

Seismic Stability Evaluation

What is meant by seismic stability?

Seismic stability refers to a dam's ability to withstand an earthquake.

What is a seismic stability evaluation?

A seismic stability evaluation looks at how a dam will perform during a large earthquake and examines the effects of seismic hazards such as shaking and surface fault rupture.

What is a fault rupture study?

Fault rupture determines if an active fault exists directly under a dam and if the dam would be damaged if the fault moved in that location.

Why do our dams need such an evaluation?

Dams upstream of towns and cities create a high risk potential for life and property, particularly in seismically active states such as California. According to the U.S. Geological Survey, California has more than a 99 percent chance of having a 6.7 or larger magnitude earthquake within the next 30 years, with a 46 percent likelihood of a major quake of magnitude 7.5 or greater in the next 30 years. These evaluations allow agencies such as the Santa Clara Valley Water District to pinpoint and identify any potential weaknesses in its dams and ensure they can withstand large earthquakes. The water district is currently examining eight dams, including Anderson, the largest of the water district's dams, as a result of recently adopted, more stringent, earthquake standards.



Soil samples are obtained at Almaden Reservoir using a drill rig mounted on a barge.

How does the water district monitor its dams to ensure they are safe?

The water district monitors its dams visually and with instruments installed in the dams. In 2005, the water district created a formal dam safety program, which includes dam surveillance and monitoring. The water district uses a number of instruments to monitor its dams. Internal piezometers measure the dam's internal core for water pressure, much like a person monitors their blood pressure. Pore pressures determine how the water is flowing through the dam. This is supplemented with seepage monitoring downstream of the dams. Inclometers measure deformation, or a change of shape within the dam. The water district also uses survey monuments to check on the movement of dams on the surface. In addition, water district staff, the California Division of Safety of Dams and Federal Energy Regulatory Commission conduct annual inspections of the dams.

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Are our dams safe?

The water district has always maintained its dams in a safe fashion. However, it is still evaluating them under severe seismic conditions, recognizing the potential threat to downstream and upstream life and property if an earthquake occurs. If a dam is found to have a problem, the water district will lower the reservoir water level until it corrects the problem to ensure the dam remains safe.

Have all our dams been the subject of a seismic stability evaluation?

The water district has proactively conducted seismic stability evaluations for the last 50 years on most of its 10 major jurisdictional dams. Studies in the 1970s and 1980s found most of the dams to be seismically safe according to the standards of that time, except for Stevens Creek, which underwent a seismic retrofit in the 1980s.

Why do dams need new seismic stability evaluations after undergoing studies in the late 1970's and early 1980's?

In recent years, countries such as Turkey and China have endured devastating earthquakes. Each new temblor brings information to analyze for use in creating new standards and methodologies to measure dam safety. The methods and analysis used in the 1970s and 1980s are now outdated and require modification to keep pace with the growing body of knowledge surrounding earthquakes.

Why is seismic stability important to a dam?

Dams must withstand severe earthquakes with minimal deformation to prevent overtopping and protect life and property. Earthen dams may slump or deform under severe earthquake shaking. Analysis determines the behavior of dams and whether they require retrofit projects. Each of the water district's dams has the capacity for at least 400 acre-feet of water, with the largest of the dams – Anderson – able to contain 90,373 acre-feet. Failure of a dam the size of Anderson could be catastrophic, causing loss of life, property destruction and major flooding for many miles downstream.

What is a dam inundation map?

These maps show areas of potential flooding in the event of sudden or total failure of any dam. As a dam owner, the water district creates maps showing such areas as required by the Federal Dam Safety and Security Act. The law came into effect following the near failure of the Lower San Fernando Valley Dam in 1971, which came within inches of overtopping. The water district provides these maps to local governments, which in turn adopt emergency procedures for the evacuation and control of areas in the event of a dam failure.

What we do

The Santa Clara Valley Water District manages water resources and provides stewardship for the county's five watersheds, including 10 reservoirs, hundreds of miles of streams and groundwater basins. The water district also provides flood protection throughout Santa Clara County.

Visit our website, www.valleywater.org.



Soil samples are obtained on Calero Dam using a mud rotary drill rig mounted on tracks.

Contact us

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