UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, MD 20910

Supplemental Environmental Assessment
Issuance of a Modification to Scientific Research Permit No. 1596-02 for Tag Attachments to Leatherback Sea Turtles

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Document Supplemented: Supplemental Environmental Assessment for Issuance of a Modification of a Scientific Research Permit to the NMFS Southwest Fisheries Science Center (SWFSC, Permit File No. 1596-02) to Conduct Research on Protected Sea Turtles.

Location: Pacific Ocean waters of the United States off the coasts of California, Oregon, and Washington

Abstract: The National Marine Fisheries Service (NMFS) proposes to issue a modification to scientific research Permit No. 1596-02 for takes of sea turtles pursuant to the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. 1531 et seq.) and the regulations governing the taking, importing, and exporting of endangered and threatened species (50 CFR 222-226). The purpose of the proposed research is to continue long-term monitoring of the status of the leatherback (*Dermochelys coriacea*). The SWFSC requests a permit modification to change the attachment method for satellite tagging during captures and to attach a suction cup tag/camera system to the turtle prior to capture. The SWFSC wants to replace the previously authorized harness attachment method with direct attachments of satellite tags to the medial ridge. No increase in the number of animals captured or changes in the manner of take authorized would occur. Under NOAA Administrative Order 216-6, NMFS' issuance of scientific research permits is generally categorically excluded from the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.) requirements to prepare an environmental assessment (EA) or environmental impact statement (EIS). However, for the original permit NMFS prepared an EA and for a modification to the permit, a supplemental environmental assessment (SEA) to facilitate a more thorough assessment of potential impacts on sea turtles. For the same reason NMFS has prepared a SEA for the proposed action. This SEA evaluates the potential impacts to the human environment from issuance of the proposed permit modification.

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CHAPTER 1 PURPOSE OF AND NEED FOR ACTION

The information in Ch.1.1 has not changed from what was previously described and analyzed in the SEA prepared for Permit No. 1596-02 (NMFS 2009). NMFS Office of Protected Resources (NMFS PR) proposes to issue a modification to scientific research Permit No. 1596-02 held by the NMFS SWFSC under Section 10(a)(1)(A) of the Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1531 et seq.). The permit, as modified, would help gather information important to sea turtle conservation and management as well as ecosystem management. The modified permit would be assigned No. 1596-03.

1.2 OTHER EA/EIS THAT INFLUENCE SCOPE OF THIS EA

An EA (NMFS 2007a) was prepared for issuance of the original Permit (No. 1596) which determined that issuance of the permit and the associated research would not result in significant impacts to any portion of the human environment. In 2009, a SEA was prepared for issuance of a modification to the permit to change the suite of research activities authorized (NMFS 2009). NMFS determined that issuance of the modified permit and the associated research would not result in significant impacts to any portion of the human environment.

Because the proposed action would not change the nature, timing or location of the research activities, the effects on the physical, social, and economic environment are not re-examined in this SEA. The modification would only change the attachment method of satellite tags for captured leatherback (*Dermochelys coriacea*) sea turtles; therefore, the scope of this SEA is limited to the potential impacts to leatherback sea turtles.

1.3 SCOPING SUMMARY

The purpose of scoping is to identify the issues to be addressed and the significant issues related to the proposed action, as well as identify and eliminate from detailed study the issues that are not significant or that have been covered by prior environmental review. An additional purpose of the scoping process is to identify the concerns of the affected public and Federal agencies, states, and Indian tribes. CEQ regulations implementing the National Environmental Policy Act of 1969 (NEPA; 42 U.S.C. 4321 et seq.) do not require that a draft SEA be made available for public comment as part of the scoping process.

1.3.1 Public Comments on Application

A Notice of Receipt for the application was published in the *Federal Register*, announcing the availability of the application for public comment (74 FR 22517, May 12, 2010). No comments were received.

1.4 APPLICABLE LAWS AND NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

This section has not changed from that described in the 2009 SEA. Applicable laws include the NEPA and ESA.

CHAPTER 2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This chapter describes the range of potential actions (alternatives) determined reasonable with respect to achieving the stated objective, as well as alternatives eliminated from detailed study. This chapter also summarizes the expected outputs and any related mitigation of each alternative.

2.1 ALTERNATIVE 1 – No Action

Under the No Action alternative, no permit modification would be issued. The existing permit would remain in effect and the effects would be those analyzed in the 2009 SEA conducted for issuance of Permit No. 1596-02. No additional effects from the requested modification would occur.

2.2 ALTERNATIVE 2 – Proposed Action (Issuance of Permit Modification with Standard Conditions)

Under the Proposed Action alternative, a permit modification would be issued for activities proposed by the applicant, with the permit terms and conditions as issued by NMFS.

Permit No. 1596-02 authorizes the SWFSC to capture, measure, weigh, blood and tissue sample, photograph, flipper and PIT tag, fat biopsy, ultrasound, satellite tag, and attach a VHF/TDR/sonic tag/video system, VHR/TDR/sonic tag/GPS unit, or VHR/TDR/sonic tag/GPS/video camera system to leatherback sea turtles during research activities conducted off the western coast of the continental United States. Animals with the video camera system may be re-approached to collect the unit and then sampled, tagged, and have another video camera unit attached. The SWFSC now requests authorization to use a direct tag attachment method in place of previously authorized harness attachments to conform to recent studies demonstrating that a new method of tag attachment directly to the medial ridge of the turtle carapace lessens hydrodynamic impacts to the sea turtle (Fossette et al. 2008). In addition, to efficiently maximize the data the SWFSC could obtain from an individual, the applicant also requests to attach a VHF/TDR/Sonic tag/GPS/Video camera system by suction cup to the free-swimming turtle prior to capture. The purpose of the proposed research would remain unchanged which is to study the population biology of sea turtles inhabiting the Pacific Ocean off the coast of California, Oregon, and Washington to address priorities outlined in the U.S. Pacific leatherback Recovery Plan. These tags would provide valuable information on leatherback movements and behavior in the Pacific Ocean between their foraging areas and nesting beaches. No increase in the number of animals taken is requested. The research would continue to occur in waters off the coast of the western United States through February 1, 2012.

<u>Background</u>

Due to the unique nature of their shell, leatherback sea turtles pose difficulties to researchers who want to affix satellite tags to the turtles for telemetry studies. To deal with this logistical constraint, researchers have devised a harness system consisting of vinyl-covered straps encircling the turtle's shoulders and midsection, with the satellite tag positioned on top of the carapace (Eckert and Eckert 1986). For years, this method was considered a reliable way to ensure tag retention and was utilized by biologists to obtain valuable information on leatherback movement and behavior (Byrne et al. 2009). Still, the belief that tags do not alter, impede, or in any way act as a detriment to the study animal is a crucial assumption, and researchers began to examine the potential impacts of harness attachment on leatherback sea turtles.

A harness-tagged female leatherback was re-sighted in Costa Rica after two years at liberty and provided an opportunity to examine the long-term effects of this attachment method. Troëng et al. (2006) observed that the straps had cut into the lateral ridges and caused callusing around the shoulders. Although the researchers doubted that the turtle was permanently harmed by the harness (it had been observed nesting twice, indicating successful mating), they still expressed concerns that the harness could impact the turtle's migrating and foraging abilities (Troëng et al. 2006). In a telemetry study, Fossette et al. (2008) monitored five leatherback sea turtles, three that had the satellite attached by a harness, and two which had the tag directly attached to the carapace. Decreased speed and dive duration were witnessed in the harness-tagged turtles when compared to the carapace-tagged turtles, suggesting a marked hydrodynamic impact from the harness (Fossette et al. 2008).

In response to these findings, after discussions with NMFS PR, the SWFSC discontinued the telemetry portion of their study which used the harness attachment method. The SWFSC now wishes to update their methodology to incorporate the findings of this study by directly attaching the satellite transmitter to the medial ridge of the carapace. Although a relatively new technique, medial ridge attachment of satellite tags is emerging as a desirable alternative to previous attachment methods due to its comparatively minimal impacts on leatherback turtles. The methodology described below follows procedures laid out in Permit No. 1557-02, where researchers at University of New Hampshire attached satellite tags to the medial ridge of leatherback turtles.

Beyond tagging these animals with a suction-cup tag in addition to direct attachments, no other changes in the manner of take would occur as a result of the proposed modification. Vessel approaches and suction-cup tag attachments would occur in the same manner as previously described for the permit. Therefore, the location, the proposed suction-cup tagging, and all other methodologies for authorized activities (measure, weigh, blood and tissue sample, etc.) would remain unchanged from how they were described and analyzed in the 2009 SEA prepared for the issuance of Permit No. 1596-02.

The permit conditions of the existing permit included to mitigate the effects of the research would remain in effect. Table 1 outlines the number of protected species, by species, that would be authorized to be taken, and the locations, manner, and time period in which they may be taken with the proposed changes in bold font. A description of the proposed direct tag attachment follows.

# of Turtles	Species	Life Stage	Research Take Activities	Details
10	Leatherback	Adult or Large Immature	Capture, measure, weigh, blood and tissue sample, photograph, flipper and PIT tag, fat biopsy, ultrasound	January to December
8	Leatherback	Adult or Large Immature	**Close approach turtle in water, attach VHF/TDR/Sonic tag/GPS/Video camera system by suction cup AND** Capture, measure, weigh, blood and tissue sample, photograph, flipper and PIT tag, and satellite tag (**direct medial ridge tag attachment**), fat biopsy, ultrasound	January to December
20	Leatherback	Adult or Large Immature	Close approach turtle in water, attach VHF/TDR/Sonic tag/GPS/Video camera system by suction cup AND capture, measure, weigh, fat biopsy, ultrasound, blood and tissue sample, photograph, flipper and PIT tag, and attach VHF/TDR/GPS/Sonic tag/Video camera system by suction cup before release	January to December
20	Leatherback	Adult or Large Immature	Close approach turtle in water, attach VHF/TDR/Sonic tag/GPS unit by suction cup to free-swimming animal, track AND tissue sample with biopsy pole	January to December; No capture of animals

Medial Ridge Direct Attachment of Satellite Tags
Leatherback sea turtles would be captured in the same manner (i.e., the break-way hoop net procedure), physical condition evaluated and monitored during the procedure as described in the original permit. All other handling, monitoring, and release protocols would be conducted as authorized in the permit. Co-investigator Scott Benson, who has been trained in this method by researchers at the Canadian Sea Turtle Network, would perform the attachment procedure.

The site for satellite transmitter attachment would be the medial ridge of the carapace, at the point where the ridge is most prominent, generally posterior to the widest area of the carapace to lessen the drag effect of the tag on the turtle, relative to attachment near the leading edge of the carapace. The site would be sterilized with three applications of Betadine antiseptic and isopropyl alcohol and then desensitized with topical anesthetic (ethyl chloride).

Two 4.5-mm diameter holes would be drilled into the medial ridge at a horizontal angle with an orthopedic drill bit; the drill bit would not enter the body cavity and each hole would only

penetrate a few millimeters into the carapace ridge. Prior to and between each use, the drill bit would be sterilized with Betadine. Surgical tubing, also sterilized prior to use in Betadine, would then be inserted into the holes to act as a sheath for the tether.

Plastic-coated flexible braided stainless steel wire (1.8 mm diameter) would be slid into the surgical tubing inside the holes. Each end of the wire would be looped by a corrodible stainless steel crimp after insertion through the sheath (Figure 1). To form the base on the carapace for the satellite tag, a fast-setting, non-adhesive, cold curing silicone putty would be place over the medial ridge; this putty was selected for this purpose because it would not compress at depth and it would conform to the shape of the ridge.

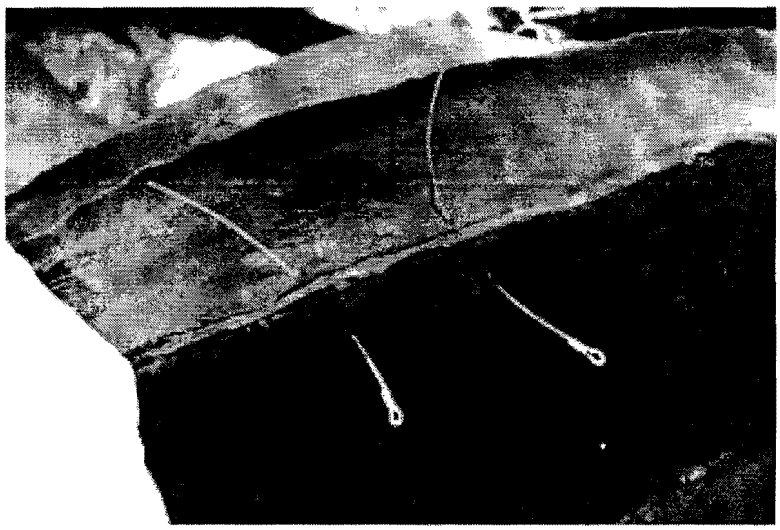

Figure 1: Plastic-coated flexible braided stainless steel wire

The transmitter (Wildlife Computers, model Mk10 "ridgemount") has been designed for direct attachment to the medial ridge of a leatherback turtle, in the shape of an inverted "V" (Figure 2). The tag weighs approximately 8 ounces and is 130 mm in length, 80 mm wide, and 40 mm high. The transmitter would be placed on the putty base, and the wire tether line tightened over the tag with the loops at each end secured with cable ties on top of the tag. One week prior to attachment, the transmitter would be painted with a non-toxic anti-fouling marine paint (e.g., ceramic epoxy) (Johnson and Gonzalez 2004). Photos would be taken of the mounted transmitter to document position on the medial ridge and included in each turtle's medical record to evaluate wound healing at the attachment site should recapture occur.

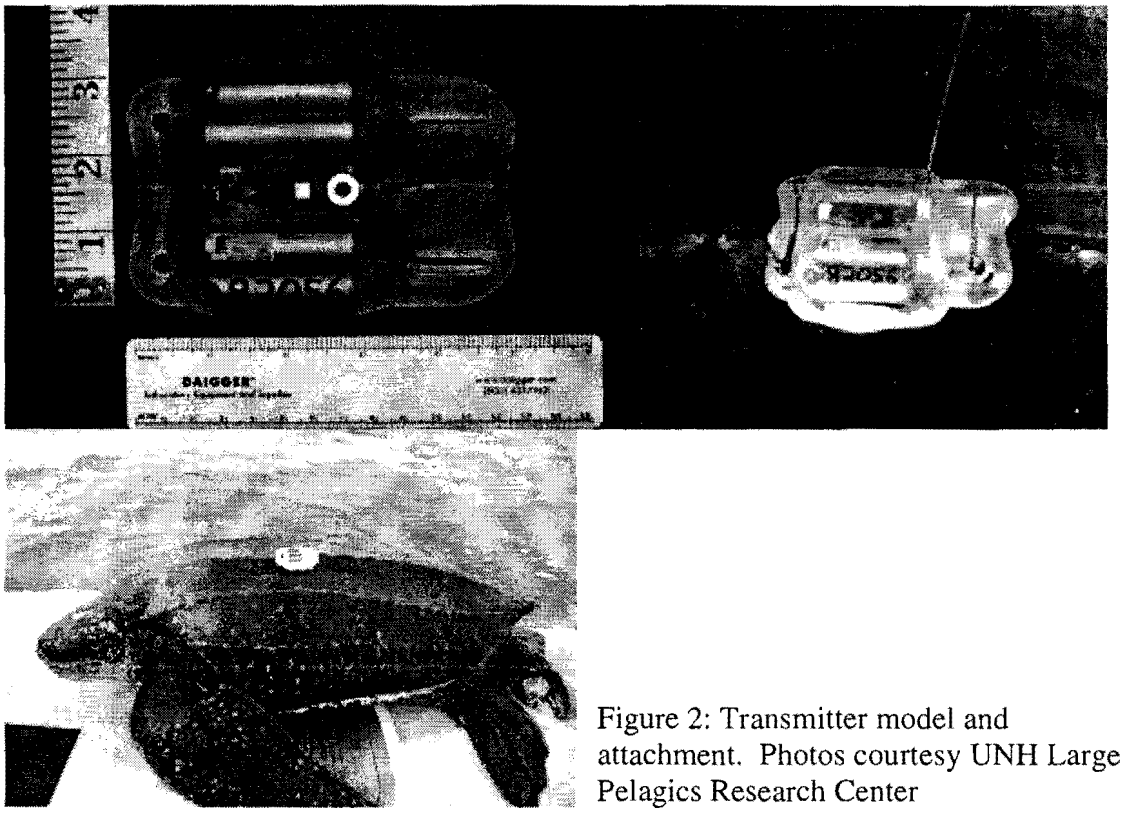

Figure 2: Transmitter model and attachment. Photos courtesy UNH Large Pelagics Research Center

Based on the results of a lab study conducted by the NMFS Pacific Islands Fisheries Science Center, researchers expect that the crimps in the tether would corrode after one year. Therefore, it is expected that the transmitter would remain attached for one year. With the crimps gone, the tag would fall out, pulling the tethers out of the drill tract.

Medial ridge attachments would only be performed by properly trained individuals on healthy turtles based on observations of behavior and movement. Healthy turtles are defined as those animals that are able to actively swim and dive, show evidence of recent foraging activity (i.e., bits of jellies in or around mouth), demonstrate symmetrical use of the head and limbs, are mentally alert, in good nutritional condition, and have no evidence of recent debilitating traumatic injury or epibiont loads that compromised normal movement.

CHAPTER 3 AFFECTED ENVIRONMENT

The affected environment would not change as a result of the proposed action and would remain as previously described in the 2007 EA. Research would take place in the Pacific Ocean waters of the United States off the coasts of California, Oregon, and Washington, including National Marine Sanctuary waters. However, as analyzed in the 2007 EA, impacts to physical habitat are not expected based on the nature of the research activities. The affected biological environment would be limited to the target leatherback sea turtles authorized for research. The 2007 EA also noted that the research would be unlikely to affect the physical or socioeconomic environment or pose a risk to public health and safety

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter represents the scientific and analytic basis for comparison of the direct, indirect, and cumulative effects of the alternatives. Regulations for implementing the provisions of NEPA require consideration of both the context and intensity of a proposed action (40 CFR Parts 1500-1508).

4.1 EFFECTS OF ALTERNATIVE 1: No Action

The environmental consequences of No Action (not modifying the permit) are the same as those identified for the proposed action in the 2009 SEA. The existing permit would remain in effect and the effects of research would be limited to those analyzed in the 2009 SEA, resulting in no more than short-lived disturbance of target sea turtles. This alternative would eliminate any potential risk to the environment from the proposed research activities. However, researchers would lose the opportunity to gain valuable information on leatherback movements and behavior in the Pacific Ocean between their foraging areas and nesting beaches.

4.2 EFFECTS OF ALTERNATIVE 2: Issue permit modification with standard conditions

Effects of the Vessel Approach and Suction-cup Tagging

Impacts from the proposed vessel approach and suction-cup tagging would be same as those previously described and analyzed for Permit No. 1596-02 in the 2009 SEA. The 2009 SEA noted that previous suction-cup attachments have shown little or no impact on leatherback behavior, and therefore concluded that no adverse impacts to target animals caused by sequential suction-cup tagging and biological sampling were expected. Therefore, the proposed approach and tagging of eight leatherbacks during authorized research is not expected to result in significant impacts to target leatherbacks, populations or the species.

Effects of the Medial Ridge Direct Tag Attachment

The environmental consequences to the individual sea turtles for the activities currently authorized have not changed from how they were described and analyzed in the 2009 SEA. No increase in takes of leatherback sea turtles would occur. Tagged animals would be minimally impacted by the direct tag attachment. Overall, the direct tag attachment method is expected to reduce tagging impacts to individual animals over the previously authorized harness attachment method.

Significant adverse effects are not anticipated from the medial ridge attachment technique. Use of sterilized techniques described above will minimize risk of infection, seroma, or hematoma formation. The SWFSC's co-investigator Scott Benson performed this procedure on two leatherbacks at nesting beaches in Mexico in February 2010 and did not observe bleeding associated with the drill tracts. In addition, Casey and Southwood (2008) observed that turtles tagged with this method did not visibly react to the procedure and the tag site on the carapace looked healthy post-tagging.

The section 7 consultation conducted for the proposed action and resulting biological opinion concluded that the effects of the proposed research activities have the potential to elicit short-

term changes in sea turtle behavior, but are not likely to result in long-term effects on individuals or populations of leatherbacks. This research would affect leatherbacks by harassing individual turtles during the research thus raising levels of stressor hormones, and the turtle may experience some discomfort during research activity procedures. Based on past observations of similar research authorized by NMFS, these effects are expected to dissipate with minimal impact. NMFS does not expect any delayed mortality of turtles following their release based on past research efforts by other researchers and adherence to certain protocols that are included in the current permit.

In evaluating this technique for another NMFS permit (No. 1557-02), a suite of veterinarians and sea turtle experts reviewed the attachment method and provided the following input. Dr. George (veterinarian) suggested that the medial ridge location is a good location for attachment. He has often drilled small holes in the medial ridge to attach EKG wires running along the carapace to a transmitter on the peduncle, and stated that it provides enough dense tissue for an anchor and is far removed from any vital structures. He suggested that the best feature of the ridge is its superficial nature, stating that even in a worse case scenario, infection around the device with the device pulling out, the area affected would be minimal and superficial. He added that such a lesion would be easily dealt with by the turtle's immune system and should heal without problem. He was able to monitor turtles with the wires attached to the medial ridge and the equipment was removed after ten days when the turtles re-nested. There was no problem noted in the short term and when several of these turtles returned to nest two years later no problems were detected by the biologists who observed them. He stated that all things considered he has very positive feelings about this attachment system and feels the benefits from easily deployment, minimal invasiveness, and its attachment in a location that would cause minimal problems for the animal in the event of a system failure would make it worth using. Dr. Rhodin (orthopedic surgeon) suggested that the risk for carapacial infection or osteomyelitis (bone infection) is extremely low even in the case of hardware failure and breakout due in large part to the leatherback's inherent natural ability to heal from major natural injuries encountered in the environment. He suggested that the overall risks of the deployments are less than the risks animals (e.g., females) face from courting males, fishing gear, and other natural or human-induced trauma. Dr. Wyneken (sea turtle physiologist) stated that assuming they are careful to use aseptic techniques, she sees no reason to think this method would create greater problems than existing alternative techniques and it is likely to increase the data collected if the tags will stay on longer [than other tag units authorized for Permit No. 1557].

The size, shape, and footprint of the attachment would be substantially smaller than the previously authorized harness method thereby resulting in reduced hydrodynamic effects to the tagged animal. Little data exists on the impacts of satellite tagging on leatherback sea turtles; however, the size and design of the proposed method is similar to that of direct tag attachments using epoxy or resin for hardshell sea turtles. Hence, NMFS would expect any hydrodynamic impacts from the proposed medial ridge attachment to be comparable to those identified for epoxy or resin attached tags to hardshell sea turtles. Impacts of epoxy or resin attached tags were analyzed in the 2007 EA (NMFS 2007b) prepared for issuance of Permit No. 1591 and determined that the tagging would not result in significant impacts to the environment. That EA determined that 1) the transmitters signals would not affect sea turtles or the marine environment, 2) tags would not result in serious injury, mortality or have a lasting effect on

turtles' behaviors or habitat use patterns, and 3) the short-term stresses resulting from transmitter attachment would be expected to be minimal and not add significantly to any stress that turtles have already experienced from capture or other the research activities. Further, a recent preliminary study by Fosette et al. (2008) indicates that hydrodynamic effects of the proposed medial ridge attachment would be significantly lower than the previously authorized harness method for leatherback sea turtles. After monitoring tagged leatherbacks over a 3-month period, Fosette et al. (2008) found that harness-equipped turtles travelled 16 percent slower and had 12 percent shorter dives than turtles with direct carapace tag attachments. Laboratory tests also are currently underway to measure the hydrodynamic drag created by the harness attachment; however, results of this project are not available at this time. Based on the available information, NMFS therefore expects that hydrodynamic effects of the medial ridge attachment would be greatly reduced compared to the harness method.

Casey and Southwood (2008) tagged female leatherbacks under Permit No. 1557 in this manner while ovipositing during the nesting season on St. Croix; noted that 12 of 19 females returned to the beach to nest again indicating that nesting was not impacted by the tag attachment. All 12 animals behaved normally and the wound site did not have signs of infection, chaffing, or necrosis. Two of the 12 tags had shed prior to the animal's return to the beach. Of the seven females that did not return to nest, four turtles begin a post-nesting migration with the tag attached, some of which are thought to have nested elsewhere based on movements. Tags transmitted for at least one to two months each. The remaining three tags are believed to have been shed early based on the two observed animals that returned to the St. Croix nesting beach without tags. Lutcavage (2009, 2010) reported for Permit No. 1557 tagging 12 and 3 turtles, respectively, noting a similar ease of tagging and behavior of animals. Transmissions from all tags ranged between 150 – 300 days and demonstrated that animals continued to migrate across the North Atlantic, possibly to nesting beaches. Based on these reports, the proposed tagging method would not be expected to reduce the numbers, distribution, or reproduction of sea turtles in the wild or reduce the likelihood of survival and recovery of these species.

In terms of acoustics of the proposed tagging method, the sonic tag frequency (34-75 kHz) would be above the hearing range of the turtles (under 1 kHz) (Lenhardt 2003) and any of their predators (approximately under 1 kHz) (Kritzler and Wood 1961; Banner 1967; Casper et al. 2003) and therefore would not affect the tagged sea turtle or attract predators. In summary, based on leatherback biology, direct observations, impacts of similar tagging methods, expert opinions and the available literature, NMFS does not expect the medial ridge attachment technique to result in significant impacts to tagged leatherback sea turtles, the population or species.

In addition to the above noted impacts, it should be noted that the data generated by the applicant over the duration of the study will provide beneficial information that will be important to the management and recovery of sea turtles. The information collected as a direct result of permit modification issuance will be available to implement goals identified in the leatherback recovery plan (NMFS and USFWS 1998). Therefore issuance of the proposed permit modification would have beneficial effects for leatherback sea turtles.

The modification would only affect sea turtles, therefore, no new effects to other portions of the environment would occur beyond those already considered in the 2009 SEA.

All existing conditions to minimize the impact of the research to the environment would remain in effect.

4.3 SUMMARY OF COMPLIANCE WITH APPLICABLE LAWS, NECESSARY FEDERAL PERMITS, LICENSES, AND ENTITLEMENTS

NMFS has determined that the proposed research modification is consistent with the purposes, policies, and applicable requirements of the ESA and NMFS regulations.

4.3.1 Endangered Species Act

This section summarizes conclusions resulting from consultation as required under section 7 of the ESA. The consultation process was concluded after close of the comment period on the application to ensure that no relevant issues or information was overlooked during the initial scoping process. The conclusion of the opinion was that the proposed action would not likely jeopardize the continued existence of the species and would not likely destroy or adversely modify designated critical habitat.

4.4 COMPARISON OF ALTERNATIVES

While the No Action alternative would limit environmental effects to those analyzed in the previous 2009 SEA, the opportunity would be lost to collect additional information that would contribute to better understanding sea turtles and that would provide information to NMFS that is needed to implement NMFS management activities. The Proposed Action alternative would only impact individual sea turtles using authorized research activities and conditioned by the modified permit. The effects would be minimal and short-lived; no serious injuries or mortalities would be expected. This alternative would allow the collection of valuable information that could help NMFS recover sea turtles. Neither the No Action nor Proposed Action is anticipated to have adverse population effects on sea turtles. Given the Proposed Action's minimal impact to the environment and the potential positive benefits of the research, it is the most desirable action to pursue.

4.5 MITIGATION MEASURES

There are no additional mitigation measures beyond those conditions that would be required by the permit, as modified. These include conditions that require researchers to sterilize equipment before tagging and to monitor and document the carapace tag site if animals are recaptured. Permit conditions are intended to minimize unavoidable adverse effects of the research activities. The permit conditions also require regular reports on the effectiveness of the research at achieving the applicant's stated objectives (and thus at achieving the purpose and need of the federal action) and on the effectiveness of the mitigation measures required by the permit. By statute, regulation, and permit conditions, NMFS has authority to modify the permit or suspend the research if information suggests it is having a greater than anticipated adverse impact on target species or the environment.

4.6 UNAVOIDABLE ADVERSE EFFECTS

The research would involve the direct attachment of tags to the carapace, thus the research activities will unavoidably result in some harassment to target animals. However, the research is not expected to have more than a minimal effect on individual sea turtles, and no effect on populations or the species. While individual animals may experience short-term stress and discomfort in response to the activities, the impact to individual animals is not expected to be significant. No serious injuries, mortality, or reduced fecundity would be expected. The minimization measures imposed by permit conditions are intended to reduce, to the maximum extent practical, the potential for adverse effects of the research on the species. Since the proposed action would only occur on sea turtles, no other portion of the human environment would be affected in a manner not already considered in the 2009 SEA or 2007 EA.

4.7 CUMULATIVE EFFECTS

Cumulative effects are defined as those that result from incremental impacts of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions that take place over a period of time.

Today sea turtles may be impacted by a variety of human activities, including commercial fisheries, subsistence harvest, vessel interactions, and scientific research. However, it should be noted that the authorized take of leatherback sea turtles by NMFS research permits is minimal throughout the Pacific Ocean. Only three other research permits authorize the take of leatherback sea turtles. Two of these permits, Nos. 14510 and 14097, are held by the SWFSC. No. 14097 authorizes standard activities on animals caught offshore in conjunction with cetacean research surveys. No. 14510 authorizes research on stranded animals off the coast of California. The remaining permit, No. 14381, is held by the NMFS Pacific Islands Fisheries Science Center for studying animals captured in commercial fisheries around Hawaii and American Samoa. None of these permits authorize the medial ridge tag attachment method. Combined these permits authorize a total of 57 annual takes of leatherback sea turtles during research.

The cumulative effects to the target sea turtles at the individual level have changed slightly but not significantly from that described in 2009 SEA. Up to eight animals per year would have tags attached directly to the medial ridge as noted in bold font in Table 1 instead of previously authorized harness attachments. However, the tagging is not expected to add appreciably to the stresses the animal would already experience during the other portions of the interaction with researchers (capture and other procedures) and would not significantly impact the individual animals. While the effects of the proposed research activities have the potential to elicit short-term changes in sea turtle behavior, as discussed in this SEA none are expected. However, any behavioral changes are not likely to result in long-term effects on individuals or leatherback populations. NMFS does not expect any delayed mortality of turtles following their release based on past reported observations from other researchers and adherence to certain protocols identified in the proposed action. Moreover, the proposed action when considered cumulatively with takes authorized under the existing research permits is not expected to result in significant impacts to the population or species. The data generated by the applicant over the duration of the study will provide beneficial information that will be important to the management and recovery of sea turtles. The information collected as a direct result of permit modification issuance will be

available to implement the goals identified in the leatherback Recovery Plan. Therefore, the proposed permit modification would have beneficial effects for leatherback sea turtles. Issuance of this permit modification would not be expected to reduce the numbers, distribution, or reproduction of sea turtles in the wild or reduce the likelihood of survival and recovery of these species. The incremental impact of the action when added to other past, present, and reasonably foreseeable future actions would not be significant at the individual, population, or species level of the affected sea turtles.

The cumulative effects to all other portions of the environment have not changed from that described in the 2009 SEA.

CHAPTER 5 LIST OF PREPARERS

Office of Protected Resources, NMFS, Silver Spring, Maryland

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