Introduction

This report analyzes a new transbay crossing to provide additional travel capacity between San Francisco and the East Bay, complementing the existing Bay Area Rapid Transit (BART) tube and the San Francisco-Oakland Bay Bridge. Several Bay Area organizations have published reports advocating for or contemplating the implications of a new crossing.[1] At the same time, public agencies, city officials, regional bodies, and state-level agencies have begun to evaluate the potential for such a project. Many expect the new crossing to constitute a new line within the BART system, and simply refer to the project as a "second tube."

However, we approach this project in a new and holistic way; as such, we consider an additional BART line to be just one of several alternatives. Working over the course of a semester, our team of 15 transportation planning and engineering graduate students at UC Berkeley has analyzed a comparison of alternatives—both in travel mode and alignment—as well the magnitude and distribution of potential benefits the project would yield. We have also turned to the historical context of Bay crossings and regional megaprojects in analyzing the governance, risk management, and funding and financing implications for a new crossing, providing recommendations in each case.

Given a multi-billion dollar project with widespread and long-lasting impacts, a thorough social equity analysis is imperative. To that end, this report carefully considers project benefits and involvement in the planning process across a range of communities. We provide a set of recommendations for how a new crossing can best serve the needs of the region and promote equitable outcomes.

A Megaproject in a Megaregion

There is a growing body of literature on megaprojects, which can most easily be thought of as multibillion-dollar infrastructure developments.[2] A new transbay crossing would definitely qualify as a megaproject, given early cost estimates between $8 billion and $12 billion.[3] (Such preliminary estimates usually mark the lower bound of eventual costs and do not include financing or operations and maintenance costs.) This project would be larger and more expensive than the combined scale of many other major Bay Area transportation projects of recent years, including the Bay Bridge Eastern Span replacement, the San Francisco Central Subway, Caltrain electrification, and BART extension projects in the East Bay and South Bay. The time scale for the project could also be immense—these same recent major projects in the Bay Area have taken between 15 to 28 years to complete from the start of planning.

Thus, a new transbay crossing would be significant not just for the nine-county Bay Area but also for a much larger *megaregion*. The megaregion concept is not new. A consolidated "Northern California Megaregion" including the Sacramento and Stockton metropolitan areas was first identified by the Regional Plan Association's *America 2050* project and expanded upon in a 2007 report from SPUR, *The Northern California Megaregion*. In 2016, the Bay Area Council published a report arguing that

[1] For a list reports that have informed this project, see Appendix A: Annotated Bibliography.
[2] Flyvbjerg, B. Buzelius, N. Rothengatter, W. *Megaprojects and Risk: An Anatomy of Ambition*. 2003.
[3] "The Case for a Second Transbay Transit Crossing." Bay Area Council. February 2014. http://www.bayareaeconomy.org/report/the-case-for-a-second-transbay-transit-crossing/

"challenges in housing, land use, jobs, transportation, and the environment have crossed regional boundaries," making planning at the megaregion scale necessary.[4] Indeed, this project would likely benefit from a planning process at the megaregion level.

In the Bay Area, the Metropolitan Transportation Commission (MTC) complements the traditional concentration of planning at the municipal and state levels, but this organization is still limited to a scale smaller than the megaregion. The U.S. Department of Transportation has recently funded research into the role and importance of megaregions in transportation planning, and it is likely there will be more institutional interest in addressing infrastructure investment at the megaregion scale in the near future.[5] A new transbay crossing could be a test case for such an effort.

Scope of Analysis

Our analysis of the potential new crossing is grounded in a consideration of social equity. Transportation infrastructure in the Bay Area has historically not been planned or executed with the needs of disadvantaged communities in mind. At the same time, these communities have frequently borne the costs of that infrastructure without sharing in the full benefits. This legacy informed an awareness of the need to not only avoid past mistakes, but also proactively orient a future project around improving social equity. Our primary geographic scale for this analysis is the five-county core of the region. However, we also take into consideration the traditional nine-county Bay Area, as well as the Northern California megaregion.

Research Design

To inform our key considerations, we first reviewed recently published reports from advocacy and nonprofit organizations as well as public agency documents.[6] We supplemented our review with formal and informal interviews of representatives from transportation agencies; planning organizations; transit providers; advocacy organizations focused on social equity and disadvantaged communities; and municipalities from the Bay Area, California and across the country.

To analyze the impact of different travel modes and crossing alignments, we began with alignments proposed in published reports and in our interviews. We added stations and alignments that appeared promising for the group's equity goals, subject to engineering feasibility. We then ran the proposed alignments through both MTC's regional travel model and land use model to provide projected future land use and travel data for the various alternatives.

In addition to the modeling outputs, we utilized existing data on the transbay corridor and region to inform public health, economic development, and resiliency analysis. We conducted a supplementary

[4] "The Northern California Megaregion: Innovative, Connected, and Growing." Bay Area Council. June 2016. http://www.bayareaeconomy.org/files/pdf/The_Northern_California_Megaregion_2016c.pdf.
[5] Ross, Catherine L. "Megaregions: Literature Review of Organizational Structures and Finance of Multijurisdictional Initiatives and the Implications for Megaregion Transportation Planning in the U.S." U.S. Department of Transportation, Federal Highway Administration. October 2011. https://www.fhwa.dot.gov/planning/publications/megaregions_report_2012/megaregions2012.pdf.
[6] Refer to Appendix A: Annotated Bibliography for a list of reports and for summaries of each.

literature review and case study analysis to inform research on risk analysis, governance structures, resiliency, finance and funding, and social equity.

This report is organized into the following topics:

- **Key Considerations:** A presentation and justification of overarching purpose and need statements for a new crossing. The five key considerations guiding our analysis are: social equity; accessibility and connectivity; land use planning coordination; climate change mitigation; and resilience and adaptation.
- **Policy Context and Current Conditions:** This section gives context for the existing and future transportation and social equity issues facing the region. Includes a presentation of the existing travel and land use patterns, economic conditions, and socio-demographic makeup of the Bay Area. A discussion follows of the relevant state, regional, and local policies that directly affect and inform the potential construction of a new crossing, as well as a description of the key agencies likely to be involved.
- **Historical Context:** Discussion of a new crossing must grapple with the history of San Francisco Bay crossings and regional megaprojects. Major infrastructure projects in the Bay Area have often experienced controversy stemming from cost overruns and negative impacts to low-income neighborhoods. This section first assesses that history, then offers a series of case studies that explore how social equity is incorporated in megaprojects across the country.
- **Social Equity Opportunities:** The process by which a new crossing is designed, built, funded, and operated will determine the extent to which it benefits disadvantaged communities. These communities historically have suffered in the planning and construction of major infrastructure projects, and this section analyzes what opportunities exist at all stages of the process to maximize equitable outcomes.
- **Governance and Risk Management:** This section explores the potential benefits and drawbacks of different governance structures for the project delivery and operation of a new crossing. Risk management is a particularly important aspect of this analysis given the massive scale a new crossing represents. Case studies from across the country offer insight into the potential risks and rewards of these governance structures.
- **Performance Metrics and Alternatives Development:** Using the goals established in the key considerations, a set of performance metrics to judge potential crossings is proposed, defined, and justified. Four alternatives to be studied are then described. They include two BART-only alternatives, one standard rail alternative, and a no-build alternative with dynamic pricing and improved bus service on the Bay Bridge.
- **Alternative Analysis:** This section assesses the performance of each alternative compared to baseline and each other. Estimates for quantitative metrics are derived existing regional datasets, as well as from running each alternative through MTC's

UrbanSim land use model and Travel Model One. The potential for further extension and refinement of the models is also analyzed.

- **Funding and Financing:** The funding & financing section outlines key recommendations for appropriate cost estimating and incorporation of equity concerns in transportation fundraising. Two funding scenarios are presented: an ideal and constrained, with assumptions explained by funding source. Innovative funding tools used in Sao Paulo and Denver are analyzed with discussion on applicability and adaptation for a third crossing.

The report also contains the following appendices:

- **Appendix A**: An annotated bibliography of reports and resources that discuss a third crossing.
- **Appendix B**: Communities of Concern Definitions from the Metropolitan Transportation Commission
- **Appendix C**: Transbay Travel Patterns
- **Appendix D**: Performance Metric Sources & Methodology
- **Appendix E**: Land Use Scenario Outputs for Various Model Runs