Alternative Development

The five Key Considerations formed the basis of the development of specific alternatives for a new crossing. Every possibility contained trade-offs in service of these considerations, and we did not find one clearly superior preferred alternative. However, this section is not intended to provide an exhaustive list of potential alternatives. Instead, we will present several of our best-performing alternatives and alignments that address the problems outlined in the Key Considerations and represent distinct visions for the priorities of a new crossing.

Each alternative considers the factors described in the Key Considerations:

1) Social Equity: Improve service and mobility options for disadvantaged communities.
2) Accessibility and Connectivity: Improve in-system and intermodal connectivity of existing and future transportation infrastructure.
3) Land Use Planning Coordination: Serve existing density and catalyze new development opportunities.
4) Climate Change Mitigation: Maximize transit mode share by providing greater service to both existing and newly-emergent high-demand areas.
5) Resilience and Adaptation: Provide redundancy in case of an existing tube shutdown.

In addition to these considerations, capacity concerns and engineering feasibility were also taken into account. The two primary capacity issues for BART are overcrowding at Embarcadero and Montgomery stations and potential bottlenecks in the Oakland Wye. Transbay standard rail alternatives have capacity concerns as well, but they only affect service patterns, not potential alignments. In terms of engineering feasibility, we relied heavily on the Core Capacity Initial Engineering Study and expert interviews to eliminate potential alignments that are operationally impractical or add considerable construction risk or cost to the project. These engineering considerations include but are not limited to: turning radii, land entry points, hills, station depths, tunneling under buildings, and existing infrastructure. Table 5 presents the alternatives chosen for deeper analysis.

Table 5: Analyzed alternatives and brief descriptions

Alternative 1: New Opportunities (BART)	Includes a BART diversion south of MacArthur Station running along a reimagined I-980 corridor in Oakland. Connects with San Francisco's South of Market (SoMa) before continuing West on Geary via Civic Center
Alternative 2: Critical Needs (BART)	Includes a BART diversion south of MacArthur Station running along Franklin St. in Downtown Oakland. Connects with Mission Bay and Downtown San Francisco via Geary
Alternative 3: Connecting the Megaregion (Standard Rail)	Includes a standard rail diversion south of the existing Emeryville Station running along a reimagined I-980 corridor in Oakland. Connects with San Francisco via the Transbay Transit Center. Extends Capitol Corridor service to Transbay Transit Center and extends Caltrain service to Richmond.

Alternative 4: Performance Pricing	Addresses transportation problems without a new crossing by increasing westbound Bay Bridge tolls during peak hours and using the revenue to fund increased bus service and land use changes that reduce demand on the corridor, in addition to other equity opportunities. Impacts to vulnerable groups would be mitigated by a lifeline discount.

Alternative 1: New Opportunities (BART)

Route Description

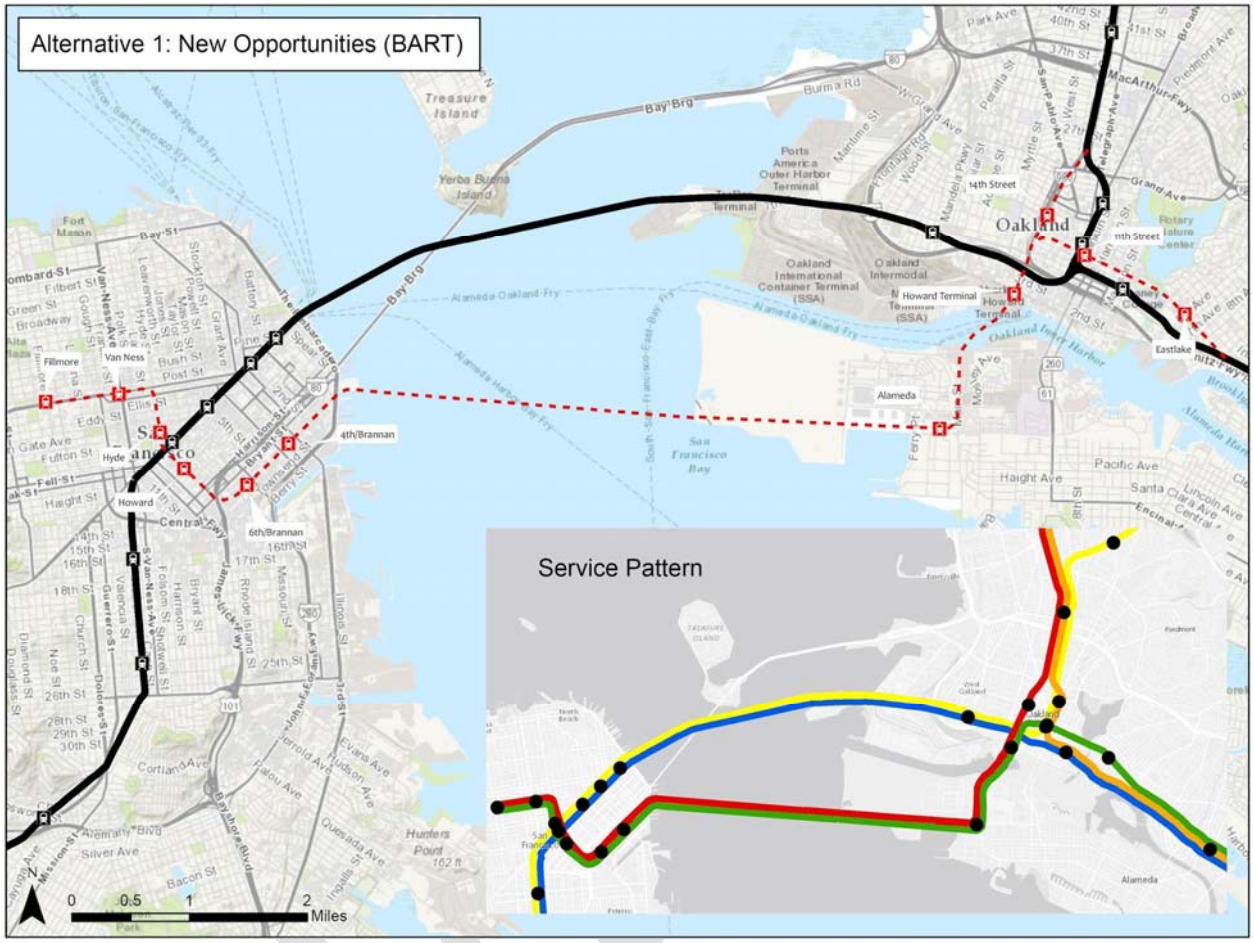
East Bay

Alternative 1, which is shown in Figure 36, includes a BART diversion south of MacArthur Station where the existing BART track diverges from I-980. The new BART line runs along the existing I-980 right-of-way, including new stations at 14th Street and Howard Terminal. The I-980 trunk connects with the southern East Bay BART lines via a diversion between the existing Fruitvale and Lake Merritt Stations. The new line tunnels under 12th St, creates a new station, Eastlake, east of Lake Merritt on 12th Street between 5th and 6th Avenues, then continues under 11th Street with a stop sharing existing infrastructure for 12th St Station. It then converges southbound with the I-980 tunnel. Moving south from the Howard Terminal station, the new crossing tunnels below the Oakland Estuary, travels south through Alameda along the right-of-way immediately east of Main Street, turns west on Atlantic Avenue, where a new station would be located. Then it continues west as far as possible before tunneling under the bay towards San Francisco.

San Francisco

This alignment approaches San Francisco at Pier 30-32, an entry point designated as "Promising" in the MTC's Core Capacity Transit Study Initial Engineering Memo (IEM). It then follows Brannan St through South of Market (SoMa), with one station between 3rd St and 4th St and another between 6th St and 7th St. The station at 3rd-4th St would provide a transfer to the Central Subway Brannan stop, as well as a short walk to the 4th and King St Caltrain and High-Speed Rail station. After 7th St, the line turns north to follow 8th St to a new station at Howard St. It then continues to another new station on Hyde St between Golden Gate Ave and McAllister St, providing a transfer to the Civic Center BART station. The line then heads west on Geary Blvd, with stations at Polk St-Van Ness Ave and Fillmore St. A full build-out of the line would see it continue westward on Geary Blvd to the Richmond District.

Figure 36: Alternative 1 alignment, stations, and service pattern



Source: Map produced by students in the Fall 2016 Transportation Planning Studio

Operational Implications

Northern Lines

The Red line would be routed into the new transbay crossing, while the Yellow line would continue through the existing crossing. Yellow line riders wishing to travel via the new crossing would switch lines via timed transfer at MacArthur Station. Red line riders would also have to transfer at MacArthur to access the 19th and 12th St Oakland stations, though much of the travel demand from southbound into Downtown and Uptown Oakland could be satisfied by the new station at 14th Street in the I-980 corridor. Travel time from the MacArthur station to the combined Civic Center-Hyde St Station would be reasonably similar via either crossing, as each route is similar in length and passes through three stations on each side of the Bay.

Southern Lines

Coming from the South, Green lines would be routed through the new crossing, while Blue lines would continue their current operation. Riders seeking to switch between these two lines would transfer at Fruitvale Station. Green line riders travelling to Downtown Oakland will no longer need to transfer to an Orange line, as they would instead be taken to the 12th St Station. However, the new route would

result in four stops between Fruitvale and San Francisco, compared to two stops today. The Orange line would continue its current route on both the northern and southern ends, and Blue line riders traveling north towards Downtown Oakland and Berkeley would continue to transfer to the Orange line at or before Lake Merritt Station.

Ridership Concerns

As discussed in the Current Conditions section, travel demand during the peak period is largely driven by destinations in the San Francisco Financial District. This demand suggests that the existing crossing would still be heavily utilized in this build-out scenario, with inbound Green and Red line riders transferring to this crossing.

However, the Financial District is currently at nearly full build-out and is forecasted to experience little employment growth according to the MTC's Market Assessment. We can expect the new crossing to attract riders with destinations in high-growth office areas in SoMa, Mission Bay, and Mid-Market that are not currently well-served by regional transit. This matching of crossings and destinations will mitigate capacity concerns and should justify the increased transfers. Additionally, the major East Bay growth opportunities at Eastlake, 14th St, Howard Terminal, and Alameda, as well as the South Bay extension stations, are all located on lines utilizing the new crossing.

Service Impacts

The service impacts vary depending on the side of the bay. San Francisco gets a new line that opens up ridership access, with service on the existing trunk changing very little. On the other hand, the East Bay, sees fewer new stations but significant capacity increases through improved frequency on the entire network. Since each crossing would only have two lines instead of all four (as with the existing tube), peak frequencies would increase by 83% on the Green line, 60% on the Red and Blue lines, and 55% on the Yellow line compared to MTC's 2035 service levels. Downtown Oakland experiences a massive increase in frequency as all lines except the Blue line make stops directly in the core. However, frequency in the existing San Francisco trunk would be lower than what is assumed in the 2035 projections (decreasing from 27 trains per hour to 25), though still higher than the current service level (24 trains per hour). The only other stations to experience a decline in peak frequency compared to that baseline are Lake Merritt (from 16 tph to 13 tph) and West Oakland (from 27 tph to 25 tph).

Context

I-980 Removal

Alternative 1 operates under the assumption that Oakland proceeds with the transformation of I-980 into a multi-modal boulevard, as discussed in the Current Conditions section. This transformation would remove the physical and psychological barrier dividing the two communities, thereby providing better connections between West Oakland and downtown. This connection should yield equitable outcomes for historically disadvantaged communities in West Oakland. Also, the wide, trenched I-980 freeway right-of-way could make underground rail construction easier.

East Bay Land Use Opportunities

The new East Bay stations have the potential to stimulate significant development potential and create new transit hubs in the heart of Oakland. The Howard Terminal BART station would be accessible to Jack London Square and would directly serve a Howard Terminal redevelopment. The Downtown Oakland Specific Plan Alternatives Report (DOSPAR) studies three alternatives for the Howard Terminal site, including a new baseball stadium and a transit-oriented development with nearly 900 housing units.

Converting I-980 into a boulevard would by itself create significant development potential for Downtown Oakland. The DOSPAR includes two alternatives for the transformation, both of which would include over 1,000 housing units and over 500,000 square feet of combined retail/office uses. Additionally, the new Eastlake station would provide rail access to a dense residential community east of Lake Merritt and a multimodal connection to the Bus Rapid Transit line set to open along International Boulevard. The station would also only be a half mile walk from the currently under construction Brooklyn Basin development.

Alternative 2: Critical Needs (BART)

Route Description

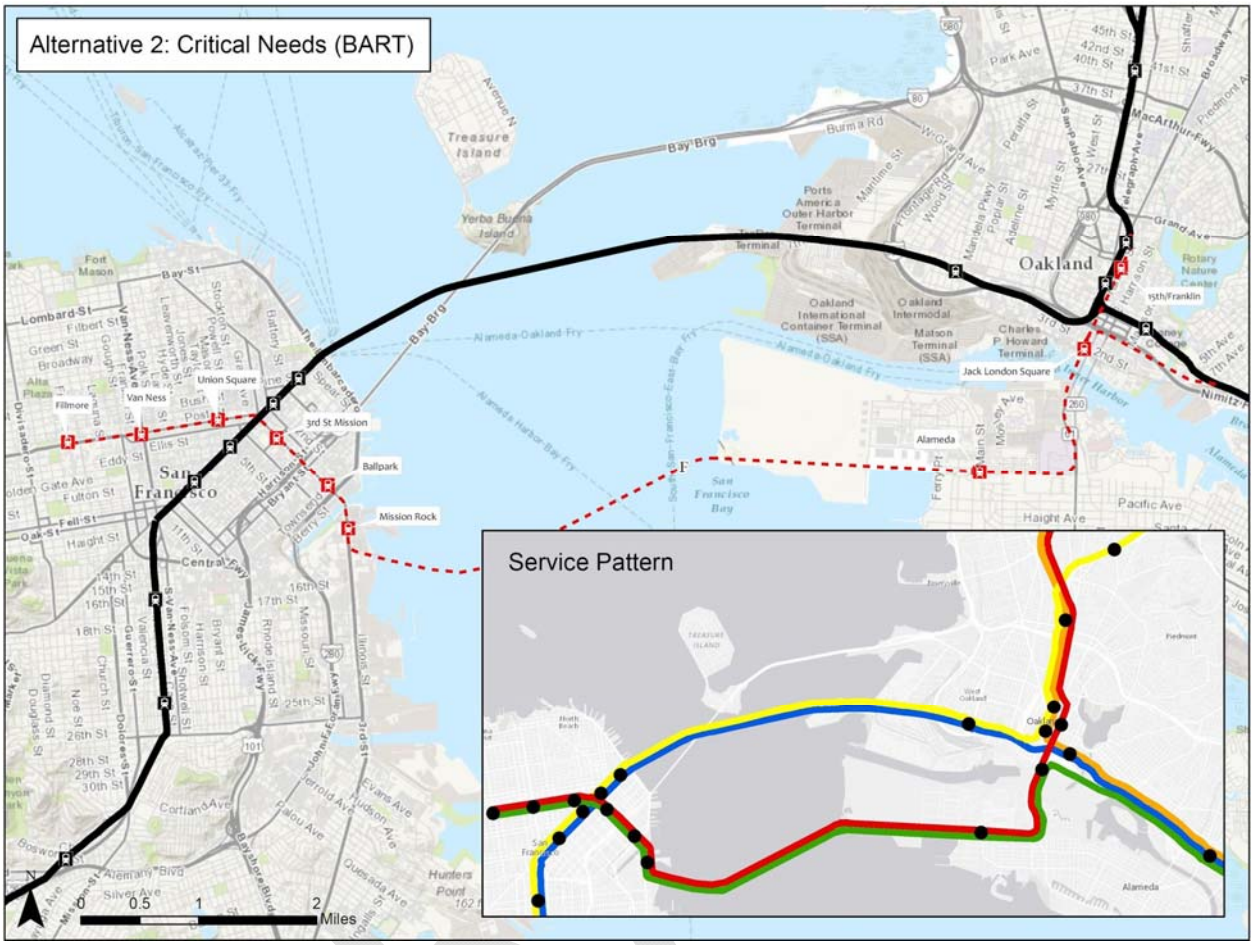
East Bay

Alternative 2, which is shown in Figure 37, has a BART diversion immediately south of MacArthur station, resulting in one set of tracks traveling south on Franklin St instead of Broadway. A station at 15th St provides transfers to the existing 19th St and 12th St stations, resulting in the connection of all three central Oakland stations. From the other side, new track diverges from the existing line around 8th Ave between Fruitvale and Lake Merritt. It then crosses the creek and follows I-880 before connecting with the Franklin line. Unlike in Alternative 1, no new stations are created on this line between Fruitvale Station and the connection of the two lines. The combined track passes through a new station at Jack London Square before crossing into Alameda. After crossing under the Oakland Estuary, the line follows Webster St in Alameda before turning west on Atlantic Ave, with a new station west of Main St. It then continues as far west as possible before tunneling under the Bay towards San Francisco.

San Francisco

This alignment approaches San Francisco at Pier 52 in Mission Bay, another entry point deemed "Promising" by the IEM. It then heads north on 3rd St, with a station at Mission Rock facilitating an easy transfer to the Muni Metro station above. The line continues on 3rd St through SoMa, with stations at Brannan St and Mission St. The Mission Street station provides a free underground transfer to the Montgomery BART station, as well as an underground connection to Caltrain, High-Speed Rail, and transbay buses at the Transbay Transit Center. After crossing Market St, the line heads west on Geary. There is a station near Union Square between Taylor St and Mason St, with an underground connection to the future Union Square Muni stop. Two additional stations at Polk St-Van Ness Ave and Fillmore St are the same as in the other BART alternative. Likewise, full build-out of the line would also entail continuing west on Geary Blvd to the Richmond District.

Figure 37: Alternative 2 alignment, stations, and service pattern



Source: Map produced by students in the Fall 2016 Transportation Planning Studio

Operational Implications

Northern Lines

As with the other BART alternative, the Red line would be routed through the new crossing, while the Yellow line would continue travelling through the existing tube. Transfers would again occur at MacArthur Station. Red line riders would retain direct access to Downtown Oakland via the 15th/Franklin station. Traveling from MacArthur to 3rd/Mission through the new crossing will be slower than traveling to Montgomery through the existing tube, as the new route has more stops and a longer travel distance.

Southern Lines

As with the other BART alignment, the Green line would be routed through the new crossing, while the Blue line would continue travelling through the existing tube. Transfers would again occur at Fruitvale Station. The Orange line would continue its current route on both the northern and southern ends, and Blue line riders seeking to go north towards Downtown Oakland and Berkeley would continue to transfer to the Orange line at or before Lake Merritt Station. While the travel time differential to Downtown San

Francisco is not as large between these two lines as it is for the northern lines, it is still somewhat slower to travel to 3rd/Mission than it is to Montgomery.

Ridership Concerns

Unlike in Alternative 1, this alignment provides direct service to the San Francisco Financial District and Union Square, the area with the highest demand in the BART system, and it does not reduce convenience of travel to the area with the second highest demand, Downtown Oakland. Although this route is not quite as direct as the existing crossing, the difference between the two is reasonable, and it is likely that most riders will opt for a one-seat ride and not transfer to the existing crossing. The other new stations in this alternative (Jack London Square, Mission Rock, and 3rd/Brannan) represent potential growth areas that are more mature and less speculative than those in Alternative 1. While that offers safer and more reliable rider demand, it also precludes the chance of transformative land use that might occur in the I-980 corridor, Howard Terminal, and Western SoMa.

Service Impacts

Service patterns are exactly the same as in the other BART alternative. In summary, frequency in the existing San Francisco trunk slightly decreases compared to MTC's 2035 service levels (though still above current levels), while the frequencies of the East Bay lines dramatically increase, especially in the Downtown Oakland core. Also as in the other alternative, the only East Bay stations with a (slight) reduction in frequency compared to the 2035 projected levels are Lake Merritt and West Oakland.

Context

3rd St vs 2nd St

One variation of this alignment involved traveling under 2nd St instead of 3rd St through SoMa. A 2nd St alignment would allow for better spacing between the BART line and the Central Subway running under 4th St. A station at 2nd/Mission would also directly abut both Montgomery Station and the Transbay Transit Center instead of requiring ~ 1,000 ft. long underground walkways. Lastly, the turn from 2nd St to Post St is unencumbered by existing buildings, unlike the turn from 3rd St to Geary. However, while a 2nd St alignment has significant service advantages, reliability and ease of engineering ultimately make 3rd St the more viable option. A 2nd St alignment would make a station in Mission Bay impractical due to the need to travel under AT&T Park. It would also, more significantly, travel directly under the Downtown Rail Extension for most of the length of 2nd St. Traveling under the length of another tunnel presents significant reliability concerns: if the BART tunnel requires repair, it can also affect the standard rail tunnel immediately above it. An attempt to avoid this situation by traveling under 3rd St before turning onto 2nd St immediately north of the TTC results in severe right turns that would require the demolition of numerous massive buildings and extremely slow travel speeds.

Construction Considerations

One complication of a 3rd St alignment is the turn onto Geary, which requires tunneling underneath part of the 700 block of Market St. Whether this requires removing one or more of those buildings is dependent on the depth of the tunnel, as well as the depth of the buildings' support structure. However, two blocks after crossing Market St, this alignment already must travel underneath the Central Subway,

which is roughly 100 feet deep. While this requirement means that the new BART tunnel would very deep, it does perhaps allow it to avoid conflicts with the 700 block of Market St.

Land Use Opportunities

As previously mentioned, several of the new stations in this alignment are located in areas that are already undergoing land use changes, which is both an advantage and disadvantage. These areas have fairly certain future demand that lacks quality connection to the regional transit system, and it makes sense to plan service to meet that demand. However, while the addition of a BART station may facilitate even further intensification, it will not be an impetus for brand new redevelopment opportunities by itself. The other stations in this alignment also provide direct access to existing areas of high demand such as Downtown Oakland, the San Francisco Financial District, and Union Square. Overall, this alignment trades the potential of transformative land use shifts for better service of more reliable locations of demand.

Alternative 3: Connecting the Megaregion (Standard Rail)

Route Description

East Bay

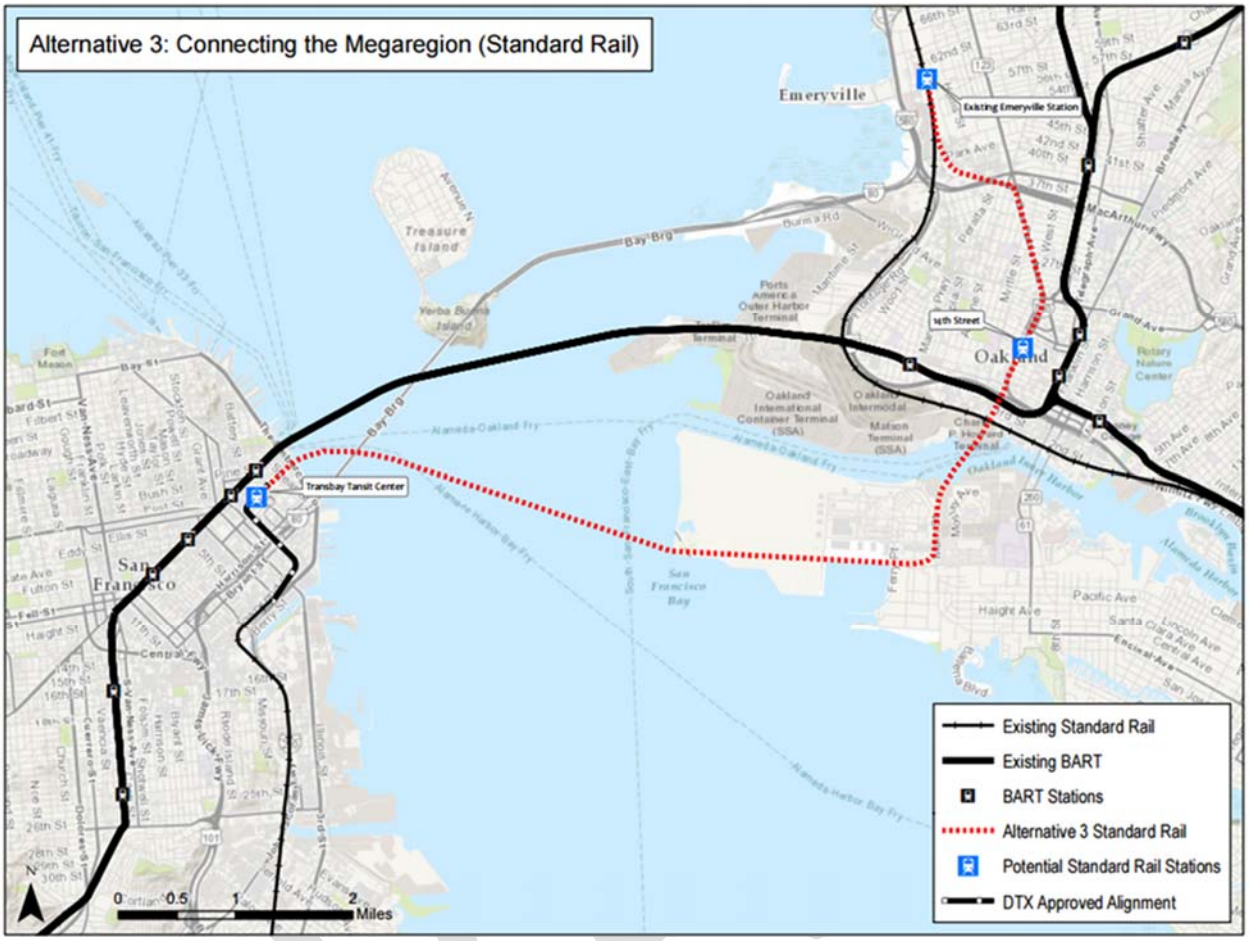
Alternative 3, which is shown in Figure 38, includes a standard gauge diversion south of the Emeryville Station before Sherwin Avenue. The new tracks tunnel below I-580 before turning southeast under San Pablo Avenue, where the tunnel runs for one mile before turning south into the 980 trench. Similar to Alternative 1, Alternative 3 includes a new station at 14th Street before traveling south below the Oakland Estuary, through Alameda along the right-of-way immediately east of Main St, and then west on Atlantic Ave as far as possible before tunneling under the Bay towards San Francisco.

In order to better integrate this alternative with existing transit infrastructure, Alternative 3 includes a BART diversion south of MacArthur Station where the existing BART track diverges from I-980. This BART diversion travels along the I-980 trench to the 14th St Station to allow for transfers between standard rail and BART. This diversion would leave the door open for a potential second BART crossing, as described in Alternative 1.

San Francisco

This alignment approaches San Francisco near Pier 14, an entry point designated as “Promising” in the MTC’s Core Capacity Transit Study Initial Engineering Memo. The tunnel travels under the Embarcadero and continues west under three blocks of buildings between Embarcadero and Main Street before connecting with the Transbay Transit Center between Main Street and Beale Street. The Transbay Transit Center would then be connected to the rest of the peninsula via the already planned Downtown Rail Extension, which will connect the Transbay Transit Center to the Existing Caltrain Terminus at 4th and King.

Figure 38: Alternative 3 alignment and stations



Source: Map produced by students in the Fall 2016 Transportation Planning Studio

Operational Implications

Operators

Alternative 3 allows for a variety of operators to make use of the third crossing, including Capitol Corridor, Caltrain, and California High Speed Rail. Capitol Corridor could send approximately four trains per day from its existing service originating in Sacramento through the new crossing and ending at the Transbay Transit Center in San Francisco. Caltrain could extend all of its Baby Bullet trains from the Transbay Transit Center through the new crossing to Richmond Station, with stops at the new 14th Street station and the existing Emeryville and West Berkeley Stations. There are currently six Baby Bullet trains per day in each direction, but this is slated to increase once Caltrain is electrified. Presumably, the crossing could also extend High Speed Rail service from San Francisco to Sacramento.

Service Impacts

In order to accommodate the BART connection to standard rail at the 14th Street Station, new Yellow and Red lines would be introduced, running from their respective northern termini to the 14th Street station at three trains per hour during peak and 2 trains per hour for off peak. These new lines would increase frequencies for Red Line riders between MacArthur and Richmond and Yellow Line Riders

between MacArthur and Pittsburg-Bay Point, but would not impact frequencies anywhere else throughout the system. These new lines would create a direct connection standard rail and BART in the heart of the East Bay.

Capitol Corridor runs on tracks owned by Union Pacific Railroad (UPRR) and must share them with freight traffic. In an effort to minimize impacts to freight conflicts, the four trains per day that Capitol Corridor could run through the new crossing would not be added to existing service. Rather, these trains will be shifted from existing Sacramento–Jack London Square and Sacramento–Oakland Coliseum lines. This change would not affect the existing Sacramento–San Jose line. The net result of these changes would be reduced Capitol Corridor frequencies at Jack London Square (which are offset by the creation of the 14th Street Station) and at Oakland Coliseum.

Context

There are two types of rail in the Bay Area: BART gauge, which is exclusive to BART, and standard gauge, which accommodates Caltrain, Capitol Corridor, and High Speed Rail. Unfortunately, the two types are incompatible. The region is already in the process of making large investments in its standard rail network, including the electrification of Caltrain tracks, High Speed Rail to San Francisco, and the Downtown Rail Extension from the current standard rail terminus at 4th and King St to the new Transbay Transit Center. Alternative 3 seeks to maximize those investments and connect San Francisco to the larger Northern California megaregion. This connection would open up South Bay jobs to Oakland's residents via rail. At a public presentation, a CalSTA official stated that she would like to see this project make its way into the 2018 State Rail Plan (SPUR Second Transbay Tube Event 2016).

I-980 Removal

The New Opportunities and standard rail alternatives both operate under the assumption that Oakland moves forward with the transformation of I-980 into a multi-modal boulevard. For more information on this proposal, see the Current Conditions section and Alternative 1 discussion.

Railyard Alternatives & I-280 Boulevard Study and Potential Construction Complications

The City of San Francisco is currently undergoing a Railyard Alternatives & I-280 Boulevard (RAB) Feasibility Study, which, among other things, is analyzing potential alignments for a Transbay Transit Center Loop. This loop is critical to realize the long-term benefits of the Transbay Transit Center for Caltrain and California High Speed Rail. It will become even more important if new service is introduced connecting Capitol Corridor to San Francisco. The potential loop alignments all exit the northeast side of the Transbay Transit Center and loop back to connect to the Downtown Rail Extension on Townsend.

Given the location of the Transbay Transit Center in the middle of the block between Howard Street and Mission Street, any loop alignment would need to run under three blocks of buildings. While analysis of these implications will be examined further in the RAB study, it is likely that some of these buildings will have to be repurposed to accommodate the rail tunnel between the Transbay Transit Center and Embarcadero. This reality undoubtedly incurs high construction costs, but it is the only direct way to enter the northeast side of the Transbay Transit Center. Given that the only realistic scenario in which a standard rail crossing would be built would be to connect the East Bay to the Transbay Transit Center,

standard rail alternative assumes that the City will move forward with the Transbay Transit Center Loop and that the third crossing would share the tunnel between Embarcadero and Main St. with the Loop.

East Bay Land Use Opportunities

As discussed under Alternative 1, transforming I-980 into a boulevard, alone, would create significant development potential for Downtown Oakland. The DOSPAR includes two alternatives for the transformation, both of which would include over 1,000 housing units and over 500,000 square feet of combined retail/office uses.

In addition to the new growth created around the 14th Street Station and along I-980, Alternative 3 creates significant development opportunities around existing standard rail stations that are connected to the third crossing. Given the service pattern outlined, this is particularly true for the Emeryville, West Berkeley, and Richmond Stations. Emeryville and West Berkeley stations are relatively close to BART stations, but providing a rail connection to Downtown Oakland, San Francisco, and Silicon Valley with meaningful frequencies would dramatically increase opportunities.

Alternative 4: Performance Pricing (No Third Crossing)

Description

The Performance Pricing alternative does not include a new crossing. Instead, transbay travel concerns are addressed by increasing westbound Bay Bridge tolls during peak hours and using the revenue to fund increased bus service and land use changes that reduce demand on the corridor, in addition to other social equity opportunities.

Figure 39: Bay Bridge toll plaza during period of high demand with express lanes for carpools and buses visible at right

Source: Federal Highway Administration

Components

Increased Tolls during Peak Demand

The Bay Bridge currently runs at capacity going into San Francisco during both morning and evening rush periods (see Figure 39). Tolls are collected in the westbound direction only and are $6 on weekday mornings from 5am to 10am, $4 other times on weekdays, and $5 on weekends (BATA, 2016). This alternative would adjust bridge tolls during high-demand hours to maximize revenue while maintaining vehicular throughput. In keeping with current practice, carpools with 3 or more riders would be discounted and allowed to use the HOV lane on the bridge. The resulting shift to higher-occupancy vehicles due to these toll increases means that the bridge would increase passenger throughput even as vehicular throughput remained constant.

Ideally, the tolls would be periodically updated in response to changing demand, resulting in what is commonly referred to as performance pricing or congestion pricing. The frequency of toll adjustment would depend on the trade-off between commuter cost certainty and the bridge operator's need for flexibility to address short-term fluctuations in demand.

This alternative is inspired by the success of pricing schemes across the world and builds on the limited form of congestion pricing currently implemented on the Bay Bridge and through High-Occupancy Toll (HOT) lanes on many Bay Area highways. Although the new HOT lanes in the Bay Area adjust tolls in real-time to keep HOT lanes flowing at a faster rate than other lanes (Bay Area Express Lanes, 2016), it is likely more politically problematic to apply this to the entire Bay Bridge.

Improved Bus Service

This alternative would also increase transbay bus service by AC Transit, reducing headways by 25 percent, and the toll increases for personal vehicles would improve AC Transit transbay travel times by reducing delay from congestion. Additionally, toll revenue could be used to redesign Bay Bridge entry points, making them more hospitable to buses by ensuring that cars do not block AC Transit vehicles from taking advantage of the carpool access lanes. This increased service would leverage the recent investment in new ramps that will go directly from the Bay Bridge to the bus terminal at the Transbay Transit Center.

Social Equity Concerns

While those who commute to work by car typically have higher incomes than those who commute by other modes, increasing bridge tolls still has a potentially negative impact on social equity. Whereas higher-income drivers might still be able to pay the toll with ease, low-income drivers who cannot easily switch modes or time-shift their travel would be forced to pay a potentially burdensome amount. This could be eased by instituting a program similar to the Lifeline utility assistance program, where low-income travelers could sign up to receive a discount at point-of-service through FasTrak. MTC's travel model estimates that in 2010, individuals making less than $30,000 who drove alone accounted for only 6 percent of San Francisco-bound Bay Bridge drivers during the morning commute, so this program's effect on overall congestion-reduction and revenue-generation would be minimal.

Distributing Excess Toll Revenue

The amount of new revenue available depends on the size and duration of toll increases. As a point of reference, total Bay Bridge toll revenue was $228 million during fiscal year 2014-15 (BATA). In a simplified case where tolls were increased by $1 across the board with no decrease or time-shifting of crossings, it would generate approximately $50 million in annual revenue. This alternative's focus on revenue-generation and less-expensive transit improvements creates opportunities for funding projects more tangentially related to a transbay crossing. Redirecting toll revenue, however, has a complicated history in the Bay Area. When MTC considered implementing congestion pricing on the Bay Bridge in the 1990s, a persistent concern of residents was how the revenue would be used (Trapenberg Frick et al, 1996). Outside the Bay Area, some cities have used revenue from congestion pricing to improve public transit, while others used the revenue on road projects to benefit drivers now paying higher tolls (Eliasson, 2014).

For this alternative, funding is directed towards projects that address the Key Considerations identified at the beginning of this report, with a particular focus on social equity and supporting land use that reduces the number of trips across the Bay. After funding improvements to transbay bus service, remaining revenue would be administered by MTC in part to support housing construction in San Francisco and job creation in the East Bay core. Specific measures might include offsetting impact fees and paying for environmental reviews. The Social Equity Opportunities section contains further analysis for how to use this money to best serve the needs of underserved communities.

Context

This alternative aims to address the Key Considerations with the construction of a new crossing. In particular, it has the potential to improve travel times by reducing congestion, reduce vehicle miles traveled (VMT) per capita by encouraging transit ridership and carpooling, and generate funding for projects that help rebalance demand across the corridor in addition to other social equity opportunities.

The major limit of the alternative is that it does not directly address regional transportation system resilience in the event of a disruption to the transbay BART tube or Bay Bridge. That said, the revenue it generates could be used in an emergency to fund additional bus or ferry service, or even a partnership with transportation network companies like Uber and Lyft. This alternative also provides more flexibility than a large infrastructure project to adapt to economic or technological changes. Further, this alternative does not preclude a future crossing project in response to changing conditions or extreme increases in demand. Other alternatives that include a crossing would likely in reality utilize a version of performance pricing across the Bay Bridge, but we chose to keep them separate to both isolate the individual effects and offer a complete vision of what would be possible to accomplish without building a third crossing. In addition, future work could consider the extension of peak pricing to BART.

Other Alternatives Requiring Further Consideration

With limited time and resources, we only explored two BART alignments, one standard rail alignment, and the Performance Pricing alternative. However, there are many alternatives that we considered (including the Performance Pricing alternative), but did not have time to fully analyze. The alternatives below are could be analyzed further in future study:

Combined BART and Standard Rail

While the funding challenges are daunting, a combined BART and standard rail alternative could reap the benefits unique to each crossing. Somewhat counterintuitively, the IEM found that two separate two-track crossings would be approximately 25% less expensive than a four-track crossing due to the geometric demands of such a large crossing. A combined BART and standard rail alternative would therefore not have to settle on single entry and exit points on either side of the Bay. Integrating Alternatives 1 and 3 suggests strong potential benefits. BART would serve high-growth areas and help with transformative land use change, while a standard rail connection to the TTC would provide additional capacity and service directly to Downtown San Francisco. Because of these potential synergies, any station in the I-980 corridor should be built with the possibility of connecting the other service at a later date in mind.

Southbound BART Alignments

Both of the BART-only alignments explored in depth in this report continue west along Geary due to the density and lack of existing rail transit in that corridor. However, we also considered alignments that traveled south towards Hunter's Point after entering San Francisco either north of Market St or in SoMa. These alignments avoid crossing under the Central Subway and could serve more new growth areas along the southwestern waterfront. However, we did not include any of them in our final analysis, as they typically performed extremely poorly on one or more Key Consideration.

Auto-Inclusive Tunnel

We also considered ways to include automobiles in these alternatives, particularly in context of a means for additional funding. However, an auto-inclusive tunnel or tube dramatically increases construction costs due to the required increase in size and provides limited transportation benefit, as even a one-way four-lane highway can only transport 8,000 vehicles per hour at capacity.