



4.0 Concept Development

For this project, Concept Development analysis included:

- Bridge Structure Evaluation
- Conceptual Engineering
- Station/Stop Design Criteria
- Cost Estimating

One of the most critical elements that can set the stage for the successful implementation of a streetcar system occurs through **Concept Development**. In general, **Concept Development** focuses on:

- Avoiding underground utilities where possible
- Minimizing potential modifications to traffic operations at critical intersections
- Minimizing impacts to on-street parking
- Configuring termini with consideration for future expansion
- Optimizing streetcar operations

For this project, such issues as the structural integrity of the Tower Bridge and I-5 overpasses can affect project costs. Where the tracks and stations are physically placed can have a direct effect on capital costs, traffic operations, surrounding built environment and the amount of disruption to the community during construction.

4.1 Bridge Structure Evaluation

The Downtown/Riverfront Streetcar Study project area includes two existing bridges - the Tower Bridge over the Sacramento River and the Capitol Mall Separation, which carries Capitol Mall

Figure 14. West Sacramento Approach to Tower Bridge



over Interstate 5. The analysis includes a preliminary investigation of both structures' ability to carry streetcar traffic with current motor vehicle, bicycle and pedestrian traffic. Lane configurations, clearances and structural capacities of each bridge were also analyzed. The evaluation also included preliminary recommendations for addressing issues related to bridge structures. Historic issues were explored as part of the environmental screening process.

A Bridge Structure Evaluation Technical Memorandum detailed findings of the analysis. Summaries of specific findings



are described below:

4.1.1 The Tower Bridge

The Tower Bridge (Figure 14, above), owned by Caltrans, is listed on the National Register of Historic Places. It is a seven-span steel truss and plate girder bridge with lightweight concrete deck. The bridge spans 737 feet 7 inches over the Sacramento River. The main river span is a vertical lift span measuring 209 feet 6 inches. The lift span is flanked by truss spans of 192 feet 6 inches and 167 feet 5 inches on the west and east, respectively. The overall bridge width is just over 68 feet with a 52-foot-wide roadway and 4-foot wide sidewalks cantilevered outside of the trusses.

The bridge originally carried a single track electric interurban passenger and freight railway line along the center of the bridge flanked two lanes of traffic on each side. After the interurban passenger trains stopped operating, freight trains continued to use the bridge for a number of years before the tracks were paved over and ultimately removed.

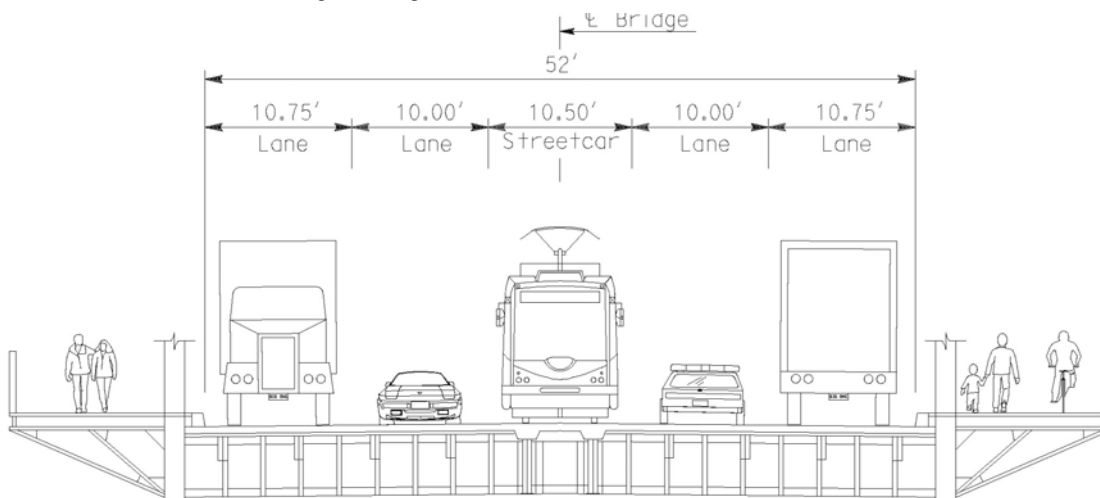
Alternatives Evaluated

Three rail transit alternatives were evaluated to determine the most efficient traffic and streetcar operation scenario and to assess whether structural reinforcements would be needed:

- ***Two Traffic Lanes with One Dedicated Streetcar Track*** - In this alternative, a single streetcar track would run in a centered, dedicated right of way. Here, the number of traffic lanes would be reduced from four to two - one eastbound and one westbound traffic lane. This alternative would include 12-foot-wide traffic lanes, a 14-foot dedicated streetcar guideway, and seven-foot-wide shoulders. Initial discussions with Caltrans indicate that this alternative may be feasible. Both of the cities, however, object to the reduction in capacity given traffic projections for the area. In Phase 2, traffic studies will be conducted to further evaluate the viability of this option.
- ***Two Traffic Lanes and Two Mixed Flow (Traffic and Streetcar) Lanes*** - This lane configuration is comprised of four 11-foot-wide traffic lanes with two 4-foot-wide shoulders. However, two of the four lanes (one in each direction) would serve as mixed-flow of highway and streetcar traffic lanes. For this alternative, the mixed-flow lanes could either be the two interior lanes or the two exterior lanes. This configuration would require structural alteration to the bridge deck or roadway stringers to accommodate double tracking.
- ***Four Traffic Lanes with One Dedicated Streetcar Track*** - In this alternative, shown in Figure 15, a single streetcar track would run along the centerline of the bridge in a dedicated right of way between two eastbound and two westbound traffic lanes. This is the historic rail configuration. Implementing this alternative would require reducing lane widths to below 11 feet and eliminating the existing 4-foot shoulders. This would require a design exception from Caltrans, which Caltrans has indicated would not be approved.



Figure 15. Possible Tower Bridge Configuration



A final lane configuration for the Tower Bridge will be selected in next phase of project implementation.

Original Tower Bridge Design Loads

The original rail line was designed to accommodate rail use of the bridge. Two heavy steel stringers, designed were constructed directly under each rail of the original bridge rail track. Generally speaking, all of the rail vehicles being considered for the proposed streetcar system can be accommodated.

Current Design Loads — Streetcar Loading

Two different electric traction vehicles are being considered for the proposed streetcar system: a replica Birney Trolley (Birney, manufactured by Gomaco Trolley Company), and a modern streetcar such as the Inekon TRIO (modern streetcar).

Streetcar Dead Loads

Dead loads associated with track, train control equipment and an Overhead Catenary System (OCS) must be considered for analysis of project implementation on the Tower Bridge structure. Strengthening of the floor system for double tracking would further add to the dead load.

The bridge's lift span is extremely sensitive to the addition of dead load. The lift span weighs approximately 1,000 tons and the counterweights have a combined weight of over 988 tons. Caltrans' goal is to avoid adding additional lifting weight to the span.

- **Existing and Required Capacity** - The capacity of the main structural components, the lift span trusses, floor beams and stringers to carry the proposed streetcar loads was evaluated by comparing the proposed loads to the original design loads and to the current rated capacity of the bridge. This analysis indicated that the trusses are adequate for all lane configuration alternatives when using either the modern streetcar or the Birney trolley. The floor beams are adequate for any of the proposed streetcar vehicles, including the LRV.



For the third lane configuration, use of either the modern streetcar or the LRV would require strengthening roadway stringers. Consequently, only three first two lane configurations are viable without strengthening of either the deck, four of the roadway stringers, or both.

- **Structural Modifications** - Addition of streetcars to the existing Tower Bridge would require significant strengthening the roadway stringers when using the third lane configuration.

Finally, any re-introduction of electric transit to the bridge will require consideration of electrical stray current. Stray current provisions will need to be added to the bridge to prevent stray current corrosion.

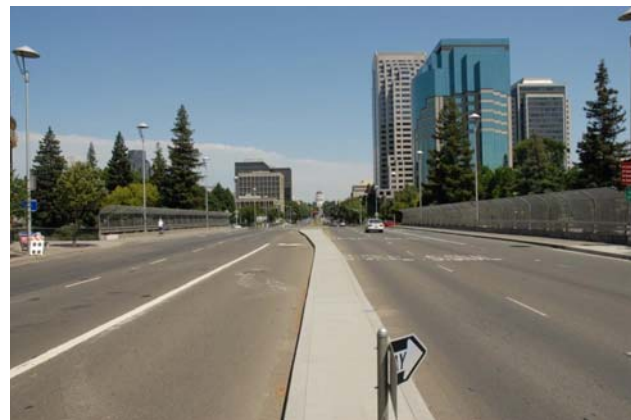
4.1.2 Capitol Mall Separation (Capitol Mall over Interstate Route-5)

The Capitol Mall Separation (Br. No. 24 0236), shown in Figure 16, was constructed in 1966 and is a three-span prestressed concrete box girder structure that carries Capitol Mall over Interstate Route 5 (I-5). This structure actually consists of two independent structures carrying the eastbound and westbound lanes of Capitol Mall and separated by a 1-inch joint centered on the raised median. The structure is approximately 225 feet long with spans, from west to east, respectively, of 48 feet, 87 feet, and 90 feet. The total width of the deck is approximately 108 feet, including barriers, sidewalks, raised median, and a 90-foot roadway.

In contrast to the Tower Bridge, the Capitol Mall Separation was not designed for interurban trains or any other rail vehicles. However, being designed in the 1960s, it was designed for HS 20 loading and overload vehicles.

Alternatives Evaluated - Currently, the structure accommodates one eastbound auxiliary lane between 1st Street and an off ramp to 3rd Street, two eastbound through traffic lanes, a 10-foot raised median, two westbound through traffic lanes, one westbound auxiliary lane extending from the on ramp from 3rd Street to a right turn only lane at 1st Street, and four 2-foot shoulders. There is also a westbound left turn lane to 1st Street that starts just before the west end of the separation structure. The separation structure has sufficient width within its 90-foot roadway to accommodate streetcars either in existing traffic lanes or in the median, except at the westbound left turn lane.

Figure 16. Capitol Mall Separation, Looking East Near Front Street



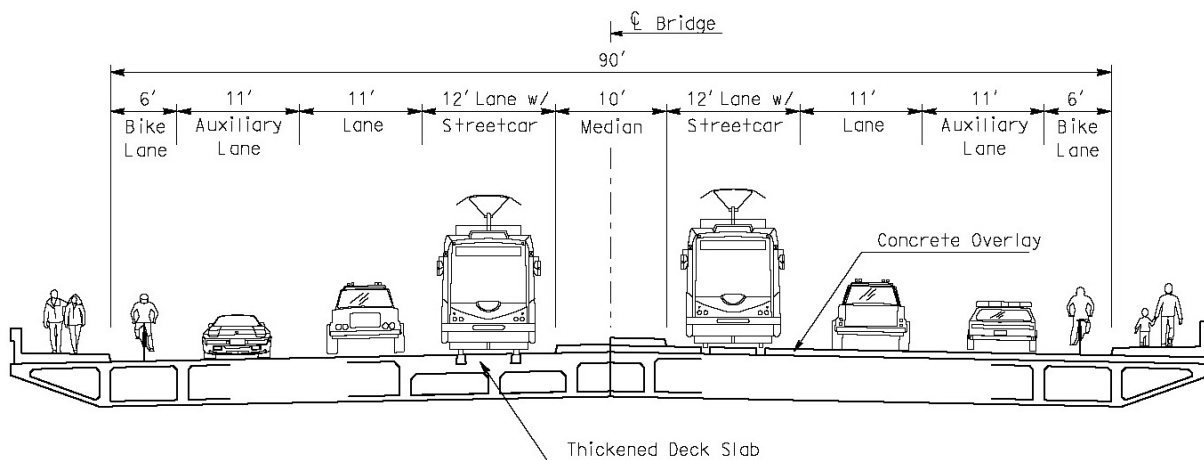
According to Caltrans, there is a plan to remove the two ramps to and from 3rd Street. If this is done, then the two outer (auxiliary) lanes on the structure may no longer be needed, especially if the Tower Bridge is reduced to two lanes. For purposes of this discussion, the two auxiliary



lanes will hereafter be referred to as the outer traffic lanes. Following are three potential lane configuration alternatives that were investigated:

- **Six Traffic Lanes and One Dedicated Streetcar Track** - This alternative would consist of placing a single dedicated streetcar track in the existing 10 foot median while maintaining the existing six lanes on the bridge. This lane configuration could be accommodated with either flush-mounted rail or rail on the raised median. This configuration is incompatible with the westbound left turn lane unless the turn lane is shortened so it is not on the structure and the track splits between the separation structure and 1st Street.
- **Four Traffic Lanes and Two Dedicated Streetcar Tracks** - This alternative would consist of adding double track in dedicated ROW replacing either the two inner or two outer lanes.
- **Four Traffic Lanes and Two Mixed Flow Lanes** - This alternative would consist of adding double track to either the two inner or two outer lanes to create two mixed flow lanes as shown in Figure 17. This configuration would not require change to the existing raised median and lane configuration, except that the one eastbound and one westbound lane would be converted into a mixed flow lane where automobiles, trucks, and streetcars would all share the same lane. This alternative would require either flush-mounting the track in the existing bridge deck or overlaying the bridge deck with up to 7 inches of concrete or asphalt to raise the entire deck surface to the track elevation.

Figure 17. Possible Capitol Mall Configuration



Existing and Required Capacity

- **Structural Modifications** - The analyses for all of the proposed lane configurations and all three streetcar vehicles indicate that the overall capacity of the existing structure is adequate for these alternatives. Local thickening and strengthening of the deck slab would be required for flush-mounted embedded rail.



- Consideration will also have to be given for the Capitol Mall Separation, as for the Tower Bridge, for electrical stray current. Stray current provisions will be added to the bridge to mitigate stray current corrosion.

4.1.3 Conclusions

Following is a summary of conclusions reached based on our data collection and analyses of the two structures:

- The addition of streetcars to both the Tower Bridge and the Capitol Mall Separation is feasible using either Birney replica trolleys or modern streetcars such as the Inekon TRIO.
- The Capitol Mall Separation also has adequate capacity for Sacramento Regional Transit LRVs.
- The Tower Bridge appears to have adequate capacity for LRVs on a single, central track, but more detailed analysis would be required to confirm this.
- Both single and double track alternatives are structurally viable for the Capitol Mall Separation.
- Double tracking on the Tower Bridge may be structurally feasible, but would require strengthening or replacement of at least four stringers and a portion of the deck, as well as the addition of support beams for the rails if the existing stringers are to remain and be strengthened.
- Stray current provisions would be required for both structures.
- Tracks on the Capitol Mall Separation could be recessed into a thickened and strengthened deck slab, placed in a full-width overlay, or set on a raised concrete pad.
- Vertical clearances through the trusses on the Tower Bridge are adequate for any lane configuration.

4.1.4 Cost Estimate

Preliminary cost estimates have been prepared for modifications to the two bridges to accommodate streetcars. These do not include track, power distribution and train control systems, mobilization or a contingency.

Tower Bridge

- Single Track Modifications- \$720,000
- Double Track Modifications - \$4,320,000

Capitol Mall Separation

- Double Track Modifications (thickened slab)- \$936,000
- Double Track Modifications (overlay) - \$720,000



4.2 Conceptual Engineering

The Conceptual Engineering Technical Memorandum presents the track design requirements for Alignments A and B. The level of design enables an initial analysis and discussion of how the alignment and streetcar interact with existing traffic, parking, adjacent properties, and pedestrian and bicycle traffic. Cost-saving design elements are discussed. A set of 11"x17" Conceptual Engineering drawings accompany the detailed Technical Memorandum in the appendix.

4.2.1 Alternative A – West Sacramento Civic Center to the Sacramento Convention Center

Following is a general description of the general alignment, and details are shown in Table 6. Beginning at the West Sacramento Civic Center/Community College/Transit Center on Merkley Avenue, the alignment proceeds northward onto West Capitol Avenue. It continues on West Capitol Avenue and turns south onto the proposed Garden Street into the planned Triangle street network. The alignment would traverse over the existing Union Pacific rail yard on a temporary trestle, then continue along Riske Lane to South River Road. Here it would turn north to Raley Field and onto the approach to Tower Bridge. The single track proceeds across the bridge toward Capitol Mall.

On the east side, it passes Old Sacramento and crosses over I-5 to 3rd Street, where the tracks enter the grass median on Capitol Mall. The eastbound streetcar operations would then leave Capitol Mall and join the existing Sacramento RT light rail tracks on Eighth Street. The streetcar operations would operate jointly on the existing RT tracks on 7th/8th Streets and along K Street to 12th Street. East of 12th Street, streetcars would enter a short stretch of single track and terminate at 13th Street.



Table 6. Conceptual Alignment Summary Alignment "A"

| Street | Segment | Tracks in: | Remarks |
|---|---|--------------------|--|
| Merkley Avenue | Terminus to West Capitol Avenue | West curb lane | Two-way single track at Civic Center Stop/Terminus |
| West Capitol Avenue | Merkley Avenue to Garden Street | Left (inside) lane | Streetcar runs in traffic adjacent to existing median |
| Planned Garden Street | W. Capitol Avenue to Tower Bridge Gateway | Travel lane | Future at-grade intersection, no stops |
| Future Garden Street | Tower Bridge Gateway to Riske Lane | On new trestle | Two-way single track on temporary trestle over switch yard |
| Riske Lane | Future Garden Street to South River Road | West edge of ROW | Two-way single track, temporary alignment |
| South River Road | Riske Lane to Tower Bridge Gateway | Travel lane | Two lane, two-way traffic |
| Tower Bridge Gateway | South River Road to Tower Bridge | Left lane | Transitioning to exclusive single track |
| Tower Bridge | Tower Bridge Gateway to Capitol Mall | Median | Two way, exclusive, single track |
| Capitol Mall | Tower Bridge to I-5 Crossing | Median | Exclusive, embedded double track |
| Capitol Mall | I-5 Overcrossing | Median | Exclusive double track on top of deck |
| Capitol Mall | I-5 to Third Street | Median | Exclusive, embedded double track |
| Capitol Mall | Third Street to Eighth Street | Median | Exclusive, landscaped track |
| 7 th , 8 th , K Streets | Capitol Mall to Twelfth Street | Existing LRT track | Shared with light rail vehicles |
| 12 th /K Pedestrian Mall | Eastern terminus | Exclusive ped area | Two-way single track |

4.2.2 Alternative B – West Sacramento City Hall to Amtrak Station via Capitol and 5th St.

Following is a general description of the general alignment, and details are shown in Table 7. The eastbound alignment begins at the West Sacramento Civic Center/Community College/Transit Center and turns right onto West Capitol Avenue. It continues down West Capitol Avenue, turning right on planned Garden Street. The trackway would then turn left onto Tower Bridge Gateway through a new at-grade intersection.

Running east, the tracks would be located exclusively in the median or in the left-lane adjacent to the median. The alignment would pass under the existing Union Pacific Railroad overcrossing and then arrive at the Gateway stop adjacent to a new, signalized, at-grade intersection with Fifth Street. The type of trackway used in the Capitol City Freeway median could be one of several types depending on cost constraints and aesthetics, and could include embedded concrete track slab, landscaped or grass track, or tie and ballast. Continuing in the median the alignment would cross a new at-grade intersection at Third Street to serve Raley Field and Raley's landing. The



alignment would enter a single-track segment across the Tower Bridge, and then back to a double-track alignment.

Similar to Alternative A, the exclusive-running tracks would serve Old Sacramento and cross I-5 and Third Street into the Capitol Mall median, where landscaped double track would extend as far as Fifth Street.

The alignment would turn north at Fifth Street in the right lane. Fifth Street's lane configuration and traffic signaling is configured for two-way traffic operation north of Capitol Mall, the length of the streetcar alignment. The tracks would follow the existing roadway under the Westfield ShoppingTown Downtown Plaza and transition to the west curb line of 5th Street north of I Street, adjacent to the Amtrak station. Immediately north of the Amtrak station the single-track alignment would turn left and join with existing LRT tracks to serve a shared terminus stop platform.

Table 7. Conceptual Alignment Summary Alternative "B"

| Street | Segment | Tracks in: | Remarks |
|-----------------------|---|--------------------|--|
| Merkley Avenue | Terminus to West Capitol Ave. | West curb lane | Two-way single track at Civic Center Stop/Terminus |
| West Capitol Avenue | Merkley to Garden Street | Left (inside) lane | Shared lane adjacent to existing median |
| Planned Garden Street | West Capitol Ave. to Tower Bridge Gateway | Travel lane | Future at-grade intersection, no stops |
| Tower Bridge Gateway | Garden Street to Tower Bridge | Median | Shared, right lane |
| Tower Bridge | Tower Bridge Gateway to Capitol Mall | Median | Two-way, exclusive, single track |
| Capitol Mall | Tower Bridge to I-5 Crossing | Median | Exclusive, embedded double track |
| Capitol Mall | I-5 Overcrossing | Median | Exclusive, above deck, double track |
| Capitol Mall | I-5 to Third Street | Median | Exclusive, embedded double track |
| Capitol Mall | Third Street to Fifth Street | Median | Exclusive, landscaped, double track |
| Fifth Street | Capitol Mall to I Street | Right lane | Two way, double track, adjacent to parking |
| Fifth Street | I Street to H Street | Left lane | Single, exclusive, embedded, adjacent to curb |
| H Street Terminus | Adjacent to Amtrak Platform | Right lane | Single, shared with existing LRT |

4.3 Station/Stop Design Criteria

For streetcar stop design criteria, the intent is to have the most cost-effective, community accessible stops at the proper locations. The criteria are coordinated with the general alignment developed in the Route Study, Service Planning, Equipment Analysis, and Conceptual



Engineering Tasks. The primary design principles for this Task, in keeping with the overall project goals, are to:

- Keep the design simple and inexpensive
- Use “off-the-shelf” equipment whenever possible
- Design for ease of construction
- Provide safe locations for streetcar patrons
- Offer patrons information on arrival of the next streetcar

4.3.1 Basic Parameters

While the preferred vehicle type can affect the design of the stop, the following basic parameters are applicable:

- Most stations will have two platforms - one for westbound cars and one for eastbound cars
- The streetcar berthing area will be approximately 60-65 feet long, sized for a single car
- The boarding area will be 40-45 feet long
- A shelter, schedule and patron information rack, a sign with the stop name, a bench, a lean rail, a trash receptacle, and an appropriate ADA pedestrian warning strip at the curb edge, along the entire length of the boarding area, would be provided at each station
- “Next vehicle arriving” technology would be included in the shelter to inform riders when the next streetcar will arrive
- A ticketing kiosk, unless there is no fare or there is on-board ticketing, would be provided
- A bicycle rack
- A curb extension (bulb out) to board the car to minimize the loss of on-street parking
- If a replica streetcar is used, an on-board lift or a high block platform will be required for ADA access
- If a modern car is used, curb modifications will be required along K Street and in the median stations

4.3.2 Enhanced Parameters/Amenities

For higher visibility stop locations, in addition to the basic parameters, enhanced amenities may include:

- Enhanced architectural treatment for shelters to reflect the character of the specific location
- Specialty lighting with banners or other decorative features
- Enhanced paving
- Information kiosks

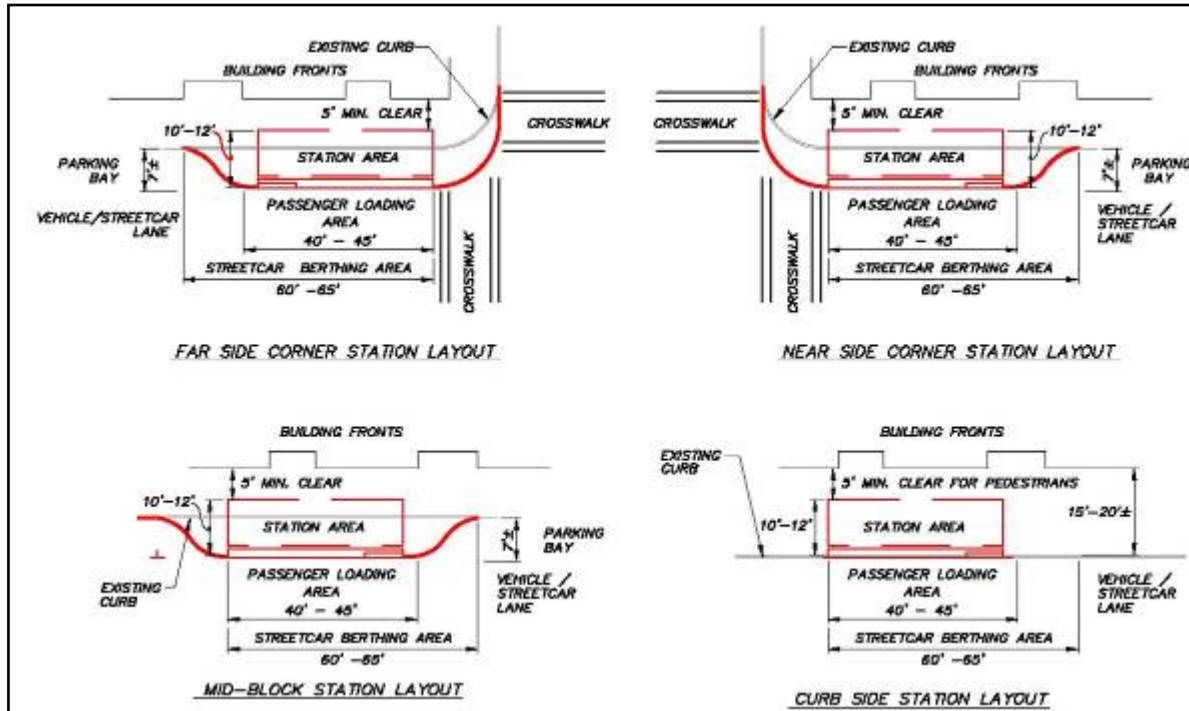


- Public art
- Additional seating beyond the shelter

4.3.3 Streetcar Stop Types

Based on the proposed stop locations and the basic parameters, several stop types may be found – Corner, Mid-block, Curbside and Median/Center Stops. A general description and diagram (Figure 18) of these types follow.

Figure 18. Streetcar Stop Types



- Corner Stop (near or far side) – This stop occurs at the corner to allow direct access from the sidewalk (direct boarding with a low floor vehicle, from an on-board lift or from a raised, ADA-compliant high block platform). The stop is a “bulb-out” or an extended sidewalk. The vehicle stays in the travel lane, minimizing on-street parking loss.
- Mid-block Stop – This type occurs less frequently but may be required due to specific site or block considerations, and it, too, is a “bulb-out” design. The vehicle stays in the travel lane, minimizing on-street parking loss.
- Curbside Stop (Likely Mid-block) – This stop is on a street with no on-street parking, and it allows berthing directly from the existing curb.
- Median/Center Stop – This type occurs if the streetcar is running on the inside lanes. It may take up more available lane width, since it cannot be located in a moving lane. The Median/Center Stop is also applicable for the tracks that run through the grassed median in the Capitol Mall. This application requires enhanced pedestrian safety and amenity features. The primary implication of this type is the need for left side doors on all cars in the fleet, and



- Left-side disabled boarding capability.

The following table summarizes planned stations, locations, and platform types for the Preferred Alignment.

Table 8. Streetcar Stations

| Station Name | Location | Type | Improvement Level |
|---------------------------------|--|---------------------|---|
| Civic Center | West side of Merkley Avenue, in planned Transit Center | Curbside | Minor modification to existing Transit Center |
| West Capitol at Garden | West Capitol at Garden | Median/Center | High |
| Raley Field | Tower Bridge Gateway and Third Street | Median/Center | High |
| Old Sacramento | Capitol Mall and Front Street | Median/Center | High |
| Fourth and Capitol | Capitol Mall and Fourth Street | Median/Center | High |
| Eighth and Capitol (eastbound) | Eighth Street, north of Capitol | Curbside | Medium |
| Seventh and Capitol (westbound) | Seventh Street, north of Capitol | Existing – curbside | Low |
| St. Rose of Lima | 7 th -8 th and K Street | Existing – Midblock | Low |
| Cathedral Square | 11 th and K Street | Existing – Midblock | Low |
| Convention Center | 13 th and K Street | Curbside | Low |
| Fifteenth and J | 15 th south of J Street | Curbside | Medium |
| Fifteenth and L | L Street west of 15 th | Curbside? | Medium |

4.4 Cost Estimate

The capital costs include the track and systems work, civil and roadway engineering, stop shelters and amenities, vehicles, and soft costs associated with the design and construction of the preferred project. For the Initial Preferred Alignment, the estimated capital cost is \$53,132,000 or approximately \$14,966,000 per track mile. The Planning Criterion was a project cost to not exceed \$50,000,000; however the decision to include the loop to Midtown was made with the understanding that the Planning Criterion on cost would be “flexed” to allow a slightly more expensive, but significantly more viable project.



Table 9. Conceptual Cost Estimate

| Item | Cost Category | Unit Price | Units | Quantity | Total Price |
|-------------------------------------|--|------------|-------|---------------|---------------------|
| 1.1 | Trackwork – Track Slab (single) | \$425 | tf | 10,250 | \$4,356,250 |
| 1.2 | Trackwork – Grass Track (single) | \$468 | tf | 2,800 | \$1,310,400 |
| 1.3 | Trackwork – Tee Rail on Tower Bridge (single) | \$450 | tf | 660 | \$297,000 |
| 1.5 | Trackwork – Tee Rail on Tie & Ballast (single) | \$270 | tf | 5,100 | \$1,377,000 |
| Total Length of Single Track | | | | 18,810 | |
| 2.0 | Trackwork – Turn/Track Crossing Installation | \$150,000 | ea | 10 | \$1,500,000 |
| 3.0 | Catenary Poles and Overhead Wire | \$200 | tf | 18,810 | \$3,762,000 |
| 4.0 | Traffic Signals – New (or Full Replacement) | \$200,000 | ea | 8 | \$1,600,000 |
| 5.0 | Traffic Signals – Modified | \$120,000 | ea | 9 | \$1,080,000 |
| 6.0 | Civil/Roadway – general pavement overlay | \$15 | f | 10,250 | \$153,750 |
| 7.0 | Civil/Roadway – High end treatments & landscaping | \$200 | f | 3,850 | \$770,000 |
| 8.1 | Utilities – High Allowance | \$600 | f | 450 | \$270,000 |
| 8.2 | Utilities – Medium Allowance | \$300 | f | 5,500 | \$1,650,000 |
| 8.3 | Utilities – Low Allowance | \$150 | f | 4,300 | \$645,000 |
| 9.0 | Drainage Allowance | \$100 | f | 12,475 | \$1,247,500 |
| 10.1 | Stop Platforms – Low (side) | \$20,000 | ea | 5 | \$100,000 |
| 10.2 | Stop Platforms – Low (center) | \$30,000 | ea | - | \$0 |
| 10.3 | Stop Platforms – Medium (side) | \$45,000 | ea | - | \$0 |
| 10.4 | Stop Platforms – Medium (center) | \$70,000 | ea | 2 | \$140,000 |
| 10.5 | Stop Platforms – High (side) | \$100,000 | ea | 5 | \$500,000 |
| 10.6 | Stop Platforms – High (center) | \$150,000 | ea | 3 | \$450,000 |
| 11.0 | Temp. Trestle over Triangle Rail yard (1250' long) | \$0 | sf | - | \$0 |
| 12.0 | Tower Bridge Improvements (single track) | \$900,000 | ea | 1 | \$900,000 |
| 13.0 | I-5 Overcrossing (double track) | \$900,000 | ea | 1 | \$780,000 |
| 14.0 | Substations | \$500,000 | ea | 4 | \$2,000,000 |
| 15.0 | Train Signaling Systems | \$550,000 | ea | 5 | \$2,750,000 |
| 16.0 | BASELINE SEGMENT COST | | | | \$27,758,900 |

MOS Alternative

| | | | | | |
|------|---|-------------|--|-----------|---------------------|
| 17.0 | Construction Subtotal | | | | \$27,758,900 |
| 18.0 | Construction Soft Cost (mob. Traffic control, QC) | 18% | | 4,996,602 | \$4,996,602 |
| 19.0 | SUB-TOTAL CONSTRUCTION COST | | | | \$32,755,502 |
| 20.0 | Construction Contingency Cost | 15% | | 4,913,325 | \$4,913,325 |
| 21.0 | TOTAL ANTICIPATED CONSTRUCTION COST | | | | \$37,668,827 |
| 22.0 | Engineering and Administration Cost | 15% | | 5,650,324 | 5,650,324 |
| 23.0 | Vehicles (including testing, spare parts, etc.) | \$1,000,000 | | 8 | \$8,000,000 |
| 24.0 | Right-of-way | | | | \$0 |
| 25.0 | Maintenance Facility Allowance | | | | \$2,000,000 |
| 26.0 | TOTAL PROJECT COST (2007 DOLLARS) | | | | \$53,131,885 |