Broadway Bridge Feasibility Study

Introduction

The Broadway Bridge Feasibility Study is the latest step in the development of a potential new crossing of the Sacramento River south of the U.S. Route 50 (US 50)/Pioneer Bridge. The three primary purposes of the feasibility study are to 1) identify fatal flaws for the Broadway Bridge alignments, local connections, and bridge types; 2) focus on opportunities and constraints at this specific location; and 3) help inform the project scope and limits for the subsequent environmental/preliminary engineering phase. This Executive Summary includes a description of the prior planning efforts and milestones, overview of the technical scope and conclusions of the feasibility study, summary of the study recommendations, and proposed next steps.

Prior Planning Milestones

The Broadway Bridge and the new I Street Bridge have been identified as priority projects by the City of West Sacramento and City of Sacramento (Cities) to support long-term connectivity and economic development along the riverfront. The Cities have explored the possibility of creating additional crossings of the Sacramento River on several occasions over the last decade. Key planning milestones in that process are shown below.

Sacramento Riverfront Master Plan (2003)

Starting with the Sacramento Riverfront Master Plan in 2003, the Cities developed a bold vision for the riverfront, including numerous river crossings forming an urban "Web of Connectivity" spanning from the I Street Bridge on the north to the Stone Lock/Miller Park areas on the south. The Riverfront Master Plan identifies the need for the Broadway Bridge and other river crossings to enable the riverfront districts in the Cities to reach their full potential, both in terms of public space and private development. Specifically, the master plan identified priority opportunity areas for infill development near Broadway and Pioneer Bluff. The plan states that without new crossings, the riverfront areas will not develop as envisioned by both Cities due to insufficient access and a lack of interconnectivity between neighborhoods.

Sacramento River Crossing Alternatives Study (2011)

In 2011, the Cities completed the Sacramento River Crossing Alternatives Study, which identified eight new crossing locations that would serve three distinct multimodal "Market Areas" depicted in Figure 1. The study concluded that any new crossing should address the following needs and project objectives:

- Limited connectivity across the river creates longer trip lengths, which discourages walking and bicycling.
- Longer trip lengths create dependence on automobile use that generates negative public health effects and adverse environmental effects such air pollutant and greenhouse gas (GHG) emissions.
- Limited connectivity across the river creates concentrated vehicle traffic flows on existing bridges and their connecting approach roadways resulting in undesirable travel delays for vehicle traffic, including public bus transit during weekday peak periods and special events.
- Limited connectivity across the river reduces options for emergency response teams thereby increasing response times and limiting alternatives for evacuations.

- I Street, Tower, and Pioneer bridges do not fully comply with current design standards, which limit or restrict multimodal use, increase seismic vulnerability, and exacerbate the potential effects of natural disasters.
- Limited connectivity across the river is a barrier to economic activity, social exchanges, recreational opportunities, and access to jobs within the urban core of the Cities.
- Limited connectivity to the riverfront reduces the potential to achieve planned urban development and redevelopment of opportunity sites identified in the adopted plans of the Cities.
- Limited connectivity reduces opportunities to use the riverfront for enjoyment and recreation.

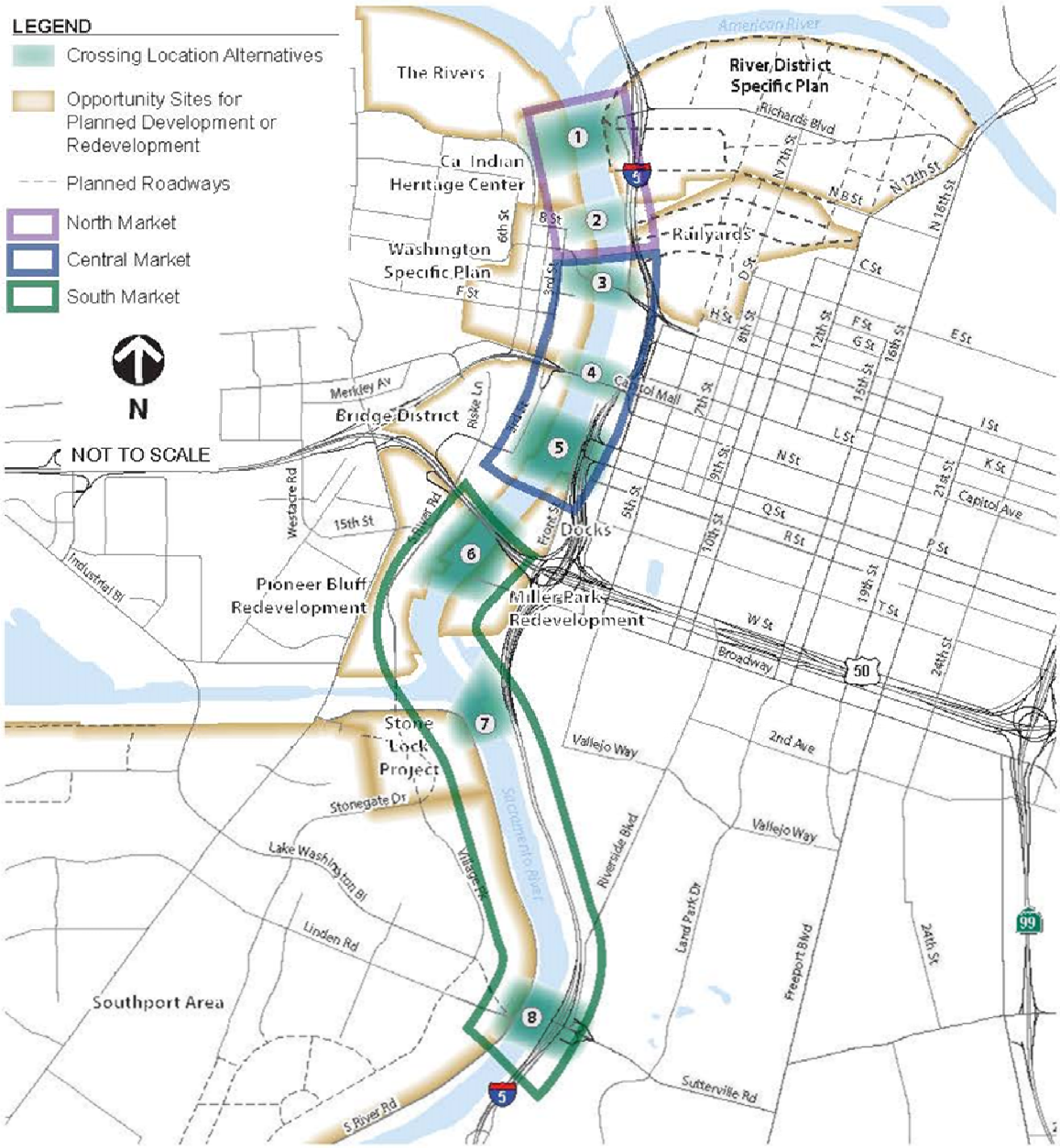


Figure 1. Market Areas
Source: Sacramento River Crossings Alternatives Study

In summer 2011, the City Councils for both Cities accepted the study and directed staff to proceed with a detailed study to examine the feasibility of new river crossings in the north and south market areas identified in the River Crossings Study, with the exception of the Sutterville Road/Linden Road location,

which was eliminated from further consideration by the City of Sacramento (see Appendix A for the Executive Summary of the Final 2011 Sacramento River Crossings Alternatives Study Technical Report).

Neighborhood-friendly Bridge Definition (2011)

As a follow up to the prior study, a "Neighborhood-friendly Bridge" definition was developed in coordination with the Sacramento Area Council of Governments (SACOG) and was presented to both City Councils in fall 2011. The Neighborhood-friendly criteria include:

- Supports primary function for local connectivity rather than regional travel and mainly serves short local trips.
- Serves all users, including motorists, bicyclists, pedestrians, low-energy vehicles, and public transit riders.
- Provides aesthetics and dimensions that are architecturally pleasing and contextually appropriate for the adjacent neighborhoods.
- Does not exceed or expand the already-planned capacity of the approach roadways
- Designed with a target speed that is equal to, or less than, the approach roadways.
- Reduces the growth in vehicle miles traveled in the adjacent communities.
- Does not connect directly to streets that are primarily residential in character.

Transportation Investment Generating Economic Recovery (TIGER) Grant Program Acceptance (2014)

In December 2013, the Cities obtained $442,700 in funding from the SACOG Regional Funding Program to prepare a feasibility study for the Broadway Bridge project. Additionally, on April 16, 2014, the West Sacramento City Council approved Resolution 14-16 directing staff to submit an application for $1.5 million in federal funding under the competitive TIGER VI Discretionary Grants Program for the environmental and preliminary engineering phase of the Broadway Bridge project. In September 2014, those funds were awarded to the City of West Sacramento (see Appendix B for the successful 2014 TIGER Planning Grant Application).

Summary of Feasibility Study

This Feasibility Study includes planning, engineering, and outreach efforts conducted between March and December 2015, and builds on the goals, objectives, need, and purpose identified in the 2011 River Crossing Alternatives Study. Several technical memoranda have been prepared by the project team, which are summarized in the table of contents, and included as appendices. The most pertinent of these are summarized below.

Conceptual Alignment Alternatives

On completion of the initial traffic analysis and coordination with land use planning in the area, it became clear that the Broadway Bridge project will serve a diverse mix of trip purpose (through and destination) and modes (auto, transit, bicycle, and pedestrian). If carefully implemented, the project has a unique opportunity to effectively serve both auto-based trips and alternative modes without sacrificing safety, efficiency, and the context and qualities of the adjoining corridors and neighborhoods.

As shown in **Figure 2**, the crossing corridor would accommodate local destination trips (blue) and through trips (black). These trips would be combined on the bridge and, through careful planning and design, would be segregated and routed to compatible adjoining corridors.

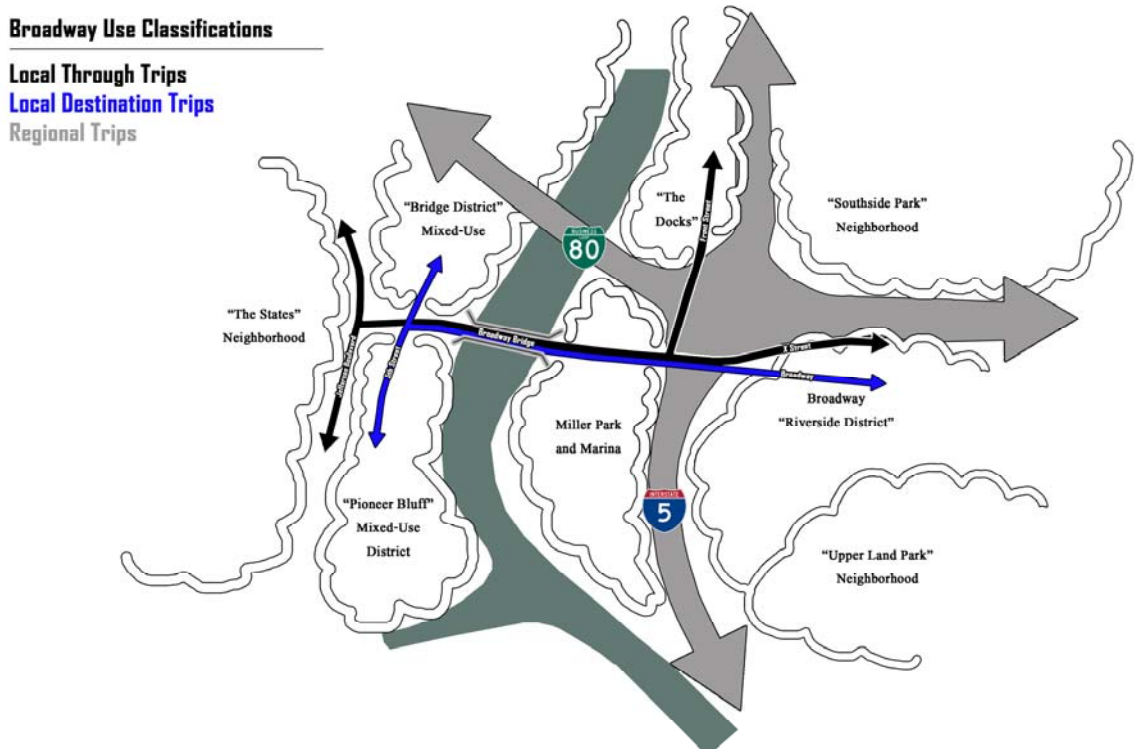


Figure 2. Balanced Corridor Circulation Concept

In West Sacramento, most of the through trip travel demand will be to and from the Southport area along either Jefferson Boulevard or 5th Street. How the crossing connects to both will affect which corridor travelers choose. It is recommended that the bridge crossing project be carefully coordinated with land use planning with the intent to direct auto-based through trips to Jefferson Boulevard and shorter destination trips to redeveloped areas along 5th Street.

In Sacramento, through trips are bound for employment centers downtown and points further east. The feasibility study identified three alternative connections to Broadway and X Street with the intent to direct through trips to X Street and destination trips to Broadway.

At this early stage of development, the potential river crossing alternatives are defined by their alignment and connection points, cross section width, and the movable span bridge types. The details of this analysis are included in the Conceptual Alignment Alternatives Technical Memorandum (see Appendix D) and summarized below.

Alignments and Connections

With extensive agency and stakeholder input, four crossing alignments have been developed in the feasibility study (**Figure 3**). The alignments represent a range of feasible options consistent with the existing and planned land use, property access, economic development opportunities, and regulatory constraints on both sides of the river. Alignments A, B, and C were reviewed by the U.S. Coast Guard (USCG), as part of a field visit in April 2015, to determine the appropriate navigation channel width and location. Subsequently, Alignment D was developed in response to an additional redevelopment scenario. It has been initially reviewed by the USCG, but will require additional review to confirm the appropriate navigation channel dimensions and configuration. For purposes of this feasibility study, a 200-foot navigation width is assumed for Alignment D.

Each of the alignments have unique benefits and impacts; however, all alignments are feasible and comparable in potential costs at a planning level. Alignments A and D are the most northerly and southerly alignments, respectively, that are feasible. Alignments B and C are relatively unconstrained and can be adjusted and refined in response to a significant and not yet defined redevelopment of the Pioneer Bluff industrial properties and potential realignment of the street network. The alignments provide the land use planning team maximum flexibility to craft the redevelopment vision consistent with any of the proposed bridge alignments.

On the east side of the river, the landing point is more constrained and centered on the existing Broadway alignment. All of the alignments conform to Broadway west of the crossing beneath Interstate 5 (I-5). The feasibility study identified potential improvement alternatives to Broadway further to the east, near 3rd Street, intended to balance the traffic flow directed to Broadway and X Street. Each alternative is feasible and offers unique benefits in terms of balancing traffic distribution to Broadway and X Street, which must be weighed against property impacts, the potential closure of the X Street off-ramp, and construction costs. The alternatives are described in the Conceptual Alignment Alternatives Technical Memorandum (see Appendix D).

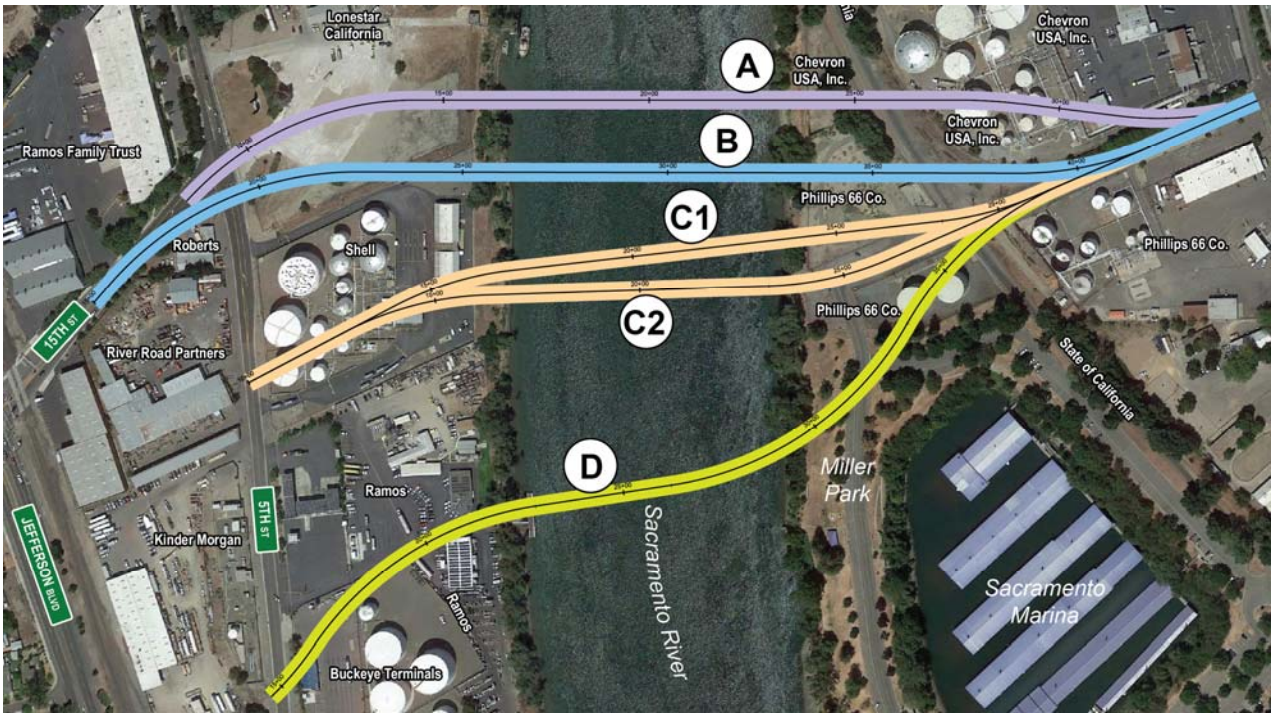


Figure 3. Broadway Bridge Alignment Options

Vertical Profile

Preliminary vertical profiles of the crossing alternatives were prepared to confirm that minimum vertical clearance for marine vessel traffic with the bridge in the closed position could be achieved while providing reasonably flat approach grades consistent with bicycle, pedestrian, and streetcar use. With all of the crossing alternatives, the minimum vertical clearance was achieved with the approach grades between 2 percent to 4 percent. These values are within the desirable range and pose no technical or feasibility challenge to the project.

Cross Section Width

The team developed four cross section alternatives:

1. Two lanes (minimum width)
2. Adaptable two lanes (convertible to minimum four lanes)
3. Four lanes (standard)
4. Four lanes (dedicated transit)

All the alternatives accommodate a future streetcar line and include provisions for bicyclists and pedestrians. Year 2040 traffic volumes for a two-lane bridge would be approximately 32,000 vehicles per day (vpd) and for a four-lane bridge would be approximately 49,300 vpd—17,300 more daily trips than a two-lane bridge. Traffic modeling efforts suggest the future travel demand may require up to a four-lane crossing of the river. However, depending on how the intersections are configured at 5th Street and Broadway, it is possible that a two-lane crossing may be a viable solution. The two-lane crossing may be more compatible with the Neighborhood-friendly definition and more acceptable to stakeholders.

Another critical factor in the selection of the cross section width is the 80- to 100-year design life of the movable span bridge and the feasibility of widening the bridge in the future. None of the movable bridge types can simply be widened. If additional width is needed in the future, an entirely new bridge would need to be constructed along and paired with the initial structure, each functioning independently with its own operating system. Pairing would not be possible with the swing bridge as their operating motion would conflict with one another.

Movable Span Bridge Alternatives

A vertical lift span, bascule, and bobtail swing span have been identified as being appropriate for the site based on the required navigational channel opening width and proposed bridge cross sections. However, as **Table 1** shows, the wider cross sections and longer movable span reduces the feasible movable bridge types. Figures showing preliminary concepts for each of these options are contained in the Bridge Alternatives Technical Memorandum (see Appendix D). Table 1 details the feasibility of the movable bridge types by alignment, bridge cross section, and navigation opening. Alignments A, B, and C assume a 170-foot navigation channel, and Alignment D assumes 200 feet. For the four-lane cross section, a four-leaf bascule bridge would be required. The 200-foot navigation opening is near the maximum limit for a double-leaf bascule bridge, particularly with the accommodation of a streetcar. The adaptable two- and four-lane cross section, combined with a 200-foot opening, requires four leaves for the bascule movable type.

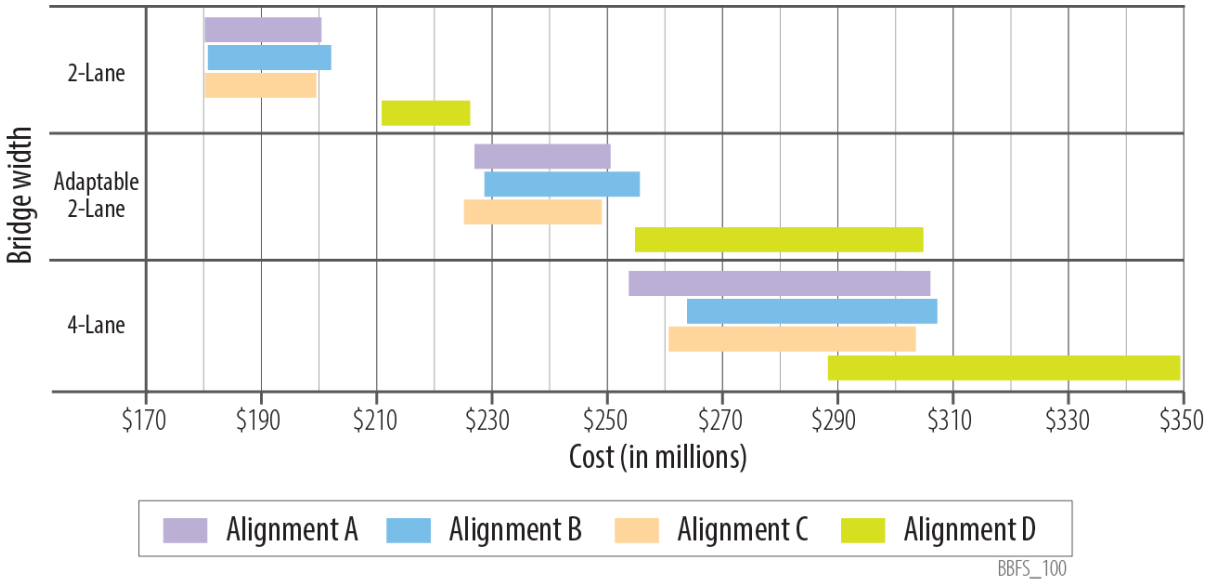
Table 1. Feasible Movable Bridge Types by Alignment, Cross Section, and Navigation Opening

	Cross Section		
Alignment	**Minimum Two Lanes**	**Adaptable Two Lanes**	**Maximum Four Lanes**
A	L, B, S	L, B, S	L, B (four leafs required)
B	L, B, S	L, B, S	L ,B (four leafs required)
C	L, B, S	L, B, S	L, B (four leafs required)
D	L, B	L, B (four leafs required)	L, B (four leafs required)

Notes:
B = Bascule
L = Lift
S = Swing

Cost Estimate

Figure 4 summarizes the range of project costs for the various alignments, bridge widths, and movable bridge types under consideration. The costs ranges reflect the variation in costs of the applicable movable bridge types. Depending on the preferred alternative chosen in the environmental/preliminary engineering phase, actual project costs will fall somewhere within these ranges. The Cost Estimate Technical Memorandum (see Appendix D) provides a detailed description of the costs and additional information regarding the cost implications of each alternative and the applicability of the movable bridge type by alternative. As Figure 4 shows, for all three bridge width options, Alignments A, B, and C have relatively similar costs for each movable bridge type. Under all scenarios, Alignment D is the highest cost alternative due to the longer alignment and the wider bridge opening required for river navigation.



Notes:

Costs shown above include capital support costs (i.e., PA/ED, PS&E, construction support) but exclude right-of-way and utility coordination/relocation costs.

The estimates include 10% time-related overhead, 10% mobilization, 25% contingency on bridge items, and 30% contingency on roadway items.

Costs assume a construction year of 2025 and an escalation factor of 3%.

Figure 4. Project Cost Ranges (by Alignment and Crossing Width)

Stakeholder Outreach

Public outreach and workshops held during the feasibility phase included updates and information sharing with key stakeholders, elected officials, and the general public on both sides of the river. Key stakeholder meetings included those with affected property owners, utilities, regulatory agencies, and focus groups such as the Greater Broadway Partnership and Pioneer Bluff Transition Team. Informational workshops were held to present, evaluate, discuss, and receive comments on the conceptual bridge location alternatives; alignment and roadway network alternatives, bridge type selection; and preliminary traffic analysis results. Workshops held included the West Sacramento Transportation, Mobility and Infrastructure Commission on Monday, July 6, 2015; and the West Sacramento City Council on July 15 and October 21, 2015. A community open house was hosted at Leataata Floyd Elementary School in the City of Sacramento on July 23, 2015. The open house was attended by over 80 community members from both Cities.

Key Findings

Key findings from the public workshop include several comments received related to concerns about the project's potential to direct regional traffic onto local streets, and the need for a bridge designed to accommodate all modes of transportation. The multimodal use of the bridge is demonstrated by the responses shown in **Table 2** of a question posed at the public meeting, where community members were invited to identify how they would use the proposed Broadway Bridge by placing a dot sticker next to their preferred use. Information shared and comments received at the public workshop is summarized in Appendix C of this Feasibility Report.

Table 2. Public Meeting Question, "How Would You Use the Broadway Bridge?"

Preferred Use	No. of Responses
I would ride a bike	26
I would walk	15
I would drive	22
I would take transit	15
I would like to ride the future streetcar	22

Comments received from the agencies' governing bodies support and reinforce the public's recommendations on incorporating multimodal design elements, and went further to suggest pursuing transit-only travel lanes for Bus Rapid Transit (BRT), streetcar, and/or local bus routes. The bridge cross sections described above attempt to address these concerns and comments. Additional input received focused on balancing the bridge's architectural features with funding constraints, and the need to include traffic performance metrics, such as vehicle miles traveled (VMT), in future traffic analyses, to align with the region's transportation planning efforts and sustainable communities' strategies.

In addition to comments received at the public workshop, the Land Park Community Association (LPCA) submitted a letter to the City of Sacramento (see Attachment 1). The letter confirmed LPCA's support of the Broadway Bridge, but requested the City "honor" previous agency commitments to a "neighborhood friendly" bridge, which was defined to include "pleasing aesthetics, accommodation of all users, target speeds equal to or less than the approaching roadways, and a bridge that does not expand the already-planned capacity of the existing roadways."

Traffic Analysis

The Traffic Analysis Technical Memorandum (see Appendix D) presents findings related to travel demand modeling and traffic operations analysis for the proposed crossing, approaches, and key intersections on the west and east sides of the river. A two- and four-lane crossing scenario was analyzed. Key findings are summarized below.

Bridge Traffic Comparison (Two versus Four Lanes)

- Year 2040 traffic volumes for a two-lane bridge would be approximately 32,000 vpd.
- Year 2040 traffic volumes for a four-lane bridge would be approximately 49,300 vpd, 17,300 more daily trips than a two-lane bridge.
- Traffic volumes on the Broadway Bridge would not vary substantially due to the various bridge connection options on either side of the bridge, and are primarily dependent on the number of lanes provided on the bridge.

- Construction of a four-lane bridge would increase traffic volume on connecting roadways relative to a two-lane bridge.
- The Broadway Bridge would decrease traffic on the Tower Bridge:
  - 2,500 fewer daily trips with the two-lane Broadway Bridge compared to No Project.
  - 3,400 fewer daily trips with the four-lane Broadway Bridge compared to No Project.

Effects on State Highway System

- The Broadway Bridge would substantially decrease traffic on Jefferson Boulevard to/from US 50:
  - 10,700 fewer daily trips with the two-lane Broadway Bridge compared to No Project.
  - 17,000 fewer daily trips with the four-lane Broadway Bridge compared to No Project.
- The Broadway Bridge would decrease traffic on the Pioneer Bridge:
  - 16,500 daily trips with the two-lane Broadway Bridge compared to No Project.
  - 27,000 daily trips with the four-lane Broadway Bridge compared to No Project.
- The Broadway Bridge would increase traffic on the I-5 northbound (NB) off-ramp to Broadway (diverting NB trips that currently use the Pioneer Bridge):
  - 4,000 additional daily trips with the two-lane Broadway Bridge compared to No Project.
  - 5,700 additional daily trips with the four-lane Broadway Bridge compared to No Project.

Effects on Broadway Corridor (East of 5th Street)

- The two-lane bridge with Broadway connection (off-ramp open) compared to the X Street connection (off-ramp closed) would result in the following:
  - 2,000 additional daily trips on Broadway directly east of 5th Street.
  - 1,500 additional daily trips on Broadway directly east of 9th Street.
  - 700 additional daily trips on Broadway directly east of Riverside Boulevard.
  - 800 additional daily trips on Broadway directly east of 16th Street.
- The four-lane bridge with Broadway connection (off-ramp open) compared to the X Street connection (off-ramp closed) would result in the following:
  - 3,000 additional daily trips on Broadway directly east of 5th Street.
  - 3,000 additional daily trips on Broadway directly east of 9th Street.
  - 1,400 additional daily trips on Broadway directly east of Riverside Boulevard.
  - 700 additional daily trips on Broadway directly east of 16th Street.

Figure 11, in the Traffic Analysis Technical Memorandum (see Appendix D), shows future volumes on Broadway with and without the bridge project in place. To provide the reader with context on the additional traffic to the Broadway corridor with a two- or four-lane bridge, Table 1 in the Traffic Analysis Technical Memorandum compares existing traffic volumes on local roadways to those forecasted for Broadway.

Effects on Local Neighborhood Streets

- Construction of the Broadway Bridge would result in relatively minor changes in traffic on residential streets in the vicinity of the bridge.
- The combined closure of the off-ramp and addition of the bridge in the X Street connection scenario would result in relatively minor changes in total daily traffic volumes on key streets located south of Broadway (i.e., 5th Street and Riverside Boulevard). There would be slightly higher levels of traffic on these streets with the Broadway connection

Local, State, and Federal Funding

The Pioneer Bluff area in West Sacramento and the Sacramento waterfront areas known as the Docks and Miller Park will undergo substantial changes as a result of the planned Broadway Bridge. The potential effects and influences of the planned bridge on land use and associated funding is heavily influenced by the bridge alignment and capacity to carry two versus four lanes of traffic. The land use and funding opportunities summarized in the Local, State, and Federal Funding Technical Memorandum (see Appendix D) analyze opportunities and constraints at a macro level on both sides of the river. Given the relationship between land use, funding, and the bridge's ultimate location, a focused memo was prepared by Tom Trzcinski Consulting (TTC) to the City of West Sacramento summarizing the vested property rights for the Riverfront Street corridor south of US 50, and compared the real estate potential for Pioneer Bluff, Stone Lock, and Southport Districts with and without the Broadway Bridge (see Attachment 2).

The Broadway Bridge project will require funding from multiple sources, to include federal and state grants and local matching sources. The funding memorandum includes sources tied to redevelopment of both sides of the river, as well as local, state, and federal transportation funds currently available. Some of the fund sources' ultimate capacity will only be achieved through buildout of forecasted development, and others are most competitive for "shelf-ready" projects—those that are ready for construction.

Environmental Considerations

In most cases, the alternatives have identical environmental considerations and there would be little difference in the level of impact between each of the alternatives. Alignment D would have the greatest effect on Fredrick Miller Regional Park due to elevation of the approach roadway and the potential need to reconfigure the access to the park and Sacramento Marina. For other resources, no substantial difference exists between the alternatives.

The project could result in significant impacts, and there is a potential that some of these impacts could not be reduced to less-than-significant levels with the implementation of mitigation. Because of this, the anticipated environmental document needed for California Environmental Quality Act (CEQA) compliance is an Environmental Impact Report (EIR). The City of West Sacramento would be the CEQA lead agency.

Based on the project's potential for impacts as defined by the National Environmental Policy Act (NEPA), and considering both the context and intensity of the impacts, an Environmental Assessment with Finding of No Significant Impact (EA/FONSI) is the anticipated environmental document for NEPA compliance. Caltrans would be the NEPA lead agency, as assigned by the Federal Highway Administration (FHWA).

Next Steps

The Feasibility Study phase will conclude in December 2015. It is anticipated that the environmental/preliminary engineering phase of the project will commence in spring 2016. Pending additional funding, the project team expects to initiate the final design and right-of-way acquisition phases by 2020, with construction completion between 2025 and 2030. An overview of the current phase in relation to an overall project development schedule is shown in **Figure 5**.

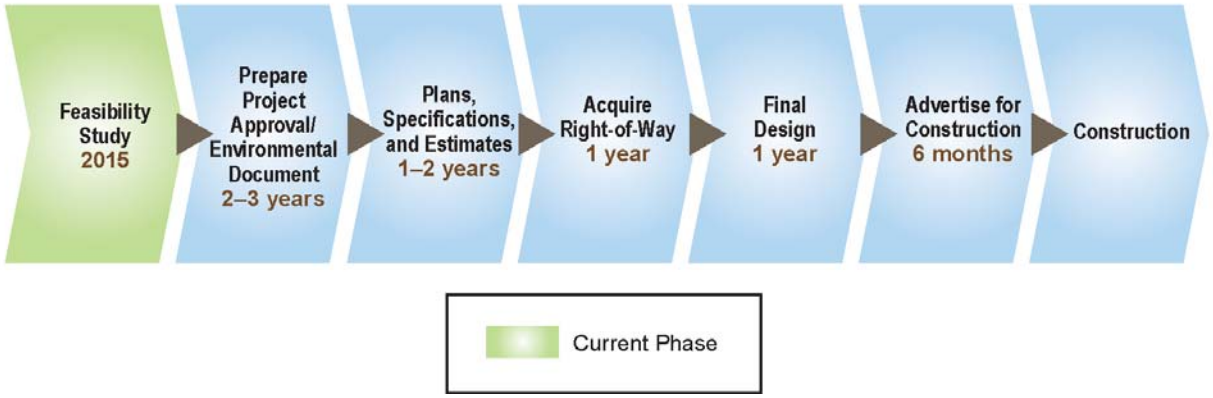


Figure 5. Typical Project Development Schedule

Key Actions for Next Phase

To support an efficient and informed decision-making process on the ultimate preferred bridge alignment, cross section, movable bridge type and local connections, the early coordination and analysis activities in the Project Approval/Environmental Document (PA/ED) phase should include the following:

- **Close Coordination between Transportation, Levee Design, and Land Use Planning.** Given the significance between the bridge alternatives and land use scenarios, close coordination will be required with the Pioneer Bluff revitalization team and property owners/development interests on the east side of the river. This coordination should include:
  - A comprehensive traffic analysis to inform land use decisions and support the project's need and purpose.
  - A robust outreach process for both sides of the river, to include the use of a Stakeholder Advisory Committee comprised of affected property owners and key agency representatives.
  - Integration of levee setback requirements and coordination on levee preliminary design with the Sacramento Area Flood Control Agency (SAFCA) and the City of West Sacramento's Urban Levee Design Criteria (ULDC) reconciliation team.
- **Regulatory Coordination to Facilitate Environmental Approvals.** Solidifying decision points and agency input on remaining technical issues will be key to facilitating environmental approvals and informing the next phase. These include:
  - Confirming the navigation channel required by the USCG for Alignment D.
  - Coordination with Caltrans on impacts to state facilities and exploring the potential closure of the southbound I-5 off-ramp to X Street.
  - Proactive analysis of levee impacts, geotechnical, and hydraulics/scour issues to form a detailed project description.