Empty Champlain Towers garage offers rare window into impact of sea rise underground

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Whether rising seas played a role in the collapse of the doomed Surfside condominium is unclear—and perhaps, unlikely—but the new research

from Florida International University provides the data for what regular passersby have witnessed in the now-empty parking garage floor: Water rises and falls not just with rain but with the tides. It's made the site of the tragedy a curious little observation tank, a window to watch how groundwater levels shift up and down at the site, and likely along the entire barrier island.

To keep the empty garage relatively dry as federal and other inspectors continue to piece together the puzzle of the collapse, the cost of temporary pumps and workers to run them runs a staggering $60,000 a month.

In the FIU study, Randall Parkinson, a professor of hydrogeology, compared the elevation of the garage floor with sea levels from monitoring stations in Miami Beach. He found water levels were higher than the garage floor about 244 times a year between 1994 and 2006. From 2007 to 2020, that number nearly tripled to 636 times a year.

That means that in the most recent decade, sea level was above the Champlain garage floor nearly every day at both high tide events. Add in groundwater, freshwater that floats on top of saltwater that has pushed in along the coast, and the potential for flooding virtually doubles.

"It's pretty mind-boggling," Parkinson said.

In a December hearing, the court-appointed receiver for the condo site said he spends about $60,000 a month holding the water back so that the specialists investigating what caused the collapse can do their work. That's three times the monthly cost of hiring security guards to patrol the fenced-off site.

"There's definitely tidal factors affecting the amount of water," Michael Goldberg, the receiver, told the Miami Herald.

Flooding in the garage was already a problem before the collapse. Residents complained that the garage constantly flooded, and a pool repairman told the Miami Herald the underground pool maintenance room burned through a water pump every two years trying to keep the water at bay.

Compounding the effects of rising seas is the fact that the building didn't stay in the same place as when it was built 40 years back. It actually sunk a little, research from FIU Professor Shimon Wdowinski showed.

In a 2020 paper that analyzed which parts of Miami Beach lost elevation in recent years, a process known as subsidence, Wdowinski found that the Champlain building sunk a little more than most of the buildings on the island—about 2 millimeters a year between 1993 and 1999.

In a newer analysis, he and his team looked at their data again (plus some new data) and found something even more specific. They found that the pool side of the building, where experts told the Miami Herald they believe the collapse was initially triggered, sunk at a slightly faster rate than the road side of the building from 1980 to 2000.

Wdowinski found the beachfront side of the building sunk a total of 4 centimeters in those 20 years, "which means the eastern part of the building subsided about 1 centimeter more than the western side of the building," he said.

However, they did not observe any additional sinking from 2016 to 2021.

It's unclear how the one-two punch of repeated flooding and minor sinking may have affected the structural stability of Champlain Towers, or if they played any role in the collapse. The initial theory that underground water movement created a sinkhole that destabilized the

building has effectively been ruled out, but experts say it's worth paying attention whenever the conditions a building was built in change.

"We make assumptions about how the soil is supporting the design, but if the water is changing the soil and the structure of it … then that's always a concern," said Dawn Lehman, a professor of structural engineering at the University of Washington and consultant to the Miami Herald.

And when floodwaters are repeatedly soaking the base of a building, it can lead to a weakening process in the concrete and steel called corrosion. Corrosion is a widespread issue in coastal buildings, and they regularly need to be inspected and repaired from the damage done by salt air and waves.

But as sea levels creep up and flooding becomes more common, Lehman said she worries it could be doing more harm to buildings than researchers or builders even know.

"What assumptions were made in the design and what's the condition of the building now?" she said. "We need to be able to consider all these possible scenarios and likely with older structures they weren't considered."

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