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Army Corps proposal for sand dunes to protect Texas coast brings questions about cost, feasibility

Nick Powell | Oct. 16, 2019 | Updated: Oct. 16, 2019 8:18 p.m.



File photo shows Chuck Hale surveying the damage to a geotube, a sand-filled tube, that was exposed at Rollover Pass near Gilchrist on the Bolivar Peninsula on July 16, 2003. Residents said the protective tubes were covered with three feet of sand until Hurricane Claudette battered the Texas coast.

Photo: Joshua Trujillo, Staff / Houston Chronicle

Nearly a decade before the “Ike Dike” became accepted jargon for residents of southeast Texas, there were ge

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was to provide an artificial dune structure to guard coastal residents from floodwaters. The installation cost \$5.4 million, a relative pittance for a mitigation measure.

The geotubes were damaged by various storms, and Hurricane Ike dealt a death blow in 2008. The Category 2 hurricane brought 100 mph winds and a 10-foot storm surge from the Gulf of Mexico, leveling the dune lines on Bolivar Beach, Galveston and leaving the exposed geotubes prone on the sand like dead whales.

Ike showed, said Rice University professor emeritus John Anderson, "that a storm could defeat all our progress."

Having learned this lesson the hard way, the Army Corps of Engineers proposed 14-foot-high natural sand dunes in the latest version of its \$1.5-billion plan for protecting the Houston-Galveston region from storm surge. The plan calls for dunes and flood gates running from High Island to San Luis, as well as ecosystem restoration farther inland.

The dunes are seen as the latest innovation designed for Texas to engineer its way out of an existential crisis: a coastline gradually vanishing and increasingly vulnerable to massive storm surges and sea level rise.

The Corps believes the natural dunes will endure longer than the geotubes, which were a Band Aid of sorts quickly tested after construction and now considered a costly failure.

The shift to natural sand dunes has been largely embraced by experts and

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or a powerful tropical sto

The dunes proposal follows a vocal backlash from Galveston and residents to an original proposal to construct levees that would run parallel to 3005 on Galveston Island and Texas 87 on Bolivar Peninsula but behind the line. This plan for the harder barrier would have left thousands of homes to the beach exposed to flooding and likely required extensive eminent domain buyouts.

“We’re talking about a dune system that runs along the existing dune line in Burks-Copes, the Corps’ project manager, said of the current plan. “Basically just one solid continuous line, with beach access still afforded, with dunes and walk-overs, in compliance with the Open Beaches Act.”

While bolstering the coast’s natural barriers would be less disruptive to property owners, dunes present challenges of their own. The Corps acknowledges they will not protect coastal residents from every storm and will not be as effective as a levee. The proposed dunes also won’t be anchored, and some experts say they would benefit from a hardened clay core.

Sand, a global commodity, is in abundant supply, but far enough from the coast that dredging the necessary volume to build the dunes will be costly. Beach nourishment will be required, further stretching state and federal budgets. The Corps will also have to contend with the constant threat of tropical storms and hurricanes that can lay waste to even the most robust dunes.

“We have a fairly good understanding of how large a dune or a nourishment maintenance plan should be to withstand certain storm design conditions,”

Massive dredging need

The sand dune field is am a series of revisio the Corps has made recentl the draft coastal barrier alignment released last year. The plan is simila ambitious than the “Ike Dike” proposed by Texas A&M researchers : devastated the Texas Gulf Cc

The current proposal includes a gate across the mouth of Galveston Bay the Houston Ship Channel, which is less restrictive that what was : proposed. It would provide for one-way boat traffic in both direction limit water flow as much — something environmentalists had called for. still doesn't include the mid-bay gate that Rice University research needed to protect the Port of Houston and the sprawling indu petrochemical facilities along the

The Corps would establish roughly 44 miles of sand dunes from Hig southwest to the tip of Bolivar Peninsula, and then further down the : the end of the Galveston seawall to San Luis

Dunes were already a part of the Corps' original plan but at a smaller feet above sea level versus the 14 feet proposed now. The dunes are in be multi-purpose — reduce shoreline erosion losses, absorb surge dur and provide habitat for turtles and birds. The dune field model is in provide multiple lines of defense against storm surge — one dune at tl the beach to provide additional sand to absorb surge and wave ene increasing nesting habitat for sea turtles an

“It would effectively double the width of the dunes, with the beachfront same because they have to keep the same slope,” said Azure Bevington, ecologist and High Island resident who has participated in meeting Corps to discuss the proposal. “It allows natural sand to move between dunes and build up more complex dune fi

Building a dune system of that magnitude will require a colossal operation that would dwarf the Corps’ maintenance dredging of relative waterways such as the Houston and Corpus Christi ship channels. would be one of the largest dune-building projects in the Corp

Journalist Vince Beiser, author of the [bThe World in a Grain: The Story of Sand and How it Transformed Civilization](#),” recently spent time on *Ellis Island* a 433-foot long hopper dredge, the largest of its kind in the country rebuilt Ship Island, a barrier island off the Gulf Coast of Mississippi. Be the Corps will have to be precise on where to draw its dredge material quality of sand needed to build di

“You can’t just drop a suction pipe in the bottom of the Gulf, you’ve got to find somewhere where there is the right kind of sand and where you can dig without really harming the environment,” Beise

The Corps estimates 40 to 50 million cubic yards of sand over 50 years needed to maintain the dune system along Bolivar and Galveston. The Corps is targeting two sand banks in the Gulf to supply the necessary material: Bolivar Bank, 17 miles south of the mouth of Sabine Pass; and Heald Bank, 2 miles offshore from Galveston

Sabine and Heald Bank “will nowhere near fit the bill,” Anderson said. look at the rough area of these banks, there’s only about 2 or 3 feet of those banks

The Colorado River Delta Complex could be a more plentiful source Anderson says, but is farther offshore, south of Matagorda

The state might eventually have to purchase its own dredge ship to provide regular nourishment that a dune system requires, Anderson added. says the shift to a dune model will likely not change the original cost of the coastal barrier system — somewhere between \$23 billion and \$32 billion but that does not factor in annual maintenance

Sustaining the dune structure will likely require costly annual beach nourishment particularly as major storms continue to batter the coast

“What we’re analyzing is (dune) performance in the face of one or two storms and the cost of renourishment,” said Burks-Copes, the project



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Push for hybrid dune

The dunes could also mitigate the continued erosion of the Texas coast sea level rise and the dwindling conveyor belt of sediment moving from tributaries. The Bureau of Economic Geology, which monitors shoreline along the Texas coast, estimates that parts of Galveston and Bolivar have lost 8 feet of shoreline over the last 80 years.

“If you do add sand or width (to) the beach or a dune to the coastline, it some time, it does not eliminate the (erosion) process,” Figlus said. “It’s eroding the porch of your house, it’s eroding the dune or the beach that was put there as replenishment.”

The erosion problem has led to a push for a hybrid dune system — essentially a sand dune with a fortified core made of a clay composite. A hard underpinning the dunes could reduce the cost of replenishing sand on the beach.

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public.

Fortified dunes “provide less of a footprint, it can be much smaller in volume, we can get protection up to the point of a hard core, put sand over it and it will look totally natural,” Merrell said.

Merrell said the dune height that the Corps has proposed is insufficient to protect against an Ike-level storm surge, and said the fortified dune he envisioned could rise as high as 17 feet. He cited a thesis recently published by Luis Roldan Galvez, a student at Delft University of Technology in the Netherlands, who argues for dunes as high as 23 feet to protect Galveston and the surrounding area.

The Corps “is not providing enough protection, I’ve told them that a number of times,” Merrell said.

A Corps spokeswoman said there is interest in Merrell’s demonstration, but further study is needed on the maintenance requirements for the fortified dunes as well as its impacts on wildlife, erosion and sediment transport.

Environmentalists say a dune could contribute to habitat loss for endangered species, such as the Kemp’s Ridley sea turtle.

Joanie Steinhaus, the Gulf program director of the Turtle Island Restoration Network, said fortified dunes built on Follets Island, across San Luis Pass from Galveston, were unable to maintain enough sand and vegetation for the sea turtle nest at the foot of the dunes, leaving what is now a mostly barren beach.

“We’ve had instances of turtles trying to nest where they actually crawl

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conundrum the Corps will have to solve before it submits a final propo
coastal barrier to Congress for funding in 2021, all while sea level
powerful storms continue to pose a t

“This is a problem we’re gonna live with,” Anderson said. “Unfortunately
has to deal with this problem by engineering our way o

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