

Pupukea-Paumalu (Sunset Beach Park) Beach Maintenance Guidelines



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November, 2009



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Sea Grant publication number TT-09-01.

This paper is funded in part by a grant/cooperative agreement from the National Oceanic and Atmospheric Administration, Project 42.A/AS-1, which is sponsored by the University of Hawaii Sea Grant College Program, SOEST, under Institutional Grant No. NA09OAR4170060 from NOAA Office of Sea Grant, Department of Commerce. The views expressed herein are those of the author(s) and do not necessarily reflect the views of NOAA or any of its subagencies. UNIHI-SEAGRANT-TT-09-01.

EXECUTIVE SUMMARY

This report is prepared in response to a request by the City and County of Honolulu Department of Parks and Recreation (C&C). The intent of this preliminary report is to evaluate current sand management techniques at Sunset Beach park and identify best management practices (BMP) for management of the beach area. The C&C is responsible for beach and park maintenance in accordance with state Executive Order 2598 of December 31 1971 Pupukea-Paumalu Beach (Kewaena to Sunset-backyards) which designates the primary management of the beach, access ways and park area to the City and County of Honolulu, Department of Parks and recreation for the purpose of park improvements and maintenance. The C&C and the Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands (OCCL) have a shared regulatory function for the beach area here through the overlapping jurisdiction of the state Conservation District which is defined by the certified shoreline and the C&C’s responsibility to manage the beach park area designated from the high watermark to the private property boundaries (Figure 1). Both agencies have received complaints from the adjacent beachfront residents regarding the C&C annual beach maintenance practice. They are concerned that excessive beach grooming may negatively impact local sediment transport and contribute to seasonal beach erosion downdrift.

This report provides a preliminary review of current beach maintenance practices with a summary list of recommended best management practices for the Sunset beach park area. The report provides short, mid and long-term goals and objectives and provides some preliminary recommendations for addressing the pressing management concerns. The report highlights the need for long-term planning and supports the effort for more comprehensive regional beach management plans throughout the region.

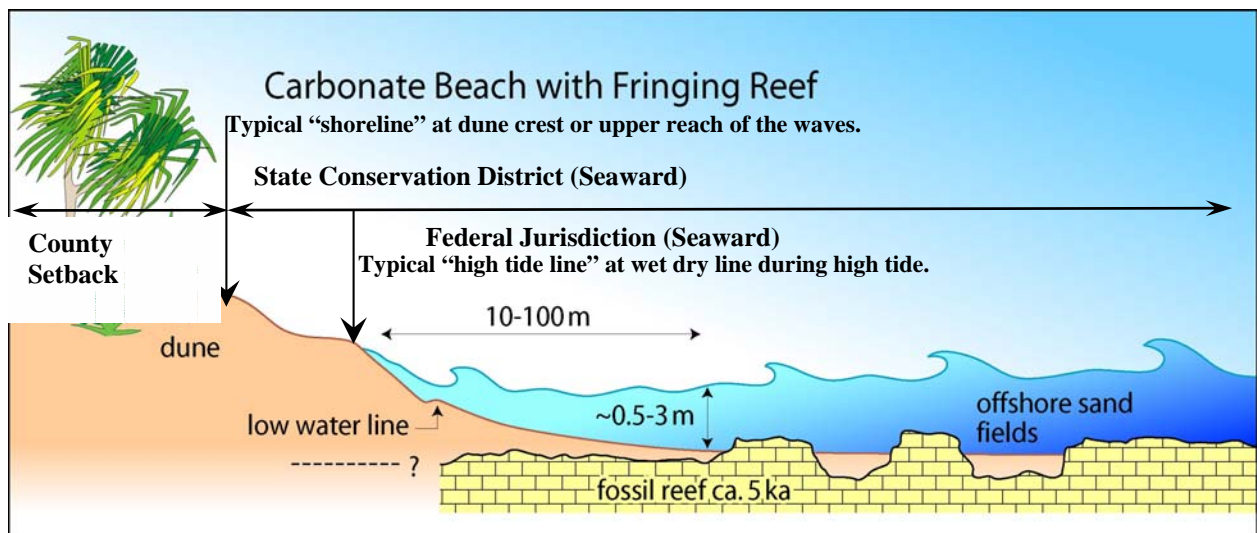
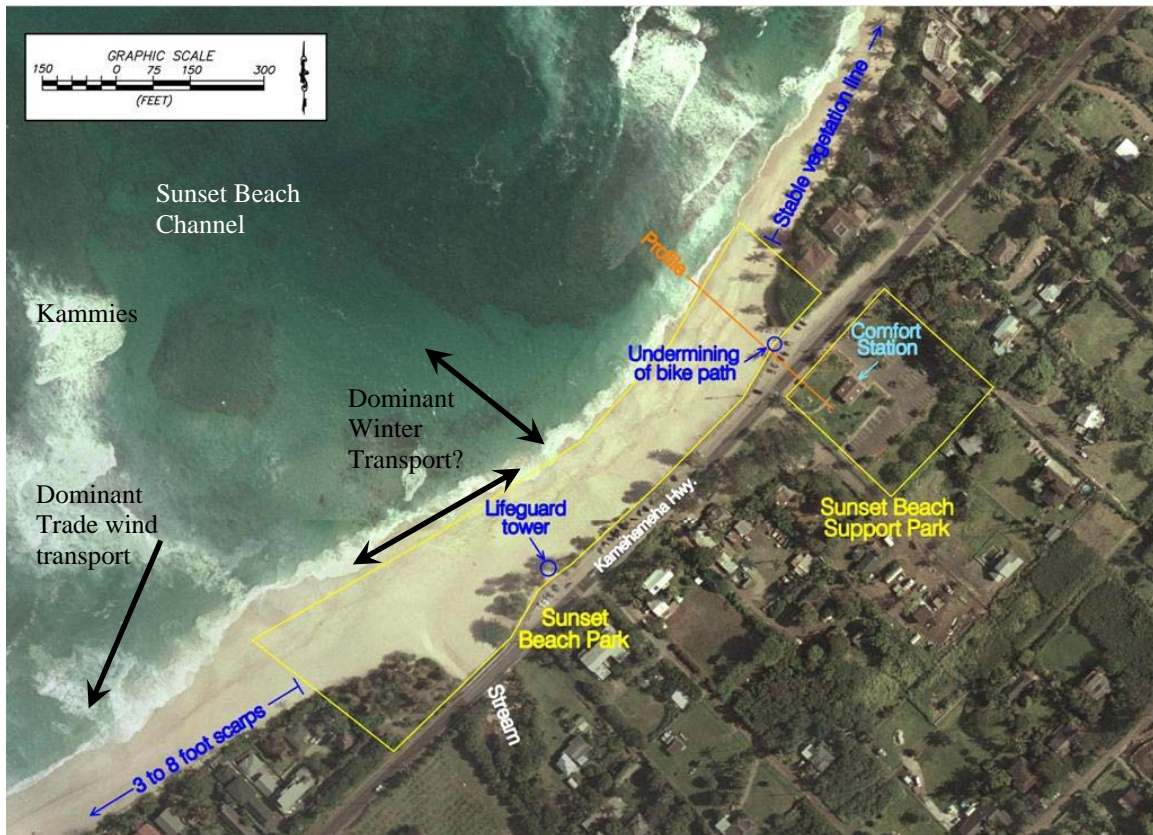


Figure. 1 Conceptualized Shoreline Jurisdiction. Base Image: Chip Fletcher, UH

SITE DESCRIPTION

The study area encompasses Sunset Beach and includes the world-renown surfing beaches at Backyards, Sunset Beach and Rocky Point. This reach encompasses the popular sandy beaches and recreational surf spots that have made this region internationally renown. Sunset beach park has approximately 1,300 feet of continuous sandy shoreline and several public beach access Right of Ways (ROW's) which are subject to regular beach maintenance by the (C&C). The park contains a bike path, a lifeguard tower, and roadside parking areas (Figure 2). A comfort station, a shower, picnic tables, and additional parking are available across Kamehameha Highway at the Sunset Beach Support Park. The backshore area throughout much of the beach park contains no vegetation, likely due to heavy foot traffic The park is bordered along the shoreline and across Kamehameha Highway by private residences. The beach park is directly exposed to winter northwest swell and indirectly exposed to trade wind waves. Some of the world's best-known surf breaks are found along the Pupukea-Paumalu coastline, where winter waves annually draw large numbers of surfers and spectators. Many surf journalists have referred to this unique stretch of coast as "the miracle mile" due to the high concentration of high-quality surfing waves found along this stretch of coast.

Figure 2. Sunset Beach Park and Beach Area (Base Image: Sea Engineering, Inc.)



SUNSET BEACH PARK MAINTENANCE GUIDELINES

Sand pushing is a common remedial erosion mitigation measure at the beach park. This can be an effective beach maintenance technique in which sand is taken from lower sections of the beach profile and pushed into an artificial protective berm higher on the beach profile. This technique can be especially useful for areas that experience high foot traffic erosion of the beach. A bike path runs between the park and Kamehameha Highway. A small area of erosion caused by precipitation runoff was noted west of the lifeguard stand, and an area where the bike path was undermined was found in the eastern portion of the park¹. The beach width was measured to be more than 150 feet from the bike path to the top of the foreshore slope near the lifeguard stand.

SEDIMENT TRANSPORT CHARACTERISTICS

Sunset beach is characterized by coarse-grained tan to golden marine carbonate sands. These poorly-sorted sands are typical of the high-energy beaches along the north shores of the Hawaiian Islands. The sand is of biogenic origin and derived from the carbonate reefs as well as marine tests (shells) of microscopic pelagic organisms. Sediment transport in the Sunset Beach area is not well understood and has not been researched well enough to develop quantitative sediment transport results. We can however describe these processes qualitatively based on abundant empirical knowledge. A fact illustrated by the large population of highly experienced surfers and lifeguards with years of first-hand knowledge of seasonal and episodic events. Many of these local residents offer a valuable resource for understanding the relationship between the offshore wave energy spectrum and the resulting observed sediment transport (erosion or accretion) on the beach.



Dramatic seasonal variation in beach with is common in Pupukea-Paumalu and requires site-specific understanding of coastal processes in order to respond to beach maintenance and management issues.

¹ DRAFT-CITY BEACH PARKS EROSION STUDY ISLAND OF OAHU, HAWAII February, 2009 Sea Engineering, Inc.
.Prepared for: City and County of Honolulu, Hawaii Department of Design and Construction.

Based on these empirical observations, Sunset beach is dominated by a bi-modal longshore seasonal transport mechanism driven by wave direction displacing large sand volumes in a very short time period under high-energy, acute angle swell energy. The westerly transport of sediment is driven by swells from the north-northwest, while the easterly transport is driven by swells from the west to north west (Figure 2). These swell directions are typical of winter conditions and tend to accumulate sediment in the Sunset Beach region during the winter months. Typical trade wind swell out of the east to northeast dominates the summer months and tends to transport sediment to the west towards Rocky Point. The summer months tend to be erosional in nature at Sunset Beach and is particularly pronounced at the exposed section of residential properties immediately to the east of Sunset beach park fronting the “Kammies” Surf break. It is unknown what role the Sunset Beach channel plays in the function of sediment transport in the region but is likely to be a significant sediment pathway in the nearshore.

PROBLEM STATEMENT

Background

Studies show that nearly 25 percent of sandy beaches (17 miles) on the island of Oahu have been severely narrowed or lost over the past 70 years due to shoreline armoring. On the island of Maui, nearly 30 percent (9 miles) of the shoreline has experienced beach loss or significant narrowing. Beaches and dune systems are a critical component in the prevention of coastal erosion and flooding by serving as a natural buffer to prevent property damage from storm waves and undermining due to shoreline retreat. Beaches are also the backbone of Hawaii’s visitor economy, which provides the majority of Hawaii’s jobs and income. Beaches are also critical for ecological, spiritual, local recreational and cultural reasons.

Coastal management policies in Hawaii have not prevented the loss of miles of sandy beach and coastal land to the ravages of erosion and inappropriate development. The administration is poised to implement new, sustainable approaches to the problem of beach management provided that credible supporting scientific studies and data can be established on which to base decisions. This commitment takes on a critical light given global predictions for continued, possibly accelerated, sea-level rise and the ongoing focus of intense development along the Hawaiian shoreline. Hawaii’s coastal resource managers are faced with the daunting prospect of managing the effects of erosion while simultaneously monitoring and regulating high-risk coastal development that often impacts the shoreline.

The Pupukea-Paumalu dune system has not been adequately protected or effectively managed despite local sand abundance. Along this once pristine coast, the dunes have been graded and developed with homes. This has been to the detriment of the adjoining beach and associated habitat, which relies on this stored source of sand during times of episodic erosion. In addition, the grading of the primary coastal dune also has increased the vulnerability of the residents to coastal hazards such as storm waves and erosion.

SUNSET BEACH PARK MAINTENANCE GUIDELINES

Elsewhere the dune has been alternately developed, inappropriately landscaped, or altogether removed in random fashion based on localized development styles. A site-specific comprehensive, conservation-oriented management and maintenance plan is needed for the Pupukea-Paumalu beach and dune system to ensure the preservation and protection of this unique resource for future generations.

There are a number of direct threats to Pupukea-Paumalu beach and dune system that may lead to ecosystem degradation, loss of recreational opportunities, loss of public access and increased exposure to coastal hazards. These include:

1. Continued localized erosion in Ehukai and Sunset Beach Park region due to a lack of a public access plan and coordinated sand management practices related to large foot traffic loads (Figure 3).
2. Diminished coastal access due to seasonal beach erosion and human-induced erosion.
3. Haphazard, ad-hoc dune protection and emergency erosion control measures that often result in unintended consequences.
4. Unauthorized landscaping, and erosion control measures that can result in the loss of access the shoreline area by aggressively overtaking portions of the beach and dune.
5. Increased exposure of beachfront residents to coastal hazards due to human-induced and natural shoreline modifications.
6. Insufficient shoreline construction setbacks to guarantee beach and dune conservation and hazard mitigation.

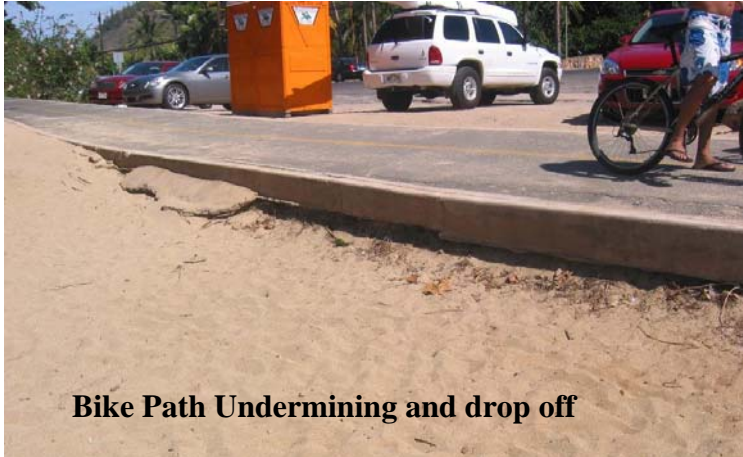
Foot Traffic Erosion

The Pupukea-Paumalu area offers a unique environmental and recreational setting as well as a demonstrated interest and community participation in the coastal land use and beach conservation. One unique resource management aspect of the Pupukea-Paumalu area is the tremendous amount of foot traffic it receives during high surf and associated surfing contests. It is not uncommon to have over 5000 people visit Ehukai beach park during a major contest with similar volumes at Sunset beach. This volume of foot traffic contributes significantly to the deflation of the beach profile and necessitates costly sand pushing by the City and County of Honolulu to restore the beach to a normal volume. The University of Hawaii conducted a Topographic Lidar survey of Ehukai beach in the winter of 2007. This ongoing beach volume study reveals significant upper beach profile volume loss during periods of heavy foot traffic. The study confirmed local resource managers understanding that pedestrian foot traffic accounted for the primary mechanism for beach deflation and dune degradation. The lack of dedicated public access corridors at Sunset and Ehukai beach parks may be contributing to the need to maintain the upper beach volume through mechanical means and highlights the need for a comprehensive beach maintenance plan with specific BMPs.

Figure 3. Foot Traffic Erosion



High volume foot traffic associated with surf contests can contribute to beach erosion and damage dune vegetation.



Bike Path Undermining and drop off



Bike Path and recommended railing.

Beach Maintenance (Sand Pushing)

Beach scraping or "sand pushing" commonly consists of excavating sand from the berm, beach face or nearshore areas and depositing the sand farther landward on the beach or in the dune system. A relatively thin layer of sand (1 ft. or less) is removed from the lower beach and spread over the upper beach. Sand is typically moved with a bulldozer, front-end loader or pan excavator, often in a landward direction across the beach. However, in some cases it may be moved from a shoreline where it is abundant to neighboring beach areas. Beach scraping is often carried out as a temporary erosion control measure before the onset of seasonal high wave activity. Sand pushing in Hawaii is utilized to cover exposed geotextile bags, protect roadways, and to shore up public beach access ways. This procedure is usually carried out over much larger areas of beach in the mainland U.S. than is commonly practiced in Hawaii.

Beach scraping is the least expensive erosion mitigation technique. It has served to temporarily alter a limited portion of the beach face to providing infill for an eroded area. Beach scraping should *not* be considered a long-term alternative for erosion management as it is primarily a temporary cosmetic fix. Beach scraping in Hawaii may occur on scales from one-time occurrences for single parcels to ongoing projects across broad sections of beach. Small-scale beach nourishment should be considered to compliment beach scraping projects that are needed regularly. *Careful judgment and analysis of nearshore processes (such as the dominant transport mechanisms and direction) must be exercised when planning these efforts, as there is evidence that beach scraping may accelerate erosion under some circumstances.* See beach scraping references Appendix A. Consult with the DLNR-OCCL for more information.



Sand Pushing at Ehukai Beach, Oahu.

Beach Scraping Restrictions and Limitations:

Beach scraping as practiced and permitted in Hawaii consists of excavating the beach berm and beach face usually with a front-end loader or a bulldozer. This practice has been carried out on a limited basis, typically for public safety at beach right-of-ways or fronting heavily eroded beaches with episodic erosion.

To limit the potential adverse impacts of sand pushing, the following restrictions apply:

- First, assess the potential of beach nourishment as an alternative to beach scraping.
- The depth of excavation is limited to one (1) foot below the original beach profile elevation.
- The seaward limit of excavation should be limited to the mean high water mark

usually evidenced by a foreshore berm, debris line and/or a wet/dry line.

- The pushed sand shall *not* be placed any farther landward than the seaward line of dune vegetation. Existing vegetation shall not be buried or otherwise harmed.
- Grading to occur in the shoreline set back zone (40 ft landward of the certified shoreline) should be minimized and where possible, the natural undulations and contours of the shoreline preserved.
- Excavation is generally limited to the lateral bounds of the property where it is placed.
- Scraping is allowed only if the berm is sufficiently wide to provide a reasonable source of sand. If the beach is too narrow fill must be used (nourishment) rather than scraping.
- Sea turtle and Monk Seal and bird nesting may limit scraping location and timing

RECOMMENDED BEST MANAGEMENT PRACTICES

Based on the conversations with local residents, lifeguards and park managers the following recommendations are offered as best management practices for the Sunset Beach park erosion control and maintenance.

SHORT-TERM

1. Minimize the extent and frequency of sand pushing at Sunset Beach Park.

- a. This might be carried out through more strategic sand pushing focused on restoring the upper beach berm near the bike path and lifeguard tower and only in areas with a vertical drop off of more than 2 feet.
- b. The temporal and spatial extent of sand pushing should be scaled to the level of urgency based on public safety.
- c. Conduct limited sand pushing on an as-needed basis rather than annually.
- d. Limit the spatial extent of sand pushing to only those areas with a pronounced public safety concern.

MID-TERM

2. Reduce foot traffic erosion adjacent to the bike path and minimize public exposure to safety hazards.

- a. Provide several dedicated beach access points with stairs to minimize foot traffic erosion over the reach of the bike path at Sunset Beach park.
- b. Install pedestrian guard rails along the bike path to reduce the public hazard exposure from the bike path drop offs (Figure 3).
- c. Dedicating access ways will reduce the frequency and scale of regular sand pushing.

LONG-TERM

3. Redesign the bike path to be an elevated boardwalk and relocate the parking lot (Appendix B)

4. Long-term Planning and Management

In the long-term, the OCCL and the C&C are attempting to obtain grant funding to develop a comprehensive beach and dune management plan for Pupukea-

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Paumalu Beach on the North Shore of Oahu². The DLNR, OCCL will oversee and manage a contract with a professional consultant to assist with development and authoring of the plan. The objectives of the management plan include; identification of unique cultural and natural resources of the littoral system, documentation of activities negatively impacting the beach and dune ecosystem and establishing best management practices for beach maintenance in the study area. The plan is primarily focused on developing comprehensive planning and management strategies to address the following:

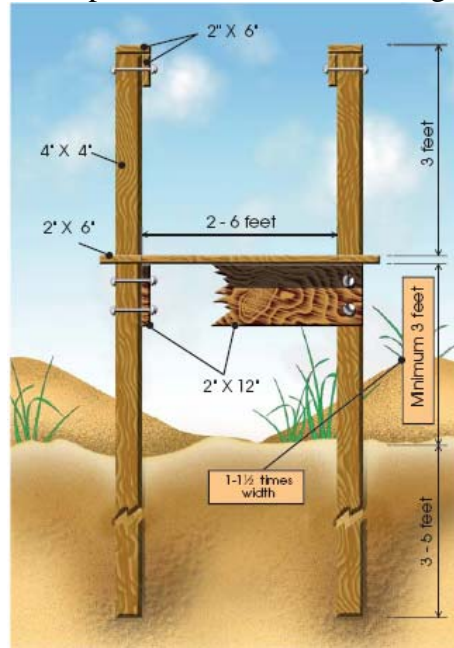
- Coastal hazard mitigation and coastal community resilience. These will be developed through community education and land use controls and guidance.
- Beach and dune conservation through the development of strategic land use controls, maintenance and management strategies and community partnerships.
- Preservation of unique social, cultural, recreational and economic opportunities in the region.

² Ocean Resource Management Plan (ORMP) Implementation Strategies 2009 Grant. Department of Business, Economic Development & Tourism, Office of Planning, Coastal Zone Management Program

APPENDIX A. Beach Scraping Report References

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APPENDIX B. Elevated Boardwalk Design Examples
Conceptual Dune Walkover Design



Boardwalk Examples. Gold Coast, NSW, Australia

