APPENDIX A6

2021 BRIDGE TYPE SELECTION REPORT UNION PACIFIC RAILROAD (UPRR) INDUSTRY LEAD CROSSING

Bridge Type Selection Report (BTSR) Union Pacific Railroad (UPRR) Industry Lead Crossing

OC Loop Segments O, P & Q

County of Orange, California

Prepared for:

ORANGE COUNTY OC Public Works

601 N. Ross St.
Santa Ana, CA 92701

Prepared by:

Contact Person: Bruce Schmith, PE

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UPRR Industry Lead over Coyote Creek (looking upstream from downstream of bridge)

1. Introduction

A gap in the 66-mile regional bikeway corridor, the OC Loop, is along the length of the Coyote Creek flood control channel, upstream and downstream of the Santa Ana Freeway (I-5). This gap is designated as segments O, P, and Q. The OC Loop Segments OPQ (proposed project) begins at the existing Coyote Creek Bikeway in the City of Cerritos where the flood channel divides into north and east forks, running 2.7 miles connecting to another portion of the Coyote Creek Bikeway at La Mirada Blvd./Malvern Ave. in the cities of Buena Park and La Mirada. The Los Angeles County Flood Control District (LACFD) owns the majority of the property required for this project. See Figures 1 and 2 below for Vicinity Map as well as the OC Loop overview & Gap Segment Map.

The project contains three railroad crossing sites, two of which require grade separated crossings that are key elements to the project and necessary for the bikeway to traverse existing railroad corridors. The UPRR Industry Lead crossing will be addressed in this Report.

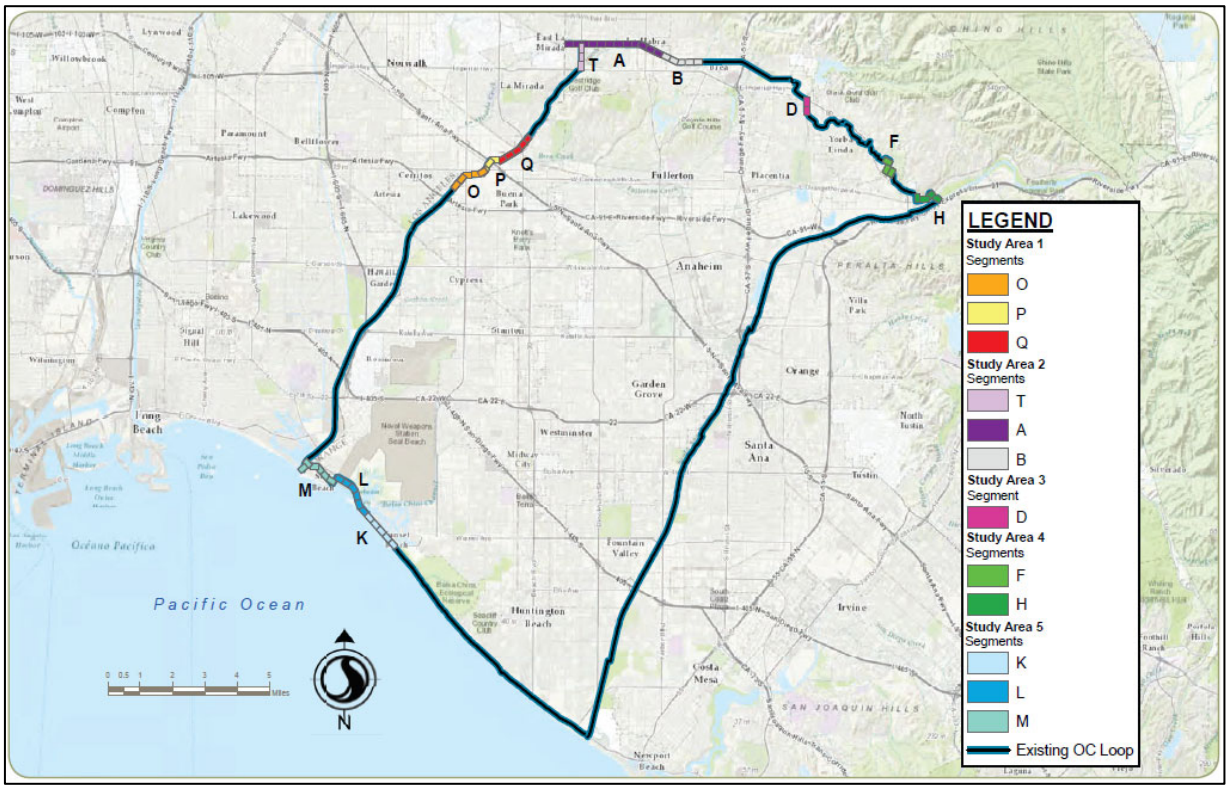
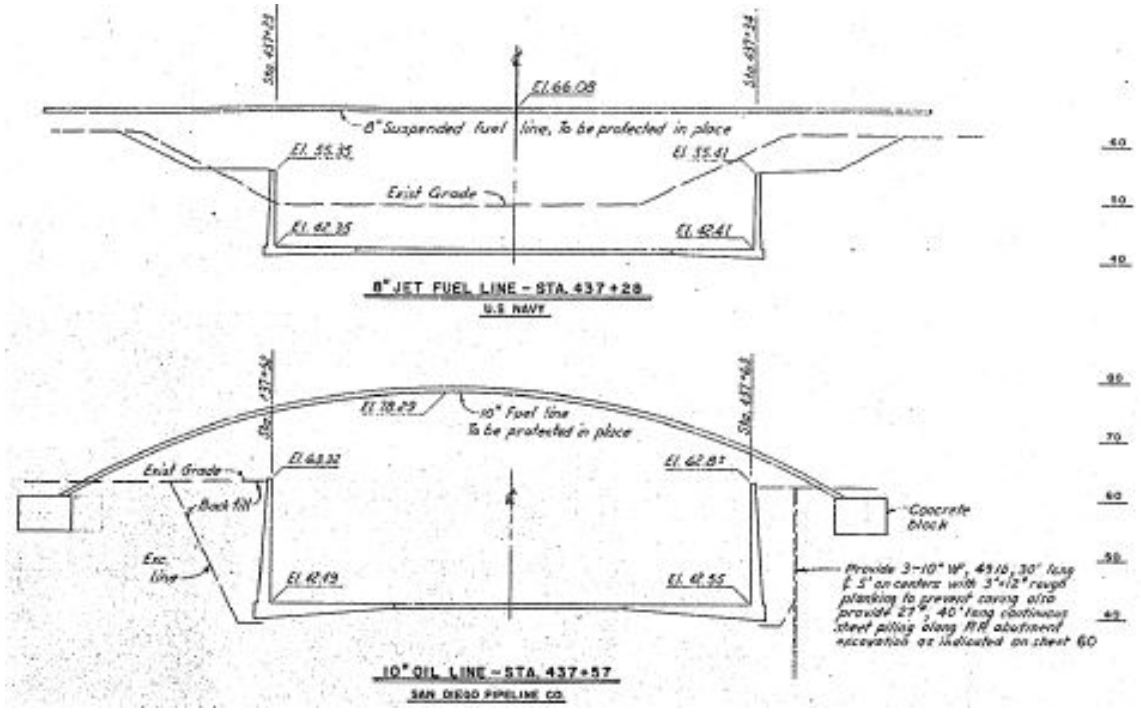


Figure 1 Vicinity Map

Figure 2 Project Location Map – OC Loop Segments O, P & Q

2. Existing Conditions

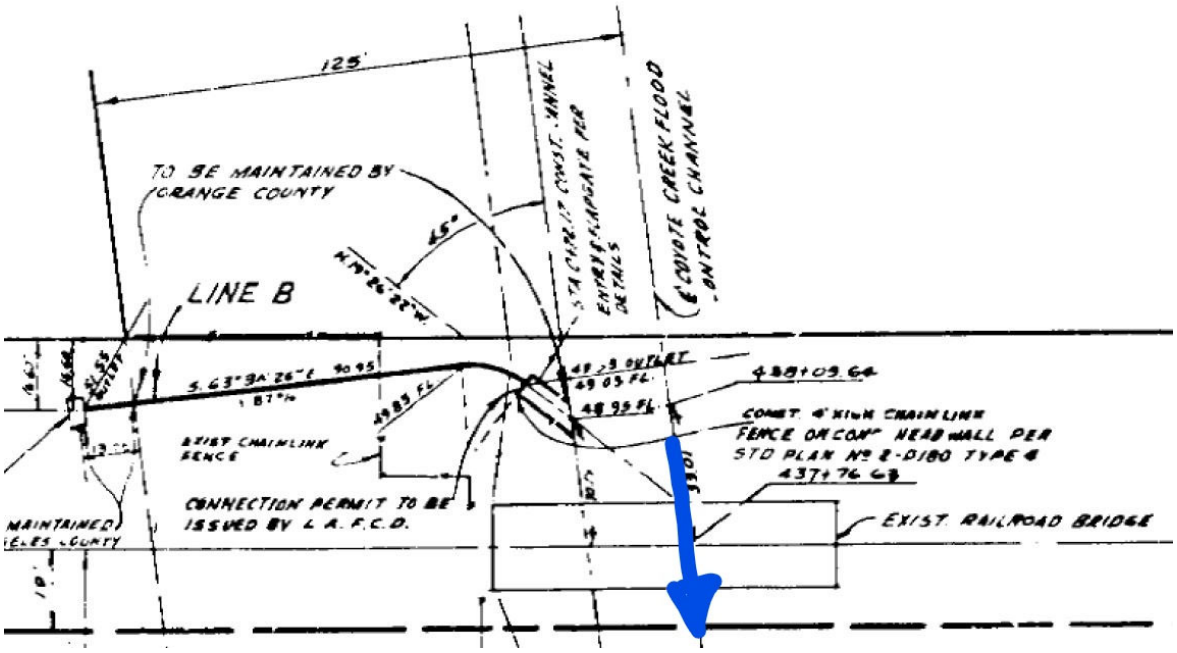
A grade-separated crossing of the single UPRR Industry Lead track is proposed within Segment P, upstream from the Artesia Blvd. Undercrossing and downstream from where Coyote Creek crosses under the I-5 Freeway (see Figure 2). Several major utility and storm drain lines run parallel to the railroad and perpendicular to the proposed bikeway crossing. Downstream from the railroad bridge are an abandoned 10” Kinder-Morgan fuel pipeline and an abandoned 8” Navy jet fuel line. The abandoned Kinder-Morgan pipeline is the arched pipe in the background in the picture at right and the abandoned Navy jet fuel line is in the forefront and is suspended from above by a cable & harness system between two towers on either side of the channel.

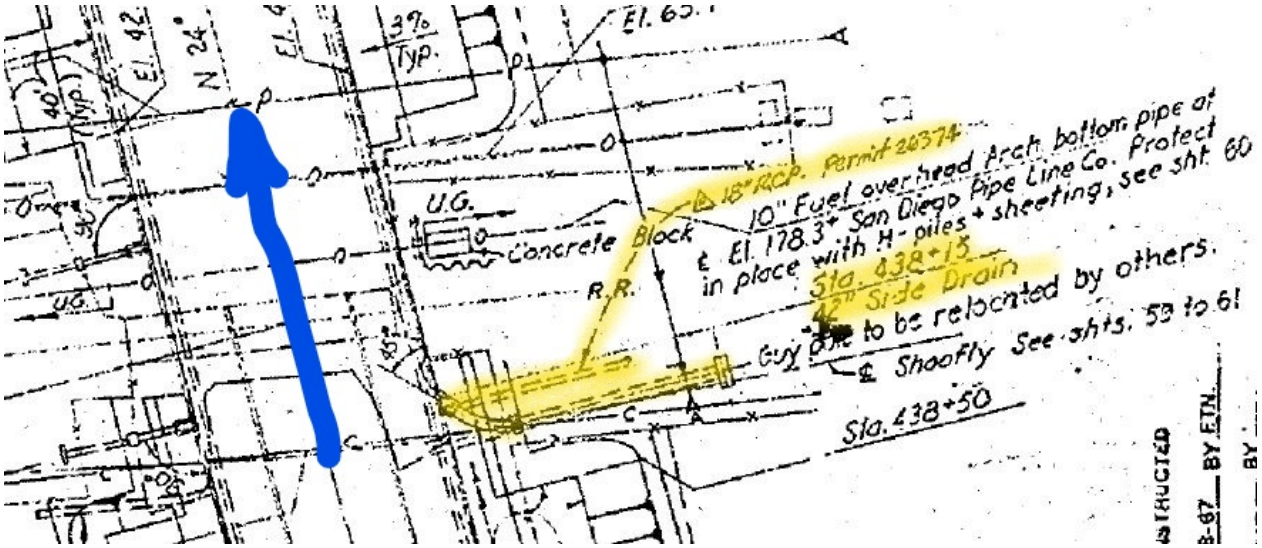


The cross sections of these two pipeline crossings above are from the original Coyote Creek Channel construction plans and are looking downstream so the proposed bikeway crossing is on the right side of the sections. As shown in the sections, the abandoned Navy jet fuel line does not pose a conflict for an undercrossing of the UPRR. However, the abandoned Kinder-Morgan fuel line may have some shoring left in place and, depending on the depth of the concrete block and the angle and depth at which the existing pipeline dips below grade and then turns north along the railroad corridor, there could be a conflict with a proposed undercrossing option.

Within the railroad bridge over Coyote Creek, there are Sprint transcontinental fiber optic lines in 2 – 4” steel conduits on the downstream side of the bridge and, along the upstream side of the bridge, is a CenturyLink communications line and a 16” Kinder-Morgan fuel line. The 16” Kinder-Morgan fuel pipeline appears to have replaced the abandoned 10” pipeline, discussed previously, downstream from the bridge. The picture at right is looking downstream from the upstream side of the UPRR bridge over Coyote Creek and shows the communication line in a steel conduit at the track level and the 16” Kinder-Morgan fuel line below the communications line and supported on the pier.

Immediately upstream from the bridge is an existing 42” RCP storm drain that outfalls into the side of the channel wall (see center left in picture at right). This existing 42” RCP runs parallel to and along the east side of the track and drains the railroad corridor and a tributary area to the north (see “Line B” in the detail below). Additionally, an 18” RCP storm drain was connected to the 42” storm drain when the Coyote Creek Channel was constructed (see detail on next page). These storm drains are in conflict with an undercrossing option and will require relocating (as discussed in the next section).





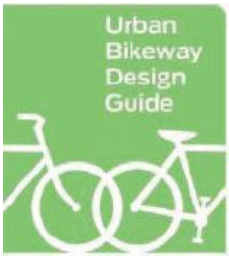
Existing 42" & 18" RCP storm drains outfalling on upstream side of UPRR Bridge

Finally, if an overcrossing is selected, then an existing SCE power line that runs along the R/W then crosses the channel just downstream from the UP tracks will most likely be in conflict. The power line crossing the channel from the 3rd pole from the left in the pic at right will require either lowering or raising to maintain clearance. Another option could be to shift the SCE power line crossing of the channel further downstream to, for example, the first pole from the left in the pic at right, where the overcrossing profile is lower thus eliminating the conflict.

3. Design Criteria

Grade separation design adheres to the latest edition of the following guidelines:

- OC Loop Gap Feasibility Study;
- Caltrans Highway Design Manual (HDM), specifically, Chapter 1000 Bicycle Transportation Design;
- National Association of City Transportation Officials (NACTO): Urban Bikeway Design Guide;
- American Railway Engineering and Maintenance-of-Way Association (AREMA) manual;
- Union Pacific Railroad - BNSF Railway Guidelines for Railroad Grade Separation Projects; and
- Manual of Uniform Traffic Control Devices (MUTCD).



4. Alternatives Considered

An initial meeting with UP representatives indicated an at-grade crossing of this Industry Lead track is not feasible. Overcrossing and undercrossing options were requested by UP representatives. See Appendix A for a plan & profile of each alternative and typical sections for the undercrossing option.

Overcrossing of UPRR Industry Lead

Appendix A shows the plan & profile for crossing over the entire UPRR right-of-way using a prefab steel truss bridge over the track, a similar bridge to the one proposed at the crossing of the North Fork Coyote Creek (Bridge #1), maintaining a railroad minimum required vertical clearance of 23' - 4". While on the downstream side an acceptable grade of 4.9% can be achieved between the undercrossing at Artesia Blvd. and the UPRR overcrossing, on the upstream side, an unacceptable grade of 9.74% would be required so the bikeway can meet the undercrossing of S. Firestone Blvd. and I-5. Therefore, to meet a 5% maximum design grade, a switchback is required as shown on the plans in Appendix A. Temporary Construction Easement (TCE) is required upstream from the tracks (in a currently vacant lot owned by Caltrans) for purposes of erecting the steel prefab truss sections and for staging the crane to set the bridge. See the plans for exact location of this TCEs.

Undercrossing of UPRR Industry Lead

The UP - BNSF Guidelines for Railroad Grade Separation Projects allows a trail underpass, or undercrossing, per Section 7.3.2. Two options for undercrossing the Industry Lead track are feasible, either "open-cut" or jacking a box ("box-jack") under the width of the railroad right-of-way.

Undercrossing by Open Cut

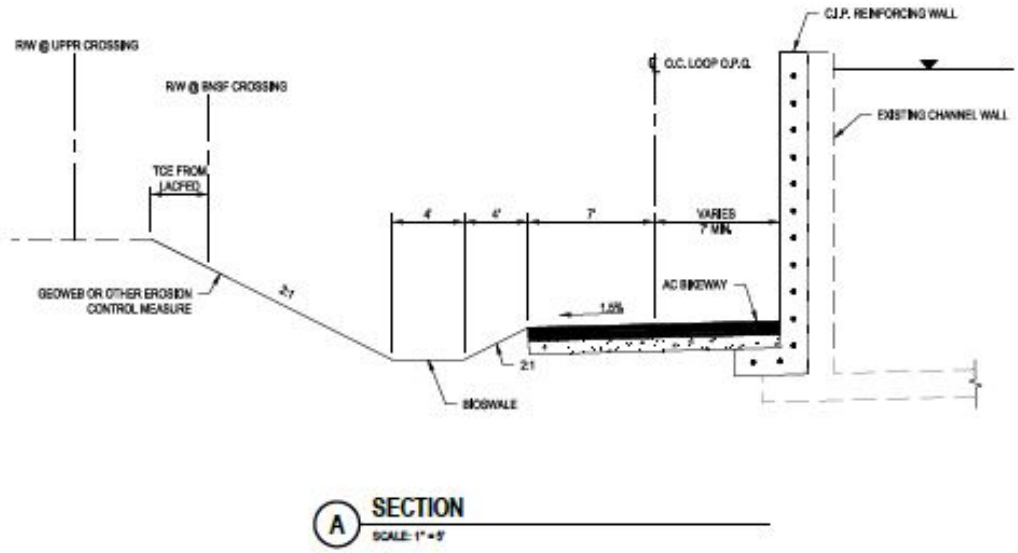
Open cut would involve removing a section of existing track; excavating, installing a reinforced concrete box (RCB) culvert and backfilling; then replacing the section of track. This construction could be accomplished either by temporarily shutting down the track for at least one or two weekends or a shoofly track to maintain continuous uninterrupted service. Also, it would require supporting the existing utility lines through the open trench during the work. This option is not discussed further for the following reasons:

- Difficulty in obtaining approval from UP for track closures and shutdowns;
- Prohibitive cost of having to construct a shoofly which would also require a temporary shoofly bridge;
- Risk and difficulty with maintaining the active 16" Kinder-Morgan fuel pipeline (along the upstream side of the bridge) over the open cut trench during construction; and
- The overall cost for construction including railroad and utility costs and, especially, if a shoo-fly is required, appears to make this option infeasible at this location.

Undercrossing by Box-Jack

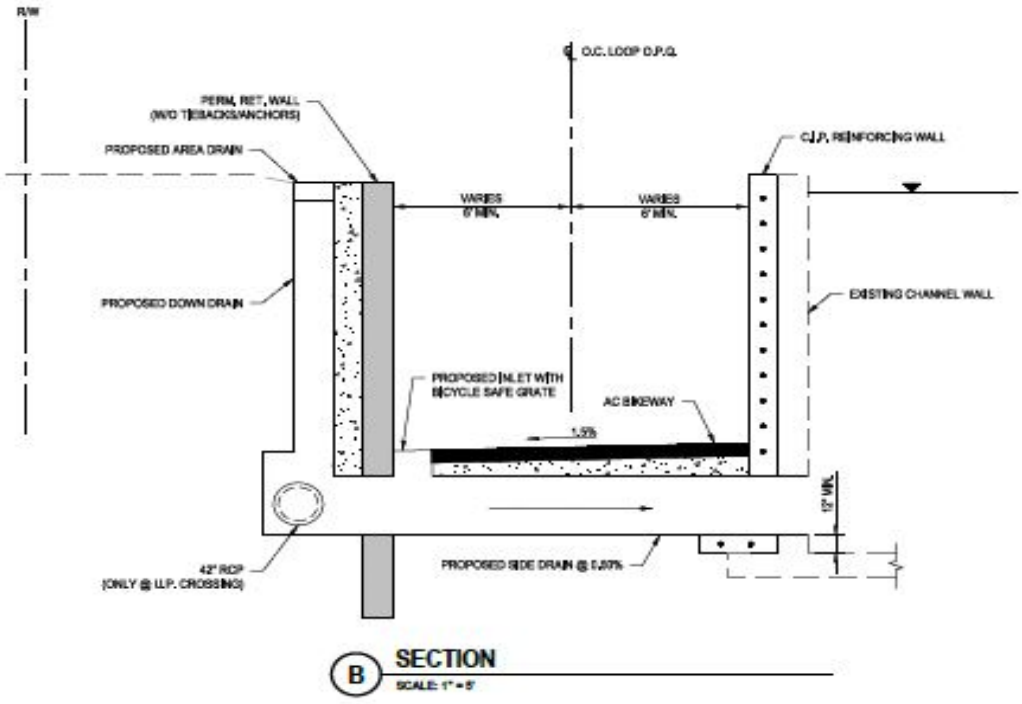
Appendix A also shows the plan & profile for crossing under the UPRR right-of-way by jacking a 12' wide x 10' high RCB under the railroad corridor using a 5% maximum downgrade and upgrade on either side of the RCB. This option has the following design features:

- *Bikeway Profile (Downstream Side)* - Approaching from the downstream side, the bikeway needs to be lowered in a trench. The typical way to construct this trench is to construct a "U-wall" with concrete walls for the sides and a concrete slab for the floor. Another way, which may save considerable construction costs, is what is shown in the plan & profile sheet in Appendix A and the typical section below. Our idea takes advantage of the existing channel wall to act as one side of the "U-wall" and then laying back the slope at 2:1 on the other side since sufficient right-of-way exists. Unfortunately, it appears after reviewing the existing Coyote Creek Channel plans, that the existing channel wall was designed for earth retaining against it but not when the earth is removed so this wall will need reinforcing for bending in this direction. Below is a typical section along the downstream approach to the UPRR UC.



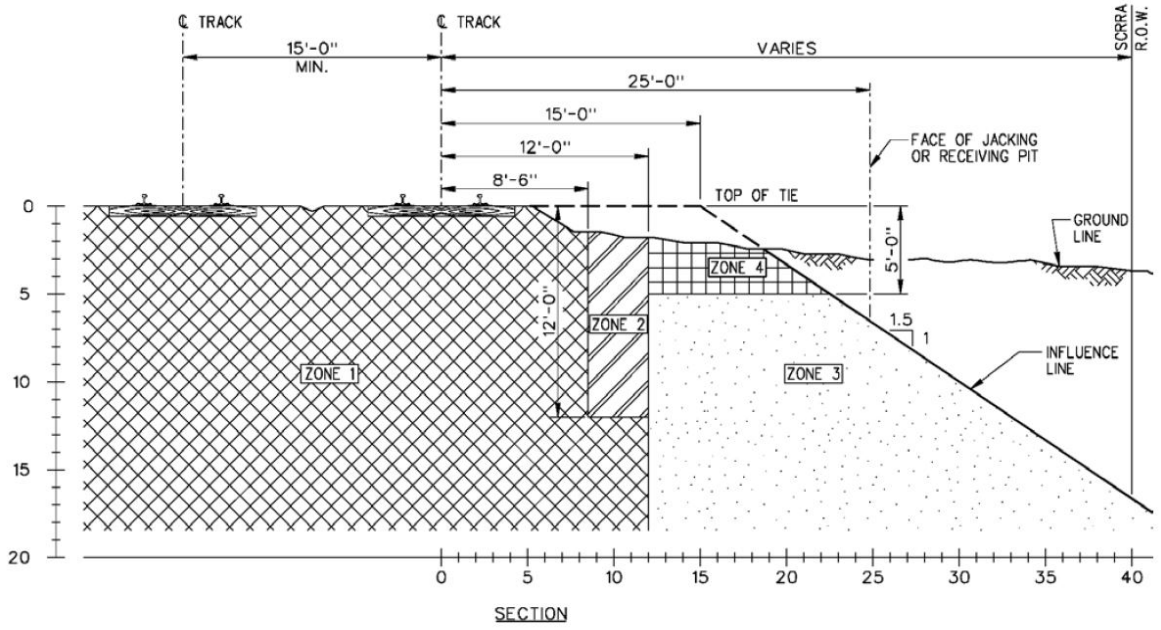
- *Bikeway Profile (Upstream Side*) - On the upstream side of the UPRR undercrossing the profile rises at almost the 5% maximum tapering off to near 2% approximately 150' downstream from the S. Firestone Blvd undercrossing. In this reach the flood control right-of-way is narrower and laying back the slope at 2:1 is not possible without going outside the right-of-way. Therefore, a top-down type retaining wall (without tiebacks or anchors that

extend outside the right-of-way) is required along the right-of-way side as shown below.



- *12' x 10' RCB* – The RCB is shown at an elevation designed to meet the 8' minimum vertical clearance (from top/box to base/rail), per Section 7.3.2.1 of the UPRR/BNSF Guidelines for Railroad Grade Separation projects, but still just above the channel invert so stormwater can be drained, by gravity flow, out of the RCB and into the channel. The length of the RCB shown extends outside the UPRR right-of-way on both sides.
- *RCB Jacking End* – A jacking pit at approximately Sta. 72+00 is shown. The jacking pit is shown on the upstream side of the railroad because equipment and materials required for construction of the jacking pit, and the jacking equipment and RCB sections, can be easily transported from S. Firestone Blvd. The front face of the jacking pit is shown as a temporary shoring wall, such as a soil mixing wall, a wall strong enough to retain the earth behind the wall (to support the deep excavation required for the jacking pit) but, at the same time, able to allow the RCB sections to be jacked through it. Additional discussion regarding the box jacking process can be found in the "Preliminary Box Jack Design Report."
- *RCB Receiving End* – Typically a pit would also be required for the receiving end of the box-jack but for our construction method (shown in the typical section on the previous page) a receiving pit is not required as the contractor can construct the bikeway cross section up to the downstream end of the box culvert. Just as was done for the jacking end, a similar temporary shoring wall would be constructed along the front face of the receiving pit.
- *Utility Conflicts* – On the downstream side of the crossing, the abandoned Kinder-Morgan pipeline may be in conflict with the RCB. Potholing for conflict verification has been denied by UPRR. Also on the downstream side of the railroad, while the Navy's abandoned 8" jet

fuel line is not in conflict with the RCB, it is in conflict with the contractor's ability to remove the abandoned Kinder-Morgan pipeline, including having to remove any abandoned shoring, if needed. On the upstream side of the crossing, the existing 42" RCP storm drain requires rerouting as it is in direct conflict with the RCB box-jack (see plan & profile sheet in Appendix A). Any shoring required for excavation and removal of the storm drain that falls within the railroad influence Zones shown below needs to meet railroad design guidelines for that Zone.



- *Drainage/Water Quality* – A low point in the bikeway profile was created just downstream from the RCB. This low point can then be drained by a cross culvert under the bikeway that outfalls into the side of the existing channel wall. On the downstream side of the undercrossing, stormwater will runoff into the bioswale where it can be treated then routed to the cross culvert at the low point. On the upstream side of the undercrossing, stormwater runoff will come from the upstream side of the I-5 undercrossing and should either be collected in inlets (with filters for treatment) that outfall under the bikeway and into the side of the existing channel, or allowed to drain to the low point where a treatment basin could be constructed. Flap gates on the outfall pipes from the bikeway will prevent water in the channel from backing up into the bikeway but stormwater collected at the low point in the bikeway can't get out until the WSE (Water Surface Elevation) in the main channel drops below the invert of the outfall from the bikeway. Consequently, there is a certain amount of stormwater that will collect at the low points. However, flooding of the bikeway can be prevented by:

    - Creating detention areas by making the ditch wider at the low points.
    - Limiting the amount of stormwater collected at the low points by intercepting runoff further uphill on both sides of the low points and outfalling into the main channel (the outfall invert will then be much higher than the main channel invert).
    - Creating a swale at the top/cut slope or top/wall to intercept off-site drainage thus keeping it from draining to the bikeway low points.

These ideas need to be further explored in the PS&E Phase.

- *Clearances for Emergency Vehicles* – The proposed box culvert for the undercrossing is 10' high so that shouldn't pose an issue for police SUVs and the tallest ambulance is 110" so that shouldn't be a problem for emergency vehicles at those two undercrossngs.

5. Recommendations

While an undercrossing of the UPRR Industry Lead track is preferred (since it allows for a bicyclist's momentum on the downgrade to easily traverse the upgrade as opposed to the overcrossing which has an upgrade with no downgrade preceding it and an undesirable switchback alignment), opposition from the UP for either of the undercrossing options has resulted in having to move forward with the overcrossing alternative. Additionally, a bypass route, such as Alternative 1 in the CEQA Environmental Document, is a safety risk since it requires bicyclists having to travel along busy Artesia Blvd., with an at-grade crossing of the same UP Industry Lead, then under I-5 and across a very busy Artesia Blvd. to North Firestone Blvd. at the I-5/Artesia Blvd. Interchange.

Other recommendations if the undercrossing were to be selected include:

- Potholing the abandoned 10" Kinder-Morgan pipeline to determine its exact location and to determine if any shoring was left in place;
- Continued coordination with the U.S. Navy to "cut, cap & remove" their abandoned 8" jet fuel line If the contractor will require access to the abandoned 10" Kinder-Morgan pipeline;
- Potholing the active 16" Kinder-Morgan pipeline to determine its exact location.

Appendix A:

Overcrossing Plan & Profile

Undercrossing Plan & Profile

Undercrossing Typical Sections

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Bruce Schmith, PE, ENV SP
Bruce.Schmith@ghd.com
949-585-5274

www.ghd.com