



**East Bay
Municipal
Utility
District**

Seismic Improvement Program

The East Bay Municipal Utility District (EBMUD) provides water service to 1.2 million people along the east side of San Francisco Bay. Three major, active faults create a high seismic risk to EBMUD's water supply facilities.

Case Studies

EAST BAY MUNICIPAL UTILITY DISTRICT, CALIFORNIA

East Bay Municipal Utility District, California

The Hayward Fault, which bisects the service area, poses the greatest threat of a major earthquake within 30 years and is one of the most active faults in the State of California.

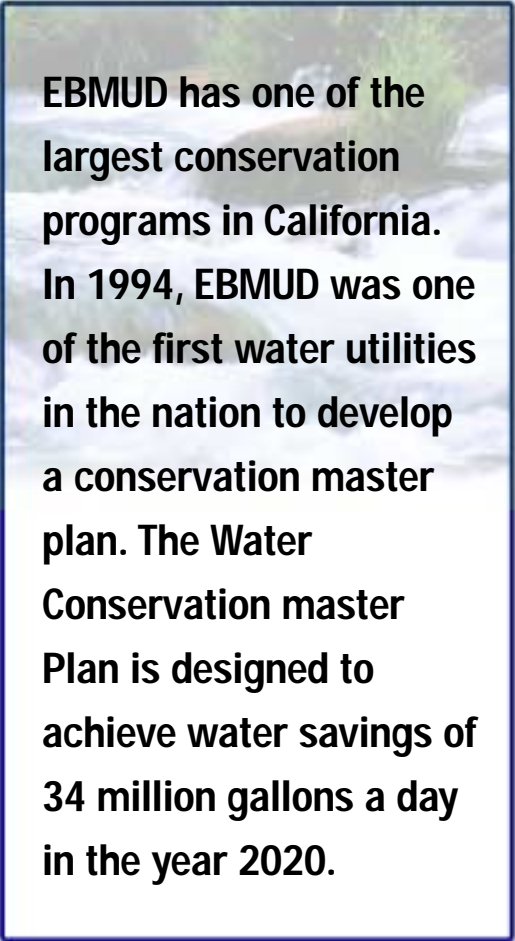
Following the Loma Prieta Earthquake in 1989, EBMUD performed an in-depth evaluation of the seismic vulnerability of its water treatment plants, reservoirs, buildings, pipelines, tunnels, pumping plants and communication facilities. Using state-of-the-art computer models, damage estimates were made and post earthquake system performance was studied.

The results showed that, for a magnitude seven earthquake on the Hayward Fault, 63 percent of the customers would be out of water, one-third of the reservoirs and two-thirds of the pumping plants would be out of service, 5,500 pipes could break, and four out of six water treatment plants would be out of service. It would take approximately six months to restore partial service, and the costs to repair damage to facilities were estimated at \$245 million.

The Project

The EBMUD Board of Directors decided to take action in 1994 by approving an aggressive, ten-year, \$189 million capital improvement program to minimize damage to the water system, improve fire-fighting capability, and protect customers from long, disruptive water outages following a catastrophic seismic event.

The Seismic Improvement Program (SIP) reduces long-term risks to EBMUD facilities, people, property owners and the local economy.



EBMUD has one of the largest conservation programs in California. In 1994, EBMUD was one of the first water utilities in the nation to develop a conservation master plan. The Water Conservation master Plan is designed to achieve water savings of 34 million gallons a day in the year 2020.

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The four goals of the SIP are:

Safety – to minimize the loss of life due to failure of any EBMUD structure;

Water Quality and Public Health – to ensure that all water introduced into the treatment system is fully treated;

Fire Service – to enable water availability in all areas, especially high fire danger zones; and

Customer Service – restore minimum water service to 70 percent of customers within ten days.

The SIP is now finishing its fourth year of implementation. During the next six years, the individual facility upgrades will continue, and the design of three large projects within the SIP will begin.

EBMUD uses the latest seismic strengthening techniques to retrofit structures' cost effectively. To date, the District has completed seismic upgrades for 21 reservoirs. EBMUD has installed shutoff valves and emergency hose connections at nine locations where water mains



Flexible hoses can bypass sections of broken water pipes. This innovative solution to seismic risk will allow quick restoration of service and vital fire fighting capacity.

Photograph Courtesy of EBMUD, Oakland, CA

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that cross earthquake faults are particularly vulnerable. These upgrades will either prevent pipe rupture or provide a bypass system to reroute water around broken pipes to protect life and property, and to preserve the water supply for post-earthquake uses, including fighting fires.

The Building and Structural Upgrades Subprogram seismically retrofits EBMUD buildings to meet safety performance goals. Upgrades to five or six water treatment plants are complete and ensure they will be available and functioning after an earthquake.

The Planning Process



An EBMUD contractor installed a flexible pipe joint in an area experiencing "fault creep" near the entrance to the Oakland Zoo.

Photograph Courtesy of EBMUD, Oakland, CA

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The Southern Loop Pipeline Environmental Impact Report (EIR) was certified by the EBMUD Board of Directors on March 23, 1999. EBMUD conducted a thorough analysis and evaluation of alternative routes, reviewed potential impacts including traffic, noise and environmental impacts, and identified ways to mitigate these impacts on the EIR. The Southern Loop Pipeline is an 11-mile proposed pipeline system to enable the District to meet its service restoration goal should pipelines and tunnels be damaged.

Additionally, EBMUD started preparing for the retrofit of the Claremont Tunnel, which was constructed in the 1920s to deliver water. Strengthening this tunnel will secure a water supply for 50 percent of the District's customers.



EBMUD installed remote-control shutoff valves at water treatment plants to preserve the water stored there for post-earthquake uses, such as fire fighting.

Photograph Courtesy of EBMUD, Oakland, CA

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Seismic Strengthening for the Southern Loop Pipeline

EBMUD is using proven seismic technology on the design of the Southern Loop Pipeline, such as thicker wall pipe, butt welded joints, and special soil backfill. The pipeline may be buried below soils that could shift in a landslide.

The District also educates the public about seismic risks in the Bay Area, and maintains public support for the SIP with an extensive community outreach program.

The District has been internationally recognized for application of new technologies and actively participating in international technology exchange in the field of seismic mitigation.



Photograph Courtesy of EBMUD, Oakland, CA

EBMUD has installed steel reinforcing straps inside its largest aqueduct carrying Sierra Nevada water 90 miles to East Bay customers.

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Benefits

The project saved an estimated \$1.2 billion by avoiding losses due to fire, costs to rebuild the District system, lost revenue, the economic impact to businesses in the region, and flood losses. SIP capital costs amount to \$189 million, resulting in a cost-effectiveness ratio of six to one.

EBMUD solicited community input prior to the project's implementation and routinely conducts outreach over the course of the project, resulting in the strong support of the public and local elected officials.

Additionally, the SIP Team has partnered with other agencies and state and local Offices of Emergency Services to develop a single message on how to store emergency water supplies. **EBMUD won the Partners in Preparedness Award from the International Emergency Managers Association for developing the "Waterlines are Lifelines" brochure and video.**

For more information, visit: www.ebmud.com.



Briones Reservoir, completed in 1964, stores 60,510 acre-feet of water for customers of the East Bay Municipal Utility District.

Photograph Courtesy of EBMUD, Oakland, CA

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