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RICHARDS BOULEVARD/OLIVE DRIVE CIRCULATION IMPROVEMENTS FEASIBILITY STUDY REPORT

prepared for:

Davis
California

MARK THOMAS & COMPANY

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1.0 Introduction

1.1 Project Description

The City of Davis (City) contracted with Mark Thomas and Company (MTCo) to study the feasibility for multiple transportation circulation improvement projects involving potential grade separation crossings of the Union Pacific Railroad (UPRR) tracks in the area of Richards Boulevard and Olive Drive. The goal of the study is to better understand the feasibility, costs and circulation effects of potential corridor improvements.

The proposed projects included with this study are as follows:

1. Olive Drive to L Street Vehicle Connection
2. Olive Drive to Davis Transit Depot Pedestrian/Bike Connection
3. Olive Drive Freeway Exit Ramp Closure
4. Olive Drive Bicycle Improvements

** See **Attachment A** for the project area and locations*

For a more complete picture, consideration has been included in the study for other potential transportation improvements previously studied by the City including:

- Richards Boulevard/I-80 Tight Diamond Interchange
- Downtown Gateway Arch
- Olive Drive and Pole Line Road Bike Path Connection

This study has evaluated existing and future traffic operations in the Richards Boulevard/Olive Drive area by cross-analyzing combinations of potential future growth and implementation of the proposed improvement projects to understand the effects on traffic, bicycle and pedestrian circulation. Meetings have been held with UPRR staff to discuss their relative level of acceptance for the specific grade crossing alternatives considered. Finally, order-of-magnitude cost estimates have been developed for each project alternative. The results of this effort have led to a recommended prioritization of the projects for future grant funding applications.

1.2 Project Background

The Richards Boulevard and Olive Drive corridor is a major gateway to the City from Interstate 80 (I-80) and is a key connector between south Davis, the downtown area, and the University of California Davis (UC Davis) campus. At the Olive Drive intersection, Richards Boulevard carries approximately 19,900 average daily trips with 1,220 morning peak hour trips and 1,458 evening peak hour trips. There is frequent vehicular congestion in both directions along Richards Boulevard during the AM, midday and PM peak periods where the closely spaced intersections between downtown and the I-80 interchange provide insufficient space for vehicular queues. Further, the close proximity of intersection crossings, high number of turning vehicles, and travel lanes needed to accommodate the traffic volumes limits the space available for walking and biking facilities and discourages non-motorized travel along the corridor.

Olive Drive - Railroad Fence with DIrection to Nearest Pedestrian Crossing at Richard Blvd.

There are approximately 1,100 residents who live on East Olive Drive east of Richards Boulevard and are separated from the remainder of Davis by the Union Pacific Railroad (UPRR) tracks and I-80. UPRR installed a no-climb heavy-duty fence along the tracks in 2011 to prevent residents from illegally crossing the tracks. Therefore, vehicular, bicycle and pedestrian access to downtown and UC Davis from the neighborhood is limited to the crossings under the railroad tracks at Richards Boulevard and the Putah Creek Trail from West Olive Drive. Based on SWITRS data provided by the City, between 2009 and 2014 there were 21 reported vehicular collisions at the Olive Drive and Richards Boulevard intersection, including six that involved bicyclists.

In 1997, a voter referendum was passed to retain the historic integrity of the two lane underpass on Richards Boulevard and not widen it to four lanes. The underpass is located approximately 350 feet north of the Richards Boulevard and Olive Drive intersection. Although the intersection of Richards Boulevard and Olive Drive is currently operating within the City's acceptable Level of Service (LOS) standards (LOS E or better), operations will degrade to LOS F within the timeframe of this study due to the expected increase in traffic resulting from future developments. Planned developments in the project area and included in the traffic, bicycle and pedestrian assessment for this study include:

1) Nishi / W. Olive Drive Development (Located between I-80 and UPRR south of Putah Creek)
2) Lincoln40 Residential Development (Located north of Olive Drive at Hickory Lane)
3) Davis Hotel and Conference Center (Located south and west of Richards Boulevard between Olive Drive and I-80)
4) Mace Ranch Innovation Center (Located north of I-80 and east of Mace Boulevard)
5) General Plan Buildout Under 2035 Conditions

<u>East Olive Drive</u>

East Olive Drive is a minor arterial connecting an I-80 westbound off-ramp to downtown Davis and the UC Davis campus, via Richards Boulevard. East Olive Drive has one travel lane and a bicycle lane in each direction from Richards Boulevard to the I-80 westbound off-ramp, with a vehicle turnabout circle at the east end. The US40 Regional Bike Path begins at the eastern end of East Olive Drive and continues east past Mace Boulevard to the Yolo Causeway where it runs adjacent to I-80 on the bridge structure to West Sacramento and continues on to downtown Sacramento. Land use on either side of East Olive Drive is a mix of residential houses, apartments and commercial businesses. There are multiple driveways along the street.

Olive Drive - Looking west from Arbor Apartments Driveway (Proposed L Street Intersection)

West Olive Drive

West Olive Drive is a local street connecting Richards Boulevard to businesses located between I-80 and downtown Davis. West Olive Drive has one travel lane in each direction with a vehicle turnabout circle at the west end. Land use on either side of Olive Drive is a mix of commercial businesses, car repair shops and hotels. There are multiple driveways along the street. The Putah Creek Trail connection near the west end of West Olive Drive and provides bicycle and pedestrian access under I-80 and the UPRR tracks to south Davis and the UC Davis Campus.

L Street - Looking south from 3rd Street
(PG&E Transfer Station is to the right)

L Street

L Street south of 5th Street is a minor arterial connecting residential neighborhoods and businesses in north Davis to the downtown area. The west side of L Street is characterized by commercial businesses and residential houses. A PG&E electric transfer station is located on the west side of L Street south of 3rd Street. The PG&E Davis Service Center is located on the east side of L Street. Between 5th Street and 3rd Street, L Street has one travel lane, a center turn lane, a bicycle lane, and on-street parking in each direction. Between 3rd Street and 2nd Street, L Street narrows to one travel lane and bicycle lane in each direction.

1.3 Previously Studied Transportation Improvements

As described above, there have been several transportation improvement projects proposed and previously studied to reduce vehicular congestion on Richards Boulevard and to improve access and safety for bicyclists and pedestrians along Richards Boulevard and Olive Drive. These projects are described in detail elsewhere but are summarized below and included in the recommended prioritization included at the end of this Report. Connections to these projects are considered in the concept plans, traffic analysis and cost estimates prepared for this study.

Richards Boulevard/I-80 Tight Diamond Interchange:

The Richards Boulevard/I-80 Tight Diamond Interchange project would realign the westbound ramps at the I-80 interchange to provide additional distance between the intersections for vehicles to queue, add turning lanes at the Richards Boulevard and Olive Drive and Richards Boulevard and I-80 eastbound ramps intersections to improve intersection operations, and add a grade separated bicycle and pedestrian pathway on the south side of Richards Boulevard over the freeway. The Final Project Study Report – Project Development Report (PSR-PDR) was prepared and submitted to Caltrans in September 2016 and is provided in **Attachment B**.

- Preliminary cost estimate is $9.6 Million.

Figure 1 – Rendering of the Richards Boulevard/I-80 Interchange Project

Downtown Gateway Arch:

The Downtown Gateway Arch project would improve pedestrian and bicycle access along Richards Boulevard to the existing tunnel beneath the UPRR tracks, improve safety at the intersections of Richards Boulevard and Olive Drive by adding a bicycle and pedestrian bridge over Richards Boulevard, and improve access to downtown by adding a second tunnel beneath the UPRR tracks on the east side of Richards Boulevard. A concept plan was prepared for the Downtown Gateway Arch project in March 2014 and is provided in **Attachment C**.

- Preliminary cost estimate is $6.8 Million.

Figure 2 – Rendering of the Downtown Gateway Arch Project

Olive Drive and Pole Line Road Bicycle/Pedestrian Connection:

The Olive Drive and Pole Line Road Bicycle and Pedestrian Connection project would add an elevated bicycle and pedestrian pathway structure connecting the US40 Regional Bike Path near the east end of Olive Drive to the Pole Line Road overcrossing above I-80 and the UPRR tracks. The connection would improve access for residents in south and north Davis to access the US40 Bike Path and for residents of the Olive Drive neighborhood to reach downtown and schools in south Davis. The concept plan, prepared by the City in September 2013, was modified during this study to provide additional vertical clearance for utility maintenance vehicles and is provided in **Attachment D**.

- Preliminary cost estimate is $3.9 Million.

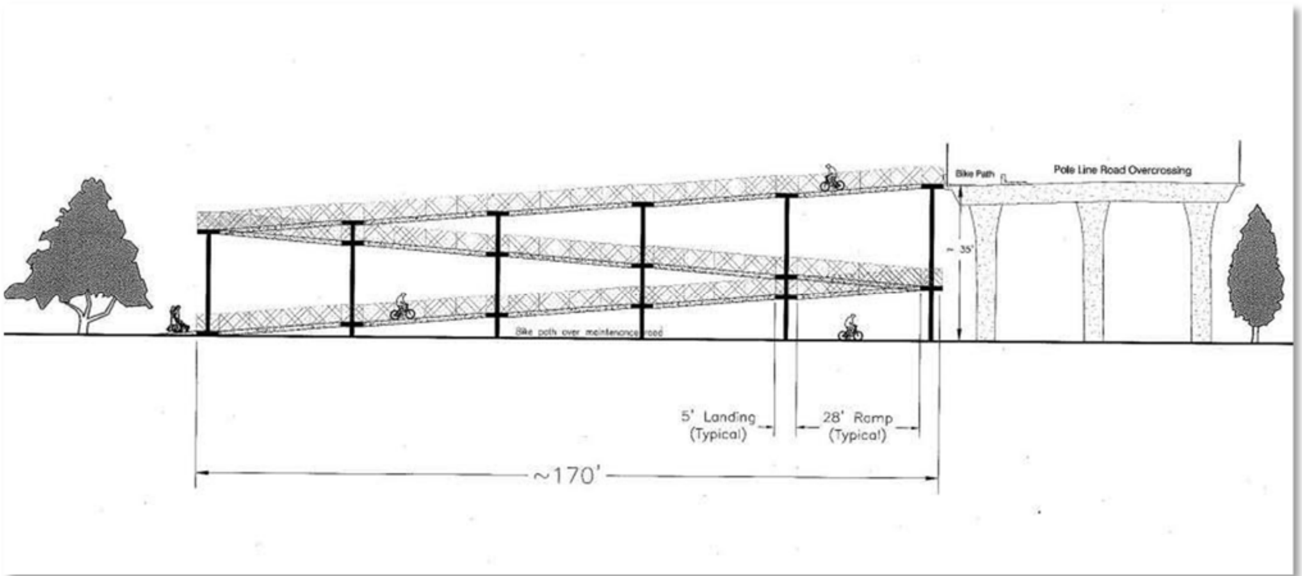


Figure 3 – Elevation of the Pole Line Road Bike/Ped Connection

1.4 Report Organization

The remainder of this report is organized into the following sections:

- Chapter 2 – Olive Drive to L Street Vehicle Connection
- Chapter 3 – Olive Drive to Davis Transit Depot Pedestrian/Bicycle Connection Project
- Chapter 4 – Olive Drive Exit Ramp Closure
- Chapter 5 – Olive Drive Bicycle Improvements
- Chapter 6 –Railroad Crossing Approval Process and Recommendations

The discussion provide below for each project and project alternative considered in this study includes the following subjects:

- Description of the location and limits for each project and the design features for each project alternative including the horizontal and vertical alignment and structure types
- Site Challenges including right of way impacts and existing utilities to be protected or requiring relocation
- Visual Assessment
- Constructing Staging / Risks
- Traffic, Bicycle and Pedestrian Assessment
- Cost Estimates
- Summary of Pros and Cons

2.0 Olive Drive to L Street Vehicle Connection

2.1 Project Description

The Olive Drive to L Street Vehicle Connection project would provide a new route for residents of the Olive Drive neighborhood and commuters on I-80 to access downtown and north Davis. The intent of the project is to reduce congestion along Richards Boulevard between the I-80 interchange and downtown.

Based on prior inquiries with UPRR regarding creating a new at-grade crossing of the tracks, UPRR has indicated creation of a new at-grade crossing would only be approved with the elimination of up to three other existing crossings of the tracks. There are no existing at-grade crossings of the UPRR tracks within the City of Davis so this investigation includes only the feasibility of a new grade separated crossing of the UPRR track that would extend L Street to form a new intersection with Olive Drive.

Two alternative crossing structures have been considered for the Olive Drive to L Street Vehicle Connection project:

1. Bridge structure overcrossing above the UPRR tracks
2. Concrete box underpass under the UPRR tracks

Conceptual layouts for both alternatives are provided in **Attachment E**.

2.1.1 Alternative 1 – Olive Drive / L Street Overcrossing

This alternative would construct a grade-separated vehicular, bicycle and pedestrian overhead structure to connect L Street to Olive Drive over the UPRR tracks. Approach ramp structures would be constructed along the existing roadway alignments to avoid realignment of the roadway and the associated property acquisitions and relocations of residents and businesses. The objective of this alternative is to provide an overcrossing with minimized costs and impacts on private property and to the railroad. **Figure 4** shows the proposed overcrossing layout. Conceptual layouts for the Olive Drive to L Street Vehicle Connection project are provided in **Attachment E**.

Horizontal Alignment:

The horizontal alignment is developed as follows:

- Approximately 2,000 feet of Olive Drive would be reconstructed and widened for the connection to L Street.
    - Beginning 920 feet west of the future intersection with L Street, Olive Drive would be widened to provide a second eastbound vehicle lane, bike lane and sidewalk for access to the properties on the south side of the street. The new travel lane, bike lane and sidewalk would be parallel to the new ramp structure and primarily be on private property in the frontage of the Cesar Chavez Plaza Apartments, Public Storage facility, The Arbors Apartments, and Olive Court Apartments.

- The western approach ramp to L Street would carry one travel lane and bike lane in each direction. A sidewalk would be provided on the north side of the structure only.
- The eastern approach to L Street would have a reduced width for one westbound travel lane and bike lane only.
- The eastern approach ramp would conform to the existing grade for Olive Drive and match the existing width 1,080 feet east of the future L Street intersection.

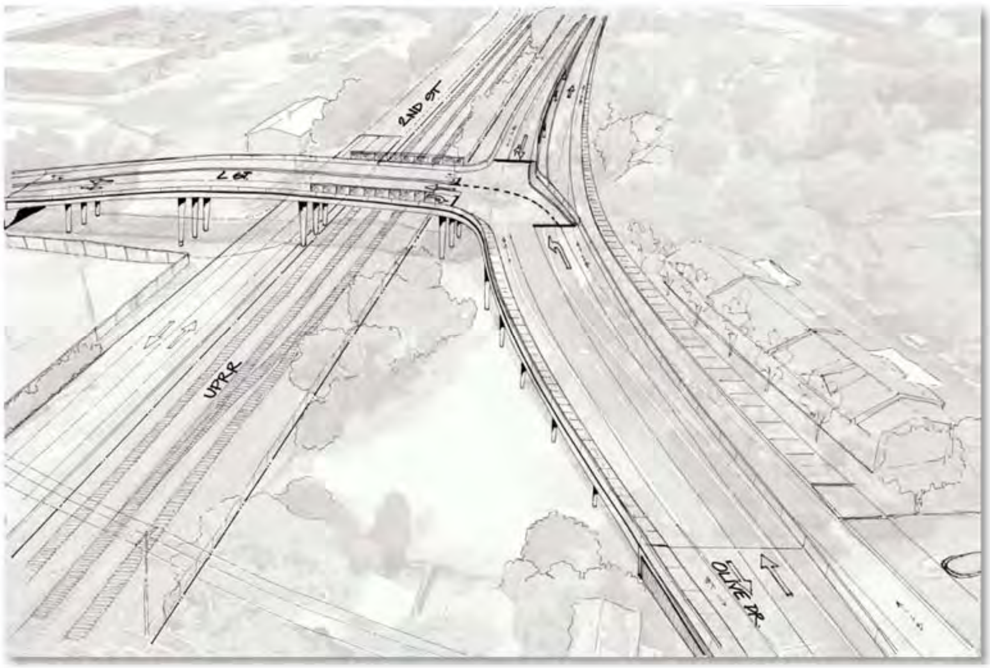


Figure 4 – Concept Layout of the Olive Drive to L Street Vehicle Connection

- Approximately 615 feet of L Street would be reconstructed between 2nd Street and the northern access driveway to the PG&E Service Center just north of 3rd Street. L Street would be extended by 140 feet across the UPRR tracks and the eastern edge of the planned Lincoln40 development to the new intersection with Olive Drive.
  - The proposed overcrossing structure and approach ramp on L Street would carry one travel lane in each direction and a two-way cycle track on the east side of the structure. A new sidewalk would be provided on the west side of the structure.
  - The approach ramp would conform to the existing grade and width for L Street 755 feet north of the future Olive Drive intersection.
  - Existing sidewalks would be maintained along the existing grade of L Street to provide pedestrian access to the properties on both sides of the street.
- To maintain vehicular, pedestrian and bicycle access to downtown for the areas served by 2nd Street to the east of the project area, 2nd Street would be extended beneath the new overcrossing structure to K Street. K Street would be reconstructed between 2nd Street and 3rd Street to complete the vehicular, bicycle and pedestrian connections that continue on 3rd Street into downtown Davis.

2nd Street - Looking west from L Street
(Proposed location for extenstion to K Street)

- Approximately 170 feet of 3rd Street east of K Street would be reconstructed and elevated to maintain an intersection with L Street. One existing driveway for the property on the northwest corner of 3rd and L Streets would need to be reconstructed and raised to the new grade of 3rd Street to maintain access to the property.

Vertical Alignment:

The vertical alignment was developed as follows:

- The crest curve over the Union Pacific railroad tracks has been designed using AASHTO design standards. It is also designed to accommodate Union Pacific's minimum requirement over their tracks across their R/W in anticipation of future railroad tracks and access roads by Union Pacific. The clearance over the tracks accommodates the Union Pacific's minimum vertical clearance of 23 feet 4 inches.
- The new approaches conform to the existing grades using vertical curves that are designed to accommodate minimum comfort speed design per AASHTO. Lighting is required to provide adequate stopping sight distance.
- The north end roadway profile conforms to the existing grade of L Street approximately 750 feet north of the L Street / Olive Drive intersection. In order to keep the connection at 3rd Street, a 7% profile grade was used and would not comply with ADA standards. The southern driveway for the PG&E Service Center and eastern driveway for the PG&E electric transmission facility would be blocked by the new structure.

L Street - Looking southwest at 3rd Street
(Intersection would be raised to connect with the crossing)

- The west end roadway profile conforms to the existing grade of Olive Drive approximately 920 feet west of the L Street / Olive Drive intersection.
- The east end roadway profile conforms to the existing grade of Olive Drive approximately 1,080 feet east of the L Street / Olive Drive Intersection.
- Access to Olive Drive from apartments and storage facilities on the south side would be restricted to right-in, right-out only so residents would be required to drive out-of-direction along Olive Drive and use the existing turnabout located at the I-80 westbound exit ramp then return on the crossing structure.

Structures:

This alternative proposes using precast concrete girders with a minimum vertical clearance of 23 feet 4 inches over the railroad. Precast girders, rather than cast in place construction, were selected for the sections of structure not over UPRR tacks to accelerate the construction.

2.1.2 Alternative 2 – Olive Drive / L Street Underpass

This alternative would construct a grade-separated vehicular, bicycle and pedestrian underpass structure to connect L Street to Olive Drive beneath the UPRR tracks with a concrete box structure. Access to the structure would be provided in conformance with Americans with Disabilities Act (ADA) standards on ramps cut into existing ground. The objective of this alternative is to provide an underground crossing with minimized visual impacts to adjacent properties. The concrete box would be pushed (jacked) beneath the UPRR tracks so that the tracks remain in service at all times.

Normally a railroad underpass would be constructed using a bridge structure rather than a jacked box. Due to the proximity of the Amtrak train depot and platform, a bridge structure was rejected because of insufficient distance from the platform to L Street to construct a railroad shoofly. Because UPRR will require uninterrupted operations, any design option that would cause the tracks to be taken out of service, even on a temporary basis, such as no shoofly construction, were not studied.

Figure 5 shows the proposed roadway and undercrossing layout for this alternative. Conceptual layouts for the Olive Drive to L Street Vehicle Connection project are provided in **Attachment E**. The jacked portion of the box crosses the UPRR right-of-way at right angles to reduce construction costs and adhere to UPRR preferences for right angle crossings to minimize track movement and settlement.

Figure 5 – Concept Layout of the Olive Drive to L Street Vehicle Connection

Horizontal Alignment:

The horizontal alignment is essentially the same as was developed for Alternative 1 and includes the same number of vehicular travel lanes, bike lanes and sidewalks. Variations on the alignment between Alternative 1 and this alternative include the following:

- To maintain vehicular, pedestrian and bicycle access to downtown for the areas served by 2nd Street to the east of the project area, 2nd Street would be extended **over** the new underpass structure to K Street.
- Approximately 170 feet of 3rd Street east of K Street would be reconstructed and **lowered** to maintain a connection with L Street. The driveway for the property on the northwest corner of 3rd and L Streets would need to be reconstructed and **lowered** to the new grade of 3rd Street.

Vertical Alignment:

The undercrossing assumes 19 feet clearance to the top of the concrete box from the top of the rail for the railroad subgrade, including the tracks, ties and ballast. A detailed geotechnical evaluation is needed to confirm the depth. The distance most likely would not be decreased, but may be increased depending on soil conditions. The concrete box culvert would have a two-foot thick top and provide 16.5 feet vertical clearance for vehicles, bicycles and pedestrians. Therefore, the undercrossing profile is assumed to be depressed a total 38 feet to cross beneath the railroad.

The approach ramp grades and conform points for this alternative are the same as for Alternative 1.

Structures:

This proposed structure types to achieve the underground crossing include:

- Reinforced concrete retaining walls are required due to site constraints that limit grading on either side of the pathway. The walls will start at-grade and descend to a maximum depth of 38 feet on the both sides of the tracks.
- A 100-foot long concrete box will be jacked across the UPRR right-of-way and 2nd Street at a depth of 19 feet beneath the top of rail.
- A temporary bridge structure would be required during construction to maintain vehicular traffic on 2nd Street for the 2nd Street and K Street connection to 3rd Street.

2.1.3 Additional Variations

Two-way Olive Drive at Existing Grade – This option would limit out-of-direction travel to provide a westbound travel lane and bicycle path at-grade beneath the structure. However, an additional acre of right-of-way would be needed plus the acquisition and relocation of five dwelling units from the mobile home trailer court on the east end of Olive Drive. Estimates for the additional right-of-way needed and relocation expenses are not included in the cost estimates for this project.

One-way (northbound only) on L Street – This option would reduce the width of proposed overcrossing and underpass structures by allowing for northbound only traffic on the grade separated portion of L Street With this option, the western approach on Olive Drive and L Street approach would be reduced to a single lane with eastbound vehicles on Olive Drive forced to turn left onto L Street. Southbound vehicles on L Street would either be forced to turn right onto 3rd Street or continue south to 2nd Street along the side of the approach structure. The eastern approach on Olive Drive would remain with a single westbound vehicle lane. Westbound vehicles would be forced to turn right onto L Street. This option would allow for two-way travel on Olive Drive to be maintained at existing grade. The cost reduction associated with this alternative would be approximately $2 Million to $3 Million.

Lidded Section – Portions of the underpass alternative at the Olive Drive/L Street intersection and proceeding approximately 300 feet in each direction on Olive Drive could be constructed as a cut/fill tunnel. The area on top of the tunnel could be used for parking or landscaping. Additional lighting and tunnel ventilation would be required. Additional costs of $5 Million to $7 Million would be incurred with this variation.

2.2 Site Challenges

Site challenges associated with the Olive Drive to L Street Vehicle Connection project include space constraints to construct the new structures within the existing right-of-way for each road involved, maintaining access to homes and businesses, achieving regulatory clearance for the new crossing over/under the UPRR tracks, and potential conflicts with overhead and underground utilities.

Right of Way:

- Olive Drive – The existing right-of-way on Olive Drive is 60 feet wide. Extensive right-of-way acquisition would be required on the south side of Olive Drive for the proposed widening of Olive Drive to accommodate the proposed new vehicle lane, bike lane, and sidewalk needed to maintain access to the homes and businesses. Approximately 11,800 square feet would be required from multiple properties on the south side of the street. Additional easements would also be needed for construction and to conform frontage areas and driveways to the widened roadway.
- L Street – The existing right-of-way for L Street is 80 feet wide and is sufficient to accommodate the proposed roadway section and approach ramp structures. No property acquisition is anticipated from the adjacent properties along L Street. However, the proposed approach ramp structure will block one driveway access each to the PG&E Service Center and Electric Transmission Facility. Both facilities have other driveways that could be used for access during and after construction but some changes to internal site circulation for vehicles may be needed to accommodate the closure.
- 2nd Street – The extension of 2nd Street beneath or over L Street to K Street would be completed within the existing right-of-way north of the UPRR tracks. Temporary construction easements may be needed on the adjacent UPRR right-of-way.
- K Street – The existing right-of-way for K Street is 80 feet wide and is sufficient accommodate the proposed roadway section. No property acquisition is anticipated from the adjacent properties along K Street.
- Lincoln40 Development – The proposed Lincoln40 residential development project would redevelop the parcels on the north side of Olive Drive. A copy of the site plan for the Lincoln40 project is provided with **Attachment I**. The City would need to acquire right-of-way or an easement to construct and maintain the crossing structure (overcrossing or

underpass) on the easternmost portion of the Lincoln40 property for the extension of L Street to Olive Drive. The plan for Lincoln40 shows proposed water quality uses for the area which would need to be redesigned or relocated to accommodate the overcrossing or underpass structures. In addition, there is one driveway for the proposed development within the limits of the approach ramp structure on Olive Drive. This driveway would need to be relocated or extended to connect with the new Olive Drive eastbound access lane.

- UPRR – Construction, access and maintenance easements would be needed from the railroad for the overcrossing and underpass. For the overcrossing alternative, a 67-foot wide easement across the railroad property would accommodate the project's improvements (47 feet to the outside barriers for the structure) plus 10 feet on both sides of the structure for maintenance. For the underpass alternative, a 51-foot wide easement across the railroad property would accommodate the project's improvements (47-foot wide roadway section plus 2 feet on both sides for the concrete box thickness).

  There will be minimal impacts to the existing railroad with the overcrossing alternative developed for this project. The overcrossing structure would be designed to place the columns outside of the UPRR right-of-way with a deck height above the minimum clearance height required by UPRR. The bridge span would be pre-cast concrete and would not require falsework to construct. During construction, railroad flaggers would be needed to signal the approach of trains when workers are within the UPRR right-of-way.

  The undercrossing concrete box would be constructed at a depth to accommodate required clearances for existing and future tracks and access road. Based on discussions with UPRR staff, it is very likely the proposed jacking operation would not be approved by UPRR. [**See Chapter 6 for additional discussion of the UPRR approval process and coordination efforts conducted with this study.]**

Utilities:

Existing utilities in the project area include the following:


Olive Drive looking towards L Street
(Overhead utilites and poles may require relocation)

- Overhead power and communication lines run throughout the project area along the north side of Olive Drive, east side of L Street, and north side of 2nd Street. Clearance to the roadway from the overhead lines crossing on 2nd Street will need to be accommodated and would require either raising or undergrounding the lines. Utility poles on the north side of Olive Drive and east side of L Street may need to be relocated away from the propose structure and acquisition of a utility easement may be needed if poles are relocated outside the public right-of-way.
- Underground gas, water, sewer and storm drain facilities are located within the right-of-way for Olive Drive and L Street. Relocation of these facilities would be needed to accommodate the proposed overcrossing structures. Relocation would be needed for the underpass structures and stormwater pumping stations would be needed within the underpass.
- Petroleum and fiber optic facilities are located within the UPRR right of way. It is assumed the proposed overcrossing structure will not impact these facilities and the proposed

underpass would be at a sufficient depth to pass beneath the utilities. Protective measures would be needed to prevent damage to the facilities during the proposed jacking operation.

- Additional investigations and coordination with public and private utilities are needed to determine if there are other potential conflicts during the preliminary engineering phase of project development.

2.3 Visual Assessment

The proposed overcrossing structures and safety lighting would result in visual impacts to adjacent properties on Olive Drive including the Cesar Chavez Plaza Apartments, Public Storage facility, The Arbors Apartments, and Olive Court Apartments, the planned Lincoln40 development, and multiple homes and businesses on L Street. The proposed underpass structures would result in less visual impacts to adjacent properties as the only visible elements would be safety rails and fences above the access ramps. Both alternatives would require removal of most, if not all, of the mature trees on Olive Drive and L Street.

It is assumed the visual impacts would be mitigated, to the extent possible, through aesthetic design of the new structures and lighting, planting new landscaping and trees to screen the structures, and providing cut-off optics and shields to limit the spread of light beyond the roadway area. However, due to the height and mass of the proposed walls and bridges, it is very likely the visual impact for the overcrossing structure could not be fully mitigated.

2.4 Construction Staging / Risks

The project has three distinct segments; north of UPRR, along Olive Drive, and the UPRR crossing. Each has their own unique features and impacts to existing users.

Construction would be sequenced to first perform all the utility relocations while the roadways remain in their current location. Utility relocations involve City water, sewer and storm drainage. Other utilities involved include PG&E gas and electric transmission and distribution lines, and fiber optic and copper communication cables. Relocation work is estimated to require up to one year of construction duration before the major structure construction can begin.

2.4.1 Overcrossing Alternative

North of UPRR:

Work would be staged to limit the impact to traffic. The new 2nd Street to K Street roadway connection would be constructed first to maintain traffic circulation. L Street would then be closed between 3rd Street and Second Street. The remaining roadwork along 3rd Street and on L Street north of 3rd Street would not be constructed until the project is almost ready to be opened to traffic. Bicycles and pedestrians would be allowed to pass through the construction zone to maintain access to the PG&E Service Center.

Olive Drive:

There are two options for the construction along Olive Drive. One option is to limit vehicular traffic to westbound travel only where the retaining walls begin, approximately 375-feet east of Hickory Lane. Vehicles would exit from I-80 and turn left into the properties and would exit by turning left towards Richard Boulevard. Bicycles and pedestrians would be allowed two way movements. This option limits access along Olive Drive for approximately 2000 feet for more than one year. During this period, vehicle traffic would be required to use I-80 to gain access to properties within the work zone.

A second option would be to construct a temporary roadway along the south side of the Lincoln40 development for westbound movements. Eastbound traffic would remain where they currently travel. Because the west approach to L Street is wider (2-lane roadway) than the east approach (one-lane roadway), only 900-feet of temporary roadway would be needed. Within this section of roadway, drivers would be allowed right-in/ right-out movements and then would either perform a U-turn at the extension of L Street or travel to the turnaround at the east end of Olive Drive at I-80 to return to Richards Drive.

The structure construction would require approximately 18 months to complete.

UPRR Overhead:

The last segment would be to complete the span over UPRR after both the L Street connection and the Olive Drive structures are nearly complete. The span over UPRR will likely be a precast concrete span. Although the placing of the span over the tracks will be performed in one day, working only when no trains are present, the entire construction over UPRR also involves placing a cast-in-place concrete deck, barriers, railings and lighting. This phase would require two months of construction duration after the other structures north and south of UPRR are completed.

Risks:

Bridge structures over railroads and roadways are normal types of construction. The greatest risk is discovery of unknown utilities or differing geologic site conditions not discovered during preliminary investigations.

Summary:

Construction of the overcrossing structure at the site is feasible. However, the limited areas for the contractor to work would likely result in slower and more expensive construction than for a normal bridge project. Utilities must be relocated prior to construction in order to reduce the likelihood of delays during construction. Access to properties on Olive Drive east of Hickory Lane would be disrupted significantly for approximately two years during the utility relocation and structure construction.

2.4.2 Underpass Alternative

North of UPRR:

For the underpass alternative, L Street would be closed between 2nd and 3rd Streets. The intersection of L Street and 3rd Street would also be closed to provide contractor access to the site. Retaining walls would be constructed using a method called soil nailing that allows the walls to be constructed from the top down and limits the construction area to the existing roadway area. Second Street would be closed for approximately one week to allow shoring and a temporary bridge to be placed to keep the new 2nd Street to K Street roadway connection open during construction. Once the retaining walls are in place, a concrete box culvert would be constructed between 2nd Street and 3rd Street. Once this box culvert has reached design strength, it would be pushed (jacked) under the temporary bridge and under the UPRR tracks. This jacking operation would take place over 24 to 48 continuous hours, stopping only when trains are on the tracks. The dirt inside the box would be removed as the box is jacked. Once the box reaches Olive Drive into a temporary area called the receiving pit, the jacking operations are complete and the jacking equipment is removed. The contractor would then construct the north end of the box under the temporary bridge. The temporary bridge would then be removed and the roadway between 2nd and 3rd Street would be restored. The remaining work at the 3rd Street/ L Street intersection legs would be completed as a last order of work to coincide with the completion of the Olive Drive portion.

Olive Drive:

Figure 5 shows Olive Drive remaining on the existing alignment. This will require one-way vehicular traffic on Olive Drive where the only access east of Hickory Lane would be from using the I-80/ Olive Drive exit. If the alignment is shifted approximately 20-feet north onto the Lincoln40 parcel, two-way traffic could be maintained. This section is also constructed by building from the top down and excavating as they go. The retaining walls will either be soil nail walls where there is land available behind the wall or potentially "H" piles with concrete lagging if UPRR will not permit soil nails intruding into their right of way.

It is estimated it will require one construction season to relocate utilities and two construction seasons to construct the underpass and roadways.

Risks:

The constructions risks of an underpass option are numerous.

Utilities- Utility lines that are to be protected in place during construction, such as the petroleum and fiber optic lines in the UPRR right-of-way could be damaged during box jacking operations. This would result in both large damage awards and potential emergency repairs that would delay UPRR operations.

Retaining walls- These walls would be constructed very close to existing structures. There is a risk of damage to nearby buildings and potential settlement along the UPRR tracks along Olive Drive and east of the L Street extension.

Jacked Box Culvert- The greatest risk is that the jacking operation results in unacceptable horizontal or vertical movement of the UPRR tracks. The second greatest risk is if something unknown that is buried under UPRR tracks that causes the jacking operation to fail. Because UPRR will not allow an open cut to remove a buried object, the project may need to be abandoned until a new design concept is approved by UPRR.

Bidders Risk- There is a limited number of contractors that have the experience to jack a box as large as the proposed crossing. Adding in the very restricted width within L Street to perform the work, the competition among bidders will be limited. Therefore, this could result in very high bid prices or the potential that no contractor bids on the project.

Summary:

Construction for this Alternative is feasible, although it has a very high risk level. The construction site would severely limit access along Olive Drive for at least two years. The difficulty of constructing retaining walls within a narrow area between Olive Drive and the UPRR tracks raises the risk of potential short or long term settlement of the tracks. If the jacking operation is halted due to an undiscovered buried object, the construction may need to be abandoned or significantly delayed until a solution is reached. Finally, the City could spend over $9,000,000 for design and environmental clearance to discover either no contractor wants to bid the project or wants an exorbitant price for the work.

2.5 Cost Estimates:

The preliminary estimates of project costs for each alternative have been prepared using a condensed Caltrans 11-page planning estimate format. A summary of project costs for each alternative, including construction costs, right-of-way acquisition and soft costs including design and construction management expenses, is provided in **Tables 1 and 2 below**.

Table 1 – Olive Dr. to L Street Cost Estimate: Alternative 1 – Overcrossing

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	ROADWAY ITEMS				
1	Clearing and Grubbing	1	LS	$40,000	$40,000
2	Roadway Import	9,000	CY	$55	$495,000
3	HMA Raodway	5,000	TON	$120	$600,000
4	Aggregate Base	6,000	CY	$85	$510,000
5	Sidewalk/Curb and Guttter	16,500	SF	$15	$247,500
6	Retaining Walls	13,000	SF	$100	$1,300,000
7	Lighting/Electrical	1	LS	$300,000	$300,000
8	Drainage	1	LS	$300,000	$300,000
9	Traffic Management Plan	1	LS	$50,000	$50,000
10	Traffic Control Systems	1	LS	$150,000	$150,000
11	Signals at 3rd and L & K	2	EA	$200,000	$400,000
12	Permanent Signing and Striping	1	LS	$50,000	$50,000
13	Landscaping	1	LS	$250,000	$250,000
14	Railroad Flagger	35	Days	$1,500	$52,500
15	PG&E Relocation	1	LS	$700,000	$700,000
	STRUCTURE ITEMS				
14	Concrete Barrier (Type 26)	975	LF	$200	$195,000
15	Concrete Barrier (Type 732)	1,015	LF	$125	$126,875
16	Chain Link Railing (Type 7L)	1,990	LF	$125	$248,750
17	72" CIDH Concrete Piling	1,350	LF	$1,200	$1,620,000
18	Structure Excavation (BR)	302	CY	$390	$117,780
19	Structure Backfill (BR)	637	CY	$200	$127,400
20	Stuctural Concrete (App Slab - Type N)	128	CY	$900	$115,200
21	Structural Concrete (BR)	2,176	CY	$1,200	$2,611,200
22	Bar Reinforcing Steel (BR)	587,600	LBS	$2	$881,400
23	Furnish PC/PS Girder (90'-100')	73	EA	$24,000	$1,752,000
24	Erect PC/PS Girder	73	EA	$5,000	$365,000
	Misc. Minor Items	10%			$1,360,561
	SUBTOTAL				**$14,966,000**
	Mobilization	10%			$1,497,000
	Contingencies	25%			$3,742,000
	TOTAL CONSTRUCTION ESTIMATE				**$20,205,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	UPRR C&M Agreement/ Easement	1	LS	$100,000	$100,000
	Estimated Right of Way Costs	1	LS	$600,000	$600,000
	Estimated Engineering and Environmental	15%			$3,031,000
	Estimated Construction Administration/Staking	12%			$2,425,000
	TOTAL ESTIMATED COST				**$26,361,000**

Table 2 – Olive Dr. to L Street Cost Estimate: Alternative 2 – Underpass

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	ROADWAY ITEMS				
1	Clearing and Grubbing	1	LS	$40,000	$40,000
2	Roadway Export	48,000	CY	$65	$3,120,000
3	HMA Raodway	7,000	TON	$120	$840,000
4	Aggregate Base	9,000	CY	$85	$765,000
5	Sidewalk/Curb and Guttter	20,000	SF	$15	$300,000
6	Retaining Walls	13,500	SF	$175	$2,362,500
7	Soil Nail Wall	57,600	SF	$250	$14,400,000
8	Pump Station and Piping	1	LS	$650,000	$650,000
9	Lighting/Electrical	1	LS	$400,000	$400,000
10	Drainage	1	LS	$400,000	$400,000
11	Traffic Management Plan	1	LS	$50,000	$50,000
12	Traffic Control Systems	1	LS	$250,000	$250,000
13	Signals at 3rd and L & K	2	EA	$200,000	$400,000
14	Permanent Signing and Striping	1	LS	$50,000	$50,000
15	Landscaping	1	LS	$400,000	$400,000
16	Railroad Flagger	60	Days	$1,500	$90,000
17	PG&E Relocation	1	LS	$950,000	$950,000
	STRUCTURE ITEMS				
16	Jacked Box (Concrete)	1,550	CY	$750	$1,162,500
17	Jacked Box (Reinf)	416,000	Lb	$2	$832,000
18	Box Jacking	1	LS	$3,200,000	$3,200,000
19	Tunnel Ventalation	1	LS	$750,000	$750,000
20	Temporary Structure for Second Street	1	LS	$75,000	$75,000
	Misc. Minor Items	10%			$2,663,000
	SUBTOTAL				**$34,150,000**
	Mobilization	10%			$3,415,000
	Contingencies	25%			$8,538,000
	TOTAL CONSTRUCTION ESTIMATE				**$46,103,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	UPRR Agreement/ Review Costs	1	LS	$150,000	$150,000
	Estimated Right of Way Costs	1	LS	$630,000	$630,000
	Estimated Engineering and Environmental	20%			$9,221,000
	Estimated Construction Administration/Staking	12%			$5,532,000
	TOTAL ESTIMATED COST				**$61,636,000**

2.6 Traffic, Pedestrian and Bicyclist Assessment

The *Richards Boulevard-Olive Drive Corridor Transportation Analysis Report* prepared by Fehr & Peers, provided under separate cover, shows existing and anticipated future peak hour traffic at several intersections through the project area. The future traffic volumes have been estimated using the development included in the City's 2035 General Plan as well as from several new developments around downtown. The addition of the UPRR crossing at L Street would reduce traffic crossing the tracks at Richards Boulevard, Pole Line Road and Mace Boulevard. However, the new trips on Olive Drive coming from the I-80 exit ramp and from L Street would increase intersection delay at

Olive Drive and Richards Boulevard. Intersection LOS would worsen from LOS C to LOS D during the PM peak period. This increase in delay assumes widening the Olive Drive approach to Richards Boulevard to add a second westbound left turn lane has been completed. Due to influx of new traffic to Richards Boulevard, intersection delay and queuing would also worsen at the intersections of Richards Boulevard at First/E Street and at First/D Street which would operate at LOS F during the PM peak period. **Therefore, due to forecasted traffic growth and re-routing of existing trips caused by the project, it is anticipated traffic congestion along Richards Boulevard would increase as a result of the Olive Drive to L Street Vehicle Connection.**

With the addition of traffic from Lincoln40 and the increase in traffic using the Olive Drive exit ramp from I-80, the intersection of Olive Drive and L Street would operate at LOS F during the AM and PM peak periods. In addition, the traffic volumes would warrant signalization at the new L Street / Olive Drive intersection and existing intersections at L Street / 3rd Street and K Street / 3rd Street. Signal timings would need to be developed to prevent westbound vehicles queues on Olive Drive at L Street from extending onto the freeway. In addition, the intersections at L Street / 3rd Street, and K Street / 3rd Street would each experience substantial delay that would necessitate adding turn lanes not shown in the concept layouts or included in the estimates for roadway improvements and potentially require additional right-of-way acquisition. Traffic calming measures may also be needed on K Street north of 3rd Street to prevent an increase in traffic cutting through the neighborhood.

The L Street Connection would more than double the area accessible within a 15 minute walk time from the Olive Drive neighborhood, generating new walking and biking trips primarily to the area northeast of downtown. The L Street connection would not however reduce the walking and biking time to downtown or the UC Davis Campus. As a result, the number of pedestrians and bicycles crossing at the intersection of Olive Drive and Richards Boulevard to use the Richards Boulevard Underpass and Putah Creek Trail is expected to be almost unchanged with the L Street Connection project.

2.7 Pros and Cons of Each Alternative

Alternative 1: Overhead:

Pros:

- **Safety –** Overcrossings users will have higher visibility on the overcrossing structure resulting in greater personal safety above that for the underpass alternative.
- **UPRR Involvement** - UPRR typically supports new overcrossings, especially when no falsework is used within their right-of-way.
- **"Throw Away" Cost -** There is no need for any type of temporary roadway structure or shoofly with this alternative.
- **Total Cost** - This alternative is less expensive, along with being easier to construct than the underpass alternative.
- **Duration** - This alternative can be staged from both sides of the UPRR tracks and would take less time to construct than the underpass alternative.

Cons:

- **Traffic –** Due the diversion of trips from other roadways into downtown to use the new facility connecting L Street to Olive Drive, traffic congestion along Richard Boulevard would increase with this project. Further, this project would require a lengthy diversion for traffic on Olive Drive and require some traffic to use I-80 to access the site.

- **R/W Acquisition** - There is substantial property acquisition required for the roadway widening needed along Olive Drive to maintain access to driveways.
- **Utilities** - Relocations of overhead electric transmission and distribution lines, communications lines and poles would likely be needed.
- **Visual Impacts** - The overhead structure would be visible to residents from their front and back yards and eliminate many mature trees along both Olive Drive and L Street.

Alternative 2: Underpass:

Pros:

- **Visual Impacts –** Most of the new structure would be below grade and residents would not see the new walls, roadway or intersection.

Cons:

- **Traffic –** Due the diversion of trips from other roadways into downtown to use the new facility connecting L Street to Olive Drive, traffic congestion along Richard Boulevard would increase with this project. Further, this project would require a lengthy diversion for traffic on Olive Drive and require some traffic to use I-80 to access the site.
- **R/W Acquisition** - There is substantial property acquisition required for the roadway widening needed along Olive Drive to maintain access to driveways.
- **UPRR Involvement -** Substantial coordination would be needed with the railroad to approve the underpass.
- **Total Cost** - This alternative will be the most expensive with the multiple retaining walls, as well as going under the tracks where the water table may need to be contained.
- **"Throw Away" Cost –** It is unlikely UPRR would approve this alternative without constructing a temporary shoofly structure to maintain railroad operations during the work, which would greatly increase project cost and duration. There would also be need for a temporary crossing structure on 2nd Street after the jacking operation is completed.
- **Duration** - This alternative would take the longer to construct than the overcrossing alternative because of the staging needed to construct the concrete box structure can only be completed on one side of the tracks.
- **Construction Risk –** Risk is substantially higher with jacking a box than constructing normal bridge structures and foundations.

Table 3: Summary of Rankings for Alternatives

	Element	Alt 1 Overhead	Alt 2 Underpass
1	“Throw Away” Temporary Const. Cost	○	●
2	UPRR Involvement/Cost	◒	●
3	R/W Acquisition Cost	●	●
4	Utility Relocation Cost	◒	●
5	Total Cost	◒	●
6	Visual Impacts	●	◒
7	Construction Duration	◒	●
8	Constructability / Risk	○	●

Legend

● High

◒ Medium

○ Low

Summary:

Construction of all three alternatives is feasible. However, the underpass concrete box structure has a very high risk level and it is unlikely that UPRR would approve the underpass alternative without the construction of a temporary shoofly, which would increase project cost by $5 Million to $25 Million and lengthen the duration of construction.

3.0 Olive Drive to Davis Transit Depot Pedestrian/Bicycle Connection

3.1 Project Description

The proposed Olive Drive to Davis Transit Depot Connection would create a new grade-separated bicycle and pedestrian facility connecting Olive Drive, just west of Hickory Lane, across the UPRR tracks to the eastern side of the Amtrak platform/boarding area at the Davis Transit Depot.

Davis Transit Depot
The Davis Transit Depot serves as a major stop for multiple Amtrak passenger trains including the Capital Corridor commuter rail line connecting Sacramento and the Bay Area. Additional transit providers using the station include Amtrak regional buses and Unitrans local buses. The Depot is situated on the eastern edge of downtown Davis with vehicular, bicycle and pedestrian access off of 2nd and G Streets.

Three alternative crossing configurations have been considered for completing the pedestrian and bicycle connection from Olive Drive to the Depot.

1. Bridge structure over the UPRR tracks with linear access ramps
2. Bridge structure over the UPRR tracks with spiral access ramps
3. Concrete box structure under the UPRR tracks

Conceptual layouts for the Olive Drive to Davis Transit Depot Pedestrian/Bike Connection project are provided in **Attachment F**.

3.1.1 Alternative 1 – Olive Drive / Depot Overcrossing (Linear Access Ramps)

Alternative 1 would construct a grade-separated pedestrian and bicycle path over the UPRR tracks. Linear access ramp structures would be constructed to access the overcrossing structure with level landings in conformance with Americans with Disabilities Act (ADA) standards. **Figure 6** shows the proposed overcrossing layout. The objective of this alternative is to provide an overhead crossing with minimized costs and impacts to the railroad and private property.

Horizontal Alignment:

The approaches to the crossing would be designed to meet ADA accessibility standards. Both pedestrians and cyclists can use the crossing, but it would not be designated as a Class I facility. A Class I would require minimum design speeds and radii. The horizontal alignment is consistent with typical pedestrian overcrossings.

The horizontal alignment is developed from south to north as follows:

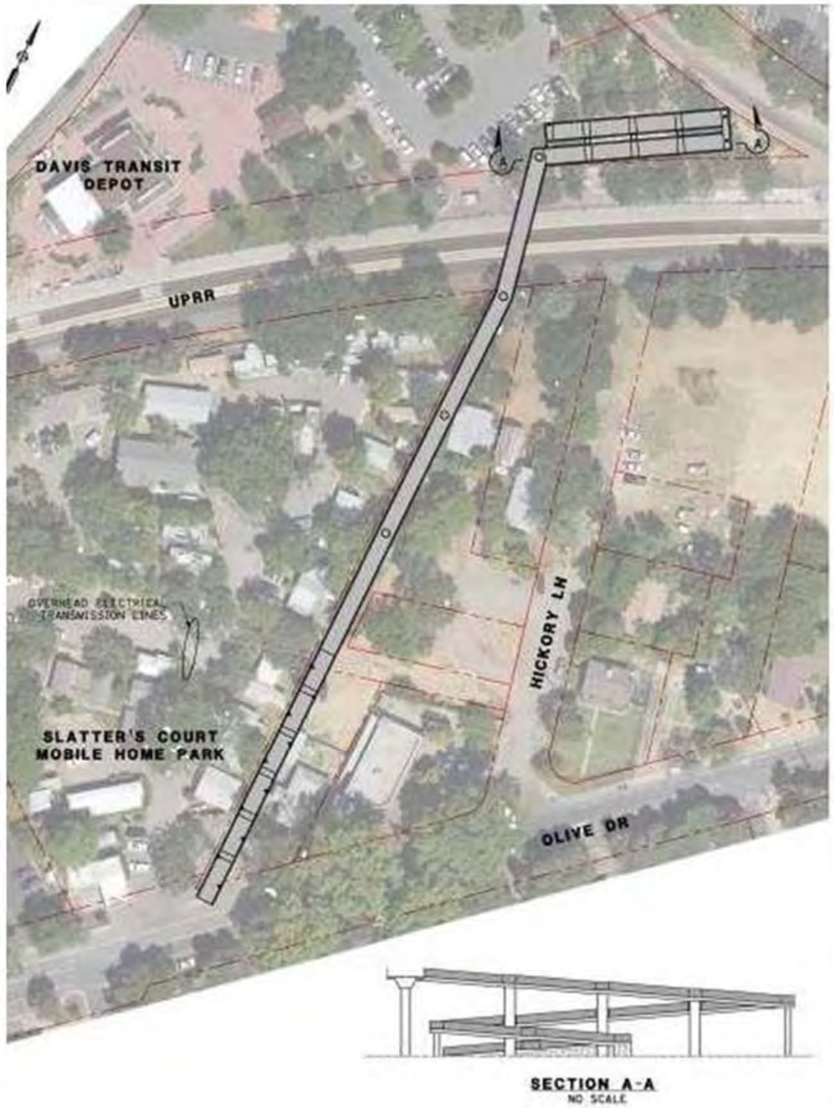


Figure 6 – Concept Layout of the Olive Drive to Transit Depot Ped/Bike Overcrossing (Linear Ramp Connection)

Olive - Looking south from Hickory Lane (Proposed pathway connection to the right is shown)

- The south end of the path would connect to the existing sidewalk and bike lanes on Olive Drive, approximately 250 feet west of the intersection with Hickory Lane at the western property line of the proposed Lincoln40 development.

- The pathway alignment proceeds in a northeasterly direction for 510 feet along the eastern property line for the Slatter's Court Mobile Home Park where it intersects the UPRR right-of-way. The crossing alignment angles slightly to shorten the crossing distance over the UPRR tracks and provide sufficient space for the access ramp on the Davis Transit Depot property.

- After crossing the tracks, the north end of the pathway descends in a series of switchback ramps on the eastern side of the Depot property and touches down near the pedestrian plaza area between the UPRR tracks and the Depot parking lot. (See Section A-A on Figure 6)
- Pathway users would continue through the Depot plaza area and parking lot to access downtown Davis at the east end of 2nd Street.

Vertical Alignment:

The vertical alignment is developed from south to north as follows:

- A linear access ramp with an 8.33% maximum gradient begins at the pathway's connection to Olive Drive and proceeds northeasterly for 210 feet with level landings provided every 30 feet to comply with ADA standards.
- After the linear ramp segment, the pathway continues at a 5% grade to the UPRR tracks on a three-span elevated bridge for 300 feet to the southern edge of the UPRR right-of-way.
- The clearance over the tracks accommodates the Union Pacific's minimum vertical clearance above the top of rail of 23 feet 4 inches.

Transit Depot - Looking south towards Slatter's Court (Proposed crossing location)

- The north end of the pathway descends to the grade of the Depot plaza using a series of four switchback ramps with a maximum gradient of 8.33% and level landing areas every 30 feet and at each switchback to comply with ADA standards.

Structures:

The proposed structure types to achieve the overcrossing include:

- 12-foot wide, cast-in-place concrete slab for a two-way bicycle and pedestrian pathway;
- 14-foot high, reinforced concrete retaining walls supporting linear and switchback ramp segments ascending from Olive Drive and descending to the Depot plaza;
- A 410-fott long, four-span, pre-stressed concrete (PC) girder bridge structure with a 4-foot structure depth. 84" cast-in drilled hole (CIDH) concrete piles and reinforced concrete columns, located beyond the UPRR right-of-way, would support the bridge and provide the minimum vertical clearance of 23 feet 4 inches for the crossing of the UPRR tracks; and
- A four-span PC girder structure with 72" CIDH concrete columns is provided for the switchback ramp structure descending to the Depot.

3.1.2 Alternative 2 – Olive Drive / Depot Overcrossing (Spiral Access Ramps)

Alternative 2 would construct a grade-separated pedestrian and bicycle path over the UPRR tracks on an alignment similar to the crossing described for Alternative 1, but with a change to spiral ramp structures that reduce the overall structure length and allow for better access to the pathway from the Lincoln40 development. **Figure 7** shows the proposed overcrossing layout.

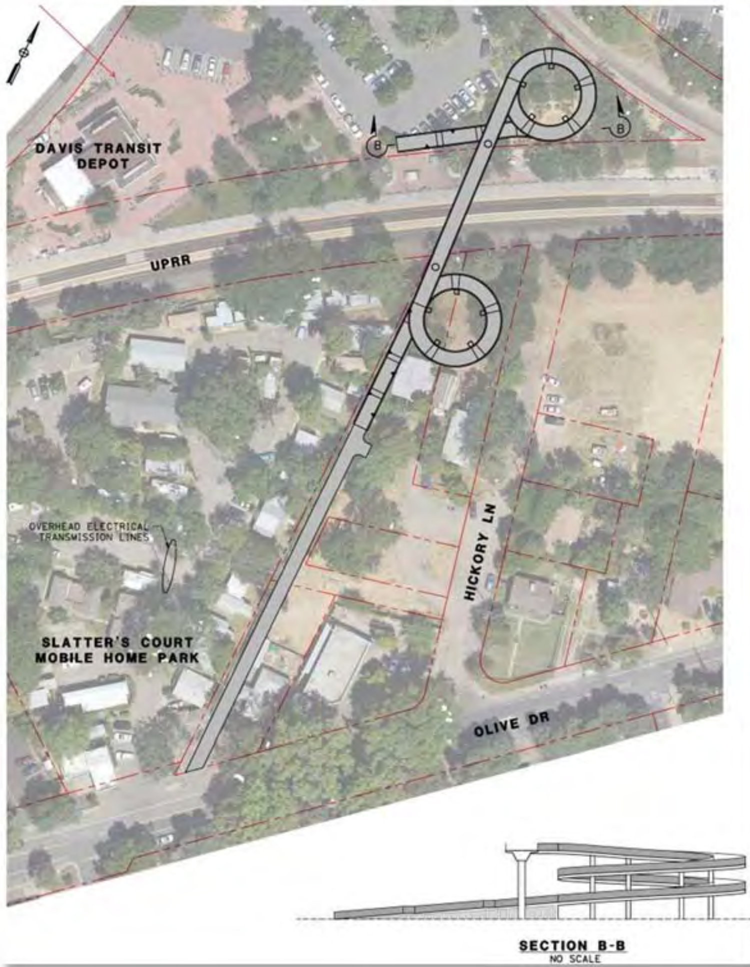


Figure 7 – Concept Layout of the Olive Drive to Transit Depot Ped/Bike Overcrossing (Spiral Ramp Connection)

Horizontal Alignment:

The horizontal alignment crossing the UPRR tracks is essentially the same as was developed for Alternative 1. The inside dimension of the spiral loop is 28 feet.

Vertical Alignment:

The vertical alignment is developed from south to north as follows:

- Proceeding north from Olive Drive, the pathway remains at-grade for 325-feet where a second access point would be provided from the planned Lincoln40 development.
- A spiral access ramp with an 8.33% maximum gradient begins at the pathway's connection to Lincol40 and adjacent to the UPRR right-of-way.

- The clearance over the tracks accommodates the Union Pacific's minimum vertical clearance of 23 feet 4 inches.
- The north end of the pathway descends to the grade of the Depot plaza using a multi-loop spiral access ramp with a maximum gradient of 8.33% and level landing areas every 30 feet to comply with ADA standards. (See Section B-B on Figure 7)

Structures:

The proposed structure types to achieve the overcrossing include:

- As with Alternative 1, a 12-foot wide, cast-in-place concrete slab for a two-way bicycle and pedestrian pathway.
- 8-foot high, reinforced concrete retaining walls to support the spiral ramps ascending from the south side of the UPRR tracks and descending to the Depot plaza.
- A 116-foot long single-span, pre-stressed concrete (PC) girder structure with a depth of four feet bridges the UPRR tracks. 84" cast-in drilled hole (CIDH) concrete piles and reinforced concrete columns, located outside the UPRR right-of-way, would support the bridge and provide the minimum vertical clearance of 23 feet 4 inches for the crossing of the UPRR tracks.
- A four-span PC girder structure with 72" CIDH concrete piles and reinforced concrete columns to support the spiral ramps ascending to the crossing bridge and descending to the Depot.

3.1.3 Alternative 3 – Olive Drive / Depot Underpass (Concrete Box Structure)

Alternative 3 would construct a grade-separated pedestrian and bicycle path under the UPRR tracks with a concrete box structure. Access to the structure would be provided in conformance with Americans with Disabilities Act (ADA) standards on ramps cut into existing ground. **Figure 8** shows the proposed underpass layout. The objective of this alternative is to provide an underground crossing with minimized visual impacts on private property.

The concrete box would be pushed (jacked) beneath the UPRR tracks so that the tracks remain in service at all times. The jacked portion of the box crosses the UPRR right-of-way at right angles to reduce construction costs and adhere to UPRR preferences for right angle crossings to minimize track movement and settlement.

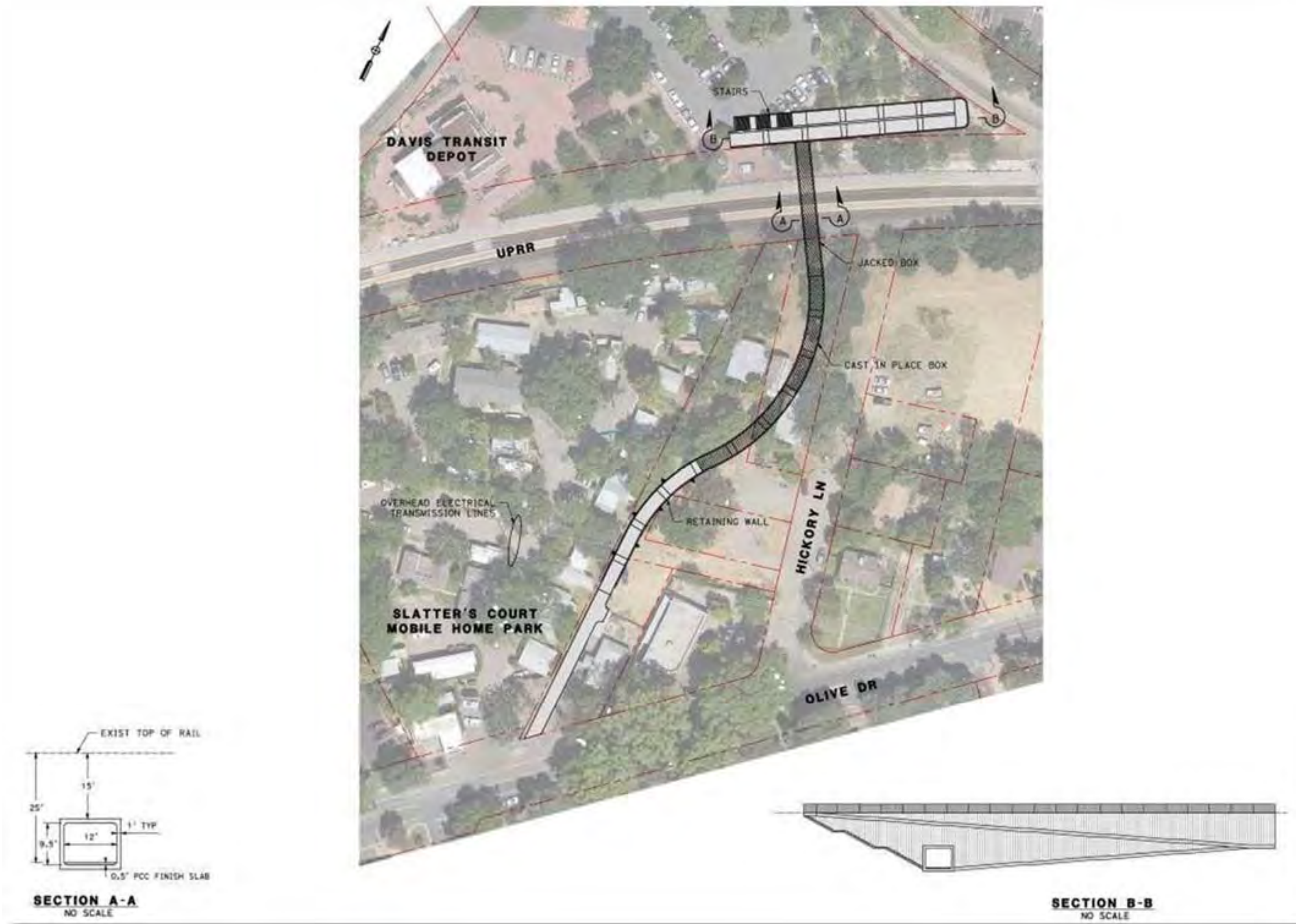


Figure 8 – Concept Layout of the Olive Drive to Transit Depot Ped/Bike Underpass Connection

<u>Horizontal Alignment:</u>

The horizontal alignment is essentially the same as was developed for Alternatives 1 and 2. Variations on the alignment between Alternatives 1 and 2 and this alternative include the following:

- As with Alternatives 1 and 2, the south end of the path would connect to the existing sidewalk and bike lanes on Olive Drive approximately 250 feet west of the intersection with Hickory Lane at the western property line for the planned Lincoln40 residential development.
- The pathway alignment proceeds, at-grade, in a northeasterly direction along the eastern property line for the Slatter's Court Mobile Home Park for 150 feet before descending on a curving access ramp to the crossing beneath the UPRR tracks. The curving alignment is needed to provide a perpendicular crossing of the tracks as would be required by UPRR for the underpass.
- The north end of the pathway ascends from beneath the UPRR tracks on the eastern side of the Davis Transit Depot property on a switchback ramp and pedestrian stairway ending at the pedestrian plaza area between the UPRR tracks and the Depot parking lot.

Vertical Alignment:

The undercrossing assumes 15 feet clearance from the top of the rail for the railroad subgrade including the tracks, ties and ballast. A detailed geotechnical evaluation is needed to confirm the depth. The distance most likely would not be decreased, but may be increased depending on soil conditions. The concrete box culvert will have a one-foot thick top and provide nine feet of vertical clearance for pedestrians. Therefore, the undercrossing profile is assumed to be depressed a total 25 feet to cross beneath the railroad.

The vertical alignment is developed from south to north as follows:

- Proceeding north from Olive Drive, the pathway remains at-grade for 150 feet where a second access point would be provided for the planned Lincoln40 development.
- The pathway would then begin its descent on an open cut ramp with an 8.33% maximum gradient and level landing areas every 30 feet to comply with ADA standards. A portion of the ramp will use a covered concrete box culvert beneath areas designated for parking, driveways and landscaping for the planned Lincoln40 development.
- North of the tracks, the pathway ascends to the grade of the Depot plaza area using a switchback ramp with a maximum gradient of 8.33% and level landing areas every 30 feet to comply with ADA standards.

Structures:

This proposed structure types to achieve the underground crossing include:

- As with Alternatives 1 and 2, a 12-foot wide, cast-in-place concrete slab is provided for two-way bicycle and pedestrian travel on the pathway.
- Reinforced concrete retaining walls would be constructed to limit grading on either side of the pathway. The walls would start at-grade and descend to a maximum depth of 10 feet on the south side of the tracks.
- A cut and covered, 205-foot long, concrete box structure would be provided the portion of the access ramp beneath areas designated for parking and driveways to the planned Lincoln40 development.
- A 125-foot long concrete box would be jacked across the UPRR right-of-way at a depth of 25 feet beneath the top of rail.
- 25-foot maximum height reinforced concrete retaining walls would be constructed for the 340-foot long switchback access ramp and stairway ascending to the Depot plaza.

Once constructed the City, not UPRR, would be responsible for the maintenance of the box under UPRR right-of-way. This is a recent change in UPRR policy.

3.1.4 Additional Variations Considered

Additional options were considered for the overcrossing alternative. Linear and switchback access ramps or spiral ramps could be used on one side of the overcrossing only or in conjunction with the switchback ramp. The same design concepts could also be shifted to the east to be within the right of way for Hickory Lane. These options would result in only minor differences in costs compared to the primary alternatives but may have more significant impacts to private property and utilities.

The reduced span over the railroad for the spiral ramp overcrossing alternative allows for an option to use a more aesthetically pleasing steel truss structure. The additional cost to provide a steel structure in place of concrete is $100,000.

3.2 Site Challenges

Site challenges associated with the Olive Drive to Transit Depot Pedestrian/Bicycle Connection project include space constraints for the access ramp structures to conform to the existing grade at Olive Drive and the Depot, impacts to private property, achieving regulatory clearance for the new railroad crossing, and potential conflicts with overhead and underground utilities.

Right of Way:

- There is an existing 40-foot wide public right-of-way for Hickory Lane between Olive Drive and the UPRR tracks near the eastern side of the Train Station property. However, there is a 130-unit student oriented development project (Lincoln40) in the planning stages on the north side of Olive Avenue that would redevelop existing residential parcels and buildings on both sides of Hickory Lane which would be converted to a driveway and parking area. The plans for the Lincoln40 project include a proposed bicycle and pedestrian easement on the western boundary of the development. The proposed pathway alignment would utilize this easement for the crossing to the Depot. A copy of the Site Plan for the Lincoln40 project is provided with **Attachment I**.
- The proposed alignment for the underpass diverts from the bicycle and pedestrian easement to be provided with the planned Lincoln40 development. This is needed to allow the underpass to be constructed perpendicular to the tracks. Therefore, an additional easement would be needed to accommodate the access ramp and culvert which would also necessitate revisions to the design of the Lincoln40 parking and landscape areas. Additional coordination will be necessary as plans are developed for both projects to ensure adequate width is provided for the bicycle and pedestrian easement and to construct the proposed pathway and crossing structures.
- UPRR – A 34-foot wide easement would be needed from the railroad for this project to accommodate the project's improvements (14 feet to the outside edge of the bridge deck and rails plus 10 feet on both sides for a maintenance easement. There would be minimal impacts to the existing railroad with this Alternative. The structure would be designed to place the columns outside of the UPRR right-of-way with a deck height above the minimum clearance height required by UPRR. The bridge span would be pre-cast or steel and would not require falsework to construct. During construction, railroad flaggers would be needed to signal the approach of trains when workers are within the UPRR right-of-way.

  A 16-foot wide easement would be needed from the railroad for this project to accommodate the concrete box structure. The underpass structure would be constructed at a sufficient depth to accommodate required clearances for existing and future tracks and access road. Based on discussions with UPRR staff, it is very likely the proposed jacking operation would not be approved by UPRR. **[See Chapter 6 for additional discussion of the UPRR approval process and coordination conducted as part of this study.]**


Transit Depot - Looking east towards garden area (Proposed pathway connection to Depot area)

- Davis Transit Depot – The property for the Davis Transit Depot is owned by the City of Davis, therefore, property acquisition is not needed to accommodate the pathway and access ramp structures on the north side of the UPRR tracks. The location of the ramp would eliminate a portion of the landscape garden area between the train boarding platform and Depot parking lot.

For the overcrossing alternative with spiral access ramps, the work would also result in permanent removal of up to 6 parking spaces if parking is not allowed to be restored beneath the spiral structure.

Utilities:

Existing utilities in the project area include the following:


Overhead power and communications crossing over Hickory Lane

- Overhead power transmission and communication lines cross the proposed pathway approximately midway between Olive Drive and the UPRR tracks. In addition, there are overhead electric service and communication lines on poles along the west side of the proposed crossing between the distribution lines and Olive Drive. The overhead transmission lines would likely need to be raised above the linear access ramp portion of the crossing structure to provide the minimum vertical clearance of 20 feet to the protective fences on both sides of the new pathway. The alternatives with spiral access ramps and the underpass would have at or below grade pathways crossing these lines so adjustment would not be needed.
- Utility poles carrying the electric and communication service lines west of the proposed pathway would likely need to be relocated away from the new crossing structures or undergrounded.
- Existing sewer and storm drain facilities are within the right-of-way for Hickory Lane with lateral connections to properties west of the proposed pathway. The sewer and storm drain facilities would be maintained by the Lincoln40 project and would need to be accommodated during design of the proposed bicycle and pedestrian overcrossing. The lines would need to be relocated to accommodate the proposed underpass structure.
- Petroleum and fiber optic facilities are located within the UPRR right-of-way but the petroleum line is assumed to be abandoned. The proposed concrete box structure would be constructed beneath these utilities and relocations would not be needed. The overcrossing structures would not impact the facilities in the UPRR right-of-way.
- Additional investigations and coordination with public and private utilities are needed during the preliminary engineering phase of project development to verify the location and clearances to existing utilities and to determine if there are other potential conflicts.

3.3 Visual Assessment

The overcrossing alternatives would result in visual impacts to adjacent properties including the Slatter's Court Mobile Home Park and planned Lincoln40 development. The spiral ramps alternative would have the advantage of reducing the structure length and reduce the visual impacts to adjacent properties. If a pre-manufactured steel truss type structure is used to span over UPRR, as would be possible with the spiral ramp alternative, the span could be painted any color or have other aesthetic features built into the structure. For both alternatives, it is assumed the visual impacts would be mitigated, to the extent possible, through aesthetic design of the new structure, preserving existing landscaping and trees to screen the structure, and providing cut-off optics and shields to limit the spread of lighting beyond the pathway area.

The underpass alternative would result in minimal visual impacts to adjacent properties which would be limited to safety railings and fences above open sections of the access ramps. It is assumed the visual impacts could be mitigated by planting new landscaping and trees to screen the structures.

3.4 Construction Staging / Risks

The project has three distinct segments; north side of UPRR, south side of UPRR and the UPRR track crossing. Each has their own unique features and impacts to existing users.

Construction would be sequenced to first perform all the utility relocations first. The overhead electric distribution/ phone/ CATV line on the west side of Lincoln40 development would either be raised or replaced underground. The overhead PG&E electric transmission line parallel to the UPRR tracks would need to be raised to increase permanent vertical clearance and may also need to temporally de-energized for the construction of the structure column and during placement of the girders over the UPRR tracks.

3.4.1 Overcrossing Alternatives

North of UPRR:

For the overcrossing alternative with linear access ramps, the work would be staged within the landscaped portion of the Depot and would require the temporary removal of approximately 12 parking spaces to provide staging and access for the contractor. Construction of the proposed concrete switchback ramps is normal construction. This construction would require approximately 10 months to complete.

Construction of the proposed concrete spiral ramps is slightly more complicated construction than for the linear ramps due to the constantly changing horizontal curves. This construction would require approximately 11 months to complete.

South of UPRR:

The linear access ramp alternative would use precast concrete girders that do not require falsework. This would allow the structure to be constructed more rapidly than a normal cast-in-place concrete structure, therefore limiting the construction duration. When the bottom of the structure is approximately 8 to 10 feet above ground, the construction would switch from precast concrete girders to dual retaining walls supporting the path. The contractor would need a 20-foot construction easement outside of the pathway on the eastern side plus additional area at each structure column. It would be beneficial if this portion of the path could be constructed either before or concurrently with the proposed Lincoln40 development project. The linear access ramp structure construction would require approximately 9 months to complete and can occur concurrently with the work on the north side of UPRR.

For the spiral access ramp alternative, the contractor would need a 20-foot construction easement outside of the spiral ramps within the Lincoln40 development and a 10-foot construction easement outside of the at-grade pathway. It would be beneficial if the spiral ramp portion of the path could be constructed either before or concurrently with the Lincoln40 project. Construction of the spiral ramp structure and connecting pathway would require approximately 11 months to complete and can occur concurrently with the work on the north side of UPRR.

UPRR Overhead:

The last segment would be to complete the span over UPRR after both approach structures have all the major structural elements completed (fencing and lighting can be ongoing). The span over UPRR is shown as precast concrete girders. Although the placing of the precast girders over the tracks would be performed in one day, working only when no trains are present, the entire construction over UPRR involves placing a cast-in-place concrete deck, barriers, railings and lighting. This phase would require two months of construction duration after the other structures north and south of UPRR are completed.

Risks:

Constructing precast girders over railroads is a normal type of construction. The greatest risk is discovery of unknown underground utilities or differing geologic site conditions not discovered during investigations. If the electric distribution overhead line needs to be de-energized during column construction or girder erection, this will need to be closely coordinated with PG&E as to when they will allow this. Although there are usually two time periods, mid-spring and mid-fall, when electricity use is lowest, the project could incur delays if unusual weather occurs and if PG&E will not allow a shutdown period, resulting in a construction claim for delay.

The risks associated with the spiral access ramp alternative are identical as Alternative 1, except if a steel manufactured structure is placed over UPRR, it will require more maintenance than a concrete girder structure. Steel bridges will need re-painting in their lifetime. Concrete girders could also be used for this alternative, however this would raise the bridge elevation by 2.5-feet because the steel truss needs only 18-inches between the bottom of the girder and the deck surface and the concrete girder requires at least 4-feet.

3.4.2 Underpass Alternative

The proposed underpass is a concrete box culvert that is jacked under the UPRR tracks. The box would be cast on a temporary concrete slab on the Lincoln 40 parcel and then jacked under the UPRR tracks. It was assumed that the top of the jacked box would be 15-feet below the top of rail. Jacking boxes of this size is somewhat rare, but not so extreme that would limit construction bids. After the box is jacked under UPRR, the southerly approach path would be constructed. It was shown with six 30-foot long ADA ramp cast-in-place concrete segments. Once completed, the area above the box could be used for parking or open space. The ramp/ stair section on the north side of

UPRR would begin construction after the box is jacked so that the exact elevation of the box is known.

On the south side of UPRR, within the Lincoln 40 parcel, a temporary construction easement would be needed. Approximately 50-feet of easement on the east side of the box would be needed during construction. The construction easement would extend to the western property line.

Within the Davis Transit Depot, the easterly 1/3 of the parking lot would be needed for staging during construction. Some of the trees in the parking islands would need to be removed along with some of the raised islands. Approximately 6 parking spaces would be permanently lost.

Risks:

The constructions risks of an underpass option are numerous.

Utilities- Utility lines that are to be protected in place during construction, such as the petroleum and fiber optic lines in the UPRR ROW could be damaged during box jacking operations. This would result in both large damage awards and potential emergency repairs that would delay UPRR operations.

Jacked Box Culvert- The greatest risk is that the jacking operation results in unacceptable horizontal or vertical movement of the UPRR tracks. The second greatest risk is if something unknown that is buried under UPRR tracks that causes the jacking operation to fail. Because UPRR will not allow an open cut to remove a buried object, the project may need to be abandoned until a new design concept is approved by UPRR.

Bidders Risk- There is a limited number of contractors that have the experience to jack a box as large as the proposed crossing. Adding in the very restricted width within the Depot to perform the work, the competition among bidders will be limited. Therefore, this could result in very high bid prices.

3.5 Cost Estimates

The preliminary estimates of project costs for each alternative have been prepared using a condensed Caltrans 11-page planning estimate format. A summary of project costs for each alternative are shown in **Tables 4, 5 and 6 below** and include construction costs, right-of-way acquisition and utility relocation costs, if needed, and soft costs including design and construction management expenses, is provided below. Table 5 includes the cost for a pre-fabricated steel overcrossing structure.

Table 4 – Olive Dr. to Depot Connection Cost Estimate: Alternative 1 – Overcrossing with Linear Access Ramps

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	PATH ITEMS				
1	Clearing and Grubbing	1	LS	$10,000	$10,000
2	Roadway Import	950	CY	$55	$52,250
3	PCC Path	70	CY	$350	$24,500
4	Aggregate Base	130	CY	$85	$11,050
5	Retaining Walls	4,400	SF	$100	$440,000
6	Lighting/Electrical	1	LS	$120,000	$120,000
7	Permanent Signing and Striping	1	LS	$50,000	$50,000
8	Railroad Flagger	10	DAY	$1,500	$15,000
	STRUCTURE ITEMS				
9	Chain Link Railing (Type 7L)	1,768	LF	$125	$221,000
10	72" CIDH Concrete Piling	225	LF	$1,200	$270,000
11	84" CIDH Concrete Piling	200	LF	$1,400	$280,000
12	Structure Excavation (BR)	47	CY	$390	$18,330
13	Structure Backfill (BR)	119	CY	$200	$23,800
14	Structural Concrete (BR)	777	CY	$1,200	$932,400
15	Bar Reinforcing Steel (BR)	177,409	LBS	$2	$266,114
16	Furnish PC/PS CA-WF Girder (120')	8	EA	$60,000	$480,000
17	Erect PC/PS CA-WF Girder	8	EA	$10,000	$80,000
	Misc. Minor Items	10%			$329,444.35
	SUBTOTAL				**$3,624,000**
	Mobilization	10%			$362,000
	Contingencies	25%			$906,000
	TOTAL CONSTRUCTION ESTIMATE				**$4,892,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	UPRR Costs				$50,000
	Right of Way Acquisition				$20,000
	Estimated Engineering and Environmental	15%			$734,000
	Estimated Construction Administration/Staking	12%			$587,000
	TOTAL ESTIMATED COST				**$6,283,000**

Table 5 – Olive Dr. to Depot Connection Cost Estimate: Alternative 2 – Overcrossing with Spiral Access Ramps

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	PATH ITEMS				
1	Clearing and Grubbing	1	LS	$10,000	$10,000
2	Roadway Import	330	CY	$55	$18,150
3	PCC Path	120	CY	$350	$42,000
4	Aggregate Base	240	CY	$85	$20,400
5	Retaining Walls	1,400	SF	$100	$140,000
6	Lighting/Electrical	1	LS	$120,000	$120,000
7	Permanent Signing and Striping	1	LS	$50,000	$50,000
8	Railroad Flagger	10	DAY	$1,500	$15,000
	STRUCTURE ITEMS				
9	Chain Link Railing (Type 7L)	1,860	LF	$125	$232,500
10	72" CIDH Concrete Piling	500	LF	$1,200	$600,000
11	84" CIDH Concrete Piling	100	LF	$1,400	$140,000
12	Structure Excavation (BR)	47	CY	$390	$18,330
13	Structure Backfill (BR)	119	CY	$200	$23,800
14	Structural Concrete (BR)	937	CY	$1,400	$1,311,800
15	Bar Reinforcing Steel (BR)	178,734	LBS	$2	$268,101
16	Furnish Prefab Truss	1	EA	$450,000	$450,000
17	Erect Prefab Truss	1	EA	$30,000	$30,000
	Misc. Minor Items	10%			$349,008
	SUBTOTAL				**$3,839,000**
	Mobilization	10%			$384,000
	Contingencies	25%			$960,000
	TOTAL CONSTRUCTION ESTIMATE				**$5,183,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	UPRR Costs				$50,000
	Right of Way Acquisition				$38,000
	Estimated Engineering and Environmental	15%			$777,000
	Estimated Construction Administration/Staking	12%			$622,000
	TOTAL ESTIMATED COST				**$6,670,000**

Table 6 – Olive Dr. to Depot Connection Cost Estimate: Alternative 3 – Underpass

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	PATH ITEMS				
1	Clearing and Grubbing	1	LS	$10,000	$10,000
2	Roadway Export	950	CY	$85	$80,750
3	PCC Path	200	CY	$350	$70,000
4	Aggregate Base	300	CY	$85	$25,500
5	Retaining Walls	10,000	SF	$175	$1,750,000
6	pump Station	1	LS	$100,000	$100,000
7	Lighting/Electrical	1	LS	$120,000	$120,000
8	Permanent Signing and Striping	1	LS	$50,000	$50,000
9	Sewer Relocation	1	LS	$100,000	$100,000
10	Railroad Flagger	3	DAY	$1,500	$4,500
	STRUCTURE ITEMS				
11	Concrete Box	210	LF	$6,400	$1,344,000
12	Jacked Box under UPRR	140	LF	$6,400	$896,000
	Misc. Minor Items	10%			$455,075
	SUBTOTAL				**$5,006,000**
	Mobilization	10%			$501,000
	Contingencies	25%			$1,252,000
	TOTAL CONSTRUCTION ESTIMATE				**$6,759,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	UPRR Costs				$150,000
	Right of Way Acquisition				$25,000
	Estimated Engineering and Environmental	20%			$1,352,000
	Estimated Construction Administration/Staking	12%			$811,000
	TOTAL ESTIMATED COST				**$9,097,000**

3.6 Traffic, Pedestrian and Bicyclist Assessment

In 2011, UPRR installed a heavy duty fence to prohibit crossings over the tracks by residents from the Olive Drive neighborhood. However, before the fence was installed, a 2008 study completed by UC Davis students counted the number of pedestrian crossings on the UPRR tracks between Richards Boulevard and Pole Line Road. The study found an average of about 30 crossings per hour during the peak periods and a total of 387 crossings for the three days of the study indicating the potential demand for a new crossing that would shorten the trip to the Depot and downtown. Since 2008, elementary school students from the Olive Drive neighborhood have been reassigned to attend schools in south Davis, rather than north of the UPRR tracks. Based on the 2008 report findings, 7 of the 89 crossings by school aged children were identified as elementary school aged students. Based on an assumed 20% growth factor, the demand for bicycle and pedestrian crossings in the vicinity of the Depot and L Street is expected to be approximately 36 crossings per hour during the peak hours.

The *Richards Boulevard-Olive Drive Corridor Transportation Analysis Report*, provided under separate cover, shows the Olive Drive neighborhood currently produces approximately 80 bicycle and 6 pedestrian trips during the morning peak hour alone. Only 20% of these trips use the Richards Boulevard tunnel into downtown Davis, with almost all of the remaining trips using the Putah Creek connection to UC Davis. This volume is expected to grow by 20% by year 2035.

The Davis Transit Depot Pedestrian/Bike Connection would reduce the walking time for residents of the Olive Drive neighborhood to a portion of the downtown area from 15 minutes via Richards Boulevard to less than 10 minutes via the new crossing. Overall the project would increase the area reachable within a 15 minute walk time from the Olive Drive neighborhood from 145 acres to 226 acres and have the potential to generate new walking and biking trips between Olive Drive and the area northeast of downtown. The walking time to the northern area of the UC Davis Campus, via H Street and Third Street, is also expected to be reduced with the addition of the pedestrian/bike connection, but would remain in excess of 15 minutes. Therefore, the addition of the pedestrian/bike connection to the Depot may result in only a minor reduction of the number of bikes and pedestrians crossing at the Olive Drive and Richards Boulevard intersection to access downtown and the Campus.

3.7 Pros and Cons of Each Alternative

Alternative 1: Overcrossing (Linear Access Ramps):

Pros:

- **R/W Acquisition** - The linear access ramp south of the UPRR tracks would be within the bicycle and pedestrian easement to be provided with the Lincoln40 development and no additional acquisition would be needed.
- **UPRR Involvement** - UPRR typically supports new overcrossings, especially when no falsework is used within their right-of-way.
- **"Throw Away" Cost** - There is no need for construction of any type of temporary facilities, such as a railroad shoofly, with this alternative.
- **Total Cost** - This alternative is cheaper, being easier to construct than the underpass alternative.
- **Duration** - This alternative can be staged from both sides of the UPRR tracks and it would take less time to construct than the underpass alternative.

Cons:

- **Utilities** - Relocations of overhead electric transmission and distribution lines, communications lines and poles would likely be needed.
- **Bridge Structure** - With this alternative the bridge is longer and more expensive than the spiral ramp alternative.
- **Visual Impacts - T**he overcrossing structure will be visible to residents from their backyards.

Alternative 2: Overcrossing (Spiral Access Ramps):

Pros:

- **Utilities** - Relocation of the overhead electric transmission and communications lines would not be needed.

- **UPRR Involvement -** UPRR typically supports new overcrossings, especially when no falsework is used within their right-of-way.
- **"Throw Away" Cost -** There would be no need for construction of any type of temporary facilities, such as a shoofly or phased utility relocations with this alternative.
- **Total Cost -** This alternative is cheaper, being easier to construct than the underpass alternative.
- **Duration -** This alternative can be staged from both sides of the tracks and would take less time to construct than the underpass alternative but take lightly longer to construct than the linear access ramp overcrossing.
- **Bridge Structure -** With this alternative, the bridge is shorter and less expensive than the linear access ramp overcrossing alternative. This option also allows the structure over the UPRR tracks to be a more attractive steel option.

Cons:

- **R/W Acquisition -** Most of the alignment would be within the bicycle and pedestrian easement to be provided with the Lincoln40 development but some property acquisition would be needed to accommodate the spiral access ramp.
- **Visual Impacts –** Impacts would be less than for Alternative 1 because the effective length of the overcrossing structure will be reduced with the spiral access ramps. However, the overcrossing structure and spiral access ramps would still be visible to residents from their backyards.

Alternative 3: Underpass (Concrete Box):

Pros:

- **Visual Impacts -** Residents would not see the pathway going under the UPRR tracks.
- **Utilities –** Relocation of overhead utilities is not needed with this Alternative. However, there would be need to protect petroleum (abandoned) and fiber optic lines in the UPRR right-of-way.

Cons:

- **UPRR Involvement -** UPRR prefers overhead crossing structures and would likely only approve an underpass where there is no a viable overhead option.
- **R/W Acquisition -** Only part of the alignment would be within the bicycle and pedestrian easement to be provided with the Lincoln40 development and some property acquisition or easements would be needed to accommodate the underground portion of the access ramp. The underpass would need to be constructed before the Lincoln40 project begins.
- **Total Cost -** This alternative would be the most expensive with the multiple retaining walls, as well as going under the tracks where the water table may need to be contained.
- **"Throw Away" Cost –** Based on discussions with UPRR staff, construction of a temporary shoofly would likely be needed with this alternative.
- **Duration -** This alternative will take longer to construct because of the staging needed to jack the concrete box structure under the tracks can only be completed on one side of the tracks. Coordination with UPRR and review time would also be much longer during the design development.
- **Construction Risk -** Risk is substantially higher with the box jacking operation than constructing normal bridge structures and foundations.

Table 7: Summary of Rankings for Alternatives

	Element	Alt 1 **Overhead** Linear/ Switchback Ramps	Alt 2 **Overhead Spiral Ramps**	Alt 3 **Underpass (Box)**
1	"Throw Away" Temporary Const. Cost	○	○	◒
2	UPRR Involvement/Cost	◒	◒	●
3	R/W Acquisition Cost	○	◒	◒
4	Utility Relocation Cost	●	○	◒
5	Total Cost	◒	◒	●
6	Visual Impacts	●	◒	○
7	Construction Duration	◒	◒	●
8	Constructability / Risk	○	○	●

Legend

● High

◒ Medium

○ Low

Summary:

Construction of all three alternatives is feasible. However, the underpass concrete box structure has a very high risk level and it is unlikely that UPRR would approve the underpass alternative without the construction of a temporary shoofly, which would increase project cost by $5 Million to $25 Million and lengthen the duration of construction.

4.0 Olive Drive Freeway Exit Ramp Closure

4.1 Project Description

Olive Drive - Looking east at the I-80 Exit Ramp

East Olive Drive is part of the historic route for the US40, Lincoln Highway, extending from San Francisco to New York City. The US40 Regional Bicycle Path is a key regional connection between Davis and Sacramento beginning at the east end of East Olive Drive and extending eastward to County Roads 32/105. The path is on Caltrans property under easement for bicycle use and maintenance to the City of Davis. The only other access to the bicycle path within Davis is at the westbound on and off ramps at the I-80 and Mace Boulevard interchange. Access to the path from East Olive Drive requires cyclists to cross the I-80 off-ramp, with vehicles traveling at high speeds. This connection presents a safety concern and may discourage use of the US40 Bicycle Path. Closure of the I-80 off-ramp would reduce traffic volumes and calm traffic on East Olive Drive.

US 40 Pathway - Looking west towads Olive Drive

A conceptual layout of the proposed closure of the I-80 Exit Ramp to East Olive Drive is provided in **Attachment G**. The closure would include removal of existing asphalt pavement on the exit ramp between East Olive Drive and I-80. **Figure 9** shows the proposed layout.

The City will be reconfiguring the connection to the US40 Bike Path with the upcoming pavement rehabilitation project on East Olive Dive and will shift the crossing west of the current location. The City project will connect to the Bike Path with a short segment of two-way cycle track on the north side of East Olive Drive that is separated from the travel lanes by striped islands and delineator posts.

4.2 Site Challenges

The project would be completed within the existing paved roadway, requiring no new right-of-way or utility relocations, but would require a Resolution of Change to the Freeway Agreement with Caltrans due to the change in access on I-80. Caltrans would be most concerned with the potential impacts resulting from the rerouting of freeway traffic to the westbound off-ramp at Richards Boulevard. An Encroachment Permit would also be required by Caltrans for the construction in State Right-of-way.

4.3 Visual Assessment

The ramp closure involves removal of roadway pavements and signage along the freeway. There would be minimal visual impact associated with the proposed changes. It is assumed the visual impacts would be mitigated with new plantings installed in the freeway ramp area.

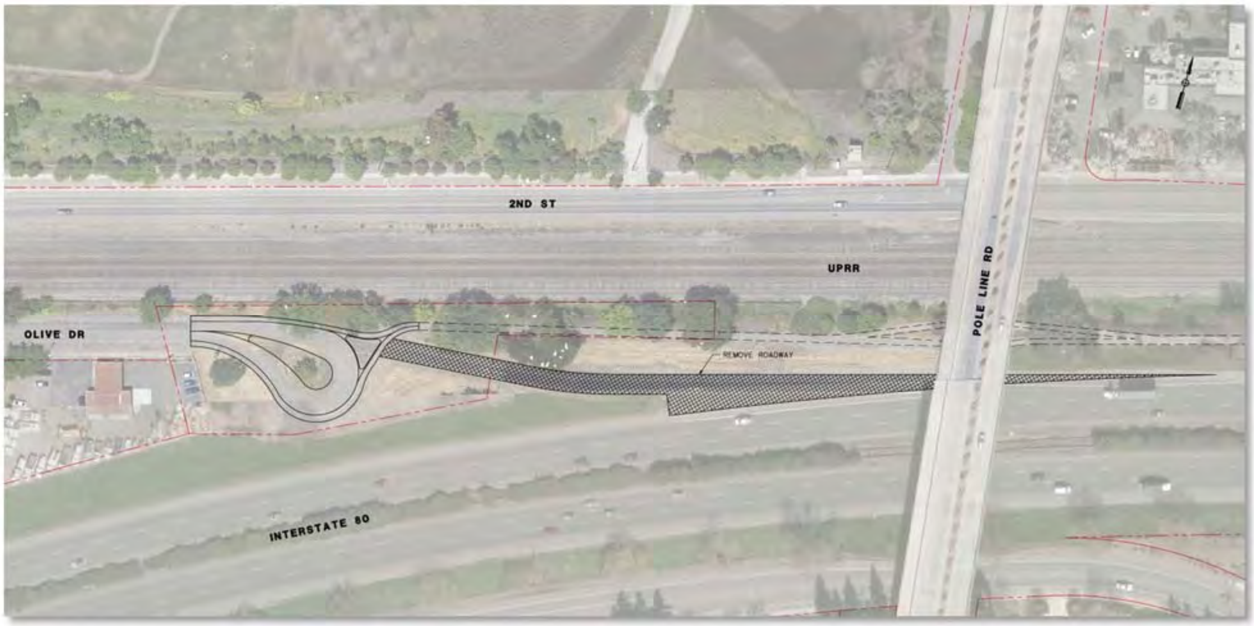


Figure 9 – Concept Layout of the Olive Drive Exit Ramp Closure

4.4 Construction Staging / Risks

Roadway closure involves excavation and removal of existing signage, striping and asphalt pavement. This type of work could be completed in a single stage with the closure of the exit ramp and there are minimal risks involved during the excavation that would be limited to digging in the vicinity of underground utilities. The anticipated duration of construction is approximately 1 month.

4.5 Cost Estimates

The preliminary estimate of project costs for this project have been prepared using a condensed Caltrans 11-page planning estimate format. A summary of project costs for the Olive Drive Exit Ramp Closure, including construction costs and soft costs, including design and construction management expenses, is shown in **Table 7 below.**

There are no anticipated right-of-way or utility relocation costs associated with this project.

Table 7 – Olive Dr. Exit Ramp Closure Cost Estimate

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	PATH ITEMS				
1	Clearing and Grubbing	1	LS	$10,000	$10,000
2	Remove Base And Surface	1,000	CY	$55	$55,000
3	HMA Roadway	600	TON	$105	$63,000
4	Aggregate Base	900	CY	$85	$76,500
6	Lighting/Electrical	1	LS	$120,000	$120,000
7	Permanent Signing and Striping	1	LS	$50,000	$50,000
	Minor Items	10%			$37,450
	SUBTOTAL				**$412,000**
	Mobilization	10%			$41,000
	Contingencies	25%			$103,000
	TOTAL CONSTRUCTION ESTIMATE				**$556,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	Estimated Engineering and Environmental	15%			$83,000
	Estimated Construction Administration/Staking	12%			$67,000
	TOTAL ESTIMATED COST				**$706,000**

4.6 Traffic, Pedestrian and Bicyclist Assessment

The *Richards Boulevard-Olive Drive Corridor Transportation Analysis Report*, prepared by Fehr & Peers and provided under separate cover, shows existing and anticipated future peak hour traffic at several intersections through the project area. The principal effect of the I-80 exit ramp to East Olive Drive closure would be to increase traffic volumes and queues on the westbound I-80 off-ramp at Richards Boulevard. The primary impact would be during the AM peak period when traffic volumes exiting the freeway are highest. However, if the Richards Boulevard Interchange improvement project is constructed, the Level of Service (LOS) of the I-80 Westbound ramps and Richards Boulevard intersection would improve to LOS D during the AM peak period resulting from reduced congestion at the nearby intersection of Richards Boulevard and Olive Drive. Vehicle queues for the westbound off-ramp would remain the same at 275 feet during the am peak period and would not exceed the available storage space of 1,150 feet. The impact during the PM peak would be much less, however the intersection LOS would worsen from LOS B to LOS C.

Without the addition of the L Street Connection, the impact to other intersections along Richards Boulevard for the Olive Drive Exit Ramp Closure would be negligible compared to the 'No Build' alternative with cumulative traffic conditions. Delay at the intersection of Richards Boulevard and Olive Drive would decrease slightly during the AM peak and increase slightly during the PM peak. With the L Street Connection, delay would increase at each intersection along Richards Boulevard during the PM peak periods. All intersections would continue to operate at LOS E or better with the exception of the intersection of First Street/D Street which would operate at LOS F during the PM peak.

The closure of the freeway exit ramp would improve safety for bicyclists and pedestrians accessing the US40 Bike Path by eliminating a potential high speed conflict with vehicles at the crossing point.

The closure of the exit ramp would also reduce the volume of vehicles on East Olive Drive by approximately half, making it a safer and more attractive street for walking and biking.

5.0 Olive Drive Bicycle Improvements

5.1 Project Description

Bicycle improvements are proposed along East Olive Drive to improve bicycle access between Richards Boulevard and the US40 Regional Bike Path. Two alternative cross sections have been evaluated. The first alternative would create a two-way cycle track on the north side of East Olive Drive to directly connect with the US40 Regional Bike Path. The cycle track would also connect with the proposed Downtown Gateway Arch project at Richards Boulevard. The second alternative would provide one-way median buffered bike lanes on both sides of Olive Drive between Richards Boulevard and the I-80 Exit Ramp. The buffered bike lanes would conform to the existing bike lane improvements to be installed by the City with the planned Olive Drive Pavement Rehabilitation project. Conceptual layouts and cross sections for the Olive Drive Bicycle Improvements project are provided in **Attachment H**.

US 40 Pathway - Looking west towads Olive Drive

Both alternatives could be completed within the existing paved roadway with narrowing of travel lanes on East Olive Drive to 10 feet wide and removal of median islands and curb extensions installed previously to calm traffic. The cycle track alternative would provide a dedicated two-way bicycle facility connecting the US40 Regional Bike Path to the proposed Gateway Arch. However, riders would be required to cross both lanes of traffic to reach apartments and businesses on the south side of the street. As an option, the cycle track could be continued on West Olive Drive to the Putah Creek Trail. This option would require widening West Olive Drive to the north and onto private property. The impacts associated with the widening include removal of parking spaces for businesses and the elimination of a garage bay at a car repair shop. **Figure 10** shows the proposed layout of the cycle track connection with the Gateway Arch project and the connection to the Putah Creek Trail.

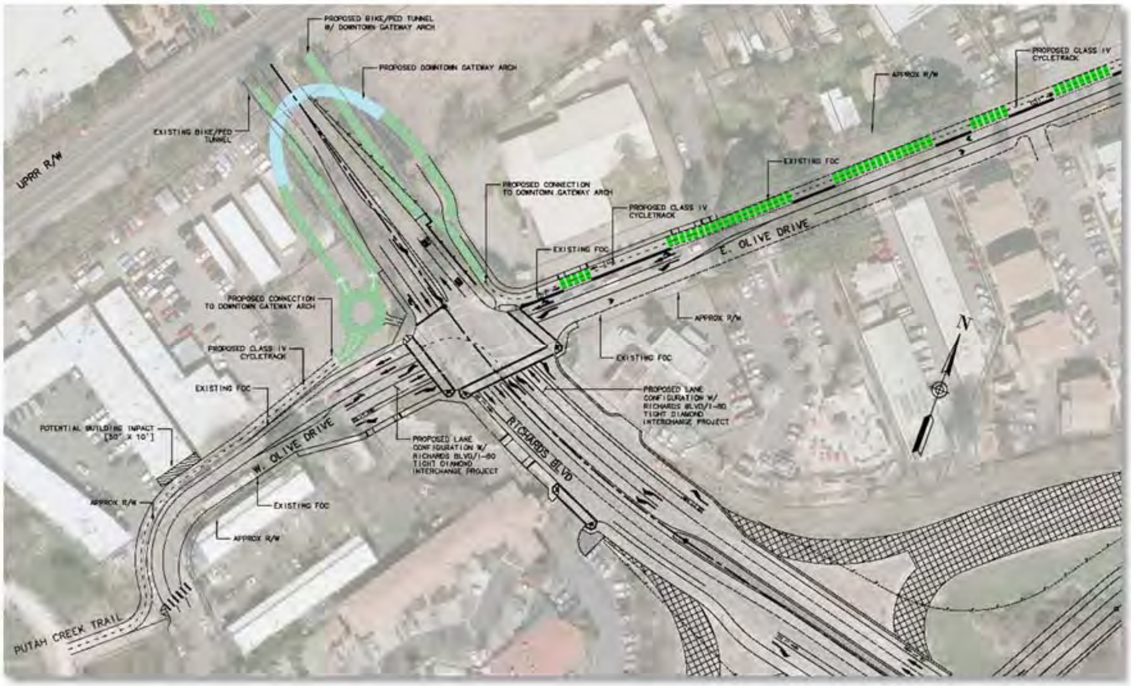
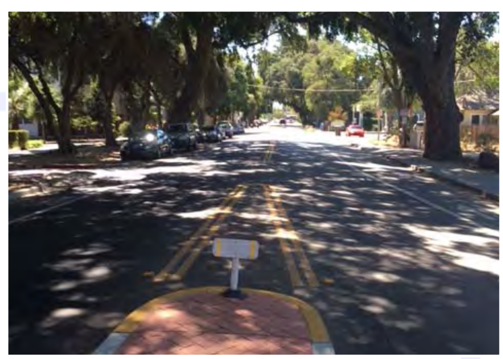


Figure 10 – Concept Layout of the Olive Drive Bicycle Improvements at Richards Boulevard

The buffered bike lanes alternative would provide dedicated bicycle facilities on both sides of the street to improve the connection between Richards Boulevard and the US40 Regional Bike Path. However, riders would be required to cross East Olive Drive at Richards Boulevard, to access the proposed Gate Way Arch facility, and at the east end of East Olive Drive, to access the US40 Regional Bike Path. This alternative would result in removal of most of the on-street parking along Olive Drive.

5.2 Site Challenges



Olive Drive - Looking west at Hickory Lane
(On-street parking and medians would be impacted by proposed bicycle improvements)

The primary challenge associated with the bicycle improvements would be the removal of on-street parking spaces on East Olive Drive. There are a total of 69 available on-street parking spaces on the street in front of the businesses and residences and they appear to be highly utilized during the day. The proposed buffered bike lane improvements would eliminate all but five of those spaces. The proposed cycle track improvements would allow for 20 on-street parking spaces to remain. There are no additional on-street or public parking lot spaces in the vicinity to East Olive Drive to replace the lost parking capacity. Therefore, additional widening East Olive Drive, which would result in removal of mature trees, would be needed to restore on-street parking spaces eliminated with the project. Roadway widening to restore parking is not included in the estimated costs for this project.

The City would need to acquire right-of-way from the commercial businesses on the north side of West Olive Drive to extend the cycle track from Richards Boulevard to the Putah Creek Trail. In addition, this option would result in parking lot and building impacts that could require additional mitigation. Costs associated with the right-of-way acquisition and impacts are not included in the estimates for this project.

5.3 Construction Staging / Risks

Roadway demolition and widening is standard work with minimal risks other than encountering unknown underground structures and utilities or for removal and disposal of hazardous and unsuitable soils excavated from the site. The project would take either one or two stages to construct depending on the alternative selected. Two stages are assumed to construct the buffered bike lanes alternative for work on both sides of East Olive Drive. This construction would require approximately 3 months to complete.

5.4 Cost Estimates

The preliminary estimates of project costs for this project have been prepared using a condensed Caltrans 11-page planning estimate format. A summary of project costs for the Olive Drive Bicycle Improvements, including construction costs and soft costs, including design and construction management expenses, are shown in **Tables 8, 9 and 10 below.**

There are no anticipated right-of-way or utility relocation costs associated with the base project to improve bicycle facilities on East Olive Drive.

Table 8 – Olive Dr. Bicycle Improvements Cost Estimate: Alternative 1 – Two-way Cycle Track

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	PATH ITEMS				
1	Roadway Excavation	1	LS	$68,000	$68,000
2	Remove Thermoplastic Traffic Stripe	1	LS	$8,000	$8,000
3	Asphalt Concrete	180	Ton	$110	$19,800
4	Slurry Seal	16,500	SY	$3	$49,500
5	Aggregate Base	30	CY	$85	$2,550
6	Minor Concrete (PCC Path)	22	CY	$350	$7,700
7	Minor Concrete (Island Paving)	47	CY	$500	$23,500
8	Median Curb (Extruded Barrier Curb Davis Standard Plan 301-2)	4,800	LF	$40	$192,000
9	Curb and Gutter (Type 2)	285	LF	$50	$14,250
10	Pavement Striping, Markings, and Markers	1	LS	$53,000	$53,000
11	Green Bike Lane Coating	1	LS	$28,000	$28,000
12	Permanent Signs	1	LS	$1,000	$1,000
13	Remove Drainage Inlet	1	LS	$2,000	$2,000
14	Install Drainage Inlet	1	LS	$3,000	$3,000
15	18" Reinforced Concrete Pipe	1	LS	$2,700	$2,700
16	Traffic Control System	1	LS	$38,000	$38,000
	Misc. Minor Items	10%			$51,300
	SUBTOTAL				**$564,000**
	Mobilization	10%			$56,000
	Contingencies	25%			$141,000
	TOTAL CONSTRUCTION ESTIMATE				**$761,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	Estimated Engineering and Environmental	20%			$152,000
	Estimated Construction Administration/Staking	12%			$91,000
	TOTAL ESTIMATED COST				**$1,004,000**

Table 9 – Olive Dr. Bicycle Improvements Cost Estimate: Alternative 2 – Buffered Bike Lanes

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	PATH ITEMS				
1	Roadway Excavation	1	LS	$72,000	$72,000
2	Remove Thermoplastic Traffic Stripe	1	LS	$8,000	$8,000
3	Asphalt Concrete	220	Ton	$110	$24,200
4	Slurry Seal	16,500	SY	$3	$49,500
5	Aggregate Base	30	CY	$85	$2,550
6	Minor Concrete (PCC Path)	22	CY	$350	$7,700
7	Minor Concrete (Island Paving)	46	CY	$500	$23,000
8	Median Curb (Extruded Barrier Curb Davis Standard Plan 301-2)	9,550	LF	$40	$382,000
9	Curb and Gutter (Type 2)	350	LF	$50	$17,500
10	Pavement Striping, Markings, and Markers	1	LS	$57,500	$57,500
11	Green Bike Lane Coating	1	LS	$3,600	$3,600
12	Permanent Signs	1	LS	$1,000	$1,000
13	Remove Drainage Inlet	1	LS	$2,000	$2,000
14	Install Drainage Inlet	1	LS	$3,000	$3,000
15	18" Reinforced Concrete Pipe	1	LS	$2,700	$2,700
16	Traffic Control System	1	LS	$52,500	$52,500
	Misc. Minor Items	10%			$70,875
	SUBTOTAL				**$780,000**
	Mobilization	10%			$78,000
	Contingencies	25%			$195,000
	TOTAL CONSTRUCTION ESTIMATE				**$1,053,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	Estimated Engineering and Environmental	20%			$211,000
	Estimated Construction Administration/Staking	12%			$126,000
	TOTAL ESTIMATED COST				**$1,390,000**

Table 10 – Olive Dr. Bicycle Improvements Cost Estimate: West Olive Dr. Cycle Track Connection

NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
	PATH ITEMS				
1	Roadway Excavation	1	LS	$93,000	$93,000
2	Remove Thermoplastic Traffic Stripe	1	LS	$500	$500
3	Asphalt Concrete	175	Ton	$110	$19,250
4	Slurry Seal	80	SY	$3	$240
5	Aggregate Base	125	CY	$85	$10,625
6	Minor Concrete (PCC Path)	40	CY	$350	$14,000
7	Curb and Gutter (Type 2)	360	LF	$50	$18,000
8	Pavement Striping, Markings, and Markers	1	LS	$2,500	$2,500
9	Remove Drainage Inlet	1	LS	$2,000	$2,000
10	Install Drainage Inlet	1	LS	$3,000	$3,000
11	18" Reinforced Concrete Pipe	1	LS	$2,700	$2,700
12	Traffic Control System	1	LS	$13,265	$13,265
	Misc. Minor Items	10%			$17,908
	SUBTOTAL				**$197,000**
	Mobilization	10%			$20,000
	Contingencies	25%			$49,000
	TOTAL CONSTRUCTION ESTIMATE				**$266,000**
	ESTIMATED "SOFT" OR "OTHER" COSTS				
	Estimated Engineering and Environmental	20%			$53,000
	Estimated Construction Administration/Staking	12%			$32,000
	TOTAL ESTIMATED COST				**$351,000**

5.5 Traffic, Pedestrian and Bicyclist Assessment

The addition of bicycle improvements to separate the bike lanes from vehicular travel lanes would further improve safety for bicyclists, encourage additional trips by less skilled bike riders, and improve connections to existing bicycle paths.

6.0 UPRR Crossing Approval Process and Recommendations

6.1 UPRR Crossing Guidelines

UPRR published new crossing guidelines dated January 5, 2016. The following paragraph is from the cover of their guidelines.

> "It is the intent of the Railroad to maintain the right-of-way free of permanent obstructions such as overhead bridge piers, earth fills and drainage facilities which do not support Railroad infrastructure. Permanent obstructions restrict the Railroad's ability to perform maintenance and expand service to existing and future customers. Keeping the right-of-way unobstructed is not a betterment for the Railroad, it is a necessity."

The following paragraphs are excerpted from their guidelines.

> "The most effective method for reducing interference to Railroad operations for construction of Grade Separation Projects is to use an Overhead Structure and avoid an Underpass Structure."
>
> The Railroad discourages Underpass Structures due to safety concerns, possible interruption to Railroad operations, cost, and limitation of future replacement and maintenance.
>
> The Railroad recommends the use of an Overhead Structure which can be designed and constructed without interruption to Railroad operations.
>
> The analysis of Cost-Benefit ratio shall be fully considered before the structure type is finalized. Cost-Benefit ratio must include all costs associated with interruption to Railroad operations during construction of the proposed structure and/or future replacement structure in addition to future maintenance and other applicable costs. However, economy alone shall not be the governing factor in determining structure type.
>
> The proposed design plans shall allow the Contractor to execute a work plan that enables the track(s) to remain in service and shall cause no interruption to the Railroad's operation during construction.
>
> Prior to any review, the Railroad Local Representative shall receive written notice from the Applicant agreeing to pay all costs associated with the Railroad's, or its consultant's, review of the design plans, construction documents and construction monitoring phase."

6.2 Crossing Approval Process

Because the railroad encourages overhead structures that can clear span their entire right-of-way, the approval process for an overhead crossing at L Street or the Depot would be simpler than for an underground crossing. Concept plans, an agreement for the City to pay UPRR review costs, and 100% design plans would need to be submitted to UPRR. Prior to the submittal of the 100% plans, the City will enter into a Construction and Maintenance Agreement (C&M). The C&M cannot be completed until an advertising date for construction is known because UPRR approval of design plans has only a two year shelf life, after which the design plans must be re-reviewed and approved. While the details of the C&M are being resolved, and after CEQA approval, an application for a new grade separated crossing is submitted to the California Public Utilities Commission (CPUC). Because UPRR is expected to be in agreement with the overhead crossing, they would not object to a new crossing at the CPUC public hearing and the project can proceed into construction.

UPRR Policy discourages underpasses and purposely makes the process difficult. UPRR estimates their review costs are double to triple the costs for review of an overhead structure. A cost-benefit analysis is required and must include any and all construction, maintenance and replacement costs, including all costs for UPRR time and materials. UPRR does not require a cost-benefit analysis for overhead structures. The minimum threshold for an agency to obtain UPRR approval for an underpass is to prove it almost impossible to construct an overhead structure. Such a case may occur where the railroad is elevated above the nearby ground level and it is not possible for a roadway to come to grade within the physical constraints of the area. UPRR does not consider aesthetics or public opinion in the cost-benefit analysis. Their guidelines state that costs alone do not determine whether to go over or under the railroad, meaning that even if an underpass is more cost effective, it would be difficult to obtain UPRR approval.

6.3 UPRR Coordination

As part of this study, a meeting was held with UPRR staff at the Davis Transit Depot on August 31, 2016 to review the initial concepts. UPRR staff were supportive of the overhead crossing options for both the Transit Depot and L Street Connections. Although they did not reject the underpass options discussed, they made it very clear that approval of an underpass was unlikely under any condition due to the long term risk to railroad operations. Further, they discussed that tunneling or jacking a pipe or box under their tracks would likely not be approved due to the construction risks of the track shifting during construction or settling over a longer period after construction. UPRR staff expects they would require the temporary relocation of the tracks, known as a shoofly, to allow normal top down construction to negate this risk. The length of the shoofly would be approximately 1,000 to 2,000-feet on each side of the underpass, depending on the design speed specified by the railroad. Unfortunately, this site has station landings and a “Y” track serving the California Northern Railroad (CNR) that would fall within the potential shoofly limits for Depot and L Street Connection projects. Temporary station landings would need to be constructed prior to removing the existing track from service. Because the shoofly track design speed is unknown, it is also unknown if the closest corner of the existing depot building would need to be removed to allow for the shoofly construction to the north. Shoofly construction to the south would be easier because the existing station landings could remain in place. However, approximately 25 residential structures would need to be removed to provide the right-of-way for the shoofly.

Shoofly construction very costs are difficult to estimate without performing detailed track design. All work performed within 15-feet of the center of the nearest track must be performed by UPRR’s own employees or one of UPRR’s on-call contractors and therefore would not be subject to competitive bidding. Almost all of the shoofly construction would fall in this category. An estimate of shoofly construction costs would range from a low of $5,000,000 to a high of $25,000,000 including construction of temporary station landings, relocating up to 4,000-feet of mainline UPRR railroad track, relocating 1,000-feet of CNR lines and switches, relocating conflicting utilities and potentially relocating up to 25 residential units. Due to the high cost and the very low probably that UPRR would approve an underpass, shoofly construction costs and impacts were not studied to the same level of detail as the other alternatives.

6.4 Summary of Estimated Costs

The preliminary estimates of project costs for each project alternative included in this study have been prepared using a condensed Caltrans 11-page planning estimate format. A summary of project costs for each project, including construction costs, right-of-way acquisition and soft costs including design and construction management expenses, is provided in **Table 11** below.

Table 11: Summary of Costs

	Transit Depot Ped/Bike Connection			L Street Connection		Olive Dr Exit Ramp Closure	Olive Dr Bicycle Improvements		Richards/I-80 Interchange	Downtown Gateway Arch	Pole Line Road Connection
	Alternative 1 Olive Drive / UPRR Overhead (Linear and Switchback Ramps)	**Alternative 2 Olive Drive / UPRR Overhead (Spiral Ramps)**	**Alternative 3 Olive Drive / UPRR Underpass[1] (Concrete Box)**	**Alternative 1 Olive Drive / L Street Overhead**	**Alternative 2 Olive Drive / L Street Underpass[1]**	**Olive Drive Exit Ramp Closure**	**Alternative 1 Two-way Cycle Track**	**Alternative 2 Buffered Bike Lanes**	**Modify Richards Blvd at the I-80 Interchange[2]**	**Pedestrian Trails, Tunnel and Bridge[3]**	**Pole Line Road Connection**
Roadway/Pathway Items	723,000	416,000	2,240,000	5,445,000	25,467,000	375,000	513,000	709,000	3,870,000	3,370,000	216,000
Structure Items	2,572,000	3,074,000	2,311,000	8,161,000	6,020,000	-	-	-	1,050,000	1,293,000	1,795,000
Miscellaneous Items (10%)	329,000	349,000	455,000	1,360,000	2,663,000	37,000	51,000	71,000	492,000	-	201,000
Mobilization (10%)	362,000	384,000	501,000	1,497,000	3,415,000	41,000	56,000	78,000	602,000	-	221,000
Contingency (25%)	906,000	960,000	1,252,000	3,742,000	8,538,000	103,000	141,000	195,000	1,551,000	932,000	553,000
Construction Subtotal	**4,892,000**	**5,183,000**	**6,759,000**	**20,205,000**	**46,103,000**	**556,000**	**761,000**	**1,053,000**	**7,565,000**	**5,595,000**	**2,986,000**
Right of Way	20,000	38,000	25,000	600,000	630,000	-	-	-	[Not Included]	[Not Included]	-
Capital Cost Subtotal	**4,912,000**	**5,221,000**	**6,784,000**	**20,805,000**	**46,733,000**	**556,000**	**761,000**	**1,053,000**	**7,565,000**	**5,595,000**	**2,986,000**
UPRR Agreement / Review	50,000	50,000	150,000	100,000	150,000	-	-	-	-	[Not Included]	-
Engineering and Environmental Document	734,000	777,000	1,352,000	3,031,000	9,221,000	83,000	152,000	211,000	1,135,000	1,165,000	560,000
Construction Administration and Staking	587,000	622,000	811,000	2,425,000	5,532,000	67,000	91,000	126,000	910,000	[Not Included]	336,000
Project Development Subtotal	**1,371,000**	**1,449,000**	**2,313,000**	**5,556,000**	**14,903,000**	**150,000**	**243,000**	**337,000**	**2,045,000**	**1,165,000**	**896,000**
Grand Total	**$6,283,000**	**$6,670,000**	**$9,097,000**	**$26,361,000**	**$61,636,000**	**$706,000**	**$1,004,000**	**$1,390,000**	**9,610,000**	**$6,760,000**	**$3,882,000**

Note: 10% has been added to Construction Items for miscellaneous minor items. For the Overhead Crossing alternatives, the Engineering / Environmental Document, and Construction Administration / Staking, and Environmental Document are approximately 15%, and 12% of the Construction Subtotal, respectively. For the Underpass Crossing alternative, the Engineering / Environmental Document, and Construction Administration / Staking, and Environmental Document are approximately 20%, and 12% of the Construction Subtotal, respectively.

1 Underpass estimates do not include the anticipated cost of a temporary shoofly structure which could increase costs by $5 Million to $25 Million.

2 Estimate prepared by MTCo in June 2016. Cost would be decrease by $730,000 for alternative without the grade separated pedestrian and bicycle pathway under the freeway on-ramp.

3 Estimate prepared by G. Albertson for Cunningham Engineers on 4/13/2016. Cost would be reduced by $1,730,000 with elimination of pedestrian/bike pathway and tunnel on the east side of Richards Boulevard.

6.5 Recommendations

For the combination of anticipated traffic growth and infrastructure projects analyzed in this study and based on the impacts identified for the alternative improvement projects studied and the likelihood of UPRR approval for new grade crossings, it is recommended the City prioritize the following projects:

Priority 1A – Richards Boulevard/I-80 Tight Diamond Interchange:

The traffic analysis shows the project's improvements to realign and signalize the westbound ramps to I-80 and to improve capacity at the I-80 eastbound ramps at Richards Boulevard, combined with additional improvements associated with other developments at Richards Boulevard and Research Park Drive and at Richards Boulevard and Olive Drive, would have the most beneficial impact to traffic circulation through the study area. The proposed bicycle and pedestrian pathway associated with the interchange project would improve access and safety for non-motorized travel between south Davis and downtown along Richards Boulevard. If funded, this project could be opened to traffic in fall 2020.

Priority 1B - Olive Drive Exit Ramp Closure:

Completion of the Richards Boulevard interchange project would provide sufficient vehicular capacity on Richards Boulevard to accommodate the rerouted traffic associated with the closure of the Olive Drive exit ramp from I-80. Therefore the proposed Olive Drive Exit Ramp Closure could be completed in conjunction with the Richards/I-80 Interchange project or separately following project completion. The Olive Drive Exit Ramp Closure project would directly benefit the residents of the Olive Drive neighborhood by substantially reducing traffic volumes and making the street safer and more attractive to walking and biking.

Priority 2 – Downtown Gateway Arch:

The Downtown Gateway Arch structure over Richards Boulevard would reduce potential conflicts between vehicles and bikes and pedestrians at the intersection of Richards Boulevard and Olive Drive and directly benefit residents of the Olive Drive neighborhood to access downtown Davis and the UC Davis campus.

Based on the review of bicycle and pedestrian activity through the area, it appears the additional tunnel beneath the UPRR tracks on the east side of Richards Boulevard would not be as beneficial as the majority of walking and biking travel from the Olive Drive neighborhood appears to be directed towards the UC Davis campus. Following discussions with UPRR staff, it also appears the construction of a railroad shoofly would be needed prior to installing the new tunnel beneath the tracks on the east side of Richards Boulevard, making construction infeasible without damaging the existing roadway underpass.

Priority 3 – Olive Drive Bicycle Improvements:

Improvements to the bicycle facilities along Olive Drive would be beneficial to the neighborhood and would be best as a follow-on project to the Olive Drive Exit Ramp Closure project, which would reduce traffic volumes on the street, and the Downtown Gateway Arch project, which would improve access and safety crossing Richards Boulevard. However, the bicycle improvements could be pursued independently of the other projects if need for improved bicycle facilities is increased, resulting from the completion of development on the Nishi property or with the Lincoln40 project. The proposed two-way cycle track alternative is recommended as it would create a continuous two-way bicycle facility connecting the US40 Bike Path, Gateway Arch and Putah Creek Trail and would preserve most of the available on-street parking spaces on Olive Drive, which appear to be highly utilized.

Priority 4A & 4B - Pole Line Road and Davis Transit Depot Bicycle/Pedestrian Connections:

Both options have merits. The Pole Line Road Bike/Pedestrian Connection project would improve access to the US40 Bike Path from the areas north and south of I-80 and the UPRR tracks. The Davis Transit Center Bike/Pedestrian Overcrossing option would provide better access for the residents of the Olive Drive neighborhood and the proposed Lincoln40 project to downtown. The higher cost of the Depot Connection relative to the Pole Line Road Bike/Pedestrian Connection would make the Davis Transit Center Bike/Pedestrian less desirable. If the Lincoln40 project contributes fair share funding the Depot project, this cost difference may not be important and it would be more advantageous to construct this crossing prior to or concurrent with the Lincoln40 project development because the Lincoln40 parcel provides an ideal construction staging area, thus potentially reducing the construction cost.

Non-Priority Projects
L Street to Olive Drive Connection:

The L Street to Olive Drive vehicle connection is not recommended for implementation. The L Street Vehicle Connection project would not provide the anticipated traffic circulation benefits due to the rerouting of trips into downtown away from Mace Boulevard and Pole Line Road / UPRR grade crossings. In addition, the L Street Vehicle Connection project would substantially alter the character of Olive Drive and surrounding neighborhood with the addition of vertical or underground structures. The construction would require removal of most, if not all, of the mature trees along the street.