

DEPARTMENT OF TRANSPORTATION

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July 25, 2014

The Honorable Mark DeSaulnier
Chair, Senate Committee on Transportation and Housing
California State Senate
State Capitol, Room 2209
Sacramento, CA 95814

Dear Senator DeSaulnier:

As a follow up to a commitment I made to you in prior hearings on the Bay Bridge construction project—and as yet another step toward modernizing the California Department of Transportation (Caltrans)—here is a copy of our *Mega-Project Management Lessons Learned Report*. The purpose of this document is to analyze some of the overarching management and organizational practices during our years of work on the East Span of the San Francisco-Oakland Bay Bridge project, with a particular focus on what worked and what did not work during the project so that we can improve our operations in the future. This review follows our practice of conducting post-construction reviews of significant projects. The purpose of these reviews is to summarize what we learned so we can improve our work going forward.

This report supports the important endeavor that you have undertaken in your committee to not only improve Caltrans moving forward, but also assist other State agencies who may undertake mega-projects in the future. It gives us an opportunity to continue our conversations on reform and identify further opportunities to improve our delivery of transportation infrastructure for the people of California.

As the purpose of this report is to articulate what we learned about management practices, it does not discuss technical details of various construction challenges that have been investigated, resolved and thoroughly documented elsewhere. For example, the reason 32 steel rods failed on pier E2 and were fixed with a seismic retrofit was extensively investigated by the Toll Bridge Program Oversight Committee last summer and is detailed in its preliminary investigative report¹ with the final report pending later this summer. Similarly, welds on the orthotropic box girders from China—fabricated from 2008 to 2011—were thoroughly investigated by a panel of external quality assurance experts who published a roughly 300-page report that concluded that implementing expert recommendations for improving the welding process resulted in welds of

¹ Metropolitan Transportation Commission, Bay Bridge East Span Bolts Update
http://www.mtc.ca.gov/news/current_topics/4-13/sfobb.htm

high quality and with very low rejection and repair percentages.² This evaluation process—thorough investigation, engagement with experts, fixing the problem, and documenting the resolution—has been repeated on many occasions over the years on this project.³

Although this report does not restate the technical conclusions of those concluded investigations, it does identify common themes that occurred over the lifespan of this project. Our honest evaluation and identification of those things that worked and did not work is part of our ongoing effort to make Caltrans and our projects more accessible and understandable to the public. For example, we recently held a six-hour town hall-style technical workshop where we invited the public and vocal critics to debate engineering and scientific issues surrounding our approach to fixing the 32 bolts that broke and the testing of other bolts.⁴ Another particularly important initiative was the decision by the Toll Bridge Program Oversight Committee to open its monthly meetings to the public.

One of the lessons we articulate in this report is that public access to problem-solving in action helps us explain how we work through challenges over time. The closed meeting structure put the Toll Bridge Program Oversight Committee and Caltrans in the difficult position of having to explain—years later—actions taken long ago to overcome construction challenges.

At the risk of overly simplifying this important document, here are a few key points worth identifying:

- 1) **The Toll Bridge Program Oversight Committee was an effective government concept, but should have been transparent.** For example, after the Committee took control of oversight responsibility in 2005, the seismic retrofit program was delivered on time and within its contingency budget. On the other hand, this process could have been more effective had it occurred during regular public meetings. Today, the meetings are public. Going forward, we recommend this type of multi-agency oversight structure, which is consistent with our ongoing effort to strengthen strategic partnerships.

² *Self-Anchored Suspension Bridge Project: Project Team Response to QA/QC Expert Panel Recommendations* (2011) <http://baybridgeinfo.org/sites/default/files/pdf/UpdatedFinal-QAQC-Rpt-2011Nov-v1.pdf>

³ We have posted literally hundreds of thousands of records on our Internet website in an effort to engage the public in our project and describe how our engineers solved problems. See, e.g., *Caltrans Tendon Corrosion Report Phase 1, 2, and 3* (2006) <http://baybridgeinfo.org/quality-assurance> (describes how Caltrans joined with the Federal Highway Administration to use a bore scope at 4,300 access points to inspect 1,635 steel strands and found 25 strands with moderate corrosion that retain 90 percent of their tensile strength and the rest retained 100 percent of their strength); *Peer Review Document: T1 Foundation Review* (2012), <http://baybridgeinfo.org/quality-assurance> (independently concludes there is no evidence that a rogue former Caltrans inspector falsified tests on the Bay Bridge and confirms, along with the Federal Highway Administration, that the foundation concrete data is sound and the structure is safe).

⁴ See 354BD Rod Testing Technical Briefing, <http://baybridgeinfo.org/rods/briefing> (Video of this six-plus hour public meeting).

- 2) **A robust risk management program helped us quantify the risk of potential construction scenarios—and plan accordingly—using statistical algorithms for calculating probability.** For example, the team identified overseas steel manufacturing as a critical risk and recommended robust material inspection engineers and construction management staff in China to oversee the quality of fabrication work. Although this risk management was useful, the project did not get the full benefits that would have accrued from implementing it earlier than 2005. Here, our use of risk management came along too late, and going forward, we recommend employing a risk manager from the beginning of a project.
- 3) **Bringing in outside experts to get technical advice was extremely valuable for ensuring quality throughout construction.** Caltrans' Materials Engineering and Testing Services provided quality assurance services. The Seismic Safety Peer Review Panel—an independent body of world-renowned engineering experts—provided technical guidance. An external Quality Assurance and Quality Control panel assisted with evaluation of steel and overseas welding fabrication. The earlier these activities occur, the better. We should have implemented this review structure from the beginning of the project. We strongly recommend that all mega-projects engage world-renowned industry experts to provide technical consultation during construction.
- 4) **Mega-projects produce potentially overwhelming volumes of records of project documentation that would benefit from dedicated records management and retention personnel.** For example, the approximate one million welds fabricated overseas required individual inspection reports, testing and follow-up tests, which generated a truly staggering volume of paperwork. Developing electronic databases to track these voluminous records can be quite difficult to implement in the midst of construction. Going forward, we recommend that Caltrans establish a formalized records management process and staffing at the beginning of the project that is capable of managing and retaining library-style volumes of construction records throughout the project.

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- 5) **Consideration should be given to the contextual relationships that exist when building large infrastructure projects.** California is a diverse place and no one project is the right one for all communities. For example, the State originally proposed a spartan concrete viaduct, but that design was unacceptable to the local community, which not only sought a lifeline structure but also one that related to the identity of the region it would serve. Caltrans is currently going through a period of self-analysis, including implementing recommendations from the State Smart Transportation Initiative to modernize our mission, vision and goals and strengthen our communication with local communities. This process has opened a window of opportunity to substantially improve our organization and our responsiveness to local community needs.

Again, we hope that this report will assist us both in accomplishing the jointly held desire to improve the State's ability to improve the management of mega-projects going forward.

Sincerely,

MALCOLM DOUGHERTY
Director

Enclosure: Mega-Project Management Lessons Learned Report