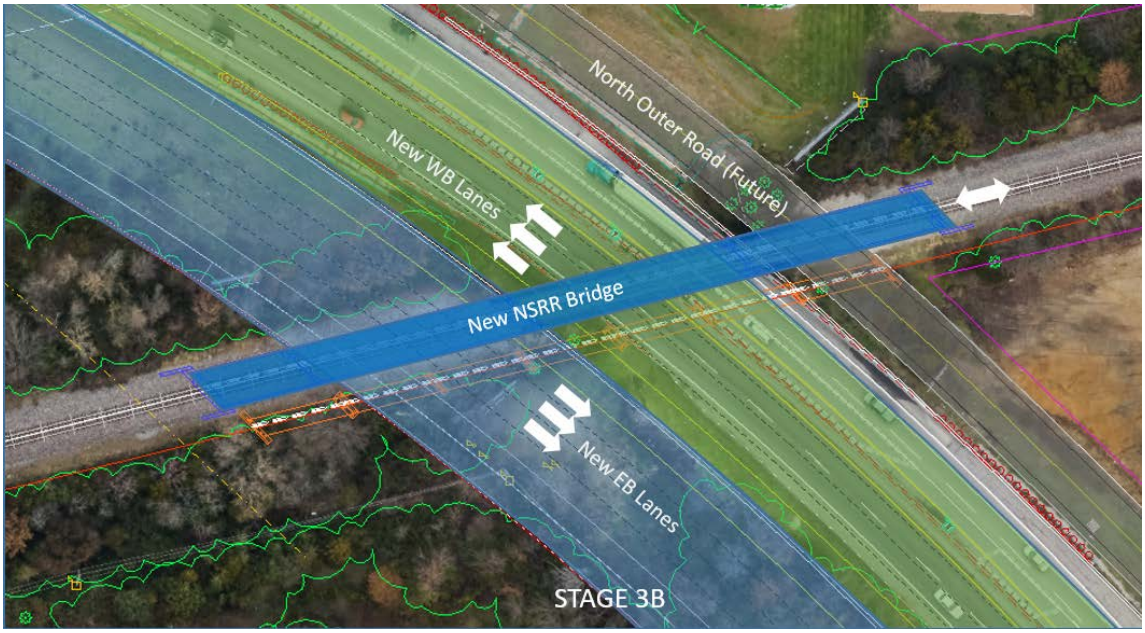
Stage 2: All eastbound and westbound traffic from existing I-70 will be shifted to the temporary portion of the proposed eastbound lanes of relocated I-70. Once traffic has been relocated, the existing NSRR Bridge will be removed and the proposed westbound lanes of relocated I-70 will be fully excavated. Similar to the proposed eastbound lanes, all westbound lanes not impacted by the temporary bridge pier locations will be constructed.



Stage 3A: Construct the proposed NSRR Bridge along the existing NSRR alignment and transfer rail traffic back to the existing alignment. This allows removal of the temporary shoofly alignment, temporary bridge, and construction of the remaining portions of relocated westbound I-70.



Stage 3B: Westbound I-70 traffic will be shifted to the newly constructed westbound lanes of relocated I-70 and the remaining pavement will be constructed as required for the eastbound lanes which were left vacant by the temporary supports of the railroad bridge. Once completed, eastbound I-70 traffic will be relocated into their final locations. The NSRR Bridge has been sized to accommodate a future North Outer Road which will be constructed at a later time as part of another project.



West Pearce Boulevard:
This option will require the realignment of approximately 2200' of West Pearce Boulevard. The road will be located approximately 24' to the north. Approximately 6 parcels will be affected by this relocation. West Pearce Boulevard will be separated from I-70 by retaining wall or concrete traffic barrier. West Pearce Boulevard will have 2-12' lanes, a 12' center turn lane, and a 2'-6" curb and gutter. There will be a 6' sidewalk located on north side of the relocated roadway and West Pearce Boulevard will be signed for 35 mph.

North Outer Road (Future):
The proposed NSRR Bridge will include an additional span such that a future outer road can be constructed along the north side of I-70. This outer road will connect to the south side of existing West Pearce Boulevard, near Patricia Court, and traverse under the new railroad bridge to the available quadrant near Mar-Le Drive. The exact location as yet to be determined. It is assumed that the outer road will be posted for 35 mph and consist of 2-12' lanes and 2-4' shoulders.

Concerns/Benefits:
The following are some concerns and benefits of this option.

Concerns:

- Additional costs related to temporary railroad bridge and track.
- Significant cost for the new NSRR Bridge.
- Additional coordination and approvals from NSRR.
- May require the reconstruction of segments of West Pierce Drive and Mar-Le Drive to accommodate full I-70 template, similar to Alternate 1.
- Right of way may be required along West Pearce Boulevard and Mar-Le Drive, impacting several commercial businesses, similar to Alternate 1.
- Significant bridge construction requires longer construction duration.
- Proposed grade for EB off ramp to Route Z matches the existing grade of 6.75%.

Benefits:

- Acceptable roadway grades and no significant fills or retaining walls.
- The new I-70 alignment and RR Bridge can be constructed without significant traffic impacts, similar to Alternate 1.
- Provides an increase in the horizontal radii of I-70 which improves sight distance, similar to Alternate 1.
- Relocated I-70 can be constructed without additional right of way as MoDOT already owns the property along the south side of I-70, similar to Alternate 1.
- Additional span length in the eastern most span of the NSRR Bridge provides space for a future outer road system which increases local mobility.
- An extra lane has been added in the area of the Route 61/I-64 on ramp which will help driver merging, similar to Alternate 1.

Conceptual Strip Maps and Profiles Sheets for Alternate 2 can be found in Appendix B.

For details of the NSRR Bridge along with Typical Sections of the Route Z Bridge widening, see Appendix C Bridge Details.

The estimated cost of Alternate 2 is **$35,881,000**; of this amount approximately **$8,850,000** is associated with NSRR costs. For a detailed breakdown of the anticipated costs see Appendix D. *The estimate assumes overbuild of the NSRR substructure elements ($450,000) to accommodate the future construction of a second mainline track by others. This additional work may or may not be included in the final project, pending coordination and agreements with NSRR.*

ALTERNATE 3: RELOCATING EASTBOUND I-70 OVER NORFOLK SOUTHERN RAILROAD

This option consists of a hybrid of the previous two alternates, in that it would involve relocating eastbound I-70 to the southwest and over the NSRR alignment. The westbound lanes will remain along the existing I-70 alignment and lowered to provide adequate vertical clearance beneath a new NSRR railroad bridge. The option will consist of three 12' through lanes, an auxiliary lane between Wentzville Parkway and Route Z, and 12' inside and outside shoulders. Similar to Alternate 1, this option will require an extensive amount of MSE walls or similar earth retention systems to accommodate the required grade raise. The overall improvements will extend from just east of the Wentzville Parkway interchange to the termini of the eastbound I-64/ Route 40/61 on ramp to eastbound I-70. The westbound off ramp to Wentzville Parkway and westbound on ramp from Route Z will be used in place. The eastbound off ramp to Route Z will be completely reconstructed. Auxiliary lanes will be constructed between Wentzville Parkway and Route Z to connect the on and off ramps. The existing I-70 bridges over Route Z will be widened to include an additional lane and new full 12' shoulders in both directions. I-70 will be restriped between Route Z and the southbound Route 61 on ramp to accommodate the additional lane work.

Construction Staging:

The benefit of this option is that relocated eastbound I-70 can be constructed with minimal interference to existing I-70 traffic operations. Majority of impacts will be for the tie in of relocated pavement to existing I-70. Staged construction will still be required for NSRR in order to construct the temporary and permanent railroad bridges over the remaining I-70 westbound lanes.

Concerns/Benefits:

The main issue with a hybrid approach is that it combines all of the concerns and limited benefits of the previous two alternatives into a single project. The concerns regarding settlement of extreme fills, embankment costs, site distance, cost of temporary railroad infrastructure, and a temporary and permanent railroad bridge spanning I-70 will overwhelm the collective benefits of the previous alternatives.

Due to the combined concerns related to the hybrid alternative, it was dismissed from further consideration.