



CONSERVATION DISTRICT USE APPLICATION (CDUA)

All permit applications shall be prepared pursuant to HAR 13-5-31

File No.:

Acceptance Date:

Assigned Planner:

180-Day Expiration Date: 2:48

for DLNR Use DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

PROJECT NAME: KALAELOA HYBRID REEF PROJECT

Conservation District Subzone: Resource

Identified Land Use: R-5 Marine Construction, (D-1) Dredging, filling, or construction on submerged lands, including construction of harbors, piers, marinas, and artificial reefs
(See *Hawai'i Administrative Rules (HAR) §13-5-22 through §13-5-25*)

Project Address: Offshore of Kalaeloa Point on the island of O'ahu

Ahupua'a, District, Island: Honouliuli, O'ahu

Tax Map Key(s): Coastal area fronting TMK (1)9-1-014:049 (submerged)

Proposed Commencement Date: May 2026

Proposed Completion Date: Permanent use following transfer to HDOT at completion of installation scheduled for May 2026.

Estimated Project Cost: \$22.4M

Type of permit sought Board or Departmental

ATTACHMENTS

\$ 250 Application fee. 2.5% of project cost for Board Permits, but no less than \$250, up to a maximum of \$2500; \$250 for Departmental Permits (*ref §13-5-32 through 34*).

\$ 250 Public hearing fee if required (*\$250 plus publication costs; ref §13-5-40*)

- 6 copies of CDUA (5 hard + 1 digital copy) (disc or cloud share; no flash drives)
- Draft / Final Environmental Assessment (EA) or Final Environmental Impact Statement (EIS) or Statement of Exemption
- State Historic Preservation Division (SHPD) HRS 6E submittal form or Determination letter (dlnr.hawaii.gov/shpd/review-compliance/forms)
- Management plan or Comprehensive management plan (*ref §13-5-39*) if required
- Special Management Area determination (*ref Hawai'i Revised Statutes 205A*)
- Shoreline certification (*ref §13-5-31(a)(8)*) if land use is subject to coastal hazards.
- Kuleana documentation (*ref §13-5-31(f)*) if applying for a non-conforming kuleana use.
- Boundary determination (*ref §13-5-17*) if land use lies within 50 feet of a subzone boundary.

REQUIRED SIGNATURES

Applicant

Name: Edwin H. Sniffen, Director

Title; Agency: Hawaii Department of Transportation, Administration Modal Unit

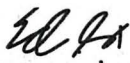
Mailing Address: 869 Punchbowl Street, Room 513, Honolulu, HI 96813

Contact Person & Title: Genevieve Hilliard Sullivan, Project Manager

Phone: 808-587-2169

Email: edwin.h.sniffen@hawaii.gov and genevieve.h.sullivan@hawaii.gov

Interest in Property: Permanent Use

Signature:  Date: 02/09/2026

Signed by an authorized officer if for a Corporation, Partnership, Agency or Organization

Landowner (if different than the applicant)

Name: Click or tap here to enter text.

Title; Agency: Department of Land and Natural Resources, Land Division

Mailing Address: 1151 Punchbowl St., Room 220, Honolulu, HI, 96813

Phone: 808-587-0419

Email: Click or tap here to enter text.

Signature: _____ Date: _____

For public lands, the government entity with management control shall sign as landowner.

Agent or Consultant

Agency: Click or tap here to enter text.

Contact Person & Title: Click or tap here to enter text.

Mailing Address: Click or tap here to enter text.

Phone: Click or tap here to enter text.

Email: Click or tap here to enter text.

Signature: _____ Date: _____

For DLNR Managed Lands

Chairperson, Board of Land and Natural Resources

P.O. Box 621

Honolulu, Hawai'i 96809-0621

Signature: _____ Date: _____

PROPOSED USE

Total area of proposed use (indicate in acres or sq. ft.): 27,000 sqft (0.62 acres)

Please provide a detailed description of the proposed land use(s) in its entirety. Information should describe what the proposed use is; the need and purpose for the proposed use; the size of the proposed use (provide dimensions and quantities of materials); and how the work for the proposed use will be done (methodology). If there are multiple components to a project, please answer the above for each component. Also include information regarding secondary improvements including, but not limited to, grading and grubbing, placement of accessory equipment, installation of utilities, roads, driveways, fences, landscaping, etc.

Attach all associated plans such as a location map, site plan, floor plan, elevations, and landscaping plans drawn to scale (*ref §13-5-31*).

Overview:

This project (the Proposed Action) seeks to test and develop a living, self-healing hybrid reef to protect infrastructure and communities by mitigating damage related to coastal flooding, erosion, and storm surge. The purpose of the Proposed Action is to test the performance of a prototype hybrid reef that may attenuate wave energy more effectively than traditional hardscaping with added benefits to the marine environment and local communities. The need for the Proposed Action is to find cost-effective and novel solutions (i.e., alternatives to shoreline hardening) for protecting shorelines from storm surges and sea level rise.

The Defense Advanced Research Projects Agency (DARPA) is providing support to University of Hawai'i (UH) engineers and coral researchers to develop and install a hybrid-reef prototype off shore of Kalaeloa Point on the island of O'ahu. DARPA through its Reefense Program would fund the deployment of the hybrid-reef prototype, which would start once permitted. When the hybrid reef is deployed, ownership, maintenance, and monitoring requirements would be transferred to Hawai'i Department of Transportation (HDOT). HDOT would then be responsible for the monitoring, reporting, and maintenance of the hybrid reef. UH is pursuing funding to continue research and monitoring efforts of the hybrid-reef prototype.

The Hawai'i Department of Transportation (HDOT), Climate Adaptation Action Plan, 2021 provides a roadmap for HDOT's Highways Division to make the highway system more resilient to climate-related effects. It identifies locations along the state highways that are exposed to natural hazards, and outlines strategies to be implemented and actions to be taken to incorporate resilience into its programs and policies.

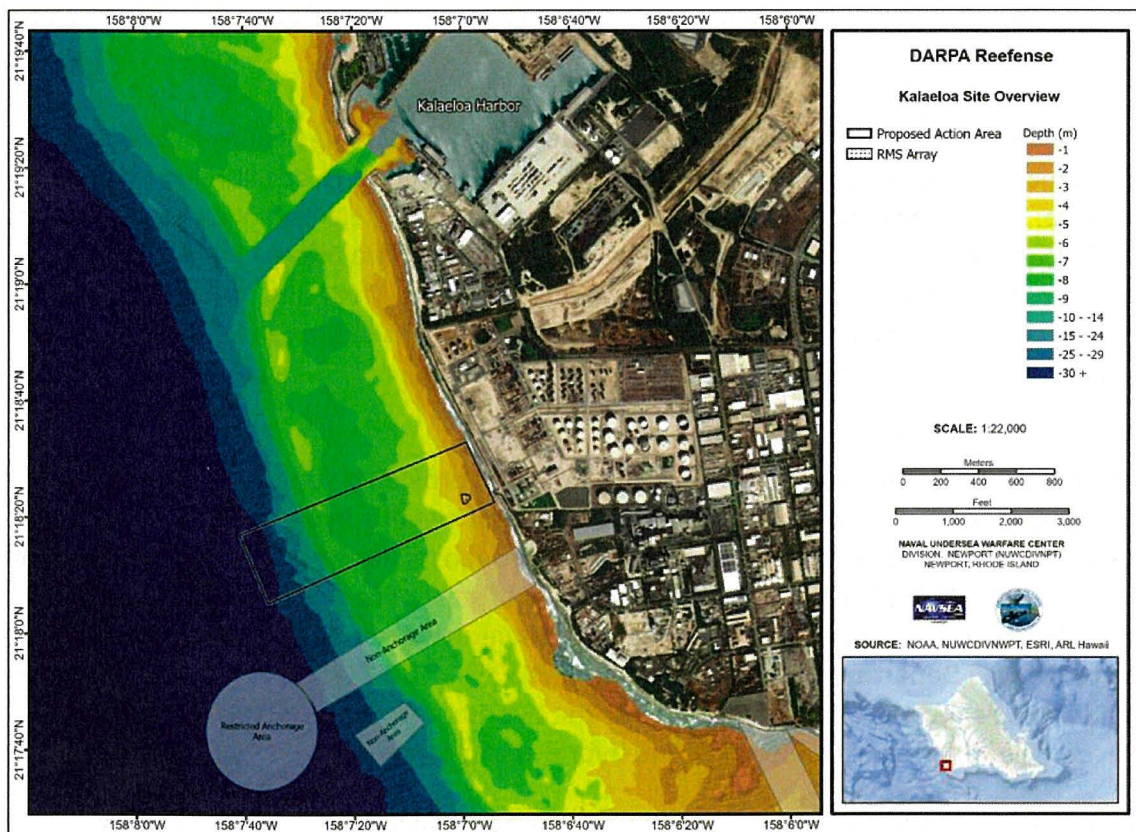
The exposure assessments reveal that of approximately 564 miles of roads assessed 34% of the assessed network are exposed to passive flooding, 23% are exposed to annual high wave flooding, 11% are exposed to coastal erosion, 50% are exposed to storm surge, and 73% are exposed to Tsunami. Recent extreme weather events have resulted in significant unanticipated impacts to Hawai'i's highways. Coastal erosion and shoreline change are some of the most visible impacts associated with changing climatic conditions in Hawai'i, especially when coupled with coastal

development and shoreline hardening. Storm surge resulting from tropical storms and hurricanes can exacerbate coastal erosion and cause serious damage to roads.

The severity and increased frequency of these events are attributed to weather or climate change hazards that are not typically effectively addressed in traditional highway design methods. Therefore, HDOT is piloting engineered, nature-based, and hybrid adaptive design solutions to protect vulnerable coastal roads and transportation assets. The Proposed Action to test a living, self-healing hybrid reef that can attenuate wave energy aligns with HDOT’s climate adaptation efforts.

Location:

The proposed location offshore of Kalaheo, on the island of O’ahu, is illustrated below.



Proposed Use:

A hybrid (combination artificial and biological) reef would be deployed within the proposed action area that would mimic many functions of an existing fringing reef. The engineered-reef design consists of individual base structures that mimic sections of a fringing reef: the reef crest (highest point of the reef) and the back reef or reef flat (shallow, shoreside).

RMS Design and Components

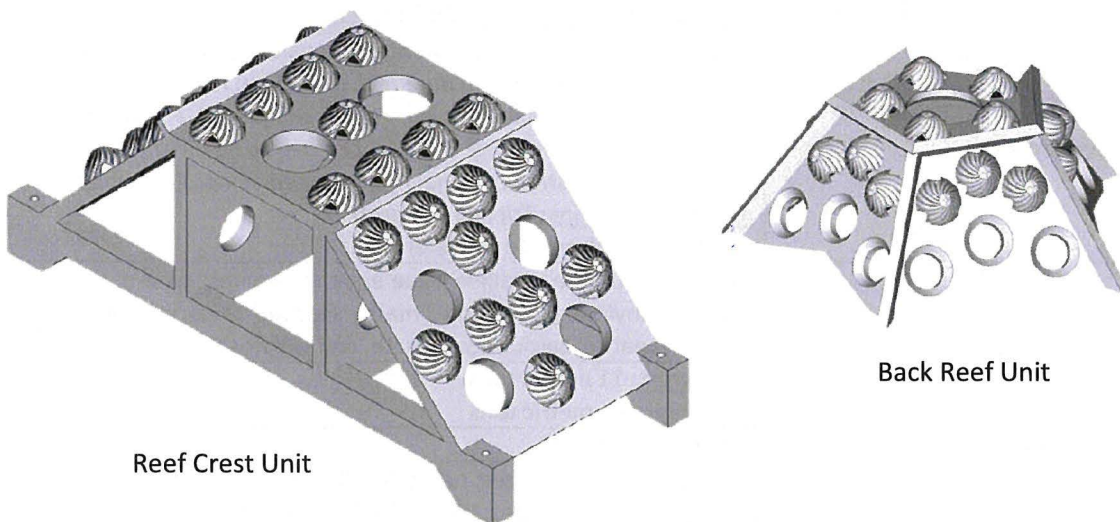
The following table summarizes the different components of the hybrid reef array. All RMSs would be constructed from concrete reinforced with glass fiber reinforced polymer (GFRP) and stainless-steel prestressing strand. Meso-scale and micro-scale habitat structures would be attached to the RMSs. Meso-scale structures would add relief and geometric complexity to

encourage the recruitment of coral, other sessile invertebrates (e.g., sponges, tunicates, oysters), and herbivorous reef fish. Micro-scale structures would be coated with materials that inhibit the growth of algae and include sections of natural biofilm to encourage coral settlement and growth. RMS designs have been tested for loading and stability via extensive scale-model testing exceeding 20-year storm events. These tests, in concert with in-water anchor testing in Hawai'i, validate survivability of the structures in anticipated wave environments. Additionally, manufacturers of RMSs and an external validation and verification team has performed industry-standard tests for reinforced concrete as part of the quality control process to validate long-term durability of the RMSs. Concrete samples have passed American Society for Testing and Materials (ASTM) tests including compressive-, tensile- and flexural-strength, surface resistivity, and lengthening tests. Compressive strength tests included dry and seawater-conditioned tests.

Component	Description
Biological components	<u>Local reef-building species:</u> <i>Montipora capitata</i> , <i>M. flabellata</i> , <i>M. patula</i> , <i>M. studeri</i> , <i>Pavona duerdeni</i> , <i>P. varians</i> , <i>Pocillopora grandis</i> , <i>P. ligulata</i> , <i>P. meandrina</i> , <i>P. acuta</i> , <i>Porites compressa</i> , <i>P. lobata</i> , <i>P. evermanni</i> , <i>P. brighami</i> , <i>P. stellata</i> , <i>Leptastrea bewickensis</i> , <i>L. purpurea</i> , <i>Cyphastrea ocellina</i> , <i>Psammocora stellata</i> , <i>P. explanata</i> <u>Native sea urchins:</u> <i>Tripneustes gratilla</i> <u>Native limu (algae):</u> To be determined
Biofilms	Alginate, crustose coralline algae exo-metabolites, gelatin, mineral oil, polyethylene glycol, polydimethylsiloxane, silica, liposomes, hydroxyapatite, calcium carbonate, and cellulose
Weight for single RMS	<u>Reef crest:</u> 11 metric tons <u>Back reef:</u> 4.5 metric tons
Length	Up to 164 ft (50 m)
Area	<u>Reef crest:</u> 40 structures; height 7.9 ft (2.35 m); width 7.9 ft (2.44 m) <u>Back reef:</u> 21 structures; height 5.3 ft (1.57 m); width 13.8 ft (4.15 m) <u>Total Number of RMSs:</u> 61 <u>Approximate Total Footprint:</u> 8,945 square feet (ft ²); 831 square meters [m ²])
Materials	Primarily concrete reinforced with glass fiber rebar and stainless-steel prestressing strand loops for anchoring
Anchoring method	Anchor bars would be drilled into the seabed for some or all of the RMSs and secured in place with epoxy.
Moorings and navigational markers	3 subsurface day-use moorings 10 white marker poles
Reef enrichment	Healthy coral reef soundscape would be played at night; plankton-attracting lights; up to 5,000 native collector urchins (<i>Tripneustes gratilla</i>); up to 40 umu kai (fish houses)
Oceanographic monitoring equipment	Standard oceanographic equipment would be attached directly to RMSs as well as placed adjacent to the structures on the seafloor. Equipment on the seafloor would be weighted but not anchored; ballasted grid frames would be deployed with equipment to keep it in place. The equipment would monitor structural integrity, flow patterns, and environmental conditions.

The following images show the two different designs of the RMSs as well as 20-in (50-cm) diameter dome-shaped coral settlement modules that would be attached to the structures. The reef crest structures have four stainless-steel strand loops at the feet to connect anchors and may have four steel lifting eyes (removable) on the top that pass through holes. A maximum of 61

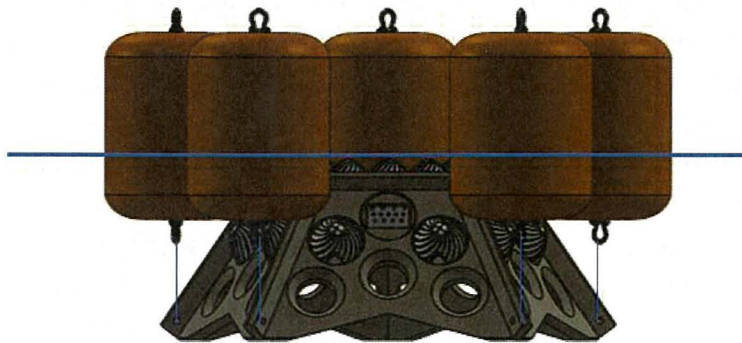
RMSs would be placed on the seafloor (40 reef crest; 21 back reef). The total array may be deployed in stages in order to evaluate anchoring and stability on a subset of the structures prior to deploying the complete 164 ft (50 m) array. Each RMS would be designed with perforated holes (diameter of 0.9 to 2.7 ft [30 to 82 cm]) that attenuate wave energy through generation of turbulence and allow for egress of mobile marine species. Deployment of the back reef array would likely precede the reef crest array. All structures would be deployed in 6.5 to 13 ft (2 to 4 m) water depth. Detailed engineering designs of both types of RMSs can be found in Appendix A of the Final Environmental Assessment.



Deployment and Monitoring

The specific vessels and plan are to be determined closer to installation and are subject to availability, final design, and the development of a safe installation methodology. Deployment of the RMS units would likely occur using a dynamically positioned vessel approximately 181 ft (55 m) long by 34 ft (10 m) wide with a 12 ft (3.7 m) draft. RMS units would be transported with temporary buoyancy systems to their shallow water deployment locations. A workboat with twin engines, approximately 84 ft (25.5 m) in length, and a small, rigid inflatable or whaler-type boat less than 26 ft (8 m), also referred to as a daughter craft, would assist the final stages of deployment and operate at 5 knots or less in the proposed action area. Below are two deployment options, providing solutions based on available vessels and budget.

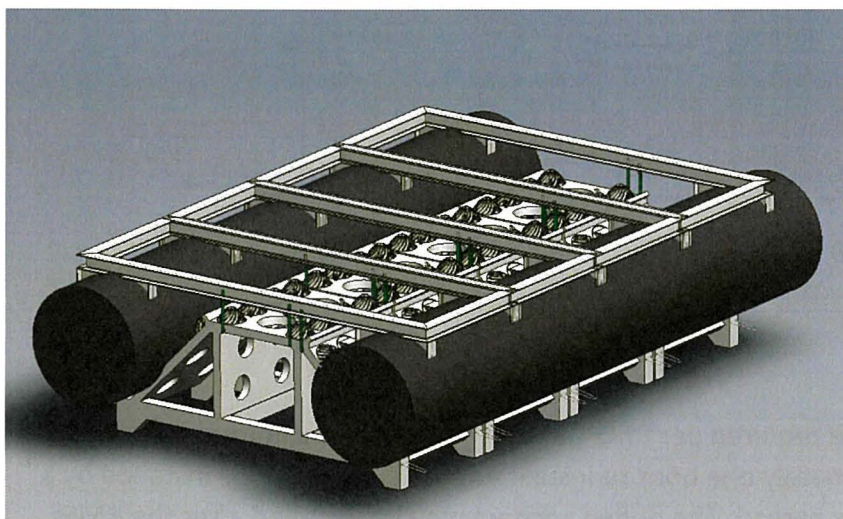
One option would be to lower the RMSs into the water alongside a deep-water-positioned dynamic positioning vessel, supported by temporary buoyancy (shown below). In this case, smaller vessel(s) such as a rigid inflatable boat, would maneuver the RMS unit, supported by temporary buoyancy, into the shallow water deployment site, where the buoyancy would be reduced and the RMS unit placed slowly onto the seabed.



Back reef unit supported with air-filled lift bags to enable towing into shallow water.

A second option is to use a custom built deployment catamaran vessel (image below) to buoyancy support multiple RMS units for a tow using a small support vessel from the staging/launching site to the deployment site. Once in position at the deployment location within the proposed action area one of the following methods would occur to deploy the RMS unit(s): (1) the RMS units would be lowered in a controlled manner from the floating catamaran vessel or (2) the catamaran vessel itself, including RMSs, would be submerged in a controlled manner, by flooding the sponsons. Once the RMSs are on the seabed in position, the RMSs are disconnected from the catamaran frame by divers and (if needed) the sponsons are refilled with air using a compressor on a small surface vessel to allow the catamaran vessel to refloat to the surface.

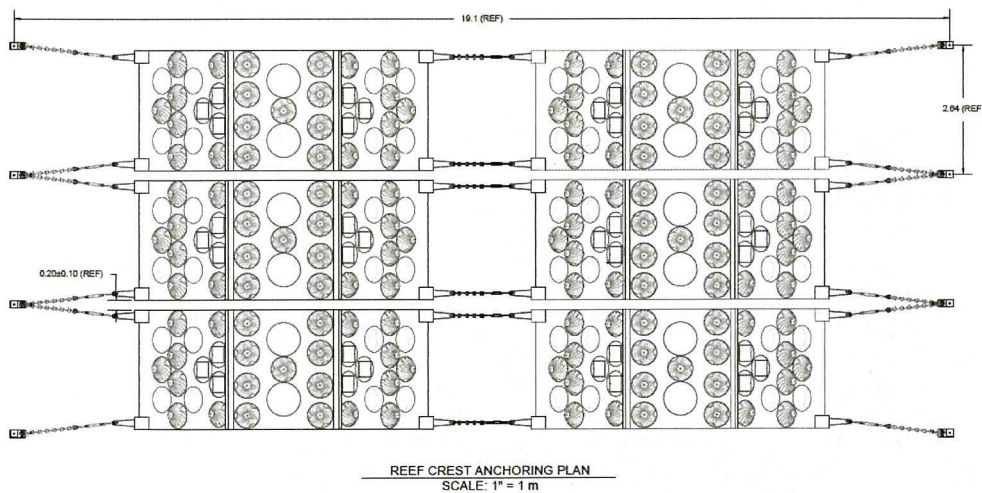
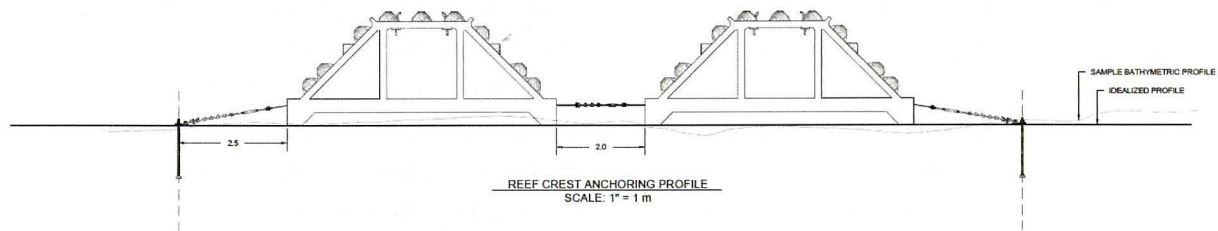
In most cases, divers would assist in the anchoring and placement of RMS units, if it is safe to do so, to avoid placement on non-encrusting corals. RMS installation would take periods of several days and may last several months overall. The supporting vessels would transit from Kalaheo harbor during the installation period to reload RMS units and avoid unfavorable weather conditions.



Custom deployment catamaran with buoyant pipe sponsons for deployment of reef-crest units.

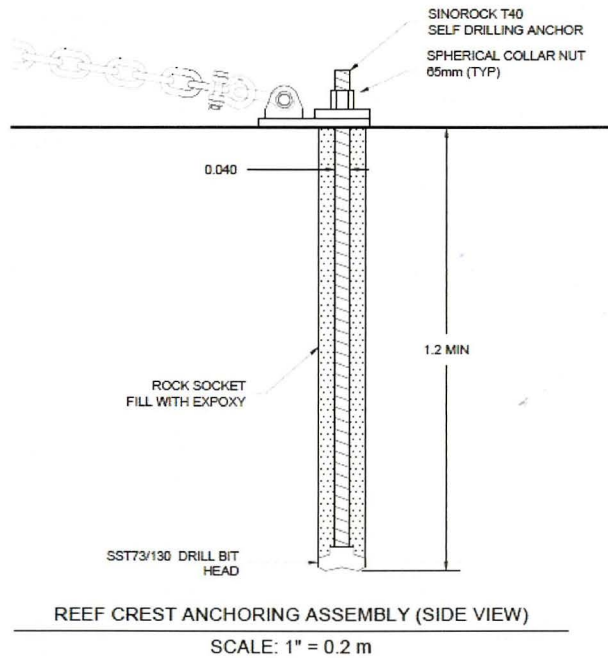
Anchoring System

Anchoring and supplementary ballast may be required to ensure the RMSs stay in place on the seafloor. An example anchoring plan is shown below with a subset of the RMS units. Ballast would likely be in the form of several tons of steel blocks or chain clumps incorporated/connected into the structure close to the seabed. Anchors would consist of a steel bar in a drilled rock socket with a maximum of 10 ft (3 m) embedment (see schematic below), held in place with a two-part mortar epoxy (i.e., HIT-RE 500 V3). When injecting epoxy into the annulus (i.e., the space between the drill string and the inside diameter of the hole being drilled), the gap at the seabed surface around the anchor bar is small, and the process would be monitored with sensors and cameras. During the injection process, significant loss of epoxy is not anticipated. Once the annulus is filled, a permanent cap would be placed over the pile that would have the effect of preventing loss of epoxy while it cures. The drilled hole would be less than 6 in (15 cm) in diameter, and the bar would be less than 3 in (8 cm) in diameter. The anchor bars would either be installed by divers with a handheld drill or with a remotely operated vehicle (ROV) drilling rig that would be temporarily lowered to the seafloor and tended from a surface vessel. Provided it is safe to do so, divers would be present in the water when the ROV is in operation to ensure impacts to corals are avoided.



One to four anchor bars would be required per RMS (no more than 124 anchor bars total), and each anchor would take approximately one hour to install. Anchor bars would be installed by a single team operating one drilling spread. The drilled anchors may be installed after the RMSs have been deployed. Alternatively, the drilled anchorages may be pre-installed using a seabed

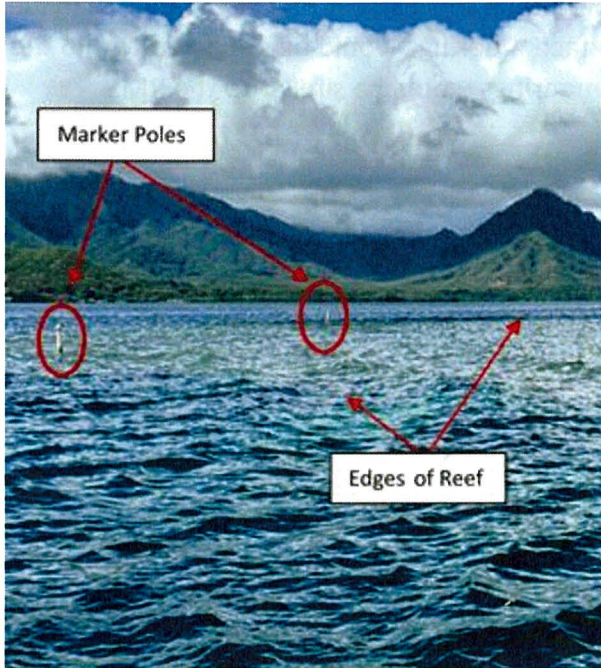
template for alignment, and the RMSs would be installed subsequently. The anchors would be drilled through holes at the base of each RMS, or the drilled anchors would be set into the seabed in close proximity (up to 10 ft [3 m]) to the RMSs and connected via a steel plate, tendon, chain, or turnbuckle. This mechanical connection between the anchor and the RMS would be made by divers immediately after each RMS is deployed. To facilitate deployment and installation activities and limit impacts to the seafloor, up to three subsurface moorings would be deployed within the proposed action area. Anchoring of the subsurface moorings would be similar to the RMS anchoring process.



Vertical Clearance and Navigational Aids

Similar to nearby fringing and patch reefs, tides and weather conditions would determine whether RMSs would be fully submerged or at the water surface level. Vertical clearance is helpful for ingress/egress of marine life, reducing potential navigational hazards, and leaving the sight lines and aesthetics of the shoreline intact. The shallowest reef crest structures would be fully submerged, at an estimated 1.45 ft (0.44 m) depth below the water's surface at Mean Lower Low Water (MLLW) and 0.93 ft (0.28m) below water's surface at the Lowest Astronomical Tide (LAT). There may be other structural components attached to the top of the RMSs (such as coral settlement modules) with intentional gaps between each. These components would add approximately 0.82 ft (0.25 m) to the prototype height, resulting in the shallowest reef crest structures being 0.82 ft (0.25 m) below the surface at MLLW and 0.43 ft (0.13 m) below the surface at LAT. The shallowest back reef structures are estimated to be 2.37 ft (0.72 m) below the surface at MLLW and 1.84 ft (0.56 m) below the surface at LAT. If coral settlement modules are attached to the top of the back reef structures, these structures would be an estimated 1.80 ft (0.55 m) below the surface at MLLW and 1.42 ft (0.43 m) below the surface at LAT. Due to the sloping bottom, these numbers represent the shallowest structures in the array.

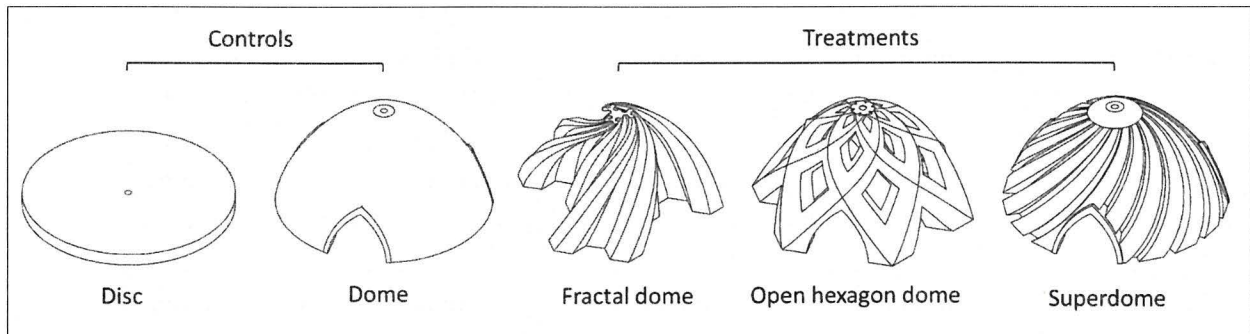
Up to 10 white marker poles would be deployed to designate the boundaries of the hybrid reef array. The marker poles would be attached directly to RMSs at the corners and sides of the hybrid reef array. These marker poles would be similar to those deployed by the Department of Aquatic Resources to designate patch reef locations in Kāneʻohe Bay.



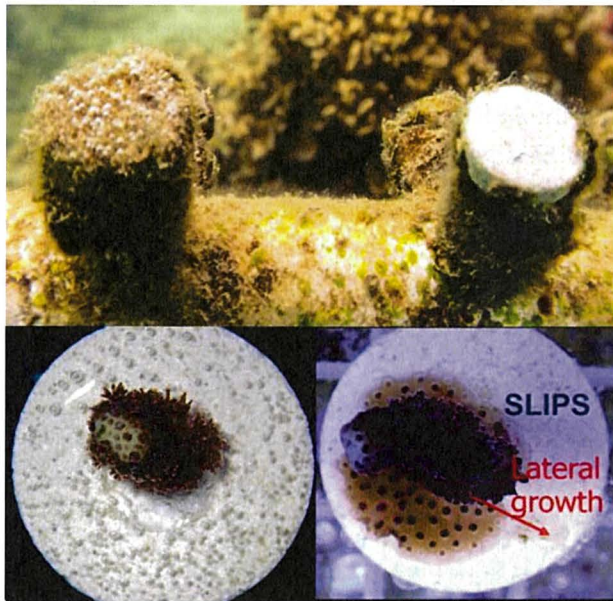
Marker poles identifying a patch reef in Kāneʻohe Bay, Oʻahu

Biological and Structural Components

Once the RMSs are deployed, structural and biological components would be added to the structure. Up to 1,300 coral settlement modules would be attached to the RMSs to add three-dimensional habitat and encourage recruitment of coral, other sessile invertebrates (e.g., sponges, tunicates, oysters) and herbivorous reef fish. The two control and three treatment designs are shown below. All are made of concrete and have a diameter of 19.6 inches (50 cm), a height of 9.8 in (25 cm), and a weight of no more than 50 pounds (22 kg). Coral settlement modules have internal cave systems and would be attached to the perforations in the RMSs by underwater drilling. A 1-in (2.54 cm) diameter polyvinyl chloride (PVC) pipe may be inserted across some of the coral settlement modules to provide additional habitat for fish larvae recruited to the reef.

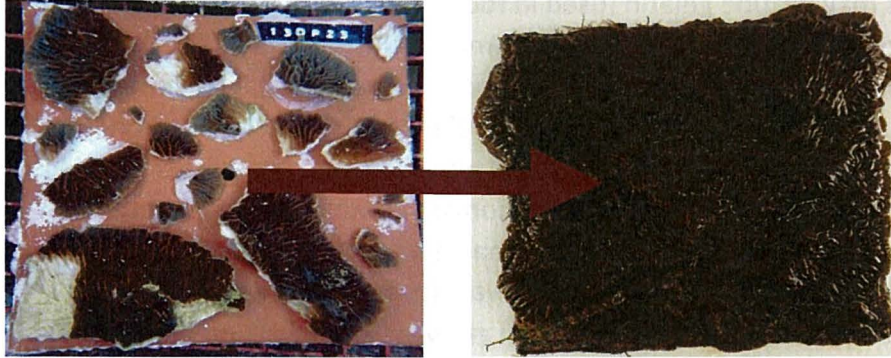


Portions of the RMSs and coral settlement modules would be coated with a solution to enhance coral recruitment and reduce algae growth. Less than 20 liters of solution would be used, and it would be from locally-sourced materials, such as alginate from seaweed and components isolated directly from local crustose coralline algae and corals. Additional biodegradable and non-toxic molecules may be included (less than 20 liters total) to concentrate the solution for the experiment. Other molecules may include gelatin (used in food preparation), mineral oil (used in moisturizers), polyethylene glycol (used in laxatives), polydimethylsiloxane (used in children’s toys, including silly putty and kinetic sand), silica (used in food and cosmetics), liposomes (used in gel capsules for human consumption), hydroxyapatite (mineral in bones), calcium carbonate (mineral in coral skeletons), and cellulose (molecule from plant cell walls). Researchers may also use up to 5 liters of solution with less than 1% volume of biomass containing the bacterium *Cellulophaga lytica* and up to 5 liters of solution with less than 1% volume of biomass of green micro algae *Marinichlorella kaistiae* both sourced from Hawai’i (provided by Kewalo Marine Laboratory). The image below shows the reduction of algal growth (top right) and enhancement of coral growth (bottom) from the coating.



Coral growth modules (CGMs) would also be attached to the RMSs to stimulate rapid coral growth and provide additional fish habitat, wave attenuation, and structural support, thus improving the ecological function and resilience of the entire hybrid reef. Corals would be directly attached to the RMSs (up to 1,000 corals) or attached to up to 500 CGMs (see example image below), which are then attached to the RMSs. In total, this process would create up to 8,073 square feet (ft²; 750 square meters [m²]) of coral cover. Coral stock would primarily be from loose corals not attached to an intact reef or preemptively removed from the proposed action area to avoid negative impacts from deployment of RMSs. These corals are referred to as “corals of opportunity” and could originate from the Kalaeloa area. Coral species may include *Montipora capitata*, *M. flabellata*, *M. patula*, *M. studeri*, *Pavona duerdeni*, *P. varians*, *Pocillopora grandis*, *P. ligulata*, *P. meandrina*, *P. acuta*, *Porites compressa*, *P. lobata*, *P. evermanni*, *P. brighami*, *P. stellata*, *Leptastrea bewickensis*, *L. purpurea*, *Cyphastrea ocellina*, *Psammocora stellata*, *P. explanata*.

The coral fragments would be attached to CGMs via cyanoacrylate glue, marine epoxy, and/or LOCTITE HY 4090. CGMs would be attached to the RMSs on land, prior to deployment, using stainless steel threaded rods capped with a nut and washer, and reef-safe epoxy (e.g., Loctite HY; cyanoacrylate, silicone, and/or polyurethane) or a similar method. CGMs may be attached to the tops and sides of the RMSs, and possibly also over footings with anchor bars.



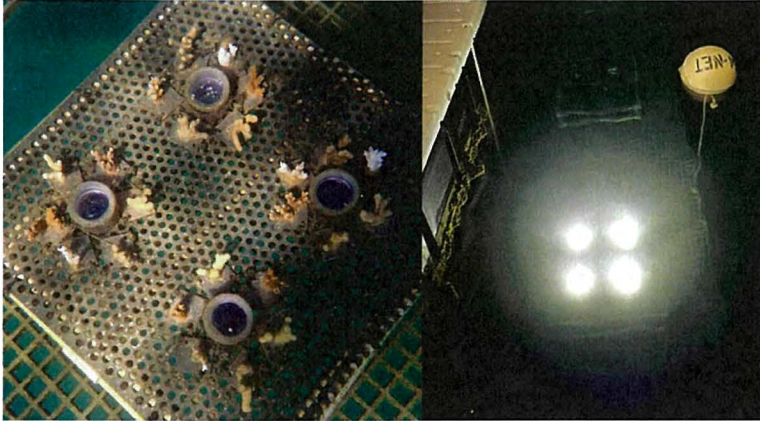
Concrete CGM grown over by adult coral fragments fused into a single coral colony.

Additionally, 56 small autonomous reef monitoring structures (mini-ARMS) consisting of up to 10 layers of plastic sheets (20 cm x 20 cm x 20 cm total) would be attached to 28 of the reef crest structures (2 CGMs per reef crest structure) to test the effect of coral diversity on coral growth and general biodiversity. Researchers would attach mini-ARMS using threaded bolts that have been glued to the top of the CGMs. Mini-ARMS would be scraped and recruited organisms would be consumed during post-processing.



CGM (left) with pre-drilled holes to fit aragonite plugs that hold juvenile corals (right)

Up to 10 of the coral settlement modules may have battery-powered coral feeding units (Underwater Zooplankton Enhancing Light Array—UZELA)—shown below in an experiment in Kaneohe Bay. The UZELA would be installed with the CSMs to encourage nighttime feeding of newly recruited corals and adult colonies, especially during periods of temperature stress when the corals may be compromised (e.g., bleached) and unable to gain nutrients via photosynthesis. Lights would be programmed to turn on for one hour each night. Further details on the UZELA system are in the following section.

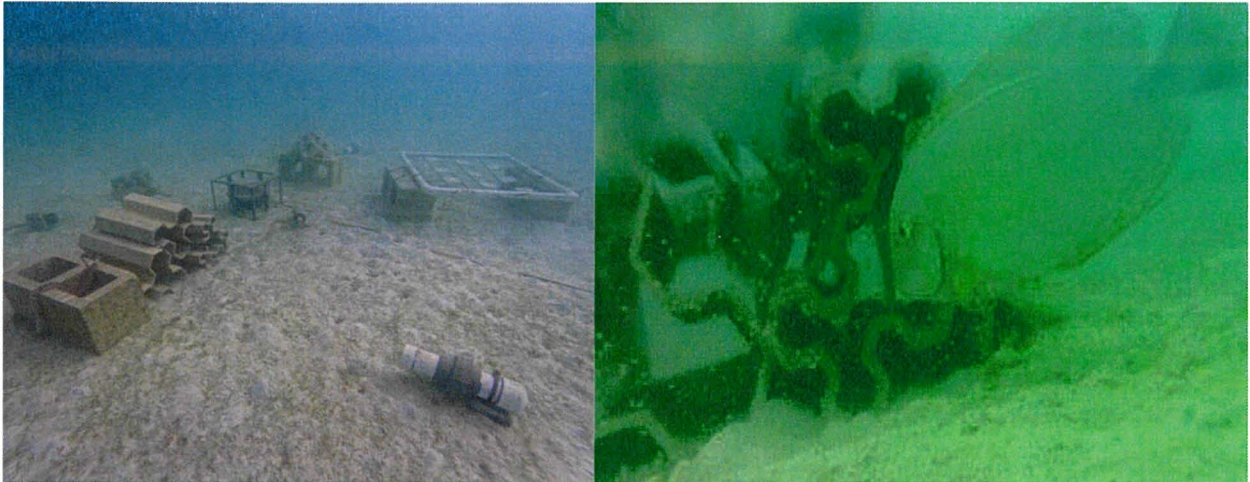


UZELA underwater lights

Reef enrichment

Acoustic enrichment devices would be used to play back the sounds of a healthy active reef environment in order to attract and recruit fish larvae and juvenile fish to the proposed action area. Recordings would be obtained from a productive, adjacent reef in the Kalaeloa region with higher densities of similar species composition than the proposed action area. Sound levels would be played back with a 10 decibels (dB) higher level than recorded to be detectable above ambient levels out to a 66-ft (20-m) range from the speaker. If playback occurred at the same level, the sound would not be detectable compared to actual background levels at any range. Frequencies below 20 Hz and above 20 kHz are removed before playback. Acoustic enrichment devices would be located near the center of the hybrid reef or in the center of the back reef RMSs. The sound emitted would likely remain within the proposed action area since playbacks are estimated to drop to ambient noise levels within 66 ft (20 m) of the source. Unless otherwise stated, all reef enrichment devices would be internally powered by batteries and deployed by divers. Some instruments would be retrieved monthly or bi-monthly for data download. The majority of the retrievals would occur during the summer when larval fish recruitment peaks.

Speakers that play back healthy reef sounds at close to ambient volume would be mounted directly onto or outside a RMS unit, most likely using tie wraps and/or hose clamps. Three cylindrical pressure cases filled with nickel-metal hydride batteries would be attached using zip ties or hose clamps. Each case would be 3.2 ft (1 m) long by 10 in (25.6 cm) in diameter, with a submerged weight of 50 lbs (22 kg) each. An underwater speaker (0.32 m x 0.32 m x 0.16 m) may also be mounted on or between the RMSs. The speakers may play continuously for up to 12 hours, primarily during evening hours. The broadband acoustic output of the speaker is estimated to be 120 dB re 1 μ Pa at 1 m (root mean square) between 1 and 20 kHz. The images below show how these devices would be set-up on the seafloor. Acoustic enrichment devices are shown below with acoustic playback attracting larvae and large fish to an experimental site.



In addition to acoustic enrichment, plankton-attracting lights called an Underwater Zooplankton Enhancing Light Array (UZELA) may be added to some RMSs to encourage nighttime feeding of newly recruited corals and adult coral colonies, which would support the overall survivorship and growth of the corals. Up to 10 of the coral settlement modules may have battery-powered coral feeding UZELA units. Lights would be programmed to turn on for one hour each night, starting approximately 30 minutes after sunset. The UZELA would emit white light at a maximum of 700 lumens, and the cone of light emitted would have a diameter of approximately 20 in (50 cm) when not enclosed by a module. However, it is anticipated that the light emitted would be lessened due the restriction of the beams by the modules and the absorption of light from the water. Based on observations of other similar projects, light from UZELA would only be visible from the surface right above the lights. The lights would not be visible from even several meters away.

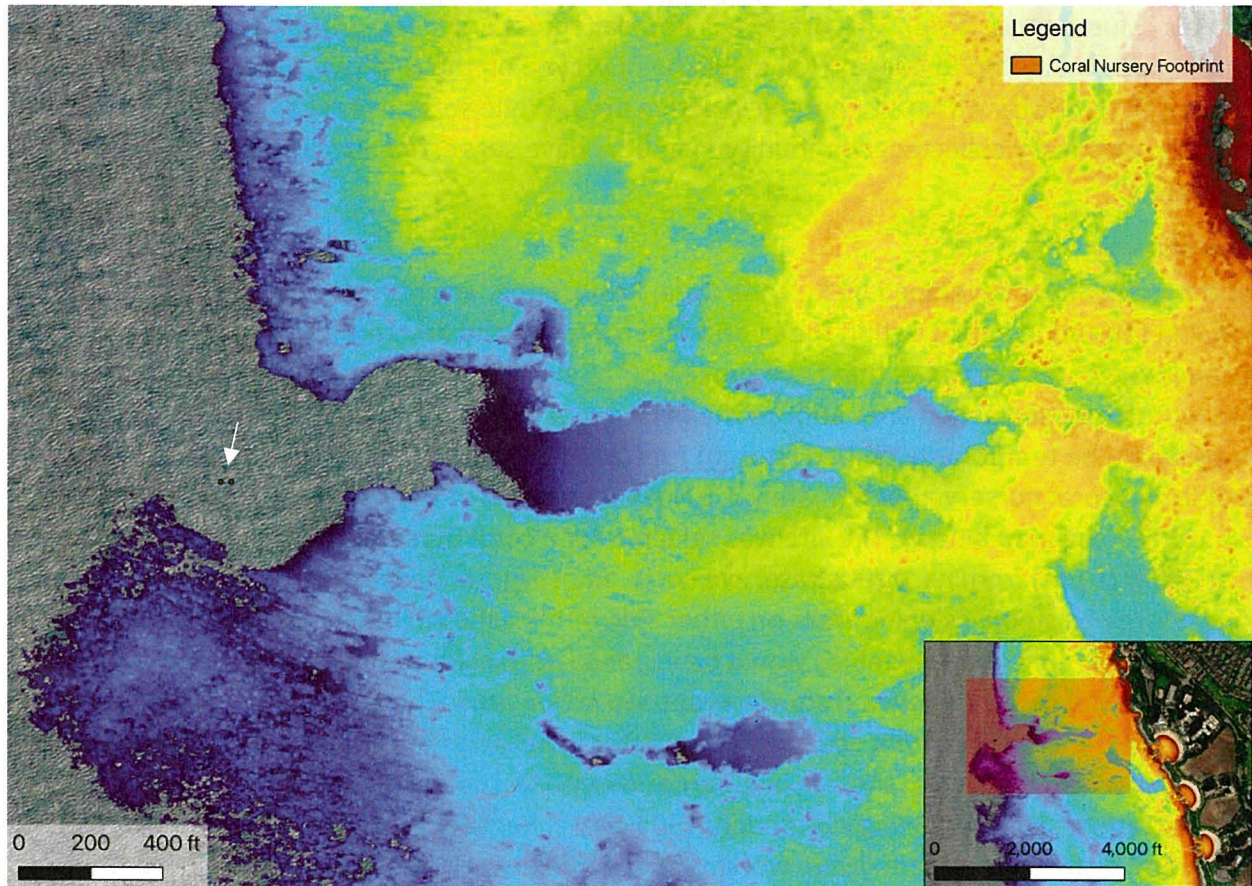
Additionally, up to 5,000 native collector urchins (*Tripneustes gratilla*), a non-boring species, may be released in the proposed action area to reduce the overgrowth of invasive algae that competes with coral. The released urchins would be those bred at the Division of Aquatic Resources Anuenue Sea Urchin Hatchery facility. One million urchins have already been released in multiple bays across O‘ahu (NOAA 2023). Researchers have also been in touch with the Waimānalo Limu Hui about potentially outplanting native limu (algae) to the RMSs. Native limu is also propagated at the Division of Aquatic Resources Anuenue facility.

Up until the middle of the 20th Century, Hawaiians frequently built Umu Kai, which are arrays of artificial reefs (or fish houses) to attract fish to otherwise barren areas (Kikiloi 2003). Umu Kai function similarly to a coral reef by providing habitat for fish to congregate and reproduce. These umu (heap of rocks) can be up to 4 ft by 8 ft (1.2 m by 2.4 m) and are constructed with loosely stacked rocks or coral with an opening at either end to let the current run through. Native limu naturally settle on the rocks, which would be eaten by fish and/or harvested by the fishermen. Small fish hide and feed on the growth inside, and these smaller fish attract larger predator fish, who also enter the chamber, although the larger fish cannot reach all of the hiding spaces. Fish known to associate with Umu Kai include squirrelfish (*Myripristis* spp.; *u‘u*), unicornfish (*Naso unicornis*; *kala*), surgeonfish (*Acanthurus triostegus*; *A. manini*), goatfish (*Parupeneus multifasciatus*; *moano*), greater amberjack (*Seriola dumerili*; *kahala*), parrotfish (*Scarus* spp.; *uhu*),

and eels (*Muraenidae*; *puhi*). This practice is popular across Polynesia and is continued by local communities today. Up to 40 Umu Kai would be deployed on the seafloor, either inside or adjacent to the RMSs within the proposed action area. While some live rock from the site would be opportunistically collected, community members have suggested also bringing rocks in from the shore.

Coral Nursery

Per the procedures developed by Kuleana Coral Restoration, any non-encrusting corals greater than 4 in (10 cm) in height within the hybrid reef footprint and any corals of opportunity (recoverable coral fragments that have broken off of existing reef colonies) would be removed within the proposed action area prior to the hybrid reef deployment and installation. These corals would be temporarily cached (stored) for future use on the hybrid reef at a previously established coral nursery approximately 2.2 NM to the north of the deployment site (21.338N, 158.136W—see map below). The site was selected for a coral nursery because it is located at least 200 ft (61 m) from hard substrate, live coral, and seagrass beds and it is protected from wave energy by steeply sloping walls on either side of the sand channel. As a part of the proposed use, additional coral nursery tables would be installed at the site to provide additional space to safely store the corals removed from the proposed action area. The tables would elevate the corals from the seabed to limit sedimentation. After installation of the coral tables, only simple hand tools would be used at the site in accordance with Occupational Safety and Health Administration, scientific diving exemptions (50 Federal Register [FR] 1050, January 9, 1985). Any ephemeral disturbances from divers working at the nursery are expected to be below background levels generated by local wave action. The image below illustrates the coral nursery location offshore of the Ko Olina resort in ahupua'a Honouliuli. Two small red squares at the mouth of the channel represent the footprint (to scale) and approximate location of the proposed coral tables.



As part of the proposed use, two 10 ft by 10 ft (3 m by 3 m) tables would be installed for caching several hundred coral colonies and corals of opportunity (coral fragments). The nursery tables are constructed with a steel frame and a fiberglass grating tabletop and weigh approximately 4,800 lbs each. Tables with the same design and construction are currently being used for restoration projects in Maunalua Bay. These tables have reinforced-steel struts on the legs as well as longitudinal bracing across the table to allow the tables to withstand loading from larger wave events. A flat bar (0.25 in by 3 in [0.64 cm by 7.6 cm]) creates a 2 in (5 cm) lip on the sides of the table to help prevent corals from falling off the sides. A fiberglass grating covers the table, allowing corals to be zip tied or secured by other means as needed. The tables' frames are 4 ft (1.2 m) tall with no closed walls, allowing water to flow naturally in the channel. The tables at their highest points would be approximately 35 ft (10.7 m) below sea level, and thus would not constitute a high point navigational hazard as deemed by U.S. Coast Guard or be visible from shore. An example of the coral nursery table design on the seabed is shown below at Maunalua Bay.



Coral nursery table

Monitoring

UH would conduct surveys immediately after the hybrid reef is deployed and two-months post deployment. UH is currently pursuing funding for the next three years. Additionally, divers would survey the structures every five years to assess anchoring system integrity until the living breakwater system is deemed to be self-secured/attached. These surveys would include general assessment of system health and stability. UH will seek further funding for long-term surveys to understand the effectiveness of the system. These will include the following: quarterly underwater photogrammetry to assess coral health, recruitment and growth; continuous passive acoustic surveys with data analyzed quarterly; and periodic environmental DNA sampling to measure the changes in quantity and relative abundance of the corals between a control site and the proposed action area. All additional diver surveys listed here would include removal of any marine debris from the structures that may create a hazard to the hybrid-reef system or marine life in the area.

Camera monitoring:

Scientific monitoring equipment would be deployed onto and adjacent to the RMSs. Up to 30 autonomous cameras would be deployed within the proposed action area and these cameras would be used to monitor fish settlement on the RMSs. Half of the cameras would be accompanied by an underwater light, so the cameras can take photographs of activity at night. The lights would activate for five seconds every five minutes over the course of 12 hours (assumed nighttime duration). The lights would emit white light and be housed in polyvinyl chloride (PVC) housings attached to the RMSs

Oceanographic instrumentation:

Additional monitoring equipment listed in the following table would also be attached directly to RMSs. Equipment would either be attached to the RMSs prior to deployment and lowered with the RMSs from the barge or installed by divers via a support craft post- deployment of the hybrid reef. The instruments are small standard oceanographic testing equipment that would be attached (via bolts, zip ties, or similar method) to monitor structural integrity, flow patterns, and other environmental conditions.

Monitoring instruments attached directly to the RMSs.

<i>Instrument Name</i>	<i>Function</i>	<i>Count</i>	<i>Area (m²)</i>	<i>Length (m)</i>	<i>Width (m)</i>	<i>Height (m)</i>
Acoustic Doppler Velocimeter (ADV)	Measures instantaneous velocity at a point	12	0.04	0.23	0.16	0.18
Strain Gauge	Measures strain on the RMS	12	0.009	0.17	0.05	0.05
SeaBass system main bottle with a 3-10m cable	Helps resolve sediment dynamics near the toe of the reef structure	1	0.14	0.63	0.22	0.22
SeaBASS system Blueview M900-2250 sonar	Helps resolve sediment dynamics near the toe of the reef structure	1	0.03	0.21	0.13	0.13
RBR Solo-DWave16 data logger	Pressure sensors which provides high resolution wave data	5	0.03	0.4	0.07	0.07
Odyssey PAR logger + Wiper	Measure photosynthetic active radiation near coral	3	0.02	0.16	0.09	0.09

Monitoring equipment described in the following tables would be placed on the seafloor adjacent to the hybrid reef. These instruments would either be lowered from the barge or installed by divers via a support craft (with a lift bag if necessary) post-deployment of the hybrid reef. The instruments are standard oceanographic testing equipment to monitor oceanic conditions, flow patterns, and other environmental conditions. The instruments would not require anchoring, but they would be weighed down by ballasted grid frames. Their footprint on the sea floor would be less than 11 ft² (1 m²) each. The tables and figures below are organized by each instrument set that would be deployed together on the same ballasted grid frame, in no particular temporal order.

Monitoring instruments deployed adjacent to the RMSs: Instrument cluster #1.

<i>Instrument</i>	<i>Count</i>	<i>Function</i>	<i>Depth (m)</i>	<i>Area (m²)</i>	<i>Length (m)</i>	<i>Width (m)</i>	<i>Height (m)</i>	<i>Weight (lb)</i>
Nortek Acoustic Wave & Current Profiler (AWAC)	1	Acoustic surface tracking to measure wave height, direction, and current profile	6-8	0.57	0.61	0.92	0.61	150-200 (frame)
Battery Canisters	2							

Monitoring instruments deployed adjacent to the RMSs: Instrument cluster #2.

<i>Instrument</i>	<i>Count</i>	<i>Function</i>	<i>Depth (m)</i>	<i>Area (m²)</i>	<i>Length (m)</i>	<i>Width (m)</i>	<i>Height (m)</i>	<i>Weight (lb)</i>
Nortek Signature 1000	3	Releases sound waves to measure the speed & direction of currents	4-6	0.32	0.61	0.61	0.51	150-200 (frame)
RBR Virtuoso Dwave Logger	1	Pressure logger						
Seabird MicroCAT	1	Conductivity & temp. recorder						
RBR Tu with ZebraTech Hydro Wiper	1	Turbidity logger						
HOBO Water Level Data Logger	10	Measures water level	2-10	0.007	0.16	0.04	0.04	0.4
Surface floater	10	Locates the HOBO sensors	2-10	0.13	0.31	0.36	0.36	5
Lead weight	20	Secures the floaters	2-10		0.18	0.11	0.06	10-20
Rope	10	Connects the floater to the lead weights	2-10	0.052-0.26	4-20m	0.013	0.013	2.5

Monitoring instruments deployed adjacent to the RMSs: Instrument cluster #3.

<i>Instrument</i>	<i>Count</i>	<i>Function</i>	<i>Depth (m)</i>	<i>Area (m²)</i>	<i>Length (m)</i>	<i>Width (m)</i>	<i>Height (m)</i>	<i>Weight (lb)</i>
Nortek Signature 1000	1	Sound waves to measure the speed & direction of currents	4-6	0.38	0.61	0.61	0.51	150-200 (frame)
RBR Virtuoso Dwave Logger	1	Pressure logger						

Monitoring instruments deployed adjacent to the RMSs: Instrument cluster #4.

<i>Instrument</i>	<i>Count</i>	<i>Function</i>	<i>Depth (m)</i>	<i>Area (m²)</i>	<i>Length (m)</i>	<i>Width (m)</i>	<i>Height (m)</i>	<i>Weight (lb)</i>
RBR Virtuoso Dwave Logger	1 per frame (total of 6)	Pressure logger	1-6	0.38	0.61	0.61	0.51	100 (frame)

Acoustic monitoring:

Up to nine passive acoustic recorders (SoundTraps) would be deployed to record the activity of fish and other biota (e.g., crustacean) in the vicinity of each recorder as well as to assess the impacts of the underwater speakers across a gradient. Each SoundTrap is roughly the size of a soda can (4.7 in [12 cm] long by 1.57 in [4 cm] in diameter). They would be mounted on a sand anchor that is attached to the seafloor, attached to another seafloor-mounted instrument, or mounted on the end of a 2-ft (0.6-m) rod, with the other end mounted to a RMS. These devices cannot be attached directly to a RMS because the dynamic fluid flow occurring through the energy-dissipating holes in the RMSs generates acoustic flow noise that interferes with the monitoring. The sand anchors would be deployed next to the RMSs, evenly spaced along the lateral dimensions of the structure (i.e., possibly placed every 20 ft [6 m] along the shoreside of the hybrid reef array). Submerged weights would be 1.1 lbs (0.5 kg) each.

Vector sensor modules (VSMs) would be deployed to record directionality of fish and crustacean activity within 66 ft (20 m) of each recorder. Up to six “Wilcoxon” VSMs would be evenly-spaced along the hybrid reef array using sand anchors attached directly to the seafloor or mounted on another seafloor-mounted instrument. The dimensions of the pressure cases for the VSMs are 14 in (36 cm) long with a diameter of 5.1 in (13 cm). Submerged weights would be 2.2 lbs (1 kg) each. An additional two “DASARs” would be deployed for specialized detection of low-frequency fish sounds for two months a year during the summer. A DASAR has a 2 ft (60 cm) by 2 ft (60 cm) footprint on the seafloor, using sand anchors or stakes attached directly to the seafloor. The DASAR height is about 2 ft (60 cm).

EXISTING CONDITIONS

Please describe the following, and attach maps, site plans, topo maps, colored photos, and biological or archaeological surveys as appropriate:

Prior Conservation District Use Permits or Site Plan Approvals (if applicable):

None.

Existing access to site:

Access to the installation site would be from offshore. Monitoring efforts would also primarily be from offshore using small boats. Limu/beach surveys may include pedestrian access via Kalaeloa Beach Park or similar beach access.

Existing buildings/structures:

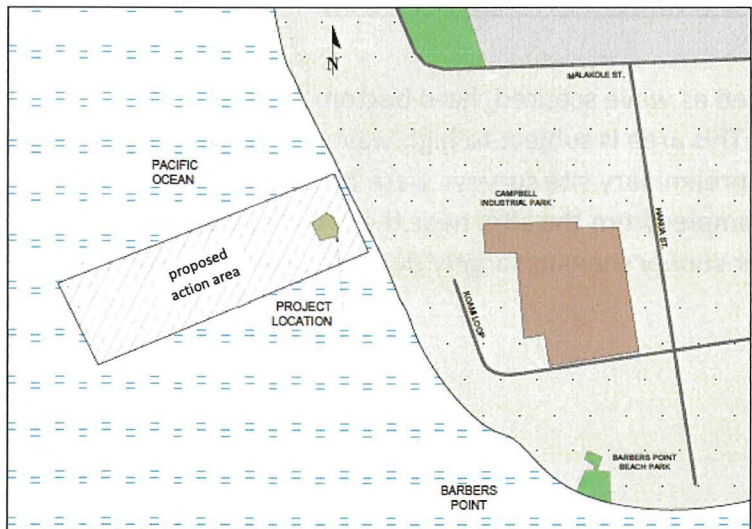
None.

Existing utilities (electrical, communication, gas, drainage, water & wastewater):

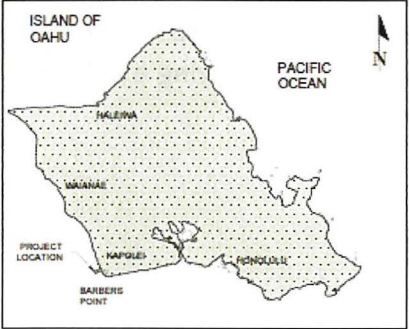
None.

Physiography (geology, topography, & soils):

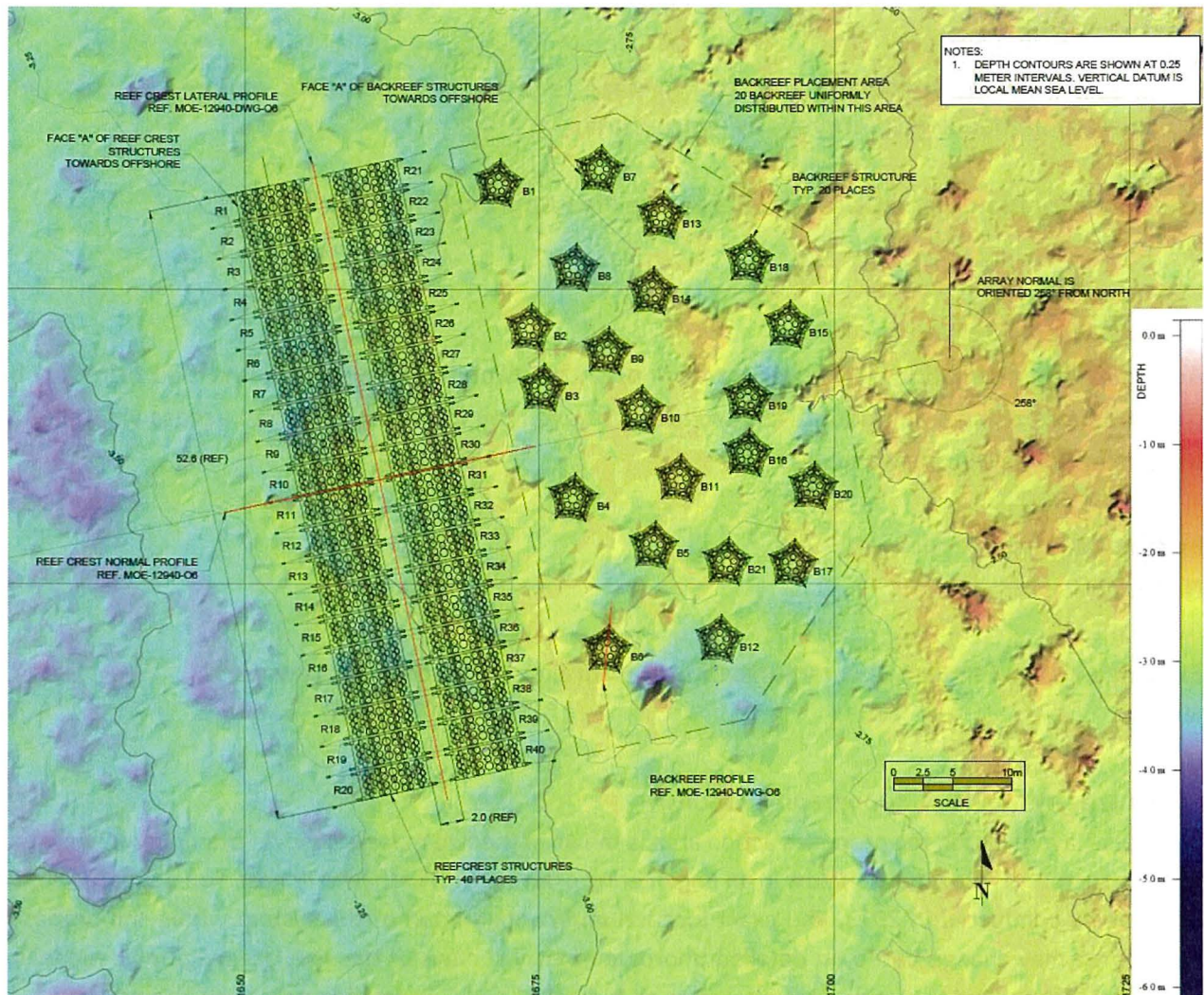
A notional layout within the proposed action area is shown in the two maps below. An example configuration of the structures is also shown below in an engineering drawing with bathymetry based on a 1-m resolution lidar survey conducted in 2013. The exact location and configuration of the system within the proposed action area may change based on detailed photogrammetry surveys of the site, oceanographic modeling, structural testing, and to avoid adverse impacts on biological and cultural resources such as coral.



VICINITY MAP



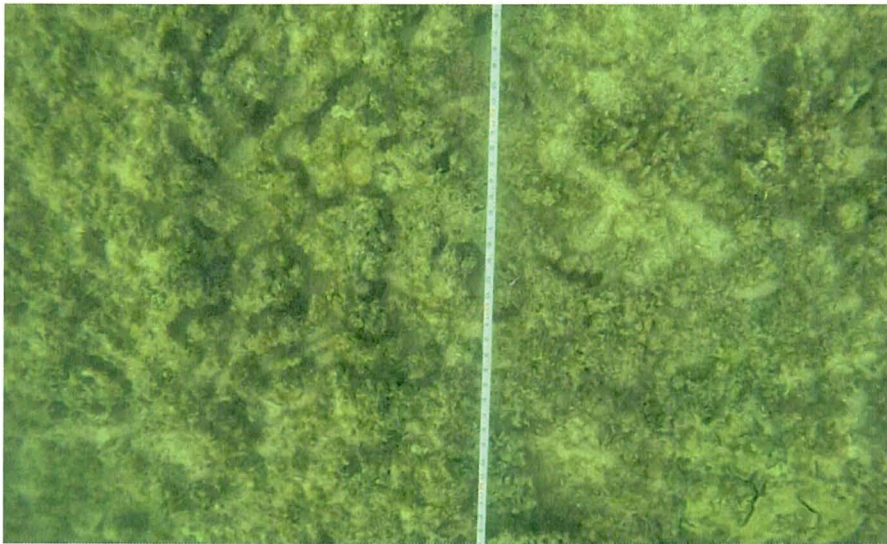
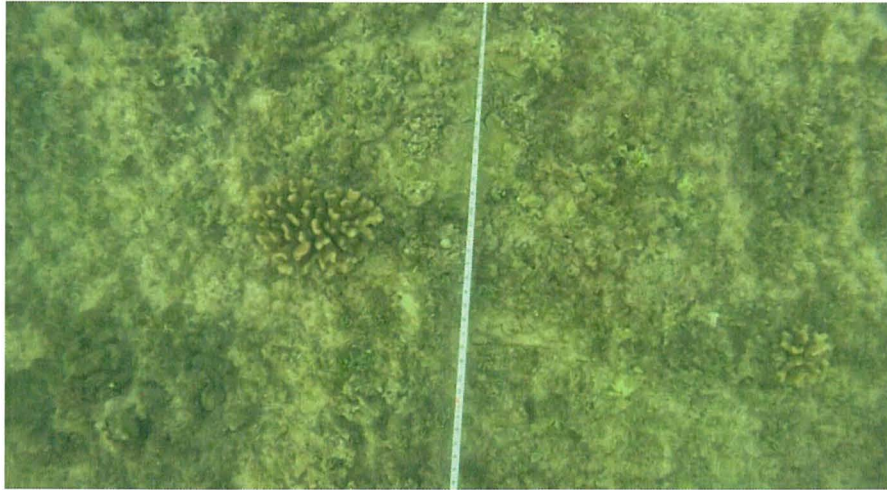
LOCATION MAP



ENGINEERING PLANS (SUBJECT TO FINAL SITE SURVEY)

Site surveys:

The proposed action area is characterized as wave scoured, hard bottom seabed with intermittent patches of coral and sand. This area is subject to high wave action with a depth range of approximately 0-50 ft (0-15 m). Two preliminary site surveys were conducted in 2025. The following images are representative examples from the site, near the proposed deployment location, taken during a 6/12/2025 diver survey showing largely degraded reef with some live coral.



The following table lists surveys that have been conducted within/near the proposed action area.

<i>Date</i>	<i>By</i>	<i>Location</i>	<i>Data collected</i>	<i>Purpose</i>
09/2013	USGS	Oahu	Topobathy LiDAR	Topographic and shallow-water (0-30m) bathymetric surveys
04/2025	UH	Kalaeloa (21.306, -158.117)	Underwater imagery (random points)	Initial site suitability assessment
06/2025	UH	Kalaeloa (21.306, -158.117)	Underwater imagery and video (transects)	Preliminary benthic cover assessment

UH: University of Hawai'i, USGS: United States Geological Service

Hydrology (surface water, groundwater, coastal waters, & wetlands):

The proposed action area is in nearshore coastal waters (within approximately 200 yards of the shoreline). The industrial area adjacent to the project site is bounded by artificially constructed lagoons to capture excess storm runoff. There is a stormwater pipe south of the project area.

Flora & fauna (indicate if rare or endangered plants and/or animals are present):

Coral cover in the proposed action area is low—less than 5%—(Franklin et al. 2013; Franklin et al. 2014) and distributed intermittently across the seafloor. Any non-encrusting corals greater than 4 in (10 cm) in height that could potentially be disturbed during the deployment of the RMSs or associated instruments and components would be collected and cached at deeper sites close by, per procedures developed by Kuleana Coral Restoration (Kuball et al. 2024). These coral would be fragmented and attached to the RMSs after installation. Additionally, corals of opportunity, sourced from the proposed action area may also be outplanted to the hybrid reef.

Per consultation with NOAA PIRO ESA Team, it is likely that the R3D Team could encounter the following ESA-listed species:

1. *Chelonia mydas*, Central North Pacific Green Sea Turtle, Threatened
2. *Etmochelys imbricata*, Hawksbill Sea Turtle, Endangered
3. *Neomonachus schauinslandi*, Hawaiian Monk Seal, Endangered
4. *Pseudorca crassidens*, False Killer Whale, Endangered
5. *Manta birostris*, Giant Manta Ray, Threatened

A detailed list of all biological resources present in the area is provided in Section 3.2 of the final environmental assessment.

Natural hazards (erosion, flooding, tsunami, seismic, etc.):

The primary natural hazards which are of concern for this proposed use are large storm-generated waves and swell. The reef mimicking structures have been designed and successfully tested in wave flumes for extreme wave conditions (greater than 20-yr return period). Successful field testing of the system, a main objective of this deployment, will result in a potential solution

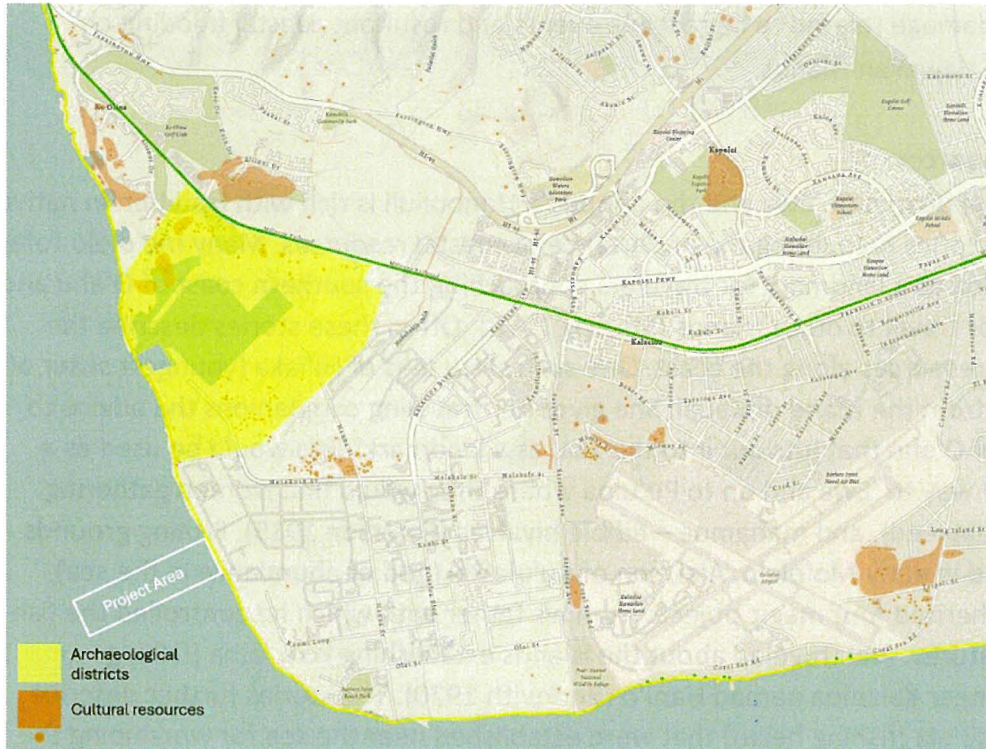
to mitigate shoreline damage related to large wave events and resultant coastal flooding on coasts throughout the Hawaiian Islands.

Historic & cultural resources:

Kalaeloa, located in the district of 'Ewa and the ahupua'a Honouliuli is rich with tradition in native Hawaiian history and stories recounting the importance of coastal resources. Many mo'olelo refer to the region of Kalaeloa as a landmark for travelers approaching the southern coast of O'ahu and as a launching point for travel to other islands (Sterling 1978). Often these stories describe the abundance of marine resources along the coast. One such story tells of Hi'iaka (youngest sister of Pele) traveling to and from the island of Kauai. She gives her traveling companions the advice to use Kalaeloa, the tip of O'ahu that juts out into the sea, as a landmark. This would be used as a reference to find their way to 'Ewa and on to Pu'uloa where they would find women gathering pāpa'i (crabs), limu (seaweed), and mahamoe—edible bivalves (Emerson 1915). Fishing grounds of 'Ewa are also named in early Mo'olelo. Aiai, son of Ku'ula'kai (god of abundance in the sea), was known to have inherited four magic objects from his father with which he controlled the fish and other marine creatures. Aiai traveled about the islands establishing ko'a 'āina (fishing grounds) such as one near Kalaeloa named Hani'o (Beckwith 1970). The stories further describe the establishment of kū'ula (fishing heiau) that were established near the sea for worshiping the ancient fish gods.

Community members and cultural practitioners have shared place-based knowledge regarding the coastal resources of Kalaeloa. Observations regarding the seasonal presence and movement patterns of 'ama'ama (mullet) in the nearshore waters were provided by Damon Duhaylonsod, Po'o Lawai'a of Ho'ola Hāni'o, based on personal experience and 'ike passed down through his 'ohana. This cultural knowledge informed the identification of culturally important marine resources within the project area.

Known cultural sites (current and historical) near the proposed action area are limited (see maps below). The closest known cultural resources are three precontact sites approximately 700 yards north of the proposed action area on the coast: beach midden site (SIHP ID: 50-80-12-02722) and two subsurface cultural deposits (SIHP ID: 50-80-12-04526). None of these sites are expected to be impacted by activities at the proposed action area. Preliminary in-water surveys of the proposed deployment location have revealed no archaeological sites or artifacts present in the proposed use area. A detailed cultural resource assessment and Ka Pa'akai Analysis are included as Appendix E of the final environmental assessment.



Archaeological districts in Honouliuli with project site overlaid (adapted from Wahl, 2021).



Traditional Hawaiian sites in Honouliuli with project site overlaid (adapted from Wahl, 2021). Closest cultural resources denoted with arrows.

EVALUATION CRITERIA

The Department or Board will evaluate the merits of a proposed land use based upon the following eight criteria (*ref §13-5-30(c)*)

1. **The purpose of the Conservation District is to conserve, protect, and preserve the important natural and cultural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare. How is the proposed land use consistent with the purpose of the conservation district?** (*ref §13-5-1)*

This hybrid-reef prototype and follow-on monitoring would conserve, protect, and preserve coral, which is both an important natural and cultural resource in Hawai'i. This project is encouraging long-term sustainability by providing structurally complex habitat for a coral reef to thrive.

2. **How is the proposed use consistent with the objectives of the subzone of the land on which the land use will occur?** (*ref §13-5-11 through §13-5-15*)

13-5-11: This project would protect valuable natural and cultural resources (i.e., coral reefs and associated organisms) by enhancing the seafloor with structure to provide new suitable habitat for a coral reef ecosystem to exist, while also dissipating wave energy to protect geological resources near the shoreline; **13-5-12:** This hybrid reef prototype is intended to dissipate wave energy to protect lands susceptible to floods and soil erosion; **13-5-13:** This land is in marine waters seaward of the shoreline. The project will ensure the sustainable use of the natural resources in this area by avoiding impacts to marine organisms and enhancing the land with the outplanting and recruitment of coral reef organisms; **13-5-14:** This is not applicable since, to the best of our knowledge, the submerged land is not being considered for urban use; **13-5-15:** This is not applicable since, to the best of our knowledge, this area does not possess unique developmental qualities.

3. **Describe how the proposed land use complies with the provisions and guidelines contained in chapter 205A, HRS, entitled "Coastal Zone Management"** (*see 205A objectives on p. 9*).

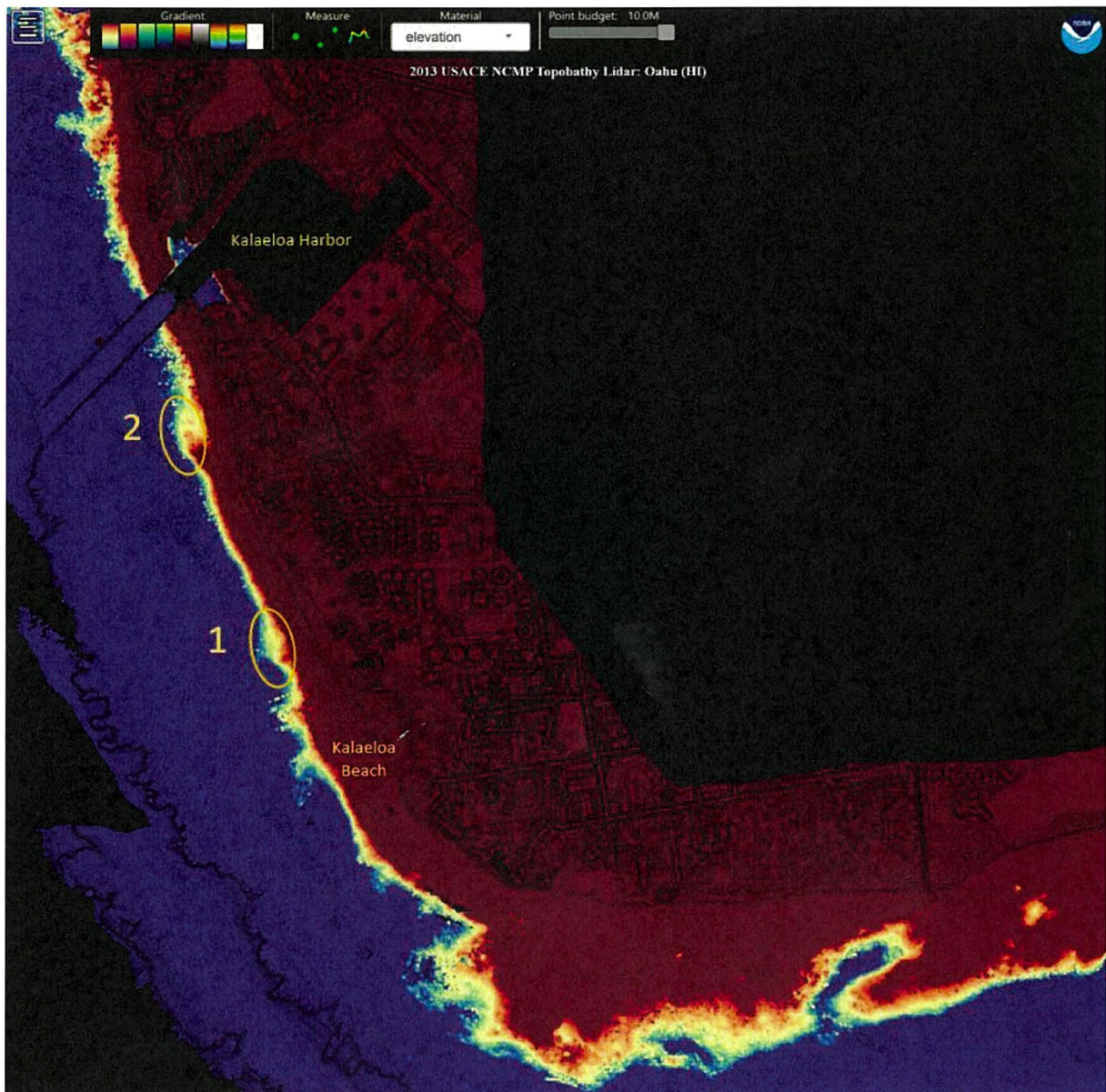
This project aligns with Objective 4, *coastal ecosystems, minimizing disruption or degradation*. This project would promote the protection of marine resources, prototype a system that can reduce hazards caused by storm surge through dissipating wave energy, improve the technical basis for natural resource management, minimize disruption or degradation of the coastline, and encourage public participation/engagement through outreach and education.

4. **Describe how the proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region.**

Corals >10 cm in height would be moved prior to structure deployment on bare substrate. Design and testing of the anchoring load has been completed to ensure the system is survivable in extreme wave environments.

5. **Describe how the proposed land use, including buildings, structures and facilities, is compatible with the locality and surrounding areas, appropriate to the physical conditions and capabilities of the specific parcel or parcels.**

In late 2024 the project team was in permitting for development of a hybrid reef in Kailua Bay. Construction of the hybrid-reef units, at concrete pre-cast yards in Kapolei, began in 2024 and were completed in early 2025. However, due to a submerged-land ownership dispute, which was independent of the project use case, the project team was forced to find an alternate site that met specific criteria of the pre-built system. The reef-mimicking structures (RMSs) are designed for three primary purposes: 1) to reduce wave energy, 2) to change the nature of waves from plunging to spilling in order to improve conditions for coral settlement, and 3) to provide base structure for incorporating habitat for reef life (coral and non-reef-building organisms). The intent of the prototype deployment is to test the effectiveness of these structures as well as new coral restoration techniques and technology under realistic conditions. In order to identify potential new sites for the prototype, several criteria were identified: water depth, bottom roughness, existence of a degraded reef, exposure to sufficient wave energy, absence of known surf breaks, and absence of known anchorages or submerged pipelines. Specifically, the following criteria were used to assess potential sites and were met at the proposed use location: 1) A region with a shallow coastal shelf from 8 to 15 ft (2.5 to 4.5m) water depth with a gentle slope and relatively smooth bottom. A disqualifying factor includes very rough bottom topography such as a spur-and-groove seabed (parallel ridges and deep troughs). 2) An existing reef with moderate to low coral coverage. Existing live coral colonies indicate both the presence of coral larval supply and sufficient water quality for coral survival. While low to moderate coverage ensures that the system has the opportunity to be successful, disrupting a pristine reef with high coral coverage would be a disqualifying factor. 3) Sufficient wave energy. The site needs to be exposed to representative wave energy for a coastline in Hawai'i. For example, exposure to north or south swell (i.e., waves originating from northern or southern mid-latitude storms). Conversely, a protected bay would be a disqualifying factor. 4) Absence of known use that would be incompatible with coral reef restoration or a submerged breakwater. For example, known surf breaks and presence of known anchorages or submerged pipelines were disqualifying factors. The team took advantage of a 2013 topographic-bathymetric (land-to-sea) lidar survey that provides a high resolution 3.3 ft (1-m) measurement of the seabed surrounding O'ahu. This survey includes mapping to the 164-ft (50-m) depth contour. Through this analysis the team identified two locations on the shallow coastal plain of 'Ewa that fit the above criteria (circled in the figure below). Subsequent in-water site surveys revealed a degraded reef with low coral coverage at site 1 as discussed in the *Existing Conditions* section of this application. Site 2 was disqualified due to the proximity to Kalaeloa harbor, potential future dredging operations of the harbor channel, and the desire to avoid the significantly altering (and potentially increasing) sea life so close to an active harbor and shipping lane. Site 1 is characterized by a relatively flat plateau extending several hundred yards from the shore. Water depths of 8 to 15 ft (2.5 to 4.5m) are shown in the figure in yellow shading. Wave heights have been estimated to be sufficient to test the structures with a bi-modal-distributed wave climate (prevailing waves are 4.1 ft (1.25 m) in height and 12 s period from the northwest and 3.3 ft (1.0 m) in height and 15s period from the southwest). No known surfbreaks, submerged pipelines, or anchorages exist in the proposed area.



6. **Describe how the existing physical and environmental aspects of the land, such as natural beauty and open space characteristics, will be preserved or improved upon.**

The physical and environmental aspects of the submerged land would be improved upon, from a mostly degraded reef to a coral reef ecosystem. Researchers would avoid impacts to environmental resources by moving corals >10cm in height and placing structures on bare substrate. Most organisms would still be able to move above, below, through, and around the structures.

7. **If applicable, describe how subdivision of land will not be utilized to increase the intensity of land uses in the Conservation District.**

Not applicable.

8. **Describe how the proposed land use will not be materially detrimental to the public**

health, safety and welfare.

The proposed use would not create air/water pollution nor hazardous waste as all materials are standard construction materials (e.g., concrete, GFRP, epoxy) with biological materials already existing in the environment. Additionally, because it falls within 200 yds of the coastline, it would be located in the breaker zone of the coastal waters with low public access. It would not present any further safety hazards to swimmers or recreational boaters that do not already exist in the breaker zone. Finally, once installed, if required the project will be marked with U.S. Coast Guard approved navigational markings.

CULTURAL IMPACTS

Articles IX and XII of the State Constitution, other state laws, and the courts of the State, require government agencies to promote and preserve cultural beliefs, practices, and resources of Native Hawaiian and other ethnic groups.

Please provide the identity and scope of cultural, historical, and natural resources in which traditional and customary native Hawaiian rights are exercised in the area.

A detailed cultural resource assessment and Ka Pa‘akai Analysis are included as Appendix D of the final environmental assessment.

Identify the extent to which those resources, including traditional and customary Native Hawaiian rights, will be affected or impaired by the proposed action.

The project avoids impacts cultural resources on land by building a submerged structure with construction staged from the sea. The proposed project site is offshore and within a breaker zone, which already limits public access. As with any construction project, access to the specific site would be limited for safety reasons during the installation of the prototype, which is expected to take approximately three months with the total period depending heavily upon favorable weather windows for construction. Construction would temporarily impair cultural resources by altering the visual seascape and further limiting access to the already restricted site. The floating barges and construction hazard would be roughly half the size of a football field and limited to the installation period. Further, this project also seeks to protect and enhance cultural resources once installed. If the prototype is effective at reducing wave energy as designed, similar hybrid reefs may serve to reduce future shoreline erosion that threatens ‘iwi kūpuna and coastal infrastructure along Hawai‘i shorelines. Additionally, the use of corals to enhance the engineered structure is designed to restore degraded nearshore coral reef ecosystems and enhance nearshore fisheries. These ecosystem-level effects will be monitored as part of the project to confirm whether there is net enhancement of cultural resources. Incorporation of umu kai into the design could further enhance limu and i‘a productivity of the area. Overall, while the access would be temporarily limited for safety during construction, the proposed project seeks to ultimately enhance and protect cultural resources rather than degrade them.

What feasible action, if any, could be taken by the Board of Land and Natural Resources regarding your application to reasonably protect Native Hawai‘i rights?

We do not feel action would need to be taken by the Board of Land and Natural Resources because the project will not directly impact cultural resources and will only temporarily limit access for active construction purposes.

OTHER IMPACTS

Does the proposed land use have an effect (positive/negative) on public access to and along the shoreline or along any public trail?

The hybrid reef would be submerged and accessed offshore and therefore would not impact land access.

Does the proposed use have an effect (positive/negative) on beach processes?

While this is the first-of-a-kind hybrid-reef system we believe the impact on beach processes, specifically coastal sand transport, will be negligible for the following reasons:

- The RMSs would be sitting on hard substrate where there is little or no sand or the sand layer is very thin. So, no significant sand movement is expected in the project area.
- The structures would not be installed flush with the seabed (i.e., there are gaps between the structure and hard substrate to accommodate the irregular seabed). These gaps would allow sand transport, where present, underneath the structures. Additionally, the structures would be perforated with large (19.7 in (50 cm) and larger) holes, which would allow transport of suspended sand through the structures.
- This is a prototype with an alongshore length of 55 yds (50 m) that is approximately 170 yards away from the shoreline. Even though the wave energy immediately behind the project area would be significantly reduced, the waves reaching the shoreline may not be significantly changed due to the diffraction of waves around the project area. Therefore, the change of sand movement in the swash zone would likely also be insignificant.
- Since all of the structures are perforated, deployed 170 yds away from the shoreline and have only 55 yds in the alongshore length, these structures are not expected to alter the nearshore current system in any significant way. Therefore, changes in sand transport parallel to the shoreline should also be insignificant.

Finally, the purpose of the prototype system, partly, is to study any potential effects on the shoreline so we have a robust monitoring program underway. This includes four seasonal drone photogrammetry surveys of the coastline before the structure is installed, as a baseline, and quarterly surveys for ~2 years after the structures are installed to verify our predictions.

Will the proposed use cause increased sedimentation?

No, because the site is nearly bare substrate or thin layers of sand combined with the fact that the structures are perforated and allow sediment to move below, through, and over the structures, increased sedimentation is not expected with this system.

Will the proposed use cause any visual impact on any individual or community?

Vessels required for the deployment and installation of the Proposed Action would be visible in the proposed action area for up to several months, and thereafter for monitoring activities. However, once deployed, the project would be submerged at all tide levels aside from potential

Coast Guard approved navigational markers. The only exception would be that the system may be observable briefly during large breaking waves (similar to a natural coral reef).

Please describe any sustainable design elements that will be incorporated into the proposed land use (e.g. the use of efficient ventilation and cooling systems; renewable energy generation; sustainable building materials; permeable paving materials; efficient energy and water systems; efficient waste management systems; etc.).

Any equipment installed at the site (for example, monitoring instrumentation) would be battery powered with minimal energy demand. The structures themselves are expected to become largely covered over time with live coral providing increased strength and increased wave attenuation. As a self-healing system, the hybrid reef would incur reduced long-term maintenance costs over traditional breakwaters that are subject to wave-induced scour which can require major maintenance or replacement. These reduced maintenance efforts inherently make this a more sustainable design.

If the project involves landscaping, please describe how the landscaping is appropriate to the Conservation District (e.g. use of indigenous and endemic species; xeriscaping in dry areas; minimizing ground disturbance; maintenance or restoration of the canopy; removal of invasive species; habitat preservation and restoration; etc.)

Not applicable.

Please describe Best Management Practices that will be used during construction and implementation of the proposed land use.

Standard Operating Procedures (SOPs), protective measures, best management practices, and conservations recommendations would be implemented during the Proposed Action.

Standard Operating Procedures

- Personnel on lookout onboard the vessels would conduct visual monitoring for marine species during all operations. Lookouts would not be performing any other tasks.
- All lookouts aboard platforms involved in the Proposed Action would review the NMFS-approved Marine Species Awareness Training material prior to Reefense deployment.
- Lookouts shall be trained in the most effective means to ensure quick and effective communication to facilitate implementation of mitigation measures if marine species are spotted.
- Personnel on lookout on the deck of the vessels would have a set of binoculars available for each person to aid in the detection of large fish, marine mammals, and sea turtles.
- All vessels would use extreme caution and proceed at a "safe speed" so proper and effective action can be taken to avoid a collision with any sighted object or disturbance, and the vessel can be stopped within a distance appropriate to the prevailing circumstances and conditions.
- Movement of the vessels would be limited to a maximum speed of five knots within the proposed action area.

- Any temporary equipment deployment and retrieval would not occur under high surf conditions, except for efforts to avoid or minimize resource damage.
- Minimize anchor drag by periodic visual observation to monitor dragging and to identify if proper tension is being maintained on the line and monitor ocean conditions that might affect the anchor's functionality.

Protective Measures for Deployment/Installation and Monitoring Activities

- The action agency and any permittee shall ensure that all personnel associated with the project are instructed about the potential presence of species protected under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA). All on-site project personnel are responsible for observing water-related activities for the presence of protected species. All personnel shall be advised that there are civil and criminal penalties for harming, harassing, or killing listed species and all marine mammals. To determine which protected species and critical habitat may be found in the proposed action area, personnel will review the relevant marine mammal and ESA-listed species at Find A Species (<https://www.fisheries.noaa.gov/findspecies>) and the consultation documents that have been completed for the project.
- All work shall be postponed or halted when ESA-listed marine species are within 164 ft (50 m) of the proposed work, and will only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species are noticed within 164 ft (50 m) after work has already begun, that work may continue only if, in the best judgement of a biologist, the activity will not adversely affect (i.e., disturb or harm) the animal(s). For example: divers performing underwater work (excluding the use of toxic chemicals) such as surveys would likely be permissible, whereas operation of heavy equipment is not.
- Temporary deployed monitoring equipment and RMSs deployment/installation would not occur within a 164 ft (50 m) radius around any observed marine mammal or sea turtle.
- In-water surveys would be conducted in the site prior to the deployment of RMSs.
- When a diver is involved in the proposed action area, the diver would do their best to avoid ESA-listed species. If an animal traverses within 164 ft (50 m), however, the diver would take into account his/her own personal safety.
- In-water lines would be non-looping with no excess line allowed in the water (i.e., taut at high tide).
- Vessel anchor placement and temporary equipment deployment would not occur on any non-encrusting corals over 4 in (10 cm) in height found within the proposed action area. Provided it is safe to do so, divers (or small ROV) would assist in the placement of the vessel anchors to avoid non-encrusting coral over 4 in (10 cm) in height, when necessary.
- Monitoring will occur post-deployment, two months post-deployment, and every five years to assess the anchoring system. At the time of this consultation, UH is seeking additional funding for long-term surveys to understand the effectiveness of the hybrid-reef system. Long-term surveys will include the following: quarterly underwater

photogrammetry to assess coral health, recruitment and growth; continuous passive acoustic surveys with data being analyzed quarterly; and periodic environmental DNA sampling to measure the changes in quantity and relative abundance of the corals between a control site and the proposed action area. Any diver surveys would include identification and removal of any marine debris from the structures that may create a hazard to the hybrid-reef system or marine life in the area.

- Mortar epoxy (e.g., HIT-RE 500 V3) that is needed to secure the anchor bars up to 10 ft (3 m) into the seafloor would only be used within the seafloor to secure the anchor bars. It would not be used in the benthic environment where any foraging would occur or have the potential to leach into the environment. Additionally, once mortar epoxy has hardened it is certified safe by the National Science Foundation.
- Monitoring equipment would be placed in open areas with a minimum distance of 6.5 ft (2 m) from any non-encrusting corals greater than 4 in (10 cm) in height, when practicable.
- Vessels would reduce speeds to 5 knots or less when approaching the proposed action area and even less when deploying RMSs.
- Provided it is safe to do so, divers would be present in the water during ROV installation of anchor bars to ensure environmental impacts are avoided.
- Equipment would be lowered to the seafloor slowly to ensure turbidity from deployment of equipment would be minimal and any suspended sediment would quickly settle and for the safety of equipment.
- Temporary deployed equipment would be clean and free of pollutants.
- If an ESA-listed species is adversely affected as a result of the project, all work must stop until coordination with NMFS has been completed.
- All interactions with listed species must be documented and reported to NMFS in daily monitoring logs. The monitoring logs will be submitted in a digital and searchable format to NMFS, with the following information:
 - Total hours and dates of monitoring,
 - Identification of which ESA species were observed and in what location and circumstances, including date, numbers of individuals of species observed, the outcome of the species observance relative to the authorized project, and any factors which may have affected visibility
 - If applicable, observed ESA species behaviors and movement types relative to the project activity at time of observation
 - All monitoring logs must be submitted to the NMFS within 90 calendar days of the completion of the project.

NOAA Office of Coastal Management Best Management Practices for Drone Operations

- Drone operators must follow all established NOAA, Federal Aviation Administration (FAA), and International Civil Aviation Organization requirements and practices, including:
 - (i) Drone operators must be certified with a FAA Part 107 drone pilot license;
 - (ii) Drone

operators must yield the right of way to manned aircraft; (iii) Drones will not fly directly over people; (iv) Drone operations will occur only during civil daytime; (v) Visual line-of-sight must be maintained by the operator or a visual observer who can provide immediate flight commands to the operator; and (vi) Drone operators will actively avoid aerial hazards (i.e., other aircraft, birds, and vessels).

- Drones shall be operated in a way as not to disturb wildlife.
- Any action involving drone operations with sustained flight below 328 ft (100 m) will require discussion and potential consultation or permitting under the ESA, Migratory Bird Treaty Act, Airborne Hunting Act, and/or Fish and Wildlife Coordination Act with the USFWS Migratory Bird and Ecological Services Divisions prior to the action to complete environmental compliance.
- If marine mammals are hauled out, the drone operator will not fly the drone within 200 ft (61 m) of the mammal.
- Drones will not approach within 66 ft (20 m) of ESA-listed butterfly habitat.
- Drones will not approach within 200 ft (61 m) of ESA-listed birds or bats, as well as occupied habitat. Prior to drone use, the flight path will be inspected for potential occupancy by ESA-listed species.
- Deviation from these practices will also require discussion and potential consultation or permitting under the ESA, Migratory Bird Treaty Act, Airborne Hunting Act, and/or Fish and Wildlife Coordination Act with the USFWS Migratory Bird and Ecological Services Divisions and/or NMFS Protected Resources Division prior to the action.
- For areas with established drone operations manuals and guidance, such guidance must be discussed with the USFWS and/or NMFS and amended as appropriate if such discussions and revisions have not already taken place. When such manuals or guidance are established, they must be followed for all drone operations. Deviations from requirements here in related to wildlife protection are acceptable if approved by USFWS and/or NMFS for their respective trust resources.
- Any behavioral disturbances from ESA-listed species must be reported immediately to NMFS. Examples include: (i) Hauled out pinnipeds move or alter body position to look up; (ii) Animals purposefully moving away, including entering the water; (iii) Diving to get away.
- Should any UAS make an emergency landing in the water, the UAS will be retrieved as immediately as possible to minimize potential for pollution to the marine environment small boats will be deployed.

Please describe the measures that will be taken to mitigate the proposed land use's environmental and cultural impacts.

The project will incorporate the *NMFS Conservation Recommendations for EFH, pursuant to MSA*:

- Ensure all gear, diving equipment, coral transplants, rocks used for Umu Kai, and tools are free of invasive species prior to in-water work to prevent spread of invasive species between the sites.

- Use locally sourced vessels and equipment when possible to avoid introduction of invasive species from outside Hawai‘i. Ensure vessels are free of organic material and invasive species prior to installation or removal activities to avoid spreading invasive species.
- Avoid placing anchors and structures on seagrass or corals of any size, whenever possible.
- Ensure all components (e.g. speakers, coral transplants, sensors) are properly secured and weighted so that they do not become detached and damage nearby resources. Ensure all components, including mechanical connections, are properly maintained. If the placement of any structures, equipment, rocks, or other components end up moving and causing damage elsewhere (e.g. nearby reef, shoreline), provide NMFS with an assessment of the damage and a restoration mitigation plan, if needed. Surveys will be conducted, one week, one month, and two months post-deployment. UH is currently working on securing additional funding for extending monitoring. If additional funding is not secured, all scientific monitoring equipment will be removed from the proposed action area at the end of DARPA’s funding.
- Surveys will be conducted, one week, one month, and two months post-deployment. UH and HDoT are currently working on securing additional funding for extending monitoring beyond this time.
- Make efforts to track the number of corals unavoidably lost due to structure installation, anchoring, transplanted from the site to the structures, and transplanted to or recruited to the Reefense structures.
- Share reports with data from monitoring equipment, in-water surveys, and findings with NMFS.
- Ensure all Best Management Practices described in the Standard Operating Procedures are applied.
- HDoT will perform a preliminary site assessment from shore after a severe storm event, to determine if structures have significantly shifted from their original positions. If shore-based assessments indicate potential shifting of the structures, an in-water assessment will be conducted. UH is seeking additional funding to conduct surveys, which would include assessments of the structures post-severe storm and for marine debris identification and removal. Based on the experimental and numerical modeling conducted for the reef-mimicking structures, the back reef and reef crest structures are designed to prevent the structures from overturning or rolling in extreme wave events. The only risk during extreme wave events is if the anchoring system fails (which is unlikely based on the models) and the structures slide until the feet become fixed by bedforms or roughness on the sea floor. As such, it is considered extremely unlikely that the structures would slide outside of the proposed action area.
- Ensure all components, coral fragments, and scientific measuring devices are properly secured or otherwise removed if the structures will not be checked or monitored for an extended period of time.

SINGLE FAMILY RESIDENTIAL STANDARDS

Single Family Residences must comply with the standards outlined in HAR Chapter 13-5, Exhibit 4. Please provide preliminary architectural renderings (e.g. building foot print, exterior plan view, elevation drawings; floor plan, etc.) drawn to scale.

SIZE OF LOT

	Existing	Proposed	Total
Proposed building footprint			
Paved areas/ impermeable surfaces			
Landscaped areas			
Unimproved areas			

SETBACKS Front: Side: Back:

SHORELINE PROPERTIES

Average Lot Depth (ALD): Average annual coastal erosion rate:

Minimum shoreline setback based on Exhibit 4:

Actual shoreline setback or proposed structure:

MAXIMUM DEVELOPABLE AREA

The Maximum Developable Area includes all floor areas under roof, including first, second, and third stories, decks, pools, saunas, garage or carport, and other above ground structures.

Maximum Developable Area based on Exhibit 4:

Actual Developable Area of proposed residence:

Actual height of the proposed building envelope as defined in Exhibit 4:

COMPATIBILITY

Provide justification for any proposed deviation from the established residential standards.

Click or tap here to enter text.

How is the design of the residence compatible with the surrounding area?

Click or tap here to enter text.

If grading is proposed, include a grading plan which provides the amount of cut and fill. Has grading or contouring been kept to a minimum?

Click or tap here to enter text.

CHAPTER 205A – COASTAL ZONE MANAGEMENT

Land uses are required to comply with the provisions and guidelines contained in Chapter 205A, Hawai'i Revised Statutes (HRS), entitled "Coastal Zone Management," as described below:

- **Recreational resources:** Provide coastal recreational opportunities accessible to the public.
- **Historic resources:** Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.
- **Scenic and open space resources:** Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.
- **Coastal ecosystems:** Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.
- **Economic uses:** Provide public or private facilities and improvements important to the State's economy in suitable locations.
- **Coastal hazards:** Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.
- **Managing development:** Improve the development review process, communication, and public participation in the management of coastal resources and hazards.
- **Public participation:** Stimulate public awareness, education, and participation in coastal management.
- **Beach protection:** Protect beaches for public use and recreation.
- **Marine resources:** Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

CERTIFICATION

I hereby certify that I have read this completed application and that, to the best of my knowledge, the information in this application and all attachments and exhibits is complete and correct. I understand that the failure to provide any requested information or misstatements submitted in support of the application shall be grounds for either refusing to accept this application, for denying the permit, or for suspending or revoking a permit issued based on such misrepresentations, or for seeking of such further relief as may seem proper to the Land Board.

I hereby authorize representatives of the Department of Land and Natural Resources to conduct site inspections on my property. Unless arranged otherwise, these site inspections shall take place between the hours of 8:00 a.m. and 4:30 p.m.

Signature of authorized agent(s) or if no agent, signature of applicant

AUTHORIZATION OF AGENT

I hereby authorize Click or tap here to enter text. to act as my representative and to bind me in all matters concerning this application.

Signature of applicant(s)

JOSH GREEN, M.D.
GOVERNOR
KE KIA'ĀINA



RECEIVED
OFFICE OF CONSERVATION
AND COASTAL LANDS

2026 FEB 13 P 2:48

STATE OF HAWAII | KA MOKU'ĀINA 'O HAWAII
DEPARTMENT OF TRANSPORTATION | KA 'OIHANA ALAKAU
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

EDWIN H. SNIFFEN
DIRECTOR
KA LUNA HO'OKELE

Deputy Directors
Nā Hope Luna Ho'okele
DREANALEE K. KALILI
TAMMY L. LEE
CURT T. OTAGURO
ROBIN K. SHISHIDO

IN REPLY REFER TO:

OES-2025-025

January 30, 2026

VIA ONLINE: <https://planning.hawaii.gov/erp/submittal-form/>

TO: JAMES KUNANE TOKIOKA, DIRECTOR
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT, AND
TOURISM

ATTENTION: MARY ALICE EVANS, DIRECTOR
OFFICE OF PLANNING AND SUSTAINABLE DEVELOPMENT

FROM: EDWIN H. SNIFFEN *Ed H.*
DIRECTOR OF TRANSPORTATION

SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT - FINDING OF NO
SIGNIFICANT IMPACT FOR KALAELOA HYBRID REEF
LABORATORY PROJECT LOCATED IN THE HONOULIULI
AHUPUA'A, 'EWA DISTRICT, O'AHU ISLAND, COASTAL AREA
FRONTING TAX MAP KEY (TMK) [1]9-1-014:049

With this letter, the State of Hawai'i, Department of Transportation (HDOT) transmits this Final Environmental Assessment for the Kalaeloa Hybrid Reef Laboratory Project located in the Honouliuli Ahupua'a, 'Ewa District, O'ahu Island, Coastal Area fronting TMK [1]9-1-014:049 for publication in the next available edition of The Environmental Notice.

If you have any questions, please contact Genevieve Hilliard Sullivan, HDOT Project Manager at (808) 587-2169 or by email at genevieve.h.sullivan@hawaii.gov.

State Historic Preservation Division
HRS 6E Submittal Form

Per §6E, Hawai'i Revised Statutes, if the Project requires review by the State Historic Preservation Division (SHPD), please review and fill out this form and submit all requested information to SHPD. All forms and project documentation must be submitted **electronically** via HICRIS. Please visit our website.

<https://shpd.hawaii.gov/hicris>

If you are unable to submit electronically, please contact SHPD at (808) 692-8015. Mahalo.

The submission date of this form is:

1. APPLICANT (select one)

Property Owner Government Agency

2. AGENCY (select one)

Planning Department Department of Public Works Other (specify): Department of +

Type of Permit Applied For: Conservation District Use Application

3. APPLICANT CONTACT

3.1) Name: Genevieve Hilliard + 3.2) Title: Resilience Coordinator

3.3) Street Address: 869 Punchbowl Street, Room 513

3.4) County: Honolulu 3.5) State: HI 3.6) Zip Code: 96813

3.7) Phone: 808-587-2169 3.8) Email: genevieve.h.sullivan@hawaii.gov

4. PROJECT DATA

4.1) Permit Number (if applicable):

4.2) TMK [e.g. (3) 1-2-003:004]: Coastal area fronting TMK (1)9-1-014:049 (submerged)

4.3) Street Address: Offshore of Kalaeloa Point

4.4) County: Honolulu 4.5) State: HI 4.6) Zip Code:

4.7) Total Property Acreage:

4.8) Project Area (acreage, square feet):

4.9) List any previous SHPD correspondence (LOG Number & DOC Number, if applicable):

LOG NO. 2025-07-31T17-15-4

DOC NO. 2024PR00891

5. PROJECT INFORMATION

5.1) Does the Project involve a Historic Property? A Historic Property is any building, structure, object,

district, area, or site, including heiau and underwater site, **which is over 50 years old** (HRS §6E-2).

Yes No

5.2) The date(s) of construction for the historic property (building, structure, object, district, area, or site, including heiau and underwater site) is

5.3) Is the Property listed on the Hawai'i and or National Register of Historic Places? To check:
<http://dlnr.hawaii.gov/shpd/>

Yes No

5.4) Detailed Project Description and Scope of Work:

The project entails the construction and installation of a hybrid reef approximately 50 meters by 60 meters (165 by 200 feet) offshore of Kalaeloa. The reef will consist of engineered structures seeded with coral fragments, arranged to mimic the structure of a natural fringing reef. Monitoring will

5.5) Description of **previous** ground disturbance (e.g. previous grading and grubbing):

Please see the Cultural Resource Assessment (CRA) found in Appendix D of the attached Final EA. This CRA investigated potential traditional or customary practices that occur within the proposed project area. This survey found that while the project area may have been used for traditional

5.6) Description of **proposed** ground disturbance (e.g. # of trenches, Length x Width x Depth):

Sub-seabed impacts would result from installation of the rock anchors that will be used to secure the reef crest structures. Drilled holes would be between 1.2 m and 3.0 m deep and between 6.5 cm and 15 cm in diameter, with between 42-124 holes being drilled in total. Steel anchor bar would be secured in the hole with a two-part mortar epoxy.

5.7) The Agency shall ensure whether historic properties are present in the project area, and, if so, it shall ensure that these properties are properly identified and inventoried. Identify all known historic properties:

Based on a review of literature from SHPD, there are no known historic sites within the Project Area. The closest known cultural resources are three precontact sites approximately 700 yards north of the proposed action area on the coast: beach midden site (SIHP Number 50-80-12-02722) and two

5.8) Once a historic property is identified, then an assessment of significance shall occur.

Integrity (check all that apply):

Location Design Setting Materials Workmanship Feeling Association

Criteria (check all that apply):

- a – associated with events that have made an important contribution to the broad patterns of our history
- b – associated with the lives of persons important in our past
- c – embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value
- d – have yielded, or is likely to yield, information important for research on prehistory or history
- e – have an important value to the Native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out or still carried out, at the property or due to associations with traditional beliefs, events, or oral accounts - - these associations being important to the group's history and cultural identity

5.9) The effects or impacts of a project on significant historic properties shall be determined by the agency.

Effect Determination (select one):

- No Historic Properties Affected
- Effect, with Agreed Upon Mitigation Commitments (§6E-42, HRS)
- Effect, with Proposed Mitigation Commitments (§6E-8, HRS)

5.10) This project is (check all that apply, if applicable):

- an activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency;
- carried out with Federal financial assistance; and or
- requiring a Federal permit, license or approval.

If any of these boxes are checked, then the Project may also be subject to compliance with Section 106 of the National Historic Preservation Act (NHPA).

6. PROJECT SUBMITTALS

6.1) Please submit a copy of the Tax Map Key (TMK) map

6.2) Please submit a copy of the property map showing the project area and indicate if the project area is smaller than the property area.

6.3) Please submit a permit set of drawings. A permit set is a set of drawings prepared and signed by a licensed architect or engineer and is at least 65% complete.

6.4) Are you submitting a survey?

- Yes No

Specify Survey:

6.5) Did SHPD request the survey?

- Yes No

If 'Yes', then please provide the date, SHPD LOG NO, and DOC NO:

Date:

LOG NO.

DOC NO.

6.6) **SURVEY REVIEW FEES.** Fee for Review of Reports and Plans (§§13-275-4 and 284-4). A filing fee will be charged for all reports and plans submitted to our office for review. Please go to:

The Submittal Filing Fee Form is located on the Forms page

A check payable to the Hawaii Historic Preservation Special Fund should accompany all reports or plans submitted.

6.7) Please submit color photos/images of the Historic Property (any building, structure, object, district, area, or site, including heiau and underwater site) that will be affected by the Project.

The following are the minimum number and type of color photographs required:

Quantity	Description
1-2	Street view(s) of the resource and surrounding area
1-2	Over view of exterior work area
1	exterior photo of the North elevation (if applicable)
1	exterior photo of the South elevation (if applicable)
1	exterior photo of the East elevation (if applicable)
1	exterior photo of the West elevation (if applicable)
1-2	interior photos(s) of areas affected (if applicable)

CHECKLIST

- SHPD FORM 6E** (this form)
- PROJECT SUBMITTALS** (any requested documentation for items 6.1 - 6.7 of this form)
- FILING FEE FORM** (if applicable)