

# Loss Avoidance: Northern California Flood Control Mitigation

The Federal Emergency Management Agency (FEMA) developed a loss avoidance methodology to evaluate the effectiveness of the mitigation projects. The methodology is based on the analysis of actual events that have occurred in the project study area since project completion. It determines losses avoided by comparing damage that would likely have been caused by the same storms without the project (Mitigation Project Absent, or MP<sub>A</sub>) with damages that actually occurred with the project in place (Mitigation Project Complete, or MP<sub>C</sub>).

The methodology was piloted by FEMA Region IX and the California Governor's Office of Emergency Services who noticed a dramatic decrease in damages from severe storms and flooding in 2005 and 2006 when compared with similar flood events from the late 1990s. The study analyzed six projects in the Northern California area that were impacted by the winter and spring storms of 2005 and 2006.

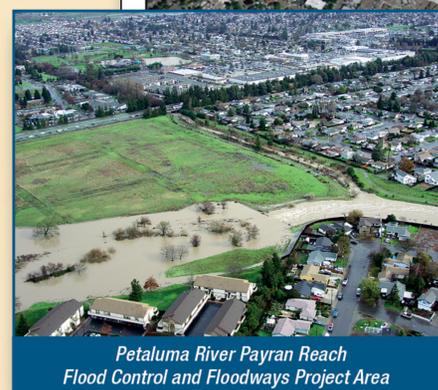
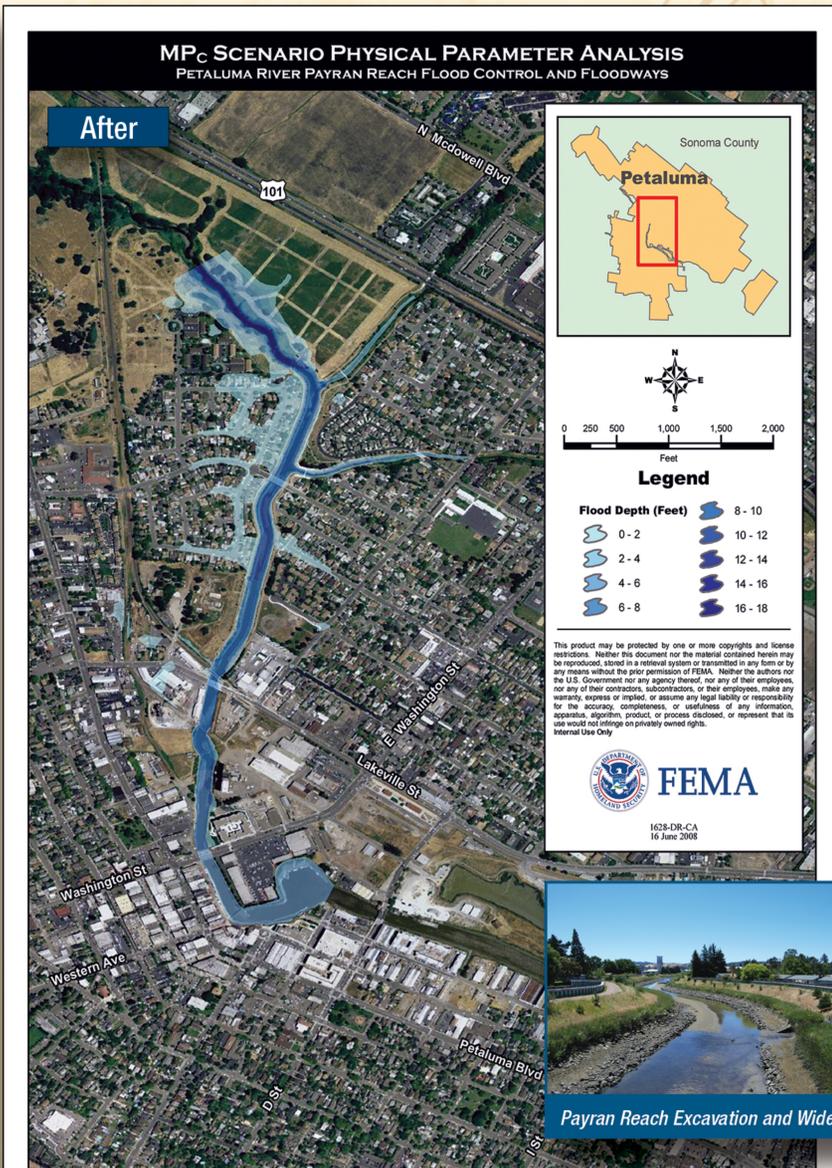
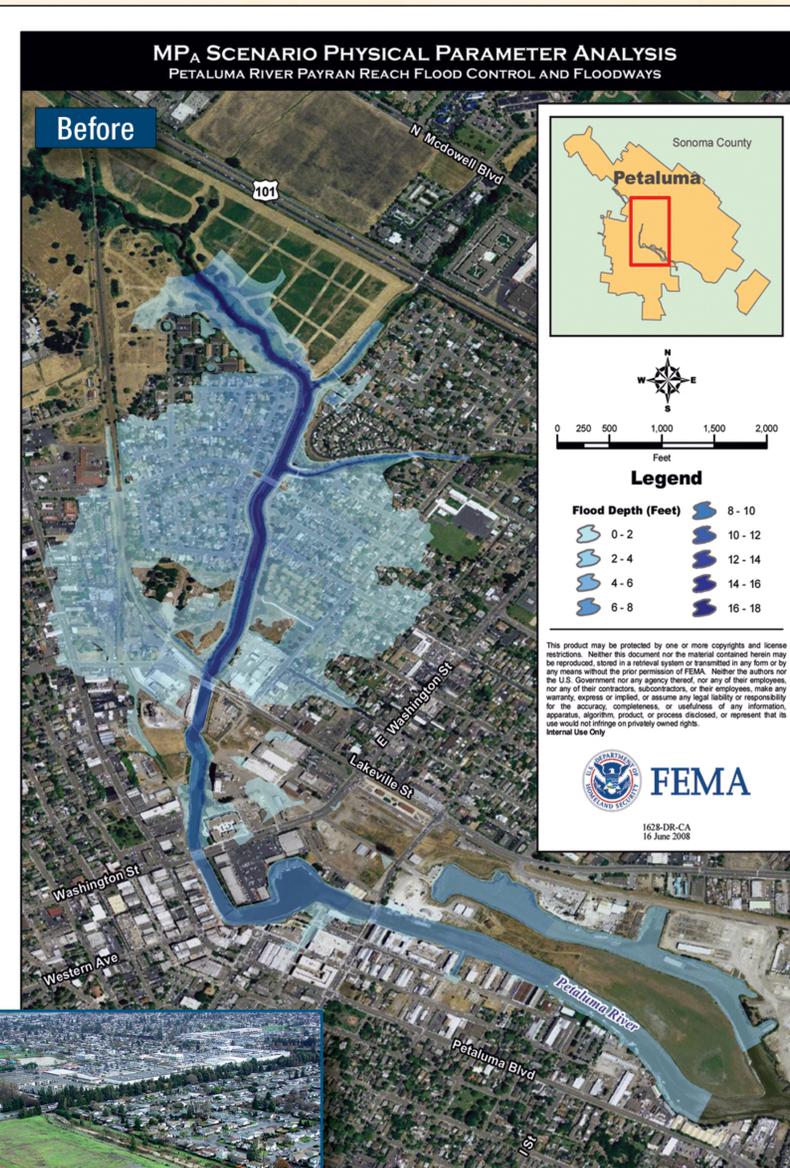
One of these projects was the Petaluma River Payran Reach Flood Control and Floodways project, completed in late 2004. It included floodwall construction, channel excavation and widening, mitigation planting, bridge replacements and relocations, storm drainage facilities, and a channel constriction weir at the upstream extent of the Payran Reach to relieve the flood levels associated with a 5-year storm event.

To determine the level of construction needed, officials used both hydrologic and hydraulic analyses and modeling that included Geographic Information Systems (GIS)-based data such as topography, aerial photography, and stream gage data for information such as water flow and channel stage (depth).

The total cost was \$44,907,802 (adjusted for 2008 dollars), using funds from FEMA's Hazard Mitigation Grant Program, the U.S. Army Corps of Engineers, and local funds. It was evaluated for one post-construction storm event in a 10-year period on December 31, 2005. Losses avoided due to the completion of the mitigation project totaled \$44,170,317. When compared to the project investment, it yields a return on investment (ROI) of 98%, indicating that with one event the project costs were almost fully recovered. If a similar event occurs within the expected life of the project (30 years), the ROI will likely exceed 100%. As a result, investment could be fully recovered within the project's intended lifespan.

FEMA's Hazard Mitigation Grant Program:  
[www.fema.gov/government/grant/hmgp/index.shtm](http://www.fema.gov/government/grant/hmgp/index.shtm)

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RETURN ON MITIGATION INVESTMENT								
GENERAL PROJECT INFORMATION			RESULTS BY LOSS CATEGORY			LOSSES AVOIDED TOTAL	PROJECT INVESTMENT Adjusted for 2008 Dollars	CURRENT ROI
Project Name	County	Date of Project Completion	Physical Damage Subtotal	Loss of Function Subtotal	Emergency Management Subtotal			
Petaluma River Payran Reach Flood Control and Floodways	Sonoma	2004	\$36,704,454	\$7,319,808	\$146,055	\$44,170,317	\$44,907,802	98.36%
Soscol Avenue Area Drainage Interceptor	Napa	10/28/1998	\$294,057	\$94,091	\$12,213	\$400,361	\$766,914	52.20%
Humboldt Road Box Culvert at Malloy Creek	Butte	10/14/1998	\$9,428	\$50,762	\$7,734	\$67,924	\$257,106	26.42%
Alhambra Creek Channel Improvements	Contra Costa	07/06/2001	\$280,104	\$19,354	\$170,586	\$470,044	\$1,709,693	27.49%
Hilltop Green Flood Mitigation Project	Contra Costa	07/03/1999	\$132,891	\$1,452	\$58,366	\$192,709	\$248,520	77.54%
Broadway Culvert Replacement	Yuba	09/29/1998	\$1,328,497	\$233,289	\$42,063	\$1,603,849	\$138,961	1,154.17%
Total			\$38,749,431	\$7,718,756	\$437,017	\$46,905,204	\$48,028,996	97.66%

All amounts rounded to the nearest dollar.

DATA SOURCES: Gage Data for Maps— California Department of Water Resources, California Data Exchange Center: <http://cdec.water.ca.gov/>

Hydraulic Modeling for Maps— U.S. Army Corps of Engineers, 1994. Petaluma River Basis of Design to the Section 205: Detailed Report for Flood Control

Topographic Data for Maps— James Lopez, City of Petaluma

Building Data for Analysis of Return on Investment— FEMA project files for Project 1046-1007; R.S. Means, 2006 Building Construction Cost Data; R.S. Means, 2008 Residential Cost Data; Dean Eckerson, P.E., Engineering Manager, Department of Water Resources and Conservation, City of Petaluma, CA; FEMA. 2001. What is a Benefit? Guidance on Benefit-Cost Analysis of Hazard Mitigation Projects.

Photo Credits— Dean Eckerson, City of Petaluma (left); Robert Patton, FEMA (right)



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