

## WAIKĪKĪ AREA DESCRIPTION

The Waikīkī shoreline (transects 1 - 193) extends 2.4 miles from Diamond Head to Ala Wai Boat Harbor. Waikīkī is an urban shoreline and bears little resemblance to its original natural condition. Modern Waikīkī is largely the result of engineering efforts (groins, sand-fill, and seawalls) intended to widen the beach and move the shoreline seaward (Miller and Fletcher 2003, Wiegel 2008). The coast is exposed to refracted easterly tradewind waves year-round; southerly swell, most common during summer months; and southerly Kona storm waves any time of the year (most often in winter). The inner reef and shoreline are protected from open-ocean wave energy by a fringing reef.

Engineering events at Waikīkī Beach (adapted from Miller and Fletcher 2003, Weigel 2008):

- 1917 Ft DeRussy concrete storm drain installed.
- 1927 War Memorial Natatorium constructed.  
Royal Hawaiian groin constructed.
- 1939 Northern Kūhiō Beach constructed with submerged offshore breakwater
- 1951 Kapahulu storm drain installed.  
Kūhiō Beach constructed with sand fill.
- 1953 Construction of central and southern Kūhiō groins and southern Kūhiō breakwater.
- 1956 Duke Kahanamoku Beach and Lagoon constructed.  
Queen's Beach groin and uniform beach to the Natatorium constructed.
- 1957 Queen's Surf Beach constructed with sand fill, shore-parallel swimming basin dredged.
- 1959 Kūhiō Beach, sand fill added.
- 1963 Outrigger Canoe Club groin and beach constructed.
- 1969 Ft DeRussy storm drain lengthened.  
Ft DeRussy Beach expanded, rubble groin installed next to storm drain.
- 1972 Kūhiō Beach reconfigured, sand added.
- 1975 Ewa-side Kūhiō breakwater raised to +3ft in some segments: sand added.  
Ft DeRussy filled with additional sand.
- 1981 Ft DeRussy sand fill added.

- 1991 Kūhiō Beach enlarged with sand fill
- 2000 Diamond-head Kūhiō Beach, sand fill added.
- 2008 Kūhiō Beach, sand fill added.
- 2012 Waikīkī Beach, sand fill added.

Historical shorelines from aerial photographs 1927 - 2015 are available for most of the Waikīkī shoreline. Due to extensive shoreline reconstruction, only historical shorelines for the modern configuration of each beach are used to calculate change rates. Engineered structures divide the Waikīkī shoreline into separate littoral cells (Miller and Fletcher 2003) resulting in highly variable change rates from one segment to another. The distribution of shoreline change rates suggests that in several locations these structures are interrupting the natural long-shore sediment movement resulting in up drift (accretion) and down drift (erosion) impacts (e.g., Natatorium, transects 23 - 24).

In the time span of this study the beach was lost to erosion near the middle of Outrigger Canoe Club Beach (transects 4 - 9), at the south end of Kaimana Beach (transects 14 - 15), and in the south of Queen's Beach (transects 27 - 35). For areas where the beach has been lost, rates are calculated up to and including the first historical shoreline with no beach and show the speed at which the beach disappeared. Little or no beach has existed near the center of Gray's Beach since 1927, so those transects were removed from the study (would-be transects 130 - 132). Shoreline position is now fixed by seawalls in areas where the beach has been lost.

For more information see: <http://www.soest.hawaii.edu/asp/coasts/oahu/index.asp>

<sup>1</sup> Hwang, D. (1981) "Beach changes on O'ahu as revealed by aerial photographs", State of Hawaii, Department of Planning and Economic Development.

<sup>2</sup> Sea Engineering, Inc. (1988) "O'ahu shoreline study", City and County of Honolulu, Department of Land Utilization.

Keywords:

O'ahu; Waikīkī; Diamond Head; Ala Wai Boat Harbor; Kaimana Beach