Honolulu District
US Army Corps
of Engineers

Public Notice of Application for Permit

Regulatory Office
Building 230
Fort Shafter, Hawaii 96858-5440

Public Notice Date: January 17, 2014
Expiration Date: February 17, 2014
File Number: **POH-2012-00127**

Interested parties are hereby notified that an application has been received by the U.S. Army Corps of Engineers (Corps) for a Department of the Army (DA) permit for certain work in waters of the United States as described below and shown on the attached drawings.

APPLICANT: Mr. Edward Underwood, Department of Land & Natural Resources, Division of Boating & Ocean Recreation (DOBOR), 333 Queen Street, Suite 300, Honolulu, Hawaii 96813

AGENT: Scott Sullivan, Sea Engineering, Inc., 41-305 Kalanianaole Highway, Makai Research Pier, Waimanalo, Hawaii 96795

LOCATION: Keauhou Bay, Keauhou, Kona, Island of Hawaii, Hawaii
Coordinate location: 19.56139°N, -155.96333°W

PURPOSE: Increase navigational capacity and accessibility.

AUTHORITY: This permit application will be reviewed under the following authorities:

(X) Perform work in or affecting navigable waters of the United States – Section 10 Rivers and Harbors Act 1899 (33 U.S.C. 403).

PROPOSED ACTIVITY: DOBOR proposes to reconfigure the existing layout of offshore mooring sites within Keauhou Bay. The bay contains 9 vessel moorings for commercial and recreational use, which are secured by a total of 16 anchors. DOBOR proposes to remove and replace all of the existing mooring structures and add 7 new moorings sites using a standardized mooring design. The 16 total mooring sites would require 32 total anchor locations. DOBOR also proposes to remove and dispose of all existing floats, mooring hardware, and unsuitable materials found within the proposed mooring design footprint (See: Reference plan). Structures colonized by corals would be abandoned in place to avoid impacting corals.

The standardized offshore mooring system would provide mooring space for a total of 16 vessels (two 40-foot sailing canoes, six 30-foot vessels, three 40-foot vessels, three 50-foot vessels and two 60-foot vessels). The proposed layout would occupy the seafloor within the current boundaries of the existing 9 moorings within the bay and would not extend beyond the current footprint. The mooring layout would have four mooring rows, each row spaced at least 50 feet apart. Three rows would be positioned south of the U.S. Coast Guard (USCG) Ingress/Egress Channel of the bay and one row would be positioned to the north of the channel. Vessels would be anchored at both bow and stern by steel, dead-weight, Danforth-type gravity boat anchors. Anchor weights would be dependent on the length of the vessel. The distance between each mooring within a row would be 2.5 times the water depth to provide 3 to 5 feet of clearance. The length of chain attaching the anchor to mooring floats at the bow and stern of each vessel would be equal to the depth of the water plus an additional five feet. Pennant lines connecting the mooring floats to the vessel would be approximately 20 feet long.

Removal of the existing mooring structures and installation of the new mooring system would occur from a single 72-foot floating platform/work boat anchored at four stationary points to allow for winch-adjusted maneuvering and positioning for access and staging at each mooring site within the bay. All demolition/removal and installation activities would be achieved using a crane staged atop the work boat for accurate control. Precise deployment of mooring anchors at proposed anchor locations would require GPS-coordination and diver assistance.

The proposed work would be accomplished in approximately four to seven days; placement of mooring anchors and coral relocation would require approximately three days of in-water work and mooring line/hardware attachment would require approximately one day of in-water work.

The DOBOR work plan is attached to this notice (Enclosure 1).

BACKGROUND INFORMATION: Currently, each existing mooring design and maintenance is the responsibility of each respective mooring/vessel owner. An evaluation by DOBOR of the existing mooring anchors indicates the current structures are aging, undersized and/or un-engineered, with use of unsuitable anchorage material such as concrete blocks, steel train wheels, manta-type anchors, coral heads, etc. Existing inadequate mooring anchors contribute to continued mooring slippage or failure during storm and high wave conditions and consequent damage to vessels, property and natural resources in the bay.

The purpose of the proposed action is to maximize the efficient use of mooring space, improve mooring holding strength as well as improve accessibility for both recreational and commercial boaters within the bay.

MITIGATION: DOBOR has proposed a Best Management Practices (BMP) plan to be implemented throughout the entirety of the proposed action to avoid and minimize potential adverse impacts to historic properties, federally-protected marine species, and coral reef resources.

DOBOR has proposed ceasing of all work in the immediate area of any discovered, previously unidentified archaeological sites within the work footprint with subsequent coordination with the Hawaii Island field office of the State Historic Preservation Division. Work would not resume until DOBOR receives clearance from the Historic Preservation Division. Installation work will be conducted from atop a non-motorized, four-point anchored

platform that can be positioned using a winch system thereby eliminating the potential for direct physical impact by protected marine species with a motorized vessel. Mooring rows have been selected to avoid interference within the USCG Ingress/Egress Channel and maintain navigational accessibility that is currently encroached upon by existing moorings. Proposed anchor locations have been pre-surveyed by DOBOR for placement with the greatest avoidance of coral resources in the bay. For those coral colonies that cannot be avoided based on the proposed configuration, DOBOR would relocate in accordance with the proposed mitigation plan. Divers would assist installation of each mooring anchor to survey for marine life, endangered/threatened marine species, and coral prior to anchor deployment. Radial safety zones around each mooring anchor are included in the layout to avoid potential impacts to marine resources by the anchors and anchor chains and account for mooring line sweep during normal and storm conditions. For coral(s) present within the safety zone, DOBOR proposes to relocate to a receiving site within 8 to 15-feet from its origin (receiving sites to be determined on site).

The DOBOR BMP plan is attached to this notice (Enclosure 2).

The application proposes no compensatory mitigation.

WATER QUALITY CERTIFICATION: The Corps may not issue a DA permit for the proposed activity until a certification or waiver of certification, as required under Section 401 of the Clean Water Act, has been received from the State of Hawaii, Department of Health-Clean Water Branch (DOH-CWB). The Corps has determined the proposed action would not result in the discharge of fill material into a water of the U.S. and would not require authorization under Section 404. If this office has not received within the 30-day comment period a written determination from the DOH-CWB stating that water quality certification is required, this office will assume that no water quality certification is required prior to the issuance of a DA permit.

COASTAL ZONE MANAGEMENT ACT CERTIFICATION: The proposed action would affect land or water uses in the Coastal Zone. Under Section 307(c)(3) of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)(3)) (CZMA), the Corps may not issue a permit for the described work until the applicant obtains an individual CZM Consistency Concurrence from the State of Hawaii, Department of Business, Economic Development, and Tourism, Office of Planning.

CULTURAL AND HISTORIC RESOURCES: In accordance with the requirements set forth in Section 106 of the National Historic Preservation Act (NHPA), the proposed work is being evaluated for possible effects on historic properties, including those listed in or eligible for inclusion in the National Register of Historic Places.

The proposed action would involve in-water work activities sited entirely in marine waters located seaward of TMK (3) 7-8-012:008. DOBOR has not proposed any upland activities within the subject parcel. All staging and stockpiling activities will occur on the work platform. DOBOR has determined there are no known cultural or historic resources on or beneath the sandy substrate within the mooring anchor locations.

The Corps has reviewed the National and State Registers of Historic Places for the Island of Hawaii for the presence of historic properties within the subject parcel and none were identified. A nearby parcel, TMK (3) 7-8-012:017, features a historic property identified on the State Inventory of Historic Places (SIHP) as Site #10-37-4383, the “Kauikeaouli Stone”, King Kamehameha III Birthplace. No proposed project activities would occur at TMK (3) 7-8-012:017.

Accordingly, a determination of eligibility and, if needed, a determination of effect will be made in consultation with the State Historic Preservation Division (SHPD). This application is being coordinated with SHPD. Any comments SHPD may have concerning presently unknown archeological or historic data that may be lost or destroyed by work under the requested permit will be considered in our final assessment of the proposed work.

ENDANGERED SPECIES: Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1536) (ESA) requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and/or U.S. Fish and Wildlife Service (USFWS) on any action that may affect a species listed (or proposed for listing) under the ESA as threatened or endangered or any designated critical habitat.

DOBOR assessed marine resources at Keauhou Bay within a 12-foot radius of each of 32 proposed mooring anchor locations. The results of the survey identified corals, invasive species, seagrass, marine protected species and other non-coral, macro-invertebrates (see Enclosure 2, Marine Biological Resource Surveys). No federally-listed threatened, endangered, or candidate species of coral were observed during surveys.

The Corps has determined the following ESA-listed marine species have the potential to occur within the project area: Hawksbill sea turtle (*Eretmochelys imbricate*), Green sea turtle (*Chelonia mydas*), Humpback whales (*Megaptera novaeangliae*), endangered, Hawaiian monk seals (Monachus schauinslandi), endangered, and Hawaii Insular False Killer Whale (*Pseudora crassidens*), endangered. Concurrently with the issuance of this notice, the Corps will evaluate the potential project-related impacts to protected marine species and their designated critical habitat and, if required, initiate consultation with the local NMFS office.

ESSENTIAL FISH HABITAT: The proposed work is being evaluated for possible effects to Essential Fish Habitat (EFH) pursuant to Section 305(b) the Magnuson Stevens Fishery Conservation and Management Act of 1996 (16 U.S.C. 1855(b)) (MSFCMA) and associated federal regulations found at 50 CFR Part 600 Subpart K. The Honolulu District area of responsibility includes areas of EFH as Fishery Management Plans. We have reviewed the January 20, 1999, Western Pacific Fishery Management Council's Environmental Assessment to locate EFH areas as identified by NMFS.

The seafloor in Keauhou Bay is a mixture of basalt boulders, carbonate and basalt sediment, and modern reef. The central portion of the bay is covered by sandy and cobble substrate. The sandy substrate is a mixture of carbonate sand and cobble, basalt cinder and terrigenous sand grains. Boulders in the region are basaltic in origin. The modern reef extends across both carbonate reefal platforms and pre-existing, submerged basalt flows. Much of the hard substrate in the region is covered by modern, living coral. DOBOR has selected mooring anchor locations in areas consisting primarily of sandy and absent of corals. Of the 32 proposed anchor locations, 13 anchor locations (A1, A2, A3, A4, A5, A6, B'1, B'2, B'3, C1, C7, D2 and D3) would require relocation of corals present within the 5-foot radius of the anchor point.

Based on the project location, the Corps has determined that the project area contains EFH identified for the following Management Unit Species: Bottomfish (all life stages), Pelagics (all life stages), Coral Reef Ecosystem, and Crustaceans (lobster and crab, all life stages). Concurrently with the issuance of this notice, the Corps will evaluate the potential project-related impacts to EFH and, if required, initiate consultation with the local NMFS office.

Reference additional benthic information provided at Enclosure 2 of this notice.

EVALUATION: The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits, which reasonably may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered, including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people.

The Corps is soliciting comments from the public; Federal, State, and local agencies and officials; and other interested parties in order to consider and evaluate the impacts of this activity. Any comments received will be considered by the Corps to determine whether to issue, modify, condition, or deny a permit for the work. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the activity.

PUBLIC HEARING: Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings must state clearly and concisely, the reasons and rationale for holding a public hearing.

COMMENT AND REVIEW PERIOD: Conventional mail or e-mail comments on this public notice will be accepted and made part of the record and will be considered in determining whether it would be in the public interest to authorize this proposed work. In order to be accepted, e-mail comments must originate from the author's e-mail account and must include on the subject line of the e-mail message the permit applicant's name and the Corps file number **POH-2012-00127.**

All e-mail comments should be sent to:

jessie.k.paahana@usace.army.mil

Conventional mail comments should be sent to:

U.S. Army Corps of Engineers, Honolulu District
Regulatory Office, Building 230
Attention: Jessie Paahana
Fort Shafter, Hawaii 96858-5440

Both conventional mail or e-mail comments must reach this office no later than the expiration date of this public notice to become part of the record and be considered in the decision. Please contact Ms. Jessie Paahana at (808) 835-4107 if further information is desired concerning this notice. This public notice is issued by the Chief, Regulatory Office.

Attachments

Enclosure 1: DA Permit Application and BMP Plan
Enclosure 2: Marine Biological Resources Surveys

Sea Engineering, Inc.
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Supplemental

Keauhou Bay Mooring Buoys

Keauhou Bay Moorings, Keauhou, North Kona, Island of Hawaii
Seaward of TMK (3) 7-8-012:008

Department of Land and Natural Resources
Division of Boating and Ocean Recreation

Prepared by:
Sea Engineering, Inc.

A. Location

The project is located at Keauhou Bay, Keauhou, North Kona, Island of Hawaii, Hawaii, U.S.A., seaward of TMK (3) 7-8-012:008.
Latitude 19° 33' 41.00"
Longitude 155° 57' 48.00"

Project location maps and graphics are presented within the Drawings Exhibit.

Adjacent Properties include:

Tax Map Key	Owner	Mailing Address
7-8-012:001	Catherine Evans Family Trust	78-131 Ehukai St, Kailua Kona, HI 96740
7-8-012:002	Hokukano Ranch Inc.	PO Box 1140, Kealakekua, HI 96750
7-8-012:006	PGG Real Estate LP	PO Box 306, Kamuela, HI 96743
7-8-012:007, 013, 014, 027, 048	Kamehameha Investment Corp	PO Box 5685, Kailua Kona, HI 96745
7-8-012:008	State of Hawaii	
7-8-012:035	Edward J Rapoza	PO Box 2077, Kailua Kona, HI 96745
7-8-012:040, 051, 075	Handgis Trust	PO Box 390010, Keauhou, HI 96739
7-8-012:069	Downs Family Trust	46 Linda Isle, Newport Beach, CA 92660

B. Proposed Action

The State of Hawaii Division of Boating and Ocean Recreation (DOBOR), within the Department of Land and Natural Resources, proposes to redesign the mooring layout and mooring assembly design for Keauhou Bay, Hawaii. The area is currently utilized for mooring vessels, and is managed by DOBOR. The proposed mooring layout is re-designed to more effectively accommodate vessels while also improving mooring assembly design and vessel and user safety.

The mooring areas, on both the north and south side of a designated approach channel, have a combined area of approximately 102,500 square feet (sf), with individual areas of approximately 32,500 sf and 70,000 sf, respectively. One row of moorings is proposed for the north area, and three are proposed for the south area. In total, the proposed moorings will accommodate fourteen vessels ranging from 30 to 60 feet in length and two sailing canoes. Mooring locations have been selected to avoid areas with high benthic marine life as far as practicable.

The mooring plan calls for two sailing canoes, six 30 ft vessels, three 40 ft vessels, three 50 foot vessels, and two 60 foot vessels.

Ingress and egress for the mooring installations will be from the ocean, using both a 72' work

boat and a dive boat.

Site maintenance, including removal of all existing floats and mooring hardware, will be completed as part of the placement activity for the new moorings. All existing mooring blocks and anchors with coral colonizing their surfaces will be left in place to minimize impacts.

All depths are in mean lower low water (mllw).

MOORING REQUIREMENTS:

1. Typical mooring space is 2 times the boat length between bow and stern mooring blocks
2. Typical distance between each set of mooring, the bow mooring of one set and the stern mooring of the next set, is 2.5 times water depth in order to provide 3 ft to 5 ft of clearance
3. Spacing between rows is 50 ft
4. Sailing canoes require single 4,000 lb mooring blocks at bow and stern
5. 30 ft vessels require single 4,000 lb mooring blocks at bow and stern
6. 40 ft vessels require two 4,000 lb mooring blocks at bow and stern
7. 50 ft vessels require one 4,000 lb and one 6,000 lb mooring block at bow and stern
8. 60 ft vessels require two 6,000 lb mooring blocks at bow and stern
9. Length of long link chain mooring rodes will typically be equal to depth of water plus 5 feet
10. Mooring pennants will typically be 20 ft in length, though may be shorter for sailing canoes
11. Mooring block sites need a clear five foot radius from the center of placement for anchor chain and mooring rode sweep
12. 2.5 square foot footprint per anchor, total footprint of all anchors is about 100 sf

INSTALLATION EQUIPMENT:

1. 72’ workboat
2. Dive boat
3. Hypack Navigation Software
4. DGPS Receivers
5. Forty-eight 4,000 lb and 6,000 lb metal deadweight anchors
6. Forty-eight 4 foot lengths of 1 ½ inch (in.) ship chain (chain dampers)
7. Ninety-six 1 3/8 in. shackles
8. Thirty-two 6 in. lifting rings
9. Thirty-two ¾ in. long link chains (mooring rodes), variable lengths depending on water depth
10. Ninety-six ¾ in. shackles
11. Thirty-two 24 in. mooring buoys with stainless steel load member and swivel
12. Thirty-two 1in. diameter, 20 foot (ft) polypropylene mooring pennants with 1 in. thimbles

WORK PLAN:

1. Pre-rig Mooring Blocks
   - Attach 4 ft lengths of 1 ½ in. ship chain to each mooring block with 1 3/8 in. shackle
   - Attach 1 3/8 in. shackle to the end of each length of chain

2. Establish Four-Point Moor for 72’ work boat
   - Divers will deploy from the dive boat to visually inspect each mooring location for marine life, endangered or threatened species, and coral at the southeast, northeast, northwest, and southwest most mooring anchor locations
   - The southeast corner mooring location has a single coral colony that will be relocated prior to mooring anchor placement
   - Position 72’ work boat over both northern and the offshore southern mooring locations using Hypack Navigation software coupled with a DGPS receiver
   - DGPS receiver will be positioned atop the 72’ work boat crane, to give exact locations for mooring anchor placement
   - Project engineer will guide placement using Hypack for guidance and spotters on the dive boat
   - Mooring anchors will be lowered to the seafloor by crane
   - 72’ work boat will position over the top of these three mooring anchor locations and divers will connect the vessel’s mooring lines to each block
   - 72’ work boat will use winches for each of the three mooring lines, with assistance from the screws, to position over the inshore southern mooring anchor location
   - Divers and 72’ work boat will relocate the single *Porites Lobata* colony, following the mitigation plan described in Section I
   - Divers will connect the vessel’s mooring line to the anchor
   - Following establishment of four-point moor, 72’ work boat will power down engines and adjust position using winches for each of the vessel’s mooring lines

3. Placement of Remaining Mooring Anchors
   - Divers on dive boat, using onboard navigation will visually inspect each mooring site, moving from inshore to offshore
   - Each site will be inspected for marine life, endangered and threatened species, and coral, prior to positioning 72’ work boat for mooring anchor deployment
   - 72’ work boat will move into position using winches for each line in the four-point moor
   - As needed, divers and the 72’ work boat will relocate coral colonies, following the mitigation plan described in Section I prior to mooring anchor deployment
   - Project engineer will ensure correct positioning using Hypack coupled with the DGPS receiver on the crane tip and spotters on the dive boat
   - Mooring anchors will be lowered to the seafloor by crane

4. Remove existing mooring assemblies

- 72’ work boat will move into position alongside the existing mooring assembly
- Divers will inspect the hardware for existing marine life, including colonies
- Divers will cut the existing mooring assembly from the anchor
- Assemblies will be removed from the water using the 72’ work boat crane
- Any anchor with coral colonies or marine life will be left in place on the seafloor
- If divers observe that no marine life or coral colonies exist on the anchor, then it may be retrieved by the 72’ work boat using the crane
- Divers will inspect the site, after removal, and retrieve any project related debris

5. Retrieval of Four-Point Moor
   - 72’ work boat will retrieve its mooring lines from offshore moorings, then onshore moorings, with diver assistance
   - Following retrieval of the four-point moor, the 72’ work boat will move outside of the mooring areas

6. Pre-rig Hardware
   - Polypropylene pennants will be connected to 24 in. moorings balls with ¾ in. shackles
   - ¾ in. long link chains will be connected to opposite ends of mooring balls with ¾ in. shackles
   - 6 in. lifting rings will be connected to opposite ends of long link chains with ¾ in. shackles

7. Attachment of Mooring Hardware
   - dive boat will position over each mooring anchor
   - Divers will inspect each mooring location to ensure that anchors are correctly positioned and chain dampers are free for connection
   - Divers will deploy each hardware assembly and move it into position over the mooring anchor
   - Divers will connect 1 3/8 in. shackles to 6 in. lifting rings, in the water
   - Divers will photograph the mooring station
   - Divers will clear the mooring location of any project related debris prior to departing the site

8. Egress
   - 72’ work boat and dive boat will depart the site by sea

SCHEDULE:
Work is expected to last approximately four days. Placement of the mooring blocks and repositioning of coral covered boulders by crane will take approximately three days, and hardware attachment will take approximately one additional day.

Work is expected to take place during **October 2013**, with scheduling dependant on weather conditions and sea state.

STOCKPILING:
There will be no stockpiling of material within U.S. waters. All materials will be brought in by vessel and deployed in correct location and orientation.

ADDITIONAL SITES:
There are no borrow or upland disposal sites associated with this project.

BEST MANAGEMENT PRACTICES PLAN:
Best Management Practices Plan (BMPP) is attached as Exhibit 2.

Project maps and graphics are presented within the Drawings Exhibit.

C. Discharge of Dredged and/or Fill Material
There is no discharge of dredge or fill material associated with this project.

D. Dredging Projects
No dredging will be conducted as part of this project.

E. Structure in Navigable Waters
The mooring layout at Keauhou Bay, as proposed by DOBOR, is re-designed to more effectively accommodate vessels while improving overall mooring use and safety. Currently the non-channel portions of the bay, in sufficient water depth, are used for vessel mooring and managed by the State of Hawaii DOBOR.

Thirty-two mooring anchor locations are proposed for placement in Keauhou Bay. Four of the initially planned mooring anchor locations have been moved from the proposed mooring plan locations due to the discovery of significant coral cover during the detailed site investigations. Mooring will be aligned in four rows, with three south of the channel and one to the north. These moorings are designed to accommodate 14 vessels ranging from 30 to 60 feet in length, and two sailing canoes. Details on the mooring assembly designs, components, and placement work plan are provided in Section B, above.

Project maps and graphics are presented within the Drawings Exhibit.

F. Existing Environment

a. Physical Environment

Keauhou Bay is located on the North Kona coastline, approximate 5.5 miles south of Kailua Kona and approximately 6.5 miles north of Kealakekua. There is a state owned and DOBOR managed boat launch at TMK (3) 7-8-012:008. There is a navigable channel with an approach exclusion zone oriented WSW in the center of the bay, which provides access to and from the boat launch, pier, and shoreline. There are currently numerous moorings on

both the north and south sides of the channel, which are managed by DOBOR.

The south side of the bay has a resort development at the seaward end, private residences along the southern coastline, and the State boat launch facility and piers at the landward corner. The mauka end of the bay has a canoe hale and launch area. The landward corner of the northern shoreline is the cul-de-sac for Kamehameha III Road, with private residences occupying the coast to the seaward point of the northern side, which separates Keauhou and Heeia bays.

The seafloor in Keauhou Bay is a mixture of basalt boulders, carbonate and basalt sediment, and modern reef. The central portion of the bay is covered by sandy and cobble substrate. The sandy substrate is a mixture of carbonate sand and cobble, basalt cinder, and terrigenous (mainly basaltic in origin) sand grains. Boulders in the region are basaltic in origin. The modern reef extends across both carbonate reefal platforms and pre-existing, submerged basalt flows. Much of the hard substrate in the region is covered by modern, living coral, as will be discussed further under Section F Biological Environment, and Special Aquatic Sites.

Kawaihae Harbor tide gauge has a mean higher high water and mean lower low water that are 1.23 feet above and 0.92 feet below mean sea level, respectively. This produces a diurnal tidal range of 2.15 feet in elevation.

The orientation of the bay and wave shadowing from the other islands in the chain protects the area from tradewind waves, and most directions of South and North Pacific swell. Long-period North Pacific swell arriving at angles of 310 degrees and less will often cause waves to break along the northern coastline of the bay. In addition, strong surges can wash into the harbor during these swell events. The bay is exposed to Kona Storms that occasionally strike the western side of the island.

Waters within Keauhou Bay are listed as Class A, and are typical of the waters along the western shorelines of the Island of Hawaii. Waters offshore of the bay are listed as Class AA. The surrounding area is primarily residential and resort, so there has been little possibility of either agricultural or industrial pollution in the area since it was developed. There are undeveloped lands inland of the bay, associated with the birthplace of King Kamehameha III.

This area does not serve as a groundwater recharge area.

Erosion along the coastline has not been a problem, as it is primarily a rocky coastline. The bay is surrounded by the high coastal hazard zone and the tsunami zone.

The air and noise quality of the area is typical of residential, boat launch, and resort areas. Motor vehicles and vessel traffic are generally the only sources of either air or noise pollutants. When motor vehicles and vessels are not in operation, natural wind and wave noise is the primary sound source. The project should have very little impact on air quality, as a result of vessels on site. The impact will only last for the three days of the project, and

will end with completion of the project.

b. Biological Environment

There are no fast lands impacted by the proposed project.

The marine environment is detailed in Exhibit 3, Marine Resources Survey of Keauhou Small Boat Harbor, Keauhou, Hawaii. In general, the project area is biologically healthy with robust marine life.

c. Special Aquatic Sites

There are no special aquatic sites in the current location of the moorings, which is the discharge site for the project. The baseline assessment, Exhibit 3, did identify coral colonies in the area; however several mooring locations were altered so that mooring anchor placement is only on sandy substrate with a five foot radius clear of any coral colonies.

For those mooring locations on both the north and south sides of the channel where movable colonies exist, mitigation is proposed through coral relocation. Section I contains the proposed mitigation plan for relocating coral colonies to adjacent locations outside the five foot sweep radius.

d. Human Use Characteristics

The existing land uses at the project site include resort, residential, park, and boat launch. Associated with the land uses, there are related water uses including: fishing, diving, sailing, snorkeling, kayaking, stand up paddling, surfing, and canoe paddling. The bay is used as a launching point for numerous recreational fishing, diving, and sightseeing boat charters. Moving inland from the coastline there is an open park area, for the birth place of King Kamehameha III, a golf course, and additional residential development.

G. Environmental Effects of Proposed Project

Re-design of the existing mooring layout as proposed, should have minimal negative, short-term impacts associated with construction, and positive long-term safety impacts associated with improving both the mooring layout design and mooring assemblies in Keauhou Bay, North Kona, Hawaii.

There will be a short-term, minor impact to access within the bay, during the first three days of mooring block placement. During these three days, the 72’ work boat will have its four-point mooring lines extending across much of the navigable, mooring area within the bay. During the first three days, human use will be limited within the mooring area. During the fourth day, human use will only be limited over the mooring block where attachments are being connected. The proposed project should not have any impact on land-based activities.

Placement of the mooring anchors should not have an impact on water quality in the area, as lowering the anchors into coarse sand and pebble substrate is not expected to create turbidity issues. Mooring anchor placement should not have an impact on marine life, either, as each site’s location was selected to avoid impacts. In addition, each location will be verified and inspected for marine life prior to placement of anchors. Inspection will include additional

visual observations to verify that no coral exists in the mooring anchor placement area. Vessel movements will be controlled by winch adjustments to the lines making up the four-point moor, once the initial anchors are placed. This will mitigate any potential vessel related impacts, as positioning and movement between stations will be very exact. Connecting the mooring attachments, including the mooring rode, buoy, and pennant, should not have an impact to water quality or marine life. Boat operation during this phase will be limited, and will be conducted from the small dive boat.

There are no known cultural or historic resources on or beneath the sandy substrate, in the locations identified for placement of mooring blocks.

No indirect impacts are expected from the proposed re-design of the mooring layout and individual mooring system, as the area is already used for mooring both commercial and recreational vessels.

These are the only moorings in the Keauhou region, and re-design of the moorings is not expected to have a cumulative impact within this area. It will, however, minimize future impacts by precluding unauthorized and unpermitted mooring placement through standardizing the mooring systems, while also improving utilization of the appropriate and available space for moorings. DOBOR manages and maintains mooring areas around the State of Hawaii. Re-design of mooring areas and mooring systems is an ongoing process, however, this project does not significantly change the magnitude or geographic distribution of those activities.

H. Alternatives

Potential safe harbor sites are limited along the Kona coastline, with Keauhou Bay representing one of the few possible locations. As such, it has already been developed as an anchorage area through both planned and unauthorized moorings. There are no other suitable locations for safe harbor in the Keauhou region, which are currently available as mooring sites. Additionally, as this is a re-design project, the bay is already used for moorings, boat launching, and pier-side activities.

The alternatives include either removing the existing moorings, or maintaining them as they are currently configured.

Removal of the moorings, as an option, was deemed to be unreasonable for the existing users. The area is currently used by both private and commercial entities, and is well situated along the coastline, providing unique access to the North Kona coastline. In addition, the current site has pier, boat launch, and public restroom facilities already in place. Removal would have a social and economic impact to the existing users, and would additionally impact some of the ongoing tourist activities based out of Keauhou Bay, which utilize the moorings.

Maintaining the mooring layout as it is currently configured is a potential alternative. If this alternative is chosen it will require replacement of nearly all of the current mooring blocks and assemblies. Many of the existing mooring blocks are aging, undersized, or are un-

engineered. This leads to continued mooring slippage or failure during storm and high wave conditions, which impacts the safety and welfare of the users and could result in possible damages to coral substrate. Replacement of the existing mooring blocks and assemblies would require a similar level of operational activity as the proposed project, in the water and on the seafloor. The current mooring layout is less effective in its allocation of mooring locations, so there would be no net benefit to conducting the maintenance operations on the existing moorings, in comparison with the proposed re-design of the mooring layout.

As no other locations in the region are available for migrating the current moorings, and maintaining the existing mooring layout would require a similar level of effort without the improved effectiveness of proposed mooring layout re-design, we believe the proposed project is the only location and the most cost-effective, environmentally benign solution for maintaining recreational and commercial moorings in the Keauhou region.

I. Mitigation

Mitigation is proposed at mooring anchor sites where coral colonies were identified in Exhibit 3, the marine resource surveys conducted by AECOS, Inc. A marine biologist from AECOS conducted two site visits to the bay. The first visit was focused on investigating the original proposed mooring layout. The second visit was conducted to investigate additional mooring locations for two sailing canoes and to assess the feasibility of shifting the middle row, on the south side of the channel, seaward. Both reports are included in Exhibit 3. A safety zone was established around the center of each mooring block. The safety zone is a five foot radius around the center of each mooring, and is sufficient to account for anchor chain and mooring rode sweep during both normal and storm conditions.

Approximately thirteen mooring block locations were identified where coral colonies were within the five foot sweep radius (A1, A2, A3, A4, A5, A6, B’1, B’2, B’3, C1, C7, D2, and D3). Of these ten locations, nine were identified as having colonies that could be relocated. Site A5 was considered an unacceptable site. The new location is approximately five feet SSE of the original, located within soft sediment and within acceptable tolerances for both mooring spacing and between row spacing.

Sites D5 and D6 were also identified as unacceptable, but were relocated to alternate sites while in the field. Discussion in Exhibit 3 is based on the alternate locations for D5 and D6. Exhibit 1, sheet 3 of 7, shows these mooring locations in plan view, including the alternate D5 and D6 locations.

Minimizing Impacts

Minimizing adverse impacts to existing coral colonies is a central concern with the proposed mooring re-design project. Relocation of existing, movable coral colonies is proposed for sites: A1, A2, A3, A4, A6, B’1, B’2, B’3, C1, C7, D2, and D3. Exhibit 3, the marine resource surveys, identified coral colonies within the five foot sweep radius of the mooring blocks for these locations. To ensure that these coral colonies are not impacted by either the mooring block placement or anchor chain and mooring rode sweep, it is recommended that

these corals be relocated. It is proposed that the receiving sites are located within eight to fifteen feet from the mooring location.

As these coral colonies are established on rubble, boulders, or small blocks, movement of the entire structure is recommended for each colony. This will further minimize impacts by eliminating impact related stress due to removal operations and limit handling to just the relocation activity.

Previous coral relocation efforts in Hawaii and the Pacific have identified important criteria for designing a relocation plan. Minimizing relocation distance by moving the colonies to an area between eight to fifteen feet from the center of the mooring block locations will ensure that criteria such as water motion, sedimentation, existing coral cover, coral species distribution, substrate characteristics, depth profiles, light conditions, and water quality remain as consistent as possible. The additional distance beyond the sweep zone is proposed as an additional standoff to minimize crowding of coral colonies around the mooring sites.

The proposed coral relocation plan will follow the accepted protocols, as identified in previous relocation projects in Hawaii and the Pacific. These protocols include:

- Coral will remain submerged during relocation.
- Because the coral colonies will be moved in complete blocks, they will not be placed in containers, but will move through open water.
- Corals will not be stored.
- Worksite conditions will be monitored to ensure that water clarity is good during relocation operations.
- If weather or sea conditions become too rough, then relocation operations will be postponed until calmer conditions are present.
- Contact with coral tissue will be avoided to the greatest extent possible.
- Coral colonies will be placed upright in the receiving locations.
- Edges of the coral colonies will be protected during both relocation and final positioning.

The proposed coral relocation work plan is as follows:

- 72’ work boat will move into position using winches to adjust its four mooring lines.
- Divers will identify the coral colonies requiring relocation, and pre-determine receiving locations.
- Divers will photograph both donor and adjacent receiving sites.
- Divers will strap the base of each coral colony with one or more soft crane slings.
- The slings will be attached to the crane hook, taking care to minimize or prevent contact with the coral tissue.
- Divers will assist the project engineer in moving the crane to the receiving location.
- Divers will assist in lowering and placing coral colonies at the receiving locations.
- Divers will disconnect the crane hook and soft crane slings from the coral colony.
- Divers will ensure that the coral colony is safely positioned and stable on the marine substrate.

- Divers will photograph the donor and receiving sites following completion of coral relocation efforts at each mooring location.

Following completion of the project, a short letter report will be submitted to the regional office detailing the activities, locations, numbers of coral, and final conditions following relocation efforts.

J. Estimate Project Costs and Time Frame

The total estimated cost for the mooring re-design project, including coral mitigation and removal of the existing mooring assemblies, is approximately $450,000 in 2013 dollars.

The mooring installation will be completed within in one week, not to include weather and operational delays, of start of work.

K. Permits

The proposed repair is seeking:

Department of the Army Permit

Submitted by

Scott Sullivan
Sea Engineering, Inc.

Sea Engineering, Inc.
Makai Research Pier • 41-305 Kalanianaole Hwy • Waimanalo, Hawaii 96795-1820
Phone: (808) 259-7966 • FAX (808) 259-8143 • E-mail: sei@seaengineering.com • Website: www.seaengineering.com

Exhibit 1

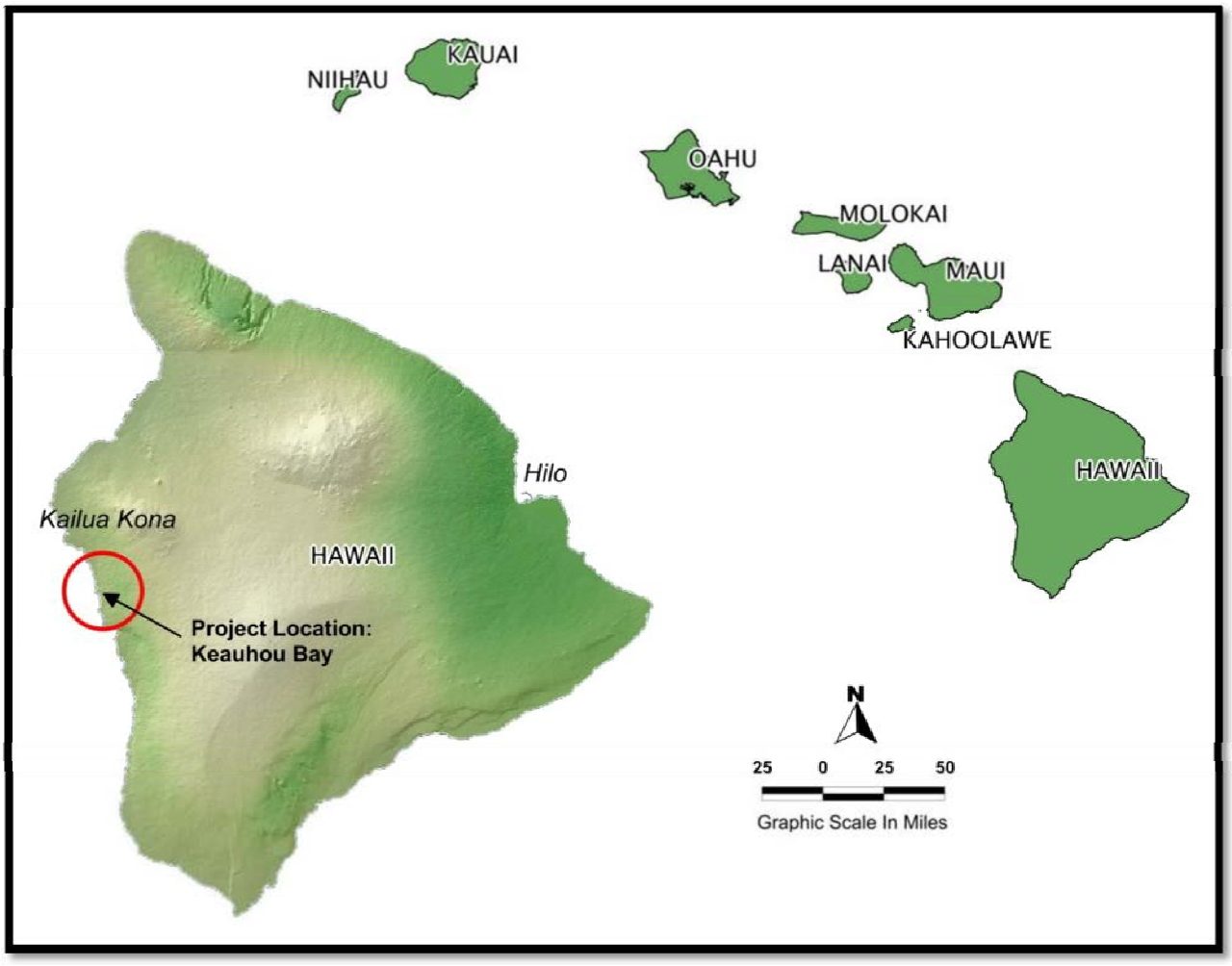
Drawings
Keauhou Bay Mooring Buoys

Keauhou Bay, Keauhou, North Kona, Island of Hawaii
Seaward of TMK (3) 7-8-012:008

Department of Land and Natural Resources
Division of Boating and Ocean Recreation

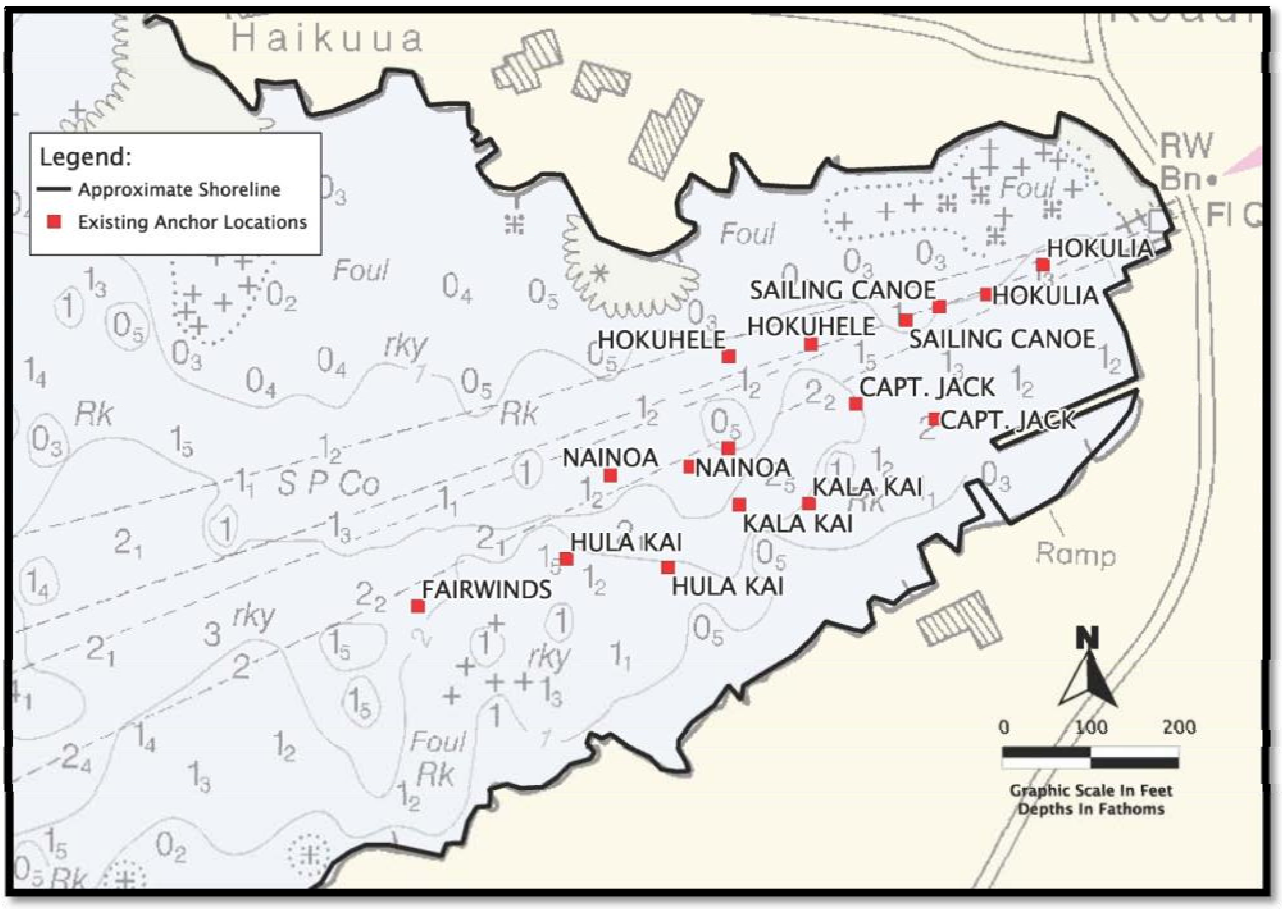
Prepared by:
Sea Engineering, Inc.

Vicinity Map – Keauhou Bay, North Kona, Island of Hawaii



Purpose: Vicinity Map Datum: NAD 83 Adjacent Property Owners: 1. State of Hawaii 2. Handgis Trust 3. Hokukano Ranch Inc. 4. Kamehameha Investment Corp. 5. Etc.	Applicant: DLNR Reference: Vicinity Map Location Address: Keauhou Bay, North Kona, Hawaii Tax Map Key: Seaward of (3) 7-8-012:008	Proposed: Proposed Re-designed Mooring Plan In: Keauhou Bay County: Hawaii State: Hawaii Sheet 1 of 7 Date: 07/02/2013

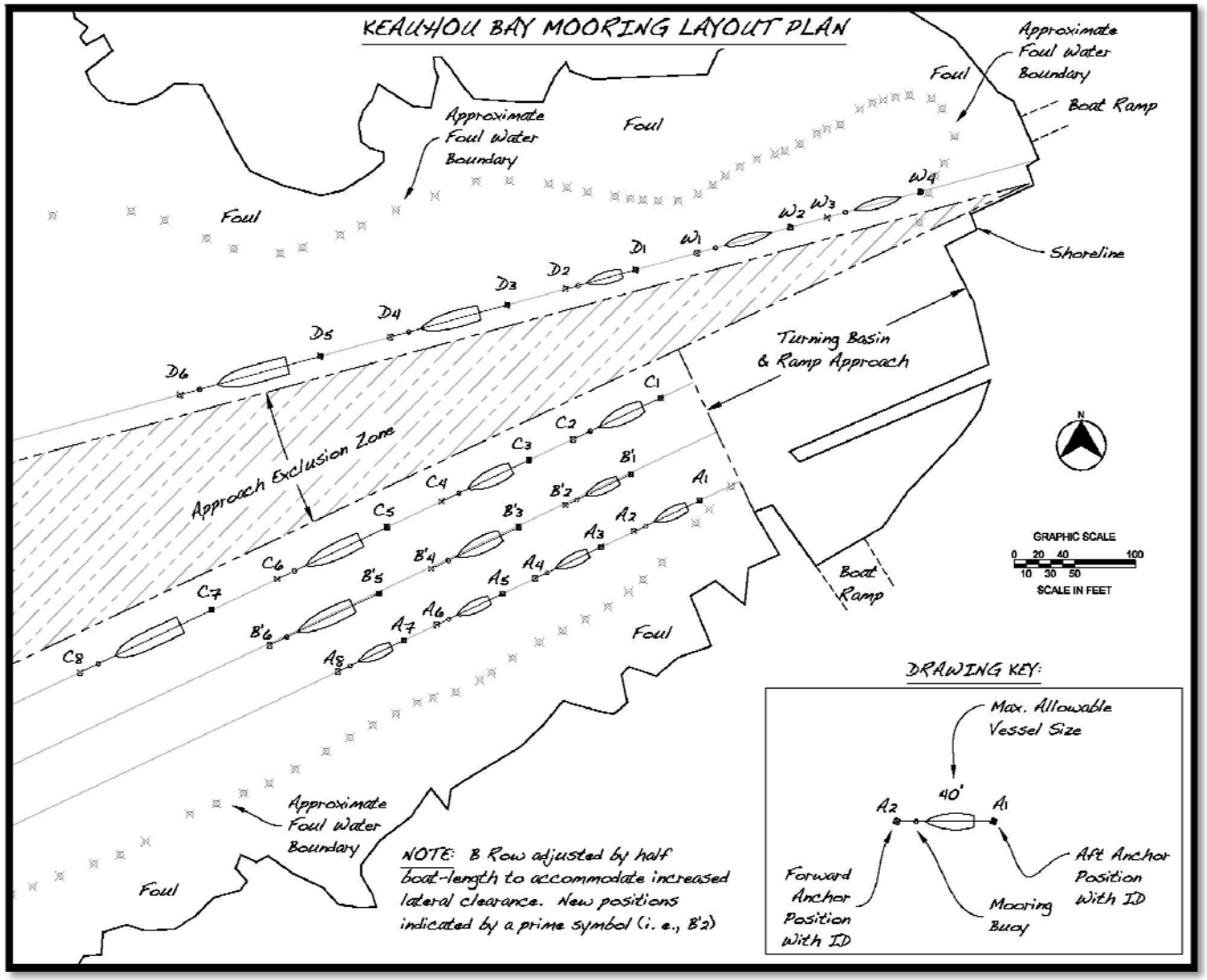
Location Map and Navigation Chart – Keauhou Bay, Keauhou Boat Launch, and Existing Boat Moorings



Reference: Location Map and Navigation Chart Applicant: DLNR Proposed Re-designed Moorings At: Keauhou Bay, North Kona, Hawaii Sheet 2 of 7 Date: 07/02/2013

Sea Engineering, Inc.
Makai Research Pier • 41-305 Kalanianaole Hwy • Waimanalo, Hawaii 96795-1820
Phone: (808) 259-7966 • FAX (808) 259-8143 • E-mail: sei@seaengineering.com • Website: www.seaengineering.com

Plan View – Re-Designed Mooring Layout

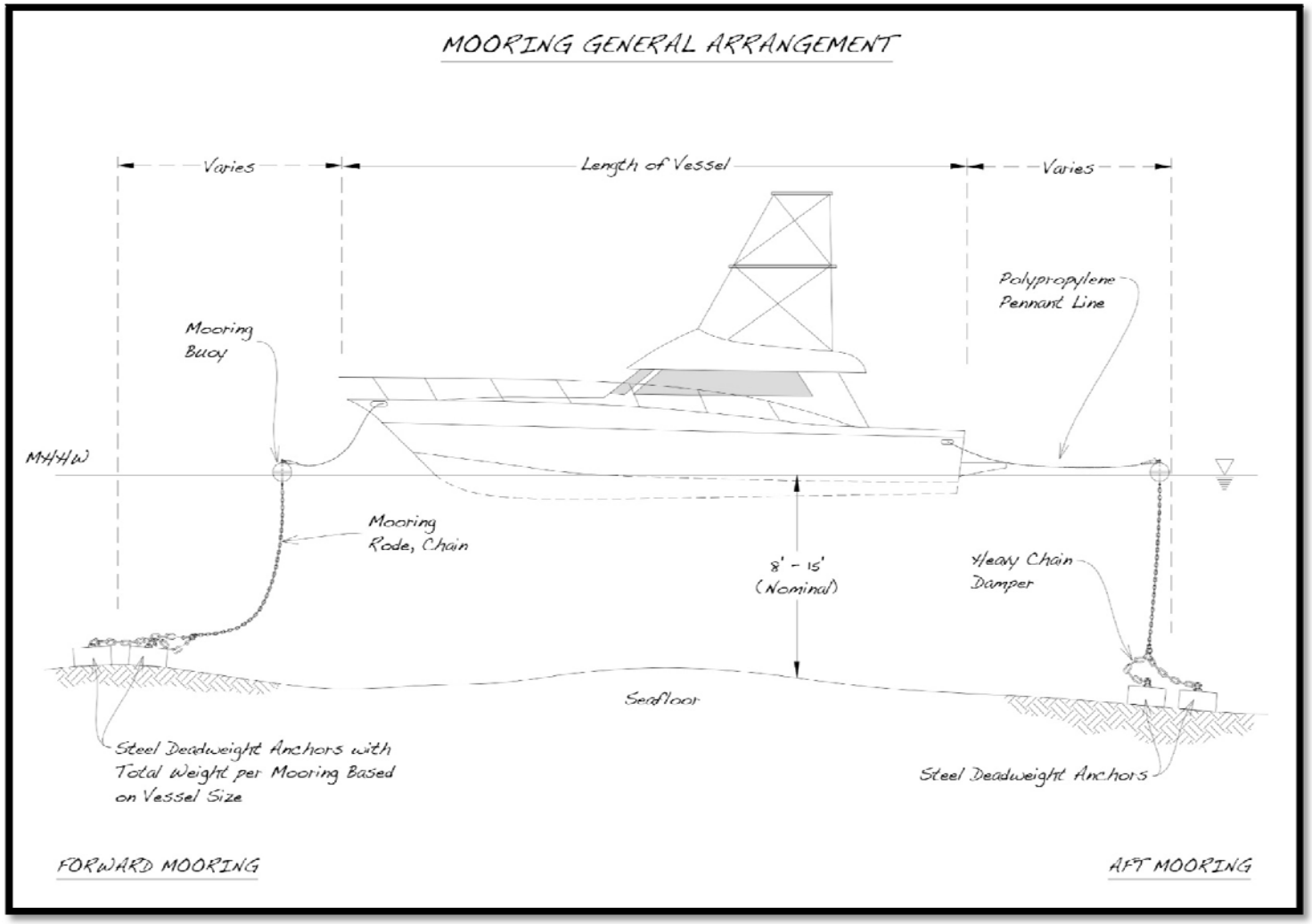


Reference: Plan View – Re-designed Mooring Layout
Applicant: DLNR

Proposed Re-designed Moorings
At: Keauhou Bay, North Kona, Hawaii

Sheet 3 of 7
Date: 07/02/2013

Profile View – Mooring General Arrangement



Reference: Profile View – Mooring General Arrangement

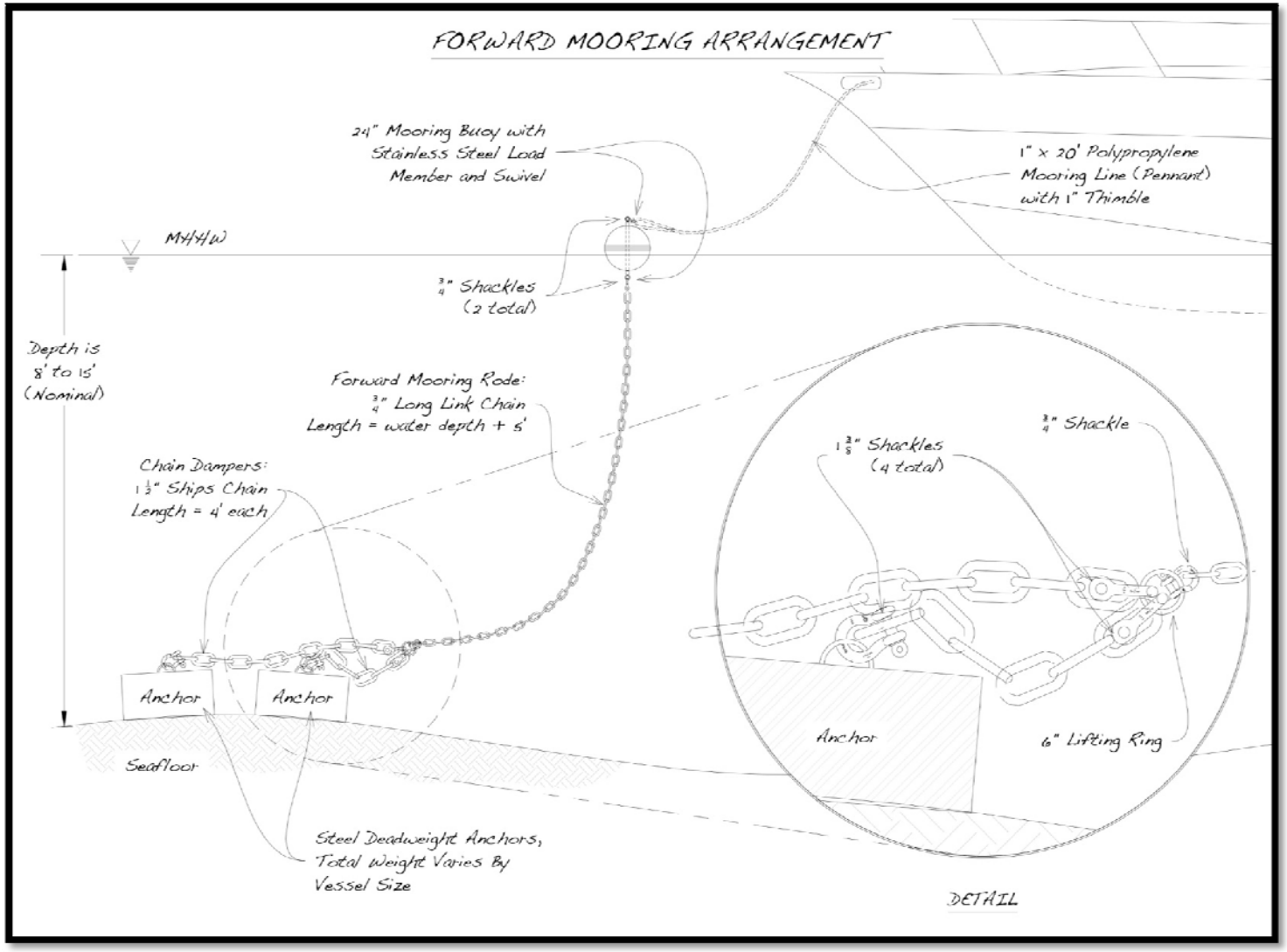
Applicant: DLNR

Proposed Re-designed Moorings At: Keauhou Bay, North Kona, Hawaii

Sheet 4 of 7

Date: 07/02/2013

Profile View – Forward Mooring Arrangement



Reference: Profile View – Forward Mooring Arrangement

Applicant: DLNR

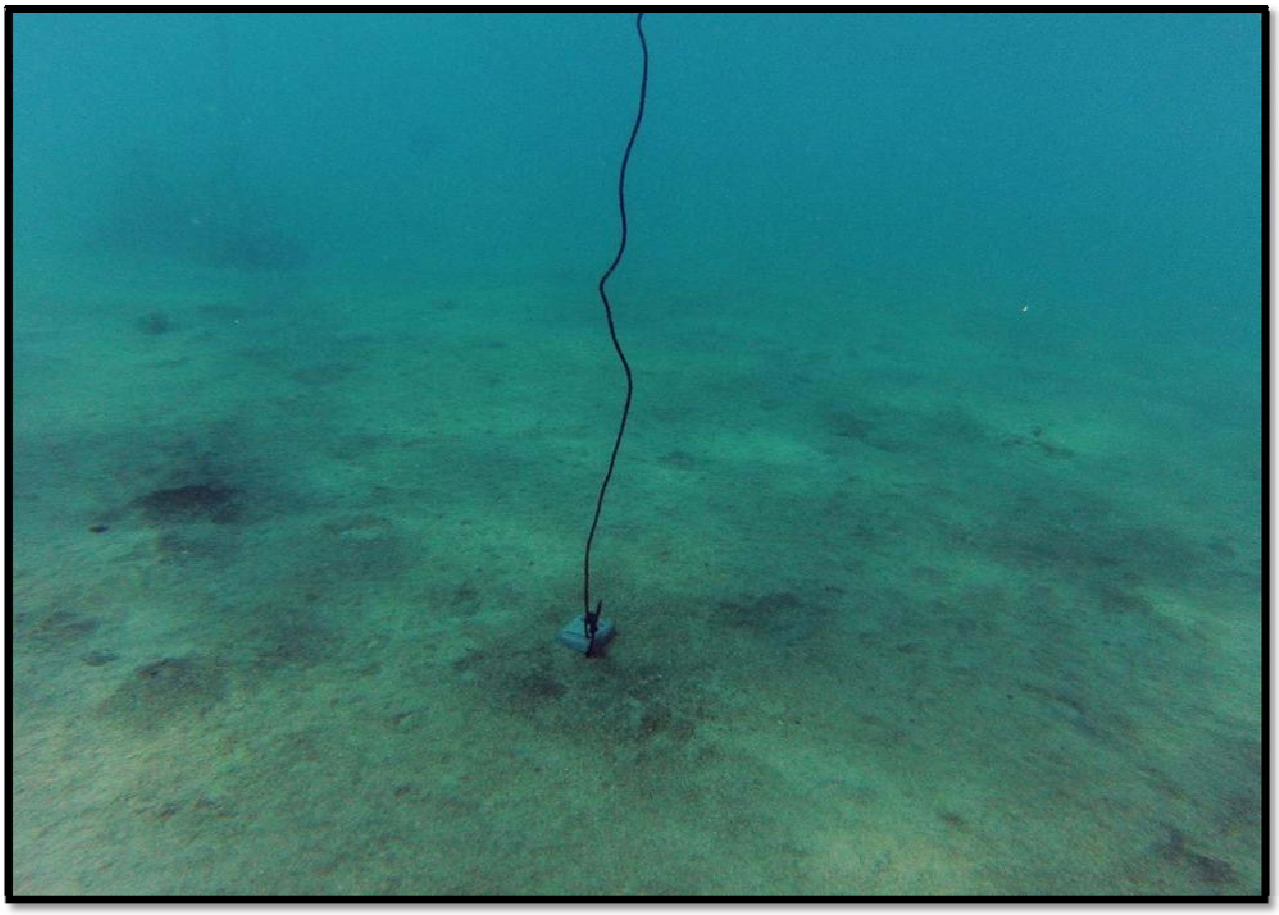
Proposed Re-designed Moorings At: Keauhou Bay, North Kona, Hawaii

Sheet 5 of 7

Date: 07/02/2013

Sea Engineering, Inc.
Makai Research Pier • 41-305 Kalanianaole Hwy • Waimanalo, Hawaii 96795-1820
Phone: (808) 259-7966 • FAX (808) 259-8143 • E-mail: sei@seaengineering.com • Website: www.seaengineering.com

Typical Soft Substrate Conditions for Mooring Locations



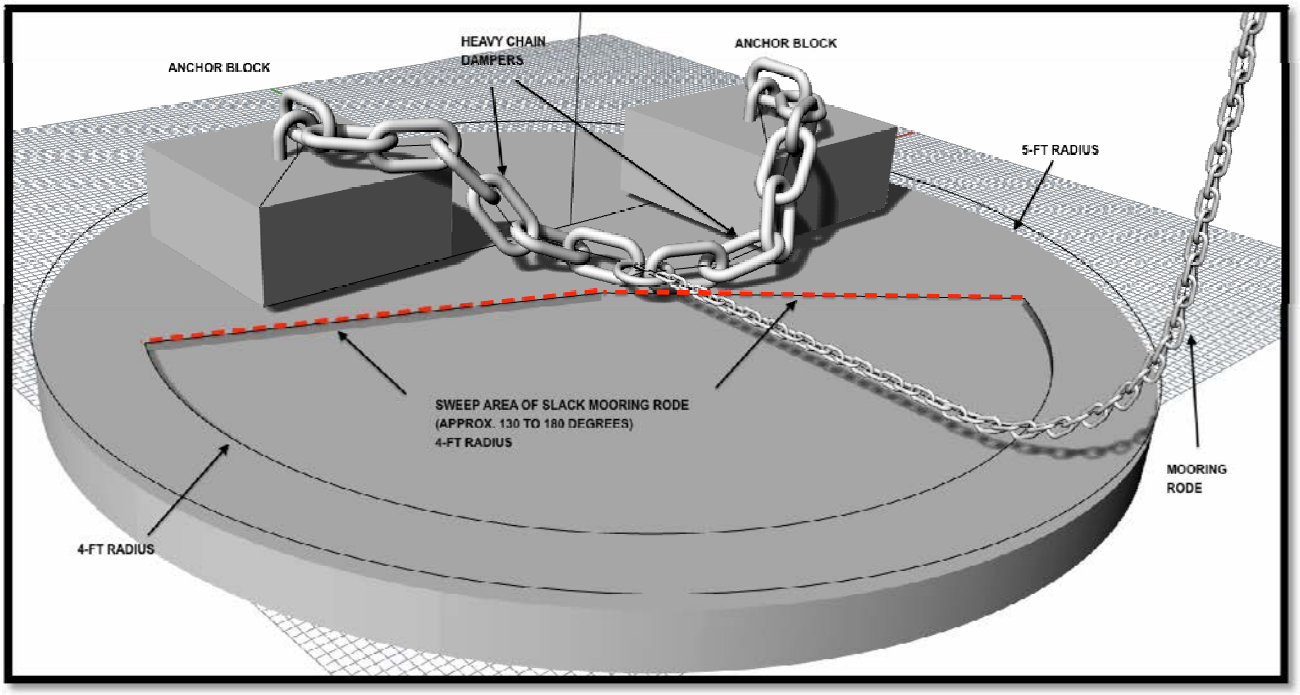
Reference: Typical Soft Substate Conditions for Mooring Locaitons

Applicant: DLNR

Proposed Re-designed Moorings
At: Keauhou Bay, North Kona, Hawaii

Sheet 6 of 7
Date: 07/02/2013

Oblique View of Mooring Blocks and Five Foot Sweep Radius

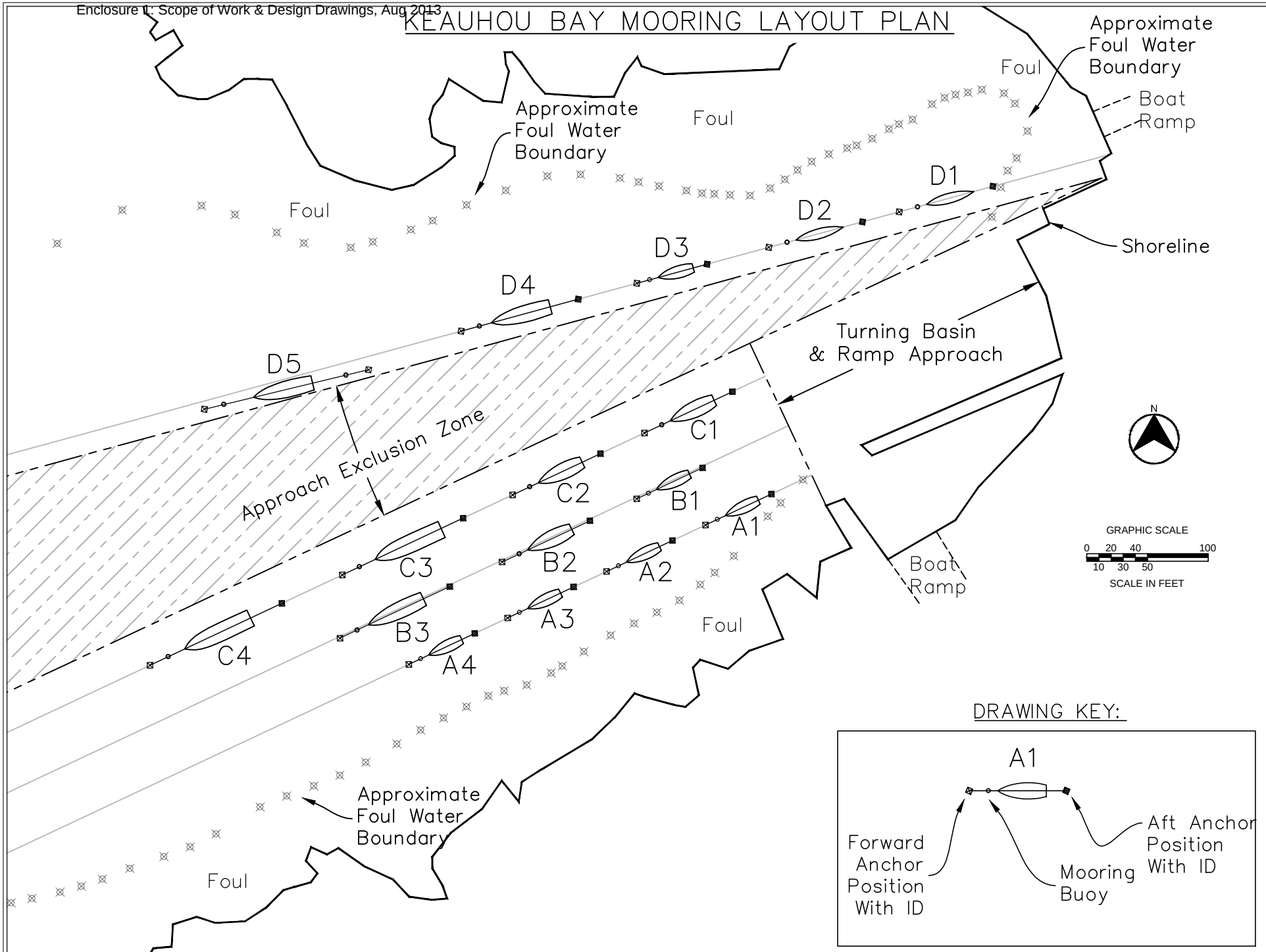


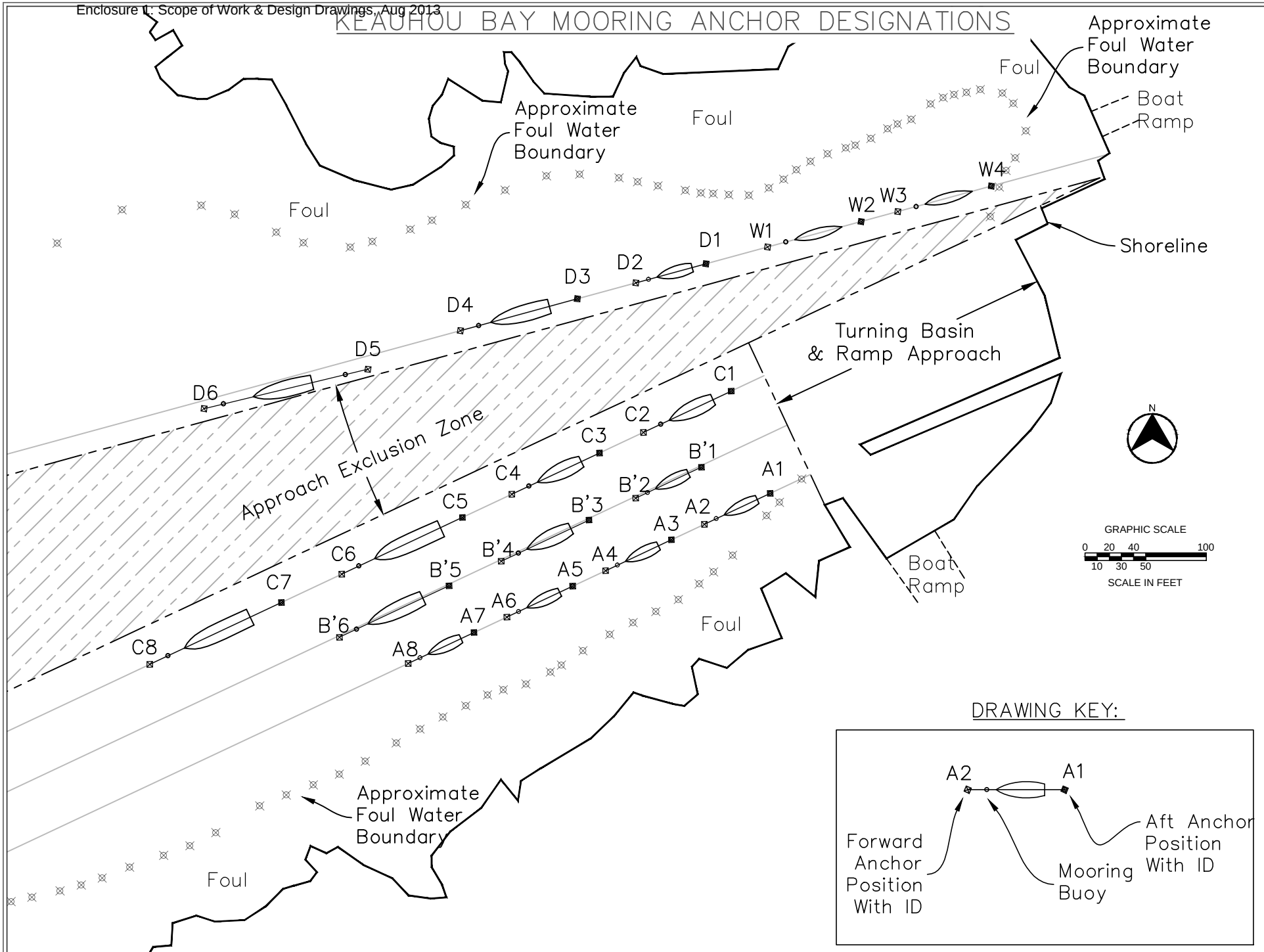
Reference: Oblique View of Mooring Blocks and Five Foot Sweep Radius

Applicant: DLNR

Proposed Re-designed Moorings
At: Keauhou Bay, North Kona, Hawaii

Sheet 7 of 7
Date: 07/02/2013


KEAUHOU BAY MOORING LAYOUT PLAN
Approximate Foul Water Boundary
Foul
Boat Ramp
Approximate Foul Water Boundary
Foul
Foul
D1
D2
D3
D4
D5
Shoreline
Turning Basin & Ramp Approach
Approach Exclusion Zone
C1
C2
C3
C4
B1
B2
B3
A1
A2
A3
A4
N
GRAPHIC SCALE
0 20 40 100
10 30 50
SCALE IN FEET
Boat Ramp
Foul
Approximate Foul Water Boundary
Foul
DRAWING KEY:
A1
Forward Anchor Position With ID
Mooring Buoy
Aft Anchor Position With ID

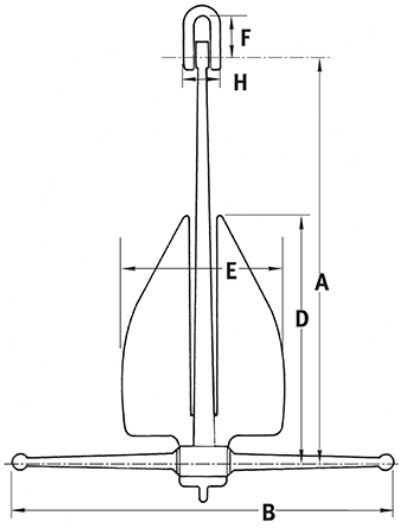

KEAUHOU BAY MOORING ANCHOR DESIGNATIONS
Approximate Foul Water Boundary
Foul
Boat Ramp
Shoreline
W1
W2
W3
W4
D1
D2
D3
D4
D5
D6
C1
C2
C3
C4
C5
C6
C7
C8
B'1
B'2
B'3
B'4
B'5
B'6
A1
A2
A3
A4
A5
A6
A7
A8
Approach Exclusion Zone
Turning Basin & Ramp Approach
N
GRAPHIC SCALE
0 20 40 100
10 30 50
SCALE IN FEET
DRAWING KEY:
A2
A1
Forward Anchor Position With ID
Mooring Buoy
Aft Anchor Position With ID

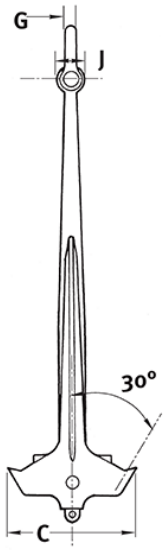
ANCHORS

About Anchors
AC/14
RWT
LWT
Stockless
Hall
US Navy Stockless

LWT

The “hook” head forces the flukes to dig in quickly, and the large fluke design provides tremendous hold- ing power in sand or mud bottoms. Adjuster blocks available to alter fluke angle.





Anchor Weight (lb)	A	B	C	D	E	F	G	H	J
100	41-1/2	39-1/2	12-3/16	24	15-5/8	3-3/4	7/8	3-3/8	2-1/4
150	46-3/4	44-1/2	13-11/16	27	17-3/8	5-1/2	1	4	2-3/8
200	47-1/2	45	14-3/16	29	18-7/8	5-1/2	1	4	3-1/8
250	47-1/2	45	14-9/16	29	18-7/8	5-1/2	1	4	3-1/8
300	53	50	16-5/16	32-1/2	21-1/4	7	1-1/4	5	3-1/4
350	53	50	16-11/16	32-1/2	21-1/2	7	1-1/4	5	3-1/4
400	57-1/2	54-1/4	17-3/4	35-1/4	23	7	1-1/4	5	3-1/2
450	60	56-1/2	18-3/8	36-3/4	24	7	1-1/4	5	3-3/4
500	61-1/2	58-1/2	19	37-1/2	24	7-1/2	1-1/2	6	4-1/4
750	69	64-1/2	21-1/8	42	28-7/16	7-1/2	1-1/2	6	4-7/8
1,000	75	71	24-1/2	46	29-1/4	9-3/4	2	8	5-1/4
2,000	92-1/2	85	30	56-1/2	37-1/4	12	2-1/2	9-1/2	7
3,000	108-1/2	104	34-3/4	66	40-3/8	15	3	11	7-3/4
4,000	116	110	37-1/2	71	44	15	3	11	9
5,000	118	112	38-3/4	72	44-3/4	17	3-1/2	12-1/2	9-1/2
6,000	124	118	41	76	47-1/4	19	4	14	10-1/4
7,000	124	118	41	76	47-1/4	19	4	14	10-1/4
8,000	128	121	43-1/2	78	50-1/4	19	4	14	12
9,000	133	126	45-1/4	81-1/8	52-1/4	19	4	14	12-1/2
10,000	144	137	49	88	55-1/4	22	4-1/2	16	13
11,000	144	137	49	88	55-1/4	22	4-1/2	16	13

Anchor Weight (lb)	A	B	C	D	E	F	G	H	J
12,000	146	138-1/2	49-3/4	89-1/8	57-3/8	22	4-1/2	16	13-3/4
13,000	154	146	52-1/2	94	60-1/2	24	5	17-1/2	14-1/2
14,000	154	146	52-1/2	94	60-1/2	24	5	17-1/2	14-1/2
15,000	157	149-1/4	53-5/8	96	61-7/8	24	5	17-1/2	14-7/8
16,000	161	152-1/2	54-7/8	98-1/4	63-1/4	24	5	17-1/2	15-1/8
17,000	164	155-1/2	56	100	64-1/2	24	5	17-1/2	15-1/2
18,000	167	158-1/2	57	102	65-5/8	24	5	17-1/2	15-3/4
19,000	170-1/8	161-3/8	58	104	66-3/4	25	5-1/2	20	16
20,000	173	164	59	106	68	25	5-1/2	20	16-3/8
25,000	191	178	67-1/4	116	75	26-1/2	5-1/2	20	16
30,000	198	189	67-1/2	121	78	29	5-1/2	20	17
35,000	208	199	71	127	82	30-1/2	6	21	18
40,000	218	240	75	131	86	32	6	24	20-1/2
45,000	227	250	78	136	89	33	6-1/4	26	22
50,000	235	260	81	141	92	34	6-1/2	27	23
60,000	250	278	86	150	97	36	6-1/2	29	24
70,000	264	290	91	157	103	38	7	30	26
80,000	275	304	95	165	107	40	7-1/2	31	27
90,000	287	317	99	172	112	41	8	33	28
100,000	296	328	102	178	116	43	8	34	29

Mooring Buoys

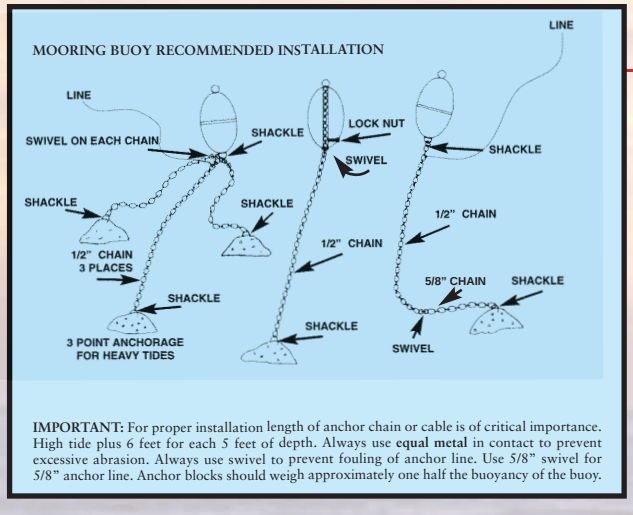
Swivel and Eye Style Mooring Buoys

Features Include:

Hot dipped galvanized swivel & eye;
also available in stainless steel
Interior rod bent to prevent pull-thru in stormy conditions
Hard Polyethylene shell - 2lb. high-density foam filled
Standard color white
Also available in orange, specify O and yellow, specify Y

PREMIUM MARK V SELECTION CHART

MODEL NUMBER	DIAMETER	SWIVEL & EYE	BUOYANCY (+ OR -5 lbs.)	PACK	SHIPPING WEIGHT
4400	12"	1/2"	22 lbs.	4	26 lbs.
4401	15"	1/2"	46 lbs.	4	42 lbs.
4402	18"	1/2"	90 lbs.	1	14 lbs.
4403	24"	5/8"	209 lbs.	1	27 lbs.
4404	30"	5/8"	400 lbs.	1	47 lbs.



IMPORTANT: For proper installation length of anchor chain or cable is of critical importance. High tide plus 6 feet for each 5 feet of depth. Always use **equal metal** in contact to prevent excessive abrasion. Always use swivel to prevent fouling of anchor line. Use 5/8" swivel for 5/8" anchor line. Anchor blocks should weigh approximately one half the buoyancy of the buoy.

Tube Style Mooring Buoys

PREMIUM MARK V SELECTION CHART-TUBE STYLE

MODEL NUMBER	DIAMETER	TUBE SIZE	BUOYANCY (+ OR -5 lbs.)	PACK	SHIPPING WEIGHT
4402-T-2"	18"	2"	87 lbs.	1	13 lbs.
4402-T-2½"	18"	2½"	86 lbs.	1	13 lbs.
4402-T-3"	18"	3"	85 lbs.	1	13 lbs.
4403-T-2"	24"	2"	196 lbs.	1	24 lbs.
4403-T-2½"	24"	2½"	195 lbs.	1	24 lbs.
4403-T-3"	24"	3"	194 lbs.	1	24 lbs.
4404-T-2"	30"	2"	396 lbs.	1	47 lbs.
4404-T-2½"	30"	2½"	395 lbs.	1	47 lbs.
4404-T-3"	30"	3"	394 lbs.	1	47 lbs.

Features Include:

2", 2 1/2 " and 3" PVC tube, other tube sizes available please contact factory
Hard Shell - 2lb. High-density foam filled
Standard color white
Also available in orange, specify O and yellow, specify Y

JIM-BUOY®

Drum Mooring Buoy

Features Include:

Heavy-duty construction
High density polyethylene
Maximum Stability- flat top and bottom
Galvanized swivel and eye, stainless available on request
3" Tube will accommodate model 4000 mooring system

DRUM BUOY SELECTION CHART

MODEL NUMBER	DIAMETER	SWIVEL & EYE	BUOYANCY (+ OR -5 lbs.)	PACK	SHIPPING WEIGHT
4304	30"	5/8"	240 lbs.	1	33 lbs.
4304-T	30"	3" tube	230 lbs.	1	30 lbs.

CHAIN

Stud Link
Open Link
Long Link Lashing Chain
Dock Fender Chain
Di-Lok
Grade 100 Alloy Chain
BBB Windlass Chain
Proof Coil Grade 30
High Test Grade 43
Grade 70
High Test Grade 43 ISO
Type 304 Stainless
Type 316 Stainless

OPEN LINK

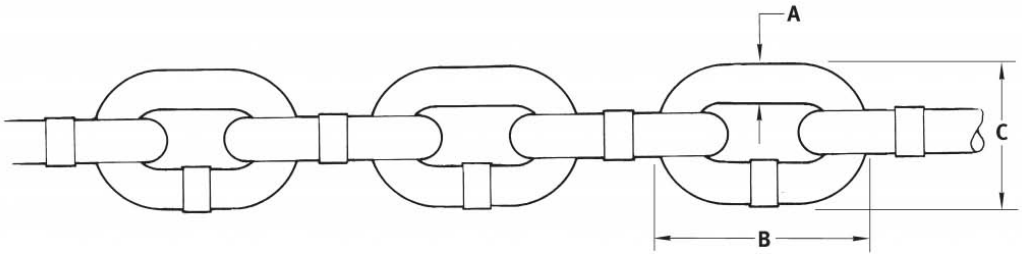
Manufactured in accordance with U.S. Coast Guard Specification Mil-C-22521C, welded buoy chain is an open-link, studless chain manufactured to a minimum quality of Grade 1.

Both the chain links and the end links are manufactured from carbon-steel bar stock, AISI 1030 per Mil-S-16974, with a tensile strength ranging from 71,00 to 92,500 psi.

Available with or without end links.

Ask for specifications.

Dimensions			Carbon Steel		Alloy Steel		Approx. Weight Per Foot (lbs.)
Link Diameter A	Link Length B	Link Width C	Proof Load (lbs.)	Break Test Load (lbs.)	Proof Load (lbs.)	Break Test Load (lbs.)	
1/2	3	1-7/8	7,500	15,000	13,500	30,500	2.3
5/8	3-3/4	2-3/16	11,700	23,400	21,200	47,700	3.6
3/4	4-1/2	2-11/16	16,000	32,000	32,200	69,500	4.8
7/8	5-1/4	3-1/8	22,000	44,000	40,200	93,500	5.6
1	6	3-9/16	29,000	58,000	54,100	122,000	8.6
1-1/8	6-3/4	4	38,500	77,000	62,300	143,000	10.8
1-1/4	7-1/2	4-7/16	45,500	91,000	80,500	180,000	13.5
1-1/2	9	5-5/16	65,500	131,000	112,000	244,000	19.4
1-5/8	9-3/4	5-13/16	76,500	153,000	123,000	270,000	22.7
1-3/4	10-1/2	6-1/4	86,500	173,000	142,000	312,000	26.3
1-7/8	11-1/4	6-11/16	100,000	200,000	163,000	360,000	30.1
2	12	7	115,000	230,000	185,000	410,000	34.3



Crosby® Screw Pin Shackles

Load Rated® Fatigue Rated® "QT" QUENCHED & TEMPERED QUIC-CHECK® MAXTOUGH® "TA" TYPE APPROVED

SCREW PIN ANCHOR SHACKLES

G-209 / S-209

G-209 Screw pin anchor shackles meet the performance requirements of Federal Specification RR-C-271F Type IVA, Grade A, Class 2, except for those provisions required of the contractor. For additional information, see page 444.

- Capacities 1/3 thru 55 metric tons, grade 6.
- Forged - Quenched and Tempered, with alloy pins.
- Working Load Limit and grade "6" permanently shown on every shackle.
- Hot Dip galvanized or Self Colored.
- Fatigue rated.
- Shackles 25t and larger are **RFID EQUIPPED.**
- Shackles can be furnished proof tested with certificates to designated standards, such as ABS, DNV, Lloyds, or other certification. Charges for proof testing and certification available when requested at the time of order.
- Approved for use at -40 degree C (-40 degree F) to 204 degree C (400 degree F).
- 2t through 25t bow and screw pin are Certified to meet charpy impact testing of 42 joules (31 ft-lbs.) min. ave. at -20 degree C (-4 degree F).
- All shackles are Quenched and Tempered and can meet DNV impact requirements of 42 joules (31 ft. lbs.) at -20 degree C (-4 degree F).
- Meets or exceeds all requirements of ASME B30.26.
- Type Approval and certification in accordance with ABS 2006 Steel Vessel Rules 1-1-17.7, and ABS Guide for Certification of Cranes.
- Crosby 2t through 25t G209 anchor shackles are type approved to DNV Certification Notes 2.7-1 -Offshore Containers. These Crosby shackles are statistical proof and impact tested. The tests are conducted by Crosby and 3.1 test certification is available upon request.
- Look for the Red Pin® . . . the mark of genuine Crosby quality.

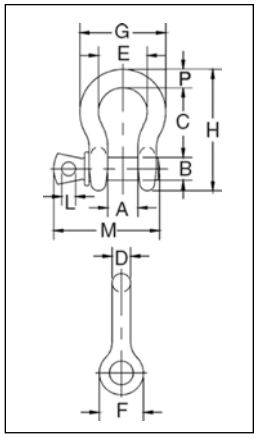
SCREW PIN CHAIN SHACKLES

G-210 / S-210

G-210 Screw pin chain shackles meet the performance requirements of Federal Specification RR-C-271F, Type IVB, Grade A, Class 2, except for those provisions required of the contractor. For additional information, see page 444.

G-209 / S-209 Screw Pin Anchor Shackles

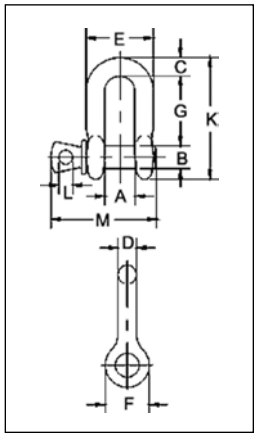
G-209 / S-209



Nominal Size (in.)	Working Load Limit (t)*	Stock No. G-209	Stock No. S-209	Weight Each (lbs.)	Dimensions (in.) A	B	C	D	E	F	G	H	L	M	P	Tolerance + / - C	A
3/16	1/3	1018357	–	.06	.38	.25	.88	.19	.60	.56	.98	1.47	.16	1.14	.19	.06	.06
1/4	1/2	1018375	1018384	.10	.47	.31	1.13	.25	.78	.61	1.28	1.84	.19	1.43	.25	.06	.06
5/16	3/4	1018393	1018400	.18	.53	.38	1.22	.31	.84	.75	1.47	2.09	.22	1.71	.31	.06	.06
3/8	1	1018419	1018428	.31	.66	.44	1.44	.38	1.03	.91	1.78	2.49	.25	2.02	.38	.13	.06
7/16	1-1/2	1018437	1018446	.38	.75	.50	1.69	.44	1.16	1.06	2.03	2.91	.31	2.37	.44	.13	.06
1/2	2	1018455	1018464	.72	.81	.63	1.88	.50	1.31	1.19	2.31	3.28	.38	2.69	.50	.13	.06
5/8	3-1/4	1018473	1018482	1.37	1.06	.75	2.38	.63	1.69	1.50	2.94	4.19	.44	3.34	.69	.13	.06
3/4	4-3/4	1018491	1018507	2.35	1.25	.88	2.81	.75	2.00	1.81	3.50	4.97	.50	3.97	.81	.25	.06
7/8	6-1/2	1018516	1018525	3.62	1.44	1.00	3.31	.88	2.28	2.09	4.03	5.83	.50	4.50	.97	.25	.06
1	8-1/2	1018534	1018543	5.03	1.69	1.13	3.75	1.00	2.69	2.38	4.69	6.56	.56	5.13	1.06	.25	.06
1-1/8	9-1/2	1018552	1018561	7.41	1.81	1.25	4.25	1.16	2.91	2.69	5.16	7.47	.63	5.71	1.25	.25	.06
1-1/4	12	1018570	1018589	9.50	2.03	1.38	4.69	1.29	3.25	3.00	5.75	8.25	.69	6.25	1.38	.25	.06
1-3/8	13-1/2	1018598	1018605	13.53	2.25	1.50	5.25	1.42	3.63	3.31	6.38	9.16	.75	6.83	1.50	.25	.13
1-1/2	17	1018614	1018623	17.20	2.38	1.63	5.75	1.54	3.88	3.63	6.88	10.00	.81	7.33	1.62	.25	.13
1-3/4	25	1018632	1018641	27.78	2.88	2.00	7.00	1.84	5.00	4.19	8.86	12.34	1.00	9.06	2.25	.25	.13
2	35	1018650	1018669	45.00	3.25	2.25	7.75	2.08	5.75	4.81	9.97	13.68	1.22	10.35	2.40	.25	.13
2-1/2	55	1018678	1018687	85.75	4.13	2.75	10.50	2.71	7.25	5.69	12.87	17.84	1.38	13.00	3.13	.25	.25

G-210 / S-210 Screw Pin Chain Shackles

G-210 / S-210



Nominal Size (in.)	Working Load Limit (t)*	Stock No. G-210	Stock No. S-210	Weight Each (lbs.)	Dimensions (in.) A	B	C	D	E	F	G	K	L	M	Tolerance + / - G	A
1/4	1/2	1019150	1019169	.11	.47	.31	.25	.25	.97	.62	.97	1.59	.19	1.43	.06	.06
5/16	3/4	1019178	1019187	.17	.53	.38	.31	.31	1.15	.75	1.07	1.91	.22	1.71	.06	.06
3/8	1	1019196	1019203	.28	.66	.44	.38	.38	1.42	.92	1.28	2.31	.25	2.02	.13	.06
7/16	1-1/2	1019212	1019221	.43	.75	.50	.44	.44	1.63	1.06	1.48	2.67	.31	2.37	.13	.06
1/2	2	1019230	1019249	.59	.81	.63	.50	.50	1.81	1.18	1.66	3.03	.38	2.69	.13	.06
5/8	3-1/4	1019258	1019267	1.25	1.06	.75	.63	.63	2.32	1.50	2.04	3.76	.44	3.34	.13	.06
3/4	4-3/4	1019276	1019285	2.63	1.25	.88	.81	.75	2.75	1.81	2.40	4.53	.50	3.97	.25	.06
7/8	6-1/2	1019294	1019301	3.16	1.44	1.00	.97	.88	3.20	2.10	2.86	5.33	.50	4.50	.25	.06
1	8-1/2	1019310	1019329	4.75	1.69	1.13	1.00	1.00	3.69	2.38	3.24	5.94	.56	5.13	.25	.06
1-1/8	9-1/2	1019338	1019347	6.75	1.81	1.25	1.25	1.13	4.07	2.69	3.61	6.78	.63	5.71	.25	.06
1-1/4	12	1019356	1019365	9.06	2.03	1.38	1.38	1.25	4.53	3.00	3.97	7.50	.69	6.25	.25	.13
1-3/8	13-1/2	1019374	1019383	11.63	2.25	1.50	1.50	1.38	5.01	3.31	4.43	8.28	.75	6.53	.25	.13
1-1/2	17	1019392	1019409	15.95	2.38	1.63	1.62	1.50	5.38	3.62	4.87	9.05	.81	7.33	.25	.13
1-3/4	25	1019418	1019427	26.75	2.88	2.00	2.12	1.75	6.38	4.19	5.78	10.97	1.00	9.06	.25	.13
2	35	1019436	1019445	42.31	3.25	2.25	2.36	2.10	7.25	5.00	6.77	12.74	1.13	10.35	.25	.13
2-1/2	55	1019454	1019463	71.75	4.12	2.75	2.63	2.63	9.38	5.68	8.07	14.85	1.38	13.00	.25	.25

* NOTE: Maximum Proof Load is 2.0 times the Working Load Limit. Minimum Ultimate Strength is 6 times the Working Load Limit. For Working Load Limit reduction due to side loading applications, see page 91.

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Technical Product Description

HIGH TENSILE POLYPROPYLENE ROPES (YELLOW) 3 & 4 STRAND ROPES (YELLOW) 8 STRAND

The high strength HTP ropes monofilaments are produced according to the latest state of art in extrusion technology. This guarantees a superior and safe performance in practice. The ropes are available in 3-4 strand constructions. These are used mainly on fishing vessels and inland shipping. Also HTP 8 strand plaited ropes are increasingly sold as mooring ropes on SEA going vessels.

HTP ropes are floating and do not absorb water; which makes handling very easy. The special nature of the filaments contribute highly to an increased abrasion resistance, thus improving the lifetime and security.

Specific gravity:	+/- 0,91
Chemical resistance:	good resistance to acids
Elongation at break:	approximately 16%
Floats:	yes
Resistance to abrasion:	excellent
Flexibility:	remains flexible when wet
Resistance conditions:	same resistance when wet or dry
Water absorption:	do not absorb water
Shrinkage:	do not shrink
Splice conditions:	easy
Snap-Back:	low
Lifetime:	much longer lifetime than comparable qualities
Testing method:	based on EN 919

HIGH TENSILE POLYPROPYLENE ROPES (YELLOW) 3 & 4 STRAND

DIAMETER	BREAKINGLOAD	1 COIL 220mtr
8 MM	1,2 TON	
10 MM	1,8 TON	
12 MM	2,7 TON	
16 MM	4,5 TON	
18 MM	5,8 TON	
22 MM	8,4 TON	
24 MM	9,5 TON	
28 MM	13,4TON	
32 MM	16,8 TON	
36 MM*	20,6 TON	
40MM*	25,7 TON	
44 MM*	31,8 TON	

HIGH TENSILE POLYPROPYLENE ROPES (YELLOW) 8 STRAND

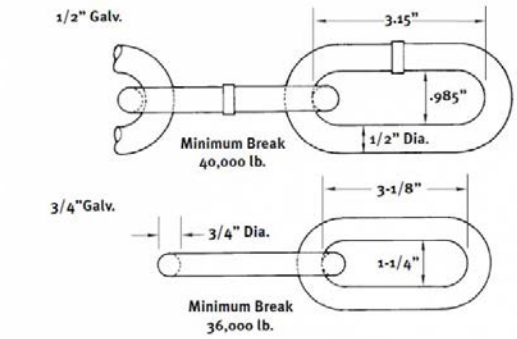
DIAMETER	BREAKINGLOAD	1 COIL 220mtr
40 MM	28,4 TON	
44 MM	33,9 TON	
48 MM*	39,8 TON	
52 MM*	45,6 TON	
56 MM*	50,9 TON	
60 MM*	59,2 TON	
64 MM	67,9 TON	

LARGER DIMENSIONS AVAILABLE ON REQUEST

CHAIN
Stud Link
Open Link
Long Link Lashing Chain
Dock Fender Chain
Di-Lok
Grade 100 Alloy Chain
BBB Windlass Chain
Proof Coil Grade 30
High Test Grade 43
Grade 70
High Test Grade 43 ISO
Type 304 Stainless
Type 316 Stainless

LONG LINK LASHING CHAIN

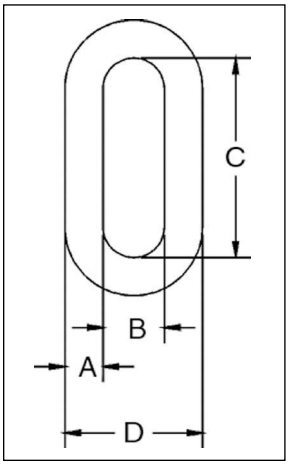
LONG LINK LASHING CHAIN						
TRADE SIZE		INSIDE DIMENSIONS (IN)		MINIMUM BREAK		#/FT
INCHES	MM	LENGTH	WIDTH	#	KG	-
3/8	10			20000	9071	1.25
1/2	13	3.15	0.985	40000	18144	2.5
5/8	16			55000	24948	3.75
3/4	20	3.125	1.25	36000	16329	4.5



Links and Rings

G-340 S-340

G-340 from 5/8″ thru 7/8″ meet the performance requirements of Federal Specification RR-C-271F, Type XV, except for those provisions required of the contractor. For additional information, see page 444.



Weldless End Links

- Forged carbon steel - Quenched and Tempered
- Self Colored or Hot Dip galvanized.

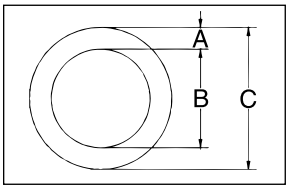
Size (A) (in.)	Stock No.		Working Load Limit (lbs.)*	Weight Each (lbs.)	Dimensions (in.)		
	G-340 Galv.	S-340 S.C.			B	C	D
5/16	1014057	1014066	2500	.15	.50	1.75	1.18
3/8	1014075	1014084	3800	.22	.56	1.88	1.38
1/2	1014093	1014100	6500	.49	.75	2.38	1.81
5/8	1014119	1014128	9300	.97	1.00	3.25	2.32
3/4	1014137	1014146	14000	1.51	1.13	3.50	2.68
7/8	1014155	1014164	12000	2.59	2.00	5.13	3.75
1	1014173	1014182	15200	3.95	2.25	5.75	4.25
1-1/4	1014191	1014208	26400	7.30	2.50	7.00	5.00
1-3/8	1014217	1014226	30000	10.38	2.75	7.75	5.50

*Ultimate Load is 5 times the Working Load Limit. Based on single leg sling (in-line load), or resultant load on multiple legs with an included angle less than or equal to 120°.

QUIC-CHECK®

S-643

Weldless Rings meet the performance requirements of Federal Specification RR-C-271F Type VI, except for those provisions required of the contractor. For additional information, see page 444.



S-643 Weldless Rings

- Forged carbon steel - Quenched and Tempered.
- Self Colored

Size (A) (in.)	S-643 Stock No.	Working Load Limit Single Pull (lbs.)*	Weight Each (lbs.)	Dimensions (in.)	
				B	C
7/8 x 4	1013780	7200	2.72	4.00	5.75
7/8 x 5-1/2	1013806	5600	3.47	5.50	7.25
1 x 4	1013824	10800	3.69	4.00	6.00
1-1/8 x 6	1013842	10400	6.60	6.00	8.25
1-1/4 x 5	1013860	17000	6.82	5.00	7.50
1-3/8 x 6	1013888	19000	10.12	6.00	8.75

*Ultimate Load is 6 times the Working Load Limit.

Sea Engineering, Inc.

Makai Research Pier • 41-305 Kalanianaole Hwy • Waimanalo, Hawaii 96795-1820
Phone: (808) 259-7966 • FAX (808) 259-8143 • E-mail: sei@seaengineering.com • Website: www.seaengineering.com

Exhibit 2

Best Management Practice Plan
Keauhou Bay Mooring Buoys

Keauhou Bay, Keauhou, North Kona, Island of Hawaii
Seaward of TMK (3) 7-8-012:008

Department of Land and Natural Resources
Division of Boating and Ocean Recreation

Prepared by:
Sea Engineering, Inc.

The following Best Management Practices (BMPs) will be adhered to during conduct of the work.

Suitable Material

1. All construction material shall be free of contaminants of any kind including: excessive silt, sludge, anoxic or decaying organic matter, clay, dirt, oil, floating debris, grease or foam or any other pollutant that would produce an undesirable condition to the beach or water quality.

Historic or Cultural Features

1. No adverse impacts to any historical or cultural feature are expected, since the project is located on sand and pebble marine substrate on the bay's seafloor, and no subaerial land area is involved.

2. Should any unanticipated archaeological site(s), such as walls, platforms, pavements and mounds, or remains such as artifacts, burials, concentrations of charcoal or shells be uncovered by the work activity, all work shall cease in the immediate area and the contractor shall notify the Hawaii County State Historic Preservation Office at 808.933.7653. No work shall resume until the owner/contractor obtains clearance from the Historic Preservation Office.

Environmental Protection

1. All permits and clearances shall be obtained prior to the start of any construction activities. The Contractor and his sub-contractors shall ensure that all construction work complies with all permit conditions and commitments made with environmental agencies.

2. The Contractor shall perform the work in a manner that minimizes environmental pollution and damage as a result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of the construction period.

3. The construction contractor shall complete daily inspection of equipment for conditions that could cause spills or leaks; clean equipment prior to operation near the water; properly site storage, refueling, and servicing sites; and implement spill response procedures and stormy weather preparation plans.

4. Any construction related debris that may pose an entanglement hazard to marine protected species must be removed from the project site if not actively being used and/or at the conclusion of the construction work.

5. The Contractor shall not dispose of any concrete, steel, wood, and any other debris into ocean waters. Any debris that falls into the water shall be removed at the Contractor's own expense.

6. No contamination (trash or debris disposal, alien species introductions, etc.) of marine (reef flats, lagoons, open oceans, etc.) environments adjacent to the project site shall result from project related activities.

7. The Contractor shall remove all floating or submerged construction materials and/or debris at the end of each day.

8. The Contractor is responsible for the proper handling, storage and/or disposal of all waste generated by this construction.

9. The Contractor shall confine all construction activities to areas defined by the drawings and specifications. No construction materials shall be stockpiled in the marine environment outside of the immediate area of construction.

10. The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface or marine waters. Daily visual inspection of the construction site and its environs will be conducted by a designated individual, or his representative, to verify that the permitted activities do not result in uncontrolled adverse environmental impacts. Visual inspections will be documented with photographs and written descriptions, if necessary.

11. The Contractor shall ensure that an Oil Spill Response Plan is in place which shall detail procedures for managing the accidental release of petroleum products to the aquatic environment during construction. Absorbent pads, containment booms and skimmers will be available to facilitate the cleanup of petroleum spills.

12. Any spills or other contaminations shall be immediately reported to the DOH Clean Water Branch (808-586-4309).

13. In the event that floating hydrocarbon (oil, gas) products are observed, the Contractor or his designated individual will be responsible for directing that in-water work be halted so that appropriate corrective measures are taken in accordance with the BMPP. The Honolulu District Regulatory Branch shall be notified as soon as practicable, and the activity causing the plume will be modified by containment. The responsible individual will document the event and the measures taken to correct the issue, and will report the incident (with photographs) to the Regulatory Branch as soon as is practicable. Work may continue only after the issue is no longer visible.

14. No contamination of the marine environment shall result from the permitted activities. Particular care must be taken to ensure that no petroleum products, trash or other debris enter near-shore and open ocean waters. When such material is found within the project area, the Contractor, or his designated construction agent, shall collect and dispose of this material at an approved upland disposal site.

15. Waste materials and waste waters directly derived from construction activities shall not be allowed to leak, leach or otherwise enter marine waters.

16. The project shall be completed in accordance with all applicable State and County health and safety regulations.

17. Best management practices shall be utilized to minimize adverse effects to air quality and noise levels, including the use of emission control devices and noise attenuating devices.

18. Noise shall be kept within acceptable levels at all times in conformance with HAR Title 11 § 46 Community Noise Control, State Department of Health, Public Health Regulations. The contractor shall obtain and pay for a community noise permit from the State Department of Health when the construction equipment or other devices emit noise at levels exceeding the allowable limits.

19. The Contractor shall provide notifications to the National Marine Fisheries Services, 808.944.2200, including the Protected Resources Division, at least 72 hours prior to scheduled start of construction.

20. The Contractor shall provide the following information to the U.S. Coast Guard, Aids-To-Navigation Office, at least 30 days prior to the start of construction:

    a. Project start date
    b. Project completion date
    c. Name of the Contractor performing the work with the name of a point of contact, address and telephone number
    d. Hours of construction activities for the project, i.e. 0800-1700 hrs, Monday through Friday
    e. If vessels are involved, names, call signs and radio frequencies on the VHF-FM.
    f. Any special request of maritime public, i.e. reduction of speed, wide berth
    g. General scope of project and how it will affect the maritime public, i.e. degree of encroachment of navigable waters and how obstructions will be marked i.e. signs, lights
    h. The information shall be sent to:

        Commander
        Fourteenth Coast Guard District
        Prince Kuhio Federal Building
        300 Ala Moana Boulevard, Room 9-216
        Honolulu, Hawaii 96850-4982
        Phone: 808.541.2315

Protected Marine Species

1. The project manager shall designate a competent observer to survey the marine areas adjacent to the proposed action for ESA-listed marine species, including but not limited to the green sea turtle, hawksbill sea turtle, and Hawaiian monk seal.

2. Visual surveys for ESA-listed marine species shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour, to ensure that no protected species are in the area (typically within 50 yards of the proposed work).

3. All in-water work shall be postponed or halted When ESA-listed marine species are within 50 yards of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species are noticed after work has already begun, that work may continue only if there is no way for the activity to adversely affect the animal(s). For example, divers performing surveys or underwater work (excluding the use of toxic chemicals) is likely safe. The use of heavy machinery is not.

4. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA listed marine species.

5. All on-site project personnel must be apprised of the status of any listed species potentially present in the project area and the protections afforded to those species under federal laws. A brochure explaining the laws and guidelines for listed species in Hawaii, American Samoa, and Guam may be downloaded from: http:www.nmfs.noaa.gov/prot_res/MMWatch/Hawaii.htm

6. The Contractor shall keep a record of all turtle sightings, incidents of disturbance, or injury, and shall provide a report to the State and the National Marine Fisheries Service (NMFS), and will be the contact person for any issues involving green sea turtles during construction.

7. The Contractor shall immediately report any incidental take of marine mammals. The incident must be reported immediately to NOAA Fisheries' 24-hour hotline at 1-888-256-9840, and the Regulatory Branch of the USACE at 808-438-9258. In Hawaii, any injuries incidents of disturbance or injury to sea turtles must be immediately reported, and must include the name and phone number of a point of contact, location of the incident, and nature of the take and/or injury. The incident should also be reported to the Pacific Island Protected Species Program Manager, Southwest Region (Tel: 808-973-2987, fax: 808-973-2941).

Boat Operations

The following BMP's, as recommended by NMFS, shall be implemented to reduce or eliminate adverse effects on protected marine species through potential interactions with in-water activities such as boat operations.

1. Constant vigilance shall be kept for the presence of Federally Listed Species.

2. When piloting vessels, vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles.

3. Reduce vessel speed to 10 knots or less when piloting vessels in the proximity of marine mammals.

4. Reduce vessel speed to 5 knots or less when piloting vessels in areas of known or suspected turtle activity.

5. Marine mammals and sea turtles should not be encircled or trapped between multiple vessels or between vessels and the shore.

6. If approached by a marine mammal or turtle, put the engine in neutral and allow the animal to pass.

7. Unless specifically covered by a separate permit that allows activity in proximity to protected species, all in-water work will be postponed when whales are within 100 yards or other protected species are within 50 yards. Activity will commence only after the animal(s) depart the area.

8. Should protected species enter the area while in-water work is already in progress, the activity may continue only when that activity has no reasonable expectation to adversely affect the animal(s).

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March 26, 2013 *AECOS* No. 1347

To: Chris Goody
Sea Engineering Inc.

Marine Resources Survey of Keauhou Small Boat Harbor, Keauhou, Hawaiʻi

On March 6 and 7, 2013, *AECOS* biologist, Stacey Kilarski, conducted a reconnaissance survey in Keauhou Small Boat Harbor (KBH). The SCUBA survey was performed to assess marine resources at twenty-eight proposed mooring anchor locations. Figure 1 presents the proposed mooring anchor locations, which are arranged in rows labeled A through D. Eight anchor locations (labeled 1 through 8) were surveyed in each of rows A and C, and six anchor locations (labeled 1 through 6) were surveyed in rows B and D. The survey encompassed the harbor bottom in an approximate 12-ft (4-m) radius from each proposed mooring anchor location. Based on likely mooring design, a 5-ft (1.5-m) swath of chain would rest on the seafloor at each anchor location (Goody, pers. comm. 2013). Therefore, the biologist noted coral (visual size estimate, morphology, and ease of removal) within a 5-ft (1.5-m) radius from the center of each mooring location.

An inventory was made for any corals, invasive species, seagrass, marine protected species (DLNR, 1998, 2007; NOAA-NMFS, 2010; USFWS, 2008, 2012), and other non-coral macro-invertebrates at each mooring anchor location. A list of species observed and their relative abundances is presented as Appendix A. A summary of the bottom composition, including coral distribution within the 12-ft (4-m) and 5-ft (1.5-m) radii is provided in Appendix B. Photos taken at each mooring anchor location are presented in Appendix C. Photos show a horizontal transect along the seafloor, which represents the distance from anchor center point (12 ft; 4 m).

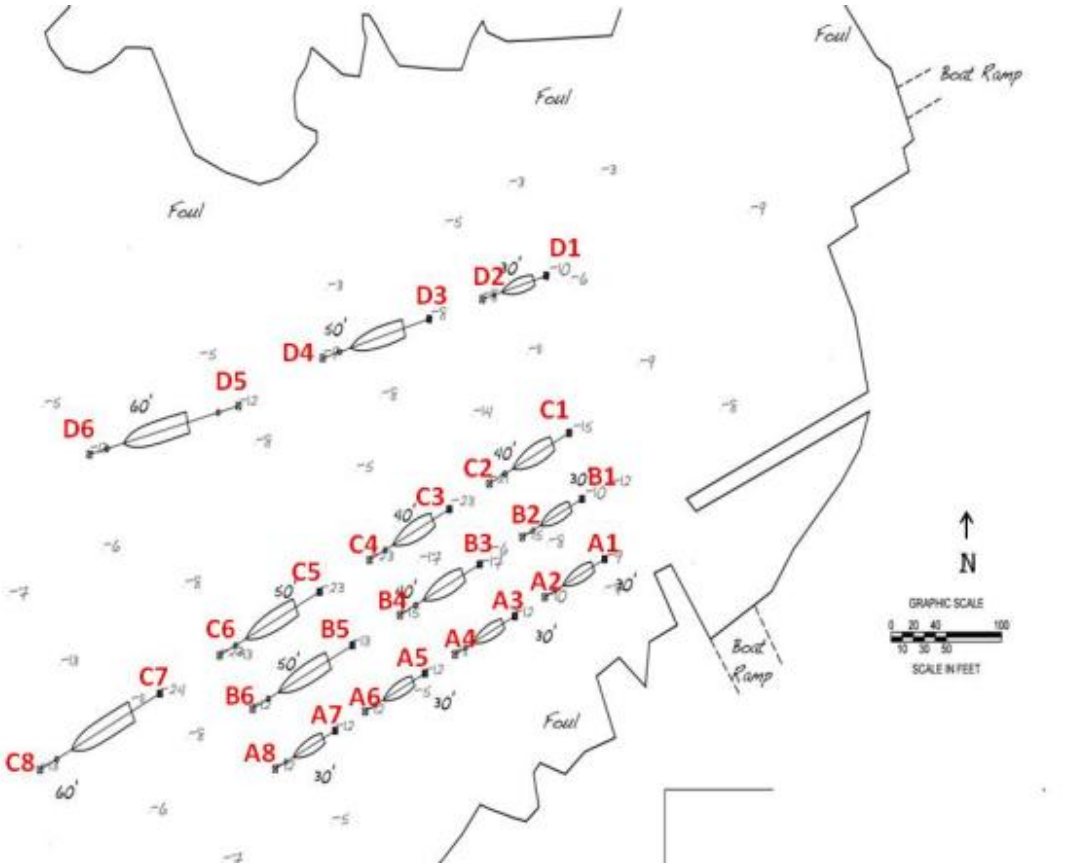


Figure 1. Keauhou Harbor proposed mooring anchor locations.

Anchor location A1

The harbor bottom within a 12-ft (4-m) radius of the proposed anchor location A1 consists of sand, loose rubble, and scattered boulders. Within the 5-ft (1.5-m) radius of the anchor location, one moveable colony of *Porites lobata* (50 cm) was encountered. Beyond the 5-ft (1.5 m) radial distance, boulders and loose rubble host some coral (*Porites lobata* and *Cyphastrea ocellina*). Collector urchins (*Tripneustes gratilla*) are common. No sea grasses or invasive species were observed.

Anchor location A2

The harbor bottom within a 12-ft (4-m) radius of anchor location A2 consists of sand, loose rubble and large boulders. Within 5 ft (1.5 m) of the anchor location, several difficult-to-move large boulders host corals (*P. lobata* and *Poc. meandrina*). Beyond 5 ft (1.5 m), large boulders and loose rubble host other corals (*P. lobata, Poc. meandrina*, *Poc. damicornis,* and *Montipora capitata*). At

12 ft (4 m) northwest from the anchor location, a large cluster of debris (concrete slabs) with encrusting coral colonies was observed. No sea grasses or invasive species were seen.

Anchor location A3
The harbor bottom within 12 ft (4-m) of proposed anchor location A3 consists of sand and small boulders. At 5 ft (1.5 m) from the anchor location, one moveable colony each of *P. lobata* (55 cm) and *Poc. meandrina* (15 cm) were encountered. Beyond 5 ft (1.5 m), small colonies (1 to 5 cm and 6 to 10 cm diameter size class) of *Poc. meandrina, P. lobata*, and *M. capitata* occur on the loose rubble and scattered small boulders. At 8 ft (2.4 m), debris (concrete slabs) with encrusting corals was observed. No sea grasses or invasive species were observed.

Anchor location A4
The harbor bottom within 12 ft (4 m) of proposed anchor location A4 consists of sand and large boulders. Within 5 ft (1.5 m) of the anchor location, three moveable boulders and one difficult-to-move boulder, all with several coral colonies (*P. lobata* and *Pavona varians*) were encountered (see Table 1 for colony details). Beyond 5 ft (1.5 m) occur several large, difficult-to-move boulders with high coral cover. No sea grasses or invasive species were observed.

Anchor location A5
The harbor bottom within 12 ft (4 m) of proposed anchor A5 consists of sand and coral. Within 5 ft (1.5 m) of the anchor location, coral dominates the bottom. Cover is high (estimated 70%), with large (>80 cm diameter size class) colonies of *P. lobata*, and colonies of *Pav. varians*, *M. capitata*, and *P. compressa*. Urchins (*T. gratilla* and *Echinothrix calamaris*) and sea cucumbers (*H. atra*) are common on limestone outcrops. One lei triggerfish (*Sufflamen bursa*) was seen foraging on the bottom. No sea grasses of invasive species were observed.

Anchor location A6
The harbor bottom within 12 ft (4 m) of anchor location A6 consists of sand and few small coral colonies. Within 5 ft (1.5 m) of the anchor location, two moveable boulders with several coral colonies (*P. lobata*) were encountered (see Table 1 for colony details). The bottom beyond 5 ft (1.5 m) is all sand out to 12 ft (4 m). No sea grasses or invasive species were observed.

Anchor location A7
The harbor bottom within 12 ft (4 m) of anchor location A7 comprises sand, gravel, loose rubble, and remnant chains and anchors. No coral colonies were encountered. No sea grasses or invasive species were observed.

Anchor location A8
The harbor bottom within 12 ft (4 m) of proposed anchor A8 consists of sand and large boulders. Within the 5 ft (1.5 m) of the anchor location, no corals occur. At 6 ft (1.8 m) southwest from the anchor location, large, difficult-to-move boulders with several colonies of *P. lobata* occur. Also, at 6 ft (1.8 m) northwest from the anchor location is an approximate (2.4-m; 8-ft) wide limestone outcrop. One oriental flying gurnard (*Dactyloptena orientalis*) was seen swimming over the sand bottom. No sea grasses or invasive species were observed.

Anchor location B1
The harbor bottom within 12 ft (4 m) radius of the center point of proposed anchor location B1 consists of sand and loose rubble with encrusting *Leptastrea bewickensis* and *P. lobata.* Within the 5 ft (1.5 m) radius of the center point of the anchor location, no corals occur. At 11 ft (3.4 m) northeast from the anchor location, one difficult-to-move boulder with *P. lobata* colonies occurs. No sea grasses or invasive species were observed.

Anchor location B2
The harbor bottom within 12 ft (4 m) ofproposed anchor location B2 consists of sand, loose rubble and debris (including a large horizontally laid pile and anchor line). Within the 5 ft (1.5 m) radius of the center point of the anchor location, no corals occur. At 8 ft (2.4 m) southwest from the anchor location, an old concrete pile lies horizontal on the seafloor. Corals (*P. lobata*, *Poc. meandrina*, and *Poc. damicornis*) encrust the pile. Also at 8 ft (2.4 m) from the anchor location is an anchor line, with several small (<5 cm) *Poc. damicornis* colonies. No sea grasses or invasive species were observed.

Anchor location B3
The harbor bottom within 12 ft (4 m) of proposed anchor location B3 consists of sand and limestone outcrops with coral cover. Within 5 ft (1.5 m) of the anchor location, no corals occur. Two large (10-ft; 3-m) wide limestone outcrops occur at 8 ft (2.4 m) northwest and 11 ft (3.3 m) northeast from the anchor location. Large (>80 cm) *P. lobata* and *P. compressa* colonies and *M. capitata*, *Pav. varians*, and *Pocillopora* spp. are common in the outcrops. Urchins (*T. gratilla*) are common on the reef outcrops. Two white-spotted augers (*Terebra guttata*) were encountered in the sand. No sea grasses or invasive species were observed.

Anchor location B4
The harbor bottom within 12 ft (4 m) of proposed anchor location B4 consists of sand, gravel and loose rubble. No coral colonies were encountered within the survey area for this anchor. No sea grasses or invasive species were observed.

Anchor location B5
The harbor bottom within 12 ft (4 m) of proposed anchor location B5 consists of sand and gravel. No coral colonies were encountered within 12 ft (4 m) of the proposed anchor location. At 12 ft (4 m) from the anchor location, a pile of derelict boat lines lies on the seafloor.

Anchor location B6
The harbor bottom within 12 ft (4 m) of proposed anchor location B6 consists of sand, gravel, debris, and some coral. No coral colonies were encountered within 5 ft (1.5 m) of the center point of the anchor location. A limestone outcrop occurs at 7 ft (2.1 m); also at 7 ft (2.1 m) from the anchor location is a large debris conglomeration (anchor lines, plastic buckets and rebar) with encrusting (*P. lobata*) and branching (*Poc. meandrina* and *Poc. damicornis)* corals. No sea grasses or invasive species were observed.

Anchor location C1
The harbor bottom within 12 ft (4 m) of proposed anchor location C1 consists of sand, loose rubble, and boulders with coral. Within 5 ft (1.5 m) of the anchor location, moveable, loose rubble with corals (*Pocillopora* spp.) were encountered. At 6 ft (1.8 m) from the anchor location, two large, difficult-to-move boulders with encrusting (*Pav. varians*) and mound (*P. lobata*) corals occur. No sea grasses or invasive species were observed.

Anchor location C2
The harbor bottom within 12 ft (4 m) of proposed anchor location C2 consists of sand and limestone outcrops. Within 5 ft (1.5 m) of the anchor location, the bottom is sand and no live coral heads occur. At 7 ft (2.1 m) northeast and 8 ft (2.4 m) east from the anchor location, large (1-m wide) difficult-to-move limestone outcrops occur and these have encrusting (*Pav. varians* and *M. capitata*) and mound (*P. lobata*) corals. One large boulder with several mound and encrusting *P. lobata* occurs at 10 ft (3 m) south from the anchor location. No sea grasses or invasive species were observed.

Anchor location C3
The harbor bottom within 12 ft (4 m) of proposed anchor location C3 comprises sand, loose rubble, and limestone outcrops. Within 5 ft (1.5 m) of the anchor location, the bottom is sand and loose rubble; no corals occur. At 8 ft (1.8 m) north, 8 ft (2.4 m) west, and 10 ft (3 m) southwest from the anchor location are large (1-m wide), difficult-to-move limestone outcrops with encrusting (*Pav. varians* and *M. capitata*) and mound (*P. lobata*) corals growing on them. No sea grasses or invasive species were observed.

Anchor location C4
The harbor bottom within 12 ft (4 m) of proposed anchor location C4 comprises sand. No coral colonies, sea grasses, or invasive species were observed.

Anchor location C5
The harbor bottom within 12 ft (4 m) of proposed anchor location C5 consists of sand and few scattered small boulders and corals. Within 5 ft (1.5 m) of the anchor location, the bottom is sand; no corals occur. At 11 ft (3.4 m) from the anchor location, three 25-cm *P. lobata* colonies are present. No sea grasses or invasive species were observed.

Anchor location C6
The harbor bottom within 12 ft (4 m) of proposed anchor location C6 consists of sand and scattered loose rubble. No coral colonies, sea grasses, or invasive species were observed.

Anchor location C7
The harbor bottom within 12 ft (4 m) of proposed anchor location C7 consists of sand, scattered loose rubble with corals, and a limestone outcrop. Several small (10 to 20-cm) colonies of *P. lobata* occur within 5 ft (1.5 m) from the anchor center point. At 8 ft (2.4 m) north from the proposed anchor is a 3-m wide limestone outcrop with live coral (*P. lobata*, *P. compressa*, *Pocillopora* spp., *Pav. varians*). No sea grasses or invasive species were observed.

Anchor location C8
The harbor bottom within 12 ft (4 m) of proposed anchor location C8 consists of sand, small boulders, and a limestone outcrop. Within 5 ft (1.5 m) of the anchor location, the bottom is sand and no corals occur. Urchins (*T. gratilla*) are common in this area. At 7 ft (3.4 m) north from the anchor location, is a limestone outcrop with corals (*P. lobata*, *Poc. meandrina*, *P.eydouxi, P. compressa*). No sea grasses or invasive species were observed. Mooring location could be positioned to avoid impacts to corals.

Anchor location D1
The harbor bottom within 12 ft (4 m) of proposed anchor location D1 consists of sand, rubble, and several moveable boulders with coral. Within 5 ft (1.5 m) of the anchor location, no corals occur. At 8 ft (2.4 m) and 12 ft (4 m) north from the anchor location, occur several moveable boulders with encrusting colonies of *P. lobata*. No sea grasses or invasive species were observed.

Anchor location D2
The harbor bottom within 12 ft (4 m) ofproposed anchor location D2 consists of sand, rubble and many moveable boulders with coral. Within the 5 ft (1.5 m) radius of the center point of the anchor, there is one small moveable boulder with encrusting and mound *P. lobata* colonies. At 6 ft (1.8 m) and 12 ft (4 m) north from the anchor location, there are many moveable boulders with encrusting colonies of *P. lobata*. No sea grasses or invasive species were observed.

Anchor location D3
The harbor bottom within 12 ft (4 m) of proposed anchor location D3 consists of sand, rubble, and many boulders (some moveable, some difficult-to-move) with coral. Within the 5 ft (1.5 m) of the proposed anchor occur several small boulders with *P. lobata* colonies. Extending north from 5 ft (1.5 m) to 12 ft (3.0 m) are several large and difficult-to-move and some moveable boulders with coral colonies (*P. lobata*, *Poc. eydouxi*, and *Poc. meandrina*). No sea grasses or invasive species were observed.

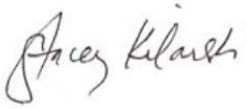
Anchor location D4
The harbor bottom within 12 ft (4 m) of proposed anchor location D4 consists of sand, rubble, and several moveable corals. Within 5 ft (1.5 m) of the anchor, the bottom is loose rubble and lacks coral growth. At 10 ft (3.0 m) from the anchor location is a large moveable boulder with coral colonies (*P. lobata*) and debris with encrusting (*P. lobata*) and branching (*P. compressa*) corals. No sea grasses or invasive species were observed

Anchor location D5
The harbor bottom within 12 ft (4 m) of proposed anchor location D5 consists of sand, rubble and several moveable coral. Within the 5 ft (1.5 m) radius of the center point of the anchor, the bottom is loose rubble and no coral. At 9 ft (2.7 m) from the anchor location, there are several moveable boulders with coral colonies (*P. lobata*, *Pav. varians*, and *Poc. meandrina*). No sea grasses or invasive species were observed.

Anchor location D6
The harbor bottom within 12 ft (4 m) of proposed anchor location D5 consists of sand, rubble, and several moveable coral heads. Within the 5-ft (1.5-m) radius of the proposed anchor location, the bottom is loose rubble and has no live coral. At 6 ft (1.8 m) from the anchor location, there are several moveable boulders with coral colonies (*P. lobata*). No sea grasses or invasive species were observed.

No federally-listed (USFWS, 2012) threatened or endangered species were encountered during the survey (e.g., sea turtles, monk seal, cetaceans). No candidate species of coral for listing (NOAA-NMFS, 2010) were observed. One state protected (DLNR, 1998, 2007) species was observed in the Project vicinity: pearl oyster.

Signed,



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Appendix A

Inventory of aquatic biota observed in Keauhou Small Boat Harbor, March 6 & 7, 2013

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
	ALGAE		
RHODOPHYTA	RED ALGAE		
Porolithon gardineri	coralline algae	**Ind.**	O
Porolithon onkodes	coralline algae	**Ind.**	O
Hydrolithon gardineri		**Ind.**	C
Hydrolithon onkodes		**Ind.**	O
Pneophyllum conicum		**Ind.**	O
	INVERTEBRATES		
SCELRACTINIA	HARD CORALS		
POCILLOPORIDAE			
Pocillopora meandrina	cauliflower coral	**Ind.**	C
Pocillopora eydouxi	antler coral	**Ind.**	O
Pocillopora damicornis	lace coral	**Ind.**	O
ACROPORIDAE			
Montipora capitata	rice coral	**Ind.**	R
PORITIDAE			
Porites lobata	lobe coral	**Ind.**	A
Porites compressa	finger coral	**Ind.**	R
AGARICIIDAE			
Pavona varians	corrugated coral	**Ind.**	O
FAVIIDAE			
Leptastrea bewickensis	bewick coral	**Ind.**	U
ANNELIDA, POLYCHAETA,			
SABELLIDAE	WORMS		
Sabellastarte spectabilis	feather duster worm	**Ind.**	U
TEREBELLIDAE			
Lomia medusa	Medusa spaghetti worm	**Ind.**	U
MOLLUSCA, GASTROPODA			
TEREBRIDAE,			
Terebra guttata	white-spotted auger; *pūpū loloa, ʻoiʻoi*	**End.**	R
CONIDAE			
Conus sp.		**Ind.**	U

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
CASSIDIDAE			
Cassis cornuta	horned helmet; *pū puhi*	**Nat.**	R
HIPPONICIDAE			
Hipponix imbricatus	shingly hoof shells	**End.**	C
VERMETIDAE			
Serpulorbis variabilis	variable worm snail	**Ind.**	O
MOLLUSCA, BIVALVIA			
PTERIIDAE			
Pinctada margaritifera	black-lipped pearl oyster, *pā*	**Ind.**	O
ISOGNOMONIDAE			
Isognomon perna	brown purse shell, *nahawele*	**Ind**.	C
OSTREIDAE			
Ostrea sandvicensis	Hawaiian oyster	**End.**	C
ARTHOPODA, CRUSTACEA, DECOPODA			
ALPHEIDAE			
Alpheus deuteropus	snapping shrimp (in *P. lobata*)	**Ind.**	R
TRAPEZIIDAE			
Trapezia sp.	coral guard crab	**Ind.**	R
ECHINODERMATEA, OPHIUROIDEA			
OPHIOCOMIDAE			
Ophiocoma erinaceus	brittle star	**Ind.**	U
Ophiocoma pica	brittle star	**Ind.**	U
ECHINODERMATA, ECHINOIDEA	SEA URCHINS		
DIADEMATIDAE			
Echinothrix calamaris	banded urchin	**Ind.**	C
ECHINOMETRIDAE			
Echinometra mathaei	rock-boring urchin, *ʻina kea*	**Ind.**	C
Echinometra oblonga	oblong boring urchin; *ʻina*	**Ind.**	U
Heterocentrotus mammillatus	red pencil urchin; *hāʻukeʻukeʻulaʻula*	**Ind.**	O
TOXOPNEUSTIDAE			
Tripneustes gratilla	collector urchin; *hāwaʻe maoli*	**Ind.**	A
ECHINODERMATA, HOLOTHUROIDEA	SEA CUCUMBERS		
Holothuria atra	black sea cucumber	**Ind.**	O

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
	VERTEBRATES		
VERTEBRATA, PICES	BONY FISHES		
FISTULARIIDAE	CORNETFISH		
Fistularia commersonii	bluespotted cornetfish, *nūnū*	**Ind.**	R
DACTYLOPTERIDAE	GURNARD		
Dactyloptena orientalis	oriental flying gurnard; *loloa'u*	**Ind.**	R
MULLIDAE	GOATFISH		
Mulloidichthys vanicolensis	yellowfin goatfish; *weke 'ula*	**Ind.**	C
Mulloidichthys flavolineatus	square-spot goatfish; *weke'ā*	**Ind.**	C
Parupeneus multifasciatus	manybar goatfish, *moano*	**Ind.**	R
CHAETODONTIDAE	BUTTERFLYFISH		
Chaetodon auriga	threadfin butterflyfish; *kīkākapu*	**Ind.**	C
Chaetodon lunula	raccoon butterflyfish, *kīkākapu*	**Ind.**	R
Chaetodon ornatissimus	ornate butterflyfish, *kīkākapu*	**Ind.**	U
Chaetodon quadrimaculatus	fourspot butterflyfish, *lauhau*	**Ind.**	U
Forcipiger flavissimus	Common longnose butterflyfish, *lauwiliwili nukunuku 'oi'oi*	**Ind.**	R
POMOCENTRIDAE	DAMSELFISH		
Abudefduf abdominalis	Hawaiian sergeant, *Mamo*	**End.**	O
Abudefduf vaigienensis	Indo-Pacific sergeant	**Ind.**	O
Abudefduf sordidus	blackspot sergeant *kūpīpī*	**End.**	O
Dascyllus albisella	Hawaiian dascyllus, *ālo'ilo'i*	**Ind.**	C
Chromis vanderbilti	blackfin chromis	**Ind.**	O
Chromis ovalis	oval chromis	**End.**	C
Plectroglyphidodon imparipennis	bright-eye damselfish	**Ind.**	O
Stegastes marginatus	Hawaiian gregory	**End.**	O

PHYLUM, CLASS, ORDER, FAMILY	Common name, *Hawaiian name*	Status	Relative abundance
Genus species			
LABRIDAE	WRASSE		
Gomphosus varius	bird wrasse; *hīnālea ʻiʻiwi*	**Ind.**	R
Thalassoma duperrey	saddle wrasse, *hinalea lauwili*	**End.**	O
BOTHIDAE			
Bothus mancus	flowery flounder; *pākiʻi*	**Ind.**	R
SCARIDAE	PARROTFISH		
Chlorurus spilurus	bullethead parrotfish, *uhu*	**Ind.**	R
Scarus psittacus	palenose parrotfish, *uhu*	**Ind.**	R
ZANCLIDAE			
Zanclus cornutus	moorish idol; *kihikihi*	**Ind.**	R
ACANTHURIDAE	SURGEONFISH		
Acanthurus achilles	achilles tang	**Ind.**	C
Acanthurus guttatus	whitespotted surgeonfish; *api*	**Ind.**	C
Acanthurus nigroris	bluelined surgeonfish	**Ind.**	U
Acanthurus olivaceus	orangeband surgeonfish; *naʻenaʻe*	**Ind.**	C
Acanthurus triostegus	convict tang; *manini*	**Ind.**	C
Ctenochaetus strigosus	goldring surgeon, *kole*	**Ind.**	O
Naso unicornis	bluespine unicornfish, *kala*	**Ind.**	O
Acanthurus guttatus	whitespotted surgeonfish; *ʻapi*	**Ind.**	O
Acanthurus leucopareius	whitebar surgeonfish; *māikoiko*	**Ind.**	O
Acanthurus nigrofuscus	brown tang, *māʻiʻiʻi*	**Ind.**	C
Acanthurus nigricans	goldrim tang	**Ind.**	O
BALISTIDAE			
Rhinecanthus rectangulus	wedgetail triggerfish; *humuhumu-nukunuku-ā-puaʻa*	**Ind.**	R
OSTRACIIDAE	BOXFISH		
Ostracion meleagris	spotted boxfish; *moa*	**Ind.**	C
TETRAODONTIDAE			
Canthigaster jactator	Hawaiian whitespotted toby	**End.**	C
Canthigaster amboinensis	Ambon toby	**Ind.**	O
BLENNIIDAE	BLENNIES		
Cirripectes obscurus	gargantuan blenny, *pāoʻo*	**End.**	R

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
GOBIIDAE	GOBIES		
Psilogobius mainlandi	Hawaiian shrimp goby	**End.**	O
BALISTIDAE	TRIGGERFISH		
Sufflamen bursa	lei triggerfish; *humuhumu lei*	**Ind.**	R
VERTEBRATA, REPTILIA	reptiles		
CHELONIIDAE			
Chelonia mydas	green sea turtle, *honu*	**Ind.**	O

KEY TO SYMBOLS USED:

Abundance categories:

R – Rare – only one or two individuals observed.
U – Uncommon – several to a dozen individuals observed.
O – Occasional – seen irregularly in small numbers
C – Common – observed everywhere, although generally not in large numbers.
A – Abundant – observed in large numbers and widely distributed.

Status categories:

End – Endemic – species found only in Hawaii
Ind. – Indigenous – species found in Hawaii and elsewhere
Nat. – Naturalized – species were introduced to Hawaii intentionally, or accidentally.

Appendix B

Summary of the bottom composition and relative coral distribution within the 12 ft (4-m) and 5 ft (1.5 m) radii

Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
A1	Moveable *P. lobata* (50 cm)	Scattered small colonies of *Cyphastrea ocellina* (<5 cm)	Sand and loose rubble, *T. gratilla*
A2	Several large, difficult-to-move boulders with coral (*P. lobata, Poc. meandrina*). Several small moveable boulders with coral (*P. lobata, Poc. meandrina*).	Large boulders with coral (*P. lobata, Poc.* spp., *M. capitata*)	Sand, loose rubble and moveable boulders with and without coral. At 12 ft from anchor location, debris with encrusting coral.
A3	Moveable *P. lobata* (60 cm); Moveable *Poc. meandrina* (15 cm)	Scattered (~8) coral colonies (*Poc. damicornis, Poc. meandrina, P. lobata*)	Sand and moveable boulders. At 8 ft from anchor location, debris with encrusting coral
A4	Moveable boulder with *P. lobata* (40 cm) and *Pav. varians* (5cm, 15 cm); Move-able boulder with *P. lobata* (15 cm, 25 cm); Moveable boulder with *P. lobata* (15 cm, 25 cm) Difficult to move *P. lobata* (25 cm)	Several large difficult-to-move boulders with coral (*P. lobata, Poc. meandrina*, *M. capitata*)	Sand and large boulders
A5	Limestone outcrop with large (>80 cm) colonies of *P. lobata,* and numerous colonies of *Pav. varians* (25 cm),	Limestone outcrop	Coral dominates bottom
A6	Moveable boulder with *P.*	Sand, no coral	

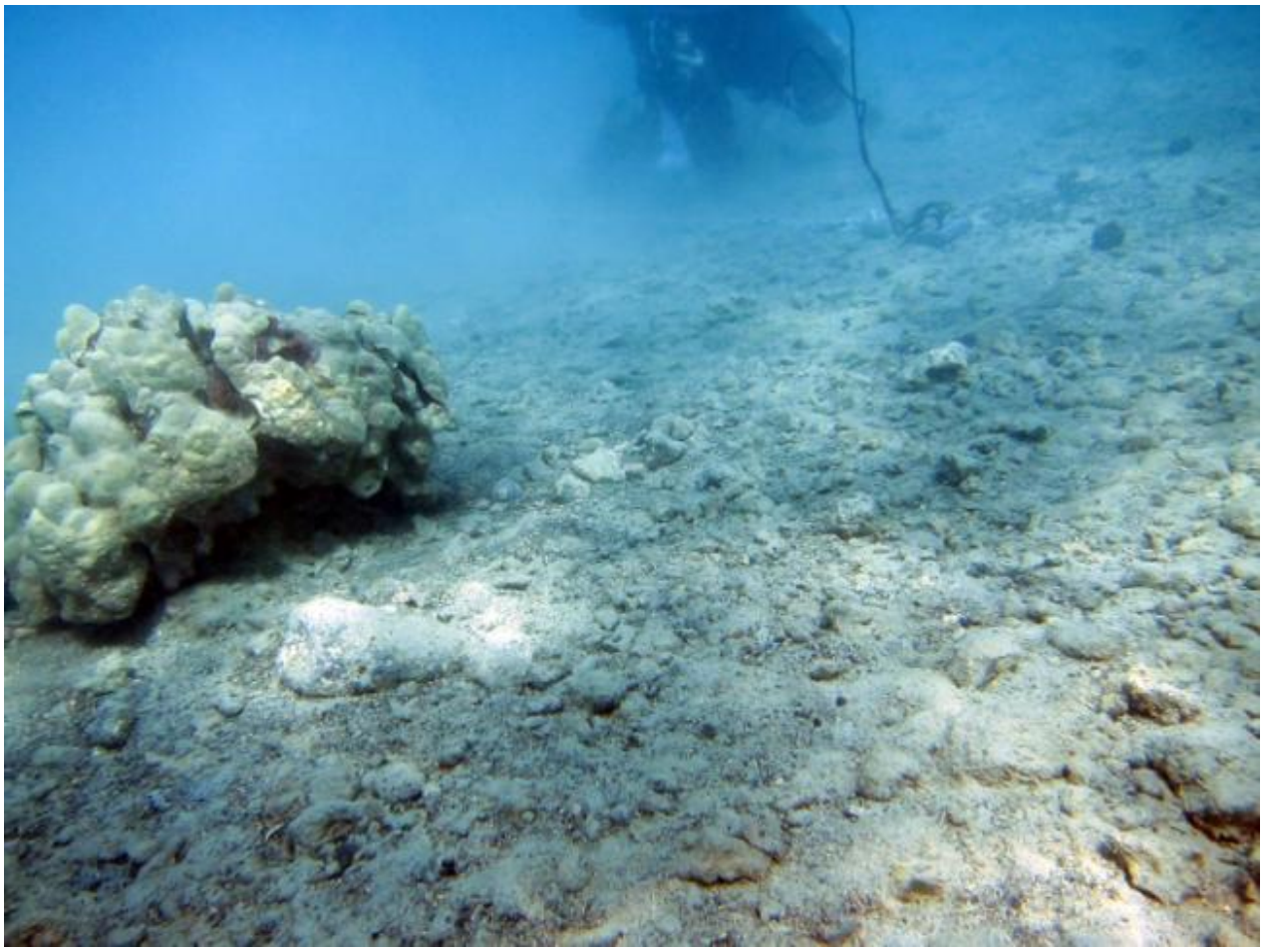
Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
	lobata (5 cm, 10 cm) Moveable boulder with *P. lobata* (40 cm)		
A7	Sand; no coral	Sand, scattered loose rubble; no coral	Remnant chains and anchors
A8	Sand; no coral	Limestone outcrop with high coral (NW and SE of anchor location	
B1	Rubble and sand, no coral	Scattered loose rubble with *Leptastrea bewickensis*. Small boulder with *P. lobata* (15 cm, 10 cm and 5 cm)	Sand, loose rubble with encrusting coral
B2	Rubble and sand, no coral	Old pile horizontal on seafloor with corals: *Poc. meandrina* (10 cm), *Poc. damicornis* (5 cm) and several 30 cm *P. lobata*. Anchor line with *Poc. damicornis* (5 cm)	Rubble and sand, scattered debris (pile and anchor line) with coral growth
B3	Sand; no gravel	Limestone outcrop with high coral cover	Sand and two large limestone outcrops with high coral cover
B4	Sand, gravel and loose rubble; no coral	Sand, gravel and loose rubble; no coral	
B5	Sand and gravel; no coral	Sand and gravel and derelict boat lines; no coral	
B6	Sand and gravel; no coral	Limestone outcrop with high coral cover Debris (anchor lines, plastic buckets and rebar) with encrusting coral	

Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
C1	Sand and loose rubble. Moveable loose rubble with *Poc. meandrina* (10 cm, 10 cm), *Poc. damicornis* (10 cm)	Sand, rubble and hard bottom. Large, difficult-to-move boulders with encrusting coral (*Pav. varians*) and mound coral (*P. lobata*)	Loose rubble and boulders
C2	Sand and gravel; no coral	Several large, difficult-to-move boulders with encrusting coral (*Pav. varians* and *M. capitata*) and mound coral (*P. lobata*)	Coral, debris
C3	Sand and loose rubble; no coral	Several large, difficult-to-move boulders with encrusting coral (*Pav. varians* and *M. capitata*) and mound coral (*P. lobata*)	Coral
C4	Sand; no coral	Sand; no coral	Sand bottom extends 15 ft (4.6 m) from anchor center point
C5	Sand; no coral	Three moveable 25 cm *P. lobata* colonies	
C6	Sand, scattered loose rubble; no coral	Sand, scattered loose rubble; no coral	Sand bottom extends 14 ft (4.3 m) from anchor center point
C7	Sand, loose rubble with coral (*P. lobata* and *Pocillopora* spp.), and small (10-20 cm) *P. lobata colonies*	Sand and limestone outcrop with high coral cover	Coral
C8	Rubble and small boulders	Sand and limestone outcrop with high coral cover	Rubble and coral
D1	Sand and rubble; no coral	Sand, rubble and moveable boulders with *P. lobata* (10 cm, 20 cm)	

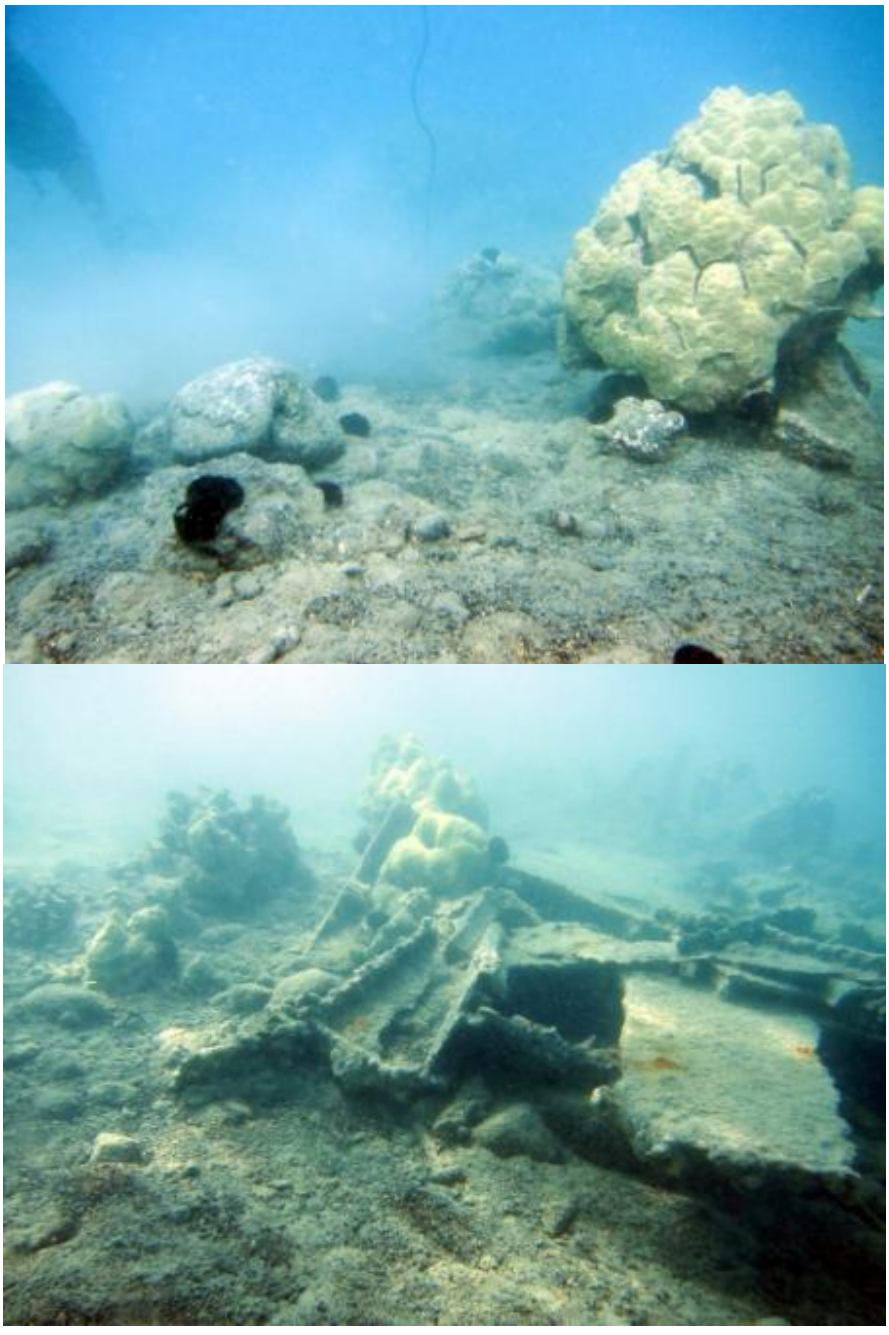
Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
D2	Sand, rubble and many moveable boulders with encrusting *P. lobata* (10 cm, 10 cm, 10 cm, 10 cm, 10 cm, 5 cm)	Sand, rubble and moveable boulders with coral	Many moveable boulders with coral
D3	Sand, rubble and several small, moveable boulders with *P. lobata* (20 cm). Several difficult-to-move boulders with large (80 cm) *P. lobata* colonies.	Several difficult-to-move boulders with coral (*P. lobata*, *Poc. meandrina*)	Many moveable boulders with coral Several difficult-to-move boulders with coral
D4	Sand and loose rubble; no coral	Large moveable boulder with *P. lobata* and debris with encrusting corals	Sand channel to south
D5	Sand and loose rubble; no coral	Several small moveable boulders with *P. lobata*	Sand channel to south
D6	Sand and loose rubble; no coral	Sand, loose rubble and several small boulders with *P. lobata*	Sand channel to south

Appendix C.

Photos of Keauhou Small Boat Harbor potential mooring anchor locations, March 6 & 7, 2013. Weighted vertical lines in photos represent proposed anchor center points.

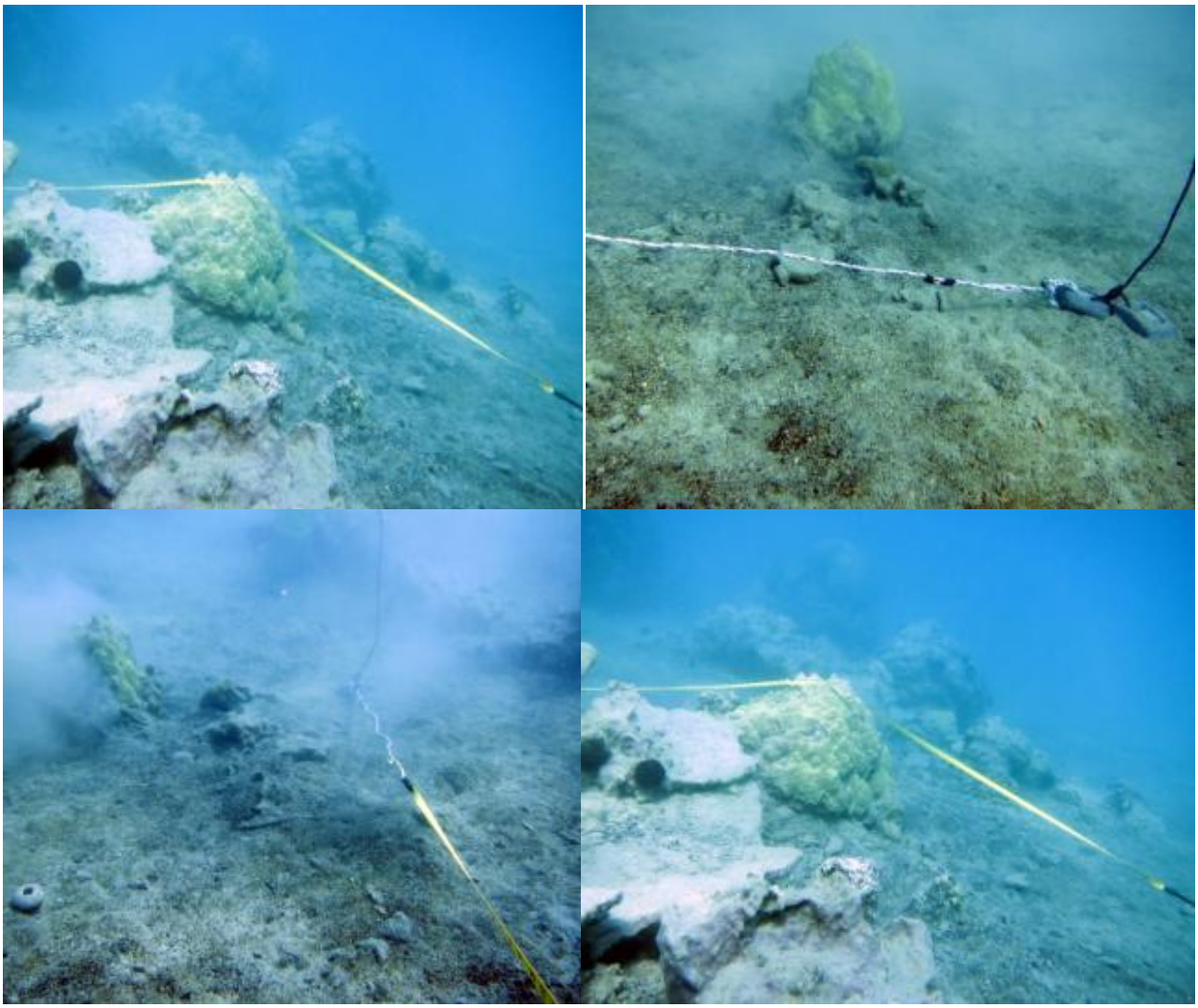


Proposed mooring anchor location A1 bottom is sand and loose rubble. One 50- cm coral colony (*Porites lobata*) is within a 5 ft (1.5 m) from proposed anchor location.

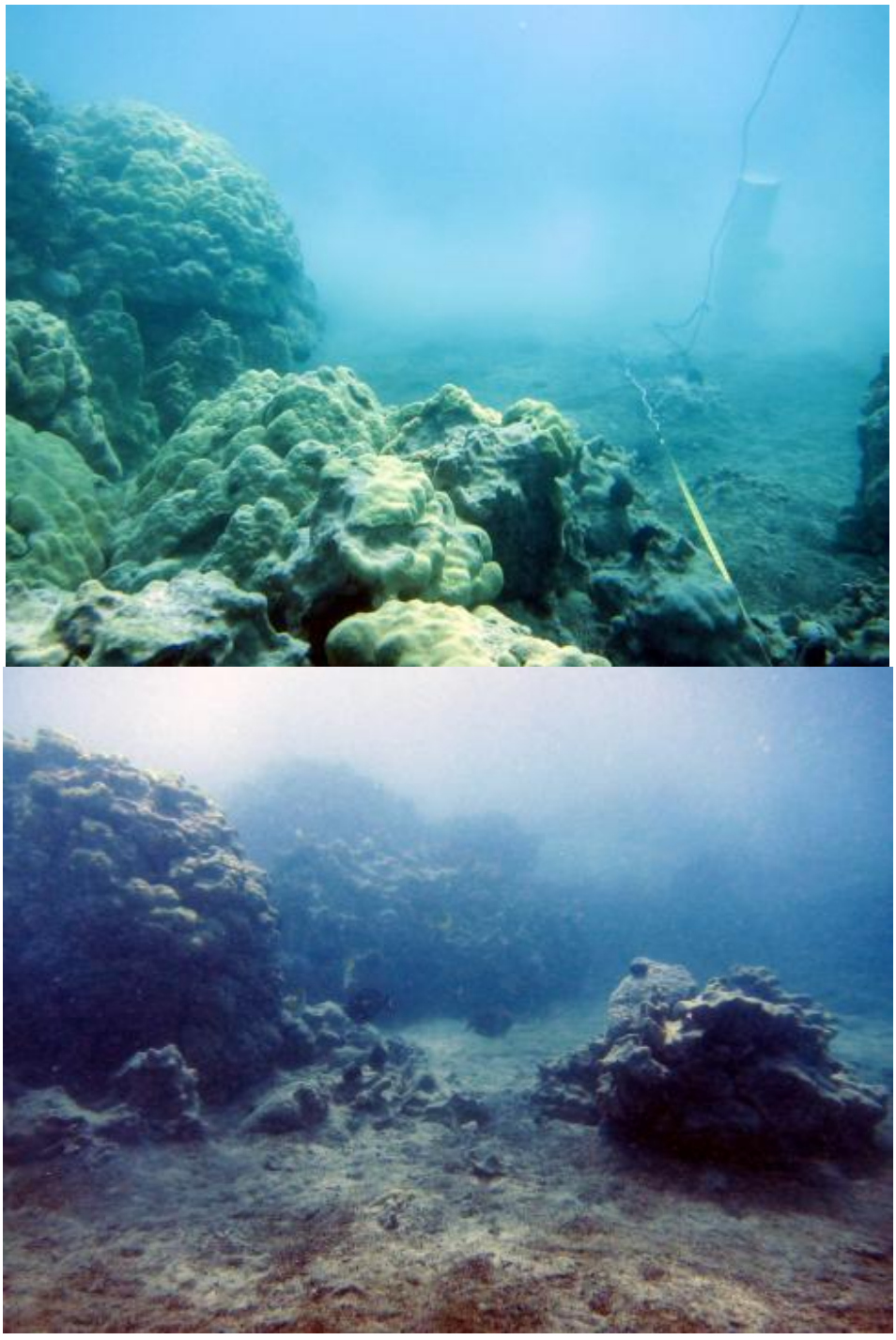


Proposed mooring anchor location A2 bottom is sand and boulders. Several large difficult-to-move boulders encrusted with coral (*P. lobata*) occur within 5 ft (1.5 m) of anchor center (top). Large boulders and debris with encrusting coral (*P. lobata* and *Poc. meandrina*) was encountered within 12 ft (4 m) of anchor center (bottom)

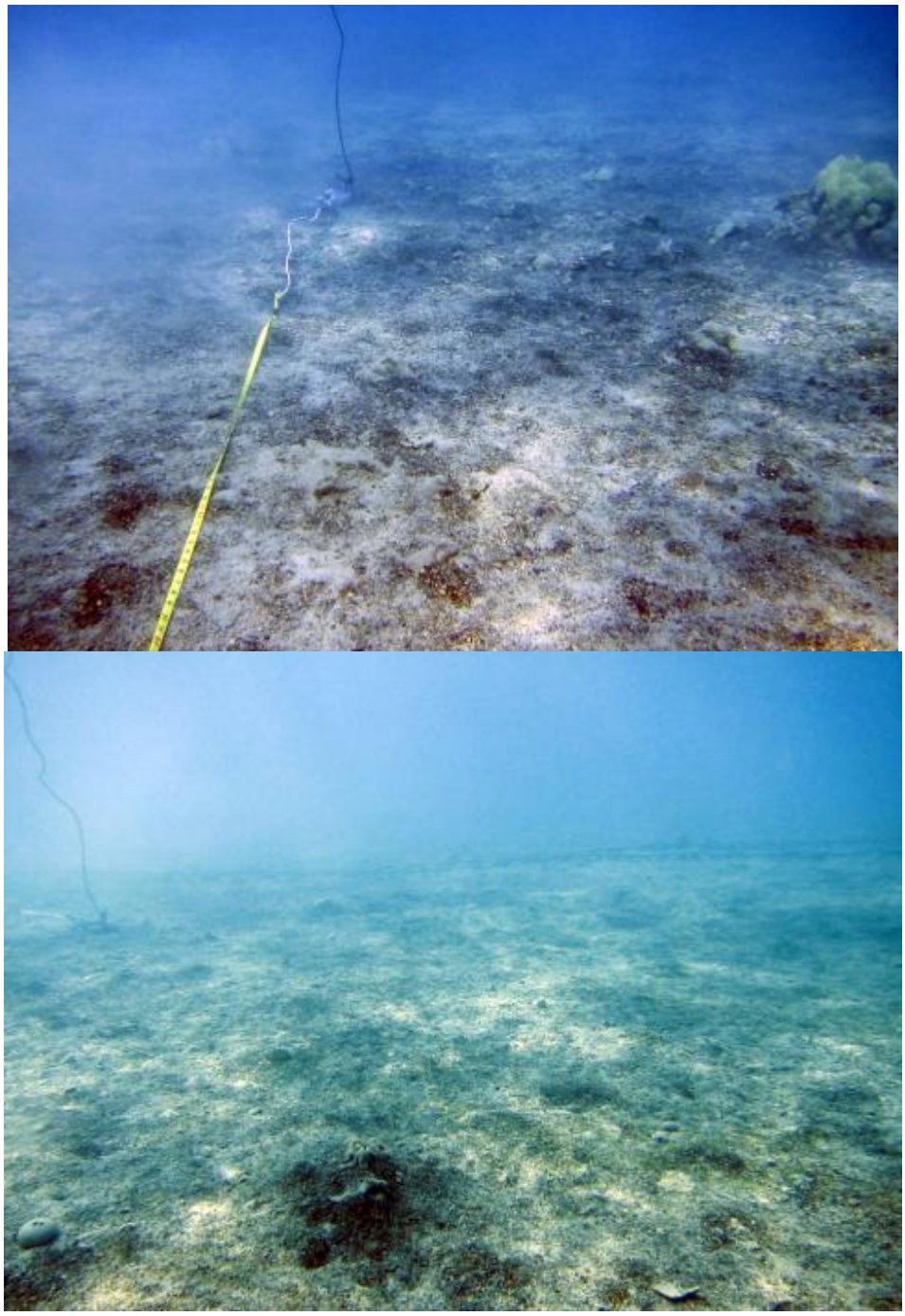
Proposed mooring anchor location A3 bottom is sand and boulders (top). One moveable, 60-cm mound coral (*P. lobata*) and moveable 15-cm branching *Poc. meandrina* occur within 5 ft (1.5 m) from the anchor center point (bottom).



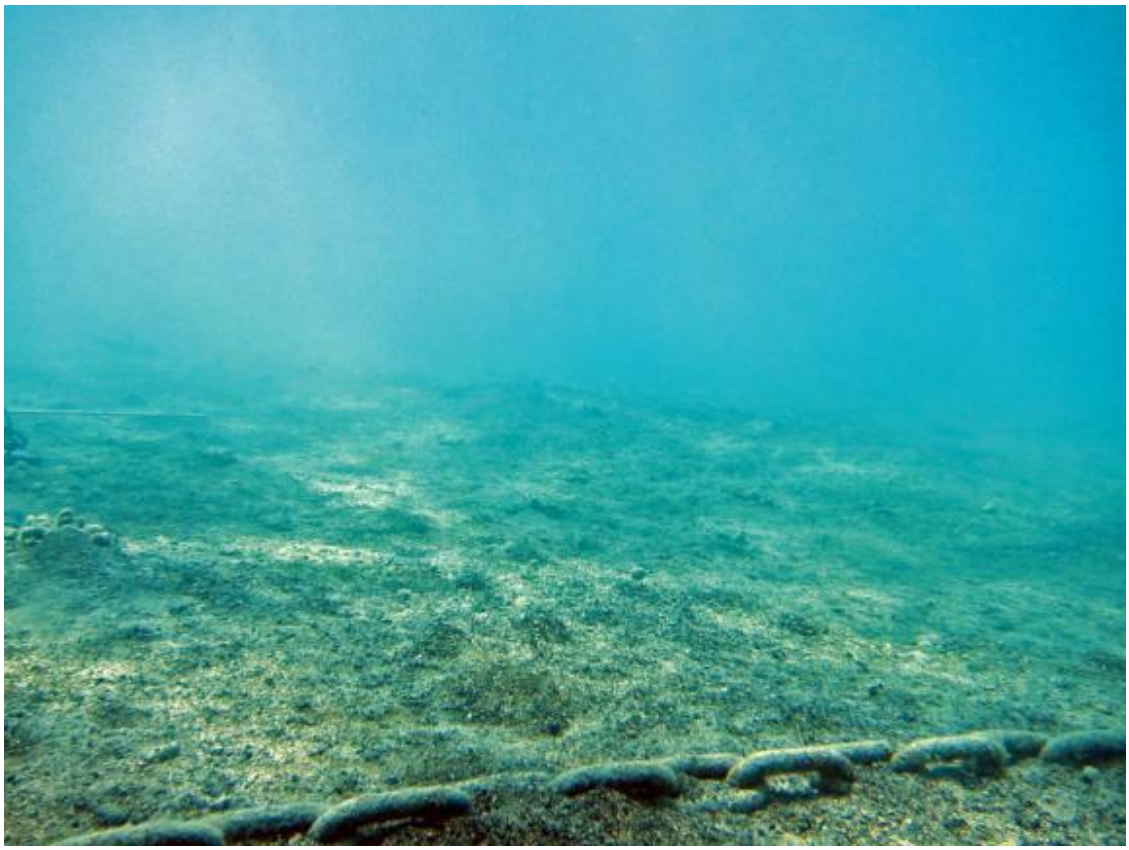
Proposed mooring anchor location A4 bottom is sand and many boulders with coral (*P. lobata*, *Poc.*spp.).



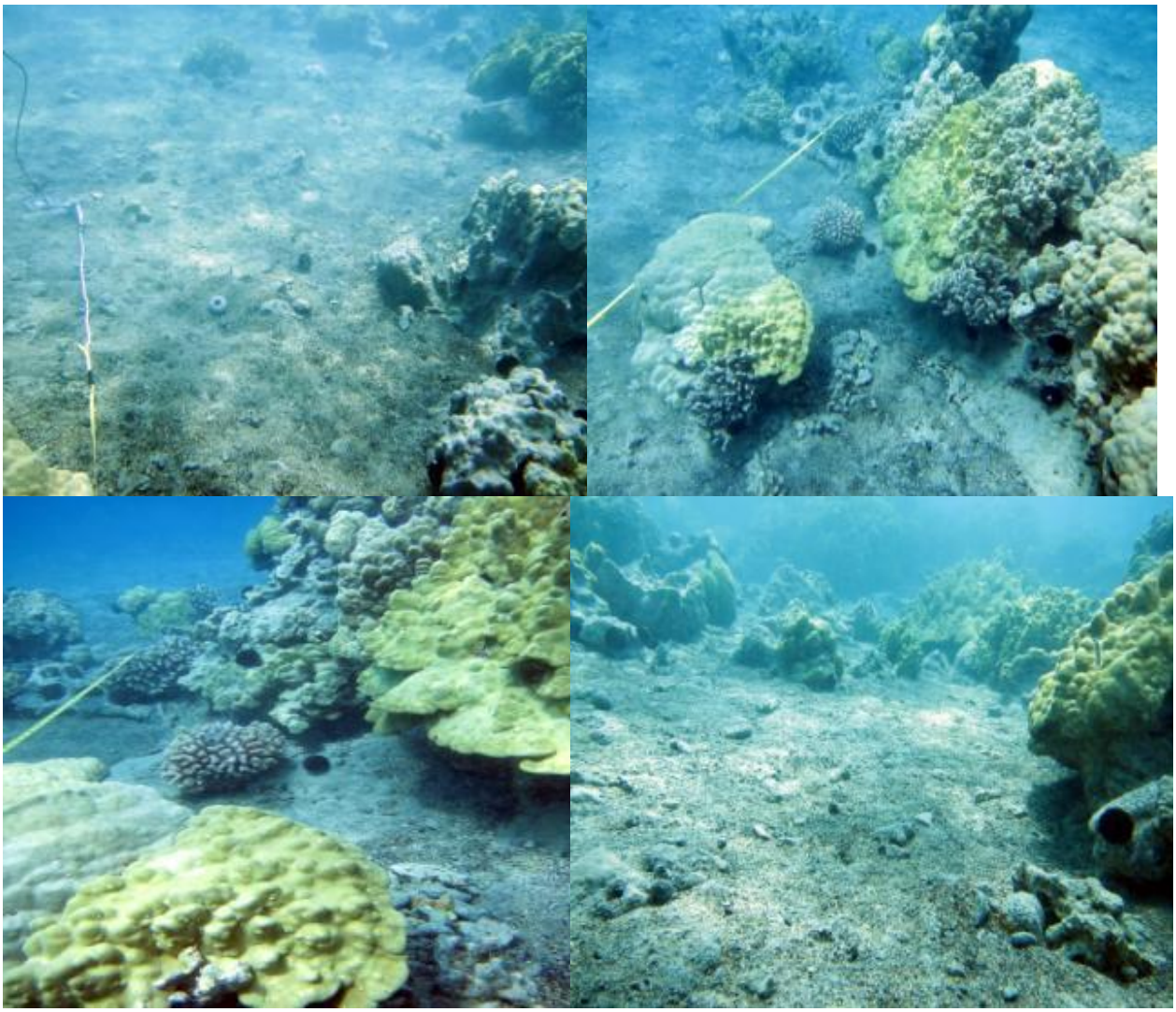
Proposed mooring anchor location A5 bottom is sand with several limestone outcrops with high coral cover.



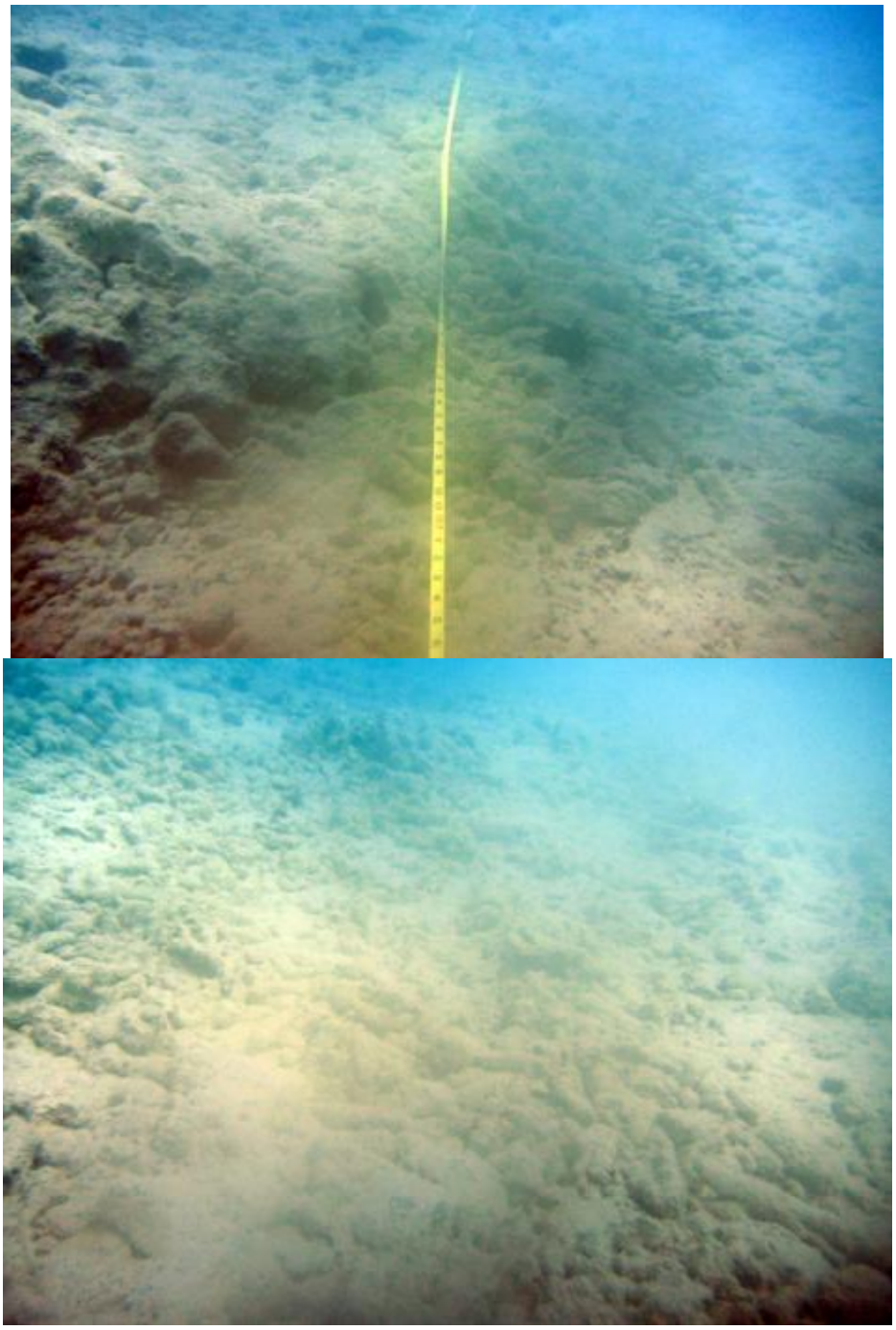
Within 5 ft (1.5 m) of the proposed mooring anchor location A6 bottom is sand with few moveable boulders with coral (top). Sand dominates the bottom beyond the 5-ft (1.5 m) radius.



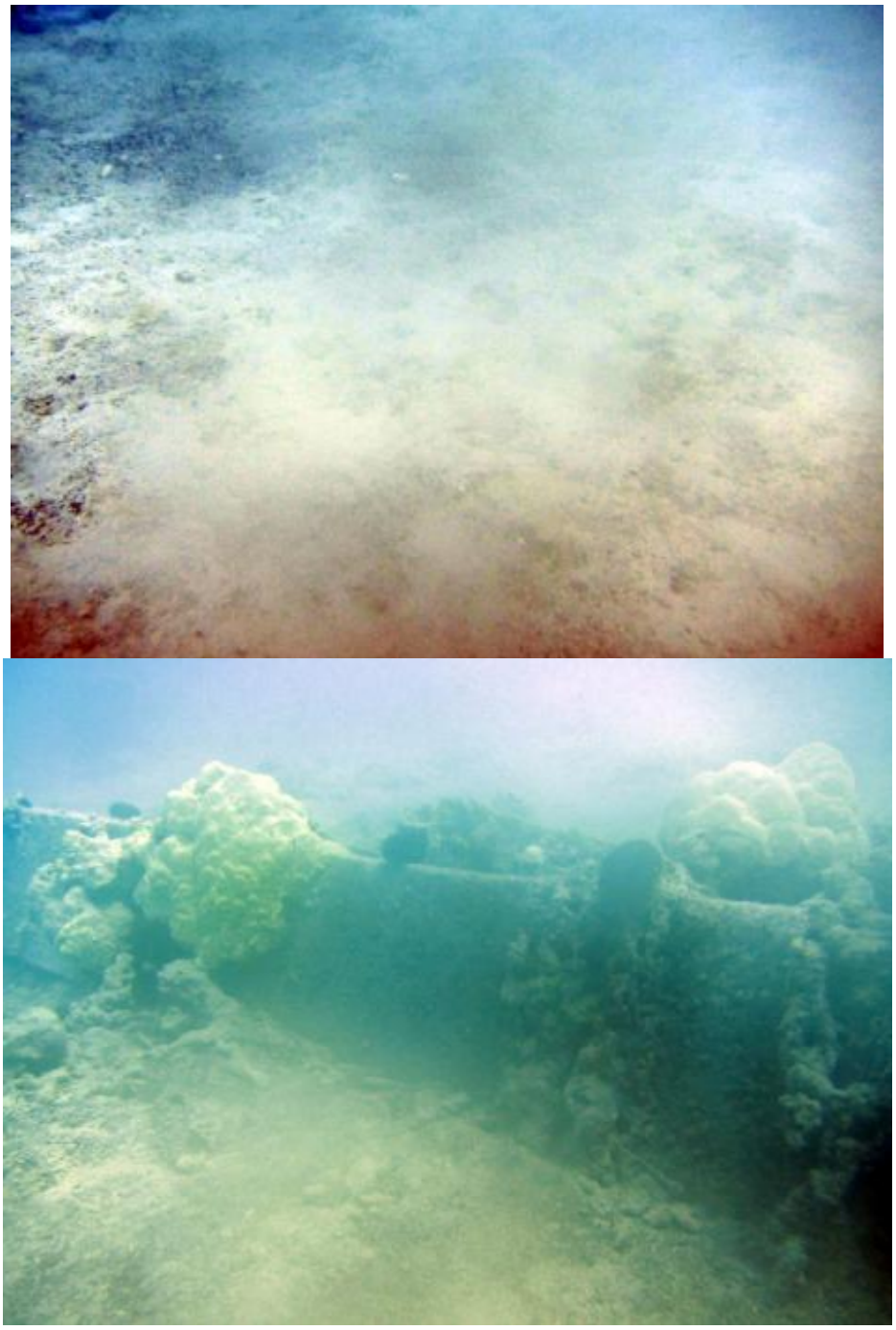
Proposed mooring anchor location A7 bottom is sand and gravel, with several remnant chains and anchors.



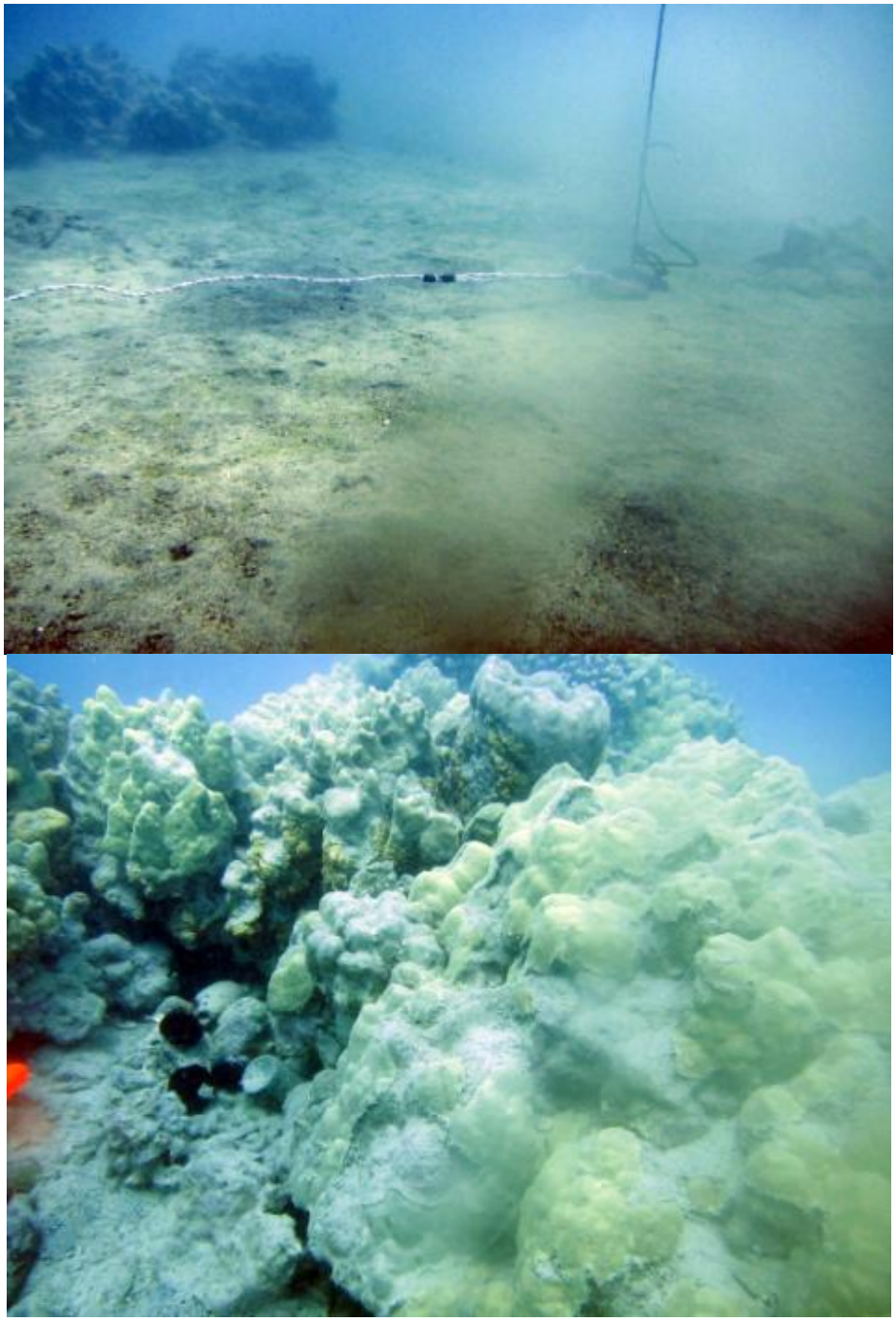
Within 5 ft (1.5 m) of the proposed mooring anchor location A8 is sand (top, left). Beyond 5 ft (1.5 m) of the anchor location, large limestone outcrops with high coral cover occur (top right and bottom).



Within 5 ft (1.5 m) of the proposed mooring anchor location B1, the bottom is loose rubble and sand; no coral observed (top). Scattered rubble with encrusting *L. bewickensis* colonies and one boulder with several colonies of *P.lobata* occur within 12 ft (4 m) of the anchor location (bottom).

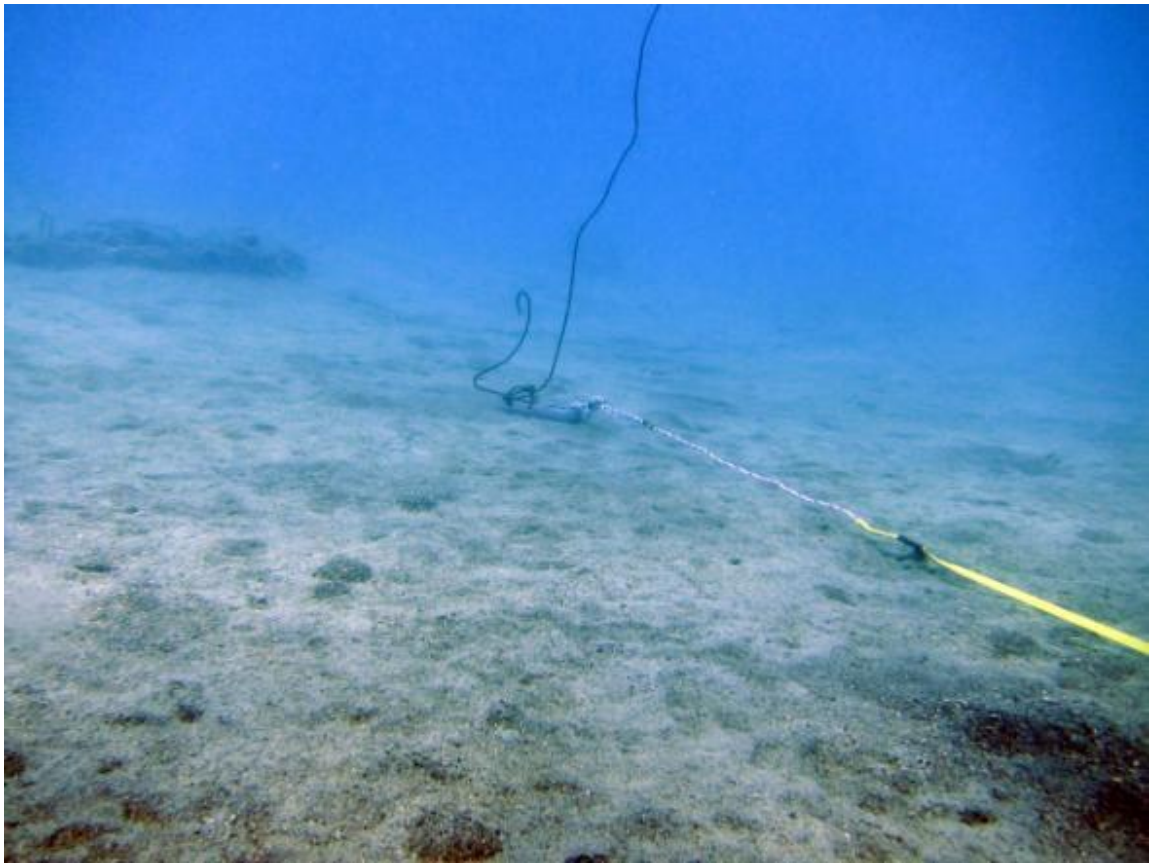


Within 5 ft (1.5 m) of the proposed mooring anchor location B2, the bottom is loose rubble and sand (top). Within 12 ft (4 m) of the anchor location, an old pier pile with several coral colonies (*P. lobata*, *Pocillopora* spp.) was encountered..

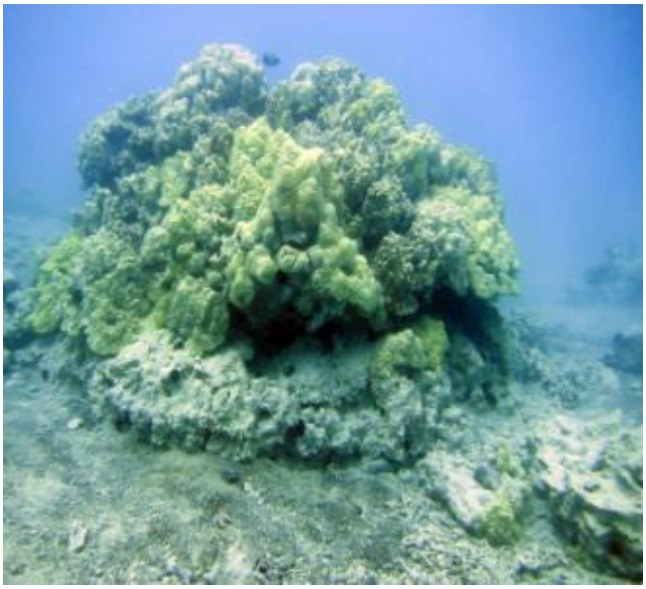


Within 5 ft (1.5 m) of the proposed mooring anchor location B3, the bottom is sand and no coral (top). Beyond 5 ft (1.5 m) of the anchor location, large limestone outcrops with high coral cover occur (bottom).

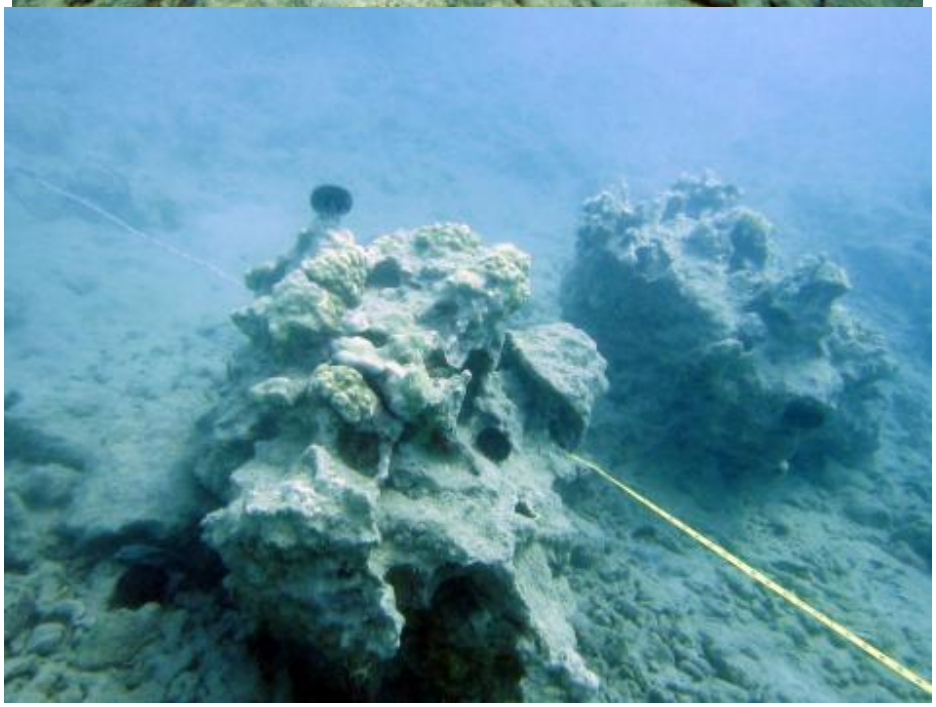
Within 12 ft (4 m) of the proposed mooring anchor location B4, the bottom is sand and gravel. No corals were observed.



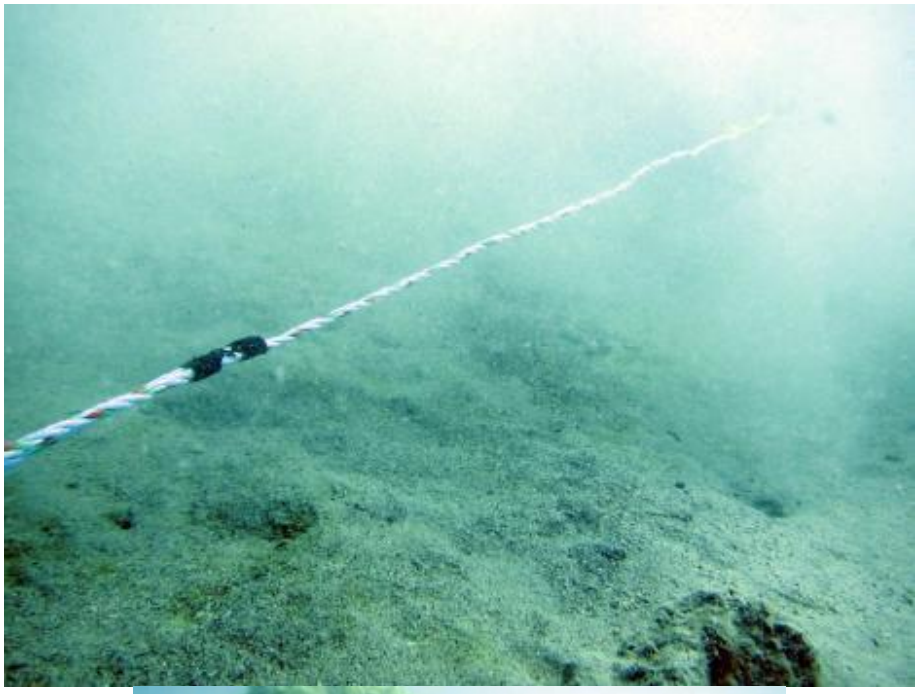
Within 12 ft (4 m) of the proposed mooring anchor location B5, the bottom is sand and gravel. No corals were observed. At 12 ft (4 m) from the anchor location, a pile of derelict boat lines lies on the seafloor.

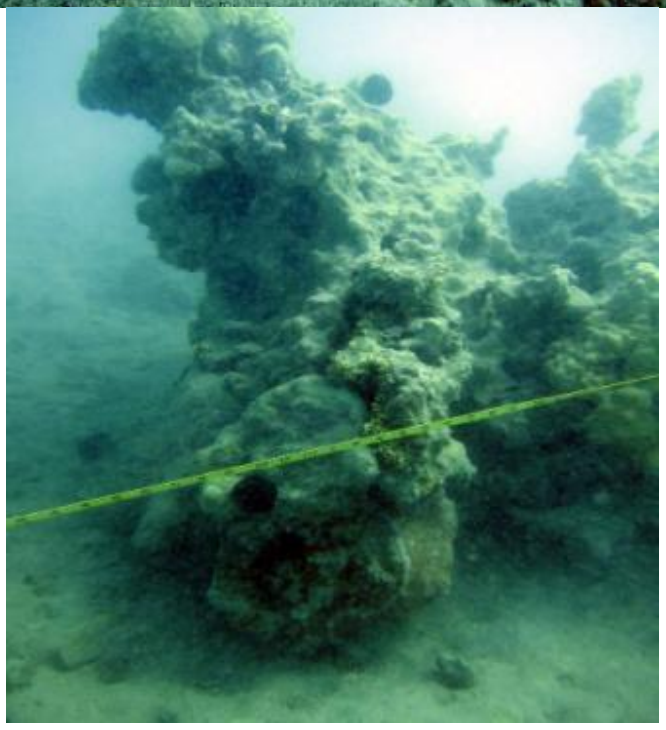


Within 5 ft (1.5 m) of the proposed mooring anchor location B6, the bottom is sand and no coral (top). Beyond 5 ft (1.5 m) of the anchor location there is a limestone outcrop with high coral cover (bottom, left) and pile of debris (plastic buckets and anchor lines) with coral growth (bottom, right).

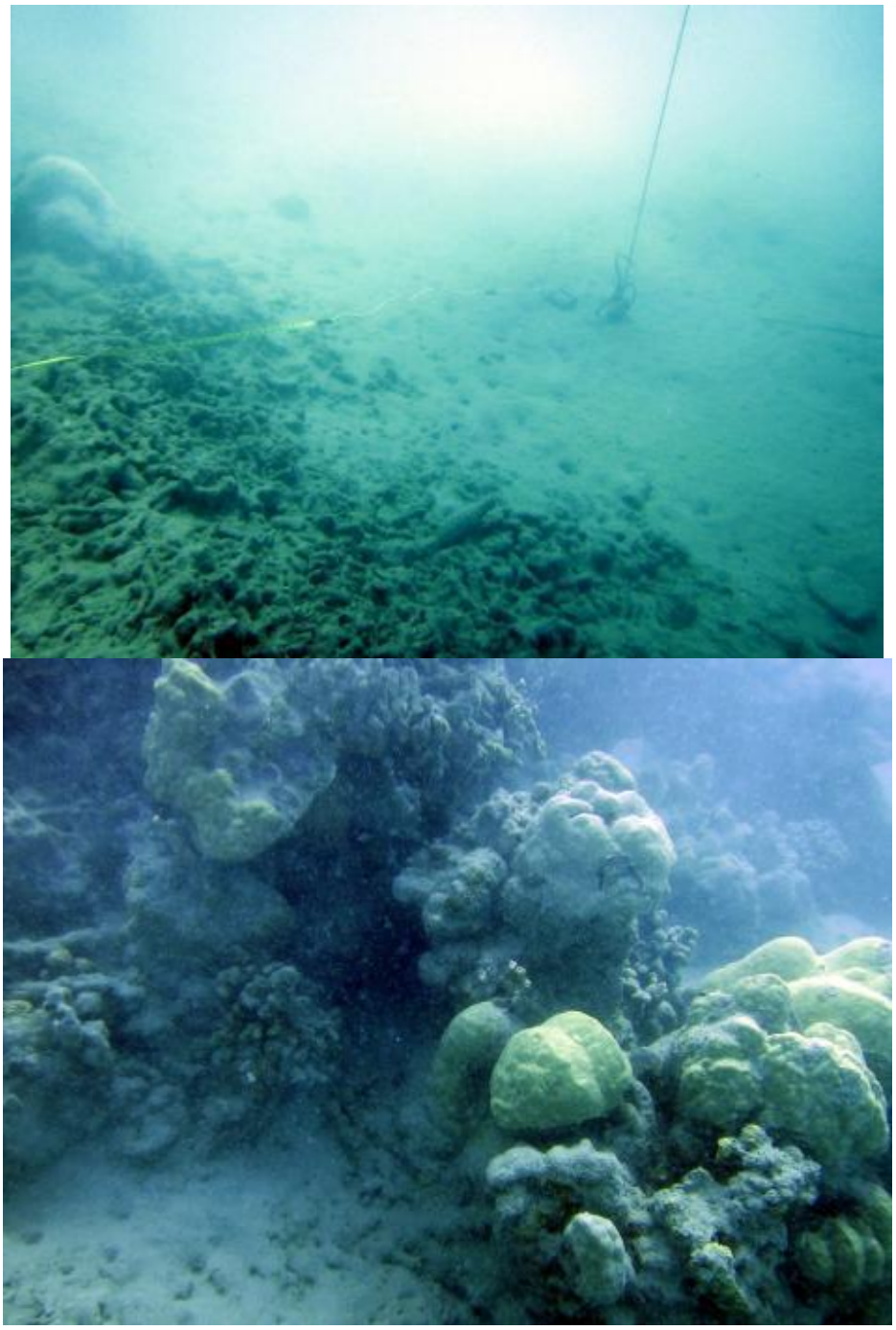


Within 5 ft (1.5 m) of the proposed mooring anchor location C1, the bottom is sand and loose rubble with small (<10 cm) corals (top). Beyond 5 ft (1.5 m) of the anchor location, limestone outcrops with coral colonies occur (bottom).

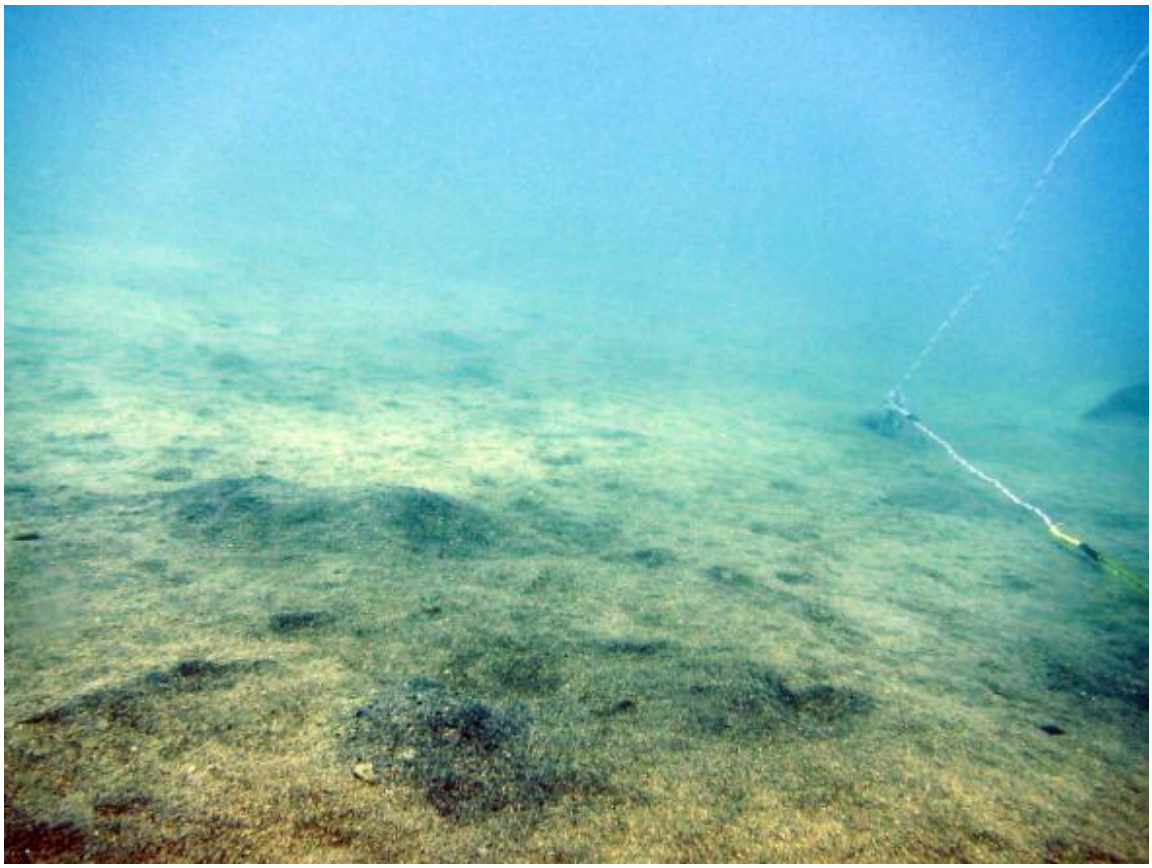




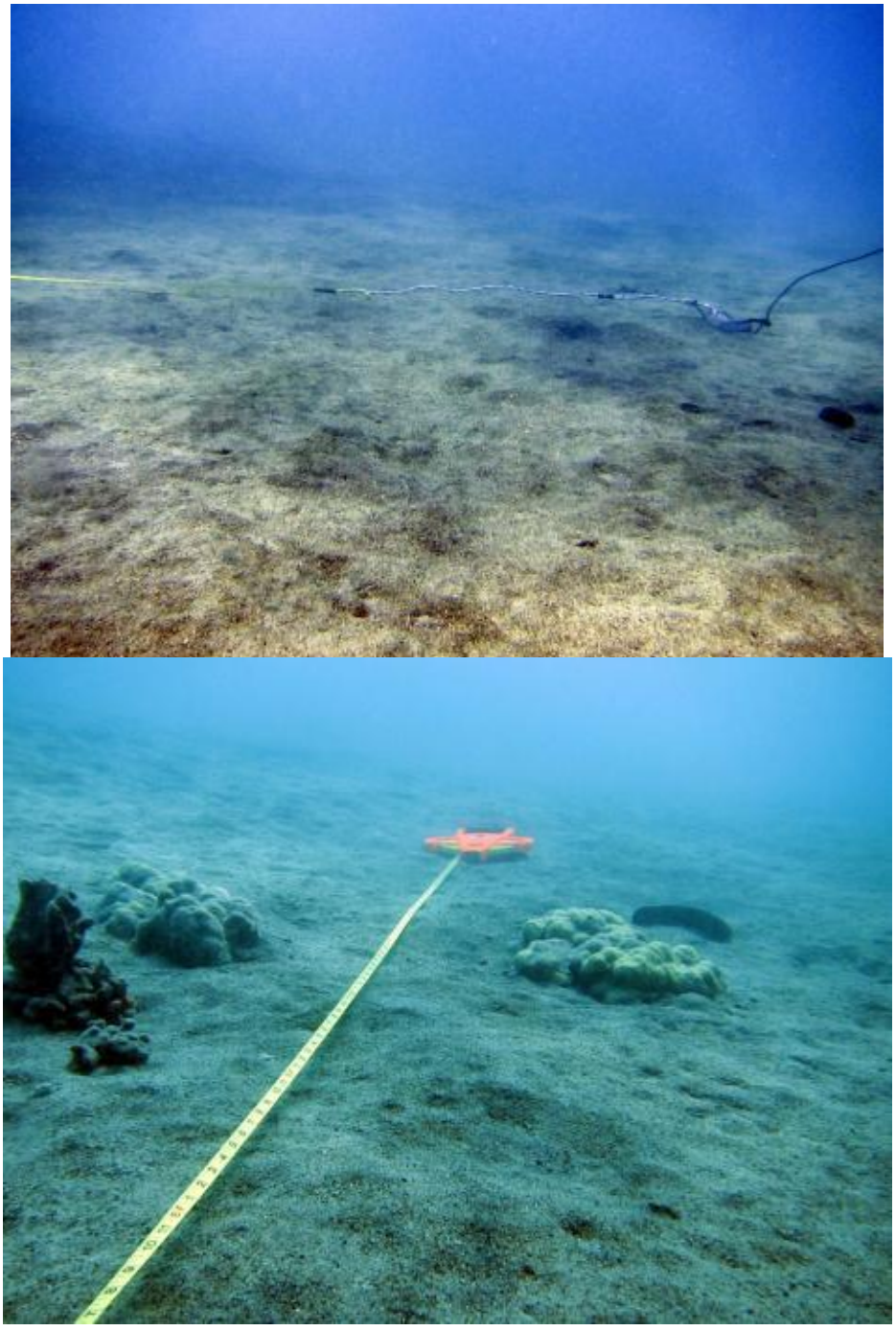
Within 5 ft (1.5 m) of the proposed mooring anchor location C2, the bottom is sand; no corals observed (top). Beyond 5 ft (1.5 m) of the anchor location, several limestone outcrops with coral are present (bottom).



Within 5 ft (1.5 m) of the proposed mooring anchor location C3, the bottom is sand and loose rubble; no corals observed (top). Beyond 5 ft (1.5 m) of the anchor location, large limestone outcrops with high coral cover occur (bottom).

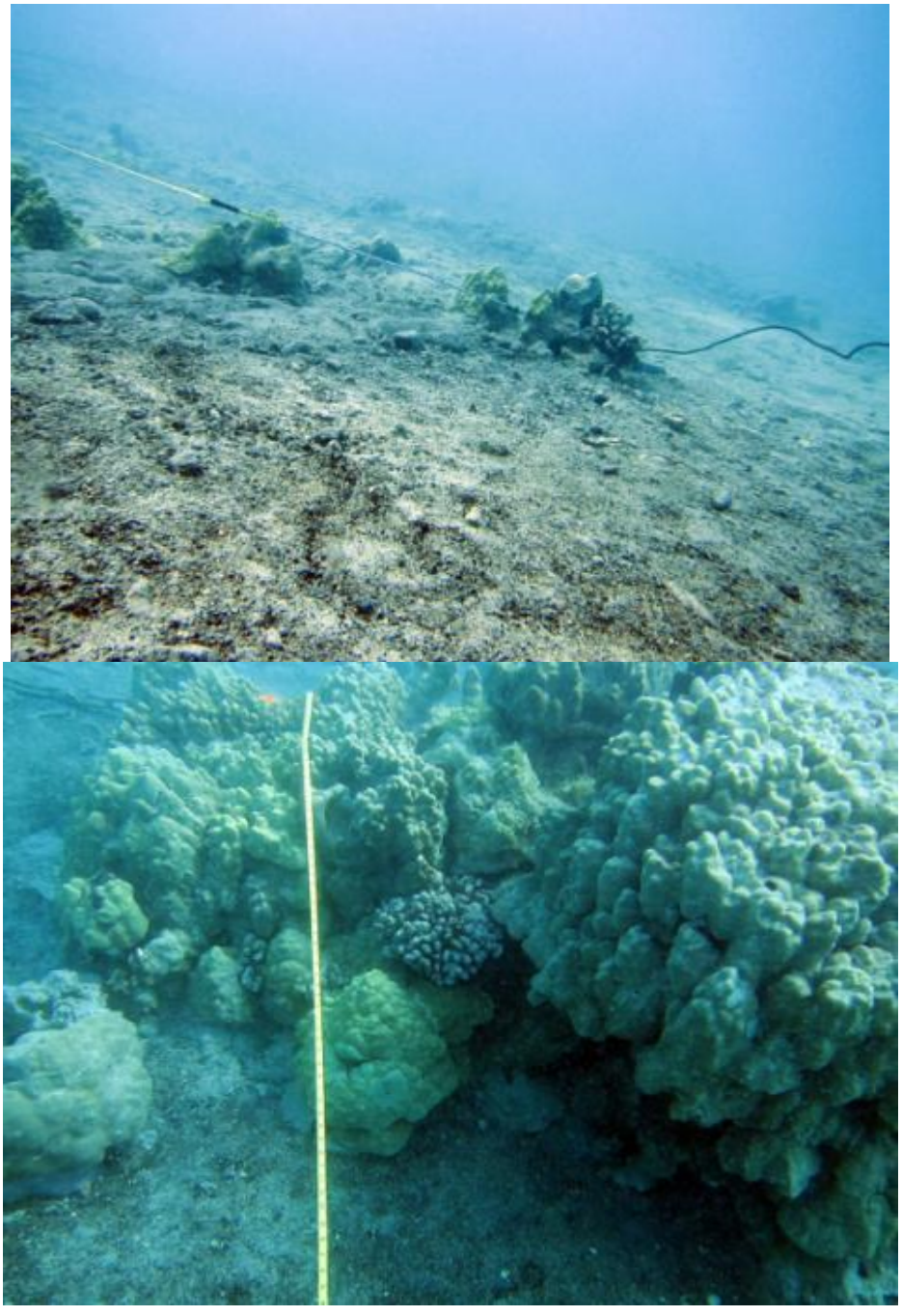


Within 12 ft (4 m) of the proposed mooring anchor location C4, the bottom is sand and gravel. No corals were observed.



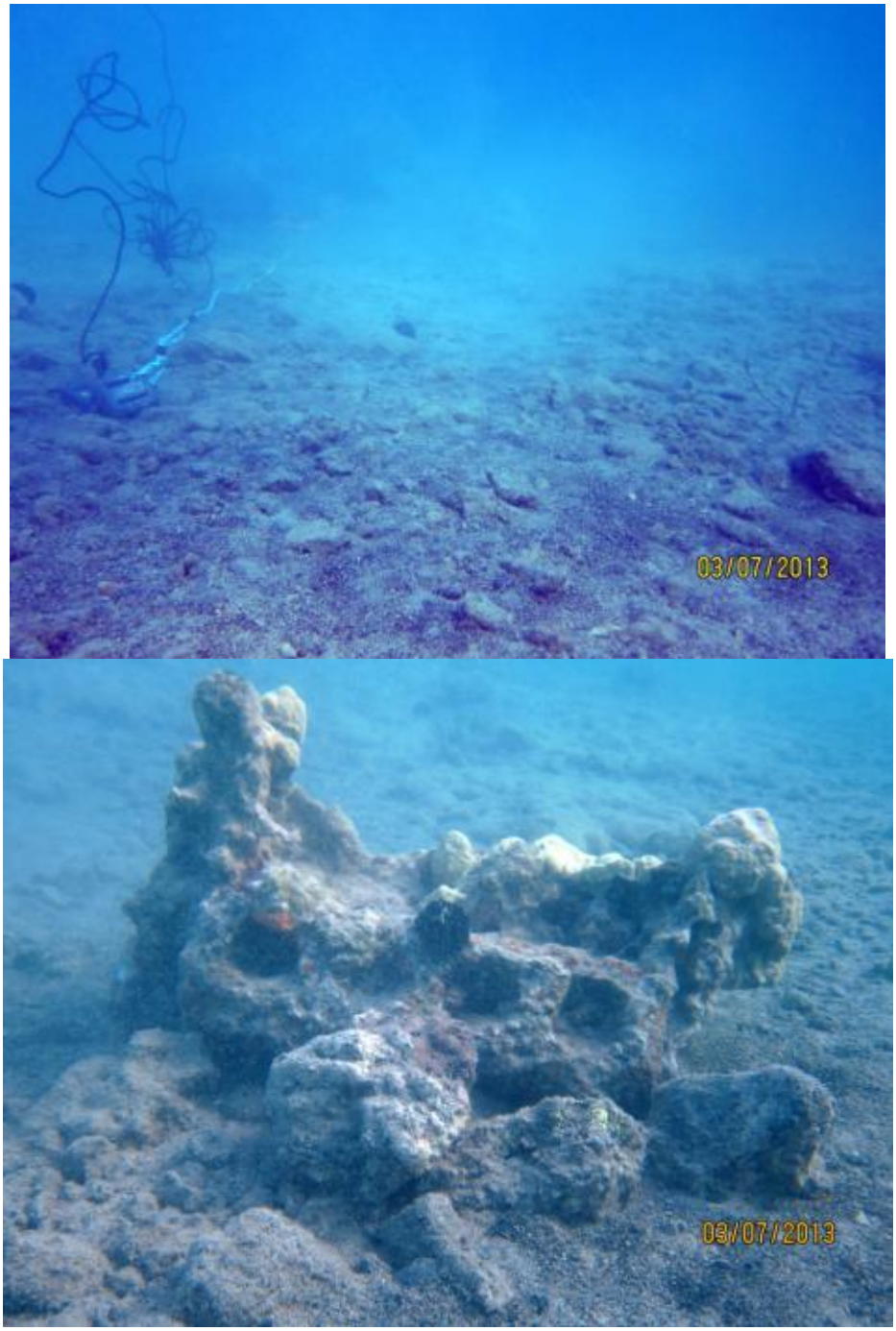
Within 5 ft (1.5 m) of the proposed mooring anchor location C5, the bottom is sand; no corals observed (top). Beyond 5 ft (1.5 m) of the anchor location, several small boulders and 25 cm *P. lobata* colonies encountered (bottom).

Within 12 ft (4 m) of the proposed mooring anchor location C6, the bottom is sand and loose gravel. No corals were observed.

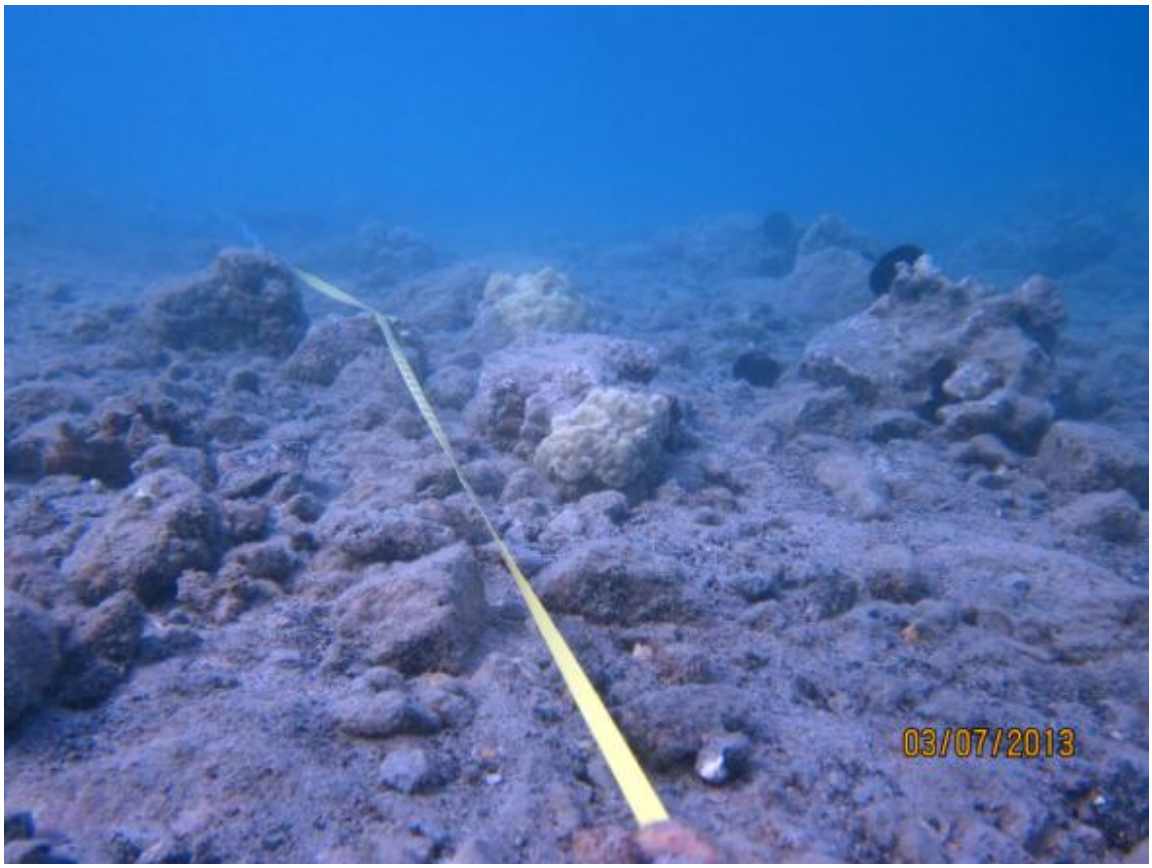


Within 5 ft (1.5 m) of the proposed mooring anchor location C7, the bottom is sand and several small *P. lobata* colonies (top). Beyond 5 ft (1.5 m) of the anchor location, a large limestone outcrop with high coral cover was encountered (bottom).

Within 5 ft (1.5 m) of the proposed mooring anchor location C8, the bottom is rubble and no corals (top). Beyond 5 ft (1.5 m) of the anchor location, a limestone outcrop with high coral cover is present (bottom).



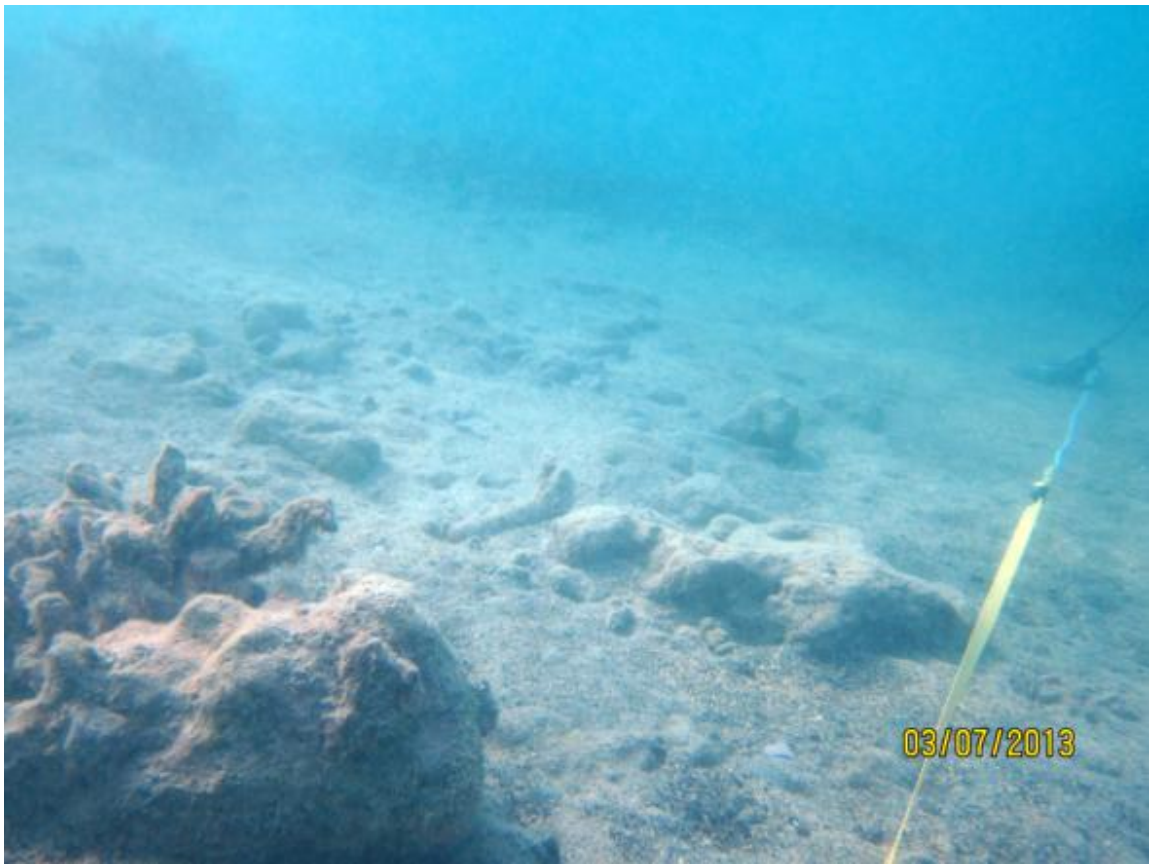
Within 5 ft (1.5 m) of the proposed mooring anchor location D1, the bottom is rubble and no corals (top). Beyond 5 ft (1.5 m) of the anchor location, several moveable boulders with encrusting coral colonies (*P. lobata*) were encountered (bottom).



Within 12 ft (4 m) of the proposed mooring anchor location D2, the bottom is sand, loose rubble and small moveable boulders with *P. lobata* coral colonies.

Within 12 ft (4 m) of the proposed mooring anchor location D3, the bottom is sand, loose rubble and many small moveable boulders with *P. lobata* coral colonies and several large difficult-to-move boulders with corals (*P. lobata, Poc. meandrina*, *Poc. eydouxi*).

Within 5 ft (1.5 m) of the proposed mooring anchor location D4, the bottom is rubble and no corals (top). Beyond 5 ft (1.5 m) of the anchor location, a large moveable boulder with *P. lobata* was encountered (bottom).



Within 5 ft (1.5 m) of the proposed mooring anchor location D5, the bottom is rubble and no corals. Beyond 5 ft (1.5 m) of the anchor location, several moveable boulders with encrusting *P. lobata* and *Pav. varians* were encountered.

Within 5 ft (1.5 m) of anchor location D6, the bottom is sand and no corals. Beyond 5 ft (1.5 m) of the anchor location, several small moveable boulders with *P. lobata* were encountered (bottom).

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June 19, 2013 *AECOS* No. 1347B

To: Chris Goody
Sea Engineering Inc.

Marine resources survey of Keauhou Small Boat Harbor, Keauhou, Hawaiʻi

On March 6 and 7, 2013, *AECOS* biologist, Stacey Kilarski, conducted a reconnaissance survey in Keauhou Small Boat Harbor (KBH). The SCUBA survey was performed to assess marine resources at twenty-eight proposed mooring anchor locations (*AECOS*, 2013). Since that report, two additional mooring locations were proposed and adjustments made to row B mooring locations. Figure 1 presents the latest mooring plan. On June 12, 2013, a survey was conducted to assess the marine resources at these new locations. Surveyed were four anchor locations (labeled 1 through 4) in row W and six anchor locations (labeled 1 through 6) in row B'.

The survey encompassed the harbor bottom in an approximate 12-ft (4-m) radius centered on each proposed mooring anchor location. Based on likely mooring design, a 5-ft (1.5-m) swath of chain would rest on the seafloor at each anchor location (Goody, pers. comm. 2013). Therefore, the biologist noted any corals (visual size estimate, morphology, and ease of removal) within a 5-ft (1.5-m) radius from the center of each mooring location.

An inventory was made for any corals, invasive species, seagrass, marine protected species (DLNR, 1998, 2007; NOAA-NMFS, 2010; USFWS, 2008, 2012), and other non-coral macro-invertebrates at each mooring anchor location. A list of species observed and their relative abundances is presented as Appendix A. A summary of the bottom composition, including coral distribution within the 12-ft (4-m) and 5-ft (1.5-m) radii is provided in Appendix B. Photos taken at each mooring anchor location are presented in Appendix C. Photos of the bottom show a horizontal transect line representing a distance out from the anchor center point of 12 ft (4 m).

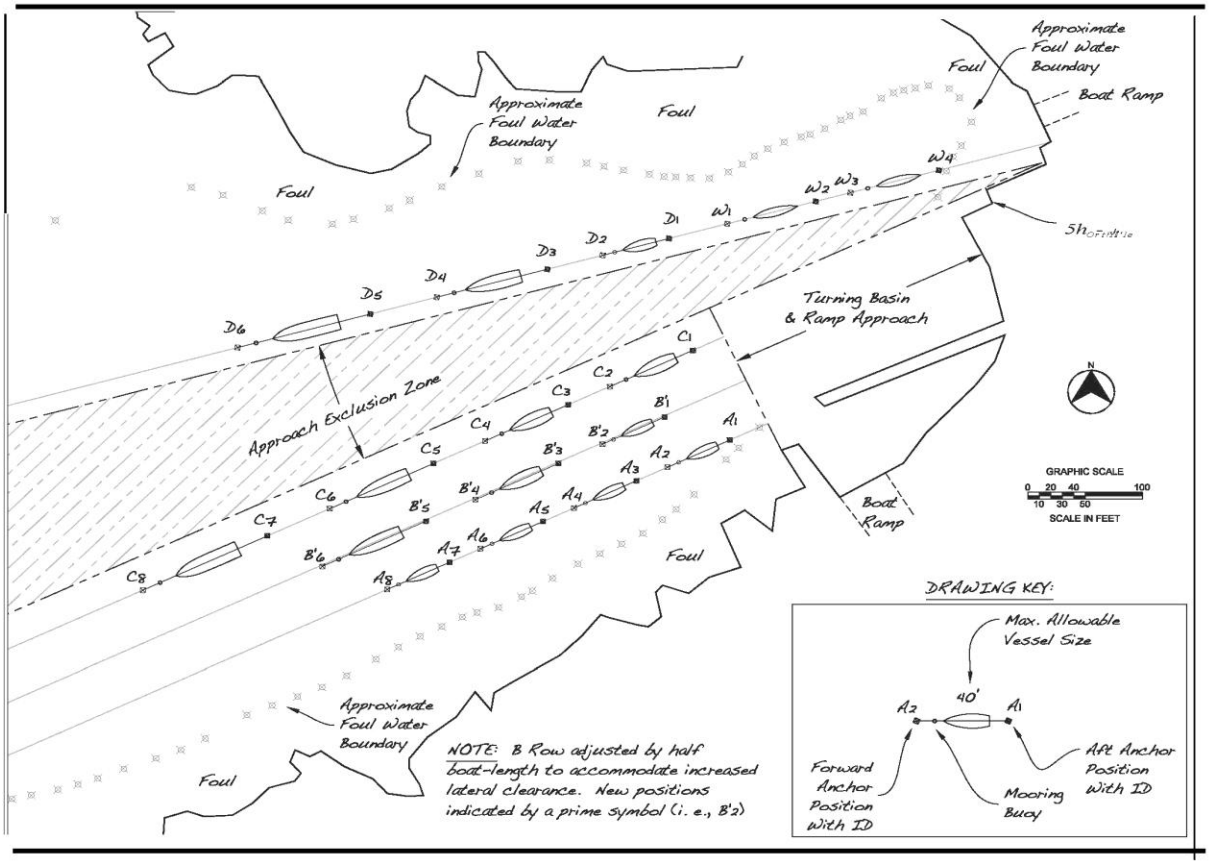

Figure 1. Revised Keauhou Harbor proposed mooring locations. Our June 12, 2013 survey included anchor locations W1 through W4 and row B'.

Anchor location W1

The harbor bottom within a 12-ft (4-m) radius of the proposed mooring anchor location W1 consists of sand and loose rubble, and scattered small boulders. No corals were encountered within the 5-ft (1.5-m) radius of the anchor location. Beyond the 5-ft (1.5 m) radial distance, moveable boulders and loose rubble host some coral (*Pocillopora meandrina*). Collector urchins (*Tripneustes gratilla*) are common. No sea grasses or invasive species were observed.

Anchor location W2

The harbor bottom within a 12-ft (4-m) radius of anchor location W2 consists of sand, loose rubble, and scattered large boulders. No corals were encountered within 5 ft (1.5 m) of the anchor location. Beyond 5 ft (1.5 m), large boulders and loose rubble host other corals (*P. lobata, Poc. damicornis,* and *Pavona varians*). No sea grasses or invasive species were observed.

Anchor location W3
The harbor bottom within 12 ft (4-m) of proposed anchor location W3 consists of sand and small boulders. No corals were encountered within 5 ft (1.5 m) from the anchor location. Beyond 5 ft (1.5 m) occur several large, difficult-to-move boulders with encrusting coral colonies (*P. lobata* and *Montipora capitata*). One oriental flying gurnard (*Dactyloptena orientalis*) was seen foraging on the bottom. No sea grasses or invasive species were observed.

Anchor location W4
The harbor bottom within 12 ft (4 m) of proposed anchor location W4 consists of, gravel, loose rubble and small boulders. Within 5 ft (1.5 m) of the anchor location, no corals were encountered. Urchins (*T. gratilla*) are abundant. Beyond 5 ft (1.5 m) occur several moveable boulders with encrusting coral colonies (*P. lobata*). No sea grasses or invasive species were observed.

Anchor location B'1
The harbor bottom within 12 ft (4 m) of proposed anchor location B'1 consists of sand, gravel and scattered outcrops with coral cover. One moveable colony of *Pocillopora meandrina* (10 cm) was encountered within the 5-ft (1.5-m) radius of the anchor location. Beyond the 5-ft (1.5 m) radial distance, boulders and loose rubble host some coral (*Porites lobata*). At 12 ft (4 m) northwest from the anchor location, an old concrete pile lies horizontal on the seafloor. Corals (*P. lobata*, *Poc. meandrina*, and *Poc. damicornis*) encrust the pile. Collector urchins (*Tripneustes gratilla*) are common. No sea grasses or invasive species were observed.

Anchor location B'2
The harbor bottom within 12 ft (4 m) of proposed anchor location B'2 consists of sand and scattered boulders. Moveable boulders with corals (*P. lobata*.) were encountered within 5 ft (1.5 m) of the anchor location. One large (10-ft; 3-m) limestone outcrop occurs 11 ft (3.3 m) northeast from the anchor location. One large (>80 cm) *P. lobata* colony and *M. capitata*, *Pav. varians*, and *Pocillopora* spp. colonies are common on the outcrops. No sea grasses or invasive species were observed.

Anchor location B'3
The harbor bottom within 12 ft (4 m) of proposed anchor location B'3 consists of sand loose rubble with coral cover. One moveable colony of *P. lobata* (50 cm) occurs within 5 ft (1.5 m) of the anchor location. The bottom beyond 5 ft (1.5 m) is all sand out to 12 ft (4 m). A spotted eagle ray (*Aetobatus narinari*) was seen foraging on the sand bottom. No sea grasses or invasive species were observed.

Anchor location B'4
The harbor bottom within 12 ft (4 m) of proposed anchor location B'4 consists of sand. No corals occur within the 5 ft (1.5 m) of the anchor location. Beyond 5

ft (1.5 m) occur several moveable boulders with encrusting coral colonies (*P. lobata*). No sea grasses or invasive species were observed.

Anchor location B'5
The harbor bottom within 12 ft (4 m) of proposed anchor location B'5 consists of sand, gravel, and rubble. No coral colonies were encountered within 5 ft (1.5 m) of the proposed anchor location. Beyond 5 ft (1.5 m) occur several moveable boulders with encrusting coral colonies (*P. lobata*). At 12 ft (4 m) from the anchor location, a pile of derelict boat lines lies on the seafloor. No sea grasses or invasive species were observed

Anchor location B'6
The harbor bottom within 12 ft (4 m) of proposed anchor location B'6 consists of sand, gravel and rubble. No coral colonies were encountered within 5 ft (1.5 m) of the proposed anchor location. Beyond 5 ft (1.5 m) occur several small, moveable boulders with encrusting coral colonies (*P. lobata* and *Poc. damicornis*). No sea grasses or invasive species were observed.

No federally-listed (USFWS, 2012) threatened or endangered species were encountered during the June 12, 2013 survey (e.g., sea turtles, monk seal, cetaceans). No candidate species of coral for listing (NOAA-NMFS, 2010) were observed.

Signed,

Stacey Kilarski
AECOS Marine Biologist

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Introduced Wild Birds. State of Hawai'i. Administrative Rule §13-134-1 through §13-134-10.

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National Oceanic and Atmospheric Administration – National Marine Fisheries Service (NOAA-NMFS). 2010. Department of Commerce. 50 CFR 75. Endangered and Threatened Wildlife: Notice of 90-Day Finding on a Petition to List 83 Species of Corals as Threatened or Endangered Under the Endangered Species Act (ESA). *Federal Register*, 75 (27; February 10, 2010): 6616-6621.

U. S. Fish and Wildlife Service (USFWS). 2012. USFWS Threatened and Endangered Species System (TESS). Available online at URL: http://ecos.fws.gov/tess_public/; last accessed September 7, 2012.

Appendix A

Inventory of aquatic biota observed in Keauhou Small Boat Harbor, March 6 & 7, 2013 and June 12, 2013.

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
	ALGAE		
RHODOPHYTA	RED ALGAE		
Porolithon gardineri	coralline algae	**Ind.**	O
Porolithon onkodes	coralline algae	**Ind.**	O
Hydrolithon gardineri	coralline algae	**Ind.**	C
Hydrolithon onkodes	coralline algae	**Ind.**	O
Pneophyllum conicum	coralline algae	**Ind.**	O
	INVERTEBRATES		
SCELRACTINIA	HARD CORALS		
POCILLOPORIDAE			
Pocillopora meandrina	cauliflower coral	**Ind.**	C
Pocillopora eydouxi	antler coral	**Ind.**	O
Pocillopora damicornis	lace coral	**Ind.**	O
ACROPORIDAE			
Montipora capitata	rice coral	**Ind.**	R
PORITIDAE			
Porites lobata	lobe coral	**Ind.**	A
Porites compressa	finger coral	**Ind.**	R
AGARICIIDAE			
Pavona varians	corrugated coral	**Ind.**	O
FAVIIDAE			
Leptastrea bewickensis	bewick coral	**Ind.**	U
ANNELIDA, POLYCHAETA,			
SABELLIDAE	WORMS		
Sabellastarte spectabilis	feather duster worm	**Ind.**	U
TEREBELLIDAE			
Lomia medusa	Medusa spaghetti worm	**Ind.**	U
MOLLUSCA, GASTROPODA			
TEREBRIDAE,			
Terebra guttata	white-spotted auger; *pūpū loloa, ʻoiʻoi*	**End.**	R
CONIDAE			
Conus sp.		**Ind.**	U

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
CASSIDIDAE			
Cassis cornuta	horned helmet; *pū puhi*	**Nat.**	R
HIPPONICIDAE			
Hipponix imbricatus	shingly hoof shells	**End.**	C
VERMETIDAE			
Serpulorbis variabilis	variable worm snail	**Ind.**	O
MOLLUSCA, BIVALVIA			
PTERIIDAE			
Pinctada margaritifera	black-lipped pearl oyster, *pā*	**Ind.**	O
ISOGNOMONIDAE			
Isognomon perna	brown purse shell, *nahawele*	**Ind**.	C
OSTREIDAE			
Ostrea sandvicensis	Hawaiian oyster	**End.**	C
ARTHOPODA, CRUSTACEA, DECOPODA			
ALPHEIDAE			
Alpheus deuteropus	snapping shrimp (in *P. lobata*)	**Ind.**	R
TRAPEZIIDAE			
Trapezia sp.	coral guard crab	**Ind.**	R
ECHINODERMATEA, OPHIUROIDEA			
OPHIOCOMIDAE			
Ophiocoma erinaceus	brittle star	**Ind.**	U
Ophiocoma pica	brittle star	**Ind.**	U
ECHINODERMATA, ECHINOIDEA	SEA URCHINS		
DIADEMATIDAE			
Echinothrix calamaris	banded urchin	**Ind.**	C
ECHINOMETRIDAE			
Echinometra mathaei	rock-boring urchin, *ʻina kea*	**Ind.**	C
Echinometra oblonga	oblong boring urchin; *ʻina*	**Ind.**	U
Heterocentrotus mammillatus	red pencil urchin; *hāʻukeʻukeʻulaʻula*	**Ind.**	O
TOXOPNEUSTIDAE			
Tripneustes gratilla	collector urchin; *hāwaʻe maoli*	**Ind.**	A

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
ECHINODERMATA, HOLOTHUROIDEA	SEA CUCUMBERS		
Holothuria atra	black sea cucumber	**Ind.**	O
	VERTEBRATES		
VERTEBRATA, PICES	BONY FISHES		
FISTULARIIDAE	CORNETFISH		
Fistularia commersonii	bluespotted cornetfish, *nūnū*	**Ind.**	R
DACTYLOPTERIDAE	GURNARD		
Dactyloptena orientalis	oriental flying gurnard; *loloa'u*	**Ind.**	R
MULLIDAE	GOATFISH		
Mulloidichthys vanicolensis	yellowfin goatfish; *weke 'ula*	**Ind.**	C
Mulloidichthys flavolineatus	square-spot goatfish; *weke'ā*	**Ind.**	C
Parupeneus multifasciatus	manybar goatfish, *moano*	**Ind.**	R
CHAETODONTIDAE	BUTTERFLYFISH		
Chaetodon auriga	threadfin butterflyfish; *kīkākapu*	**Ind.**	C
Chaetodon lunula	raccoon butterflyfish, *kīkākapu*	**Ind.**	R
Chaetodon ornatissimus	ornate butterflyfish, *kīkākapu*	**Ind.**	U
Chaetodon quadrimaculatus	fourspot butterflyfish, *lauhau*	**Ind.**	U
Forcipiger flavissimus	Common longnose butterflyfish, *lauwiliwili nukunuku 'oi'oi*	**Ind.**	R
POMOCENTRIDAE	DAMSELFISH		
Abudefduf abdominalis	Hawaiian sergeant, *Mamo*	**End.**	O
Abudefduf vaigienensis	Indo-Pacific sergeant	**Ind.**	O
Abudefduf sordidus	blackspot sergeant *kūpīpī*	**End.**	O
Dascyllus albisella	Hawaiian dascyllus, *ālo'ilo'i*	**Ind.**	C
Chromis vanderbilti	blackfin chromis	**Ind.**	O
Chromis ovalis	oval chromis	**End.**	C
Plectroglyphidodon imparipennis	bright-eye damselfish	**Ind.**	O
Stegastes marginatus	Hawaiian gregory	**End.**	O

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
LABRIDAE	WRASSE		
Gomphosus varius	bird wrasse; *hīnālea ʻiʻiwi*	**Ind.**	R
Thalassoma duperrey	saddle wrasse, *hinalea lauwili*	**End.**	O
BOTHIDAE			
Bothus mancus	flowery flounder; *pākiʻi*	**Ind.**	R
SCARIDAE	PARROTFISH		
Chlorurus spilurus	bullethead parrotfish, *uhu*	**Ind.**	R
Scarus psittacus	palenose parrotfish, *uhu*	**Ind.**	R
ZANCLIDAE			
Zanclus cornutus	moorish idol; *kihikihi*	**Ind.**	R
ACANTHURIDAE	SURGEONFISH		
Acanthurus achilles	achilles tang	**Ind.**	C
Acanthurus guttatus	whitespotted surgeonfish; *api*	**Ind.**	C
Acanthurus nigroris	bluelined surgeonfish	**Ind.**	U
Acanthurus olivaceus	orangeband surgeonfish; *naʻenaʻe*	**Ind.**	C
Acanthurus triostegus	convict tang; *manini*	**Ind.**	C
Ctenochaetus strigosus	goldring surgeon, *kole*	**Ind.**	O
Naso unicornis	bluespine unicornfish, *kala*	**Ind.**	O
Acanthurus guttatus	whitespotted surgeonfish; *ʻapi*	**Ind.**	O
Acanthurus leucopareius	whitebar surgeonfish; *māikoiko*	**Ind.**	O
Acanthurus nigrofuscus	brown tang, *māʻiʻiʻi*	**Ind.**	C
Acanthurus nigricans	goldrim tang	**Ind.**	O
BALISTIDAE			
Rhinecanthus rectangulus	wedgetail triggerfish; *humuhumu-nukunuku-ā-puaʻa*	**Ind.**	R
OSTRACIIDAE	BOXFISH		
Ostracion meleagris	spotted boxfish; *moa*	**Ind.**	C
TETRAODONTIDAE			
Canthigaster jactator	Hawaiian whitespotted toby	**End.**	C
Canthigaster amboinensis	Ambon toby	**Ind.**	O
BLENNIIDAE	BLENNIES		
Cirripectes obscurus	gargantuan blenny, *pāoʻo*	**End.**	R

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name, *Hawaiian name*	Status	Relative abundance
MYLIOGATIDAE			
Aetobatus narinari	spotted eagle ray; *hailepo*	**Ind.**	R
GOBIIDAE	GOBIES		
Psilogobius mainlandi	Hawaiian shrimp goby	**End.**	O
BALISTIDAE	TRIGGERFISH		
Sufflamen bursa	lei triggerfish; *humuhumu lei*	**Ind.**	R
VERTEBRATA, REPTILIA	reptiles		
CHELONIIDAE			
Chelonia mydas	green sea turtle, *honu*	**Ind.**	O

KEY TO SYMBOLS USED:

Abundance categories:

R – Rare – only one or two individuals observed.
U – Uncommon – several to a dozen individuals observed.
O – Occasional – seen irregularly in small numbers
C – Common – observed everywhere, although generally not in large numbers.
A – Abundant – observed in large numbers and widely distributed.

Status categories:

End – Endemic – species found only in Hawaii
Ind. – Indigenous – species found in Hawaii and elsewhere
Nat. – Naturalized – species were introduced to Hawaii intentionally, or accidentally.

Appendix B

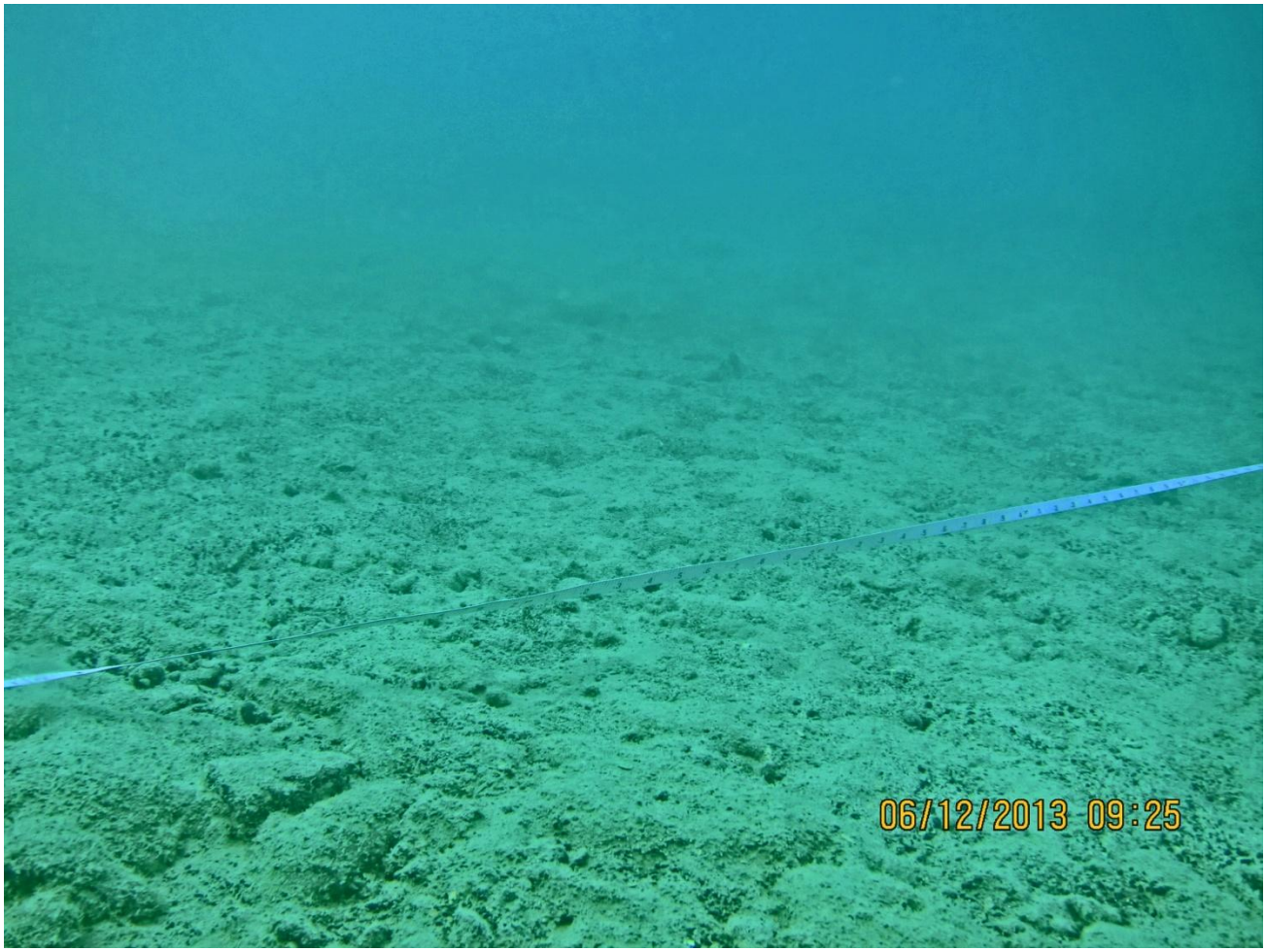
Summary of the bottom composition and relative coral distribution within the 12 ft (4-m) and 5 ft (1.5 m) radii

Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
W1	Sand and rubble, no coral	Scattered boulders with small colonies of *Poc. meandrina* (<5 cm)	Sand and loose rubble. Urchins (*Tripneustes gratilla*) common.
W2	Sand, small outcrop, no coral	Limestone outcrop with coral (*P. lobata*, *Poc. damicornis*, *Pav. varians*).	Sand, loose rubble, and moveable boulders with and without coral.
W3	Sand, no coral	Several boulders with coral (*P. lobata* and *M. capitata*)	Sand and moveable boulders.
W4	Rubble, gravel, and small boulders. No coral	Limestone outcrop with *P. lobata* colonies.	Sand and outcrops. Urchins (*T. gratilla*) common.
B'1	Sand and gravel. One 10 cm moveable *Poc. meandrina*.	Limestone outcrop with *P. lobata* colonies.	Sand, gravel, and limestone outcrops with coral cover. Urchins (*T. gratilla*) common. Horizontal pile with coral growth
B'2	Small moveable boulders with *P. lobata* (5 cm, 10 cm)	Several boulders with encrusting coral (*P. lobata*, *Poc. damicornis* and *Pav. varians*).	Sand and boulders with encrusting corals.
B'3	Sand. One moveable 50 cm (50% mortality) *P. lobata* colony.	Sand, no coral	
B'4	Sand; no coral	Sand and several moveable boulders with encrusting *P. lobata* colonies.	

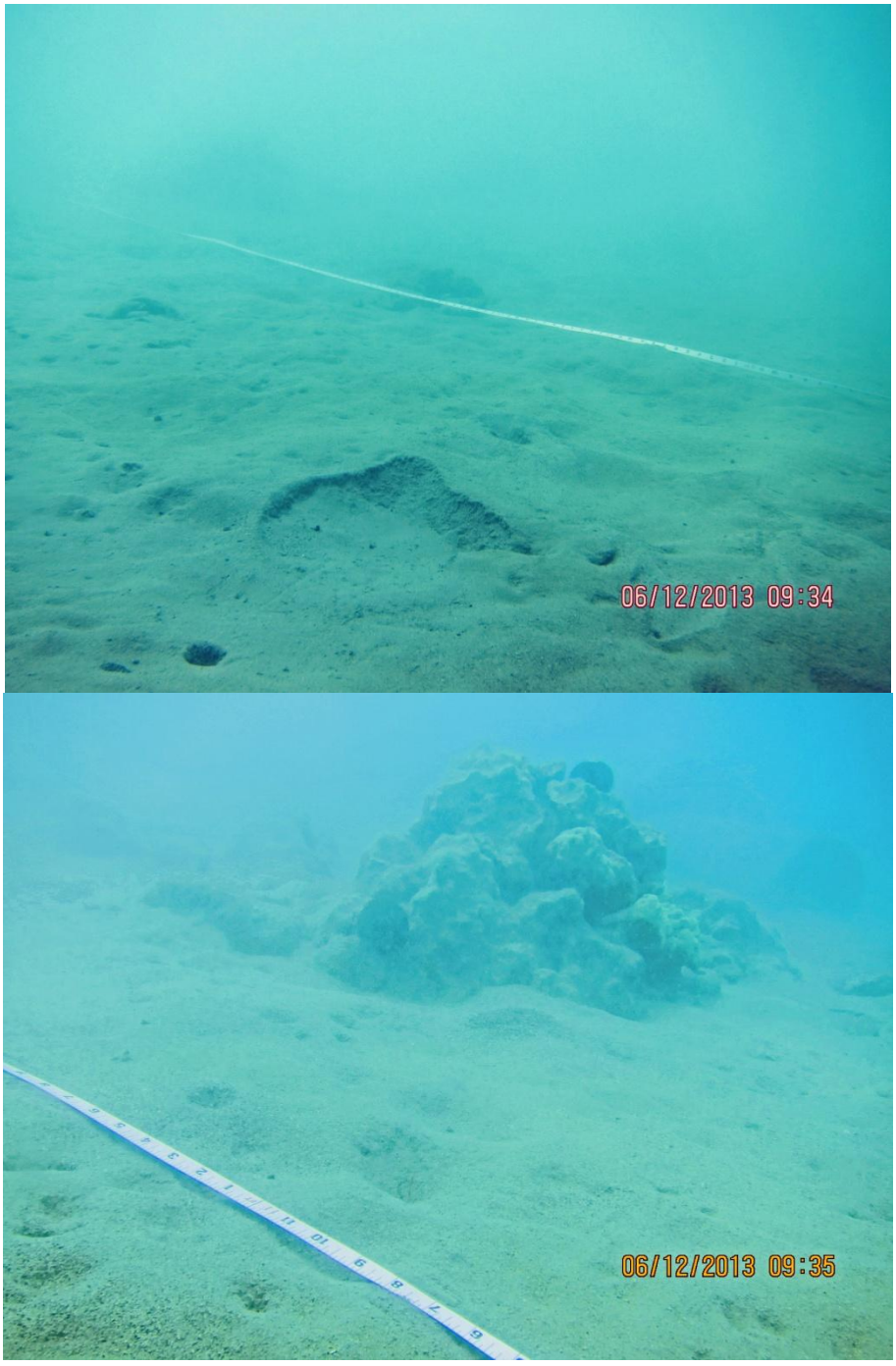
Proposed anchor location	Within 5 ft (1.5 m) from anchor center point	5- 12 ft (1.5-4 m) from anchor center point	Other bottom composition notes
B'5	Sand, rubble. No coral	Sand and several moveable boulders with encrusting *P. lobata* colonies.	
B'6	Rubble and sand, no coral	Sand and several moveable boulders with encrusting *P. lobata* and *Poc. damicornis.*	

Appendix C.

Photos of Keauhou Small Boat Harbor potential mooring anchor locations, June 12, 2013. Weighted vertical lines in photos represent proposed anchor center points.

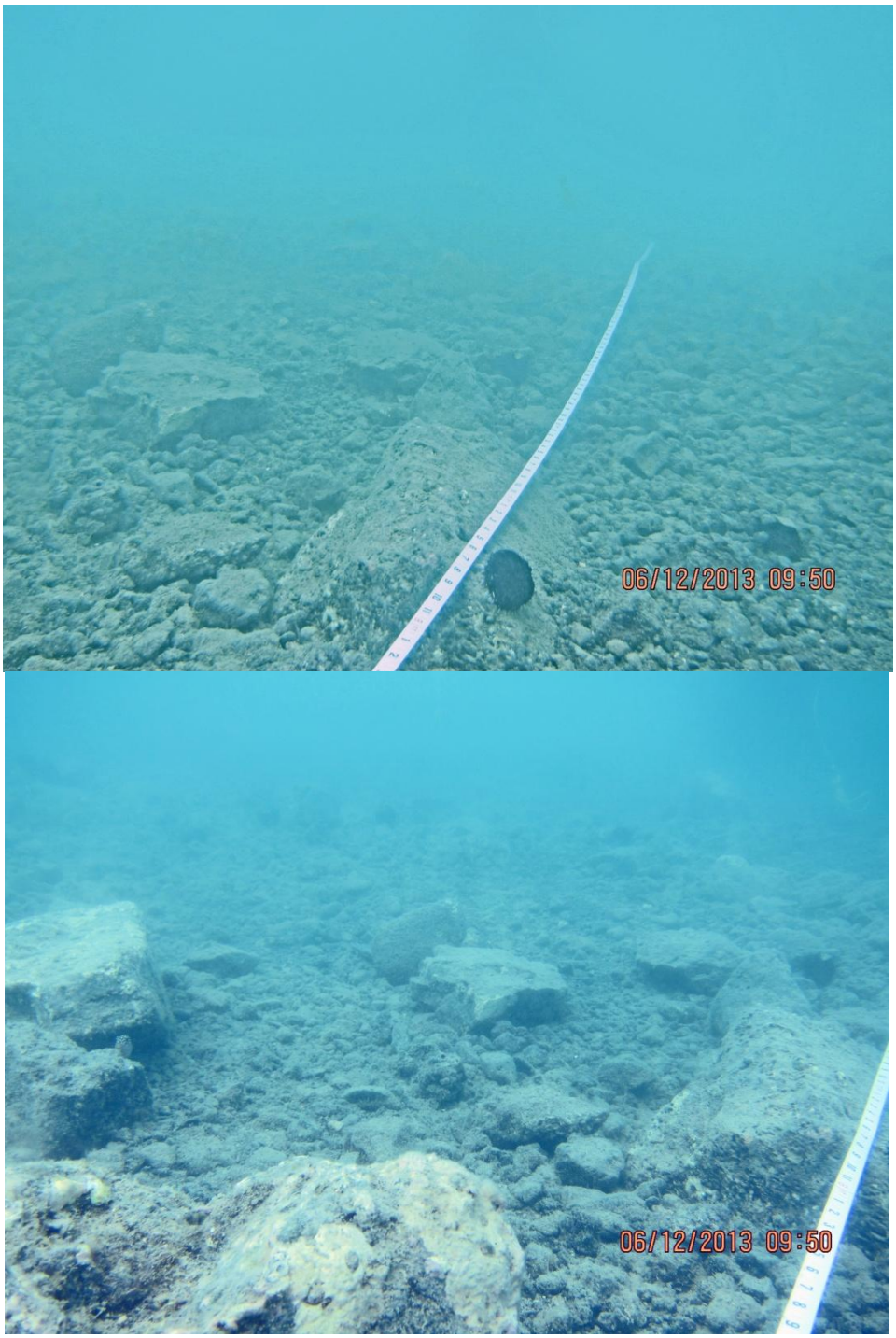


Proposed mooring anchor location W1 bottom is sand and loose rubble.

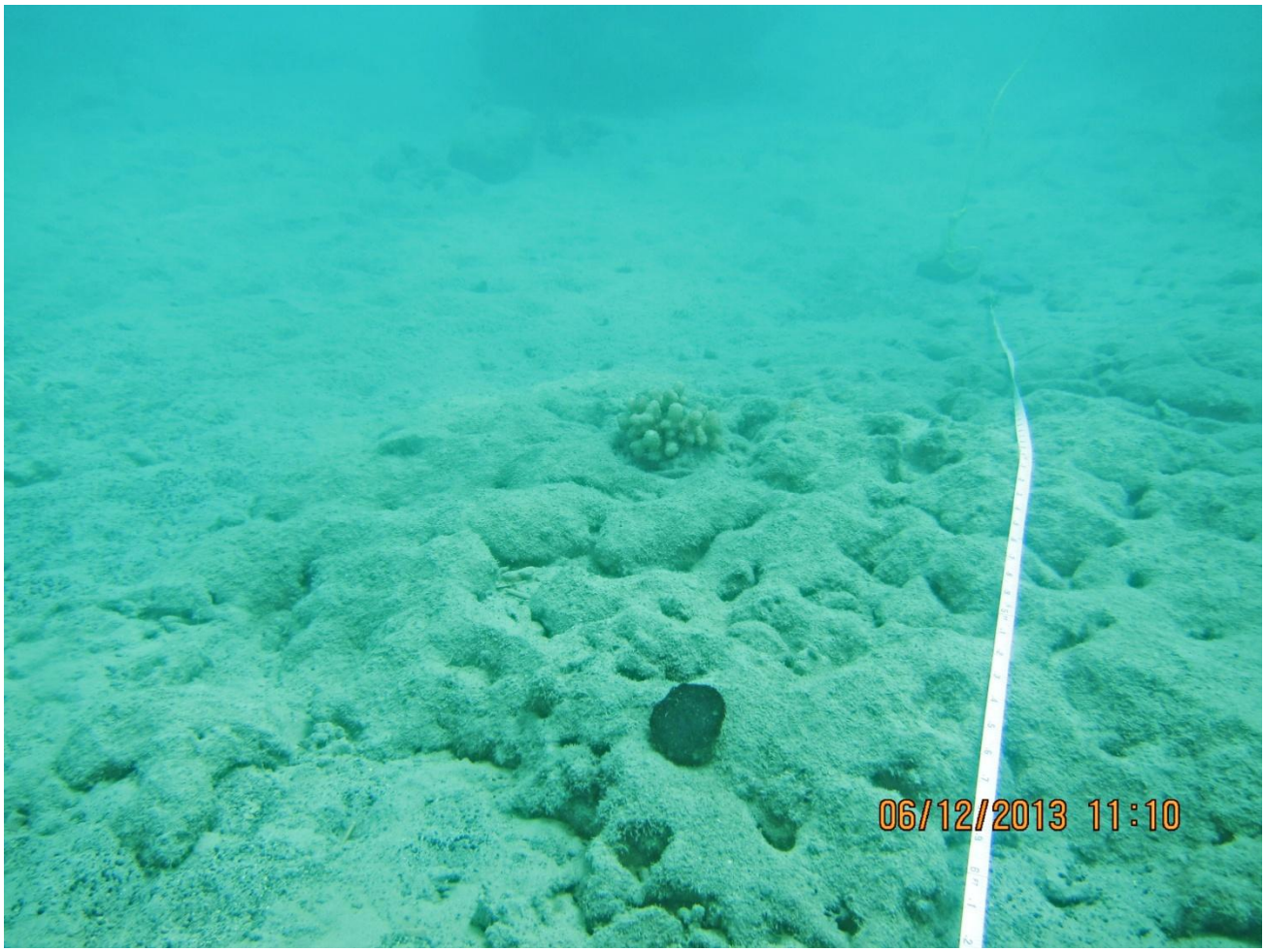


Proposed mooring anchor location W2 bottom is sand and boulders. Within 5 ft (1.5 m) of the anchor location, no corals were encountered (top). Beyond 5 ft (1.5 m), large boulders and loose rubble host other corals (*P. lobata, Poc. damicornis,* and *Pavona varians*; bottom).

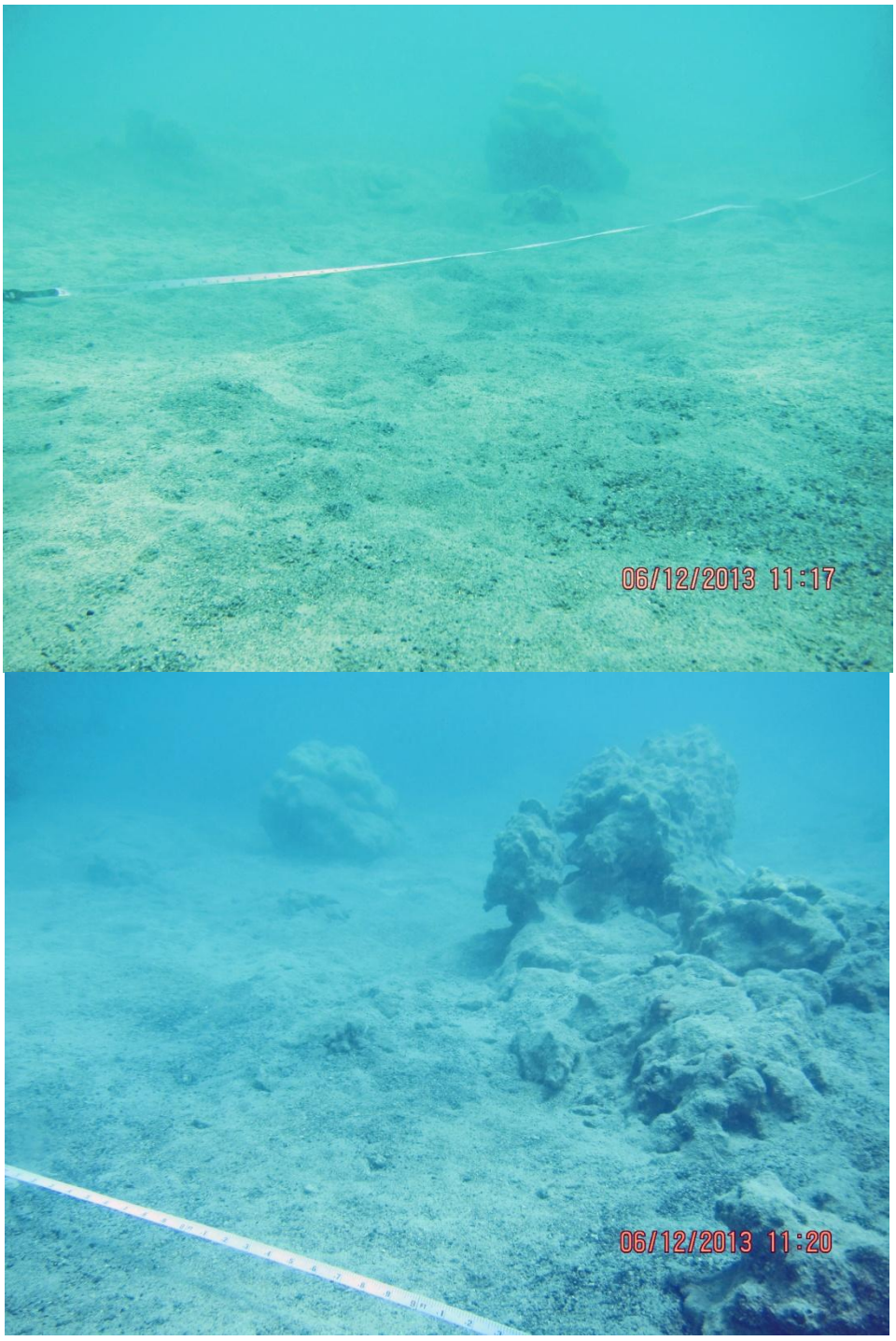
Within 5 ft (1.5 m) of the proposed mooring anchor location W3 bottom is sand and no corals. Beyond 5 ft (1.5 m) occur several large, difficult-to-move boulders with encrusting coral colonies (*P. lobata* and *Montipora capitata*).



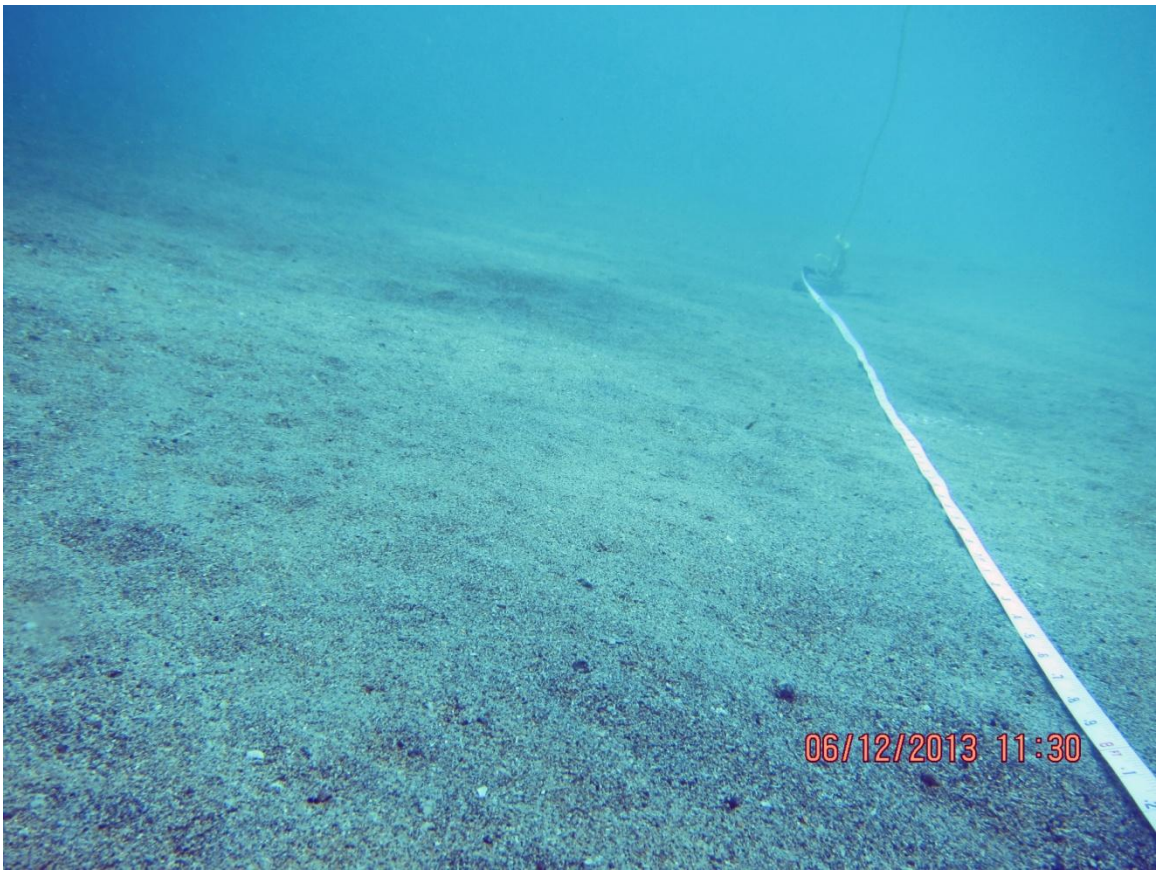
Within 5 ft (1.5 m) of the proposed mooring anchor location W4 bottom is gravel, loose rubble and small boulders.. Beyond 5 ft (1.5 m) occur several moveable boulders with encrusting coral colonies (*P. lobata*).



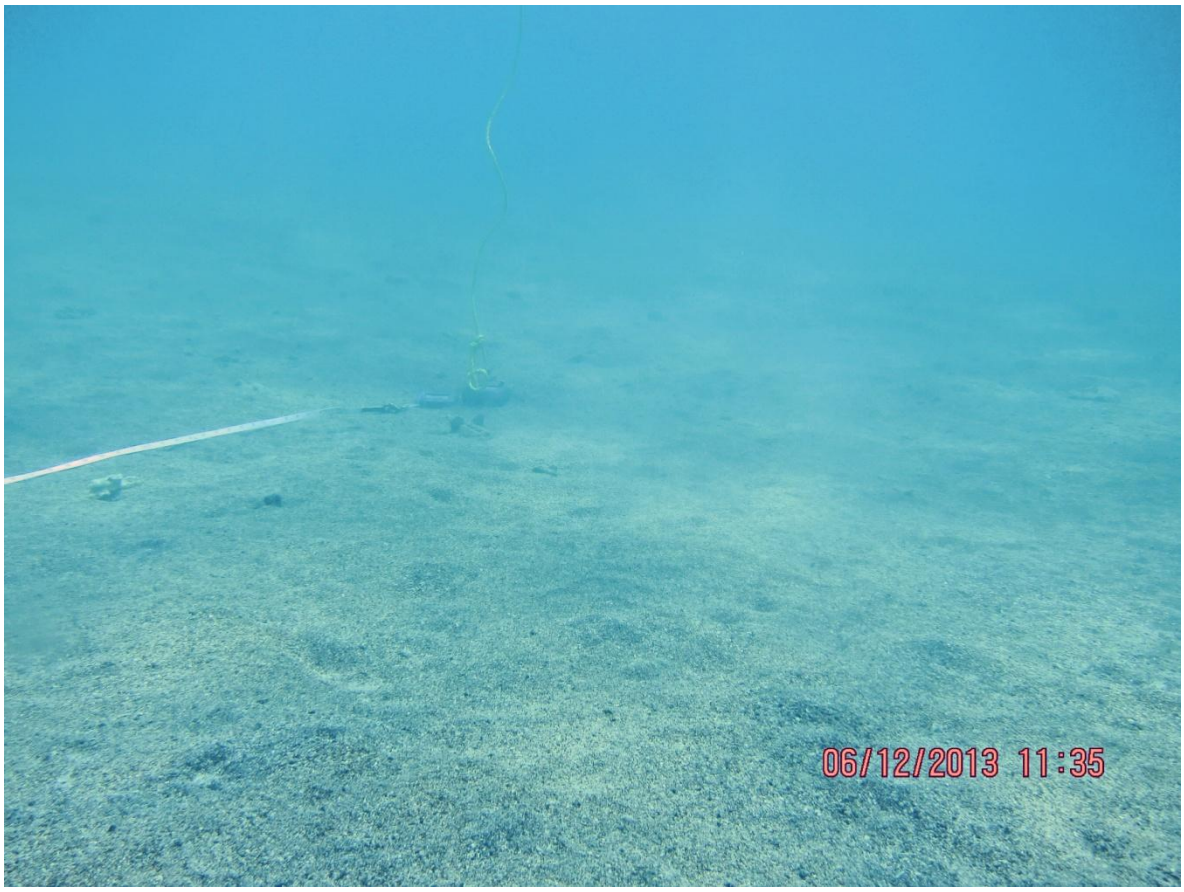
Proposed mooring anchor location B'1 bottom is sand and gravel. One 10 cm moveable *Poc. meandrina* occurs within 5 ft (1.5 m) of the proposed mooring location.



Within 5 ft (1.5 m) of the proposed mooring anchor location B'2 bottom is gravel, loose rubble and small boulders (top). Beyond 5 ft (1.5 m) occurs a limestone outcrop with encrusting coral colonies (bottom).

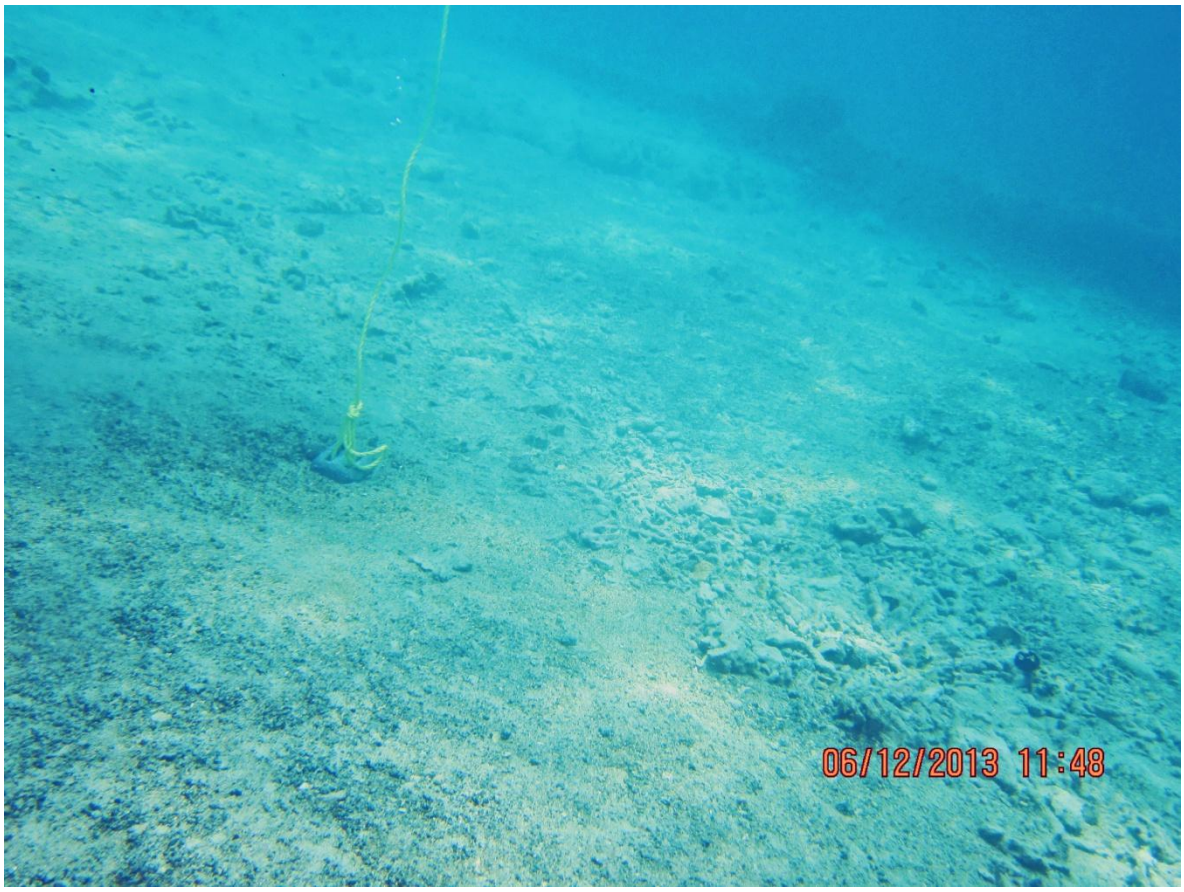


Within 12 ft (4 m) of the proposed mooring anchor location B'3, the bottom is sand and gravel. No corals were observed.



Within 12 ft (4 m) of the proposed mooring anchor location B'4, the bottom is sand and gravel. No corals were observed within 5 ft (1.5m) of the anchor location. Beyond 5 ft (1.5m), several moveable boulders with corals occur.

Within 5 ft (1.5 m) of the proposed mooring anchor location B'5, the bottom is sand and gravel, with no corals. Beyond 5 ft (1.5m) of the anchor location, several moveable boulders with corals were observed.



Within 12 ft (4 m) of the proposed mooring anchor location B'6, the bottom is sand and gravel. No corals were observed within 5 ft (1.5 m) of the anchor location. Beyond 5 ft (1.5m), several moveable boulders with corals occur.