

Papahānaumokuākea Marine National Monument
CONSERVATION AND MANAGEMENT Permit Application

NOTE: *This Permit Application (and associated Instructions) are to propose activities to be conducted in the Papahānaumokuākea Marine National Monument. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031. Within this Application, provide all information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Papahānaumokuākea Marine National Monument (Monument).*

ADDITIONAL IMPORTANT INFORMATION:

- Any or all of the information within this application may be posted to the Monument website informing the public on projects proposed to occur in the Monument.
- In addition to the permit application, the Applicant must either download the Monument Compliance Information Sheet from the Monument website OR request a hard copy from the Monument Permit Coordinator (contact information below). The Monument Compliance Information Sheet must be submitted to the Monument Permit Coordinator after initial application consultation.
- Issuance of a Monument permit is dependent upon the completion and review of the application and Compliance Information Sheet.

INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED

Send Permit Applications to:

Papahānaumokuākea Marine National Monument Permit Coordinator

6600 Kalaniana'ole Hwy. # 300

Honolulu, HI 96825

nwhipermit@noaa.gov

PHONE: (808) 397-2660 FAX: (808) 397-2662

SUBMITTAL VIA ELECTRONIC MAIL IS PREFERRED BUT NOT REQUIRED. FOR ADDITIONAL SUBMITTAL INSTRUCTIONS, SEE THE LAST PAGE.

Papahānaumokuākea Marine National Monument Permit Application Cover Sheet

This Permit Application Cover Sheet is intended to provide summary information and status to the public on permit applications for activities proposed to be conducted in the Papahānaumokuākea Marine National Monument. While a permit application has been received, it has not been fully reviewed nor approved by the Monument Management Board to date. The Monument permit process also ensures that all environmental reviews are conducted prior to the issuance of a Monument permit.

Summary Information

Applicant Name: Dr. Kelly Gleason Keogh

Affiliation: Papahānaumokuākea Marine National Monument

Permit Category: Conservation and Management

Proposed Activity Dates: 04/01/2017-03/31/2022

Proposed Method of Entry (Vessel/Plane): Plane

Proposed Locations: Midway Atoll

Estimated number of individuals (including Applicant) to be covered under this permit: 8

Estimated number of days in the Monument: 21

Description of proposed activities: (complete these sentences):

a.) The proposed activity would...

This activity aims to achieve goals to explore, manage, interpret and protect maritime heritage resources in PMNM, specifically at Midway Atoll. In 2017, maritime heritage work at Midway Atoll is funded through an Office of Exploration and Research maritime archaeology grant to conduct exploratory survey for Battle of Midway related sunken aircraft sites. Archival research identifies at least 31 plane crashes within three miles of Midway Atoll (Linville, 2010). Dozens more are probable and many more lie three miles beyond Midway Atoll. Additional aircraft losses are reported by survivors who describe loss locations based on their first-hand experience. Of these 31 aircraft reported lost, 22 were American and 9 were Japanese and all considered war graves. The Battle of Midway was one of the most decisive U.S. victories of WWII and is referred to as the turning point of the war in the Pacific. To date, four sunken aircraft have been located and documented by archaeologists at Midway Atoll (Papahānaumokuākea, 2011), with three of these discovered in the last three years; dozens more remain undiscovered.

In collaboration with the National Park Service's Submerged Resources Center (NPS/SRC), East Carolina University (ECU), and Fish and Wildlife Service (FWS), this project includes approximately 10 days of exploratory remote sensing survey at Midway Atoll in specific areas of reported and probable aircraft loss during the Battle of Midway. Exploration for sunken aircraft sites will also serve as an opportunity for progressive multidisciplinary survey through

collaboration with PMNM’s resource protection program to survey for alien invasive species on anthropogenic structures at Midway Atoll (specifically sunken aircraft). Additionally, the project will prioritize the development of cutting edge education, media and outreach products through innovative technology, award winning in-house journalists, and a strategy to create captivating materials that will bring this remote place and the project to people all over the world. Discoveries made during this research project will also fill gaps in knowledge relative to the material remains of the WWII Pacific front, linking them to managed sites in Pearl Harbor, Guam, and Saipan. Additionally, this project is timed to occur in advance of the June 2017 75th Anniversary of the Battle. Work conducted during this survey, including any discoveries made will contribute to the outreach efforts to honor this event.

Anticipated outputs from the project include: A) a comprehensive report providing fully analyzed remote sensing survey data, B) preliminary identification of artifacts and sites through ground trothing, C) alien invasive species survey data and species identification incorporated into reports, and D) at least two articles published in professional journals and several public presentations.

b.) To accomplish this activity we would

Exploratory survey at Midway Atoll will take place before June of 2017 in order to coincide the timing of this project and the 75th Anniversary of the Battle of Midway. Research, data analysis and outreach will take place during and immediately following field work. The 2017 expedition will include at least 10 days of survey at Midway Atoll. With the numerous targeted blocks from the witness accounts for the magnetometer study, there are ample areas for remote sensing and scientific investigations every day regardless of weather conditions or sea-state.

The primary objective of this project is to uncover the sunken history of the Battle of Midway through remote sensing, anomaly testing and historical research. Complete survey in areas of highest probable loss has yet to be complete, and is proposed with this project. This project builds upon existing survey data by conducting a more comprehensive examination of the inshore and offshore portions of Eastern and Sand Island as well as anomaly characterization in deeper water.

The SRC will serve as the lead for the magnetometer survey operations using a Geometrics G-882 magnetometer, newly developed data processing script in ArcGIS 10.2.2, and previous experience of surveying for lost aircraft. While WWII aircraft are largely aluminum alloy, which is not detectable via magnetometry, certain ferrous elements such as engine blocks, cast iron machine guns, or ferrous landing gear can be detected. Additionally, some early grades of stainless steel, like 300-grade, were used in WWII-era aircraft which can also be detectable. With only six of the 70-plus known anomalies having been visually inspected, we believe that there is a strong probability for making discoveries of lost aircraft using the existing data outside of the lagoon and new data collected inside.

One of the principal cultural resource detection devices used in submerged cultural resources survey, as it is with most submerged historical site surveys, is a magnetometer. The magnetometer has long been a standard archeological survey instrument (Arnold and Weddle

1978; Breiner 1973; Arnold and Clausen 1975; Shope 1997) for shipwrecks due to their high amount of ferrous cultural material, but they have also proven to be successful in locating other features including the focus of this project proposal: WWII-era aircraft. For the proposed study, a Geometrics G882 cesium-vapor magnetometer has been chosen, and it currently possesses the highest rated sensitivity for commercial magnetometers. It is important to note that unlike a sonar, a magnetometer emits nothing in to the water. It is simply reading the earth's magnetic field as it is towed through the water. For the proposed survey, the team will be using a 50 meter long tow cable, but the distance behind the boat will depend upon the size of the boat and the depth of the water. If the water is shallow (<50 feet) the team will only tow with 10 meters of cable out in the water.

Magnetometers in most basic terms detect and quantify magnetic fields. In hydrographic survey, ferrous or magnetic objects can be located by noting small perturbations, called “anomalies,” in the earth’s ambient magnetic field caused by the magnetic moment of ferrous material. Ferrous objects cause a localized increase or decrease, usually both, in the ambient magnetic field. These objects in this context of a marine environment are generally of cultural origin associated with maritime casualty, activity or depositional sites. Magnetometers measure and record the total magnetic field intensity in a manner independent of sensor orientation and presence of any kind of cover. In practice, because full-field magnetometers are not influenced by sediment, they are ideal detection devices for submerged cultural materials of ferrous construction on or beneath the seabed, or encrusted in marine growth such as the corals prevalent at Midway Atoll.

Typical cesium magnetometer resolution of the earth’s magnetic field is less than 1 gamma (in some cases like the G-882, its 0.1 gamma) in the earth’s field of approximately 50,000 gammas (nanoteslas). This means there is very little noise in the magnetic readings generated during marine survey, and even less in areas of the world that lack continuous, dense maritime activity like Midway Atoll. Noise reduction is important so that small ferrous objects, which produce small anomalies, can be reliably detected. The industry standard (for example, Department of Interior, Bureau of Ocean Energy Management Guidelines for Offshore Lease Block Surveys) specifies a noise level of +/- 3 gammas or less. The G-882 produces a remarkably low noise level because only processed data and power are transmitted over the tow cable. This in combination with a clean power source will be able to detect small deviations in the magnetic field that may represent similar artifacts that have already been found at Midway such as small ordinance, guns, and ferrous aircraft components.

Noise is an issue because the gamma reading of a particular ferrous mass, which is proportional to the size of the mass, declines as a cube of the distance between the sensor and the mass. Noise in high-resolution magnetometer survey masks smaller anomalies that might be of archeological interest, like the smaller variances that stainless steel from an aircraft would produce. The G-882 permits discrimination and recognition of anomalies that are hidden within the noise levels of most proton magnetometers; consequently very small anomalies may be reliably recognized. Discrimination of the smallest possible magnetic anomalies is desirable during archeological survey, because of the possibility of cultural material falling between survey lines producing a weaker return due to the greater distance from the sensor.

The most effective presentation of magnetic data for archeological purposes in our experiences are contour lines representing lines of magnetic intensity, called isogammas. Contour configurations representing relatively intense changes in the earth's field indicate the presence of ferrous materials. Magnetic readings simply indicate the presence and possible mass of an object. There is no unique relationship between anomaly intensity and isogamma contour configuration and an object. Any number of combinations of objects can produce similar anomalies. The only way to determine anomaly sources is by visual investigation via diver or with an ROV (Murphy and Saltus 1990).

The magnetometer is a valuable cultural resource detection instrument, and it is sensitive to many different types of artifacts associated with submerged aircraft as well as other cultural activities. Aircraft are often difficult to detect by visual inspection or sonar-based instruments alone because marine life encrustation and sediment coverings can easily obscure a site. The most effective and complementary multiple-instrument combination for hydrographic survey for historical cultural materials is currently the magnetometer coupled with a side scan sonar, but for the proposed Midway survey with its abundant coral cover, only a magnetometer will be employed. With the primary target of this project being WWII-era fighter planes, there will still be ample ferrous material remains, as evident in the remains at the site of 2012's discovery of the F2A-3 Brewster Buffalo.

In addition to magnetometry, this project will make use of a variety of software available for quick documentation and 3D image collection. Because the thrust of this project is exploration and not documentation, the team will need to move rapidly from site to site. In lieu of traditional hand mapping of sites, the team will rely on pioneering 3D structure from motion (SFM) reverse-angle photogrammetry and modelling. This new and exciting technology will provide the exploration team with photos and subsequent products produced from the photos that are both accurate and useful for study, but also available to the world via the internet in near real-time.

With no archaeological mapping planned for new discoveries, we feel that the Photoscan software is an effective and innovative method of collecting meaningful data for study, interpretation and management. It is also by the nature of 3D, an excellent form for outreach and educational material to engage and inform the public about the past.

In order to achieve critical resource protection goals in the Monument, exploration for sunken aircraft sites provides a unique opportunity to investigate and discover marine alien species in tandem with submerged cultural resources sites utilizing original methods and creative techniques. Of the more than 400 species of marine alien species recorded in the Hawaiian Archipelago only about 10% are established in PMNM. These marine alien species established in the Monument are made up of 2 marine plants, 38 marine invertebrates and 3 fish. The established alien marine invertebrates outnumber the fish and plants but have had the least focus due to the cryptic nature of this faunal group. Many of the established alien marine invertebrates are found at Midway Atoll and any undiscovered species would most likely be found at this location. This is due to the great alteration of the habitats and exposure to marine alien species transport mechanisms; such as ships; which was a product of military activities before, during and after WWII. We believe that genetic community characterization of these invasive species,

when compared to control communities in other locations, will provide data relevant to the date, intensity and mechanism(s) of alien species invasion.

Many of the alien marine invertebrate species that become established are generally “biofouling” organisms that easily adapt to man-made substrates (wood, metal, concrete) in the marine environment. These anthropogenic substrates provide a habitat in which these organisms have a competitive edge over native species within the same environment. Midway Atoll is a prime example of this type of dynamic in both shoreline and submerged reef habitats. Stabilization of shorelines through sea walls and docks provide a foothold for new introductions in harbor environments but near-shore and offshore habitats can also be influenced by anthropogenic substrates. Historically, lagoon and reef habitats at former military bases have been altered by the intentional dumping of man-made debris but also the unintentional loss of equipment during training and active hostilities. These objects of maritime history can act as establishment and stepping stone points for marine alien species within habitats that would otherwise be difficult to invade for these biofouling species. Finally, the historically and archeologically documented ages of aircraft and shipwrecks, now potentially colonized by invasive species provides a solid, scientifically documented point of initiation for colonizing species—as such cultural resources provide key dating insights into mechanisms of ecosystem change by species invasion. Paradoxically, while a cultural and military invasion was successfully fended off by US forces in 1942, the same military infrastructure that made that possible may have also fostered a moderately successful biological invasion. This OE supported project will explore and document both as complementary and mirrored processes. .

Focused surveys have been conducted at sea wall, and dock habitats at Midway Atoll by Scott Godwin from the PMNM from 2010 until 2014 and have proven to be establishment points for alien marine invertebrates that are considered biofouling species. The marine alien species established at Midway Atoll are made up of 1 plant, 48 marine invertebrates and 1 fish. Based on field observations (Godwin), a group of the marine invertebrates recorded in the inventory are species that have shown the ability to spread to natural reef areas from their established populations on man-made substrate. There has been little opportunity to conduct marine alien surveys in the lagoon habitats of Midway Atoll to be able to determine if any dispersal of the recorded alien marine invertebrates has taken place. There is a need to determine whether marine alien invertebrates have dispersed from these establishment points to man-made and natural habitats in close proximity. This can be determined by surveys within the lagoon habitats, which can be done in conjunction with the proposed maritime heritage surveys.

c.) This activity would help the Monument by ...

Through a combination of pioneering technology, original methods, and experience based strategies for survey and logistics, the team will achieve a wide suite of goals that focus on exploratory survey, resource protection and getting exciting discoveries to a wide audience from a remote atoll with a heritage that includes one of the most significant battles of World War II

and an important site for interagency management in the 75th Anniversary year of the Battle of Midway.

Midway Atoll survey in 2017 will serve to: 1) honor and enrich the legacy of the Battle of Midway, 2) connect these sites with the stories of veterans who may still be alive today, and 3) contribute significantly to the study and our better understanding of aviation archaeology. Anticipated outputs from the project include: A) a comprehensive report providing fully analyzed remote sensing survey data, B) preliminary identification of artifacts and sites through ground trothing, C) alien invasive species survey data and species identification incorporated into reports, and D) at least two articles published in professional journals and several public presentations.

Additionally, PMNM will work collaboratively with the Pacific Aviation Museum in Honolulu, Hawai`i in order to create a live broadcast from the expedition while at Midway Atoll that will engage public outreach for the 75th Anniversary of the Battle of Midway. Other outputs will include an expedition web page updated daily with photographs, video and text, 3D photogrammetric imagery, interactive video from the field and yet to be finalized museum exhibits. The expedition page will also offer daily interaction with the team, using the OER model of public interaction with scientists during the exploration and discovery phase of projects. This connection will also afford the field team daily access to WWII aircraft experts as discoveries are made. Post-expedition, the web page will continue to evolve as data analysis continues.

Other information or background:

Few places represent the legacy of World War II like Midway Atoll. Located within Papahānaumokuākea Marine National Monument and World Heritage Site (PMNM, the Monument), the sunken history left undiscovered at Midway represents the material remains of one of the most consequential events in the history of the Second World War (Figure 1). The potential for exploration at this remote atoll in the Northwestern Hawaiian Islands is remarkable, and the possibilities are demonstrated with the recent discoveries of a rare Brewster F2A-3 Buffalo located in shallow waters of the Midway Atoll lagoon, and even more recently the discovery of a P-40 Warhawk in 2014 and a F4U Corsair in 2015.

Section A - Applicant Information

1. Applicant

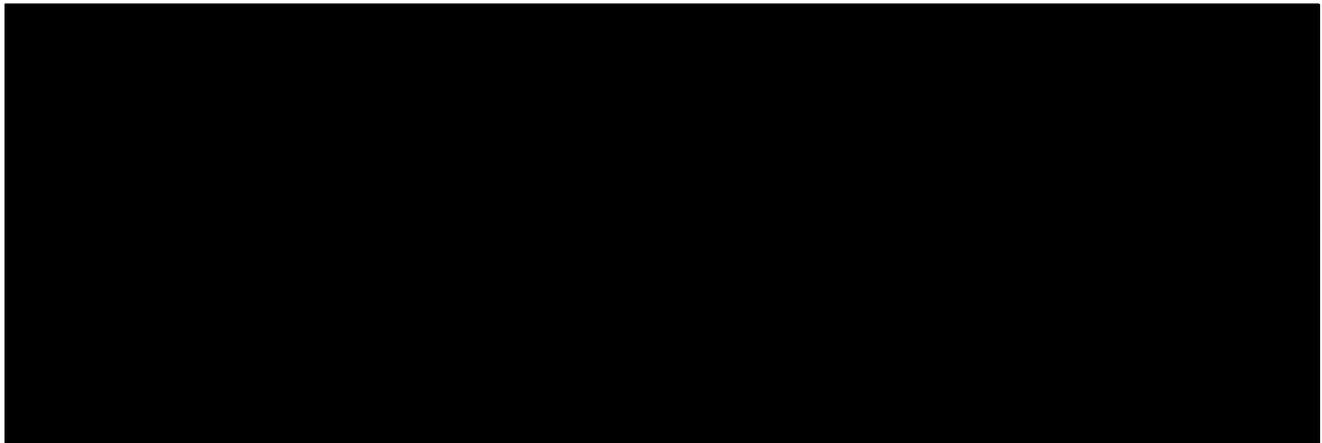
Name (last, first, middle initial): Keogh, Kelly, G.

Title: Maritime Heritage Coordinator, Papahānaumokuākea Marine National Monument

1a. Intended field Principal Investigator (See instructions for more information):

Dr. Kelly Keogh

2. Mailing address (street/P.O. box, city, state, country, zip): NOAA IRC,



3. Affiliation (institution/agency/organization directly related to the proposed project):

PMNM/NOAA/ONMS

4. Additional persons to be covered by permit. List all personnel roles and names (if known at time of application) here (e.g. John Doe, Research Diver; Jane Doe, Field Technician):

- 1) Bert Ho, Maritime Archaeologist
- 2) Dave Conlin, Maritime Archaeologist
- 3) Brett Seymour, Underwater Photographer
- 4) TBD, Invertebrate Specialist

- 5) Brian Hauk, Research Diver and Field Operations
- 6) Jason Leonard, Research Diver and Field Operations
- 7) TBD, Maritime Archaeologist
- 8) TBD, Research Diver and Field Operations

Section B: Project Information

5a. Project location(s):

- | | | | |
|-------------------------------------------------------|-------------------------------------|---------------------------------------------------|-------------------------------------|
| <input type="checkbox"/> Nihoa Island | <input type="checkbox"/> Land-based | <input type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input type="checkbox"/> Necker Island (Mokumanamana) | <input type="checkbox"/> Land-based | <input type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input type="checkbox"/> French Frigate Shoals | <input type="checkbox"/> Land-based | <input type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input type="checkbox"/> Gardner Pinnacles | <input type="checkbox"/> Land-based | <input type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input type="checkbox"/> Maro Reef | | | |
| <input type="checkbox"/> Laysan Island | <input type="checkbox"/> Land-based | <input type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input type="checkbox"/> Lisianski Island, Neva Shoal | <input type="checkbox"/> Land-based | <input type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input type="checkbox"/> Pearl and Hermes Atoll | <input type="checkbox"/> Land-based | <input type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input checked="" type="checkbox"/> Midway Atoll | <input type="checkbox"/> Land-based | <input checked="" type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input type="checkbox"/> Kure Atoll | <input type="checkbox"/> Land-based | <input type="checkbox"/> Shallow water | <input type="checkbox"/> Deep water |
| <input type="checkbox"/> Other | | | |

Ocean Based

NOTE: There is a fee schedule for people visiting Midway Atoll National Wildlife Refuge via vessel and aircraft.

Location Description:

Special note: specific location (latitude/longitude) for historically significant heritage resources is sensitive data—not to be distributed publicly. Locations for 2017 maritime heritage work have been provided to the Monument Permit Coordinator.

All survey (land and underwater) will only take place during daylight hours.

5b. Check all applicable regulated activities proposed to be conducted in the Monument:

- Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving Monument resource
- Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands
- Anchoring a vessel
- Deserting a vessel aground, at anchor, or adrift
- Discharging or depositing any material or matter into the Monument
- Touching coral, living or dead

- Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument
- Attracting any living Monument resource
- Sustenance fishing (Federal waters only, outside of Special Preservation Areas, Ecological Reserves and Special Management Areas)
- Subsistence fishing (State waters only)
- Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

6 Purpose/Need/Scope *State purpose of proposed activities:*

The primary objective of this project is to uncover the sunken history of the Battle of Midway through remote sensing, anomaly testing and historical research. To date, three magnetometer surveys have been conducted at Midway Atoll: a 2003 survey by Panamerican Consultants, Inc. (success was limited due to positioning errors discovered in post processing), a 2010 survey by SEARCH, Inc. (success limited by weather and limited time frame) and a 2012 survey by NPS/SRC (Figure 2, demonstrating areas of previous survey and intended survey in 2017). The 2012 survey, though limited in timeframe (1.5 days) still proved to be effective in detecting ferrous anomalies (over 70 anomalies located), and to date, all sites <110 feet deep have been investigated. All surveys were hindered by conditions and limited time (usually 1-2 survey days) and thus survey blocks were designated more by opportunity and circumstance than by correlation with historical accounts. Complete survey in areas of highest probable loss has yet to be complete, and is proposed with this project. This proposal builds upon existing survey data by conducting a more comprehensive examination of the inshore and offshore portions of Eastern and Sand Island as well as anomaly characterization in deeper water.

This project focuses primarily on the exploration for sunken aircraft sites and the niche of aviation archaeology. Aviation archaeology is a relatively new field of study. Despite the fact that most sunken aircraft sites are relatively recent (<100 years old), and the technology is contemporary enough to include the type of background information that provides details about construction, etc. the unique opportunity that aviation archaeology presents is the ability to open windows in to significant moments in history where pilots and their relatives may still be alive to compliment the material culture discovered on the seafloor. The opportunity to combine first-hand accounts with dynamic sites discovered via exploration creates an emotional connection that inspires us all and reinforces the lessons and relevance of history. The lost aircraft of Midway

are not just aviation archaeology sites, they are war graves and tangible reminders of the sacrifices of brave young aviators who took to the skies during World War II. This project will contribute to the field of aviation archaeology via discovery, documentation and interpretation of several sites that will provide the public with compelling stories that make connections to World War II activities in the Pacific. Even more significant is the timing of this project, which will take place in advance of the 75th Anniversary of the Battle of Midway in June of 2017. Aircraft discoveries are significant because of how much they differ from shipwreck sites, and the broader implications for the nascent field of aviation archaeology for this proposal lies in a battlefield approach to surveying multiple aircraft sites representing a famous battle like the Battle of Midway. Questions developed to address the unique survey of sunken aircraft sites include: How did each side configure and adapt their assets to confront both strategic and tactical challenges before, during, and after the epic clash in June of 1942?; what modifications from “factory stock” can be seen in the material assemblages of downed aircraft and what does that tell us about individual and collective agency on a battlefield that spanned a significant portion of the northern Pacific?; while American aircraft were technologically inferior at the outset of the war, where the materials used in their construction superior to those of the Japanese, and if so, do we see the earliest traces of American industrial excellence that would ultimately prevail in both the Pacific and in Europe?; how do archaeologists document a widespread scatter of material? Are there properties of the material used in constructing aircrafts that affect site formation processes, and what can we learn from what remains on site and from what is missing? How artifacts from these types of sites are conserved and what are the best ways to protect these sites?

As the generation of pilots that flew these aircraft continues to dwindle, there is a compelling need to incorporate their first-hand knowledge of these planes and how they were used into the discussion of how to document and interpret the wreckage. This proposed project has collected dozens of first-hand observations about aircraft wreck

locations at Midway Atoll (in addition to aircraft loss locations based upon archival research). Based on discoveries made in 2014 and 2015 of sunken aircraft within Midway's waters, we have a large degree of confidence in the locational accuracy of historical accounts of aircraft losses. Due to the chaos of the conflict, some of the most accurate information about location of sunken and lost aircraft sites has come from the first-hand observations of the men who fought for this tiny atoll in 1942. The urgent need to conduct the project proposed here stems from the loss of this type of information when veterans pass away. Additionally, the opportunity to conduct this survey in the 75th Anniversary year of the Battle of Midway lends a powerful kick to any outreach and connection to the public's interest in this historically significant event.

Additionally, there is a need to determine whether marine alien invertebrates have dispersed from these establishment points to man-made and natural habitats in close proximity. This can be determined by surveys within the lagoon habitats, which can be done in conjunction with the proposed maritime heritage surveys.

7. Answer the Findings below by providing information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Monument:

The Findings are as follows:

a. How can the activity be conducted with adequate safeguards for the cultural, natural and historic resources and ecological integrity of the Monument?

The activity will be conducted with adequate safeguards for the resources and ecological integrity of the Monument. This project is part of a continuing effort to identify, interpret and protect maritime heritage resources in the Papahānaumokuākea Marine National Monument. Proposed work will be led by PMNM maritime heritage program staff, who have been involved in Northwestern Hawaiian Islands maritime heritage research (archival as well as field) for over twelve years. Methodology and research continues to improve annually as the team's experience grows. Proposed heritage work

in the NWHI emphasizes a low-impact approach, to an extent consistent with the Monument's conservation goals and objectives. Section 106 NHPA compliance will be submitted to the State Historic Preservation Office and OHA for review.

All maritime heritage scientists will participate in a cultural briefing prior to entering the Monument. The team will respect all resources both natural and cultural. The primary permittee will consult with OHA and the Native Hawaiian Coordinator at the PMNM on cultural sensitivities, as well as the applicability of these activities to OHA and the Native Hawaiian Coordinator's efforts for the PMNM. No archaeological work will take place near any known native Hawaiian archaeological sites. If any native Hawaiian sites should be discovered, the proper experts will be notified and consulted immediately. Plans to collaborate with Native Hawaiian Program staff at PMNM will allow for further understanding and interpretation of the cultural significance of the Monument.

b. How will the activity be conducted in a manner compatible with the management direction of this proclamation, considering the extent to which the conduct of the activity may diminish or enhance Monument cultural, natural and historic resources, qualities, and ecological integrity, any indirect, secondary, or cumulative effects of the activity, and the duration of such effects?

The proposed project will have minimal impact on the resources of the region. The research consists primarily of non-invasive remote sensing and visual surveys. This research is being conducted in concert with the priorities listed in the Maritime Heritage Action Plan of the Monument's Management Plan (inventory and assessment, as well as education and outreach) and the Monument's Maritime Heritage Research, Education and Management Plan. The strategies proposed are designed to increase our understanding of maritime heritage resources and foster effective and protective management in the Monument. This project will also include multidisciplinary and partnership efforts towards increasing stewardship and enhancement of Monument goals and resources. Additionally, this project will facilitate the Monument's effort to "bring the place to the people, rather than the people to the place" through outreach and education efforts that will share PMNM resources with a broad audience.

c. Is there a practicable alternative to conducting the activity within the Monument? If not, explain why your activities must be conducted in the Monument.

There is no practicable alternative to conducting the activities in the Monument. Maritime heritage surveys are necessary to identify, document and protect the maritime heritage resources in the Papahānaumokuākea Marine National Monument. Additionally, these surveys contribute to education and outreach efforts regarding maritime heritage resources in the PMNM. These activities directly relate to activities in the Monument's management plan and the Monument's Maritime Heritage Research, Education and Management Plan.

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?

The proposed activities have been identified as vital to the future management of the Monument and will have no adverse impact on the resources, qualities and ecological integrity of the Monument. Additionally, the opportunity to conduct important education and outreach activities through the development of a short film, exhibits, web presence, presentations and articles will assist in Monument's efforts to promote stewardship and protection of resources, both natural and cultural. This project will serve to continue ongoing efforts to develop a multi-dimensional approach to understanding these maritime heritage sites in the NWHI.

Prior work by PMNM maritime archaeologists has demonstrated the broad, long term value of maritime heritage work in the NWHI. Annual expeditions have resulted in documentary films, magazine, journal and newspaper articles, graduate student research projects, television news coverage, award winning museum exhibits and websites conveying the research and findings to the public.

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.

A minimal amount of time will be spent at each location depending on weather and oceanographic conditions during research cruises.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.

Personnel included in this permit application have extensive experience conducting research in the Monument, and with all archaeological and ecological methods that will be utilized. All methods are primarily non-invasive. PMNM Native Hawaiian staff, as well as OHA and cultural practitioners will be consulted in order to further avoid any potential impacts.

g. Provide information demonstrating that you have adequate financial resources available to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.

Project is funded by a \$90,070.00 NOAA OER maritime archaeology grant.

h. Explain how your methods and procedures are appropriate to achieve the proposed activity's goals in relation to their impacts to Monument cultural, natural and historic resources, qualities, and ecological integrity.

The research consists primarily of non-invasive surveys (both archaeological and ecological) and will always follow proper protocol (Conditions for the Custody and Care of Navy Historical Property, Annexed Rules of the UNESCO Convention on the Protection of Underwater Cultural Heritage) and undergo Section 106 and NEPA clearance. PMNM Native Hawaiian Program staff, OHA and cultural practitioners will be consulted in order to further avoid any potential impacts.

i. Has your vessel has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?

The NOAA research vessel Hi'ialakai has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of the Presidential Proclamation 8031.

j. Demonstrate that there are no other factors that would make the issuance of a permit for the activity inappropriate.

There are no other factors that would make the issuance of a permit for the activities inappropriate.

8. Procedures/Methods:

Methods:

Remote sensing survey, 3D image collection and alien invasive species surveys are primary objectives of the proposed 2017 maritime heritage project. Where possible, survey locations are prioritized, providing flexible alternatives in case of rough weather, other mission priorities, etc. The following methods will be employed for each of the proposed 2017 objectives:

1) Remote sensing survey

A Geometrics G-882 cesium-vapor, marine magnetometer will be the primary instrument, with an additional G-882 magnetometer serving as a back-up unit. Survey operations will be conducted from NOAA and/or DOI small boats. Power will be provided either by a gas powered generator, converted AC power, or directly from the vessel.

As per the research objectives, the magnetometer survey is intended to locate submerged aircraft on the seabed or buried. The objective is 100% coverage with line spacing of 30 m or less in areas of high probability. Survey speed will be maintained at 4-6 knots as much as possible. Each survey block will be in the 30-45 linear nautical mile total distance surveyed, and each survey block will be less than 2 square miles each. Survey will take place for 6 to 8 hours each day.

Data acquisition will use Hypack 2015, and all pre-planning of survey lines will be conducted in combination with ArcGIS and Hypack. Positional control will be maintained using differential GPS feeding real-time data into a field laptop that will serve as the hub

for all data acquisition during survey. Using the SRC's newly developed magnetometer tool and script to process the raw magnetometer data in Arc GIS 10.2.2, data processing will be streamlined and visualizing the data will be happen each night of survey operations. This will enable the team to quickly study the data for same-day interpretation, which maximizes the time allowed for visual investigation of anomalies by diving scientists. The focus of this project is to collect accurate survey data and investigate as many targets as possible in order to make new discoveries that enrich the maritime and aviation history of Midway.

Survey operations will concentrate on pre-determined blocks representing areas that have high probability of discovery based on historical data, bathymetry, bottom type, and oral histories. Preliminary target areas include the end of the runway on Eastern Island, west end of Sand Island, and areas in the north and east within the lagoon. These areas in the lagoon are known locations where both Japanese and U.S. fighter planes crashed, as indicated in our oral history database. Based on our recent discovery of the F2A-3 Brewster Buffalo, P-40K and F4U in the same shallow waterenvironment, detection of other lost aircraft is probable.

Equipment: Marine Magnetics Explorer Mini Magnetometer
Laptop
HyPack survey software
Honda eu2000i generator or marine 12v batteries

2) 3D Image collection

In lieu of traditional hand mapping of sites, the team will rely on pioneering 3D structure from motion (SFM) reverse-angle photogrammetry and modelling. This new and exciting technology will provide the exploration team with photos and subsequent products produced from the photos that are both accurate and useful for study, but also available to the world via the internet in near real-time.

Equipment: Underwater camera equipment
Laptop and image processing software

3) Alien Invasive Species Surveys at Maritime Heritage Sites:

Based on recent surveys for marine alien species at Midway Atoll and other atolls within the Northwestern Hawaiian Islands a set of target marine invertebrate species is known that exhibit biofouling affinities for both man-made and natural habitats. These target species can be identified in situ during SCUBA diving surveys and can be used as proxies to determine successful dispersal by alien species to lagoon habitats at Midway Atoll.

Marine alien species surveys will be conducted in conjunction with maritime heritage surveys in both qualitative survey and quantitative assessment. Qualitative surveys will be conducted at all sites surveyed for potential maritime heritage interest. These will record the presence/absence of the above target species and any additional species, if present. If the target species are identified at maritime heritage sites, quantitative surveys for marine alien species will be done in conjunction with focused archaeological surveys. Quantitative surveys will be based on a 10 x 10 meter area associated with the site. The surveys will involve three randomly chosen 1 X 10 meter belt transects using a quadrat point intercept method. A 1/4 meter squared gridded quadrat with 16 intersections will be placed at 50 centimeter intervals and what falls underneath each intersection is recorded. This method will record alien species, coral species, other sessile macroinvertebrate species and substrate type on a standardized data sheet.

The efforts focusing on maritime heritage resources will bolster efforts already begun at Midway Atoll focusing on the inventory of marine alien species associated with natural resources. Additionally, the data will serve to provide early stage ranking of the alien marine invertebrate species most likely to disperse from establishment points at Midway Atoll and other areas of the PMNM.

NOTE: If land or marine archeological activities are involved, contact the Monument Permit Coordinator at the address on the general application form before proceeding, as a

customized application will be needed. For more information, contact the Monument office on the first page of this application.

9a. Collection of specimens - collecting activities (would apply to any activity): organisms or objects (List of species, if applicable, attach additional sheets if necessary):

Common name:

Scientific name:

& size of specimens:

Collection location:

Whole Organism Partial Organism

9b. What will be done with the specimens after the project has ended?

9c. Will the organisms be kept alive after collection? Yes No

• General site/location for collections:

• Is it an open or closed system? Open Closed

• Is there an outfall? Yes No

• Will these organisms be housed with other organisms? If so, what are the other organisms?

• Will organisms be released?

10. If applicable, how will the collected samples or specimens be transported out of the Monument?

11. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research:

Currently, NOAA's Maritime Heritage Program is the only agency engaged in maritime heritage survey in the PMNM. 2017 project work includes collaboration with the National Park Service's Submerged Resources Center (NPS/SRC), and East Carolina University. In addition, work will be conducted in collaboration with the PMNM resource protection specialist.

12. List all specialized gear and materials to be used in this activity:

Equipment: Underwater slates
Transect tapes
Gear bags
Open-circuit scuba
Photo scales
Garmin GPS units and waterproof boxes
Site buoy
Marine Magnetics Explorer Mini Magnetometer

13. List all Hazardous Materials you propose to take to and use within the Monument:

N/A

14. Describe any fixed installations and instrumentation proposed to be set in the Monument:

N/A

15. Provide a time line for sample analysis, data analysis, write-up and publication of information:

Initial results will be reported in a report to OER. Site reports resulting from this cruise will be finalized by June 2018. Data from this project will consist of site and artifact inventory development, site maps, digital still images and digital video products. A summary descriptive project report (activity report) including abstract, major accomplishments, participants, activity log, results of work to date, and proposed schedule of final report will be completed by December 31, 2017. A final report

including heritage background, site descriptions, methodology, results, project evaluation and recommendations for maritime heritage resource management will be completed by July 2018. Data and report from this proposal will be sufficient to provide presentations at annual maritime history and maritime archaeology symposiums (for example Society for Historical Archaeology, Society for Hawaiian Archaeology, Symposium on the Maritime Archaeology and History of Hawai'i and the Pacific), and presentations will be made available upon request. Preservation-related data from the 2017 field season will also contribute to heritage preservation material on the Monument's Maritime Heritage Program web page (www.papahanaumokuakea.gov) and OER's website (<http://explore.noaa.gov/>).

16. List all Applicant's publications directly related to the proposed project:

Price, Melissa, Raupp J.T., Keogh, K., Burns, J. Managing a Sigh of Relief: The Wreck of USNS Mission San Miguel. Australian Institute of Maritime Archaeology Bulletin. Volume 40, Fall 2016

Gleason, Kelly . A Sounding Lead on a Distant Reef: Captain Pollard's Lessons Learned. Historic Nantucket, Fall 2014.

Gleason, K. (2014), A Monumental Distance: Education and Outreach from the Most Remote Archipelago on Earth. In D.A. Scott-Ireton (ed.), *Between the Devil and the Deep, When the Land Meets the Sea* (pp141-153). New York, NY: Springer Science and Business Media.

Wagner D, Toonen RJ, Papastamatiou YP, Kosaki RK, Gleason KA, McFall GB, Boland RC, & Pyle RL (2013). Mesophotic surveys of the Northwestern Hawaiian Islands with new records of black coral species. *Proceedings of the 2013 AAUS/ESDP Curaçao Joint International Scientific Diving Symposium*: 341-345.

Kosaki RK, Wagner D, Leonard JC, Hauk, BB & Gleason KA (2013). First report of the table coral *Acropora cytherea* (Scleractinia: Acroporidae) from O'ahu Island (Main Hawaiian Islands). *Bulletin of Marine Science* 89(3): 745-746.

Papahānaumokuākea Marine National Monument. 2011. Maritime Heritage Research, Education, and Management Plan: Papahānaumokuākea Marine National Monument. Honolulu, Hawai'i. 97 pages.

Wagner D, Papastamatiou YP, Kosaki RK, Gleason KA, McFall GB, Boland RC, Pyle RL & Toonen RJ (2011). New records of commercially valuable black corals (Cnidaria: Antipatharia) from the Northwestern Hawaiian Islands at mesophotic depths. *Pacific Science* 65: 249-255.

Delgado, J.P. and K. Gleason. Lighting Strikes Twice. *The Explorers Journal*. 89:1, Spring 2011.

Raupp, Jason and Kelly Gleason. Submerged whaling heritage in Papahānaumokuākea Marine National Monument. *Bulletin of the Australian Institute for Maritime Archaeology* (2010), 34: 66-74.

Kelly Gleason and Jason Raupp. Lost and Found In Papahānaumokuākea Marine National Monument: The Possible Wreck Site of the Nantucket Whaleship Two Brothers. *Historic Nantucket*, (Volume 60, No. 3) Fall 2010.

Gleason, K. 2010. Activity Report: Maritime Heritage Resources Survey HA-010-03. Submitted to National Oceanic and Atmospheric Administration/ Papahānaumokuākea Marine National Monument.

Wagner, Daniel, Yannis P. Papastamatiou, Randall K. Kosaki, Kelly A. Gleason, Greg B. McFall, Raymond C. Boland, Richard L. Pyle and Robert J. Toonen. New records of commercially valuable black corals (Cnidaria: Antipatharia) from the Northwestern Hawaiian Islands. *Pacific Science*, in press.

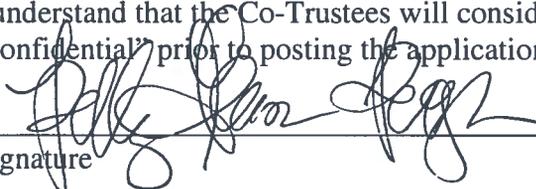
Gleason, K. 2009. Activity Report: Maritime Heritage Resources Survey HA-08-04. Submitted to National Oceanic and Atmospheric Administration/ Papahānaumokuākea Marine National Monument.

Gleason, Kelly. NHC Supports Saginaw Search. Pull Together, Naval Historical Foundation. (Volume 47, No. 2). Fall/Winter 2008/2009.

Gleason, K. 2008. Activity Report: Maritime Heritage Resources Survey HA-08-04. Submitted to National Oceanic and Atmospheric Administration/ Papahānaumokuākea Marine National Monument.

Waddell, J.E. (ed). 2005. The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2005. NOAA Technical Memorandum NOS NCCOS 11. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD. .

With knowledge of the penalties for false or incomplete statements, as provided by 18 U.S.C. 1001, and for perjury, as provided by 18 U.S.C. 1621, I hereby certify to the best of my abilities under penalty of perjury of that the information I have provided on this application form is true and correct. I agree that the Co-Trustees may post this application in its entirety on the Internet. I understand that the Co-Trustees will consider deleting all information that I have identified as “confidential” prior to posting the application.


Signature _____ Date 9/1/2016

SEND ONE SIGNED APPLICATION VIA MAIL TO THE MONUMENT OFFICE BELOW:

Papahānaumokuākea Marine National Monument Permit Coordinator
6600 Kalaniana'ole Hwy. # 300
Honolulu, HI 96825
FAX: (808) 397-2662

DID YOU INCLUDE THESE?

- Applicant CV/Resume/Biography
- Intended field Principal Investigator CV/Resume/Biography
- Electronic and Hard Copy of Application with Signature
- Statement of information you wish to be kept confidential
- Material Safety Data Sheets for Hazardous Materials