
**POLICY STATEMENT OF THE
NATIONAL MARINE SANCTUARY PROGRAM:
ARTIFICIAL REEF PERMITTING GUIDELINES**

PURPOSE

The purpose of this policy is to address how the National Marine Sanctuary Program (NMSP) will consider proposals to establish artificial reefs in sanctuaries. This policy is meant to build upon, not replace, the NOAA Fisheries National Artificial Reef Plan developed in accordance with the National Fishing Enhancement Act. Nothing in this policy is meant to conflict with that Plan or that Act and this policy only applies to activities within designated national marine sanctuaries.

BACKGROUND

Artificial reef development in national marine sanctuaries may, under certain circumstances, be an acceptable multiple use activity for educational, research, and resource management purposes. Since the positive and negative impacts of artificial reefs are not entirely understood, the NMSP will proceed cautiously in considering permits for artificial reef development in national marine sanctuaries using these guidelines to facilitate the process. The NMSP will use information obtained from monitoring artificial reefs currently in national marine sanctuaries and elsewhere to further refine policy and guidelines for artificial reef development in national marine sanctuaries.

DEFINITION

For the purposes of this policy, artificial reef development is defined as the act of deliberately placing any material or matter in an area of the marine environment where that structure does not exist under natural circumstances for the purpose of protecting, regenerating, concentrating or increasing populations of living marine resources, or for enhanced recreational, commercial, or educational use of the area.

POLICY STATEMENT

It is the policy of the NMSP to review permit applications for artificial reef development consistent with the guidelines contained herein. The NMSP will approve applications for artificial reef development projects only when they are found to be consistent with the criteria described in these guidelines.

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LIST OF ACRONYMS

AA	Assistant Administrator
ACHP	Advisory Council on Historic Preservation
ACOE	United States Army Corps of Engineers (Department of the Army)
CBNMS	Cordell Bank National Marine Sanctuary
CFR	Code of Federal Regulations
CINMS	Channel Islands National Marine Sanctuary
CZMA	Coastal Zone Management Act
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FBNMS	Fagatele Bay National Marine Sanctuary
FGBNMS	Flower Garden Banks National Marine Sanctuary
FKNMS	Florida Keys National Marine Sanctuary
FONSI	Finding of No Significant Impact
GFNMS	Gulf of the Farallones National Marine Sanctuary
GRNMS	Gray's Reef National Marine Sanctuary
HIHWNMS	Hawaiian Islands Humpback Whale National Marine Sanctuary
MBNMS	Monterey Bay National Marine Sanctuary
MMPA	Marine Mammal Protection Act
MNMS	<i>Monitor</i> National Marine Sanctuary
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NAO	NOAA Administrative Order
NARP	National Artificial Reef Plan (NMFS)
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NMS	National Marine Sanctuary
NMSs	National Marine Sanctuaries
NMSA	National Marine Sanctuaries Act
NMSP	National Marine Sanctuary Program (National Ocean Service)
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
OCNMS	Olympic Coast National Marine Sanctuary
OPR	Office of Protected Resources (National Marine Fisheries Service)
OPS	Office of Protected Species (National Marine Fisheries Service)
SBNMS	Stellwagen Bank National Marine Sanctuary
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Officer
TBNMSUP	Thunder Bay National Marine Sanctuary and Underwater Preserve
THPO	Tribal Historic Preservation Officer
USFWS	United States Fish and Wildlife Service (Department of the Interior)

1.0 INTRODUCTION

Artificial reef development (as defined above) within federally designated national marine sanctuaries (NMSs) is generally prohibited by the National Marine Sanctuary Program (NMSP) regulations (15 CFR Part 922)¹. While generally prohibited, artificial reef development may be conducted inside NMSs under the authority of a permit issued by the NMSP pursuant to sanctuary regulations. This document builds on lessons learned from past experience permitting artificial reef development within sanctuaries, and applies knowledge from other sources of information. It is intended to guide decisionmakers as they review proposals for artificial reefs. It clarifies how decisionmaking criteria contained in NMSP regulations will be applied specifically to permit applications for artificial reef development.

The National Fishing Enhancement Act of 1984 (Title II of PL 98-623) charges the Secretary of Commerce and the United States Army Corps of Engineers with the responsibility for encouraging and regulating artificial reefs in the navigable waters of the U.S. for the purposes of enhancing fishery resources. The first National Artificial Reef Plan (NARP), resulting from this Act, was published by the Joint Artificial Reef Technical Committee of the Atlantic

and Gulf States Marine Fisheries Commissions in 1985 to guide “artificial reef program managers and policy makers regarding how to access and understand the many facets of artificial reef development and use.” (See page vi of “NOAA Fisheries Draft National Artificial Reef Plan Revision” February 2002).

Artificial reefs have a long history of use for a variety of purposes. There are artificial structures that have been sunk intentionally in the world’s oceans, including materials such as aircrafts, ships, cars, tires, and household appliances. Since the 1970s, there has been a growing industry that manufactures customized artificial reefs for specific purposes ranging from diving attractions to fish propagation. In NMSs, the Florida Keys National Marine Sanctuary (FKNMS) has seen by far the most requests over the years for artificial reef development and is the only one to approve any (see Appendix A).

Box 1: About the National Artificial Reef Plan (NARP)

- The NARP provides guidance on various aspects of artificial reef use, including types of construction materials and planning, siting, designing, and managing artificial reefs.
- It provides a framework for regional, state, and local planners to develop more detailed, site-specific artificial reef plans sensitive to highly variable local needs and conditions.
- NOAA Fisheries is in the process of revising the NARP.

¹ For most NMSs, NMSP regulations prohibit: (1) the construction, placement, and abandonment of structures, material, or other matter on the seabed of the Sanctuary and (2) the discharge and deposit of matter or materials into the Sanctuary. Of the thirteen designated NMSs, only regulations for the Hawaiian Islands Humpback Whale National Marine Sanctuary and Thunder Bay National Marine Sanctuary and Underwater Preserve lack provisions that apply to artificial reef development. Artificial reefs in these areas are governed primarily by State or other Federal regulations. For all sanctuaries, any Federal permit, license, or other approval authorizing artificial reefs (e.g., ACOE permit) is subject to consultation under section 304(d) of the NMSA.

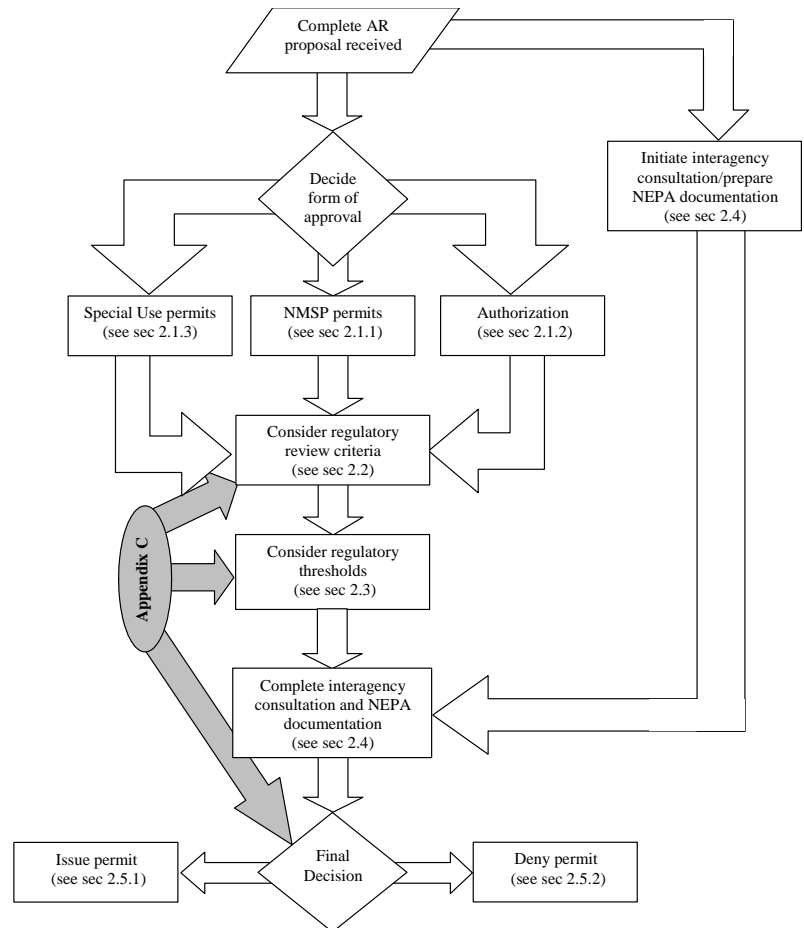
The NMSP, in conjunction with other Federal, and local agencies and non-profit groups, is monitoring and evaluating artificial and natural reefs in sanctuary waters to more fully understand their beneficial and adverse effects on NMS resources. For example, the NMSP is studying the effects of scuttling the vessel *Spiegel Grove*, which was sunk as an artificial reef in the waters off Key Largo, Florida in May of 2002. At 510 feet long, it is the largest ship ever used to create an artificial reef. The permit issued by FKNMS requires Monroe County, the permittee, to conduct pre- and post- deployment monitoring of the *Spiegel Grove* and adjacent natural and artificial reef sites to document fish presence/absence and relative abundance. The primary goal of the monitoring is to document changes in fish populations within each of the eight established monitoring stations. Related to this effort, the FKNMS has sponsored a socioeconomic monitoring study of the *Spiegel Grove* project to test the hypothesis that creating an artificial reef in the vicinity of a natural coral reef reduces dive pressure on the natural reef. In addition to learning more about the ecology and the human uses of artificial substrates, the FKNMS is also monitoring sites on or surrounding the FKNMS “shipwreck trail”². This information may be used to further refine this guidance if appropriate. To the extent possible, the NMSP should not permit any new artificial reef development within NMSs until the results of these long-term studies are available and can inform the decisionmaking process directly.

This document complements the guidance contained in the NARP to guide the NMSP and applicants through the process of evaluating proposals for artificial reef development within NMSs. There are three appendices to this document. Appendix A is a chart that provides a listing of all permits issued for artificial reefs in NMSs. Appendix B guides permit applicants for artificial reef development projects in gathering the necessary information to support their application. Appendix C provides a detailed discussion about various aspects of artificial reef development to inform decisionmakers evaluating proposals to establish artificial reefs in NMSs.

² The FKNMS Shipwreck Trail is a series of nine historic shipwrecks along the coral reefs off the Florida Keys that represent three broad periods of Keys maritime history: European Colonial, American and Modern. Two sites on the shipwreck trail are artificial reefs. Refer to http://www.fknms.nos.noaa.gov/sanctuary_resources/shipwreck_trail/welcome.html for more information.

2.0 NATIONAL GUIDELINES FOR PROCESSING APPLICATIONS FOR ARTIFICIAL REEF PERMITS

Anyone proposing to establish an artificial reef in a NMS must obtain prior approval from the NMSP. It is the policy of the NMSP to consider applications to establish artificial reefs in accordance with the guidelines provided in this section. The intent of this section is to ensure that such applications are processed consistently throughout the National Marine Sanctuary System. This will also provide greater predictability and clarity to prospective applicants. These guidelines supplement- not replace- current sanctuary permit application processing procedures and normal NMSP operating procedures related to application processing. Applications for artificial reef projects that are reasonably expected by the NMSP to meet the criteria contained herein will be reviewed consistent with these guidelines by both national and site personnel. Other applications will be rejected. The NMSP Director and the appropriate sanctuary manager will make decisions on applications jointly, with the Director having the final decision in instances where there is not concurrence.



Box 2: What is in a complete artificial reef proposal?

Applications will be considered complete when they contain enough information for NMSP staff to determine whether the project adheres to these guidelines; generally the information listed in Appendix B to these guidelines. A very brief outline of this information is:

1. A cover letter containing, among other items, personal information about the applicant and others involved in the project (e.g., name, address, funding source, qualifications, etc.).
2. A summary or abstract of the project.
3. Technical Information about the project including,
 - A description of the materials to be used.
 - A reef materials transport/deployment plan.
 - A stability plan.
 - An analysis of alternative methods and sites.
 - Siting description, including a map.
4. A monitoring plan that includes components addressing biological effects, effectiveness in meeting stated goals, and stability.
5. An analysis of the environmental consequences that includes details about the affected environment and the potential adverse and beneficial effects of the project.

2.1 Forms of approval

When an application for an artificial reef project is received, the NMSP will first decide under which form of approval to consider it. Artificial reef proposals must be eligible for at least one of three primary forms of approval to be considered. These are: (1) “Regulatory Sanctuary Permits” issued pursuant to site-specific regulations and 15 CFR 922.48, (2) “Authorizations” of other government agency approvals issued pursuant to 15 CFR 922.49, and (3) “Special Use Permits” issued pursuant to section 310 of the NMSA. If a project does not qualify for one or more of these three forms of approval, the project will not be reviewed further in accordance with these guidelines. These applications will either be denied without additional review or returned to the applicant unprocessed.

Because artificial reef development projects may be proposed for many different purposes (fish propagation, recreational diving, etc.), the appropriate form of approval for which they should be considered will vary.

Simply qualifying for one of the forms of approval below does not guarantee that the NMSP will approve the application. Once deemed eligible for one of the three forms of approval, the application will be reviewed concurrently by staff at NMSP headquarters and the site.

2.1.1 Regulatory Sanctuary Permits

Most NMSs have regulations that allow permits to be issued for activities that would otherwise be prohibited when those activities are related to research or education. There are additional Sanctuary-specific regulations that allow the NMSP to issue sanctuary permits in certain NMSs for other purposes as well. In order to qualify for a sanctuary permit, an artificial reef project must meet the description of one or more of the permit types listed in the subsections below.³

2.1.1.1 *Research*

In order to qualify for a “research permit” an artificial reef project must be expected to further research related to sanctuary resources and qualities. The artificial reef project should be part of a hypothesis-driven, scientific research project, whose goal is to answer questions about sanctuary resources. The usefulness of this information to sanctuary management does not necessarily affect the eligibility of a particular artificial reef project for this type of permit. However, research projects involving artificial reefs with little or no applicability to sanctuary management goals (i.e., the information it expects to yield is either widely known or inconsequential) would likely not be approved.

Research projects involving the placement of artificial reefs should include the removal of the artificial reef after the project is finished. In some cases the impacts of removal will be greater than leaving it place. In these cases, the NMSP may consider allowing the artificial reef to remain although this will be considered before the artificial reef is deployed and will factor in the

³ Other regulatory permit types do exist but were omitted because they could never apply to artificial reef projects.

decision to allow the artificial reef in the first place. Research projects often have defined starting and ending points. Applicants proposing research projects involving artificial reefs that need to remain in place long-term (e.g., for an extended period of time, such as 10 years or greater) should explain why the long-term placement of materials is necessary to meet the scientific objectives of the research project. A lack of funding to remove the structures is not sufficient justification.

2.1.1.2 Education

In order to qualify for an “education permit” an artificial reef project must further the educational value of the sanctuary. The placement of artificial reef materials must be a necessary part of an educational project designed to increase the awareness of sanctuary users about the NMS or a particular aspect of the sanctuary. Teaching sanctuary users about artificial reefs is not the same as teaching them about NMS resources. In addition, an educational project involving the placement of artificial reef materials must be done in a manner or in a location where a reasonable number of sanctuary users will be able to benefit from its presence. Educational permits are not available for the *Monitor* NMS.

2.1.1.3 Management

In order to qualify as a “management permit” an artificial reef project must assist in managing the Sanctuary. This type of permit is available in the following sanctuaries: Cordell Bank, Flower Garden Banks, Monterey Bay, Stellwagen Bank, Olympic Coast, and the Florida Keys National Marine Sanctuaries. Artificial reef projects in other NMSs cannot qualify for this type of permit. Applicability of any particular artificial reef project to this type of permit is dependent upon the management goals outlined in the sanctuary-specific management plans. An artificial reef project must be reasonably expected to help the sanctuary meet a previously stated management goal to qualify for this permit type. The sanctuary will not create new management objectives (i.e., management objectives not articulated in the sanctuary’s management plan) to qualify for this permit type.

2.1.1.4 Furthering the welfare of an adjacent Indian tribe- Olympic Coast National Marine Sanctuary (OCNMS)

OCNMS regulations allow for the issuance of a permit to any individual to conduct an activity that would otherwise be prohibited if the activity is expected to promote the welfare of an Indian tribe residing adjacent to the OCNMS. The NMSP/OCNMS is currently developing a separate policy on the appropriate and consistent use of this permit type. No permit for artificial reef projects in OCNMS will qualify for this type of permit until that policy becomes final.

2.1.1.5 Otherwise further Sanctuary purposes- Florida Keys National Marine Sanctuary (FKNMS)

FKNMS regulations (15 CFR § 922.166(2)(vi)) allow the NMSP to permit prohibited activities that “otherwise further the Sanctuary purposes, including facilitating multiple use of the Sanctuary, to the extent compatible with the primary objective of resource protection.” The purposes of the Sanctuary are as follows (taken from 15 CFR 922.160(a)):

- To protect, preserve and manage the conservation, ecological, recreational, research, educational, historical, and aesthetic resources and qualities of the area;
- To protect, restore, and enhance the living resources of the Sanctuary;

- To contribute to the maintenance of natural assemblages of living resources for future generations;
- To provide places for species dependent on such living resources to survive and propagate;
- To facilitate to the extent compatible with the primary objective of resource protection all public and private uses of the resources of the Sanctuary not prohibited pursuant to other authorities;
- To reduce conflicts between such compatible uses; and
- To achieve the other policies and purposes of the Florida Keys National Marine Sanctuary and Protection Act and the National Marine Sanctuaries Act.

If a proposed artificial reef development project would further one of these purposes, it may be permitted within FKNMS under this permit type.

2.1.2 Authorizations

For projects in some NMSs, the NMSP also has the authority to “authorize” an artificial reef development project if it is being permitted, licensed, or otherwise approved by a local, state, or other federal government agency. This authority will only be used in cases where a regulatory sanctuary permit is not appropriate. Flower Garden Banks, Monterey Bay, Stellwagen Bank, Olympic Coast, and Florida Keys National Marine Sanctuaries, and Thunder Bay National Marine Sanctuary and Aquatic Preserve have this authority.

Through the authorization process, applicants must notify the appropriate sanctuary manager of their desire to use another agency’s permit to conduct an otherwise prohibited activity in the NMS. The Sanctuary then must notify the applicant and the permitting agency as to whether it objects to the issuance of the other permit. The sanctuary may add additional terms and conditions that it deems necessary to protect sanctuary resources and qualities consistent with applicable laws and regulations. The activity may proceed in the sanctuary only if the NMS provides written notice to this effect.

Most artificial reef development projects will require a permit from the Army Corps of Engineers (ACOE) pursuant to the ACOE’s authority under section 10 of the Rivers and Harbors Act and/or section 404 of the Clean Water Act. If the NMSP decides to authorize another agency’s permit (rather than issue a NMS permit), a permit from the ACOE is therefore the most likely vehicle through which the NMSP could authorize artificial reef development projects in cases where a special use permit or regulatory sanctuary permit is not deemed appropriate.

2.1.3 Special use permits

Special use permits are issued pursuant to section 310 of the National Marine Sanctuaries Act (NMSA; 16 U.S.C. 1441), which allows issuance of special use permits for specific activities in a Sanctuary only if such authorization is necessary (1) to establish conditions of access to and use of any Sanctuary resource or (2) to promote public use and understanding of a Sanctuary resource. Activities that are necessary to establish conditions of access to and use of Sanctuary resources generally include concessionaire-type activities (entities operating within the

boundaries of a NMS designed for profit) and other commercial activities that require access to the Sanctuary to achieve a desired goal.

In addition, the NMSA establishes four conditions for special use permits. The NMSA requires that special use permits-

1. Shall authorize the conduct of an activity only if that activity is compatible with the purposes for which the Sanctuary is designated and with protection of Sanctuary resources;
2. Shall not authorize the conduct of any activity for a period of more than 5 years unless renewed by the Secretary;
3. Shall require that activities carried out under the permit be conducted in a manner that does not destroy, cause the loss of, or injure Sanctuary resources; and
4. Shall require the permittee to purchase and maintain comprehensive general liability insurance, or post an equivalent bond, against claims arising out of activities conducted under the permit and to agree to hold the United States harmless against such claims. (16 U.S.C. § 1441(c)).

Because the impacts of artificial reefs are not entirely understood, it is unclear whether most such projects would qualify for a special use permit due to its “no injury” requirement. However, should the NMSP determine a special use permit to be appropriate for a specific artificial reef development project, it must process that application consistent with Section 310 of the NMSA in addition to these guidelines.

2.2 Regulatory Review Criteria

Once the form of approval under which the application is being considered is determined, the NMSP will evaluate applications for artificial reef development projects based on the criteria listed below and the descriptions for those criteria. As a matter of policy these criteria will be applied to every application regardless of the form of approval selected. Much of the information listed and described below is discussed in more detail in Appendix C.

NMSP regulations provide nine review criteria by which managers must evaluate permit applications. This document combines those nine criteria into four groups. First, the NMSP will conduct a technical review of the methods proposed to establish an artificial reef. Next, the NMSP will evaluate the impacts of the proposed artificial reef on sanctuary resources. Third, the NMSP will consider the benefits and impacts of the project. Finally, the NMSP will consider other matters important for the review of artificial reef development projects that are not specifically provided in NMSP regulations.

2.2.1 Technical review

The following criteria apply to the review of the project itself. Under these criteria the NMSP is considering the applicant’s qualifications and financial resources, the methods proposed by the applicant to establish the artificial reef, and the site the applicant has chosen.

2.2.1.1 Professional and financial responsibility

The professional and financial responsibility of an applicant proposing to establish an artificial reef must be demonstrated prior to NMSP approving such activity. First, the NMSP will review the qualifications of the individual or entity proposing to establish an artificial reef in a NMS.

The NMSP will use the following questions to evaluate an applicant's qualifications:

- Does the applicant have the technical skills to establish an artificial reef consistent with all applicable permit conditions?
- Will the applicant be able to fulfill permit requirements to minimize or eliminate impacts to sanctuary resources?

For example, if an applicant claims s/he can sink an artificial reef in a precise location and position, the NMSP must ensure that the applicant has the skills and equipment available to do this. To ensure that an applicant has the technical skills to comply with a permit to establish and monitor an artificial reef, the NMSP will request that the applicant submit a resume for each person that will be participating in the project. The NMSP will not likely approve projects that rely on inexperienced individuals to perform activities related to the establishment and monitoring of an artificial reef when those activities are critical to the project's compliance with permit terms and conditions.

The financial responsibility in many cases relates to the applicant's budget for the activity, which will always be a critical issue for artificial reef projects. The following will help the NMSP determine if an applicant has an appropriate project budget:

- The applicant has shown that there are funds to comply with permit terms and conditions, including a long-term monitoring program.
- The applicant has shown that there are funds available to remove the artificial reef if something were to go wrong during or immediately after installation.
- The applicant has shown that sufficient funds will be available for the life of the project.

To ensure that funds are available for the life of a project the NMSP will request the applicant to post a bond large enough to ensure permit terms and conditions can be met for the life of the project. This includes, but is not limited to, funds for artificial reef removal and long-term monitoring as well as funds to respond to unpermitted injury to sanctuary resources. In lieu of a bond, the NMSP may consider other comparable forms of financial assurance (e.g., placing funds in an escrow account or purchasing insurance).

2.2.1.2 Appropriateness of methods

The NMSP will also consider the appropriateness of the methods a permit applicant is proposing to employ in establishing an artificial reef. The NMSP will rely on past experience, knowledge of sanctuary staff, and expert advice to ensure that more efficient or less damaging methods available to achieve a desired result have not been overlooked. Different methods of establishing artificial reefs may be appropriate in different sanctuaries or in different habitats within a single sanctuary. The following will be considered to determine if the proposed methods are appropriate:

- The applicant should demonstrate why the proposed method was chosen and why it was deemed superior to other methods not selected.
- If the applicant has dismissed alternative methods that impact sanctuary resources to a lesser degree (as compared to the proposal), the applicant must provide a thorough justification.

- An applicant's lack of funds to pursue an alternative method is not, by itself, a justification for rejecting an alternative that the NMSP determines to be less damaging on sanctuary resources.

Under this criterion the NMSP will also carefully evaluate the materials selected by the applicant, the method for placing these materials on the bottom, and the means to keep these materials stable. Appendix C discusses these issues in greater detail. To allow the NMSP to fully evaluate a proposal, applicants should include in their application a description of how these issues will be addressed by their project by doing the following:

- The applicant should submit a detailed description of all materials being used to establish the artificial reef. This description should include (where applicable) drawings of the proposed artificial reef in place and photographs of the materials.
- The applicant should submit a sinking plan that details how the materials described above will be transported to the proposed location and placed on the seabed. This plan must describe any explosives that will be used.
- The applicant should submit a stability plan that describes how the materials will be secured to the bottom. As part of this, the applicant should provide a stability analysis conducted by someone qualified to conduct such an analysis (e.g., a marine engineer) that certifies the artificial reef will remain stable during extreme environmental conditions (e.g., during a 50- or 100-year storm event) if the stability plan is executed properly.

As part of its responsibilities under this criterion and NEPA (see section 2.4.1), the NMSP may ask the applicant to investigate and analyze other methods that can be reasonably expected to achieve the stated goals of the project. One of the alternatives the NMSP may require the applicant to investigate and analyze is one that does not involve the placement of any material on the seafloor (i.e., meet the project purpose without establishing an artificial reef). The NMSP may also require the applicant to provide a written analysis of other alternative methodologies such as alternative sinking strategies, alternative means of reef stabilization, and alternative materials. Related to this (as outlined in sections 2.2.1.3 and 2.4.1 of these guidelines), the NMSP will require the applicant to justify the site selected for the proposal and analyze alternative sites that can be expected to achieve the stated goals of the project, including sites outside the sanctuary.

2.2.1.3 Activity needs to be in NMS

As stated previously, the construction of artificial reefs in NMSs is prohibited except where permitted. A proponent of an artificial reef project must justify to the NMSP that the artificial reef needs to be established inside the sanctuary to achieve the stated goals.

To satisfy this criterion and a portion of the NMSP's obligations under NEPA (see section 2.4.1), applicants for approvals to establish an artificial reef in an NMS should:

- Provide an analysis that compares the environmental impacts of the in-sanctuary proposal to at least one non-sanctuary alternative site (refer to section 2.4.1 for an exception).
- Explain why the in-sanctuary proposal is preferable to locating the project outside the NMS in terms of providing greater benefits.
- Provide the siting criteria that led to the conclusion that the site within the sanctuary is the best one that meets the project's goals.

If any non-sanctuary alternative (either one analyzed by the applicant or another analyzed by the NMSP) can reasonably be expected to achieve the desired goals of the project, the application is not likely to be approved. Siting issues are discussed in more detail in Appendix C.

2.2.2 Evaluating the effects of the project

The following four criteria examine the effects of proposed artificial reef projects and evaluate the significance of those effects. Although they are among the most important set of criteria the NMSP will consider, they can usually be evaluated more effectively after the NMSP has completed its initial review of the project as described in section 2.2.1. As background and supporting information, the NMSP will consider the section of Appendix B that describes in detail some of the debates and unanswered questions surrounding artificial reefs. These effects will be evaluated in detail in the NEPA document explained in section 2.4.1.

Because the long-term effects of artificial reef projects are not well understood, the applicant will be required to conduct or fund a long-term monitoring project. Refer to section 2.5.1 for details on the requirements of monitoring.

2.2.2.1 *Extent the activity will diminish or enhance the values of the NMS*

When processing applications to establish artificial reefs, the NMSP will consider the extent to which a proposed artificial reef project is expected to affect the values for which the applicable sanctuary was designated. The following are the primary values of sanctuaries that will be considered under this criterion (as they relate to the establishment of artificial reefs) along with questions that will help assess how each value is affected. Because the primary reason NMSs are designated is for the protection of natural and cultural resources, the effects of a project on these resources are given the most weight. Natural resource issues related to fisheries will be evaluated based on input from appropriate state and Federal fisheries organizations.

1. The natural and cultural resource protection value:
 - Does the project enhance or diminish the protection of the natural and cultural resources in the sanctuary?
 - Will there be any long-term or short-term benefits or impacts to sanctuary resources? Will those impacts be significant?
 - What natural community can the NMSP reasonably expect to be displaced when the artificial reef is established and what is the significance?
 - Will the establishment of the artificial reef prevent or inhibit the management or protection of a cultural resource site?
2. The value of the site as a source for scientific and educational information:
 - Does the project affect on-going or potential scientific monitoring projects?
 - Will the project enhance the NMSP's understanding of its resources?
 - Will the project enhance sanctuary users' knowledge about sanctuary resources?
3. The aesthetic value of the site:
 - Does the project diminish or enhance the aesthetics of the sanctuary?
 - Is it visible from the surface?
 - Will the project concentrate fishing or diving vessels? If so, will the concentration of vessels diminish the aesthetic value of the sanctuary?

- Is the reef expected to deteriorate over time and will the deterioration of the reef result in the creation of a debris field contributing to diminished aesthetic value when viewed underwater?

4. The human use value:

- Will the project prevent (on a temporary, long-term, or permanent basis) some users from conducting their normal activities at the site?
- Will the establishment of the artificial reef create new conflicts between different user groups (e.g., between recreational fishers and divers) and if so are they significant, what are the pros and cons, and can the conflicts be minimized?
- Will the artificial reef create a hazard to navigation?
- What possible future activities or management options would be precluded or foreclosed if the project proceeds?

Under this criterion the NMSP will consider both the positive and negative effects of an artificial reef project on these values.

2.2.2.2 Duration of activity and effects

The NMSP will consider the duration of an artificial reef project when evaluating each project. In general, permanent placement of materials is disfavored in sanctuaries and will not be permitted unless other criteria outweigh permanent placement (e.g., the benefits to the management of sanctuary resources outweigh the expected impacts). If removal will be required, the NMSP will also evaluate the impacts of the removal operations.

The NMSP will also evaluate the duration of the effects of an artificial reef project before issuing a permit. A project whose adverse effects continue beyond the installation phase would have less chance of being permitted than a project whose adverse effects occur only during installation.

2.2.2.3 Cumulative effects

As part of its evaluation of the effects of each artificial reef project, the NMSP will consider the cumulative effects of the project before making a decision. To facilitate this analysis, applicant should:

- a) Identify all natural resources (e.g., fish, benthic invertebrates and plants, marine mammals, etc.), cultural resources (prehistoric archeological sites, historic shipwrecks, etc.), and current human uses (e.g., fishing, diving, etc.) that could potentially be affected (beneficial or adverse effects) by the artificial reef project;
- b) Identify and describe the geographic and temporal range of all affected resources;
- c) Analyze how the project will affect all resources identified;
- d) Describe all other natural and human-caused effects (both adverse and beneficial) on all resources identified (e.g., fishing, shipwrecks, and other artificial reefs); and
- e) Describe how/if the proposed artificial reef project will interact with the other natural and human-caused effects on the resources.

The NMSP will also require the same level of analysis for each alternative. This criterion may result in NMSP denying a permit application due to the impacts of several other projects combined, rather than just the impacts of the proposal.

The NMSP will evaluate cumulative effects consistent with the Council on Environmental Quality's implementing regulations for NEPA and publication entitled *Considering Cumulative Effects Under the National Environmental Policy Act*. See <http://ceq.eh.doe.gov/nepa/ccenepa/ccenepa.htm> for the text of the publication.

2.2.2.4 *Impacts on adjacent Indian tribes*

The NMSP will consider the impacts of a proposed artificial reef project on adjacent Indian tribes. This is particularly important for projects proposed in OCNMS where staff has worked out a consultation procedure with the tribes to allow them to make this determination. If a tribe objects to the establishment of an artificial reef (based on expected impacts to them or their activities), the NMSP will consider that in the review of the application. If a tribal government expresses (in writing) support for a particular artificial reef project, the NMSP may consider that application more favorably. While this criterion only applies specifically to projects in OCNMS, the NMSP will consider this in other NMSs as appropriate.

2.2.3 Considering the end value of the activity

Once the impacts of an artificial reef project have been evaluated (section 2.2.2), the NMSP will measure those impacts against the expected benefits, or "end value," of the project. The nature of the end value of a project may result in the NMSP approving an artificial reef development project despite the impacts that may result. It is important to note that "benefits" and "end value" as used in this section, refer to benefits that help the NMSP achieve its primary objective of resource protection. Benefits to other entities that do not result in benefits to the resources of the NMS are not considered benefits in this context. In general, activities that have a positive end value to the NMS will have a favorable rating under this criterion, whereas those that are expected to result in little or no end value to the NMS will not. The end value of any artificial reef project can be assessed by answering the questions:

- What benefits will the sanctuary gain by this artificial reef being established as proposed?
- Will the artificial reef project reduce chronic impacts on existing biological communities?
- How do these benefits compare to the benefits of the artificial reef not being established and the overall impact on sanctuary resources and qualities?
- For research-related artificial reefs—
 - How will the project advance relevant science?
 - What information will be collected?
 - How will it benefit sanctuary management?
 - Why can it not be done on an existing artificial reef?

The NMSP will require permittees to monitor the effectiveness of their artificial reef projects in meeting stated goals and objectives. Refer to section 2.5.1 for details about the monitoring requirements. Projects that are not realizing the purported end value may be terminated by the NMSP. In these cases, the NMSP may require that the artificial reef be removed after carefully

evaluating all options and the practicality of such a measure. This is not meant to imply that the permittee is necessarily out of compliance with their permit. Further, it should be noted that this would occur in very rare circumstances where, despite a careful analysis of the permittee's predictions and independent verification, the benefits anticipated by the NMSP are not realized.

2.2.4 Considering other matters deemed appropriate

In certain special cases, the NMSP may consider other factors not presented above to determine whether or not to approve a particular artificial reef project. In particular, the NMSP may consider the socio-economic effects of an artificial reef development project and the human safety concerns that may result from a project in making its decision. (Refer to Appendix B for a more detailed discussion of these two factors.) While these considerations are not specified in review decision criteria in NMSP regulations or part of the NMSP's legislative mandate, they may factor into decisions in some cases when these effects are considered to be significant. While these factors are not likely to by themselves result in the denial or approval of a permit, they may result in the addition of certain conditions to minimize the effects.

2.3 Regulatory Thresholds

NMSP regulations bar the issuance of permits in some NMSs for activities that exceed certain specified thresholds of impact. The NMSP cannot approve applications for regulatory sanctuary permits in Fagatele Bay (FBNMS), Monterey Bay (MBNMS), Stellwagen Bank (SBNMS), and Olympic Coast (OCNMS) National Marine Sanctuaries if the proposed activity exceeds the threshold applicable to the sanctuary. FBNMS has two thresholds that apply: (1) permitted activities must be conducted with adequate safeguards for the environment; and (2) the environment, after the completion of the project, will be returned to, or will regenerate to, the condition that existed before the activity occurred. MBNMS and SBNMS regulations both prohibit the issuance of regulatory sanctuary permits for activities with impacts on sanctuary resources that are greater than short-term and negligible. The NMSP cannot issue any regulatory sanctuary permit for an activity in OCNMS if it will substantially injure a sanctuary resource.⁴

2.4 NEPA Documentation and Interagency Consultation

When processing applications to establish artificial reefs the NMSP is a "Federal action agency" for the purposes of many Federal laws.⁵ As such, the NMSP must comply with the statutes described below by conducting various consultations with other government agencies and by preparing environmental documentation to support whatever decision is made. This section details the requirements of six of these statutes and provides guidance on how to ensure that the NMSP is in compliance with them. Once an application to create an artificial reef is deemed complete, the NMSP must then determine which interagency consultations and NEPA documentation will be required before proceeding any further in the process.

⁴ While these requirements only apply to regulatory sanctuary permits being processed at the NMSs specified in section 2.3, as a matter of practice the NMSP will not approve an artificial reef development project in any sanctuary if it is expected to substantially injure a sanctuary resource.

⁵ While the guidance in this section is written specifically for NMS permits involving artificial reef development, the statutory requirements detailed herein apply to *all* NMS permitting actions.

2.4.1 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires Federal agencies to consider the impacts of their actions on the environment before they commit to a particular course of action. The NMSP will prepare either an Environmental Impact Statement (EIS) or Environmental Assessment (EA) for each formally proposed (i.e., when an applicant has submitted a written permit application) artificial reef project that could reasonably be expected to qualify for approval. In most cases the NMSP will begin by first drafting an EA; however, where either the EA concludes that there will be a significant impact or preliminary analysis makes it obvious that a Finding of No Significant Impact (FONSI) is not likely to result, the NMSP will discontinue the EA and begin preparing an EIS.

The NMSP will prepare the NEPA document for proposed artificial reef development projects consistent with NOAA Administrative Order (NAO) 216-6-- NOAA's implementing guidelines for NEPA and the Council on Environmental Quality's implementing regulations for NEPA.⁶ Typically the NMSP will include in its NEPA document an analysis of a range of alternatives, including but not limited to: 1) the proposed action, 2) the proposed action at an alternative site outside the sanctuary, 3) the proposed action using an alternative methodology, and 4) the no-action alternative. As discussed in section 2.2.1.3 above, at least one of the action alternatives will be to establish the artificial reef at a site outside of the sanctuary. If reasonable, another action alternative should be one that achieves the goals of the artificial reef without placing materials on the seafloor (this may be the same as the no-action alternative in some cases). The applicant should provide an analysis (description of the affected environment and environmental consequences) of each alternative the NMSP chooses to pursue. In some cases (e.g., proposals with an extremely limited scope of investigation that necessarily involve a particular reef) the NMSP may analyze fewer alternatives than it would in most cases. If fewer than four alternatives are analyzed in the NEPA document, the applicant should provide (and the NMSP will include in the NEPA document) a justification for not considering more alternatives. Neither a lack of time nor funds on the part of the applicant is sufficient justification for considering fewer than four alternatives.

The NMSP will prepare the EA or EIS prior to making a final decision on the application and will involve at the earliest practical time local, state, tribal, and other federal agencies in its development. In most cases the NMSP will coordinate closely with the local municipality affected by the action (if any), with the appropriate state agencies (including the State Historic Preservation Officer, the CZM program, and any other applicable state agencies), the local regulatory office of the Army Corps of Engineers, the National Marine Fisheries Service (including both regional and national offices of Protected Resources, Habitat Conservation, and Sustainable Fisheries), the US Fish and Wildlife Service, the Department of Defense, and the US Coast Guard (for navigational issues). The NMSP will coordinate with other agencies on a case-by-case basis. The NMSP will consult with these agencies before drafting the EA and will solicit their advice on all pending applications to establish artificial reefs.

⁶ NAO 216-6 is available for download at <http://www.nepa.noaa.gov>

Based on preliminary comments from involved agencies, the NMSP will draft and release a draft NEPA analysis document for public comments. In some cases, the NMSP will hold public hearings following the release of the draft NEPA document to solicit public comments and concerns about a pending permit application. After consulting with affected government agencies and (if appropriate) the public, the NMSP will release a final NEPA document. The NMSP will not take final action on any permit application to establish an artificial reef until the NEPA document has been cleared consistent with NAO 216-6 guidelines and signed by the Assistant Administrator for the National Ocean Service. In addition, the NMSP will delay final action on a permit application for 30 days following the release of a final EIS to accommodate the required “cooling off period.”

2.4.2 Coastal Zone Management Act, Federal Consistency Provisions

The Coastal Zone Management Act of 1972 (CZMA) requires that Federal actions that are reasonably likely to affect any land or water use or natural resource of the coastal zone be consistent with the enforceable policies of a coastal state's or territory's Federally approved coastal management program ("state CMP" or "CMP"). Depending on the affected state and if the applicant is a federal agency, the appropriate procedures for complying with the CZMA will be different when processing applications to establish artificial reefs. In either case, the EA or EIS prepared for the artificial reef will illustrate how the federal consistency provisions of the CZMA were satisfied.

2.4.3 Section 106 of the National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA), requires Federal agencies to consider the impacts of their actions on historic properties. Generally, this involves consultation with either the Advisory Council on Historic Preservation (ACHP), the appropriate State Historic Preservation Officer (SHPO), an applicable Tribal Historic Preservation Officer (THPO), or all three. As it relates to NMSP approvals for the establishment of artificial reefs, this provision will require coordination with the ACHP, SHPO, or THPO (as appropriate) when assessing whether or not historic properties will be affected by a permitted action. In cases where an artificial reef is proposed to be established outside of State waters, the NMSP will consult with the SHPO whose waters are closest to the affected area (e.g., for a proposed artificial reef in the EEZ of FKNMS, the NMSP will consult with the Florida SHPO and/or the ACHP).

Because submerged cultural, archaeological, and historic resources are “sanctuary resources,” the NMSP must ensure that they will not be placed at risk by approving the placement of an artificial reef. For each proposal, the NMSP will consult with the SHPO, THPO, and/or ACHP to determine the potential for submerged cultural resources at the preferred site and all alternative sites. Bottom surveys will be required for sites that have a reasonable probability of having submerged cultural resources. Surveys should include bathymetric maps (based on fathometer data) and SCUBA video surveys (within normal SCUBA diving depths). For depths not accessible by SCUBA, ROV surveys may be required. Based on the results of the survey, the NMSP will prepare an assessment of the potential for the permitted activity to affect historic properties. This assessment will be included in the draft NEPA document and provided to the

SHPO, THPO, and/or ACHP for comment and concurrence. No permit or other form of approval to establish an artificial reef in a NMS will be issued until the NMSP has found that the project will not adversely affect any submerged cultural, archaeological, and historic resources and the SHPO, THPO, and/or ACHP has concurred with this finding.

2.4.4 Section 7 of the Endangered Species Act

Section 7 of the Endangered Species Act mandates that each Federal agency shall, in consultation with and with the assistance of the Secretary, ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the habitat of such species. The NMSP will first determine whether any listed species are known to be located in the project area described by the applicant or in any of the alternative sites. If there are no listed species in the area (i.e., if the known range of any listed species does not overlap with the project area) and no critical habitat, the ESA does not require any further consultation. However, as a matter of policy, the NMSP will advise the appropriate regional Office of Protected Species (OPS) for the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS), known collectively as “the Services,” of a pending application and seek comment and advice.

In cases where the known range of any listed species or critical habitat overlaps with the proposed artificial reef site or any of the alternative sites, the NMSP will find that the activity “may affect” a listed species. When this is the case, the NMSP will then make a determination as to whether or not the activity is “likely to adversely affect” the listed species in the area. If the NMSP determines that the artificial reef is not likely to adversely affect a listed species (e.g., the effects are beneficial, insignificant, or discountable) and the Services concur in writing, no further consultation is required and the consultation process is terminated. This determination and concurrence will be referenced in the draft EA if provided within a reasonable period of time. Please note that while there are no regulatory timeframes for completing “informal consultation” discussed above, the NMSP should expect a notice of concurrence or non-concurrence from the Services within 30 days of providing a finding of “not likely to adversely affect” a listed species to the Services. If, after consultation with the Services, it is found that more than 30 days will be required to provide a written concurrence to the NMSP’s finding, the NMSP will distribute the draft NEPA document with a note that concurrence is pending. The NMSP will not, however, distribute the final NEPA document or approve the application until concurrence has been received.

If the NMSP determines that an artificial reef project is likely to adversely affect a listed species or the Services do not concur with a NMSP’s determination that an artificial reef project is not likely to adversely affect a listed species, it will initiate “formal consultation” with the Services. At the conclusion of formal consultation, the Services will issue a “biological opinion” with “reasonable and prudent alternatives” (RPAs), if needed, and “reasonable and prudent measures” (RPMs) that will allow the artificial reef to be established without being likely to jeopardize the continued existence of any affected listed species and minimizing the impact of any “take” (defined broadly to include harm and harassment) of individual animals of those species. If the NMSP approves of the project, RPAs, if any, and RPMs will be incorporated as binding special

conditions in the final permit and referenced in the final NEPA document. (From the date that formal consultation is initiated, the Service is allowed 90 days to consult with the NMSP and applicant and 45 days to prepare and submit a biological opinion; thus, a biological opinion is submitted to the Federal agency within 135 days of initiating formal consultation. The 90-day consultation period can be extended by mutual agreement of the Federal agency and the Service; however, it cannot be extended more than 60 days without the consent of the applicant.)

2.4.5 Magnuson-Stevens Act, Essential Fish Habitat (EFH) Amendments

Pursuant to section 305(b)(2) of the Magnuson Stevens Fishery Conservation and Management Act, each Federal agency shall consult with the Secretary of Commerce (delegated to NMFS, Assistant Regional Administrators (ARA) for Habitat Conservation) with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act. The term "essential fish habitat" (EFH) means those waters and substrate necessary to fish⁷ for spawning, breeding, feeding or growth to maturity. (50 CFR 600.10). As a matter of policy and for all practical purposes, the NMSP will assume that every artificial reef proposal may affect EFH, and will therefore consult with personnel of the appropriate ARA for Habitat Conservation.

In consultation with personnel for the appropriate ARA for Habitat Conservation, the NMSP will determine if each artificial reef proposal will adversely affect EFH. In cases where the NMSP has determined an artificial reef proposal may adversely affect EFH, the NMSP will prepare an EFH assessment. The EFH assessment will detail the impacts of the artificial reef proposal on EFH for all managed stocks for the proposed site and all alternative sites and will be made a part of the draft NEPA document. The draft NEPA document will be forwarded to personnel for the appropriate ARA for Habitat Conservation. The NMSP will not release a final NEPA document or take final action on the pending proposal until it has received concurrence with the EFH assessment from the appropriate ARA for Habitat Conservation.

2.4.6 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) does not specifically contain any direct mandates for Federal agencies. Compliance with the MMPA is ultimately the responsibility of the person or entity engaged in the conduct of an activity that may result in the take of any marine mammal. As is the case with the ESA, implementation of the MMPA is split between NMFS and USFWS, although most marine mammals that are found within NMS are under the jurisdiction of NMFS.

Depending on how the artificial reef is being established, the applicant may be required to obtain an Incidental Harassment Authorizations (IHA) from NMFS. For each artificial reef proposal, the NMSP will consult with the NMFS-OPS to determine if an IHA will be necessary. If an IHA is necessary, the NMSP will not approve any application for an artificial reef until the IHA has been obtained. In either case, this consultation with NMFS and the details of an IHA (if necessary) will be summarized in the draft and final EA. NMFS-Office of Protected Resources

⁷ The word "fish" is used here as defined by the Magnuson Stevens Fishery Conservation and Management Act and is defined as finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds. See 18 U.S.C. 1802(12).

(OPR) will be provided with a copy of the draft EA and be given an opportunity to provide comments.

2.5 Taking final action on the permit application

The NMSP will make a decision on a pending permit application to establish an artificial reef only after it has determined the appropriate form of approval as outlined in section 2.1, has considered all of the permitting review criteria and thresholds listed and described in sections 2.2 and 2.3 respectively, and prepared the appropriate NEPA documentation and conducted all of the interagency consultations described in section 2.4. Once a decision has been reached in this manner, the NMSP will adhere to the following procedures for issuance of the permit or denial, whichever the case may be. For the most part, the NMSP will do this in the same manner as all other permit applications consistent with long-standing protocols and permit processing procedures (and national policies). Regardless of the decision, no action will be taken by any single sanctuary manager or superintendent without prior clearance by NMSP headquarters staff and, where appropriate, general counsel.

Certain parties also have the right to appeal NMSP decisions on permit applications. The procedures for appeal are summarized in section 2.5.3 and are detailed in 15 CFR § 922.50.

2.5.1 Permit Issuance

If the decision is to issue the permit, the NMSP will draft a permit with all necessary special and general conditions at the site in which the artificial reef is to be established. In addition to the typical general conditions attached to all NMSP permits and authorizations, the items in the subsections below will be addressed in every approval to establish an artificial reef as a term or condition of the approval.

After it is cleared for release by headquarters and (if necessary) general counsel, the draft permit will be forwarded to all Federal, State, and local agencies with jurisdiction over the project. The NMSP will provide these agencies with a minimum of 30 days to review the draft. In some cases, it may be necessary for the NMSP to assume an agency does not have any comments on the draft permit if it has not responded in this timeframe.

Once the NMSP has considered and, where appropriate, incorporated all comments from other agencies, the NMSP will provide a draft to the permit applicant to ensure all terms and conditions are acceptable. (The permittee will also be provided with copies of all comments received from other agencies.) The NMSP will provide the permittee with at least 15 days to review this draft. If the applicant desires significant changes to permit language (e.g., changes in siting, materials, sinking methods) at this point, the NMSP may either deny the permit (see section 2.5.2) or resubmit the draft to other agencies as described in the paragraph above. If the applicant only desires minor changes to the permit (e.g., editorial/grammatical changes, minor changes in due dates or other timelines specified in the draft permit, other technical changes) or the NMSP does not hear from the applicant within 15 days, the NMSP will modify the draft permit as appropriate. At this point the applicant will be required to countersign the permit and send one of the signed originals back to the NMSP.

2.5.1.1 Monitoring

A person, organization or agency that is granted a permit to construct an artificial reef in a NMS will be required as a condition of that approval to fund or conduct three types of monitoring:

1. “Biological effects monitoring” that is designed to continuously monitor the long and short-term effects of the project will always be required. Biological effects monitoring must be designed to quantitatively assess the impacts an artificial reef is having on the surrounding natural environment in terms of community diversity and abundance. Baseline conditions (i.e., pre-deployment biological conditions) must be assessed as part of this monitoring plan. If possible, it should be flexible enough so it can be modified if circumstances warrant in a manner that does not render previously collected data obsolete. If removal will be required, the plan must include post-removal monitoring as well.
2. “Effectiveness monitoring” that is designed to tell if the project is effective in meeting its objectives and achieving the desired effect (i.e., end value) will be required in cases where the NMSP issues a permit based in any part on some expected benefit from an artificial reef project. Similar to biological effects monitoring, this monitoring plan must include pre-deployment monitoring to establish baseline conditions, against which the success or failure of the project will be measured.
3. “Stability monitoring” to ensure the artificial reef is remaining stable and is not becoming a risk to sanctuary resources will always be required. The frequency of stability monitoring should take into account the characteristics of the artificial reef itself and of the surrounding natural environment. At a minimum a stability monitoring plan should be designed to check the location of the artificial reef at regular intervals and after major storm events.

The NMSP will review the monitoring program as part of the overall proposal. Each monitoring program will be different and will be customized for the specific circumstances. The details of the monitoring plan (e.g., the entity that is conducting the monitoring, reporting frequency and format) must be reviewed and approved by the NMSP before a permit is issued. Further, the applicant must have shown that funds or resources for the monitoring program will be available. As stated in section 2.2.1.1 of these guidelines, the NMSP will require a permittee to post a bond sufficiently large to fund long-term monitoring, or provide comparable financial assurance. This will ensure that any required monitoring will be completed even if a permittee becomes unable to fund or conduct it himself.

2.5.1.2 Methods

The following will address how the artificial reef development will take place within a NMS (if approved) and will be required as terms and conditions on most permits:

1. The permittee will be required to adhere to a sinking and deployment plan submitted and approved by the NMSP and consulting/reviewing agencies in advance of the permit being issued.
2. The permittee will be required to take measures to assure the stability of the artificial reef over the long-term. The permittee must submit proof that artificial reef will remain stable in severe weather circumstances (i.e., submit a stability analysis conducted by a marine

engineer). The artificial reef's stability will then be monitored post-installation pursuant to section 2.5.1.1 above.

3. The permittee will be required to take remedial action including removal and relocation of the artificial reef in the event such action is deemed necessary by the NMSP to protect sanctuary resources.
4. The permittee will be required to post a bond to cover the costs of monitoring and remedial action in the event the permittee were to become financially insolvent and the NMSP must fund those activities. Proof of such a bond will be required to be provided before the permit is issued.
5. The permittee will be required to provide accurate siting data and depth information to NOAA's Office of Coast Survey so that the artificial reef may be accurately plotted on nautical charts.
6. The NMSP may amend, suspend, or revoke an issued permit in the event the impacts of the project are shown to justify such action, in the event the stability of the artificial reef materials causes a threat to sanctuary resources, or in the event the goals of the project are not being met and the project has had no measurable benefit to the sanctuary. In this case, the permittee may be required to remove any materials placed on the seafloor of the NMS.

2.5.2 Permit Denial

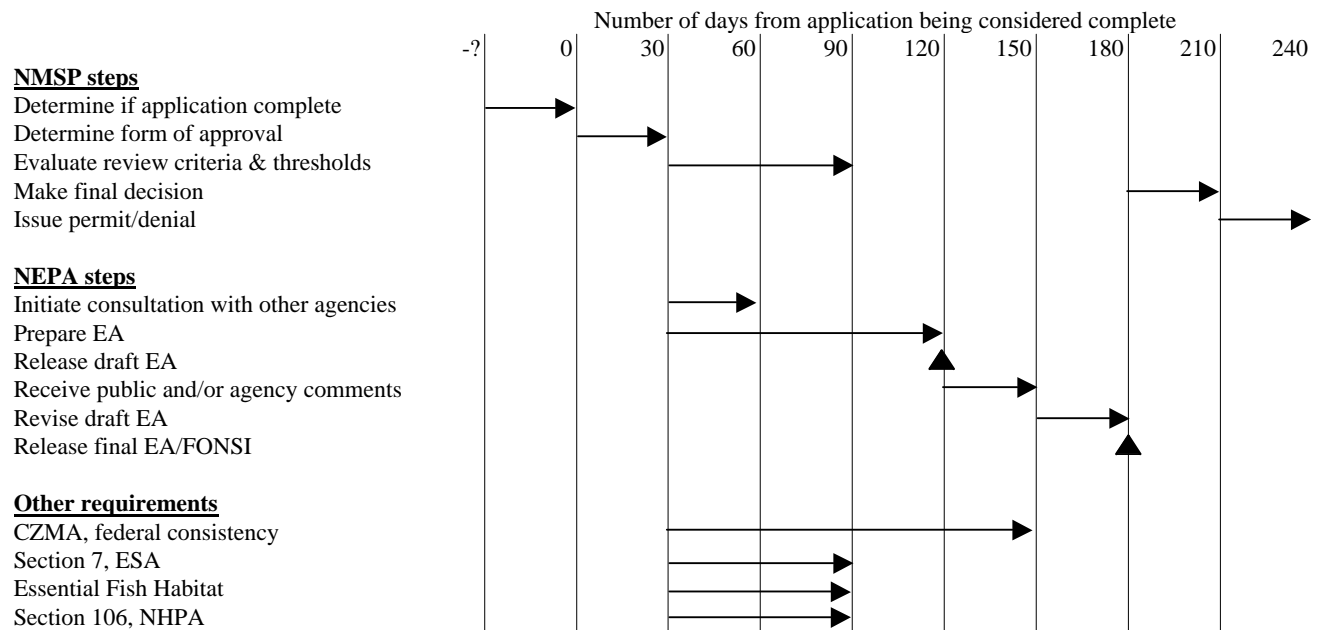
If the decision is to deny a permit to establish an artificial reef, the NMSP will notify other Federal, State, and local agencies with jurisdiction over the project of this decision. In some situations (e.g., when the denial of an application is expected to be highly controversial) the NMSP may provide these agencies 30 days to comment on its decision. Following this period, the NMSP will forward via certified mail a notice of denial to the applicant and make available the final NEPA document supporting this decision (if one was prepared). If the NMSP determines that there is no benefit to providing commenting agencies with a 30-day review period, the notice of denial and final NEPA document will be transmitted concurrent with providing other agencies with notice.

2.5.3 Appeals

Section 15 CFR 922.50 of the NMSP regulations allow for permit applicants to appeal a decision made by the NMSP. In addition, for permit applications in some sanctuaries (Monitor, Channel Islands, Gulf of the Farallones, Gray's Reef, Fagatele Bay, and Cordell Bank National Marine Sanctuaries) other affected individuals may also appeal a NMSP decision. Appellants must make their appeal in writing and submit it to the Assistant Administrator for the National Ocean Service (AA). The AA may then request additional information if s/he deems such information necessary to process the appeal. The AA will then decide if a formal administrative hearing is warranted. If warranted, the AA will appoint an officer to hear the case who will make a recommendation to the AA after the hearing is closed. The AA will then decide the appeal based on (1) the regulatory requirements by which the NMSP made the initial decision, (2) the record before the NMSP available at the time the decision was made, and (3) the record of the administrative hearing (if one was held).

Box 3: Processing time for artificial reef applications

The total processing time (i.e., time from application submittal to final action) will vary greatly depending on the details of the artificial reef project, the resources of the applicant, the response time of other commenting agencies (especially if a consistency certification is found to be necessary), and several other factors. In general, NMSP staff will review a permit application for completeness within 30 days of its receipt at the sanctuary office. Applicants will be notified of missing information within this time frame. Complete applications will be reviewed with respect to the review criteria and thresholds described in these guidelines within 90 days of the application being declared complete (i.e., all necessary information is available to the NMSP to make a determination). However, the NMSP will not be able to take final action until all of its interagency consultation obligations are satisfied and NEPA documents prepared. Completion of these obligations is not totally within the NMSP’s control but could take up to six months in some cases. The figure below is a timeline for an artificial reef development project that does not require the preparation of an EIS. Please note that timelines represented below are average “best-case scenarios” and could be much longer in some situations.



Appendix A:

Summary of NMSP permits issued for Artificial Reef projects			
Project title	Date of issue	Permit number(s)	Description
Ocean Freeze	July 1998	FKNMS-1998-067 FKNMS-1998-070	<u>Authorization of ACOE permit</u> -- The <i>M/V Ocean Freeze</i> is a 297' steel freighter that was sunk in 225 feet of water in the Northern Key Largo area to reduce fishing pressure on nearby natural reefs.
Adolphus Busch	Dec. 1998	FKNMS-1998-105 FKNMS-1998-103	<u>Authorization of ACOE permit</u> --The <i>M/V Adolphus Busch</i> is a 203' steel freighter that was sunk in about 120 feet of water in the Looe Key area to redirect diver concentration away from natural coral reefs.
Coral Shores High School	May 2000 June 1999	FKNMS-2000-032 FKNMS-1999-026	<u>Education permit</u> -- The students from Coral Shores High School were permitted to install 13 total Reef Balls near Wolfe Reef and Davis Reef in 30-60 feet of water for educational purposes.
Boy Scouts of America	May 2001	FKNMS-2001-026	<u>Education permit</u> -- The Boy Scouts were authorized to maintain existing Reef Balls in 20 feet of water off of Long Key for educational purposes.
Dr. Colette St. Mary	May 2001 June 2000	FKNMS-2001-019 FKNMS-2000-035	<u>Research permit</u> -- Dr. Colette St. Mary (Univ. of Florida) was issued a 2-year permit to deploy 25 artificial reef structures on the seabed near The Rocks and Davis Reef to study the effects of artificial reefs on natural fish assemblages.
Spiegel Grove	May 2002	FKNMS-2002-019	<u>Permit to further NMS purposes</u> -- The <i>Spiegel Grove</i> is a 510' surplus Navy ship scuttled in about 120' of water in the Key Largo Area to redirect diver concentration away from natural coral reefs.
Key West Marine Park	withdrawn	FKNMS-2002-037	<u>Education permit</u> -- The City of Key West applied to install a series of limestone modules in the shallow water (~15 feet deep) off southern shore of Key West for educational purposes.

Appendix B:

Guidelines to Applicants Proposing to Establish Artificial Reefs in National Marine Sanctuaries

GUIDELINES FOR SUBMITTING APPLICATIONS FOR NATIONAL MARINE SANCTUARY ARTIFICIAL REEF PERMITS

A. INTRODUCTION

National Marine Sanctuaries (NMSs or sanctuaries) are recognized as resource areas of national significance. Their distinctive characteristics have established them as environmental and historic resources for scientific research, public education, and other beneficial uses. With yearly increases in the number of requests to construct artificial reefs in NMSs, guidelines for managing and monitoring such projects are necessary to ensure compatibility with sanctuary goals and objectives and all other sanctuary activities.

The guidelines presented below assists those submitting proposals to establish artificial reefs in NMSs in submitting the necessary information for the NMSP to evaluate their proposal.

Anyone conducting prohibited activities without a valid NMS permit may be subject to the penalties as provided under Section 307 of the National Marine Sanctuaries Act (16 U.S.C. 1437). A civil penalty of up to \$120,000⁸ for each violation of any regulation may be levied.

B. APPLICATION CONTENTS

All applications to establish artificial reefs in NMSs should include the information listed below.

1. *Cover Sheet or Letter*: The cover sheet or letter should identify the following where applicable:
 - a) Name of the NMS in which the artificial reef will be located;
 - b) Title of the artificial reef development project;
 - c) Name, address, telephone number, and affiliation of the primary applicant;
 - d) Name, address, telephone number, affiliation, and relationship to the primary applicant of any secondary applicants to be covered by the permit;
 - e) The project's duration (i.e., time from installation to removal of materials; if permanent indicate as such);
 - f) Funding source; and
 - g) Signature of the applicant.

2. *Project Summary or Abstract*: A 250-word (maximum) summary must include-
 - a) A brief statement of the project's objectives;
 - b) Methods to be used; and
 - c) Why it is preferable that the activity occur within the boundaries of the sanctuary.

⁸ The National Marine Sanctuaries Act (16 U.S.C. 1431 et seq.; NMSA) stipulates a \$100,000 civil penalty, however this amount was increased to reflect inflation pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

3. *Technical Information:* This includes clear, concise, and complete statements in the following categories:

- a) Objectives. Clearly state the objectives of the artificial reef project. Also state how these objectives further research, education, and/or management objectives of the NMS in which the artificial reef is to be established.
- b) Hypothesis to be tested. For artificial reef projects related to scientific research, state the hypothesis to be tested.
- c) Project Significance. Discuss how the establishment of the artificial reef, as proposed, would enhance or contribute to improving the state of knowledge, use of the sanctuary or overall objectives of the Sanctuary Management Plan. Explain why the project should be performed in the sanctuary and the potential benefits to the sanctuary. For education permits, explain the educational value of the project.
- d) Methods. Describe in detail the methods by which the artificial reef is to be established by providing, at a minimum, the following information:
 - A description of the materials to be used. This description should include the dimensions of all materials to be used (length, width, weight, etc.) and photographs and/or drawings of the material. In cases where a vessel (aircraft or watercraft of any kind) is to be used to establish an artificial reef, this description should include additional details about the vessel including the vessel's history (i.e., what was it used for previously), a description of the vessel's current condition and location, and details about any toxic and/or other potentially harmful materials that are on or in the vessel (including in the paint on the outside of the vessel). If the vessel has been cleaned (or will be cleaned if the proposal is approved), provide details of the cleaning.
 - A sinking plan. Describe in detail how the materials described above will be placed on the seafloor of the NMS. If explosives are to be used, this should be stated clearly and detailed. Include in this description latitude and longitude coordinates describing the location of the proposed artificial reef.
 - A stability plan. Describe how the proposed materials will remain stable on the seafloor. Include a description of any anchoring systems that will be used. This description should also include a stability analysis conducted by someone qualified to conduct such an analysis that certifies the materials will remain stable in the most severe of weather conditions (e.g., 100-year storm event).
 - Alternative methods. Include a detailed discussion of alternative materials, sinking methods, and stability methods that could potentially be used while still meeting the objectives of the project. Discuss how/if the objectives of the project could be met without placing any materials on the seafloor of the NMS (i.e., without establishing an artificial reef). Describe why these alternatives are inferior to the proposal.
 - Siting description. Provide a description of the proposed site and all alternative sites. The descriptions should include at a minimum a bathymetric map, description of sea floor conditions, benthic habitat, marine life and the results of any other site surveys conducted, and cover an area of at least a quarter mile radius of the center coordinates of the sites. Describe the criteria used to determine the best site for the proposed artificial reef and how they relate to the objectives of the project. Include a detailed description of alternative sites that

were considered and rejected. Indicate why these sites were not selected over the proposed site. If applicable, this description of alternative sites should include at least one site outside any NMS. At a minimum this description should detail why it is necessary to establish the artificial reef inside a NMS to meet project objectives.

- e) **Monitoring.** Include a detailed monitoring plan and a description of how it will be funded. The monitoring plan will have three main components:
 - A “biological effects monitoring” plan that is designed to continuously monitor the long and short-term effects of the project. This plan should be designed to quantitatively assess the impacts an artificial reef is having on the surrounding natural environment in terms of community diversity and abundance.
 - An “effectiveness monitoring” plan that is designed to tell if the project is effective in meeting its objectives and achieving the desired effect (i.e., end value). The nature of this plan will vary depending on the objectives of the project.
 - A “stability monitoring” plan to ensure the artificial reef is remaining stable and is not becoming a risk to sanctuary resources. The frequency of stability monitoring should take into account the characteristics of the artificial reef itself and of the surrounding natural environment. At a minimum, a stability monitoring plan should be designed to check the location of the artificial reef at regular intervals and after major storm events.
- f) **Personnel.** Identify the individuals who would be supervising project activities. Provide qualifications and evidence of their ability to perform and supervise tasks. For key personnel and the primary applicant, provide a list of other artificial reefs established in the past and any information that shows the current status of each project.
- g) **References.** Cite only those used in the text of the proposal.

4. *Environmental Consequences:* The application should include an analysis of the environmental consequences of conducting the proposed activity and alternatives (methods, sites, etc.) to the proposed activity. This analysis should:

- f) Identify all natural resources (e.g., fish, benthic invertebrates, marine mammals, etc.), cultural resources (e.g., prehistoric archeological sites, historic shipwrecks, etc.), and current human uses (e.g., fishing, diving, etc.) that could potentially be affected by the artificial reef project.
- g) Analyze how the project will affect all natural resources and human uses identified. Include in this an analysis of the effects of the project on navigation in the area and include any approvals or reviews from the U.S. Coast Guard.
- h) Describe all other natural and human-caused effects (both adverse and beneficial) on all resources identified.
- i) Describe how/if the proposed artificial reef project will interact with the other natural and human-caused effects on the resources (i.e., cumulative effects). Indicate if the proposed project could make those effects worse, better, or neither.
- j) If possible, explain how the benefits of the project will outweigh the disadvantages or environmental consequences (short and long term).
- k) Describe the environmental consequences of each alternative by performing a) through f) above for each. Please note that depending on the alternatives selected, much of this

description may be redundant with the description of the environmental consequences of the proposal.

5. *Treatment of Results:* For artificial reef permits that are for scientific research, describe the nature and extent of anticipated results. Indicate how the results will be treated (e.g., published in a reference journal, incorporated into academic curriculum, used in management decision-making, published in the public press). For education permits, explain the educational value of the project and how and what products will be used or made available in the future. All information resulting from activities conducted under a NMS permit must be made available to the public.

6. *Supporting Information:* In addition to information provided above, each application to establish an artificial reef inside a NMS should include the following:

- a) **Project Budget.** A summary of project costs should include all labor and equipment for preparing the reef for deployment, deployment, and monitoring studies. Additionally, documentation should be provided to demonstrate that the permittee has (or will have) all the necessary funds, insurance, and bonds to conduct the project as proposed and approved.
- b) **Coordination with Research in Progress or Proposed.** The NMSP encourages research coordination and cost-sharing with other investigators to enhance scientific capabilities and avoid unnecessary duplication of effort. Applicants should include a description of these efforts, where applicable. Cite similar or supporting past or present research results.
- c) **Copies of Other Permits.** Applicants should include, if applicable, copies of other Federal, state and/or local permits issued with regards to this permit request. For example, EPA, U.S. Army Corps of Engineers, etc.
- d) **Other Sanctuary Permits.** Applicants should include a listing of all their previous Sanctuary permits.

C. SUBMISSION OF PERMIT REQUESTS

Three (3) copies of requests for permits should be sent to the appropriate sanctuary contact listed in section J below. Permit applications should be submitted at least 120 days in advance, however, please note that applications for artificial reefs can take up to one year to process. If greater than 120 days will be required for review, the applicant will be notified within 30 days of the receipt of the request. Requests for permits should be addressed to the manager of the sanctuary in which the activities are to be conducted. A listing of their addresses and phone numbers can be found in Section J.

D. REQUESTS FOR SANCTUARY SUPPORT SERVICES

NMSP has limited on-site sanctuary personnel, facilities and equipment that may be used to support research under special circumstances. Requests for support should accompany the permit application and include the following information: 1) type of support requested; 2) justification; 3) dates and length of use; and 4) alternative plans if support is not available.

E. EVALUATION OF PERMIT REQUESTS

Permit applications for artificial reefs are reviewed for completeness and adherence to these guidelines and the NMSP's policy on artificial reef permit applications (available upon request). Applicants will be contacted for clarification or if applications are incomplete. Complete applications are reviewed by NMSP program officials, on-site sanctuary personnel, and others outside the NMSP in governmental and academic positions that have expertise or regulatory authority in artificial reefs. Applications are judged on the basis of:

1. The applicant's professional qualifications to conduct and complete the proposed activity;
2. The adequacy of the applicant's financial resources available to conduct and complete the proposed activity;
3. The duration of the proposed activity relative to its stated purpose;
4. The methods and procedures proposed by the applicant in relation to the activity's impacts on Sanctuary resources and qualities;
5. The compatibility of the proposed activity will be with the primary objective of protection of Sanctuary resources and qualities, considering the extent to which the conduct of the activity may diminish or enhance Sanctuary resources and qualities, any indirect, secondary or cumulative effects of the activity, and the duration of such effects;
6. The necessity of conducting the proposed activity within the sanctuary to achieve its purposes; and
7. The reasonably expected end value of the activity to the furtherance of Sanctuary goals.

F. TERMS AND CONDITIONS OF PERMITS

Based on the reviews of the permit application, NMSP will approve or deny the permit. If denied, applicants are notified of the reason(s) for denial and informed of the appeal process. If approved, the Sanctuary Manager will issue the permit. The following terms and conditions will be included in every permit to establish an artificial reef. However, these will not be the only terms or conditions on the approval.

1. Permit holders must counter-sign the permit and return copies to NMSP and on-site sanctuary personnel prior to conducting the permitted activities. Copies must be signed and returned within 10 days of receipt by the permit holder. If not returned within 30 days, the permit will automatically be canceled.
2. Permits must be carried aboard research vessels and made available on request for inspection by sanctuary personnel. For underwater diving activities, it is recommended that a copy of the permit be laminated and available for display.
3. Permit holders must be present during all permit activity operations. Permits are non-transferable. Permit holders must abide by all provisions set forth in the permit as well as applicable sanctuary regulations. Project summaries and technical information are incorporated into the conditions of the permit.

4. Two important conditions of any permit are that the permit holder submit a project report and cruise log to the appropriate sanctuary office within 30 days of the permit's expiration date. The project report is a brief (1-2) page statement summarizing the results of permitted activities. A cruise log should list the days spent in the sanctuary as well as activities pursued, approximate positions, and general observations. Project reports are used in the sanctuary interpretive programs and cruise reports are used in the assessment of sanctuary activities.
5. The sanctuary manager may immediately amend, suspend, or revoke a permit granted pursuant to these guidelines and sanctuary regulations, in whole or in part, temporarily or indefinitely, if in his/her view the permit holder(s) acted in violation of the terms of the permit or of applicable sanctuary regulations, or for any good cause shown. Formal notice of such action shall be subsequently communicated in writing to the permit holder and shall set forth the reason for the action taken. The permit holder in relation to whom the action is taken may appeal the action as provided for in the sanctuary regulations.

G. AMENDMENTS TO ACTIVE PERMITS

Requests for amendments to active permits (e.g. change in study design or other form of amendment) must conform to these guidelines. Persons desiring to continue permitted activities in the sanctuary must reapply for an extension of his/her current permit before it expires. Reference to the original application may be given in lieu of a new application, provided the scope of work does not change significantly and all cruise logs and project summaries pertinent to the original permit have been submitted to and approved by on-site sanctuary personnel.

H. MONITORING PERFORMANCE

Permitted activities will be monitored to ensure compliance with the conditions of the permit. NMSP and on-site sanctuary personnel may periodically assess work in progress by visiting the study location and observing any permitted activity or by reviewing any required reports. The discovery of any irregularities in conformance to the permit shall be promptly reported and appropriate action shall be taken. Permitted activities will be evaluated and the findings used to evaluate future applications. (This is in addition to the monitoring required to be conducted by the permittee.)

I. REPORTING BURDEN

The information requested in these guidelines are necessary to evaluate whether issuance of a permit is appropriate. The information is used to evaluate the potential benefits of the activity, to determine whether the proposed methods will achieve the proposed results, and to evaluate any possible detrimental environmental impacts. It is through this evaluation and the tracking of all otherwise prohibited activities that the NMSP is able to use permitting as one of the management tools to protect Sanctuary resources and qualities. Submittal of the information requested in these guidelines is required to obtain a permit pursuant to National Marine Sanctuary Regulations (15 CFR part 922). Applicants are requested to indicate any information that is considered proprietary business information. Such information is typically exempt from

disclosure to anyone requesting information pursuant to the Freedom of Information Act (FOIA). NOAA will make all possible attempts to protect such proprietary information, consistent with all applicable FOIA exemptions in 5 U.S.C. 552(b). Typically exempt information includes trade secrets, commercial and financial information (5 U.S.C. 552(b)(4)). Personal information affecting an individual's privacy will also be kept confidential consistent with 5 U.S.C. 552(b)(6).

Public reporting burden for this collection of information is estimated to average one (1) hour per response (application, cruise log, and final report), including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to John Armor, Permit Coordinator, NOAA National Marine Sanctuary Program, 1305 East-West Highway (N/ORM6), 11th Floor, Silver Spring, MD 20910.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number.

J. FURTHER INFORMATION

For further information on the National Marine Sanctuary Program, write or call the National Marine Sanctuary Program office or the on-site sanctuary contacts listed below:

NATIONAL MARINE SANCTUARY PROGRAM

John Armor, Permit Coordinator
National Marine Sanctuary Program, NOAA
1305 East-West Highway (N/ORM6)
Silver Spring, MD 20910-3282
301-713-3125, x117
Fax: 301-713-0404
John.armor@noaa.gov

CORDELL BANK NATIONAL MARINE SANCTUARY

Mr. Dan Howard, Manager
Cordell Bank National Marine Sanctuary
PO Box 159
Olema, CA 94950
Phone: 415-663-0314
Fax: 415-663-0315
cordellbank@noaa.gov

CHANNEL ISLANDS NATIONAL MARINE SANCTUARY

Mr. Christopher Mobley, Manager
Channel Islands National Marine Sanctuary
113 Harbor Way
Santa Barbara, California 93109
805-966-7107
Fax: 805-568-1582
channelislands@noaa.gov

FAGATELE BAY NATIONAL MARINE SANCTUARY

Ms. Nancy Daschbach, Manager
Fagatele Bay National Marine Sanctuary
P.O. Box 4318
Pago Pago, American Samoa 96799
011-684-633-7354
Fax: 011-684-633-7355
fagatelebay@noaa.gov

*FLORIDA KEYS NATIONAL MARINE
SANCTUARY*

Mr. Billy Causey, Superintendent
Florida Keys National Marine Sanctuary
P.O. Box 500368
Marathon, FL 33050
305-743-2437
Fax: 305-743-2357
floridakeys@noaa.gov

*FLOWER GARDEN BANKS NATIONAL
MARINE SANCTUARY*

Mr. G.P. Schmahl, Manager
Flower Garden Banks National Marine
Sanctuary
216 W. 26th Street, Suite 104
Bryant, TX 77802
979-779-2705
Fax: 979-779-2334
flowergarden@noaa.gov

*GRAY'S REEF NATIONAL MARINE
SANCTUARY*

Mr. Reed Bohne, Manager
Gray's Reef National Marine Sanctuary
10 Ocean Science Circle
Savannah, Georgia 31411
912-598-2345
Fax: 912-598-2367
graysreef@noaa.gov

*GULF OF THE FARALLONES NATIONAL
MARINE SANCTUARY*

Ms. Maria Brown, Assistant Manager
Gulf of the Farallones National Marine
Sanctuary
Fort Mason, Building #201
San Francisco, California 94123
415-556-3509
Fax: 415-556-1660
farallones@noaa.gov

MONITOR NATIONAL MARINE SANCTUARY

Mr. John Broadwater, Manager
MONITOR National Marine Sanctuary
c/o The Mariner's Museum
100 Museum Drive
Newport News, VA 23606
757-591-7350
Fax: 757-591-7353
monitor@noaa.gov

*MONTEREY BAY NATIONAL MARINE
SANCTUARY*

Mr. William Douros, Superintendent
Monterey Bay National Marine Sanctuary
ATTN. Permit Coordinator
299 Foam Street, Suite D
Monterey, CA 93940
831-647-4201
Fax: 831-647-4250
montereybay@noaa.gov

*OLYMPIC COAST NATIONAL MARINE
SANCTUARY*

Ms. Carol Bernthal, Superintendent
Olympic Coast National Marine Sanctuary
138 West First Street
Port Angeles, WA 98362
360-457-6622
Fax: 360-457-8496
olympiccoast@noaa.gov

*STELLWAGEN BANK NATIONAL MARINE
SANCTUARY*

Dr. Craig MacDonald, Superintendent
Stellwagen Bank National Marine Sanctuary
175 Edward Foster Road
Scituate, MA 02066
(781) 545-8026
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stellwagen@noaa.gov

Appendix C:

An Analysis of Artificial Reef Development to Guide Decisionmaking

1.0 INTRODUCTION

As described in the preceding policy document, there are many things to consider when deciding whether or not to permit an artificial reef. This is complicated by the fact that there is still considerable debate on the impacts of artificial reefs on the natural aquatic community. This appendix gives a short overview of some of the major ongoing debates and unanswered questions as well as highlights some important decisionmaking criteria important to review when considering the deployment of an artificial reef.

2.0 DEBATES AND UNANSWERED QUESTIONS

There are conflicting positions on the impacts of artificial reefs that raise a number of questions of concern to marine resource managers. For instance:

- Do artificial reefs reduce pressure on natural reefs?
- Do they result in greater production of fish or simply aggregate fish from other reefs?
- Do the biological communities on the artificial reefs mimic those of natural reefs?

These questions and others are addressed below.

2.1 Reduced stress on natural reefs?

"The presence of artificial reefs as an alternative dive site can reduce the stress placed on the natural reefs," says NOAA scientist Mark Eakin. "In many cases, artificial reefs will decrease the total dives on natural reefs." Statements such as this from a 2001 National Geographic article are being tested in the Florida Keys National Marine Sanctuary (FKNMS) to determine if artificial reefs can serve as a useful management tool. This was the primary justification used by the NMSP in permitting the *Adolphus Busch* and *Spiegel Grove* artificial reefs.

Proponents of artificial reef use believe that artificial reefs do, in fact, relieve pressure on natural reefs, but until empirical monitoring and evaluation are completed over a period of time at several sites, it remains an unanswered question. It is conceivable that a decrease in pressure to natural reefs may not be realized. This could occur if divers who otherwise would not dive the natural reefs are drawn to dive artificial reefs, such as scuttled ships. During the trip to dive the artificial reef(s), they might also dive the natural reefs, thus increasing or keeping constant diving pressure on natural reefs.

The NMSP and other resource managers will be able to use the information currently being gathered by FKNMS to assist in future management decisions. Once adequate data has been gathered and analyzed on artificial reefs, this policy may need to be revised to reflect the scientific conclusions.

2.2 Attraction versus production

Do artificial reefs attract fish from adjacent ocean areas or increase fish production? This is commonly referred to as the attraction-production question. Attraction is defined as the net movement of individual organisms from natural to artificial habitats (Carr and Hixon 1997).

Production is best defined as the quantified change in biomass over time. It reflects births, immigration, growth, death, and emigration (Carr and Hixon 1997).

Many researchers have investigated this issue, but it has yet to be resolved. Artificial reef design, placement, and fisheries management may play a significant role in determining whether attraction or production occurs at a given artificial reef (Pickering and Whitmarsh 1996, Carr and Hixon 1997). Some believe that artificial reefs support increased production by providing: additional food sources; shelter from predation and shelf currents; a point of physical orientation; increased recruitment habitat for individuals that would otherwise be lost; and vacated space in the natural environment that allows replacement from outside the system (Bohnsack 1989, Carr and Hixon 1997, Meier *et al.* 1989, Randall 1963). However, artificial reefs may also simply aggregate fish and consequently may have a negative effect on their population (Bohnsack 1989, Grossman *et al.* 1997, Meier *et al.* 1989, Lindberg 1998). These effects result from: increased fishing effort and catch rates; boosted potential for over exploitation through increased access to previously unexploited stock segments; and increased probability of overexploitation by concentrating previously exploited stock segments. To minimize these potential adverse effects, the NMSF will consult with the appropriate Regional Fishery Management Council (pursuant to section 304(a)(5) of the NMSA) and state resource agency. Consultations should examine whether regulations should be promulgated (prior to reef deployment) to close permitted artificial reef sites and/or adjacent natural reefs to fishing when the purpose of the artificial reef is something other than to concentrate fish to enhance fishing.

2.3 Natural and artificial reef communities

Do communities that inhabit artificial reefs mimic natural reef communities? The material of the reef may play an important role in determining this. Fitzhardinge and Bailey-Brock (1989) compared benthic community development on coral rock with that on concrete, car tires, and painted steel. Concrete was found to develop communities most similar to corals. Carr and Hixon (1997) compared the colonization and subsequent assemblage structure of reef fishes on coral and concrete blocks in which reef size, age, and isolation were standardized. They found that overall net rates of fish recruitment for all species combined were nearly equal, however, the natural reef structures accumulated individual fish more rapidly. They also found species richness to be greater on natural reefs, although substantial differences in species composition were not detected. Ambrose and Swarbrick (1989) reported that artificial reefs had significantly more and a greater density and biomass of benthic fish species, but did not detect a difference in benthic species diversity. For fish within the water column, there was no difference in these measurements. However, it should be noted that rugosity is generally lower on artificial reefs than on natural reefs and, therefore, secretive or cryptic species may be under or over represented when sampling these sites (Charbonnel 1995).

Could the balance of natural reefs be upset if artificial reefs do not mimic natural systems, but do attract life from natural reefs? The answer, in part, depends on whether the organisms attracted to the reef would have been recruited to a natural reef or would have been lost to the system. If organisms would have otherwise been lost, recruitment to an artificial reef would not necessarily upset the balance on natural reefs. There is evidence that some natural reefs may exhibit short-term decreases in population after deployment of an artificial reef, but subsequently recover to

pre-deployment population levels (Alevizon and Gorham 1989). Parker and Greene (1999) completed a study where they removed as many high trophic level fishes as possible from two reef areas. One year after the removal of these high trophic level fishes, the population returned to pre-removal levels. Therefore, there may be evidence that, although there are short-term disturbances, the long-term balance of reefs is not necessarily upset by the removal of fishes.

There is a question of whether or not artificial reefs provide habitat for production that otherwise would not have been realized. This would result when habitat is the limiting factor for production. Reef fish abundance has generally been considered limited by habitat or space because reefs are a patchy resource, limited in geographical coverage and separate from other reefs (Bohnsack 1989). Nutrients may also be a factor limiting habitat availability (Entsch 1983). However, some researchers believe that habitat is not limiting. They reason that before reef fish were heavily exploited, the existing natural habitat supported an abundance of reef fish, presumably at or near carrying capacity (Lindberg 1997). Fishing mortality reduced stocks while the amount of natural habitat remained constant. With many fish stocks substantially below carrying capacity, many reason that the amount of hard bottom habitat could not be the limiting factor. Still other scientists argue that some species are habitat limited while others are recruitment limited (Bohnsack *et al.* 1991).

3.0 DECISION-MAKING CONSIDERATIONS

The following section outlines some factors for consideration prior to reaching a decision on whether or not to deploy an artificial reef.

- Does location or site selection of artificial reefs influence community development or negatively affect adjacent natural habitats?
- Are some substrates better than others for the placement of artificial reefs?
- What materials are preferable for use as artificial reefs?
- Can artificial reefs be stable over the long term?
- What should be considered when deploying an artificial reef?

3.1 Socioeconomic Considerations

Before placing an artificial reef, the socioeconomic impact of the reef on the surrounding community must be considered. The *Socioeconomic Study of Reefs in Southeast Florida* (Johns *et al.* 2001) was published on October 19, 2001 covering the following counties in Florida: Broward, Palm Beach, Miami-Dade, and Monroe. This study employed extensive survey research to measure the economic contribution and the use values of artificial and natural reefs from June 2000 to May 2001. In all counties, artificial reef expenditures, or economic contributions, comprised at least a third of the expenditures attributed to the entire reef system (natural and artificial reefs). In Monroe County, which abuts the FKNMS, artificial reef expenditures totaled 25 percent of the total expenditures attributed to the reef system. Additionally, when counted separately, the reef users are willing to pay 85 million dollars annually to protect⁹ artificial reefs and 228 million dollars annually to protect natural reefs in

⁹ Protecting the reef is defined as maintaining the reef in its current condition by maintaining water quality, limiting damage to reefs from anchoring, and preventing overuse of the reefs.

southern Florida. Also of note, the report found that the majority of residents would support “no take” zones on 20 to 25 percent of existing natural reefs and about 75 percent of respondents supported the existing “no take” zones in the Florida Keys.

3.2 Siting

Proper siting is vitally important to the success of the artificial reef. The National Artificial Reef Plan (NARP) points out that improperly sited artificial reefs can result in negative impacts, including navigation hazards, damage to a naturally productive bottom, and environmental clean-up problems (U.S. Dept. of Commerce 1985). Artificial reefs should be placed at a sufficient depth to avoid navigation problems. Also, reefs should generally not be placed on existing live bottom habitats or in areas where they would threaten the integrity of existing productive communities or submerged culture resources. Bottom areas consisting of hard rock or hardpan with a small amount of sand cover tend to provide the best substrate for reef construction.

The NARP goes on to say that in some cases it could make sense to construct artificial reefs in areas with sparse live assemblages or on barren bottoms in close proximity to biologically productive areas to enhance the area or divert user pressure from more fragile areas (U.S. Dept. of Commerce 1985). It is important to note that as these new communities develop, starting with sessile organisms that would have otherwise continued to a different site settling on the new hard structure, the ecological make-up of the area could potentially change. This would, in effect, change one type of habitat into another type (i.e., sandy bottom habitat becomes a hard bottom habitat), a process known as habitat conversion. Areas of bare bottom are a natural phenomenon that contribute to primary productivity in adjacent habitats as some fish species use these open areas for vital life processes. Managers should ask the question, is development of “barren bottom” habitats always for the better or are there instances where the natural bare bottom community may be preferable?

3.3 Building Materials

As discussed above, artificial reefs have been created using materials of opportunity as well as structures specifically constructed as artificial reefs. The NARP identifies several materials that are persistently problematic, including wood, fiberglass, plastic, tires, light body vehicles, railroad cars, and light gauge metal items (e.g., refrigerators, washing machines, and clothes dryers). Concrete has been shown to be one of the most favorable materials for the construction of artificial reefs (Lukens 1997). It does not easily degrade in seawater, can be constructed with a neutral pH, is easily molded, and is not easily displaced once located. Concrete can also take on a texture most comparable to natural reefs and thus develops similar communities to natural reefs (Pickering 1997). Thus, manufactured units such as reef balls are generally constructed of concrete. However, the bulkiness of concrete means that it can be difficult to transport to its deployment site.

For a detailed discussion of the advantages and disadvantages of specific reef building materials, reference Guidelines for Marine Artificial Reef Materials compiled by the Artificial Reef Subcommittee of the Technical Coordinating Committee, Gulf States Marine Fisheries Commission (Lukens 1997).

3.3.1 Scuttled Vessels

The scuttling of vessels requires particular attention in this policy because of their size and potential toxicological effects on the environment. As discussed above, sunken ships potentially attract divers away from natural reefs and thus may be beneficial to natural reefs in NMSs. However, there is a wide array of concerns that must be addressed before intentionally sinking a ship.

The removal of petroleum products, hazardous materials, paint cans, batteries, plastics, oil, and fuel is specified on the U.S. Coast Guard's Ocean Disposal/Artificial Reef Inspection form. Additionally, under the Toxic Substances Control Act (TSCA), the EPA has the authority to gather information on and regulate chemical substances and mixtures imminently hazardous or presenting unreasonable risk of injury to public health or the environment. Despite these controls, some materials of concern may still remain on items used as artificial reef material. Such materials include: asbestos, polychlorinated biphenols (PCBs), iron, lead paint, and antifouling paint. The NMSP should consider the risks associated with materials remaining on vessels to be used as artificial reefs. The NMSP will consult with appropriate agencies (i.e. U.S. EPA, MARAD) to determine the best management practices to use in evaluating materials for pollution potential.

Asbestos is the name given to six naturally occurring minerals that are used as insulators and fire retardants. Several studies have investigated the effects of asbestos on fish (Batterman and Cook 1981, Belanger *et al.* 1990, Belanger *et al.* 1986, Woodhead *et al.* 1983). The findings indicate that asbestos concentrations on the order of 10^6 to 10^8 fibers/L may cause epidermal lesions, epithelial hypertrophy, kidney damage, decreased orientation and swimming ability, degradation of the lateral line, reduced growth, and increased mortality in fish. Undisturbed, non-friable (not easily crumbled) asbestos has been found to be relatively harmless (Garcia and Salzwedel 1995, Montoya *et al.* 1985).

PCBs may still exist in water-tight gaskets, cable insulation, paint, transformers, capacitors, and other components of decommissioned Navy vessels (Matore *et al.* 1996, Eisler and Belisle 1996). These chemicals have been implicated in: reduced primary productivity in phytoplankton; reduced hatchability of contaminated fish and bird eggs; reproductive failure in seals; altered steroid levels and subsequent reproductive impairment in fish and sea stars; reduced fertilization efficiency in sea urchins; and reduced plasma retinal and thyroid hormone levels potentially leading to increased susceptibility to microbial infections, reproductive disorders and other pathological alternation in seals and other marine mammals (Adams and Slaughter-Williams 1988, Brouwer *et al.* 1989, Clark 1992, den Besten *et al.* 1991).

Antifouling paints typically containing tributyltin (TBT) and copper (Cu) are often used to paint vessel hulls to inhibit the growth of organisms below the water line. An International Maritime Organization (IMO) convention to control the use of harmful anti-fouling systems on ships was adopted on October 5, 2001. The convention will prohibit the use of harmful organotins, including TBT, in anti-fouling paints used on ships and establish a mechanism to prevent the potential future use of other harmful substances in anti-fouling systems. TBT has been found to

be toxic to non-target, non-fouling organisms at low levels (approximately 7.5-10.5 ng TBT/L). One of its most marked effects has been the induction of shell thickening and growth anomalies in oysters and imposex¹⁰ in the dogwhelk *Nucella lapillus* potentially leading to sterility (Gibbs *et al.* 1998). The discovery of the highly toxic nature of TBT-based paints has led many countries to ban the use of these paints for non-aluminum hulled vessels less than 25 meters in length. Copper, though an effective antifoulant, has not been shown to cause extensive effects on non-target organisms at relatively low levels. When present in high concentrations, however, copper can be toxic to aquatic life (Sorrenson 1991). In a study conducted when a cargo ship collided with part of the Great Barrier Reef and remained grounded for 12 days, sediment containing 8.0 mg kg super(-1) TBT, 72 mg kg super(-1) Cu and 92 mg kg super(-1) Zn was found to significantly inhibit larval settlement and metamorphosis (Negri *et al.* 2002). At this level of contamination, larvae survived but contracted to a spherical shape and swimming and searching behavior ceased. At higher contamination levels, 100% mortality was recorded. These results indicate that the contamination of sediment by anti-fouling paint has the potential to significantly reduce coral recruitment in the immediate vicinity of the site and that this contamination may threaten the recovery of the resident coral community unless the paint is removed.

Iron, an essential element like copper, can be contributed to the environment from steel hulls of sunken vessels. As an essential element, iron levels will tend to be closely regulated by organisms, and thus, it is unlikely that any pollution-derived effects will be observed except in severe and localized cases (Thompson 1990). Corals living in seawater with high iron concentrations have been shown to incorporate the iron into their skeletons (Brown *et al.* 1991). Studies on phytoplankton and macroalgae indicate that in areas where plant nutrients such as nitrate and phosphate are abundant the availability of iron is actually a limiting factor in growth and biomass (Coale *et al.* 1996, Frost 1996, Matsunaga *et al.* 1994, Takeda 1998, Wells *et al.* 1995). Hence the concern of unnatural iron inputs from artificial reefs seems to center not on the occurrence of adverse toxicological effects in marine organisms, but rather on the alteration of the composition of natural assemblages of algae and species which compete with algae.

Lead paint has been used on the interiors of some vessels. Lead has no biological function and, therefore, exhibits accumulation trends in organisms (Thompson 1990). Corals have been shown to incorporate lead into their skeletons (Dodge and Gilbert 1984). Unicellular algae and sea urchins appear to be the most sensitive marine organisms (Berhard 1980). Growth inhibition has been observed in the algae species *Thalassiosira pseudonana* and *Porphyridium marinum* exposed to lead as well as in sea urchins.

Despite the potential toxicological effects of the chemicals discussed above, adverse effects will not occur unless the chemicals are present at or above their effective concentrations. The South Carolina Department of Natural Resources completed an assessment in the mid-1990s on the levels of PCB and heavy metals in biota found on ex-military ships used as artificial reefs. Over 100 samples were collected from locations along the South Carolina coast. Of the 80 tissue samples analyzed for PCBs, only 19 were found to contain concentrations above the 100 ppb weight wet limit of quantitation and all were well below the U.S. Food and Drug Administration's alert action level of 2000 ppb weight wet. (Note that being below safe levels

¹⁰ Imposex is defined as the development of specific male sexual organs in females.

for human consumption does not necessarily mean there are no adverse effects on the marine organism itself.) No significant differences were detected in the tissues of organisms collected from vessels known to contain PCB-laden materials, vessels suspected to have PCB-laden materials, and natural hard bottom control sites. Although some of the collected samples were moderately high in a particular heavy metal, no clear correlation was found between high metal levels and a particular type of sample site. Gastropods, however, did contain much higher levels of lead, possibly attributed to the fact that they would graze directly on the painted surfaces. South Carolina concluded that the PCB and metal levels detected in the study did not indicate increased hazards around military ships used as artificial reefs.

3.4 Stability

Ensuring the stability of an artificial reef is key to its longevity in a dynamic ocean environment. Local storm events or large swells caused by outlying disturbances can substantially damage or, at worst, destroy installations that have not been properly strengthened (Grace 2001). Additionally, these structures can be moved by wave action, sometimes being moved to an entirely different location, washing up onshore, becoming hazards to navigation, or damaging other underwater environments and structures. Previous to putting in an artificial reef, wave force calculations need to be completed, for all weather conditions, to make sure that the structure is stable (Grace 2001). Stability of an artificial reef is also affected by the substrate on which it is placed. Areas with softer sediment may induce sinking or settling of the reef (McAllister 1981).

3.5 Method of Sinking

The method of sinking will vary depending on the site, weather conditions, the material used to construct the artificial reef, and the professional experience of the applicant. All of these elements need to be taken into consideration to ensure proper placement of the reef after sinking and to minimize adverse impacts. They should be used to develop a comprehensive and realistic sinking plan. Experience has shown that an inadequate sinking plan can result in improper positioning of the reef, which may require repositioning of the reef at a considerable expense.

3.6 Human safety

Human safety at permitted artificial reef sites is not within the NMSP's authority to regulate or control, however, the NMSP will evaluate, through its responsibilities under the National Environmental Policy Act, the safety concerns caused by an artificial reef before issuing the permit. Particular attention will be given to safety hazards for divers. In some cases, the NMSP may request that the permittee take action to limit the safety risk posed by a particular artificial reef.

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