Historical Context

Consideration of a new crossing must be informed by the historical context of prior megaprojects and the politics of transportation infrastructure across the country. After defining megaprojects, this section focuses on that context primarily in terms of histories of crossings of the San Francisco Bay and case studies of megaproject planning and implementation with respect to historically disadvantaged communities.

Megaprojects Defined

Multibillion-dollar infrastructure projects, also known as megaprojects, have come under increasing scrutiny due to their massive scale and frequently poor project performance.[83] Megaprojects involve the mobilization of capital, both financial and political, in ways that can transcend the spectacular feats of engineering they might involve. Despite the large amount of attention and planning these projects receive, they are often poorly executed, with substantial cost overruns and fiscal shortfalls.

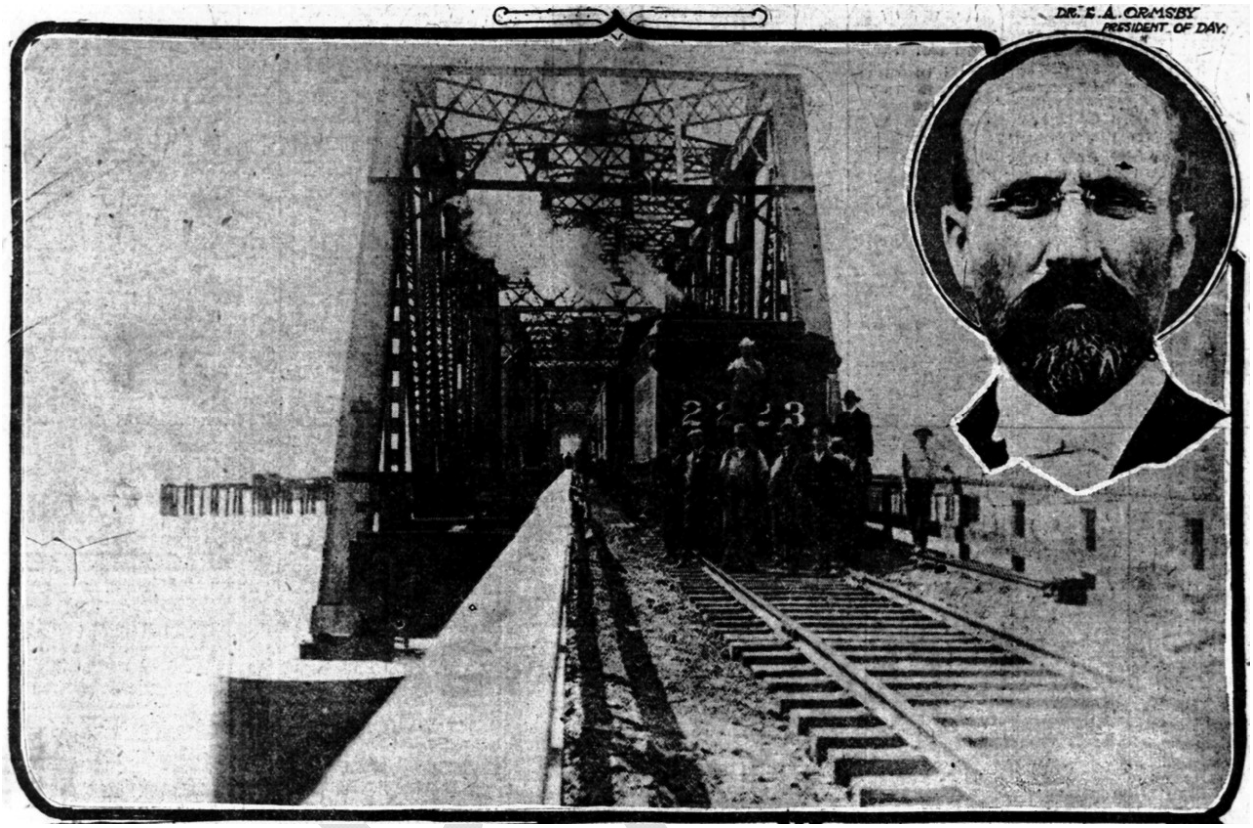
To investigate the subject of megaprojects in a bit more detail, we next examine at a specific set of megaprojects: crossings of the San Francisco Bay.

A History of San Francisco Bay Crossings

Some of the most notable megaprojects in Bay Area history consist of crossings of the San Francisco Bay. In total, there have been five bridge crossings of the Bay and one submerged tube used by the BART system.[84]

Figure 23: The first passenger train crosses the Dumbarton Bridge, 1910

[83] Flyvbjerg, B. Buzelius, N. Rothengatter, W. *Megaprojects and Risk: An Anatomy of Ambition*. 2003.
[84] The Golden Gate Bridge, opened in 1937, is omitted here. Technically, it spans the Golden Gate Strait, not the Bay itself, and moreover, it is not a State-owned bridge. While it certainly has its own rich and lengthy history, it falls outside the scope of this report, as do the Carquinez (between Vallejo and Richmond), Benicia-Martinez, and Antioch Bridges.



Source: San Francisco Call.

Initial Crossings

The very first crossing of the San Francisco Bay was the now-collapsed Dumbarton Rail Bridge, completed in 1910 and operational through 1982 (see Figure 23). The engineering required to construct the span was challenging due to swift currents and estuarine land.[85] The first automobile crossing of the Bay, the current Dumbarton Bridge,[86] was built on the same challenging terrain and opened in 1927 (see Figure 24). The bridge was rebuilt in 1982[87] with new environmental measures[88] and was subsequently widened to six lanes in 2004. This widening was funded by MTC's 1988 Regional Measure 1 toll increase.[89]

Figure 24: The original two-lane Dumbarton Bridge, 1966

[85] "Dumbarton Bridge is Approaching Completion". San Francisco Call. **103** (2). 2 December 1907.
[86] The bridge span itself has no name, aside from being a segment of California Route 84.
[87] "Dumbarton Rail: a bridge to the past ". San Mateo Daily Journal. Accessible at: http://www.smdailyjournal.com/articles/lnews/2016-07-11/dumbarton-rail-a-bridge-to-the-past/1776425164804.html
[88] C.M. Hogan, Leda Patmore, Harry Seidman et al., *Air Quality and Acoustics Analysis for the Dumbarton Bridge Replacement Project*, ESL Inc., prepared for the Bay Area Division of Toll Crossings (1973)
[89] Regional Measure 1. MTC Website. Accessible at: http://mtc.ca.gov/our-work/invest-protect/toll-funded-investments/regional-measure-1

The seven-mile long San Mateo-Hayward Bridge was the next to cross the Bay. It was the longest bridge in the world upon completion in 1929,[90] and it originally included a lift that allowed ship traffic to pass underneath.

Construction of the Bay Bridge

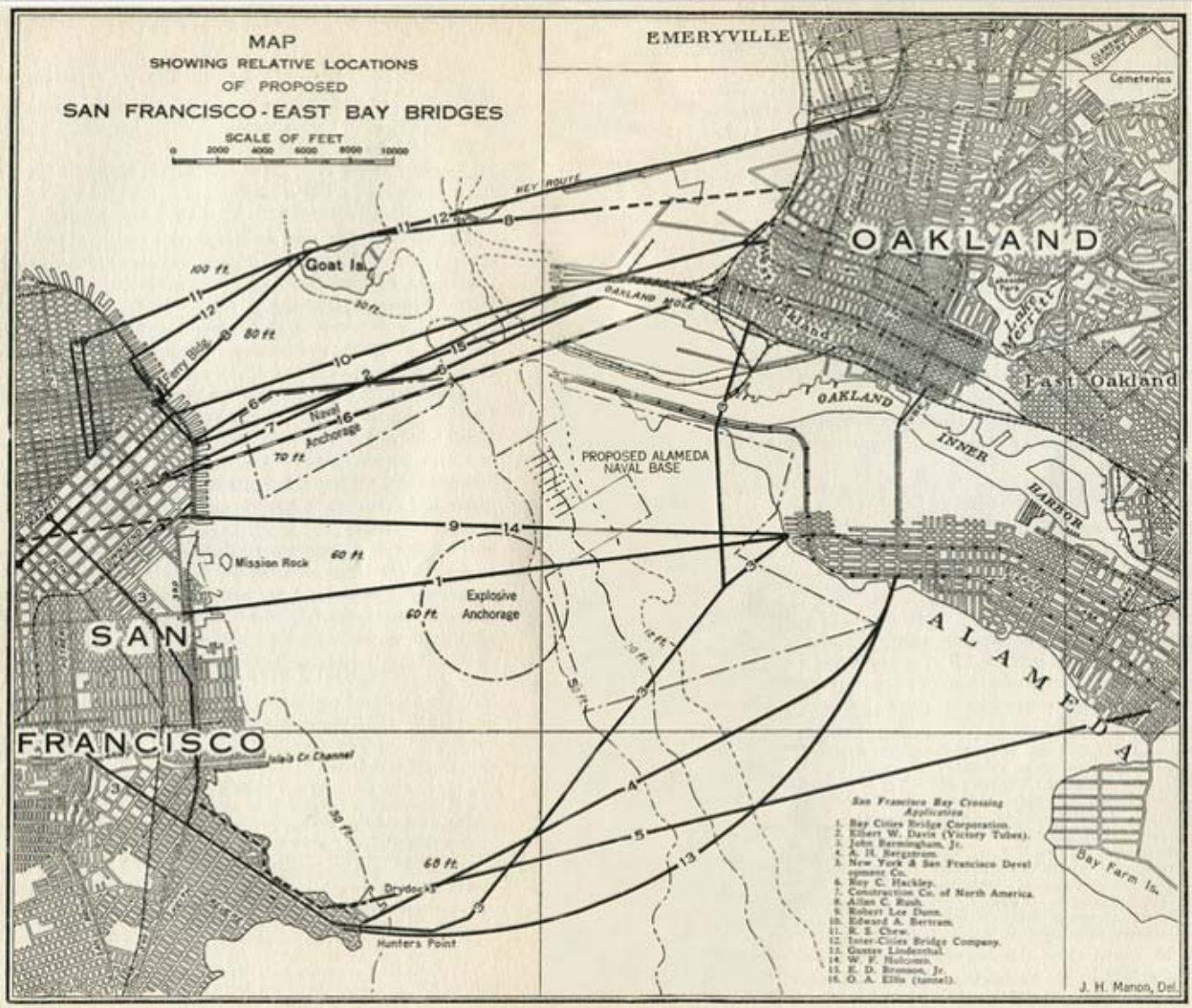
Construction then commenced on the San Francisco-Oakland Bay Bridge in 1933 (see Figure 25). Constructed over a three-year period, the process of building and maintaining the Bay Bridge has frequently attracted substantial worldwide attention. The bridge's engineering is extremely complex, and its political context is no simpler. The Bay Bridge has been subject to numerous alignment proposals advocated by cities and private bridge building consortia competing for the benefits that particular crossing offers (see Figure 26). The current version of the Bay Bridge consists of two spans. The two sides connect through a tunnel on Yerba Buena Island and travel a total distance of 8.4 miles. Planning for the bridge was complicated by the United States Navy, whose authority constrained the locations and specifications of potential crossings. The period of planning and building also coincided with the start of the Great Depression and provided a realistic means for job stimulus and economic relief.[91]

Figure 25: San Francisco-Oakland Bay Bridge from Yerba Buena Island during construction

[90] San Mateo-Hayward Bridge Facts. California Department of Transportation Website. Accessible at: http://www.dot.ca.gov/hq/esc/tollbridge/SM-Hay/SMfacts.html
[91] State of California Department of Public Works (1932); Trapenberg Frick (2016)

Source: www.alamedainfo.com.

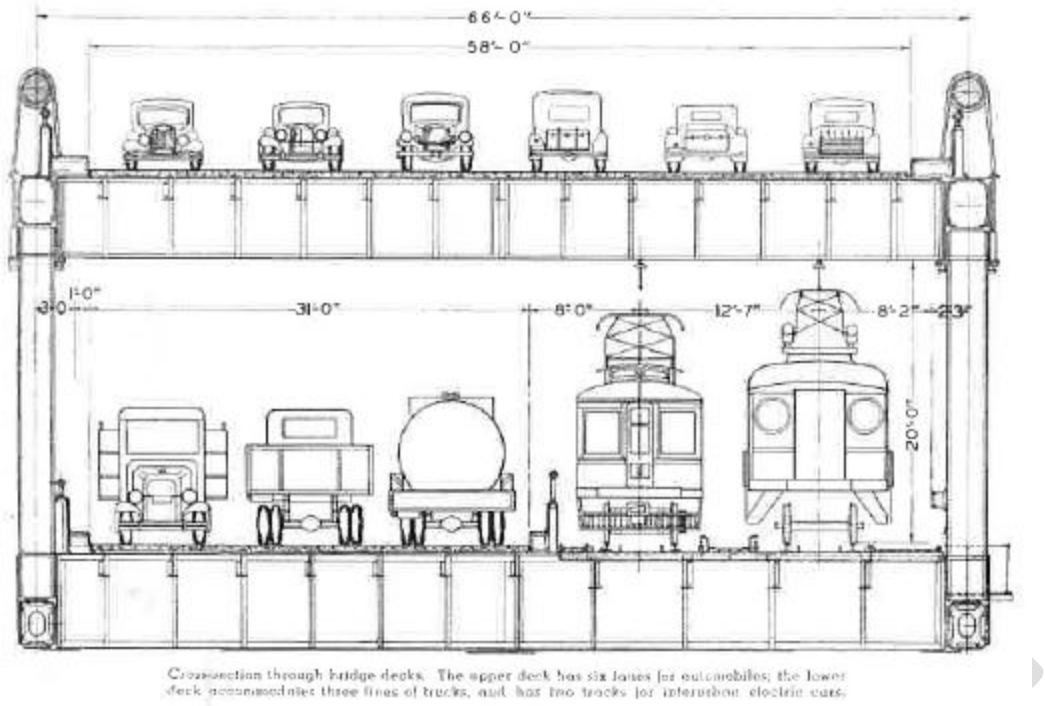
Figure 26: Locations of proposed San Francisco-East Bay Bridges, 1927



Source: San Francisco Bureau of Governmental Research, 1927.

Rail service operated on the lower deck of the Bay Bridge during its first twenty years (see Figure 27). As travel and congestion increased between San Francisco and the East Bay during this time, elected officials, citizens, academics, and professionals developed plans to increase capacity, including new auto bridges and a regional rail system. By the 1950's, though, as rail ridership flagged and auto travel increased, the Key System, a privately-owned transit company based in the East Bay, ceased service on the Bay Bridge. The State of California subsequently removed rail from the lower deck of the Bay Bridge between 1958 and 1963 (itself a massive project, involving the reconstruction of the Yerba Buena Island tunnel and upper-deck strengthening) and converted its surface to eastbound car and truck traffic.

Figure 27: Diagram showing designated lanes for trains and trucks on the original Bay Bridge, 1936

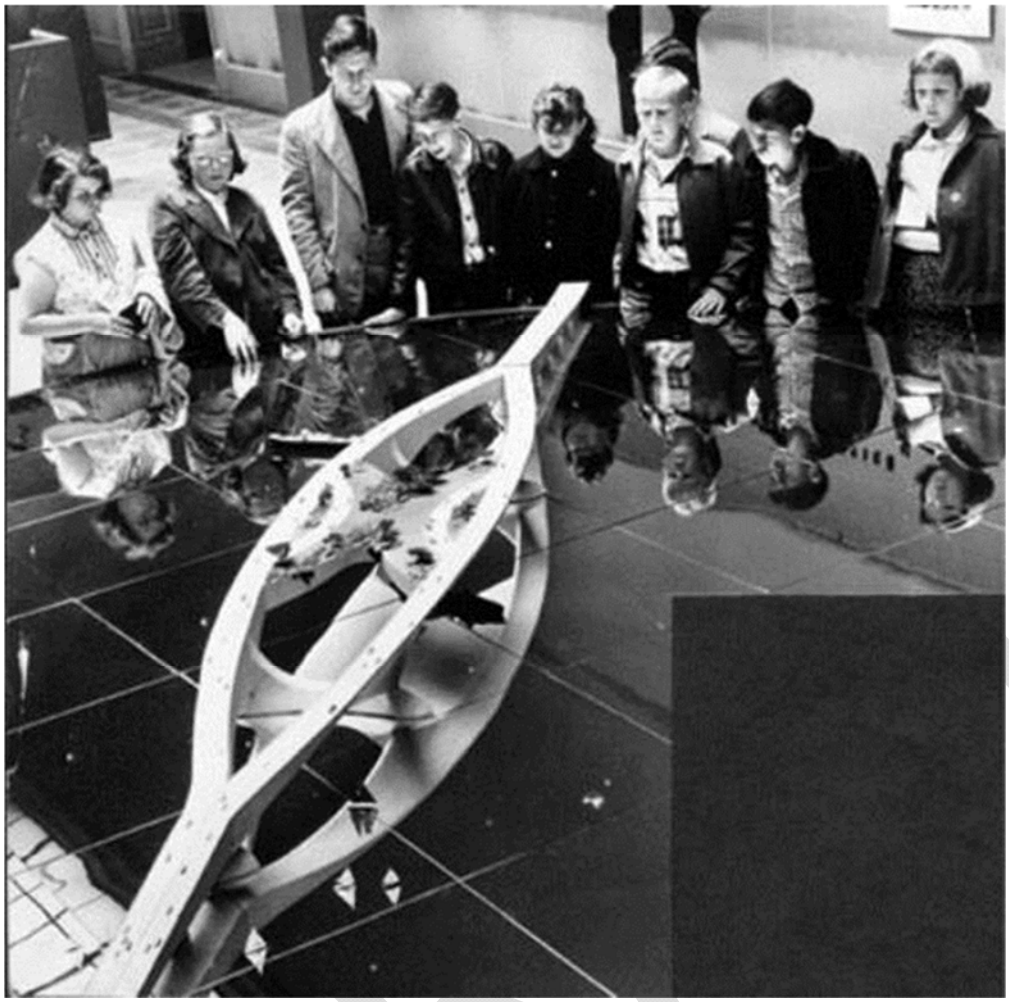


Source: Courtesy of the American Bridge Company.

Plans for a Southern Crossing

Plans for an additional Bay crossing, which became known as the Southern Crossing, began to materialize not long after the completion of the Bay Bridge. In 1949, architect Frank Lloyd Wright drew plans for a striking new bridge called the Butterfly Wing Bridge that included rail and pedestrian amenities (see Figure 28). Wright sought to create "something better suited to the times and their needs, to the superb scenery of the area, something more scientific, simpler, quieter…" This design, created alongside Bay Area architect J.J. Polivka, remains an enduring unbuilt vision for the San Francisco Bay.

Figure 28: Frank Lloyd Wright and J.J. Polivka's design for the Butterfly Bay Bridge on display at SF Museum of Art, 1953



Source: San Francisco Public Library.

Advocates for a Southern Crossing lost substantial support when the Key System withdrew, as it appeared that the rail removal would create sufficient capacity for cars without the need for a new bridge, and the idea was defeated at the ballot box in a 1972 referendum.[8] That same year, a different kind of crossing went into service, as a new regional rail system, Bay Area Rapid Transit (BART), began operation.

Discussion of a Southern Crossing was revived in 1999 by United States Senator Dianne Feinstein, who sent a letter to Governor Gray Davis during the planning process for the Bay Bridge eastern span replacement requesting further study of the matter:

> *Both the Silicon Valley Manufacturing Group and the Bay Area Economic Forum have recently released studies citing growing traffic congestion as one of the primary threats to the Bay Area's economic vitality for the 21st century… a regional traffic and transportation study for the Bay Area with respect*

> *to alternative Bay crossings and other options to increase the capacity and mobility for transbay travel between San Francisco, the East Bay and the Peninsula [should] be undertaken promptly.* [92]

Senator Feinstein, an opponent of the 1972 Southern Crossing measure, explained her newfound openness to the idea by arguing that "work patterns have changed. There wasn't a Silicon Valley. There wasn't a biotech industry. There wasn't the volume coming in at the seaport and airport."[93] However, the resulting study concluded that a major new crossing project, whether highway or rail, was not needed at the time and that the lack of political consensus made a project of that magnitude infeasible regardless.[94]

Transbay Visionaries

The fourth auto bridge to span the Bay was the Richmond-San Rafael Bridge, completed in 1956 (see Figure 29). This northernmost span replaced ferry service between Marin County and Richmond and had been a key element of bridge transportation advocacy and politics for over thirty years prior to completion. One visionary of the era was T.A. Tomasini, a Marin capitalist who designed a series of plans to link Marin, San Francisco, and Alameda Counties with a combined tube-bridge structure.[95] Quoted in the Sausalito News on July 13, 1928, Tomasini spoke confidently of his ambitions:

> *Engineers and eastern financial interests who have carefully studied every phase of the situation are even more enthusiastic over the success of the projects than many here at home. The eyes of the east are upon the bay district and toll bridges have proven to be such meritorious investments that there is no difficulty in getting ample capital with which to conduct development work of this character. If there is no delay in obtaining the franchise from the San Francisco [S]upervisors we can have Marin. Alameda and San Francisco [C]ounties all linked together with bay crossings in three and a half years.*[96]

While Tomasini's specific plans failed to come to fruition, his attention-generating plans helped garner eventual political support for the bridge's completion.

Figure 29: Richmond-San Rafael Bridge under construction, 1955

[92] United States Senator Dianne Feinstein. Letter to Governor Gray Davis. November 8, 1999
[93] Nolte, Carl. "Southern Crossing – Boulevard of Broken Dreams." San Francisco Chronicle, January 20, 2000.
[94] MTC's Bay Crossings Study: More Than Just Talk, retrieved at:
http://www.baycrossings.com/Archives/2002/06_July/mtc_bay_brossings_study.htm
[95] Madera Tribune, Number 34, 12 December 1927
[96] Sausalito News, Number 27, 13 July 1928

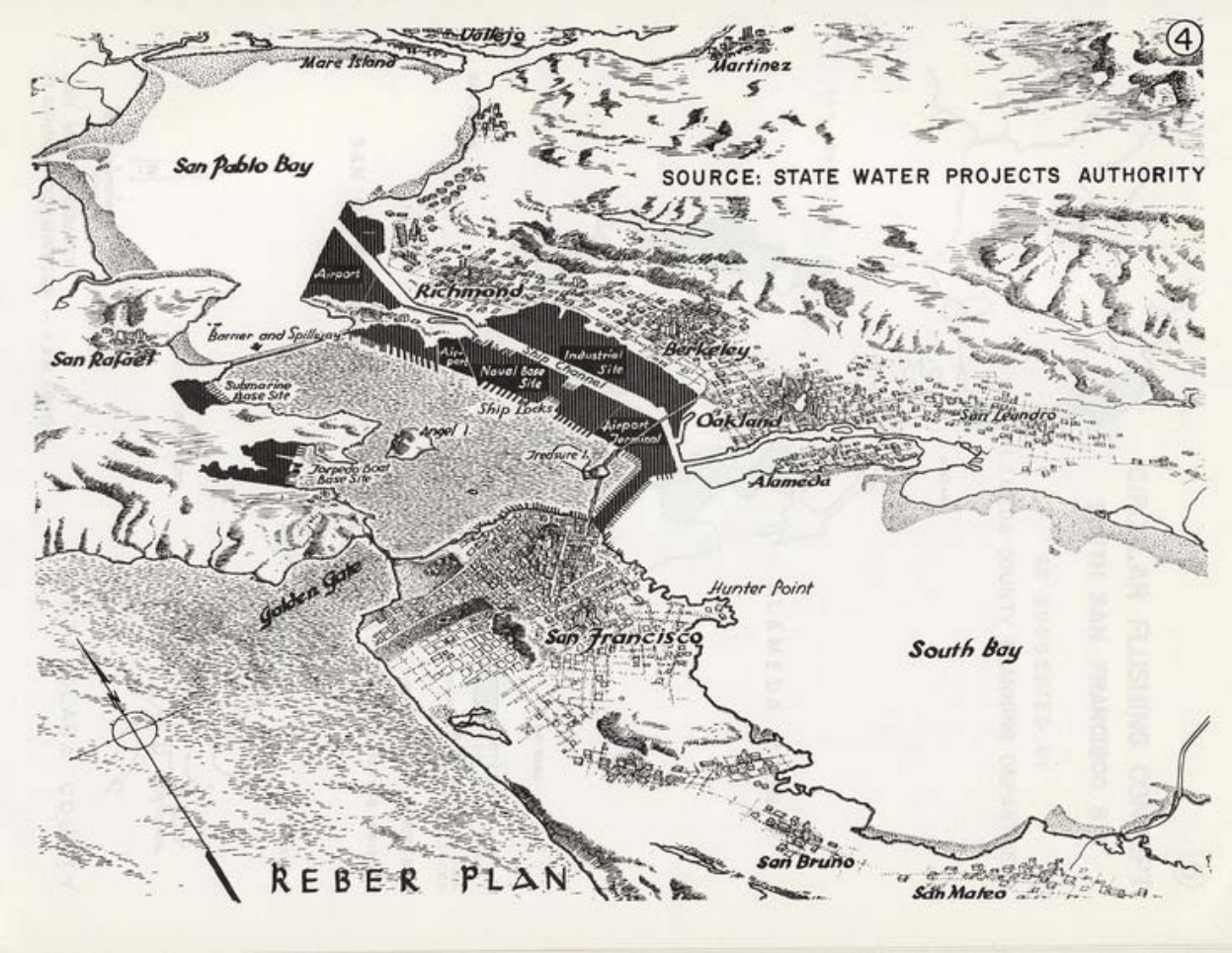
RICHMOND—SAN RAFAEL BRIDGE (4 mi. long) had low trusses in the foreground placed by floating in. Erection is underway in center section, using aluminum falsework trusses. Catilever span nearest the far shore is also underway, using the balanced method of erection.

Source: The Richmond-San Rafael Bridge: A Photographic Story. James B. Jennings, 1955.

John Reber was another transbay visionary, calling for the infill of 20,000 acres of the Bay. His plan envisioned creating two new freshwater lakes, with trains and several new roadways over a land bridge

south of the Bay Bridge (see Figure 30).[97] A 1947 Army-Navy study on Southern Crossing alignments included elements of the plan,[98] but the Reber Plan was ultimately discarded for being infeasible due to both the enormity of the project and concerns about its potentially environmentally hazardous impact. Political opposition to this plan spurred the rise of the "Save the Bay" movement to protect the Bay from further infill. It also led to the creation of the California State Legislature's creation of the Bay Conservation and Development Commission in 1965 with the regulatory authority to protect the Bay from environmental harm.[99]

Figure 30: Diagram of the Reber Plan, 1949



Source: Institute for Governmental Studies, UC Berkeley.

[97] "Bridging the Bay, Bridging the Campus: Salt Water Barriers". University of California, Berkeley.
[98] Adler, Sy. "Infrastructure Politics: The Dynamics of Crossing San Francisco Bay." The Public Historian 10.4. 1988
[99] https://boomcalifornia.com/2015/04/14/the-man-who-helped-save-san-francisco-bay-by-trying-to-destroy-it/

Modern Day Megaproject: Bay Bridge Eastern Span Replacement

The most recent Bay crossing project was the construction of the new eastern span of the San Francisco-Oakland Bay Bridge. The original eastern span's upper deck collapsed during the 1989 Loma Prieta earthquake, and after making initial repairs, the State of California decided to replace the span rather than undergo seismic retrofitting. Though construction of the new span occurred between 2002 and 2013, the entire process spanned five governors, with all the shifting priorities and state agency turnover that entails.

The new eastern span project produced the widest and longest a self-anchored suspension span in the world, winning awards for both its complex design and engineering.[100] It was also plagued by severe cost overruns, with a final headline cost of $6.5 billion, not including financing costs.[101] The process was highly controversial, with major conflicts over engineering decisions, aesthetics, and a perceived lack of oversight, risk analysis, and independent peer review. The political situation was extremely complex, as engineers, architects, academics, elected officials, local residents, and government agencies at all levels of government sought to contribute substantively to the process.

The public debate focused on the bridge's design and the extent to which the desire for an aesthetically and technologically sublime structure should compete with cost concerns. The potential to include a rail link on the bridge was another point of contention. Though the MTC's design recommendations for the new eastern span included that the bridge be strong enough to carry light rail (modern streetcars), this recommendation was not binding.[102] The mayors of San Francisco, Oakland, Berkeley, and Emeryville advocated for the inclusion of a rail crossing on the bridge, passing advisory ballot measures with overwhelming voter support. These efforts were further supported by Senator Feinstein, who requested that the new eastern span have the structural capacity to include rail in the future.[103]

As with the original Bay Bridge, the Navy objected to the new bridge's alignment north of the existing bridge. This time, though, the concern was economic rather than military. Together with the City of San Francisco, they argued that this alignment would negatively affect property on Yerba Buena Island that that the Navy was transferring to the City, and their resistance on this matter caused a two-year long delay.

The Bay Bridge rebuild is the most recent and vivid example of a transportation megaproject in the Bay Area, and the clashing political priorities, cost concerns, and long timeline provides context for potential issues in the planning and construction of a new crossing. It is essential to learn from and apply this history of visionary innovations, political maneuvering, and shortcomings in design, cost estimating, and project oversight. In doing so, we can build upon the wisdom, energy, visions, and challenges of previous crossings of the San Francisco Bay, and make plans for a more connected, equitable, and just region.

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100 "SAN FRANCISCO-OAKLAND BAY BRIDGE WINS EXCELLENCE IN STRUCTURAL ENGINEERING HONOR". California Department of Transportation Website. Accessible at: http://www.dot.ca.gov/hq/paffairs/news/pressrel/14pr095.htm

101 Potentially twice that, including the cost of financing.

102 Trapenberg Frick, 2016, pp. 93-96

103 United States Senator Dianne Feinstein. Letter to Governor Gray Davis. November 8, 1999

Social Equity Case Studies of Transportation Megaprojects

Consideration of social equity in transportation megaprojects requires attention to how the planning, building, and operation of new large-scale transportation infrastructure affects low-income and historically disadvantaged communities. This attention is especially important in light of the historical damage done to these communities by megaproject planning and construction. We first consider a case from outside the Bay Area that helps establish a general principle of social equity considerations in transportation planning before discussing two local case studies directly related to a potential third crossing megaproject: the planning and construction of the BART system and Interstate 980.

Socially Equitable Distribution of Benefits: Milwaukee's "Zoo Interchange"

The "Zoo Interchange" is the state of Wisconsin's busiest section of highway, and the high level of congestion promoted state transportation officials to embark on a project to widen and improve it. However, the $1.7 billion project they settled on contained no public transit improvements. This absence led a coalition of community groups representing black and low-income Milwaukee neighborhoods, led by the Black Health Coalition of Wisconsin and the Milwaukee Inner-city Congregations Allied for Hope, to file suit against the State. These groups argued that the project would exacerbate the city's historical legacy of racial segregation, racial wealth, and employment disparities (see Figure 31 and Figure 32).[104]

Figure 31: Equity-based transit advocacy in Wisconsin, 2013

[104] The State of Black America: Locked Out (2016), A National Urban League Publication.

Source: American Civil Liberties Union

Figure 32: More equity-based transit advocacy in Wisconsin, 2014

Source: Environmental Law and Poverty Center

Their 2013 suit alleged that the State was discriminating against urban racial minorities by allocating transportation resources exclusively to freeway improvements without commensurate funding for transit modes used more heavily by disadvantaged groups.[105] The lawsuit was settled in mediation, and the coalition secured $13.5 million in public transit funding for the City to expand and improve bus service between Milwaukee and suburban communities.[106] This result sets an important precedent concerning the importance of the socially equitable distribution of benefits in transportation megaprojects, as well as the ability for disadvantaged communities to effectively advocate for their interests in infrastructure planning through community organizing and legal action.

Social Equity in Bay Area Transportation: BART and I-980

BART is one of the key components of the Bay Area regional transportation system. As affluent Bay Area residents moved further out to the periphery, BART expanded to meet them. BART provided an easy way for these residents to be able to live outside of the core while still retaining easy access to jobs and airports.[107] The focus on outward suburban expansion demonstrates the historical development priorities for the region. A focus on suburban communities remains today, though it has been tempered somewhat with an awareness of the vital link BART provides for some disadvantaged communities and municipalities where a high percentage of people rely on public transit to reach jobs and services. Even

[105] "State to spend $13.5 million on transit to settle Zoo Interchange suit". Milwaukee Journal-Sentinel. Accessible at: http://archive.jsonline.com/news/milwaukee/state-to-spend-135-million-on-transit-to-settle-zoo-interchange-suit-b99273749z1-259843881.html

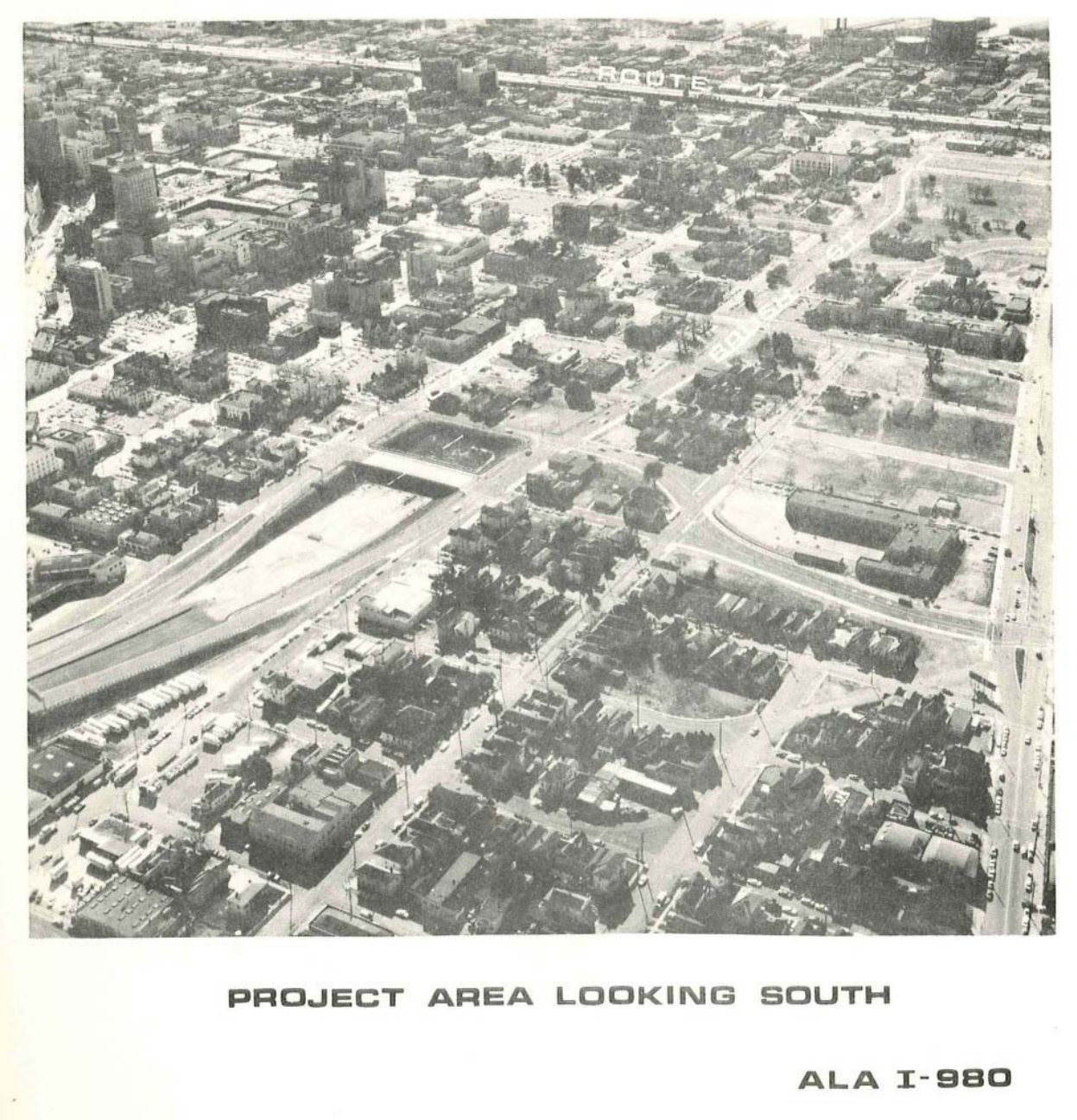
[106] "Milwaukee Transit Advocates Win $13.5 Million Settlement From State DOT", retrieved from http://usa.streetsblog.org/2014/05/22/milwaukee-transit-advocates-win-13-5-million-settlement-against-state-dot/

[107] MTC Resolution 1876 was a funding agreement among BART counties for SFO's extension in tandem with the other extensions, so each major growing area in the BART district had an extension.

with a shift in priorities to the inner core, an improvement in social equity is not assured as those inner areas also see an increase in higher-income residents.

The construction of Interstate 980 is another project with significant social equity implications that was completed in that same era (Figure 33). Construction of the highway tore a path through West Oakland communities, separated it from downtown, and displaced many African-American households.

Figure 33: Neighborhood in West Oakland, prior to intrusion by the Interstate 980



Source: www.connectoakland.org [108]

In recent years, the City of Oakland and transportation advocacy group ConnectOakland have recommended the removal of I-980. They suggest that this could occur in tandem with the construction of a third crossing, or separately as a stand-alone project. The goal of this project would be to reconnect communities torn apart by previous transportation infrastructure projects. In its 2016 application for Smart City funding from the United States Department of Transportation, the City of Oakland described its goals as such:

> *This is a bold vision to transform a segment of Interstate 980 into an at-grade boulevard to reconnect West Oakland neighborhoods into the fabric of the City. The construction of the freeway resulted in significant dislocation, effectively sealing off and surrounding West Oakland and its primarily African-American residents with freeways.*[109]

Additionally, SPUR asserted in a recent white paper that the third crossing project should build on projects like the I-980 reconstruction.[110] The filling-in of I-980 would be one of the largest social equity-oriented transportation projects in the area to date, and it represents a great opportunity for advocates of social equity in transportation and municipal economic development.

[108] "Repairing the Gash in the Heart of Oakland", available at: http://sf.streetsblog.org/2015/12/09/repairing-the-gash-in-the-heart-of-oakland/.
[109] Oakland, CA's Smart City Application, retrieved at: https://www.transportation.gov/smartcity/visionstatements/Oakland-CA
[110] Designing the Bay Area's Second Transbay Rail Crossing (2016) SPUR, retrieved at: http://www.spur.org/publications/white-paper/2016-02-10/designing-bay-areas-second-transbay-rail-crossing