ENERGY & ENVIRONMENT

Where Land Meets Water

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and Richard Frank

Those regions in California where land meets water — along the state's 1,100-mile coastline, in San Francisco Bay and along California's extensive system of lakes and rivers — constitute some of the state's most valuable real estate. Along with sensitive and important ecological resources, these littoral and riparian areas also harbor competing ownerships of privately owned uplands and publicly owned waterways.

It is no surprise that many of California's most pitched property rights and environmental battles have arisen in these coastal areas. Those battles reflect the fact that land-water boundaries are far from static: They shift constantly, due to both natural and human-induced factors. Since California became a state 159 years ago, the Legislature and especially our courts have devised rules of property law to resolve those disputes.

Climate change promises to exacerbate those boundary controversies. But it also will severely test — and likely require changes to — California's law of water boundaries.

Climate Change and Coastal Areas

Scientific experts project that climate change will have numerous effects on California's coastal environment. Perhaps the most prominent such effect is sea level rise.

Sea level along the California coast has been rising steadily for some time — seven vertical inches at the Golden Gate Bridge since 1900, according to precise monitoring studies. But climate change is greatly accelerating the pace of sea level rise: The United Nations-sponsored Intergovernmental Panel on Climate Change projected in 2007 that, on a worldwide average, sea level could rise by up to one meter by the year 2100. More recent studies suggest those projections may actually be too conservative.

Projected sea level rise associated with climate change comes with substantial economic and human costs: A recently released study by the nonprofit Pacific Institute estimates that, by the end of the century, $100 billion in property and nearly half a million people in California will be located in areas vulnerable to coastal flooding from projected sea level rise. The specter of such vulnerability will undoubtedly increase pressure to "armor" the California coast with seawalls or similar structures. And it's likely that the combined effect of sea level rise and these coastal protection structures will raise difficult and controversial questions about whether and how the boundary between state-owned tide and submerged lands and privately owned uplands moves as a result.

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Additionally, there is a growing body of evidence to suggest that climate change is likely causing other natural disasters such as tsunamis, hurricanes and typhoons to become more intense and destructive. Hurricane Ike, which ravaged Texas' Gulf Coast in September 2008, may be a harbinger of California's future. That hurricane — the third most destructive in American history — decimated many coastal residences in the Galveston area and, literally overnight, moved the ocean shoreline substantially inland. Since that disaster, a major controversy has arisen over whether private landowners whose homes were destroyed by Hurricane Ike will be allowed to rebuild or, indeed, if the land on which their homes formerly were located remains private property at all.

Rules of Coastal Boundaries

The open coast regime provides a graphic setting for application of legal principles governing the boundary of properties adjacent to navigable watercourses. The property boundary impact of climate change may be broken into two broad questions: What is the property boundary effect of the gradual submergence of littoral properties as sea level rises, and what is the property boundary effect of great storms or floods that may result from climate change?

The property boundary between coastal uplands and state-held tide and submerged lands is the "ordinary high water mark." The ordinary high water mark is a legal term translated by courts into a physical location: the mean high water line. The mean high water line is the intersection of the calculated elevation of mean high water (the mean of all high waters over an 18.6 period) and the topography of the land, whether beach, rock or bluff. The mean high water line is constantly in flux. Thus, if the elevation of the land surface rises relative to elevation of the water surface through deposition of sand, or falls relative to the water surface elevation through erosion of the beach, application of traditional principles of property boundary movement results in the property boundary following that changing physical location. Accordingly, assuming traditional boundary principles apply in the case of the gradual and imperceptible submergence of coastal property by rising sea levels, the property boundary will continue to move inland as sea level rises. California cases, dealing with inland waters, support that result.

On the other hand, when the change to the landform along the open coast is rapid and perceptible, including violent removal or addition of land, traditional property boundary law defines that process as an "avulsion." Assuming those usual property boundary principles apply to the open coast, in the case of an avulsion the property boundary would be fixed at its pre-event physical location. Most California reported decisions applying this rule arose, however, on inland watercourses. Thus, some have questioned whether, in the highly dynamic open coast, the doctrine of avulsion should apply, especially if its application would permit private ownership of tidal lands. California has no reported cases; and decisions from other states have reached conflicting conclusions.

Coastal Boundaries and Climate Change

One may question whether traditional rules of property boundary movement should apply to the unprecedented situation in which shoreline owners may find themselves due to the effects of climate change. These property boundary rules were adopted based on long experience with physical regimes that were stable over the long term and tended toward an equilibrium; what was gained over time could also be lost in time.

Seemingly, climate change challenges the basic assumption on which our traditional property boundary rules have been based: Equilibrium and stability in the physical regime is no longer true.

Adding to those challenges is the fact that the impact on property boundaries of systemic alteration in the physical regime has been treated differently by judges, depending on whether one is in state or federal court. In some cases, California courts treat such changes like an avulsion; by contrast, federal courts do not consider the property boundary impact of such changes, especially when boundary movement benefits federal interests. E.g., *California, ex. Rel. State Lands Commission v. United States*, 457 U.S. 273 (1982).

These questions must be answered sooner rather than later, since both state and federal governments have considerable rights and interests hinging on the assumption of the equilibrium of shoreline regimes. For purposes of the federal Submerged Lands Act, measurement of the seaward extent of those rights begins at coastline, defined as the mean lower low water line. As rising sea level intrudes into the upland, the "coastline," the mean lower low water line, will likely move inland as well. The landward movement of the coastline could result in a corresponding landward movement of the three-mile band of tide and submerged lands owned by the states, in which lie valuable mineral leases and ecological resources.

In the coming years, the legislative and judicial branches will have much to deal with in the "new physical regime" that climate change is likely to produce along California's coast. Having the best available information will be a good start in considering a legal regime to accommodate this new reality: Recently, Gov. Schwarzenegger commissioned the National Academy of Sciences to develop sea level rise projections specific to California by the end of 2010, to help the state plan adaptation strategies to respond effectively to rising sea levels.

Whether and how California's law of coastal boundaries will similarly adapt to the unprecedented challenges of climate change, however, remain formidable questions.

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