

Surfside condominium basement faced underground sea-rise assault

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Subterranean assaults by rising seas on the ill-fated Champlain Towers South more than doubled over a 26-year period, according to a Florida Interna-

tional University study that measured how often water levels rose higher than the building's basement floor.

The often invisible incursions may or may not have played a role in the horrifying collapse of the Surfside condominium June 24, said FIU geologist and research professor Randall Parkinson,

who conducted the study published last month in the journal *Ocean and Coastal Management*.

But he said quantifying below-ground saltwater sorties on coastal structures has been largely overlooked when climate change and sea level rise-related risks are calculated.

"Prior to June 24, 2021, our primary focus was on a relatively narrow field of future above-ground conditions and related risks," Parkinson said. "Now we must also consider existing and future below-ground conditions and climate-

See SURFSIDE, Page 19A

palmbeachpost.com | SUNDAY, JANUARY 9, 2022 | 19A

Surfside

Continued from Page 1A

related risks from a much broader perspective."

The condominium collapsed early in the morning of June 24, killing 98 people. The structure was demolished 10 days later.

Parkinson used water-level data collected from a National Oceanic and Atmospheric Administration gauge on Virginia Key, about 10 miles south of Surfside. It showed an accelerated rise of sea levels since 1981 that caused the number of hourly water level elevations above the condominium's basement floor to reach an average of 244 per year between 1994 and 2006.

That increased to an average of 636 per year from 2007 to 2020. The study attributed the substantial hike to a threefold increase in the rate of relative sea-level rise that occurred after 2006.

"We're not talking water coming in from above ground," Parkinson said. "That's not what was happening. It was coming in through the structure of the basement. Through cracks and points of weakness that may have been there from the beginning or evolved over time."

While Palm Beach County's coastline is at higher elevations than Broward and Miami-Dade counties because of a ridge of coquinooid limestone called the Anastasia formation, Parkinson said barrier islands and underground infrastructure are still vulnerable.

Spalling, where water seeps through concrete pores to damage reinforcing rebar and ultimately dislodges the concrete, is often seen on the balconies of coastal condos that must be repaired. Imagine what it could be doing unseen, Parkinson asked.

Yet, most of the studies he's found on the effects of salt water on concrete were from road studies in winter weather where salt is used as a de-icing agent. "None of them, until recently, were done on saltwater and marine conditions and most of those were done on



Firefighters pass debris from the partially collapsed Champlain Towers South condo in Surfside on June 24, 2021. The building partially collapsed at 1:30 a.m. that morning. LANNIS WATERS / PALM BEACH POST

bridge abutments," Parkinson said.

A climate change vulnerability assessment of seven coastal Palm Beach County cities that was released last summer said rainfall flooding was currently a bigger concern in many areas than tidal flooding or sea level rise.

In the city of Boca Raton, about 80% of residential properties in a southwest pocket of the city between Camino Real and 18th Street and along South Military Trail have a medium-to-high vulnerability to rainfall-induced flooding.

But the report for the Coastal Resilience Partnership of Palm Beach County noted that future increases in the frequency of tidal flooding caused by sea-level rise should be considered. By 2070, seas could balloon by 33 inches compared to a 2020 baseline, according to the report.

The partnership includes the municipalities of Lake Worth Beach, Lantana, Ocean Ridge, Boynton Beach, Highland Beach, Boca Raton and Delray Beach. Parts of unincorporated Palm Beach County are also includ-

ed in the study.

"All the flooding threats are interrelated," said Boynton Beach's sustainability coordinator, Rebecca Harvey. "Maybe we are not seeing major impacts right now. But we need to look at 2040 and 2070, because if we look at what's coming, it's a tenfold increase."

Related to sea-level rise, the report also evaluated shrinking shorelines — beaches that have fewer dunes to act as a buffer to the ocean, suffer from a lack of regular beach renourishments, or have structures that are closer to the ocean. Delray Beach and Boca Raton were ranked as having good-to-excellent shoreline conditions, but Ocean Ridge, Lantana and Highland Beach fell into the "severe" category — the lowest among the shoreline ratings.

Harvey said one of the key takeaways from the report was that the county needs a detailed analysis and modeling of its groundwater tables to better understand how sea-level rise may affect groundwater.

"Our capital planning has been focused on one, two and three years out, and we need to use the study to look longer term and plan for addressing resilience farther into the future," Harvey said.

After the collapse of the 12-story Champlain Towers, which was built in 1981, Palm Beach County officials considered creating their own program to inspect high-rise buildings but has since deferred to state lawmakers to come up with statewide requirements.

Palm Beach County has 125 condominiums that are six to 10 stories high built before 1980. Sixty-one condos built before 1980 are 11 stories or higher, according to county officials who spoke at a July meeting of the County Commission.

The city of Boca Raton became the first Palm Beach County municipality to adopt its own building inspection program in August.

"All of this is going to have to be taken a lot more seriously," Parkinson said. "We know the collapse hasn't been attributed to climate change right now, but it opened everybody's eyes to the fact that there are potential risks that we never thought about and didn't and don't have a process to evaluate those risks."