



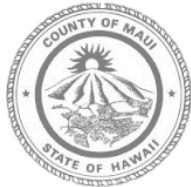
COASTAL RESILIENCE AND EROSION MANAGEMENT PLAN

Mā'alaea Village, Maui



FINAL REPORT

Produced with the County of Maui, Department of Planning



June 2023

Executive Summary

This report evaluates land- and marine-based adaptive management and planning strategies, for improved coastal resilience for Mā‘alaea Village. It includes:

- Literature search and review of existing data;
- Field work to search for potential offshore sand sources to use for beach nourishment;
- Assessment of potential coastal resiliency tools and solutions; and
- Development of a long-term adaptation pathway for the potential future relocation of Mā‘alaea Village buildings and infrastructure.

The literature review included review of current and historic shoreline and metocean conditions, projected future sea level rise conditions, regional resilience as assessed by the multi-agency-developed Coastal Resilience Evaluation and Siting Tool, and nearby biological resources. Key information included Mā‘alaea Village shoreline erosion rates of -1.2 ft per year, wave-driven sediment transport along the shoreline from south to north, exposure to future potential sea level rise of up to 3.2 ft by 2100, and exposure to wave runup inundation of approximately 40 feet from a 2,475-year-return-period tsunami. Technical analysis of this literature/data to confirm accuracy (or not) is beyond the scope of this study. Current federal, State, and County regulations are cited to provide a framework for any project proposed for implementation at Mā‘alaea.

The sand sources investigation began with an initial “desktop” study to identify potential offshore sand source areas and was followed by field investigations in Mā‘alaea Bay and Mā‘alaea Harbor. There were two sets of field work, in 2021 and 2022, which included side-scan sonar, sub-bottom profiling, jet probe measurements, benthic evaluations, and vibracore sampling for grain size analysis. The 2021 work resulted in identification of four areas in the nearshore of Mā‘alaea Village, which could potentially provide sand for a beach nourishment program. The 2021 Mā‘alaea Harbor investigation was based on historic information from the residents of Mā‘alaea Village. The 2022 work further characterized grain size, composition and suitability of the sand from these areas.

Additional studies were conducted to understand the implications of *Halimeda*, a common species of macroalgae, which is prevalent in much of Mā‘alaea Bay, including within the potential sand source areas. These *Halimeda* meadows may function as essential fish habitat and, as such, consultation with NOAA (National Oceanic and Atmospheric Administration) Fisheries would be a necessary step in assessing the potential impacts of various sand extraction approaches. Further, *Halimeda* produces a calcareous skeleton and fragments of these structures are abundant in the sediments in the sand search areas. Weathering studies were conducted with the intent of replicating decomposition of *Halimeda* sediments both naturally (e.g. intertidal action) and anthropogenically (e.g. hydraulic dredge pump and pipeline processes). The weathering experiments indicated that the *Halimeda* sediment would rapidly degrade into finer-grained particles if placed on a beach and exposed to tidal action, resulting in impacts to water quality.

The sand search and *Halimeda* studies’ results indicate:

- sand from the nearshore areas would not meet current State regulations for beach placement due to its high content of fine-grained sediments;
- the weathered fine-grained sediment *Halimeda* would be problematic for beach placement due to water quality impacts and likely exceedances of current State regulations for turbidity, as well as rapid loss of fill sand;
- extraction of sand within *Halimeda* areas would be complicated if considered essential fish habitat area; and
- there was no viable sand source within Mā‘alaea Harbor.



Unfortunately, there is currently no viable and/or efficient process for removing fines from offshore and/or inland sand sources.

In parallel with the sand search studies, a full suite of potentially suitable resiliency tools was developed and evaluated for use in the adaptation plan. These tools included:

- sand retention devices such as shore-perpendicular groins and nearshore breakwaters
- backbeach floodwalls and rock revetments
- beach nourishment and vegetated sand dunes
- elevating existing structures, and
- landward relocation of buildings and infrastructure.

These tools were evaluated both individually and in combination (“hybrid” solutions), and the pros and cons of each are discussed in Section 6.0. Based on these assessments, the results of the Mā‘alaea sand search, and current State regulations on shoreline structures, many of the tools were determined to be not currently feasible. The analysis indicated that there are tools which can be used for shorter term or interim resiliency improvements but that, ultimately, relocation may be required in the long term due to sea level rise.

The preliminary decision framework for relocation of Mā‘alaea Village buildings and infrastructure was developed and included: 1) asset analysis, 2) phased relocation actions, 3) considerations for relocation, and 4) potential steps for relocation. The discussion includes key questions to be addressed, potential regulatory and land use actions, land use designations and constraints, and agency coordination needs. It is essential that a Mā‘alaea Village relocation adaptation pathway continue to coordinate with the concurrent efforts to establish a regional wastewater treatment plant, restore Kanaio Stream, and any other future projects slated for the region.

Although this plan does not provide a recommendation for specific actions, it does provide potential conceptual adaptation pathways with coastal hazard triggers for action implementation and can serve as a basis for discussion with the Mā‘alaea Community.

