

# Drilling for knowledge on huge regional aquifer

Hydrologists measure the untapped potential

BY LILY LEUNG

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Tim Cliffe (left) and Zach Barry, both hydrographers with the U.S. Geological Survey, prepare to lower a sensor to confirm the depth of water levels at an observation well near Balboa Park. They will check the water level at five different depths within the well.

Water that may be of high enough quality to drink is stored in a 350-square-mile underground layer that stretches from [La Jolla](#) to the international border and from about state Route 125 to west of the coastline. The big mystery is how much, how deep and whether it's worthwhile for public agencies to drill wells and pump it out.

For the past nine years, researchers with the U.S. Geological Survey have been trying to figure that out by studying the character and groundwater yield of the San Diego Formation, a significant regional aquifer. They're closing in on the much-awaited answers.

The aquifer is so potentially lucrative that it has led to a fight between the city of San Diego and the [Chula Vista](#)-based Sweetwater Authority over groundwater access. Groundwater accounts for about 2 percent of the county's water supply, because the area's rocky geology produces small yields.

Sweetwater officials want to drill more wells into the San Diego Formation as part of its expansion. San Diego city officials say the additional drilling would deplete the increasingly valuable resource, cause the land to sink unevenly and allow seawater intrusion.

Those claims mirror what federal hydrologists are examining in the most extensive study of the formation and of the unconsolidated sediment along the coast that includes the formation. The Sweetwater Authority and city of San Diego are among the agencies that helped fund the geological study.



“Our goal has been to understand and monitor those effects” if groundwater were to be extracted or recharged, said Wes Danskin, who has been leading the \$10 million exploration.

Researchers also hope to create comprehensive documentation of what the most recent project update calls “a complex coastal biologic-hydrologic environment.”

Federal hydrologists have installed 10 monitoring wells throughout [San Diego County](#) — in areas such as Balboa Park and the [Otay River](#) — to test the groundwater’s quality and flow behavior. Most of the wells are at least 1,500 feet deep. Another is in progress and six more are planned throughout the region.

The San Diego Formation is a sandy rock layer that’s about 1 million years old. Danskin said the formation’s creation is “fairly recent” compared with other geological formations in the region.

Though it’s called the San Diego Formation, it is by no means neat and distinguishable. Danskin likens it to a layer cake that’s been dropped and the cream filling — the equivalent to groundwater — has mixed into neighboring layers.

That characteristic has made it difficult for researchers to study the formation’s groundwater flow.

Understanding the flow behavior is crucial to understanding the risks of seawater intrusion and the gradual sinking of the Earth’s surface above the formation, a process known as [land subsidence](#).

Researchers say both will happen but the question is when and how much. It’s also unclear whether the issues are serious enough to prevent agencies from drilling into the formation.

For example, researchers have discovered land subsidence so far amounts to about 1 centimeter.

“If it were feet, that would be cause for concern,” Danskin said. “You can always shut down the wells if there is a concern.”

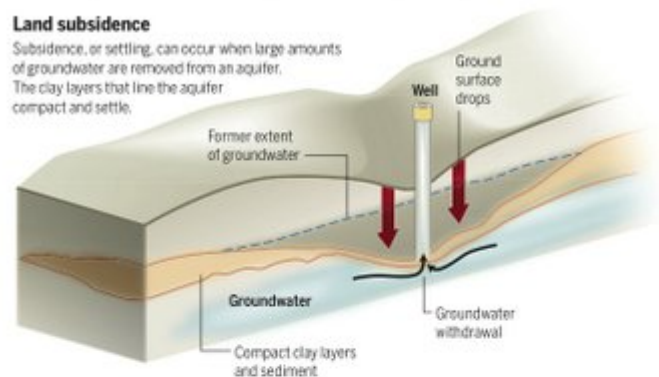
The amount of groundwater the formation holds also is unknown at this point.

### Overpumping concerns

Although monitoring wells have been installed in strategic areas of the aquifer, city of San Diego water officials say additional pumping from the formation could cause problems. Some of the key concerns voiced by the city:

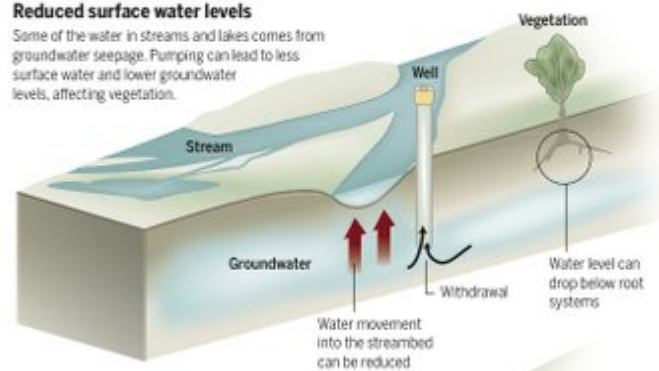
#### Land subsidence

Subsidence, or settling, can occur when large amounts of groundwater are removed from an aquifer. The clay layers that line the aquifer compact and settle.



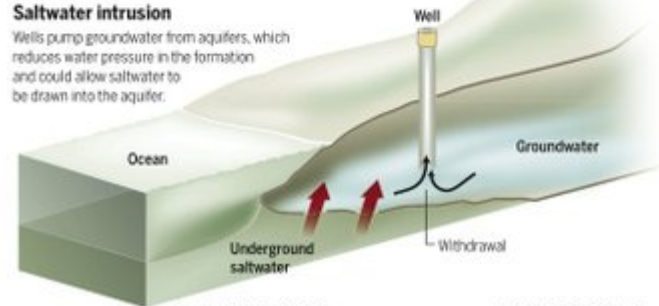
#### Reduced surface water levels

Some of the water in streams and lakes comes from groundwater seepage. Pumping can lead to less surface water and lower groundwater levels, affecting vegetation.



#### Saltwater intrusion

Wells pump groundwater from aquifers, which reduces water pressure in the formation and could allow saltwater to be drawn into the aquifer.



Sources: USGS, SanGIS, ESRI

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Sweetwater Authority officials, in their lawsuit against San Diego, believe the formation holds up to 1 million acre-feet of water. An acre-foot is enough water to serve two households for a year.

“You ask me how much water it holds, we just don’t know yet,” Danskin said.

He hopes to have most of the research summarized by late next year.

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