Anderson Dam

They built it for us. We need to rebuild it for them.

Santa Clara Valley Water District

History

California's growth into the 20th century brought an increased demand for water, electricity and flood protection. Private, local, state and federal agencies began work on projects throughout the state to meet these needs.

In 1929, as a result of lowering groundwater levels, land subsidence and salt water intrusion, the Santa Clara Valley Water Conservation District formed (currently the Santa Clara Valley Water District) to develop and manage a reliable water supply and maintain the groundwater basin in the county. The water district began building dams and reservoirs to ensure the valley would grow and prosper.

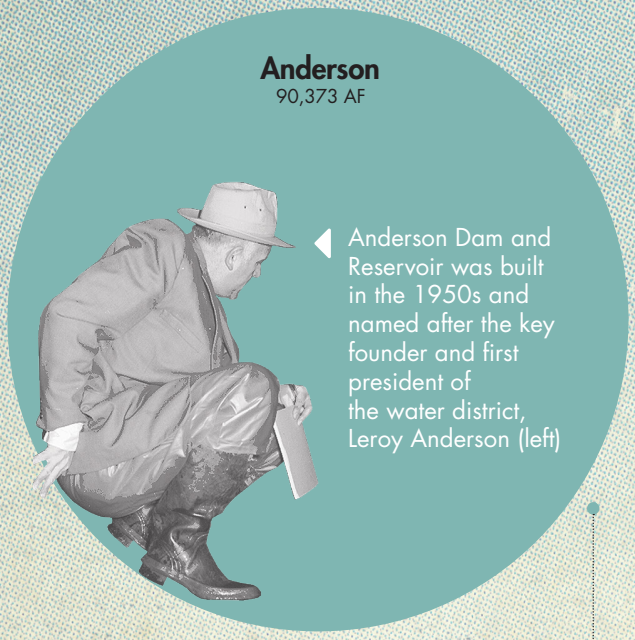
The reservoirs' primary purpose was to capture storm run-off normally lost to San Francisco Bay. A long, deep natural gorge located three miles east of U.S. 101 in Morgan Hill provided a suitable dam site. The Board submitted plans in 1949 resulting in the scheduling of a bond election for the following summer. The total cost for the land and construction was estimated at $3 million and the reservoir would store an estimated 89,073 acre-feet of water, more than all the other reservoirs combined. The bond was approved and once approval had been given by state engineers and plans and surveys had been evaluated, construction began. The dam was completed in record time between the last rains of spring and the first rains of autumn 1950.

Largest reservoir in the county

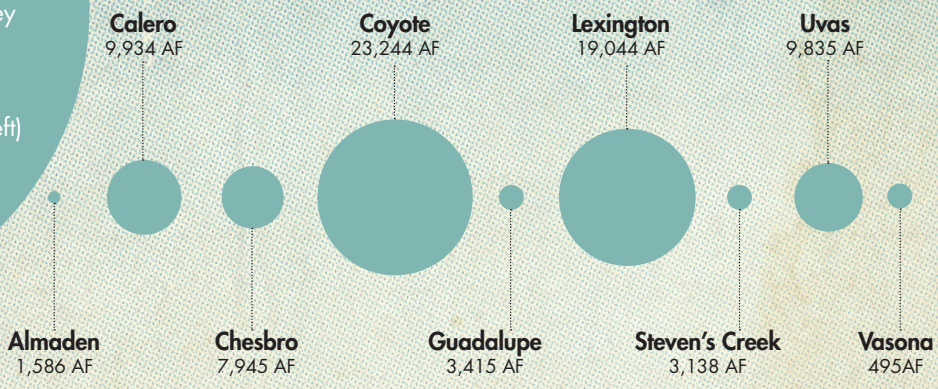
Anderson Reservoir is the largest of the 10 water district reservoirs. Large enough to fit all the other nine reservoirs inside its area.

Reservoir	Year Constructed	Capacity of Reservoir	Type of Dam	Dam Height
Almaden	1935	1,586 acre-feet (AF)*	Earth	105 ft.
Anderson	1950	90,373 AF	Earth & rock	240 ft.
Calero	1935	9,934 AF	Earth	98 ft.
Chesbro	1955	7,945 AF	Earth	95 ft.
Coyote	1936	23,244 AF	Earth & rock	120 ft.
Guadalupe	1935	3,415 AF	Earth	129 ft.
Lexington	1952	19,044 AF	Earth	195 ft.
Stevens Creek	1935	3,138 AF	Earth	120 ft.
Uvas	1957	9,835 AF	Earth	118 ft.
Vasona	1935	495 AF	Earth	30 ft.

**One acre-foot is 325,851 gallons of water, which is enough to serve the needs of two households of five, for one year.*

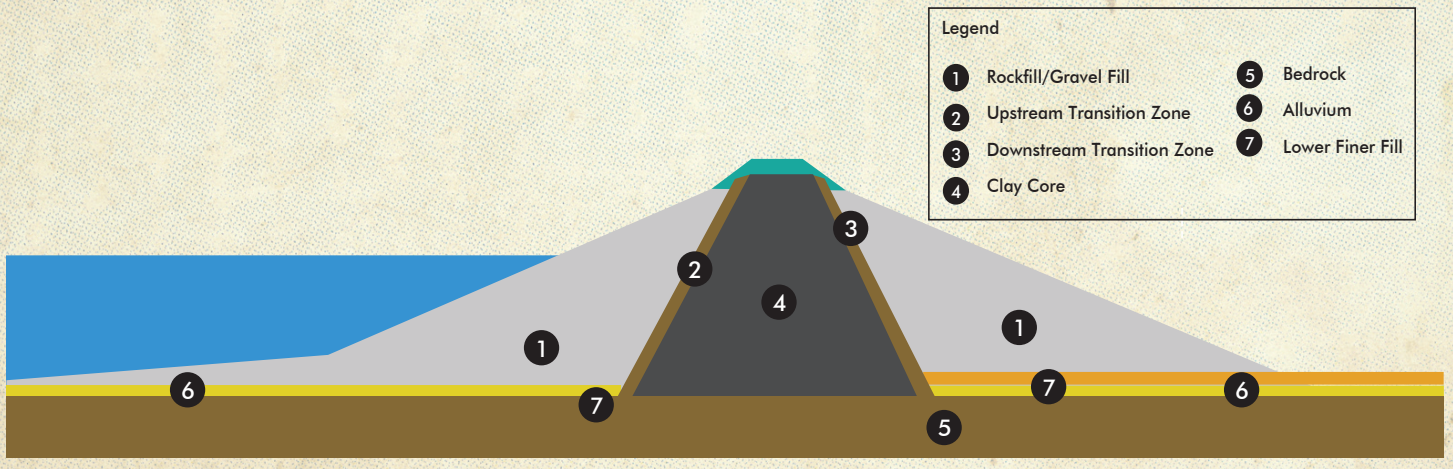


Anderson Dam and Reservoir was built in the 1950s and named after the key founder and first president of the water district, Leroy Anderson (left)



The inner workings of Anderson Dam

Most of the water district's dams are compacted embankments comprised of gravel clay earth fill. Anderson Dam was originally designed and identified as a zoned rock fill dam (see figure below). The dam was comprised of a compacted clay core that acts as the water barrier, and uncompacted (i.e., dumped) rock fill shells which support the clay core. Subsequent investigations and evaluations have demonstrated that the uncompacted shells are more of a mixed soil-gravel fill with some rock, rather than true "rockfill."



Anderson Dam has an outlet pipe to release water to Coyote Creek and groundwater recharge ponds, deliver it to pump stations and treatment plants, or draw down the reservoir levels if there is a safety concern. Anderson Dam, like all water district dams, also has a concrete spillway that releases water before it can reach the dam crest, preventing water from overtopping the dam.

The vertical distance between the spillway crest and the top of the Anderson Dam embankment is called freeboard. Freeboard allows the spillway to safely discharge high flows in huge storm events called the Probable Maximum Flood (PMF), plus provides additional height to allow for wave action, etc., to safely protect the embankment from overtopping.

Why the Retrofit is Needed

In 2011 a seismic study on Anderson Dam was conducted to evaluate the dam's stability during a large earthquake. It showed that the dumped material at the dam's base and the alluvial soil left in the foundation would weaken due to liquefaction in a 7.25 magnitude maximum credible earthquake (MCE) on the Calaveras Fault about 1.2 miles from the dam or in a 6.6 magnitude MCE on the Coyote Creek fault located directly under the dam. Liquefaction describes a phenomenon whereby a soil loses strength in response to earthquake shaking, causing it to behave like a liquid. Such a large earthquake on either fault could potentially cause significant damage to the dam, risking an uncontrolled release of the reservoir water. The study also indicated that earthquakes could cause fault rupture displacement on the Range Front Fault which also runs beneath the dam. Fault rupture on the Range Front Fault could damage the existing outlet pipe, preventing safe drainage of the reservoir.

To reduce the risk of damage and an uncontrolled release, the water district has been operating Anderson Reservoir with a restricted water level of at least 25 feet below the spillway since 2009. This restriction was approved by an independent technical review board and dam safety regulators as a prudent temporary measure to reduce risk until a permanent fix of the dam could be completed.

Anderson Dam Seismic Retrofit Project

The water district initiated the Anderson Dam Seismic Retrofit Project in 2012 as a permanent mitigation for the risks identified by the seismic study. In addition to seismically retrofitting the dam embankment, the planning phase of the project identified the need to:

- **Replace the existing outlet pipe that runs below the dam to improve capacity and reliability**
- **Increase the wall height of the concrete spillway to approximately 9 feet to safely discharge large storm flows**
- **Increase the height of the dam crest by 7 feet to provide more freeboard for larger storms' runoff**

This project is currently in the design phase. Geotechnical and geologic investigations have been performed in areas in and around the dam to collect data for the embankment retrofit and to complete the design of the additional project elements. As part of these investigations, previously unidentified seismic deficiencies were discovered:

- The upstream embankment shell material is also susceptible to liquefaction during a large earthquake
- The existing dam design is inadequate to prevent seepage and erosion of the clay core at the base of Anderson Dam due to possible fault rupture during a large earthquake

These findings resulted in changes to the reservoir restriction and the retrofit project. In January 2017, water district staff proactively lowered the restricted level an additional 10 feet, totaling 58% reservoir capacity, to accommodate greater potential damage due to liquefaction. The retrofit project, originally planned to include large upstream and downstream buttresses, was modified to a nearly complete replacement of Anderson Dam. This replacement will ensure the post-project facility has removed all liquefiable material beneath the embankment and is built to modern design standards with rigorous quality control to withstand the unique seismic hazards described above. Finally, a new high-level outlet will be constructed to allow rapid drawdown of the upper portion of the reservoir in case of an emergency.

The water district is working closely with the state's Division of Safety of Dams and the Federal Energy Regulatory Commission. Both agencies have jurisdictional authority over the dam and reservoir, and the water district must obtain their review and approval for all project design plans. Environmental documents will be prepared to comply with federal and state regulations, and permits will be obtained from several regulatory agencies for drawdown of the reservoir and water diversion during construction.

Completion of the design, obtaining regulatory approval and acquisition of permits must be completed before construction can commence, currently planned for Spring 2020.

Anderson Dam Existing Configuration

Anderson Dam as a water supply source

★ Anderson Dam ★

By the numbers

1950
Year it was constructed

192.7
Drainage Area (square miles above the dam)

90,373
Reservoir capacity (acre feet)

1,245
Reservoir surface area when full (acres)

7.8
Reservoir Length (miles)

3,320,000
Cubic yards of fill

49
Outlet pipe diameter (inches)

10,717
Average annual yield acre-feet

Anderson Reservoir is the largest of the 10 water district reservoirs and provides a reliable supply of water to Santa Clara County. Water stored in the reservoir provides about 25 percent of the county's annual water supply and has a total storage capacity of 90,373 acre-feet (one acre-foot is enough water to cover one acre of land one foot deep, or equivalent to 325,851 gallons of water, enough to serve two households of five for one year).

Anderson Reservoir captures local storm runoff during the rainy season, where it is stored for use throughout the year or as an available water supply during future dry years or emergencies. Water is released year-round from Anderson Reservoir into Coyote Creek, where it recharges the groundwater basins through the creek bed and downstream ponds, and provides for aquatic habitat.

Anderson Reservoir is one of only two water district reservoirs that connect to the water district's raw water pipeline distribution system and treatment plants. This means that imported water from state or federal water supplies, such as San Luis Reservoir, can be brought into the county through pipelines and fed into Anderson Reservoir for storage and later use. Water stored in Anderson Reservoir can be used when other supplies may not be available either due to drought, planned facility shut downs, or during emergency outages.

Also, if we know of planned projects or operations that will make imported water unavailable or unsuitable for treatment, we can either put water into Anderson Reservoir ahead of time or we can hold more of the water in storage so that it can be used during that time. The water can then be released from Anderson into pipelines and sent to treatment plants and other groundwater recharge facilities.

In addition to providing water supply storage, Anderson Dam and Reservoir provide prime recreational opportunities. The reservoir supports boating, water skiing, camping, picnic areas and boat launch facilities. Our partner, the Santa Clara County Parks and Recreation Department, manages recreational activities on water district reservoirs.

Access Valley Water

For more information, please call **Peggy Lam** at **(408) 630-2710**. You may also visit our website at **www.valleywater.org**, and use our Access Valley Water customer request and information system. With three easy steps, you can use this service to submit questions, complaints and compliments directly to a staff person.