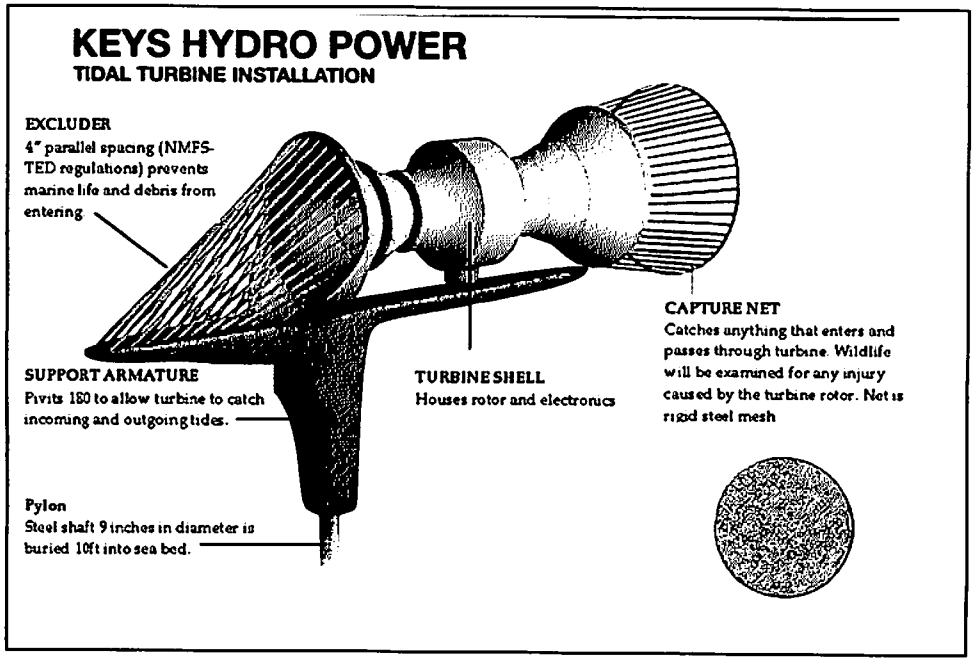
FLORIDA KEYS NATIONAL MARINE SANCTUARY

ENVIRONMENTAL ASSESSMENT

ON THE ISSUANCE OF PERMIT # FKNMS-2007-122 FOR TESTING A HYDROKINETIC TURBINE IN SANCTUARY WATERS



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EXECUTIVE SUMMARY

This document presents an analysis of a proposed action pertaining to the issuance of a NOAA permit, file # FKNMS-2007-122, for the one-time testing of a hydrokinetic turbine within the Florida Keys National Marine Sanctuary (FKNMS or sanctuary). The preferred alternative analyzed in this environmental assessment (EA) is to issue a permit to Mr. Douglas Bedgood of the Florida Keys Hydropower Corporation to conduct the test. The other alternative considered and analyzed in this document is a "no action" alternative.

The testing of the hydrokinetic turbine would consist of a one-time, sixty (60)-day deployment near Bahia Honda Channel in the Lower Florida Keys. The activity includes installing a 9" diameter steel pylon into the sea bed, attaching a turbine unit on top of the pylon, and monitoring its operation from a moored barge. The turbine unit would then be removed from the sanctuary, and the pylon would be cut even with the sea bed and the loose portion removed. The turbine would not be hooked up to an electrical grid during the test period.

The action is being considered in order to facilitate multiple uses of the sanctuary that are compatible with the primary objective of resource protection, as required by the National Marine Sanctuaries Act (NMSA) of 1972, as amended (16 USC §1431 *et seq.*), and the Florida Keys National Marine Sanctuary and Protection Act (PL 101-605).

NOAA anticipates that the preferred alternative action to issue a permit for testing of the hydrokinetic turbine in FKNMS would have little or no impact on sanctuary resources and qualities. The preferred alternative action would facilitate multiple uses of the sanctuary without conflicting with the sanctuary's resource protection mandate. Authorizing the pilot test of the hydrokinetic turbine would also support research that may someday ameliorate current stresses on Florida Keys' reefs. FKNMS evaluates the expected end value of proposed activities to the furtherance of sanctuary goals and objectives prior to making decisions on permit issuance. NOAA anticipates a Finding of No Significant Impact for this action.

NOAA prepared this EA in accordance with the National Environmental Policy Act of 1969 (NEPA; 42 USC §4321 *et seq.*) as implemented by the Council on Environmental Quality regulations (40 CRF Parts 1500-1508), and National Oceanic and Atmospheric Administration (NOAA) Administrative Order (NAO) 216-6, which describes NOAA policies, requirements, and procedures for implementing NEPA.

BACKGROUND

Office of National Marine Sanctuaries and the *National Marine Sanctuaries Act (NMSA)*
The National Marine Sanctuary System, of which FKNMS is a part, is managed pursuant to provisions of the NMSA. Under the NMSA, the Secretary of Commerce is authorized to designate and manage areas of the marine environment as national marine sanctuaries. Such designation is based on attributes of special national significance, including conservation, recreational, ecological, historical, scientific, cultural, archaeological, educational, or aesthetic qualities.

Sanctuaries are managed to protect and conserve their resources and to allow uses that are compatible with resource protection, the primary goal of the National Marine Sanctuary System. The mission of NOAA's Office of National Marine Sanctuaries is to serve as the trustee for the nation's system of national marine sanctuaries, to conserve, protect, and enhance their biodiversity, ecological integrity and cultural legacy.

Florida Keys National Marine Sanctuary
Florida Keys National Marine Sanctuary protects 2900 square nautical miles of coastal and ocean waters and submerged land. The marine ecosystem of the FKNMS supports over 6000 species of plants, fishes and invertebrates, including the nation's only living coral reef that lies adjacent to the continent. FKNMS contains one of the largest seagrass communities in the northern hemisphere, and supports unique nearshore habitats including mangroves and hard bottom. The region also contains significant maritime heritage and cultural resources, including historical lighthouses and hundreds of documented and undocumented shipwrecks and/or artifacts relating to maritime heritage (U.S. DOC 1996).

Because of its beauty, accessible location, and rich natural and cultural resources, the Florida Keys National Marine Sanctuary attracts over three million visitors annually that participate in water-based activities such as snorkeling, SCUBA diving, recreational fishing and wildlife viewing. Protecting the marine resources of the Florida Keys is valuable not only for the environment but also the economy.

PURPOSE AND NEED

Need for this Action
NOAA is evaluating alternatives on whether or not to permit the one-time, short-term deployment of alternative energy technology equipment within the Florida Keys National Marine Sanctuary. No other actions are considered or connected to the issuance of the permit. The need for this action is to authorize an activity that does not hinder the protection of the biological integrity of the Florida Keys National Marine Sanctuary in compliance with the NMSA, the Florida Keys National Marine Sanctuary and Protection Act (PL 101-605), and the Florida Keys National Marine Sanctuary Revised Management Plan (U.S. DOC 2007).

Purpose of this Environmental Assessment

The purpose of this Environmental Assessment is to consider the issuance of a FKNMS permit under the authority given at 15 CFR Part 922.166 to allow the one-time test of a hydrokinetic turbine on the seabed within the sanctuary in a manner consistent with the primary purpose of resource protection. The issuance of a permit constitutes a final agency action and is thus subject to requirements of the National Environmental Policy Act (NEPA). NOAA Administrative Order 216-6 sets forth the policies for implementation of NEPA by NOAA agencies. NAO 216-6 does not list any categorical exclusion with which the issuance of a permit to test a hydrokinetic turbine would be consistent. Therefore, the FKNMS has prepared this Environmental Assessment to document the environmental impacts of the proposed action.

Background

Through the Department of the Army Corps of Engineers (DA Corps) and Florida Department of Environmental Protection (DEP) permit application process (further described below), NOAA FKNMS began review of the project proposed by Mr. Douglas Bedgood / Florida Keys Hydropower Corporation in September 2007 and found it to be subject to FKNMS regulation. FKNMS has taken two separate actions on this project to date, both of which qualified under NOAA Administrative Order 216-6 for categorical exclusion under the National Environmental Policy Act (6.03c.3(i), Other Activity Not Having Significant Environmental Impacts).

In December 2007, Mr. Bedgood expressed his desire to temporarily place the turbine unit and associated platform/base on the seafloor within a man-made boat basin in Key West, located at the Florida Keys Community College. The purpose of this temporary deployment was to allow marine life to colonize on the turbine so an assessment of potential fouling impacts could be made prior to the pilot test in Bahia Honda Channel. On January 28, 2008, FKNMS issued permit # FKNMS-2008-002 for temporary (60 day) turbine placement at the Florida Keys Community College basin. On March 30, 2008, Mr. Bedgood reported to FKNMS that the turbine unit and base had not been deployed because the seafloor of the basin was found to contain over 70" of accumulated sediment and silt, such that any equipment deployed would be difficult or impossible to retrieve.

After several project revisions and a thorough review by FKNMS and other jurisdictional agencies (further described below), FKNMS issued a letter of authorization (# FKNMS-2007-122) to DA Corps on March 18, 2009. The letter stated that the project as proposed was subject to FKNMS regulation, and further noted that FKNMS did not object to the issuance of a DA Corps permit as long as a separate NOAA FKNMS permit was obtained by Mr. Bedgood.

OTHER JURISDICTIONAL AGENCIES

Mr. Bedgood's proposal to deploy a hydrokinetic turbine on the sea floor of Bahia Honda Channel in the Lower Florida Keys triggers review by several agencies, in addition to NOAA FKNMS, with jurisdiction over the proposed activities. These agencies and their resulting actions on the proposal to date are summarized below.

Department of the Army Corps of Engineers (DA Corps)

The Department of the Army Corps of Engineers (DA Corps) regulates activities that include placing fill in wetlands or other waters of the United States and/or the placement or construction of a structure in navigable waters, under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) and Section 404 of the Federal Water Pollution Control Act (Clean Water Act). DA Corps and Florida Department of Environmental Protection (DEP) have developed the *Joint Application for Environmental Resource Permit, Authorization to Use State Owned Submerged Lands, Federal Dredge and Fill Permit* to streamline permit application procedures for projects that trigger both federal and state regulation (see below for information on DEP authority and process).

On October 1, 2007, the DA Corps issued a public notice for Letter of Permission Application No. 2007-5383 (LP-ALS), for applicant Florida Keys Hydropower Research Corp to test a hydrokinetic turbine by placing it on the floor of Bahia Honda Channel in the Lower Florida Keys. Several information needs were addressed and project design changes made over the next 12 months, with DA Corps posting a revised permit application for comment on February 14, 2008 and again on April 30, 2008.
On May 23, 2008, FKNMS permit staff, ONMS headquarters permit staff, NOAA Fisheries Habitat Conservation Division (HCD), and Florida Fish and Wildlife Conservation Commission (FWC) staff discussed the project. The discussion resulted in a Request for Additional Information (RAI) being sent to DA Corps and DEP from FKNMS, which outlined several project design questions.

On July 2, 2008, DA Corps issued an electronic mail message to several agencies indicating that Mr. Bedgood had withdrawn his application for the project.

On November 7, 2008, the DA Corps issued a revised public notice for Individual Permit Application No. 2007-5383 (IP-ALS). FKNMS followed-up with a second RAI letter to the applicant on December 1, 2008, outlining five outstanding information needs.

Revised project information, including an Installation, Operations, and Removal Plan that addressed several of FKNMS information needs, was submitted to FKNMS via the DA Corps on December 31, 2008. On January 8, 2009, DA Corps responded to NOAA Fisheries HCD requirements (outlined in a letter from that agency on December 8, 2008) for an Installation, Operations, and Removal Plan and Biological Monitoring Plan. On January 27, 2009, NOAA Fisheries HCD submitted additional comments to DA Corps on behalf of NOAA Fisheries HCD, NOAA Fisheries Protected Resources Division (PRD),

FKNMS, and Florida FWC, which recommended two project design changes and eight special conditions for incorporation into the DA Corps permit. DA Corps responded on February 13, 2009 stating that the project design would be modified.

On March 2, 2009, FKNMS permit staff discussed outstanding information needs and the need for revised project diagrams with NOAA Fisheries HCD, NOAA Fisheries PRD, and Florida FWC staff. These joint agency comments were then submitted via letter to DA Corps from NOAA Fisheries HCD. On March 5, 2009, DA Corps responded to the joint agency comments with revised drawings from the applicant. On March 20 and March 25, 2009, DA Corps issued letters to NOAA Fisheries HCD stating that all Essential Fish Habitat Conservation Recommendations had been addressed, and that DA Corps intended to issue a permit for the project within 10 days. DA Corps issued permit SAJ-2007-5383 (IP-ALS) on April 1, 2009 to Florida Keys Hydropower Research Corp, care of Mr. Douglas Bedgood.

NOAA Fisheries Habitat Conservation Division (HCD)
As described above, NOAA Fisheries HCD has been involved in review of Mr. Bedgood's proposal since the initial application was noticed by DA Corps in 2007. DA Corps is required under the 1996 Magnuson-Stevens Fishery Conservation and Management Act to consult with NOAA Fisheries HCD on all applications to conduct dredge and fill activities to ensure that impacts to Essential Fish Habitat are avoided or minimized.

NOAA Fisheries HCD has specifically required adequate monitoring during project deployment so any fisheries and habitat impacts may be accurately assessed. NOAA Fisheries HCD led several inter-agency discussions on the project and forwarded joint comments to DA Corps on two or more occasions. On April 6, 2009, NOAA Fisheries HCD provided a letter to DA Corps concluding that with the exception of a control site being included in the biological monitoring design, the project revisions satisfactorily address NOAA Fisheries HCD recommendations and that the goals of the Magnuson-Stevens Fishery Conservation and Management Act and the regulations for implementing the EFH requirements of the Act will be met for this project.

NOAA Fisheries Protected Resources Division (PRD)
As with NOAA Fisheries HCD, NOAA Fisheries Protected Resources Division has reviewed Mr. Bedgood's proposal through the DA Corps application process under Section 7 of the Endangered Species Act (ESA). NOAA Fisheries PRD has authority for certain marine species and habitats listed under the ESA, including five species of sea turtles and smalltooth sawfish, and critical habitat for *Acropora* species corals, all of which may occur at the project site.

In June 2008, NOAA Fisheries PRD requested additional information from DA Corps on the project and potential impacts to listed species. NOAA Fisheries PRD staff subsequently participated in joint agency discussions in January and March 2009, providing design recommendations to reduce the potential that the turbine unit would entrain sea turtles. NOAA Fisheries PRD also mapped the proposed footprint of the

project and found the area to not contain substrate of suitable quality for *Acropora* species. On March 13, 2009, NOAA Fisheries PRD issued a letter to DA Corps agreeing that the project is not likely to adversely affect listed species or critical habitat and noting that ESA consultation requirements had been met.

Florida Department of Environmental Protection (DEP)

Similar to the DA Corps, the Florida Department of Environmental Protection (DEP) Environmental Resource Permit Program regulates dredging and filling activities in wetlands and other surface waters of the state. DEP received an application from Mr. Bedgood for a proposed tidal turbine experiment on August 20, 2007 and assigned it DEP file number 44-0281792-001. A copy of the DEP application was forwarded to FKNMS for review and comment on September 12, 2007. As noted above, FKNMS provided extensive input and recommendations on the project to DA Corps and DEP over the next 18 months and the project was revised several times. DEP was included in all correspondence between federal agency staff. On February 20, 2009, DEP issued a letter to Mr. Bedgood stating that the project was exempt from the need for an Environmental Resource Permit and providing authorization to use state-owned submerged lands for the project.

Florida Fish and Wildlife Conservation Commission (FWC)

Florida Fish and Wildlife Conservation Commission (FWC) manages fish and wildlife resources within the state. FWC reviewed the proposed tidal turbine project concurrent with Florida DEP's review. On December 21, 2007, FWC issued a letter to Florida DEP stating that no significant impacts to fish and wildlife resources and their habitats were anticipated from the project if three conditions were followed. These conditions included: (1) avoiding coral, hardbottom, and submerged aquatic vegetation during turbine deployment and operation; (2) immediately removing all equipment from the site upon project conclusion; and, (3) reporting injury to marine mammals or sea turtles to FWC immediately.

As noted above, in May 2008 FKNMS permit staff discussed the project with FWC staff, ONMS headquarters permit staff, and NOAA Fisheries HCD staff, which resulted in a Request for Additional Information being sent to the applicant to clarify several project design aspects. FWC participated in an additional call between agency staff on January 21, 2009, which resulted in joint agency recommendations for two project design changes and eight special conditions for incorporation into the DA Corps permit. These recommendations were codified in DA Corps permit SAJ-2007-5383 (IP-ALS), issued to Mr. Bedgood on April 1, 2009.

Florida Department of Community Affairs (DCA)

The Florida Department of Community Affairs (DCA) serves as the state's land planning agency and reviews permit applications for consistency with its statutory responsibility under the Florida Coastal Management Program. Because the proposed project is also located in the Florida Keys Area of Critical State Concern, DCA must review it for consistency with local comprehensive development plans. DCA reviewed the proposal and provided a letter to the applicant, Douglas Bedgood, on May 1, 2008 stating that

project was not inconsistent with the Florida Keys Principles For Guiding Development, Section 380.0552(b) and (e), Florida Statutes, and the provisions of the applicable local government Comprehensive Plan and Land Development Regulations.

SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

This assessment provides the following information:

- A brief discussion of the need for the action.
- A description of the proposed action and alternatives.
- A description of the environmental and socioeconomic resources in the area that may be affected by the proposed action.
- A discussion of the potential effects of the proposed action on the environmental and socioeconomic resources of the area.
- A listing of agencies and persons consulted.

This assessment is based on existing information, reports, and data submitted to FKNMS during the permit application process. As noted above, many agencies in addition to FKNMS have jurisdiction over the proposed activity. FKNMS has collaborated with all agencies throughout the application review process to compare and consolidate information needs, provide consistent updates and information to the applicant, share ideas for resource impact reduction, and generally streamline the permitting process for the applicant. A list of these agencies and persons consulted is included in this EA.

During the application process, DA Corps incorporated NOAA Fisheries PRD and HCD comments in their review. DA Corps also actively solicited FKNMS input on the project and did not issue SAJ-2007-5383 (IP-ALS) until a letter of authorization from FKNMS was received. DA Corps specifically included as Special Condition #10 in permit SAJ-2007-5383 (IP-ALS) that a NOAA FKNMS permit be obtained prior to any activities.

FKNMS recognizes that DA Corps has met its obligations under the NEPA through preparation of a Statement of Findings (SOF) for the issuance of SAJ-2007-5383 (IP-ALS), an individual permit, to Mr. Bedgood on April 1, 2009. The information contained in this document is limited in scope to address only FKNMS responsibilities under 15 CFR Part 922 and the FKNMS Management Plan that were not specifically addressed in the DA Corps SOF. Where applicable, this assessment will reference consultations described in the SOF. Should later information substantially change the results of the Environmental Assessment, supplemental analysis will be conducted if appropriate.

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Selection of Alternatives

Two alternatives are considered in this assessment. A third alternative was not considered because it would necessarily involve the placement of the hydrokinetic turbine test unit in an alternate location within the Sanctuary than the one proposed. The proposed placement site was determined by the applicant through consultation with FKNMS, DA Corps, DEP, NOAA Fisheries HCD and NOAA Fisheries PRD to be the a suitable location that would meet the proposed objectives of the activity, including tidal flow speeds, access to land based support, and necessary water depths, while minimizing environmental impacts and user conflicts.

Alternative 1: Proposed Action – Issuance of a permit to Mr. Douglas Bedgood for the installation of a tidal turbine unit (Preferred Alternative)

The proposed action (Alternative 1) involves the issuance of a permit to Mr. Douglas Bedgood / Florida Keys Hydropower Corporation to allow a temporary (60-day), one-time installation of a tidal turbine unit on the sea floor of Bahia Honda Channel, in the Lower Florida Keys and within the Florida Keys National Marine Sanctuary, for the purposes of testing the ability to generate electricity using ocean currents. The tidal turbine unit and associated support materials are proposed to be deployed approximately 350 feet south of the derelict historic Henry Flagler Overseas Railroad Bridge and near the central coordinate 24 ° 39' 14.66" N and 81° 17' 19.58" W (Figure 1). The site consists of a natural, rubble-filled depression, with water depths between 26 and 30 feet, and averaging 28 feet.

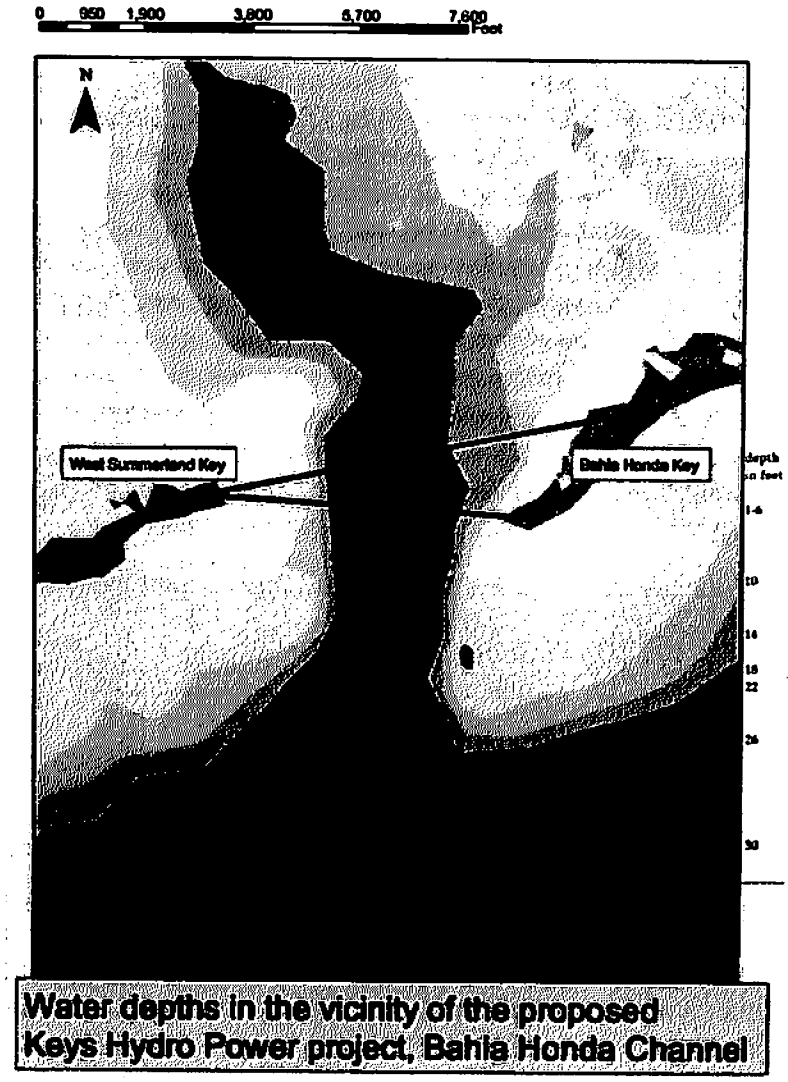


Figure 1. Proposed turbine deployment site and water depths.

Before deployment of the turbine, two U-shaped mooring pins would be installed by qualified divers into the substrate on the bottom of Bahia Honda Channel, approximately 360 feet apart from one another, centered on the coordinate listed above (Figure 2). Each U-bolt would be anchored into the hard substrate by drilling two, 4" x 18" deep holes using a core drill that remains buoyant via lift bag(s). The holes would be filled with Portland cement and U-bolts inserted. A 24' x 80' crane barge would transport the turbine unit and associated equipment to the site and use the mooring pins during turbine installation.

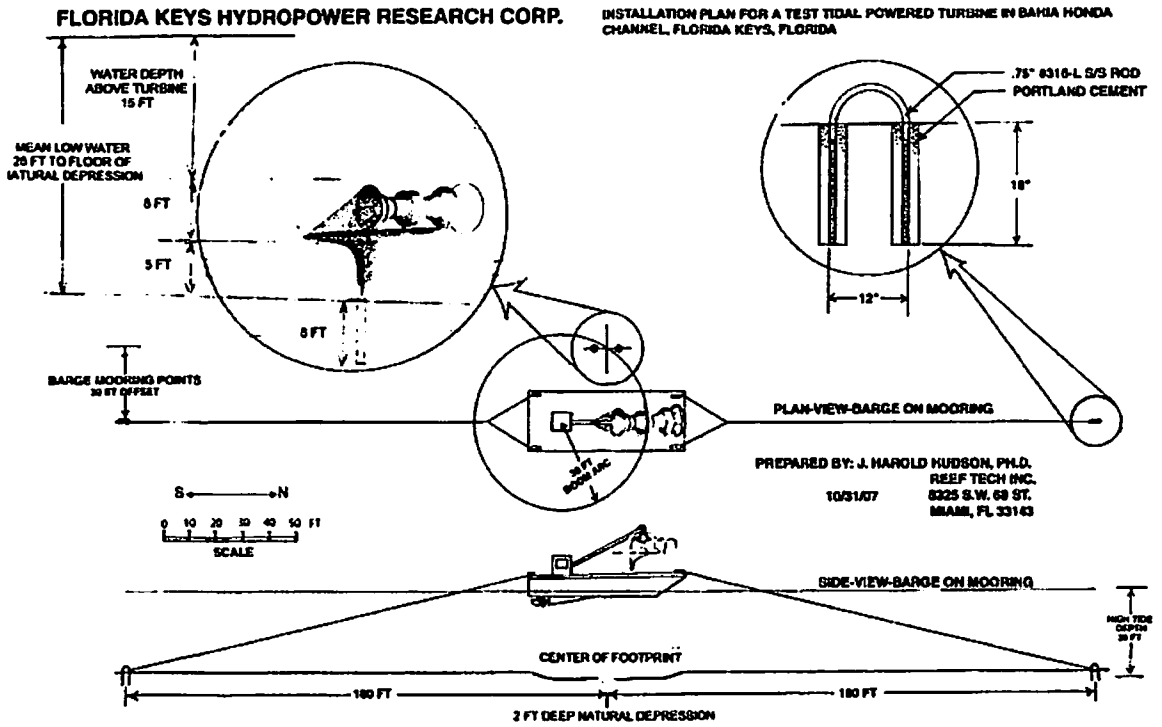


Figure 2. Proposed mooring pin location and installation.

Using the barge-mounted crane, a 30' long by 9" diameter steel pylon would be lowered to the sea bottom and guided by underwater divers to a location clear of any marine resources and within the surveyed footprint for the project. A hydraulic vibratory hammer would pound the pylon approximately 8-10 feet into the substrate and an underwater welder would cut the pylon six feet above the seafloor and the remaining steel would be lifted back to the barge.

To deploy the hydrokinetic turbine, a sling would be wrapped around the turbine and lowered using the crane boom. Buoyancy of the turbine would be controlled with an air bag from the barge as the turbine is lowered to the top of the pylon. The turbine pivot at the base of the armature would then be mounted to the pylon with mechanical and weld fastenings. Cameras would be mounted to the turbine. The divers, sling, air bag and welding equipment would return to the barge and the barge would leave the area. A work vessel would replace the barge and remain stationary for the duration of the test period using the installed mooring pins. Communication and data collection cables would be connected from the turbine to the work vessel.

The turbine itself would shade approximately 120 square feet of sea bottom but would be pivoting with ocean currents so one area is not continuously affected. The turbine duct entrance and exit are 6 feet in diameter, and the duct is 12 feet in length overall. The armature pivot is two feet in diameter and rotor cylinder is three feet long by three feet in diameter. A marine life excluder and catch net are mounted to the front and rear of the turbine unit, respectively. The frontal excluder is 12 feet in length and consists of 5/8" steel rods creating 4" open parallel spacing. The catch net is ten feet long by eight feet in

diameter and constructed of 5/8" steel rods with 4" parallel spaces and a rigid, flat steel mesh back (Figure 3). Once installed, the turbine would be situated approximately six feet above the sea floor and 14 feet below the mean low water (low tide) level. Divers would remain in the water for mooring pin, pylon and turbine installation. Installation is expected to occur within one day.

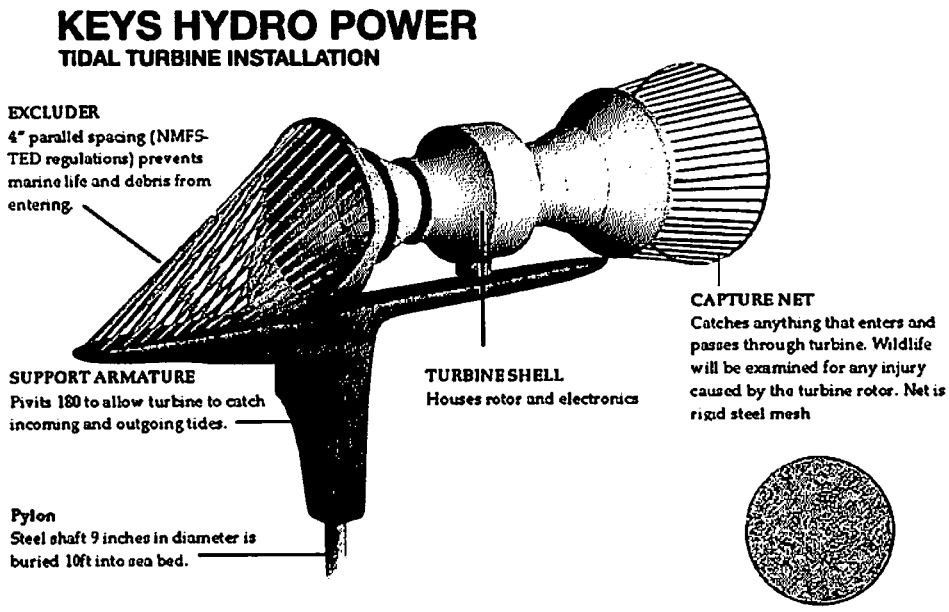


Figure 3. Proposed turbine design, showing frontal excluder and rear catch net.

During the operational or test phase of the project, which would occur for 58 days, the topside work vessel would be manned continuously for security and emergency purposes. The work vessel would monitor and measure electrical generation, biological interactions with the device, and general operations and maintenance. The turbine would not be connected to the on-shore electrical grid at any time during test operations. The turbine would be inspected and documented by a maintenance diver and a biological monitoring diver at every slack tide interval. Debris and marine life that pass through the turbine would be collected at every slack tide interval for evaluation, identification to the lowest taxonomic level (species), photographic recording and release. Fish and other marine organisms that pass through the turbine would be counted by species and life stage history. Fish survival rate would be documented and the cause of any mortalities or non-lethal injuries. Catch net contents would be compared with respect to lunar stages, tidal stages, and times of day. In addition to video surveillance, fish response to altered current fields would be examined. All operations data and documentation would be compiled as a monitoring report and submitted to FKNMS, NOAA Fisheries HCD and PRD, Florida FWC, and any other interested entities within thirty days of turbine removal, and would be made publically available online at www.keyshydropower.com.

On the last day of the project, any underwater cables would be removed by divers from the turbine and brought to the work vessel. The barge would return to the site and replace the work vessel at the mooring pins. The work vessel would depart the site. The barge

boom would lower the sling and air bag, which would be fastened to the turbine. Divers would torch-cut the top of the pylon to separate it from the turbine. The turbine would then be lifted onto the barge. The steel pylon would be torch-cut flush with the sea floor and pulled up to the barge using a sling. The two mooring pins would either be torch-cut flush with the substrate for removal or FKNMS would advise Mr. Bedgood to leave the moorings onsite, as they may be useful to support future research or monitoring efforts in Bahia Honda Channel. Finally, biologists would inspect and evaluate the site, and advise of any restoration or other actions that may be needed to restore the seabed to pre-deployment conditions.

Under this alternative, Mr. Bedgood would be solely responsible for the safe installation, operations, and removal of the hydrokinetic turbine unit. Only one, 60-day test installation would be allowed during the duration of the permit, and the test installation would not be allowed during the Atlantic hurricane season. The proposed permit would require Mr. Bedgood to avoid any sensitive resources, such as seagrass, soft coral, stony coral, sponges, and other marine life during all phases of the project. The permit would require Mr. Bedgood to remove all equipment associated with the project, with the exception of the embedded portion of the 9" steel pylon and mooring pins (the latter only on notification by FKNMS that they may be left in place). The permit would additionally require that Mr. Bedgood retrieve the turbine and/or associated equipment at any time as requested by the Sanctuary. A pre-construction meeting and inspections by FKNMS would be required. The permit would also require that a comprehensive biological monitoring plan be implemented and results reported to FKNMS and other resource agencies. Lastly, a report summarizing the turbine test results would also be required under the permit.

Alternative 2: No Action Alternative

The no-action alternative is to not issue a permit to Mr. Douglas Bedgood to deploy the hydrokinetic turbine within the FKNMS. This would result in Mr. Bedgood not being able to conduct his project within the FKNMS and the minimal impacts expected from the project during installation, operation and monitoring, and removal would not occur. While Mr. Bedgood would be able to pursue this project for a site outside of the FKNMS boundaries under this alternative, it is very unlikely that he would do so and the objectives of his project would not be met. These objectives include determining if electrical generation through tidal currents is a viable alternative energy option for residents of the Lower Florida Keys. Therefore, relocating the project to an area outside FKNMS would not meet his stated project objectives.

AFFECTED ENVIRONMENT

This section describes the natural and socioeconomic environment of the proposed hydrokinetic turbine deployment site in Bahia Honda Channel. There is a large body of literature describing the environment of the Florida Keys, including the Florida Keys National Marine Sanctuary Final Management Plan/Final Environmental Impact Statement (U.S. DOC 1996). The descriptions of various environments in the Final Management Plan are incorporated by reference, and are summarized and supplemented below. For the purposes of this assessment, the discussion of affected environment is limited to the known habitat of the proposed turbine deployment location, based on a benthic survey conducted by a qualified biologist and submitted with Mr. Bedgood's application. The environment affected by the no-action alternative is not described separately in this section, because not issuing a permit would result in the turbine not being placed within the boundaries of FKNMS.

Overview

Florida Keys National Marine Sanctuary protects 2900 square nautical miles of coastal and ocean waters and submerged land, and is among the largest, single marine protected areas in the United States. The Sanctuary encompasses all habitats and marine resources from the mean high water line out to the 300-foot isobath (depth contour) on the Atlantic side of the Florida Keys, circles around the remote islands of the Dry Tortugas, and extends several miles into the Gulf of Mexico before joining the Everglades National Park boundary in Florida Bay (Figure 4). The marine ecosystem of the FKNMS supports over 6000 species of plants, fishes and invertebrates, including the only living coral reef that lies adjacent to the continental United States.

Figure 4. Location of Florida Keys National Marine Sanctuary (blue line). Three adjacent National Parks are shown in red.

Because of its beauty, accessible location, and rich natural and cultural resources, the Florida Keys National Marine Sanctuary attracts over three million visitors annually who

participate in water-based activities such as snorkeling, SCUBA diving, recreational fishing and wildlife viewing.

Physical & Biological Environment

The site selected for test deployment of the turbine unit is located approximately 350 feet south of the derelict historic Henry Flagler Overseas Railroad Bridge in the Lower Florida Keys, near the central coordinate 24° 39' 14.66" N and 81° 17' 19.58" W. The site is within Bahia Honda Channel, a major waterway that connects the Atlantic Ocean to the Gulf of Mexico, and is one of the deepest natural passes between the islands of the Florida Keys. The channel is bordered by Bahia Honda Key on the east and West Summerland Key to the west. Two bridges span the channel. US Highway 1 serves as the only access route to islands south of Bahia Honda Key such as Key West; the project location is just offshore of approximately mile marker 38 on US 1. The defunct Henry Flagler Overseas Railroad Bridge remains standing within the channel but has been severed from the islands to prevent physical access (Figure 5).

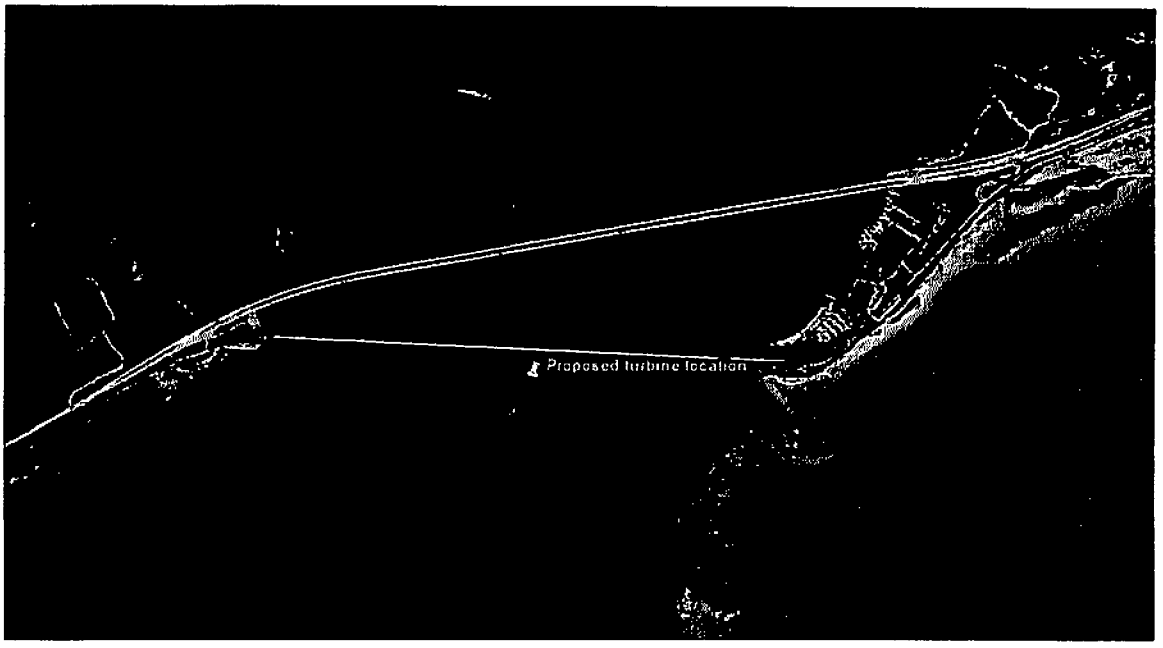


Figure 5. Aerial photo of proposed turbine deployment site.

The project site has been specifically selected to be in an area of moderate water flows to test whether water moving by tidal influence is viable for implementation of advanced hydropower technology. The turbine has been designed to increase the velocity of water moving through the unit; this project would determine whether that increased current would be at a rate sufficient for electrical generation. Current speeds and direction vary, but are typically under two and a half (2.5) knots, with an average speed of one (1) knot (Douglas Bedgood, personal communication). Primary current directions are north-south and then south-north during two tidal cycles per day (Figure 6). Studies have shown that the overall net flow of water is from the Gulf side of the Florida Keys to the Atlantic, where currents then primarily flow west. The Bahia Honda Channel, like several other

passes along the island chain of the Florida Keys, plays an important role in the distribution of water, associated nutrients, and biota between Gulf and Atlantic habitats (U.S. DOC 1996).

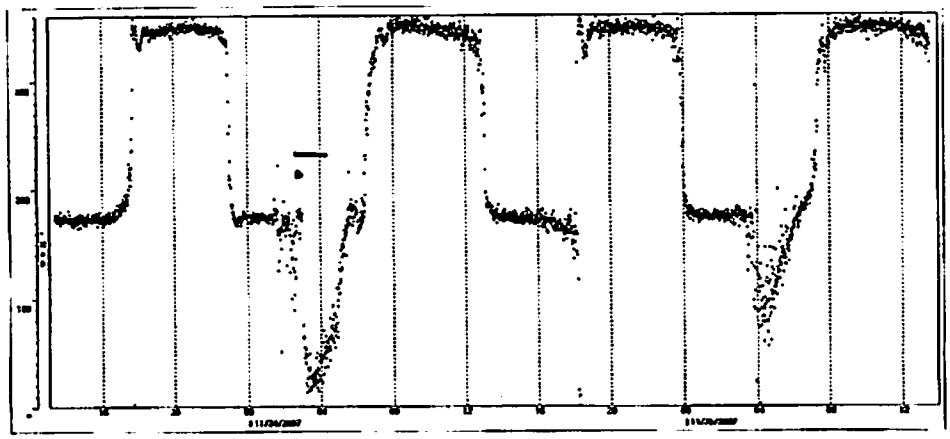
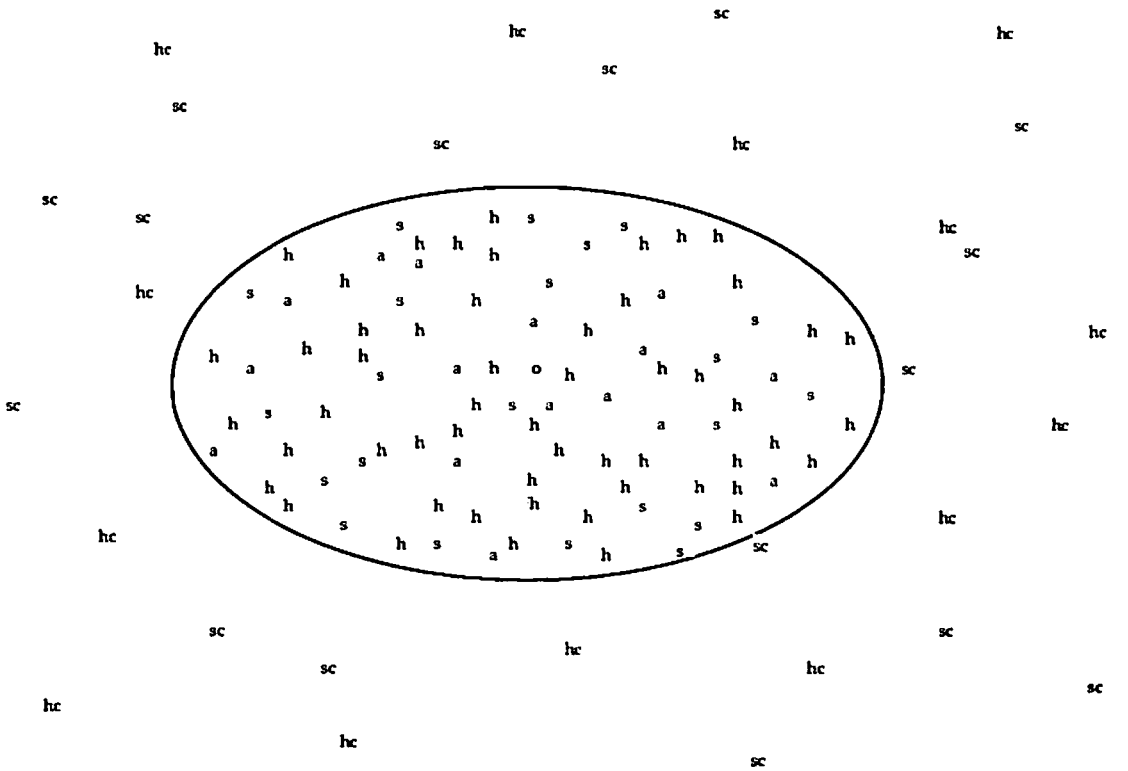


Figure 6. Tidal current velocities at Bahia Honda Channel, measured Nov. 25, 2007.

Water depth at the project site is approximately 28 feet. The sea floor at the site consists of a natural depression approximately 30' by 50' in size. The depression is filled with coarse, unconsolidated limestone rubble to a depth of 8 – 12", under which is hard-pan, Key Largo limestone common to the Florida Keys. Due to the velocity of ocean water moving past the project site, the loose rubble within the depression has shifted and moved regularly, preventing the attachment of flora and fauna typical of more stable areas, such as seagrasses, soft corals, and stony corals. The dominant benthic species at the project site include algae (*Halimeda* and *Laurencia* sp.), chicken liver sponges, and several unidentified species of hydroids, which are typically very small, colonial invertebrates that are often found encrusting other organisms or the benthos. Percent cover of attached marine life was estimated to be between 21 – 40% at the site (Figure 7).



1 inch = 10 ft

Figure 7. Schematic of benthic resources at the proposed turbine deployment site. Oval represents natural depression filled with limestone rubble, where o *= footprint of steel pylon, where turbine is to be mounted.*
h = hydroid, a = algae, s = sponge
*Note that no hard corals (*hc*) or soft corals (*sc*) are located near the turbine footprint.*

Habitats outside but adjacent to the project area are more typical of hardbottom communities as described in the FKNMS Final Environmental Impact Statement (U.S. DOC 1996). The solid and flat limestone substrate supports soft corals (*Briarium abestinum*, *Psudeopterogorgia americana*), hard corals (*Siderastrea* sp., *Montastrea* sp.) sponges, hydroids, and algae (*Halimeda* sp., *Udotea* sp.) in approximately 81 – 90% cover. The only activity planned for this habitat type is the installation of the two, U-shaped mooring pins to anchor the barge and support vessel.

Fish populations at the site have not been specifically surveyed but would be consistent with those described in the FKNMS Final Management Plan / Environmental Impact Statement for nearshore, high-velocity tidal passes. Families of fish common in this habitat may include sea basses, jacks, snappers, grunts, porgies, drums, damselfish, barracudas, wrasses, parrotfish, clinids, combtooth blennies, and gobies (U.S. DOC 1996). Areas with strong tidal influence, such as Bahia Honda Channel, may also support juveniles of many species, including angelfish, butterflyfish, and surgeonfish. (U.S. DOC *1996).*

Endangered and Threatened Species, and their Critical Habitat
The FKNMS Final Management Plan / Environmental Impact Statement lists the variety of endangered and threatened species that are found within the Florida Keys. The vast majority of these species are plant, terrestrial, or avian species that are not found in or around the proposed turbine deployment location. However, a few individual threatened or endangered species, including one marine mammal (West Indian manatee), several reptiles (five species of sea turtles), and one fish (smalltooth sawfish), are known to traverse tidal passes between the Keys such as Bahia Honda Channel. In addition, the project site lies within designated critical habitat for *Acropora* coral species, which are listed as Threatened under the Endangered Species Act (ESA).

In their permit application review process, DA Corps evaluated potential impacts to the West Indian manatee using a standard evaluation tool approved by the U.S. Fish and Wildlife Service, which has responsibility for manatee protection under the ESA. The DA Corps determined that the activity may affect but is not likely to adversely affect the manatee or its designated critical habitat. U.S. Fish and Wildlife Service concurred with this determination (U.S. Department of the Army 2009).

Several species of threatened or endangered sea turtles occur in waters of the South Atlantic and Gulf of Mexico and have been known to transit major tidal passes between the Florida Keys, such as Bahia Honda Channel. In their review of the permit application, DA Corps consulted with NOAA Fisheries Protected Resources Division (PRD) on potential impacts to green, hawksbill, loggerhead, Ridley, and leatherback sea turtles, as well as to the endangered smalltooth sawfish (*Pristis pectinata*). NOAA Fisheries PRD provided design recommendations and revisions to the DA Corps and applicant during the review process, which were aimed at reducing impingement of these species. These modifications were incorporated into the final turbine design and are further described in the Environmental Consequences section, below. As a result of design modifications, the short-term nature of the turbine deployment, adherence to the DA Corps-approved *Sea Turtle and Smalltooth Sawfish Construction Conditions* during deployment, and planned daily monitoring of the turbine for wildlife impacts, NOAA Fisheries PRD determined that affects to these listed species were discountable and insignificant (U.S. Department of the Army 2009).

Two species of branching coral that occur within the Sanctuary, *Acropora cervicornis* and *A. palmata*, were recently listed as threatened under the ESA. A benthic survey of the proposed turbine deployment site and adjacent habitats in Bahia Honda Channel did not identify any *Acropora* species. Critical habitat for these species has been identified by NOAA Fisheries PRD to occur within the Florida Keys, including the area proposed for turbine deployment (Figure 8). However, in their review of the application and associated benthic survey, NOAA Fisheries PRD found that there was not substrate of suitable quality and availability to support growth and persistence of these species (U.S. Department of the Army 2009).

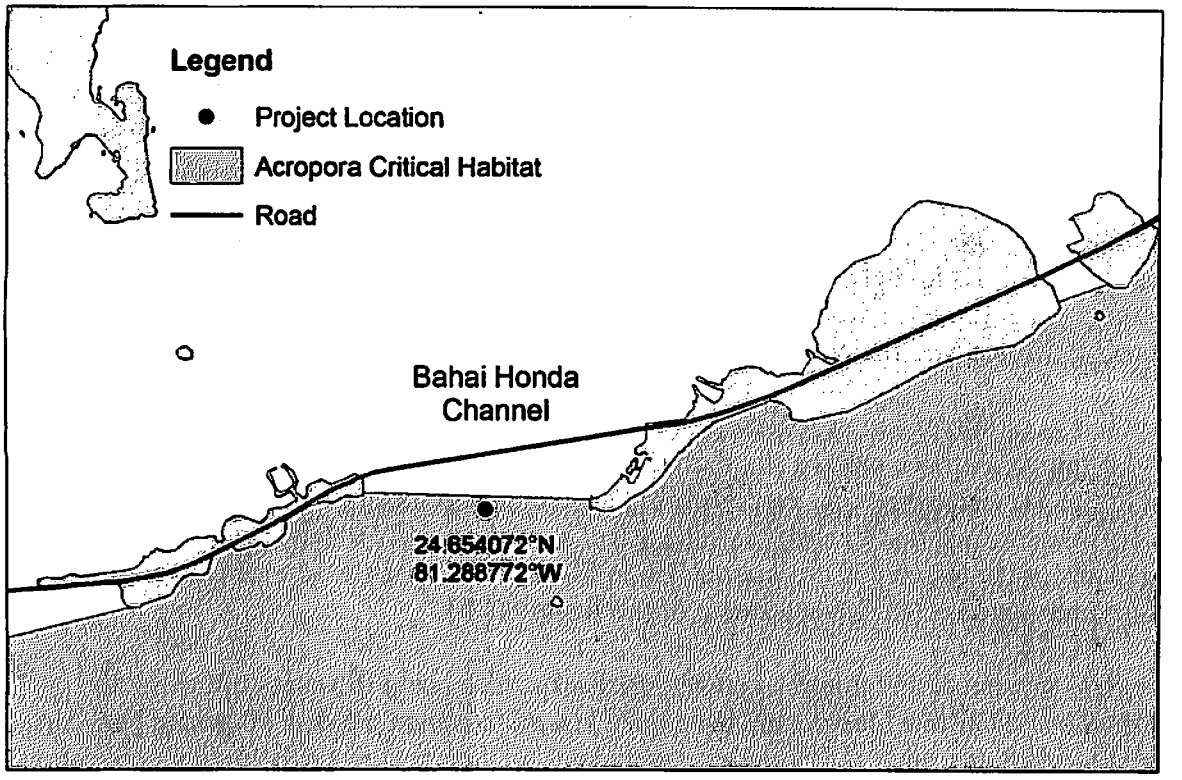


Figure 8. Graphic of Acropora species critical habitat in relation to the proposed turbine deployment site.

Socioeconomic Environment

Because of dynamic water flows and the associated diversity of fish species passing through Bahia Honda Channel, the area may be used for recreational and commercial fishing, and boating. Because the turbine deployment is proposed to be a one-time, short-term activity, a specific analysis of user habits at the site has not been conducted. However, it would be reasonable to extrapolate that fishing in the area is similar to the level of activity described in the FKNMS Final Management Plan / Environmental Impact Statement. Recreational fishing would occur from private or charter vessels and would target both demersal species (snapper, grouper) as well as pelagic fish that may be migrating between Gulf and Atlantic waters (jacks, tarpon, bonefish). Commercial fishing in the area would likely target these same species. In addition, commercial marine life collecting via SCUBA diving for butterflyfishes, angelfishes, damselfishes, marine invertebrates, and other ornamental species may occur, as might commercial and recreational SCUBA diving for spiny lobster. Recreational fishing is a popular tourism activity in which over 534,000 visitors to the Keys annually participate (Leeworthy 1996). Significant commercial fisheries of the area are estimated to earn upward of $70 million yearly (http://fkcfa.org/).

Boating activity in Bahia Honda Channel would primarily occur by commercial and recreational fishing vessels, as well as motorized and sail boats transiting the pass as an access point to either the Gulf of Mexico or Atlantic Ocean. SCUBA diving and snorkeling are not common recreational pursuits in the channel due to high currents, oftentimes poor visibility, and deep water depths.

Maritime Heritage Resources

The Florida Keys are home to hundreds of documented and undocumented shipwrecks, historic lighthouses, and cultural sites. The high concentration of shipwrecks is due to many factors including high shipping concentrations over a long period of time, shallow water depth, and the existence of natural hazards. Through their review of the project, DA Corps consulted with the State of Florida Historic Preservation Officer (SHPO). The SHPO indicated via letter to DA Corps on March 12, 2009 that the area proposed for turbine deployment did not contain record of any significant archaeological or historical resources (U.S. Department of the Army 2009). In addition, FKNMS plotted the site of proposed turbine deployment against its cultural resource database (which includes Florida Master Site File (FMSF) locations, non-FMSF locations, FKNMS submerged cultural resource permits, and other data points) and found no known cultural resource sites at the project area.

ENVIRONMENTAL CONSEQUENCES

This analysis describes the environmental and socioeconomic consequences of implementing the preferred alternative and the no-action alternative, and is focused on the potential effects to Sanctuary resources and uses. As noted previously, the DA Corps conducted additional analyses prior to their issuing an individual permit for this activity and documented them in a Statement of Findings (SOF). Those analyses are referenced when applicable.

Alternative 1: Issuance of a permit to Mr. Douglas Bedgood for the installation of a tidal turbine (Preferred Alternative)

Impacts to Physical & Biological Resources, including Threatened and Endangered Species

Direct Effects: Placement of the hydrokinetic turbine on the sea floor of Bahia Honda Channel would directly impact a total area of approximately two (2) square feet, including approximately 64 square inches for embedment of a 9" diameter steel pylon and installation of two U-shaped mooring pins via two 4" diameter holes per pin. Before installation, divers would guide the steel pylon to a pre-surveyed area clear of any attached marine life (sponges and algae). As noted above, there are no seagrasses, soft corals, stony corals, or other species of significant attached to the sea bed in the proposed deployment location. A hydraulic vibratory hammer or drop hammer, mounted on a top-side barge, would drive the pylon 8 – 10 feet into the limestone substrate. Use of a vibratory hammer or drop hammer is standard installation procedure for similar-sized pylons used in a variety of marine applications throughout the Florida Keys, including marinas, docks, and navigational aids (D. Bedgood, pers. comm.).

Prior to drilling into the substrate to attach U-shaped mooring pins, a survey would be made of all areas where the drill may contact the substrate, and holes would be specifically located to avoid disturbance to bottom organisms such as soft and hard corals, sponges and algae. The installation of mooring pins is the preferred method for securing the work barge and support vessel during the term of the project. Alternate methods, including traditional anchoring, would have the potential to create a much larger field of impact through anchor placement, retrieval, and replacement; chain drag; and movement from tidal currents. In addition, the construction contractor selected for mooring pin installation is a retired NOAA FKNMS biologist and resource manager, with over 30 years experience in such activities. Based on this information, direct impacts from the turbine installation are not expected to be significant.

Of greater concern during the application review process than benthic disturbance has been potential wildlife impacts resulting from turbine deployment, including interaction with threatened and endangered species. Several design changes and monitoring programs have been implemented to reduce these impacts to a non-significant level.

First, the turbine would be mounted six feet off the seabed, allowing ample room for manatees, sea turtles, and smalltooth sawfish to pass safely under the unit. The turbine

has been designed to have slow moving rotors with rimmed perimeters and cushioned leading foil edges, which would lessen any impacts should marine mammals, turtles, or fish come in contact with the unit. The rotor itself would assist the movement of fish and objects safely through its 12" open center if smaller animals are able to pass between the frontal excluder (further described below). The rotor is expected to rotate at less than 30 RPM, further reducing chance of injury should fish or other species slip through the frontal excluder. Small organisms that pass safely through the turbine would either go through the rear catch net bars or be temporarily entrained in the catch net for analysis and release (further described below).

An excluder device, consisting of parallel steel rods with 4" open spaces on a 40° slope, would be mounted on the front of the turbine, effectively excluding all animals and objects larger than 4". Though no fish or other wildlife injuries are expected, under consultation with NOAA Fisheries HCD, NOAA Fisheries PRD, Florida FWC, and FKNMS, the turbine has been designed to include a downstream catch net. The net would consist of a rigid, flat metal mesh with 5/8" openings. Steel rods with 4" open spaces would connect the turbine's outlet duct to the catch net. This design would allow animals passing through the turbine to escape between the bars, while temporarily entraining any that are injured in the catch net. The catch net's excluder bars would also keep animals from entering the rotor area from the rear of the turbine (Figure 9).

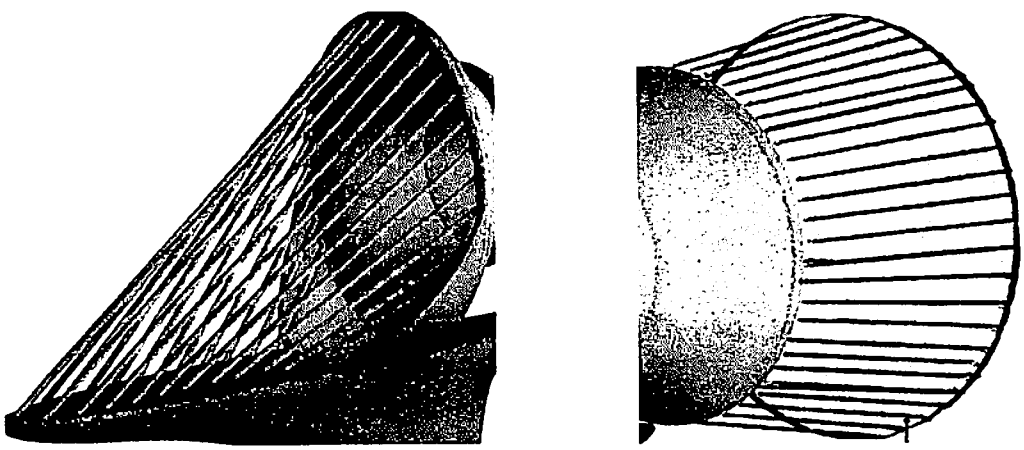


Figure 9. Close-up view of frontal excluder (left) and rear catch net (right) of the turbine unit.

Through these measures, the chance of fish or wildlife injuries has been greatly reduced. To document the movement of fish and other wildlife around the hydrokinetic turbine, infrared video cameras that are can rotate 360 degrees would be mounted on top of both the duct inlet and outlet. Cameras would be wired directly to the topside support vessel for continuous monitoring. Divers would inspect the turbine and catch net at least twice a day to review any species impacts. In the event of a wildlife injury, the Florida FWC local emergency center would be contacted to initiate a rescue operation and dispatch personnel to the scene.

The permit issued by NOAA FKNMS will include these and other required conditions for biological monitoring and reporting of species impacts, as follows:

- Written approval from FKNMS for the biological monitoring plan must be received prior to turbine deployment;
- The monitoring report shall provide an accounting of numbers of fish (by species and life stage history) that pass through the turbine;
- Fish and other marine organisms shall be identified to the lowest taxonomic level (species);
- The monitoring report shall include information based on each inspection of the turbine catch net, which shall occur twice a day at a minimum;
- The monitoring report shall provide data on fish survival rate, including whether mortalities are likely due to turbine operation or catch net impingement. Data on non-lethal injuries shall also be reported;
- The monitoring report shall provide comparisons of catch with respect to lunar stages, tidal stages, and times of day;
- The monitoring report shall include an examination of how fish respond to altered current fields in addition to the planned video surveillance;
- The completed monitoring report shall be forwarded to FKNMS and all relevant resource agencies within 30 days of turbine removal;
- Any changes to the monitoring plan and reporting schedule must be approved in writing by FKNMS and coordinated with other resource agencies.

The response of marine organisms to electromagnetic fields has been considered in the design of the tidal turbine. Fish, marine mammals, and other ocean species are exposed to natural electromagnetic fields from ocean currents, lightning, and other environmental sources. However, stronger, artificial electrical and magnetic fields may disturb normal, physiological processes in some animals by interfering with the nervous system. Before deployment, the turbine manufacturer, Florida Keys Hydropower Corporation, would have safely contained electromagnetic fields using appropriate shielding materials and insulated copper wire. Any effects of electromagnetic fields or radiation would be observed through biological monitoring protocols, which are described above. Based on these design changes and implementation of permit requirements, direct impacts from turbine operation are not expected to be significant.

Indirect Effects:

Once installed, the turbine would shadow approximately 120 square feet of sea bottom. No indirect impacts are anticipated from shading because the turbine would be pivoting with ocean currents, such that one area is not continuously affected. In addition, the turbine would be situated six feet above the sea floor in an area that is approximately 28 feet deep, and would be deployed for one, short-term interval (60 days).

The turbine would be securely attached to the embedded steel pylon through welds and mechanical fasteners to reduce the chance of equipment being dislodged and potentially impacting the sea floor. If a turbine component separates from the unit for any reason, it would be tracked and returned to the support vessel. Main components of the turbine would contain computer chips for tracking location, as needed. The turbine unit is

designed to be stable in up to 16 knots of laminar water flow; the average current speed at the Bahia Honda Channel deployment site is one knot (D. Bedgood, pers. comm.). The topside support vessel would also maintain contact with NOAA National Weather Service in Key West for local predictions and storm contingency planning, as necessary.

In addition to these safety measures, the permit issued by NOAA FKNMS will require the following conditions to further reduce the chance of indirect impacts to submerged habitats and species:

- Turbine deployment may only occur for one sixty (60)-day period;
- Turbine deployment may not occur any time during the Atlantic hurricane season (June 1 – November 1 of any given year);
- Lines connecting the work vessel to the two mooring pins must not drag on the sea floor during the turbine test period;
- No other moorings, anchors, or other equipment may be deployed at the site;
- All materials and equipment associated with the project must be removed from FKNMS at the end of the 60-day test period, with the exception of the embedded portion of the steel pylon and mooring pins (if the latter is advised by FKNMS staff);
- Any equipment, including the turbine and pylon, must be removed in the event of a hurricane or other severe weather, documented or threatened damage to sanctuary resources, or upon other direction from the Sanctuary Superintendent;
- Pre-construction meetings must be held with Sanctuary staff to confirm construction methods prior to deployment;
- Inspection(s) by Sanctuary staff must be facilitated at any time requested.

Cumulative Effects: The proposed action is not likely to result in cumulative effects to physical and biological resources, including threatened and endangered species, because the nature of the action is limited in size and scope (it is proposed within a small area for a limited amount of time). Other routine activities in the area, including commercial and recreational fishing, diving, and transit of vessels are not expected to synergistically or additively interact with the environmental effects of the proposed action. FKNMS permits for use of the sanctuary for research, education, and other purposes will not interact with this project and will not result in any cumulative effects to species or their habitats. This is based on the temporary nature of the project and the monitoring requirements placed on the applicant to ensure that the project has limited environmental effects and limited interaction with other activities that may occur in the area. No other federal or non-federal agency is proposing similar action(s) for within the sanctuary.

Impacts to Socioeconomic Resources

Direct Effects: FKNMS does not anticipate any measureable, direct impacts to socioeconomic resources as a result of the proposed project. The hydrokinetic turbine would be deployed well below the mean low tide level, with the top of the turbine unit submerged 14 feet below the surface. The top-side support vessel would be continuously moored on site, eliminating the possibility of a deep-draft vessel running over the top of the turbine deployment site. Positioning of the support vessel would also greatly reduce the chance of fishing gear interaction with the turbine unit. The support vessel would

contain visible signage for boaters to keep away from the area and would be manned continuously, so any interactions with other boats may be monitored. In addition, FKNMS will require as a condition of its permit that activities be reported to the United States Coast Guard, for inclusion in the Local Notice To Mariners, as appropriate.

The small obstruction of surface waters by the support vessel and even smaller footprint of the turbine unit on the sea floor of Bahia Honda Channel are not expected to incur any impacts to recreational or commercial fishing in the area, nor normal boating activity.

Indirect Effects: FKNMS does not expect any indirect effects to the socioeconomic resources of the area.

Cumulative Effects: FKNMS does not expect any cumulative effects to the socioeconomic resources of the area. Other routine activities, including recreational and commercial fishing and boating, are not expected to additively interact with the effects of the proposed action.

Impacts to Maritime Heritage Resources
Direct Effects: Per the Affected Environment section of this document, the area proposed for turbine deployment did not contain record of any archaeological or historical resources. Therefore, FKNMS does not anticipate any direct effects to maritime heritage resources.

Indirect Effects: Per the Affected Environment section of this document, the area proposed for turbine deployment did not contain record of any archaeological or historical resources. Therefore, FKNMS does not anticipate any indirect effects to maritime heritage resources.

Cumulative Effects: FKNMS does not expect any cumulative effects to the Maritime Heritage Resources as a result of the proposed action. No archaeological or historical resources have been identified in the area proposed for turbine deployment. Archaeological activities permitted in other areas of the sanctuary are not expected to additively interact with the effects of the proposed action.

Conclusions
The proposed action would facilitate multiple uses within the sanctuary consistent with the primary objective of resource protection, as directed by the NMSA and Florida Keys National Marine Sanctuary and Protection Act (PL 101-605). As described above, NOAA anticipates that the preferred alternative action to issue a permit to Mr. Bedgood for one-time turbine deployment would not have any significant impacts on habitats, species, cultural or heritage resources, or other components of the sanctuary's marine environment. The allowance of this discrete activity would advance research on alternative energy development, possibly leading to an overall reduction in fossil fuel dependence and associated effects of global climate change on Florida Keys' reefs.

Alternative 2: No Action

Under this alternative, a permit would not be issued and the experimental hydrokinetic turbine would not be deployed within the boundaries of FKNMS. The minimal impacts expected from the project during installation, operation and monitoring, and removal would not occur and there would be no direct or indirect effects to the environment or area's resources. As discussed previously, to meet the objectives of the project, including testing the feasibility of using tidal currents to generate electricity for the Lower Florida Keys, the turbine must be placed at the requested location in Bahia Honda Channel. For this reason, Alternative 2 is not preferred.

Alternatives Comparison Table		
Resource	**Alternative 1** **Preferred Alternative**	**Alternative 2** **No Action**
Physical and Biological, including Threatened & Endangered Species	No significant impacts to sea bed during equipment deployment. No impacts to corals or seagrasses, or to critical habitat of threatened coral species. Mobile wildlife (fish, sea turtles, manatees, and smalltooth sawfish) impacts are not expected to be significant due to design of unit and exclusion cages.	No impacts.
Socioeconomic	No impacts.	No impacts.
Maritime Heritage	No impacts.	No impacts.

Table 1. Comparison of potential impacts from the two Alternatives analyzed.

OTHER LAWS AND AUTHORITIES CONSIDERED

Executive Order 13089: Coral Reef Protection

Executive Order (EO) 13089 requires all Federal agencies whose actions may affect U.S. coral reef ecosystems to: (1) identify their actions that may affect U.S. coral reef ecosystems; (2) utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and (3) ensure that any actions they authorize, fund, or carry out would not degrade the conditions of such ecosystems.

The FKNMS has considered EO 13089 and has determined that, while the project would occur within a national marine sanctuary specifically designated to protect coral reef ecosystems of the Florida Keys, the proposed action (Alternative 1) would not impact any coral reef ecosystem due to the location of the project. Therefore, the proposed action would not degrade the conditions of any U.S. coral reef ecosystem, including the coral reef ecosystems in the Florida Keys. Conversely, if successful, this pilot project would provide research findings on the viability of ocean currents as a source of alternative energy. This information may lead to long-term reductions in greenhouse gasses and mitigating the global impacts on coral reefs stemming from climate change. This information could therefore be used to protect and enhance the conditions of such ecosystems in the future.

Executive Order 13112: Invasive Species

EO 13112 requires each Federal agency whose actions may affect the status of invasive species to, among other things, not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm would be taken in conjunction with the actions.

Under the proposed action, the hydrokinetic turbine would be manufactured on land and brought to the deployment site via barge. The turbine would not be deployed in any other waters of the United States, with the exception of the proposed deployment in the state of Florida. Therefore, the risk of invasion by aquatic nuisance species is minimal to none. FKNMS does not consider the proposed action (Alternative 1) to be one that would affect the status of an invasive species in any way.

Magnuson-Stevens Fishery Conservation and Management Act: Essential Fish Habitat

The project site for the proposed action (Alternative 1) is comprised of rubble bottom with loose, unconsolidated limestone pieces, and a portion of the surrounding water column, both identified as Essential Fish Habitat (EFH) by the South Atlantic Fishery Management Council (SAFMC). Surveys of the project site by a qualified biologist revealed that the benthic, rubble habitat is inhabited primarily by sponges and attached algae. Invertebrate infauna, burrowing fish, and bottom-dwelling fish may also visit the area but were not specifically identified during the benthic survey. None of the species observed at the site are species managed by the SAFMC; and, as discussed in the

Environmental Consequences section, no adverse direct impacts to the species present are expected. In addition, no recreational or commercial fishery in the Florida Keys uses this habitat type exclusively for any target species (–U.S. DOC 1996). Secondary, cumulative, or synergistic impacts are not expected as a result of the proposed action because of the short-term nature of the deployment, and because a vast amount of similar loose, rubble habitat would remain un-impacted directly adjacent to the project site and throughout the remainder of the Sanctuary.

The surrounding water column would be altered as a result of the proposed action through the deployment of the turbine, which would create vertical structure and relief where none previously existed. Pelagic fishes that utilize the project site are not expected to be directly impacted by this activity because individual animals would avoid the region during deployment and retrieval. During the operational phase of the hydrokinetic turbine, it is likely that pelagic fish would simply swim around the device, avoiding it altogether. Demersal, or bottom-dwelling site-attached fish, which are common in the Florida Keys reef system, are also expected to leave the area during turbine deployment and retrieval due to the presence of divers and equipment in the water. During operations, these fish species (such as grouper, snapper, and ornamental damselfishes, gobies, wrasses, and similar) may congregate around the device seeking shelter. As discussed in the *Environmental Consequences* section of this analysis, these fish are expected to avoid direct contact with the turbine, be kept out from the rotor mechanism via the frontal excluder, or, if they are small enough, pass safely through the rotor and exit the turbine and rear catch net. It is further expected that no adverse secondary or cumulative effects would occur within the water column.

In addition to rubble and water column habitats, the applicant has designed the turbine installation, operations, and removal phases to ensure that the proposed action would not have any adverse direct or indirect effects on other natural habitats in the vicinity of the project site, such as hardbottom habitats. Refer to the *Environmental Consequences* section for additional information on monitoring and contingency planning.

With these findings, FKNMS has determined that the proposed action would have no adverse short- or long-term effects on any designated EFH and therefore did not prepare an EFH Assessment. In addition and by incorporation, NOAA references DA Corps consultation with NOAA Fisheries HCD during its application review process, as DA Corps is required under the Magnuson-Stevens Fishery Conservation and Management Act. As explained in the *Other Jurisdictional Agencies* section of this analysis, the DA Corps Statement of Findings determined that consultation procedures related to EFH had been satisfied. FKNMS was copied on a letter to this effect from NOAA Fisheries HCD to DA Corps, dated April 6, 2009.

<u>Coastal Zone Management Act – Federal Consistency</u>
The proposed action (Alternative 1) is a federally licensed or permitted activity for the purposes of the Coastal Zone Management Act (CZMA). The Florida Department of Community Affairs (DCA) typically reviews proposals for work within state waters for consistency with the enforceable policies of its coastal zone management program via the

joint application process to the Florida Department of Environmental Protection (DEP) and DA Corps. DEP reviewed the proposed project concurrently with DA Corps, FKNMS, and other agencies, and issued a permit exemption on February 20, 2009 as file number 44-0281792-001. Issuance of a DEP permit certifies that the proposed project is consistent with the state Coastal Zone Management plan. Neither DA Corps nor FKNMS have received any indication from the State that the project is inconsistent with the Florida Coastal Zone Management Plan (U.S. Department of the Army 2009).

Endangered Species Act (ESA)

As described in the *Affected Environment* section of this analysis, the proposed turbine deployment location is an area that may be utilized by threatened or endangered species, including the West Indian manatee, five species of sea turtles, and the smalltooth sawfish. In addition, the project site lies within designated critical habitat for *Acropora* coral species, which are listed as Threatened under the ESA.

Due to species and habitat issues, DA Corps consulted extensively with U.S. Fish and Wildlife Service (for manatee effects) and NOAA Fisheries Protected Resources Division (for sea turtle and smalltooth sawfish effects) before issuance of a permit for the activity. FKNMS participated in most discussions and consultations with NOAA Fisheries Protected Resources Division (PRD) to ensure their concerns were adequately addressed. For a more detailed discussion of these consultations and resulting project design modifications, please refer to the *Affected Environment – Endangered and Threatened Species, and their Critical Habitat* section of this analysis.

In summary, U.S. Fish and Wildlife Service concurred with DA Corps' finding that the proposed activity may affect but is not likely to adversely affect the manatee or its designated critical habitat. Likewise, NOAA Fisheries PRD found that affects to listed species under their purview were discountable and insignificant. NOAA Fisheries PRD also found that while the general project area was located within designated critical habitat for *Acropora* species, there was not substrate of suitable quality and availability to support growth and persistence of these species (U.S. Department of the Army 2009).

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