

Battle on many fronts

The Bay Area faces a common threat along its shores, but must meet it with an array of ambitious and creative responses

By John King
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Boardwalks along the edge of the Alviso Salt Marsh restoration project allow visitors to enjoy the surrounding area on the edge of San Francisco Bay in Alviso. *Michael Macor, The Chronicle*

The levee that rings Oakland International Airport seemingly has nothing in common with the salt-crusted stretch of flat land alongside Menlo Park's Bayfront Park.

One is a 7-foot-high line of boulders, an engineered barrier between the tidal flows that surge in through the Golden Gate twice daily and the runways used by 10,000 commercial flights every month. The other is quiet desolation, a white void dotted with stagnant pools of water.

Both, though, are examples of the Bay Area shoreline at risk from the long-term effects of sea level rise — and reminders that there's no single way to prepare for what might lie ahead.

restored and managed marshes that provide habitat for wildlife and trails for people. But when major public investments or large residential communities are at risk, barriers might be needed to keep out water that wants to come in.



It's a future where now-isolated salt ponds near Silicon Valley would be reunited with the larger bay, while North Bay farmland is turned back into marshes. Levees that protect the lagoon-sliced suburb of Foster City likely would grow higher, as would the Oakland airport's seawall.

A range of responses

Anyone who knows San Francisco Bay knows that no two stretches of the shoreline are alike. Here are four areas where preparing for the future takes much different forms.

📍 Click locations on the bay-wide map to see where strategies are in the works or being planned.



Ravenswood Ponds

An example of the ongoing rebirth of the South Bay Salt Ponds is the next installment of the multidecade effort by the California Coastal Conservancy: 730 acres in Menlo Park. (A) will begin as a mudflat and evolve into a tidal marsh. (B) will remain as a salt flat that provides nesting areas for western snowy plovers. The most accessible area, (C), will be a managed pond.

[emmaruthoneill@sfchronicle.com](#) • [@emmaruthoneill](#)
[John Blanchard](#) • [jblanchard@sfchronicle.com](#)





time we have. Projections done in 2012 by the National Research Council, a scientific think tank, suggest that looking ahead to 2100, the “most likely” scenario for bay rise is average tides 36 inches higher than today’s. The worst-case scenario is more sobering, 66 inches. In either case, the tidal changes are expected to accelerate after 2050.

“We’re in a big transitional period,” said Allison Brooks, executive director of the Bay Area Regional Collaborative, an alliance of four state agencies that play a regulatory role in planning in the nine Bay Area counties. “There’s not going to be a magic bullet.”

Whatever the precise impacts of sea level rise, the mistake for us would be to treat it as one of those problems to be dealt with someday, down the road. Addressing the issue should be a Bay Area-wide priority on par with housing or transportation, and is one that will require government at all levels working together.

There’s another ingredient that would help. We need the spark of imagination.

This might sound frivolous, but it’s essential. No matter how grim the political climate in Washington, D.C., might be, the design community here and beyond can offer scientifically grounded visions of the future that stir a sense of potential rather than dwelling on apocalyptic what-ifs. A proposed competition would offer us the chance to move the discussion forward; the sooner that it begins the better off we all could be.



A jet takes off over the original levees that surround Oakland International Airport, which opened in 1962. With as little as 18 inches of sea level rise, water could spill across Doolittle Drive onto the airport runways several times a year during extra-high tides unless the drive’s low spots are raised. *Michael Macor, The Chronicle*

said John Bourgeois, driving his Prius across bumpy levees on the south edge of the bay, Silicon Valley's tech campuses visible through the haze. "But I'd destroy the infrastructure."



Bourgeois is executive manager of the California Coastal Conservancy's South Bay Salt Pond Restoration Project, which since 2004 has worked to bring 15,100 acres of former marshland back to life. About 3,750 acres have been restored so far in an effort that, when completed, will be the largest such reclamation in the Western United States.

His tour of this site begins near a managed pond where white pelicans linger. Nearby are the lumpy remnants of a levee, bits of it left in place after it was breached so that salt marsh harvest mice, an endangered species, can scamper to safety during extra-high tides. Other levees, still intact, frame grids of water that were marshland before they were remade more than a century ago to extract salt from the bay's briny flow.

This methodically altered landscape bears witness to how we treated the bay between the 1850s — when migrants descended on California seeking riches — and the 1960s, when the idea of filling the bay became virtually taboo.

First, a levee would be erected at the far edge of tidal flats. Berms added on the inland side allowed marshes to be flooded to create ponds of uniform depth. Bay waters were pumped into the first artificial pond in the sequence, then moved from pool to pool as evaporation took place.

The process took about five years, each pond becoming saltier than the one before. The end result: mountains of white crystals waiting to be refined and sold.

One functioning salt works remains north of Fremont, several thousand acres carved into ponds of different colors and operated by Cargill. Within the 10,000-plus unrestored acres that are controlled by the Coastal Conservancy, the next phase of restoration should begin in 2018 — an \$11 million rebirth of 730 acres on the shore of Menlo Park known as Ravenswood Ponds.

So much salt remains here that parts of the old, dried-up ponds look like disheveled ice rinks. Within 15 years, though, if all goes well, the area will be shorebird habitat as well as marshes intended to soften the force of rising waters. The wetlands will also protect neighbors like Facebook's main campus, which borders the area.



An egret rests at the Alviso Ponds restoration project where more than 2,200 acres of ponds have been connected to S.F. Bay in Alviso. *Michael Macor, The Chronicle*

By starting now, the restored tidal marshes should be hardy enough that as sea level rises, the remade wetlands will endure.

“Several feet of sediment needs to accumulate before vegetation can take hold,” Bourgeois said. “Once it does, marshes can keep pace” with all but the most extreme projections through the end of the century.

Starting the process sooner rather than later also allows time for trial and error.

That approach came in handy on the bay’s northern rim, where one of the first large-scale conversions to wetlands occurred near Sears Point and Highway 37 beginning in 1996.

Today, the former hay fields where a levee was breached are a sleepy rustle of cord grass and pickleweed sliced by blue rivulets of water that swell and contract depending on the tide.

Initially, though, the 25-foot-wide gap made in the levee was too narrow to allow San Pablo Bay to reassert itself. Years passed before storms created an opening wide enough to let sediment build up and vegetation take root. The conversion was a success, but took much longer than anticipated.

Last fall the Sonoma Land Trust undertook a similar effort on 1,000 acres next door, but created a breach 10 times the width of the 1996 gap. Portions of the shoreline, meanwhile, were molded into slowly rising slopes known as horizontal levees, where, if needed, marshes can migrate as sea level rises.

Such levees are the current rage among marsh planners. Yet at this site, the mud dredged to form the slopes has such high acid counts that seeds placed there haven’t sprouted.

The trust’s program manager for the effort is Julian Meisler. This fall he took stock of the situation and canceled an order for \$10,000 worth of seeds that were to be planted there.

plowed it into the slope, reducing the acid levels so that native plants someday will sprout.



“Going from dry to wet overnight is the easy part,” Meisler said during a visit to Sears Point, where he pointed with relish to a single tuft of cord grass poking above the muck. “After that, everything takes time.”



Lime waiting to be spread along a levee at the Sears Point Wetland Restoration, which began with fanfare in 2015 but could take 15 years or more. *Michael Macor, The Chronicle*

To understand why Foster City doesn't have the luxury of cloaking itself in protective marshes, contemplate the view from Beach Park Boulevard: a 13-foot-high levee that stands between you and the bay.

This community of nearly 35,000 people in San Mateo County sits on former tidal flats that were converted to ranch land around 1900. After T. Jack Foster bought the acreage in 1960, 18 million cubic yards of fill were used to raise future development parcels above sea level and shape lagoons that now hold boat slips for homeowners.

Nobody anticipated that the Federal Emergency Management Agency in 2014 would warn that Foster City could be in a flood hazard zone. To escape that designation, the city expects to spend \$70 million to raise existing levees an average of 3 feet — and perhaps millions more to take sea level rise into account.

Some residents have called for a horizontal levee, but trying to redo the mudflats beyond Foster City would be hugely expensive and scientifically problematic. Instead, the engineering firm Schaaf & Wheeler has devised a system with a line of metal plates that

levee's crest would add to the expense, but also would protect against the tide levels forecast through at least 2050. The City Council is scheduled to choose a preferred option early next year.

Keeping out a rising bay

Two views toward the bay from Bridgeview Park in Foster City: one as it appears today, and how things might look in 2050 if the levee is raised high enough to protect the waterfront community from storm surges coupled with sea level rise.



Emma O'Neill · eoneill@sfchronicle.com · [@emmaruthoneill](https://twitter.com/emmaruthoneill)

Photos: BFS Landscape Architects

“The idea is to build a foundation for the future,” said Schaaf & Wheeler’s Chuck Anderson. “Everyone around the bay is going to be dealing with decisions like this.”

That’s already the case at Oakland International Airport, which is exposed to the bay on three sides.

The main runways are fringed by bouldered riprap. But to the east, facing a bay inlet known as San Leandro Bay, airport property ends at the low bend of Doolittle Drive, a roadway owned by Caltrans that leads into the city of Alameda.

San Leandro Bay includes restored wetlands managed by the East Bay Regional Park District. A study done for the Bay Conservation and Development Commission demonstrates that with as little as 12 inches of sea level rise during storms, when tides are higher than normal, water could surge across marshes and Doolittle Drive onto the runways that serve private aircraft.



Richard Sinkoff, director of Environmental Programs and Planning, stands near the end of the runway at Oakland International Airport. *Michael Macor, The Chronicle*

Unlike its rival airport in San Francisco, which is gathering approvals for a \$58 million “shoreline protection project” that includes 4 miles of taller seawalls, Oakland is taking a more episodic approach.

“We’re studying the entire levee, but we may not have to fix the entire levee,” said Richard Sinkoff, director of environmental programs and planning at the Port of Oakland, which owns and operates the airport. “We’re focusing on the areas that are most critical to protect the entire airport.”

That includes Doolittle Drive, the weak link in the chain. “If we solve this particular stretch, we’re pretty much protected” through at least 2050, Sinkoff said. “A huge problem becomes a manageable issue.”

In an ideal world — meaning a region with a holistic approach to the challenges posed by climate change — the port, Caltrans, Alameda and the East Bay parks would collaborate on an adaptation plan for San Leandro Bay. They’d pool resources on an environmentally sensitive response that takes everyone’s needs into account. But if protecting the airport is a top priority for Oakland, a service road to Alameda probably isn’t high on Caltrans’ to-do list.

So the day may come when the port will need to bite the bullet and raise the edge of its property on the airport side of Doolittle Drive. Even though, realistically, the other upgrades will need to be made at some point as well, a duplication of efforts and expense for everyone involved.



A view of the South Bay Salt Ponds restoration project at Bayfront Park in Menlo Park. *Michael Macor, The Chronicle*

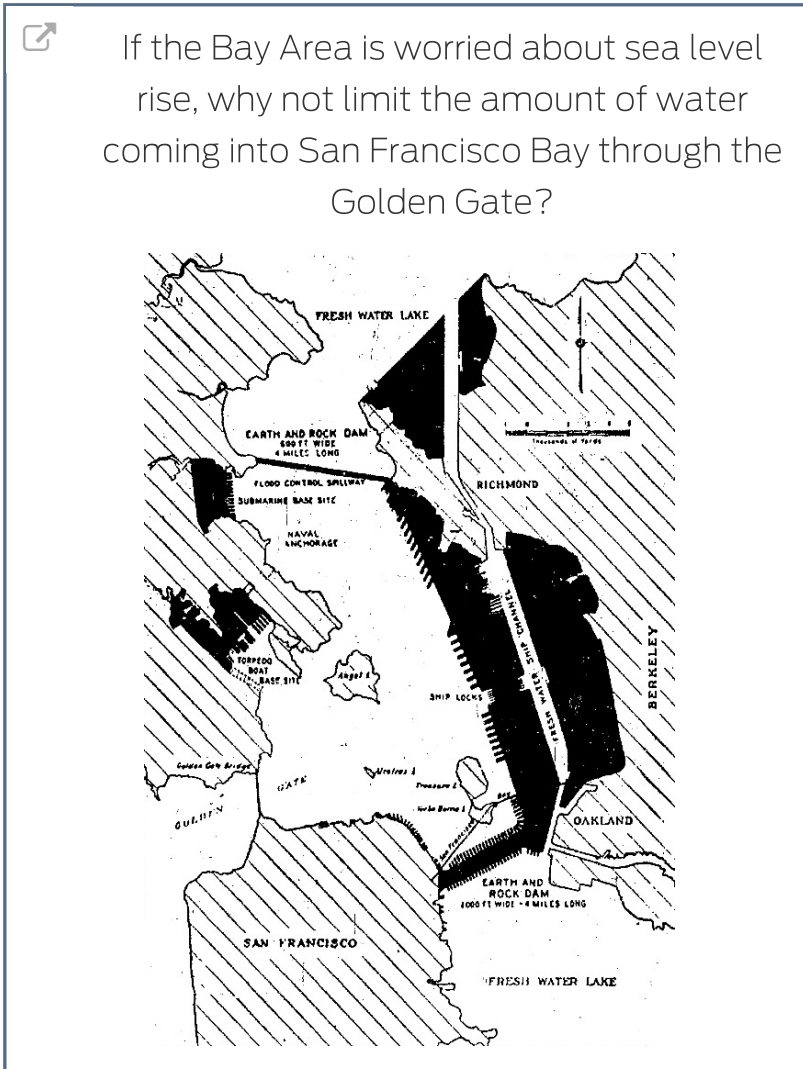
The regulatory dilemmas that hinder the Bay Area’s ability to prepare for sea level rise are confounding, whether it is the four years to secure the approvals and permits for the Ravenswood Ponds or the bureaucratic thicket along San Leandro Bay.

It’s easy to respond by fixating on the need for government reform and comprehensive planning. But there’s another avenue being pursued — a path that could lead to solutions and strategies we might not otherwise find.

That would be Resilient by Design — a design competition on a grand scale that aims to tackle the local impacts of climate change and sea rise in ways that are creative and compelling, without crossing into the realm of sci-fi.

“We want new ideas. We also want ideas based on reality,” said Margie O’Driscoll, one of two consultants working on the nine-county effort. “We’re keenly interested in making sure that they can be implemented.”

That aim distinguishes Resilient by Design from a previous effort. In 2009, the Bay Conservation and Development Commission held the Rising Tides design competition — essentially a consciousness-raising exercise that drew crowds to the Ferry Building to see 131 submissions.



This time, the competition is envisioned as a yearlong effort with a \$5 million budget. After a request for qualifications, 10 teams would be selected. Each would include architects or landscape architects as well as firms with expertise in such fields as hydrology and marine engineering.

Each team would be awarded a six-figure commission and assigned a distinct site along the bay. They'd be given several months to work with local residents to devise a plan for their site that passes environmental muster and has community support.

The model is New York's Rebuild by Design, which was held after the ravages of 2012's Hurricane Sandy and spurred such provocative notions as wave-calming oyster beds off Staten Island.

But unlike New York's competition, the Bay Area effort isn't being funded with federal dollars provided after a natural disaster. Instead, Resilient by Design languished for

things off. Now there's a 10-member oversight board drawn from around the region and a fundraising consultant making the rounds of foundations and local corporations.



“The idea is a deeply researched set of proposals with lots of people involved,” said Sam Schuchat, who heads the state’s Coastal Conservancy and is on the competition’s board. “If nothing else, we’ll get fresh thinking from smart design teams,” including thoughts on how to streamline the governmental maze.

ABOUT THIS PROJECT

All credible forecasts indicate that climate change will cause sea levels to rise at an ever-more rapid pace in coming decades, including the waters of San Francisco Bay.

Chronicle Urban Design Critic John King has explored this challenge through 2016 in all its manifestations, from the perils facing the city's crumbling Embarcadero to the potential rebirth of the South Bay's salt marshes and the creation of a small city on man-made Treasure Island.

The region needs to prepare for these shifting tides. We can protect ourselves and adapt in ways that are enticing as well as scientifically sound. But the Bay Area also must begin planning for that future now – and break the habits of a half-century that inhibit adventurous decision-making and design.

Another board member is Brooks, from the Bay Area Regional Collaborative.

“Our officials and politicians have been good at bringing this issue (sea level rise) forward,” Brooks said. “What’s been missing is turning from that to: ‘What can we do about it?’”

Brooks is right.

The Bay Area deserves credit for not ignoring the likelihood that we’ll need to learn to live with a bay much different than the one residents in the 1960s and ’70s fought so hard to save. The ongoing restoration of the South Bay salt ponds as well as the flexibility shows that we aren’t burying our heads in the sand. So does San Francisco’s requirement that development projects along the shore need to be elevated at least 3 feet above current ground levels.

But these individual local initiatives must be paired with a regional approach — one ambitious and wide-ranging enough to generate responses that can be put into action in years, not decades.

support from local governments and businesses, as well as far-sighted foundations that recognize the best time to face the future is before a disaster strikes, not afterward.



Climate change and sea level rise are ominous clouds on our horizon. But our region has faced adversity before. We have an opportunity, to begin to bring the challenge down to size. If we succeed, the rest of the world will take notice.

A virtual reality viewfinder system designed by Owlized was installed in August at Coyote Point Recreation Area in San Mateo County. It is scheduled to be in place through the end of 2016. *Erin Brethauer, The Chronicle*

Read the rest of [Rising Reality](#)

Reporter:

John King • jking@sfchronicle.com • [@johnkingsfchron](https://twitter.com/johnkingsfchron)

Lead producer:

Emma O'Neill • oneill@sfchronicle.com • [@emmaruthoneill](https://twitter.com/emmaruthoneill)

Producers:

Benjamin Din • bdin@sfchronicle.com • [@benjamindin](https://twitter.com/benjamindin)

Lucio Villa • lvilla@sfchronicle.com • [@luciovilla](https://twitter.com/luciovilla)

Graphic designer:

John Blanchard • jblanchard@sfchronicle.com

Photographer:

Michael Macor • mmacor@sfchronicle.com • [@mmacor](https://twitter.com/mmacor)