

Natural Resources Monitoring Plan for the Interim Visitor Services Program at Midway Atoll National Wildlife Refuge.



Visitors to Midway Atoll National Wildlife Refuge from the cruise ship Pacific Princess listen intently to U.S. Fish and Wildlife Service (Service) staff Bob Dieli as he gives an interpretive presentation on the history and wildlife of the refuge. Service photo, April 2004.

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Introduction

Midway Atoll is an insular possession of the United States administered by the U.S. Fish and Wildlife Service (Service) as a National Wildlife Refuge, encompassing a total of 235,473 ha (Klavitter 2004). It is also the Battle of Midway National Memorial and part of the Papahānaumokuākea Marine National Monument (Papahānaumokuākea) created by President George W. Bush in 2006 that spans across the Northwestern Hawaiian Islands from Nihoa to Kure.

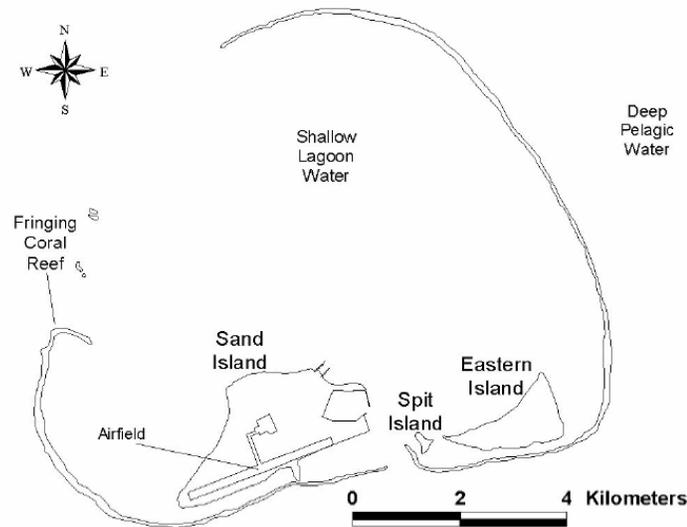


Figure 1. Midway Atoll National Wildlife Refuge.

The Interim Visitor Services Plan (VSP) for Midway Atoll National Wildlife Refuge (Midway Atoll) was approved on May 23, 2007 (Service 2007c). The Environmental Assessment and Intra-agency Section 7 Biological Evaluation have also been recently approved (Service 2006; 2007b). The Inter-agency Section 7 Biological Evaluation is currently under review by the National Oceanic and Atmospheric Administration (NOAA) and is scheduled to be approved upon completion of this monitoring plan (C. Yates, NOAA, pers. comm.). The VSP provides for a small visitor program, scheduled to begin in January 2008. The plan will allow the public the opportunity for education and interpretation of wildlife and historic resources and compatible wildlife-dependent recreation.

The VSP would be overseen by the Service. It was developed by visitor services specialists in close coordination with refuge managers and biologists. The objective of the VSP at Midway Atoll is to provide high quality, compatible wildlife or historic related education and recreational experiences. The VSP would include the following activities:

- (1) Wildlife observation and photography
- (2) Participatory management/research program
- (3) Environmental education and interpretation
- (4) Airport operation (for nonadministrative purposes)
- (5) Nonwildlife-dependent beach use
- (6) Nonwildlife-related sports

(7) Amateur radio operation

In order to prevent potential impacts to the fragile ecosystem at Midway Atoll, the Service will monitor visitor program induced disturbances to key natural resource components found on the refuge. This information will be summarized regularly, so that the refuge manager and wildlife biologist from Midway Atoll and biological specialists from Papahānaumokuākea can evaluate the information and implement visitor program changes when necessary (Service 2007a; 2007c). The purpose of this document is to briefly summarize Hawaiian Monk Seal (*Monachus schauinslandi*) disturbance monitoring (Canja 2000) during a portion (March to September, 2000) of the initial visitor program at Midway Atoll that occurred from 1996 to 2002. This review will allow the Service the opportunity to incorporate portions of the Canja's monitoring methods into this VSP Monitoring Plan. The second purpose is to describe the methodology of the monitoring plan, including instructions on how the data sheet will be filled out based on several realistic examples.

Since it is impossible to monitor all natural resources on the refuge, monitoring will focus on documenting visitor program disturbance to threatened and endangered species (Hawaiian Monk Seal, Green Sea Turtle (*Chelonia mydas*), Laysan Duck (*Anas laysanensis*), and Short-tailed Albatross (*Phoebastria albatrus*)), mortality of migratory birds, discovery of nonnative species, and damage to coral resources.

VSP Monitoring Plan Objective and Monitoring Questions

The objective of this VSP Monitoring Plan is to quantify visitor noncompliance with refuge rules and disturbance to key natural resource components at Midway Atoll. To accomplish this objective, this monitoring plan will provide the framework to gather data to answer each of the following monitoring questions:

Monitoring Questions

- 1) Are visitors accidentally or purposely visiting closed beaches on Sand, Eastern, and Spit Islands?
- 2) Are visitors accidentally introducing nonnative species to the refuge?
- 3) Are visitors or boats used in the visitor program damaging coral?
- 4) Are cruise ships, visitor small boats, and swimmers disturbing whales and dolphins?
- 5) Do visitors disturb Hawaiian Monk Seals?
- 6) Do visitors disturb Green Sea Turtles?
- 7) Do visitors disturb Short-tailed Albatrosses?
- 8) Do visitors disturb Laysan Ducks?
- 9) Does the visitor program cause mortality to migratory birds?

The VSP monitoring plan will enable the refuge to quantify the numbers of disturbances that occur to the selected resources. This will allow the refuge to track disturbances of the visitor program and make changes in how the program operates when needed. In addition to incorporating ideas from Canja (2000) into the plan, some methods from (Curry et al. 2001) have also been used. Curry et al. (2001) explored impacts of wildlife tourism on animal communities in Royal Chitwan National Park, Nepal. Unfortunately, the methodology in the monitoring plan will not allow the refuge to say if statistically significant impacts are occurring to the selected resources due to the observed disturbances. To obtain this type of impact data would require intensive research projects measuring detailed components of the natural resources of concern for several years. Ideally, the data collection would occur prior to the initiation of the visitor program so baseline data without visitor impacts could be established and then research would continue during the program. Alternatively, monitoring could

begin with the initiation of the VSP as long as control sites without visitor access could be studied simultaneously (Acero and Aquirre 1994; King and Heinen 2003). Even with this type of intensive monitoring, it is often difficult to truly show that impacts are occurring. Despite the above mentioned shortcomings, this monitoring plan should be appropriate to determine disturbances to the most important natural resources of the refuge and aid in determining if more intensive, detailed impact studies are needed in the future.

Summary of Hawaiian Monk Seal Monitoring during the Initial Visitor Program at Midway Atoll

Canja (2000) checked for closed beach compliance by visitors and monitored monk seal disturbance during a portion (February to September 2000) of the initial Visitor Program at Midway from 1996 to 2002. Canja (2000) recorded 85 events of potential and actual human/seal interactions (Appendices 1-7). Forty-three of these events occurred on closed beaches, and 42 in public access areas; 28 potential disturbances to monk seals and 14 actual disturbances. Of the 85 events detected on Sand Island, approaches to seals closer than 100 ft in public access areas made up 49% (n = 42) of them, and 19% (n = 8) of those events were approaches between 0-20 ft. On closed beaches, footprints made up 36% (n = 31) of the events detected. It was unknown if a seal was present or not when a person(s) walked or ran by; therefore any disturbance to a seal was unknown. On 11 occasions people were seen on closed beaches and asked to leave, but no disturbance to seals was witnessed. Actual human-seal interactions were exclusively witnessed in the public access areas. Forty-two approach events were documented closer than 100 ft to a seal. Most cases (n = 22) concluded with an unknown level of disturbance recorded, primarily due to the observer not being able to witness the initial approach to a seal. Also documented were 6 causes of no disturbance, 7 level zero disturbances, one level 1 and two level 2 disturbances and finally, 4 of these events caused level 3 disturbances.

Canja (2000) documented the importance of the emergent reef at Midway Atoll as a haul out resting site for Hawaiian Monk Seals and for Green Sea Turtles. For the year 2000, the mean number of seals seen on patrols of the East Reef ranged from 0 to 2.6 seals and on the North Reef ranged from 1 to 5.6 seals. The highest monthly count for seals on East Reef was August (13 total) while the highest monthly count on the North Reef was June (28 total). Ten of the 14 pups born at Midway in 2000 were sighted on the emergent reef. Most of these pups were sighted there 2 months after weaning. However, a few of them were sighted there between 2.5 to 3 months after weaning. Once sighted on the reefs, 70% of them were almost exclusively seen there instead of on the islands. A survey done on January 16 by the Hawaii Wildlife Fund recorded 27 turtles (all juveniles), all seen within sector 2. A similar event took place in February 1999 with sightings of 20 turtles during one survey and 18 during another.

Results by Canja (2000) showed that 42 events (footprints, people, bikes) were observed on closed beaches indicating there is a need to continue to monitor for compliance under the VSP Monitoring Plan. Monitoring will take place with similar methods that will be described in the methods section below. There is also a need to increase the number of refuge signs in place indicating the boundaries of the closed areas and to stress the importance of the closed areas for monk seals and turtles during the orientation.

Canja (2000) also showed that on at least 42 occasions seal disturbance or potential disturbance occurred on the open beaches. These results indicate that it is important to have refuge staff check open beaches for resting seals and turtles prior to visitors using the beaches. If animals are found, highly visible seal/turtle signs can be put in place in the vicinity of resting animals so visitors do not accidentally disturb them.

Finally, Canja (2000) documented the importance of the emergent reefs for seals and even turtles to some extent. This information is important, because visitor snorkel trips will travel to sections of the emergent reef. Refuge staff and tour guides will need to give detailed orientations to visitors before snorkelling activities begin to prevent or minimize disturbance and monitor visitors during the activity.

Methods

Refuge staff will use a data sheet (Appendix 8), a data code sheet (Appendix 9), and sector maps (Appendices 1, 2, 8-11) to document all visitor program information. Data to collect will include: 1) number of visitors, 2) number of cruise ships and aircraft bringing the visitors to the refuge, 3) disturbance to Hawaiian Monk Seals, Green Sea Turtles, Laysan Ducks, and Short-tailed Albatrosses, 4) visitor program induced migratory bird mortality, 5) numbers of nonnative species found during inspections of visitors and their luggage, and 6) damage to coral by snorkelling activities. Disturbance data will be recorded during all scheduled VSP activities, refuge staff surveys, and from incidental events that are reported. Data should be collected when the following occur:

- Ships and flight arrivals and departures.
- Guided tours.
- Refuge staff surveys.
- Nonnative species inspections.
- Incidental observations by other visitors, cooperating researchers, and island residents.

Recording Visitor, Cruise Ship, and other Vessel Arrivals

One person from the refuge staff will be elected to log the arrivals and departures of aircraft, cruise ships, and visitor vessels as well as the number of visitors (including guides) arriving with each type of transportation. It will be the responsibility of refuge staff or approved tour leaders to have a data sheet with them at all times during tours to document what activity is occurring, the number of people that are participating (including themselves and other tour leaders), what species (whales, dolphins, seals, turtles, Short-tailed Albatrosses, and Laysan Ducks) they encounter, and whether or not a disturbance occurs.

Example: At 8 pm on January 25, 2007, a chartered plane (N8E) arrives with 2 tour leaders and 12 visitors. The plane lands safely without any bird strikes or impacts to wildlife. Unfortunately, 2 Bonin Petrels (*Pterodroma hypoleuca*) crash into the airport hangar lights that are turned on for the flight arrival and are killed. The refuge manager alerts his staff that he will fill in the data sheet to document this visitor flight, the total number of visitors arriving to the refuge, and the other appropriate information. He would fill out one line of the data sheet (Appendix 8) using the list of codes (Appendix 9) supplied as shown below:

line no. note	Date	Time Begin	Time End	Observer	Data Type & no.	No. People	Loc. 1	Loc. 2	Re-source	No.	Dis-Turb	Dis-turb Type1	Dis-turb Type2	Action Taken	Result
example															
1Y	25-Jan-07	2000	x	B. Christenson	AF1	14	x	x	BOPE	2	1	4	X	NA	x

Since this was the first entry in this data sheet, a “1” is written in the “line number/note” box followed by a “Y” indicating a note will be written at the bottom of the page which will include the name of the aircraft, “Gulf Stream 1, N8E”. The date is recorded in the next box, followed by the time of the aircraft arrival. Since the

arrival of a flight is basically instantaneous, no time is needed in the “Time End” box, so an “X” is placed here. In the “Observer” box, the first initial followed by the last name of the person filling out the data sheet is recorded. “AF1” is placed in the “Data Type and no.” box which stands for the aircraft. The 1 after AF indicates this is the first line of data on the form associated with this aircraft. If more information was needed, the next line would have “AF2” coded. The total number of 14 people arriving is recorded in the next box. The next two boxes were not used or needed so “X’s” are placed there. In the “Resource” box, “BOPE” was recorded for Bonin Petrel. The number “2” was placed in the “No.” box for 2 petrels, and a “1” in the “Disturb” box which indicates a disturbance has occurred. A “4” is placed in the “Disturb Type1” box which stands for mortality. In this situation “Disturb Type 2” box is not used so an “X” is also placed here. An “NA” is placed in the “Action Taken” box which stands for “No Action” since the refuge already keeps only the minimum number of lights turned on possible at the airport during night flights. Under “Result”, an “X” is placed here since the data is not needed in this case.

Visitor and Baggage Inspections

Before visitors travel to Honolulu for their trip to Midway Atoll, extensive information will be provided to them about the risks of nonnative species to the refuge and instructions on how to clean all their clothes and baggage prior to their trip. Depending on the number of visitors for a particular trip and the number of refuge staff available, all or a portion of the visitors and their baggage will be inspected for nonnative species just prior to departing for Midway Atoll or immediately upon their arrival. Staff will inspect all footwear and field items (backpacks, rain gear, binocular straps, etc.) for nonnative species (insects, seeds, reptiles, rodents, etc.) and record the results of their inspection on the data sheet using the data codes. Any nonnative species that are discovered will be photographed and incinerated the next day to prevent their establishment on the refuge.

Example: At 830 pm on January 25, 2007, a chartered plane (N8E) arrives with 2 tour leaders and 12 visitors. The refuge law enforcement officer is able to inspect footwear and luggage of all 14 people in 20 minutes. He finds two people with small amount of mud on their shoes containing seeds. He uses a brush to brush the mud and seeds off into a plastic bag. He takes digital photographs of the seeds and seals the plastic bag. He will incinerate them the next day so they will not become established on the refuge. The photographs will be given to the refuge biologist for possible identification. The officer would fill out three lines of the data sheet as follows:

line no. note	Date	Time Begin	Time End	Observer	Data Type & no.	No. People	Loc. 1	Loc. 2	Re-source	No.	Dis-turb	Dis-turb Type1	Dis-Turb Type2	Action Taken	Result
example															
1N	25-Jan-07	2000	2010	B. Christenson	IS1	12	MA	x	NNSP	0	0	x	X	NA	X
2Y	25-Jan-07	2010	2020	B. Christenson	IS2	2	MA	x	NNSP	2	1	1	X	NI	X

The line number is written in the first box along with an “N” for no comments added. The date is written in the next box. The start and end times for the inspection in military time are recorded in the next two boxes. The inspector adds his first initial and last name. Under “data type”, “IS1” is used for first data line for this “inspection” event. The next box has “12” for 12 people whose clothing and luggage were clean. “MA” is used in “Location 1” for “Midway Airport”. An “X” is used in “Location 2”, because no data is needed here. Under “Resource”, “NNSP” is used which stands for nonnative species. The next box is “No.”. A “0” is entered since no nonnative species were found for the 12 people. Under the “Disturb” box, a “0” is placed here, because no

disturbance occurred since no nonnative species were discovered. Under “Action Taken”, “NA” is inserted for “No Action Taken”, because there was no need to do anything. Under “Result”, an “X” is used since this data was not taken or needed. The next line is similar, except for a few changes. A “Y” is used after the line number to indicate that a note will be written at the bottom of the data sheet about the nonnative species found. Under “Data Type & No.”, “IS2” is inserted to say this is the second line of data associated with this inspection event. Under “No. of People”, a “2” is written here for 2 people observed carrying nonnative species. Under “No.”, “2” is inserted here for two cases of nonnatives species being discovered. Under “Disturb”, “1” is inserted meaning a disturbance or discovery event was documented. Under “Action Taken”, “NI” is inserted showing that the nonnative species was removed, photographed, and will be incinerated the next day.

Tours

A member of the refuge staff or an appointed tour leader will accompany all visitor tours which include walking, biking, kayaking, snorkelling, etc. The staff member will bring a data sheet with him and make an initial entry on the data sheet to document the tour is occurring, its location, type of tour, start and end time, and if a disturbance occurred or not. More than one line can be used if necessary.

Example: On January 26, 2007, Barry Christenson takes a visitor group of 5 people snorkelling to Reef Hotel. The trip begins at 1 pm and returns at 430 pm. On the way to Reef Hotel, a pod of Spinner Dolphins (*Stenella longirostris*) numbering approximately 220 approaches the boat near the navigational aid range markers in the lagoon, swims in front of the bow of the boat for a few minutes and then continues on its way. No disturbance occurs. At Reef hotel, the boat ties up at a mooring, so a temporary anchor is not needed that could accidentally damage the coral. Barry gives the snorkelers an orientation which includes instructing them not to stand on or touch the coral. At 210 pm the snorkelers see two seals resting on the emergent reef and are careful to stay at least 150 feet from them and the animals are undisturbed. The seals remain on the reef resting the entire time the snorkelers are there. Barry does not attempt to read the seals’ tags to ensure that he doesn’t accidentally cause a disturbance.

Line No.	Date	Time Begin	Time End	Observer	Data Type & no.	No. People	Loc. 1	Loc. 2	Re-source	No.	Dis-turb	Dis-turb Type1	Dis-turb Type2	Action Taken	Result
example															
1N	26-Jan-07	1300	1630	B. Christenson	ST1	6	NR	01	x	X	x	x	x	x	x
2N	26-Jan-07	1325	1330	B. Christenson	ST2	6	LR	x	SPDO	220	0	x	x	x	x
3N	26-Jan-07	1400	1515	B. Christenson	ST3	6	NR	01	CORL	0	0	x	x	x	x
4N	26-Jan-07	1410	1515	B. Christenson	ST4	6	NR	01	HAMO	2	0	x	x	x	x

With this example, a total of 4 lines were filled out to capture all of the resources that were encountered. It is important to document that a snorkel trip occurred (total trip was 3.5 hrs with a snorkel time of 1.25 hrs), consisted of 6 total people, dolphins were seen and not impacted, coral was not impacted, and seals were seen and not impacted. A total of four data lines were used for this snorkel trip: ST1, ST2, ST3, and ST4.

Refuge Staff Surveys and Documented Events

Refuge staff will survey closed and open beaches on Sand Island opportunistically when visitors are present and have free time to explore open areas of Sand Island. The refuge staff will only spend a limited amount of time on the closed beaches so that they will not accidentally disturb monk seals or sea turtles. The staff will not walk the entire length of the South or West Beach on Sand Island or the beaches on Spit or Eastern. Instead, the staff will use binoculars to scan the closed beaches for visitor compliance on Sand Island from Bulky Dump, the South Beach Road, and the Pill Box on South Beach, Frigate Point, Rusty Bucket, and near the Old Seaplane Ramp (Appendix 2). This approach will save time and hopefully prevent disturbance to the natural resources that the refuge is trying to protect. Refuge staff will not approach any seals or turtles closer than 150 ft, unless there is an urgent need (i.e., entanglement).

Surveys will take place each day visitors are on Sand Island and will be conducted on foot, golf cart, or bike, 1-3 times a day opportunistically. The focus of these surveys will be to check for visitor compliance of the closed beach regulation and document any disturbance to seals and turtles. Refuge staff will scan the closed beaches for visitors, footprints leading onto the closed beaches, and approaches by visitors to turtles or monk seals closer than 150 ft. If visitors are sighted on the closed beaches, Refuge staff will immediately inform them of the violation, issue a verbal warning, refresh them of the rules and guidelines, and report the incident to the Refuge Manager and Tour Leader. Staff will also walk the open beaches 1-3 times a day when visitors are on Sand Island to look for seals and turtles and disturbances. If seals and turtles are observed, staff will note the number of animals, location, and any notes. Tags will not be read. When seals and turtles are observed on the open beaches or on the seaplane ramps, refuge staff will place signs at these locations 150 ft from the animals to alert visitors that these animals are nearby. The signs will be explained to visitors during the mandatory island orientation upon their arrival to the refuge (Service 2007a, 2007b, 2007c). When visitors see these signs, they will know that a seal or turtle is close by and they should keep their voices to a minimum and be alert to any animals that may be nearby.

Signs will also be used to re-establish a *no-stopping zone* in sector 19 along South Beach Road (Appendix 2). Human/seal interactions are likely since the South Beach Road (open to visitors) borders a closed beach. The area of particular concern is where the road comes to within approximately 25 ft of beach vegetation where seals are known to rest. Previously, this road enabled people to easily stop and watch a seal if sighted. Some visitors believed that they were not infringing on that seal's habitat, because it was being viewed from a public road. To decrease the potential of disturbance to seals there without officially closing the road, USFWS agreed in the late 1990's during the initial visitor program to allow a permanent *no-stopping zone* to be established on that 150 ft section of the road.

Example: On January 27, 2007, a visitor group of 12 visitors and 2 tour guides are on Sand Island for the day and have an activity for the morning, but will enjoy some leisure time after lunch. They have the option to ride bikes and walk on Sand Island in the open areas. Refuge Manager Christenson goes out on the open beach at 11 am and walks the beach to look for any seals or turtles. He finds two monk seals hauled up on the North Beach straight down from the Clipper House dining facility. He places two temporary seal/turtle notice signs in the sand 150 ft from the seals to alert visitors that these animals are here. At 2 pm Christenson begins a survey of the closed and open beaches using a bicycle to access the lookout areas. He starts at Bulky Dump and scans the closed South Beach with binoculars and doesn't see anyone. Next, he rides his bike down the South Beach Road and looks for any sign of visitors on the closed beach. He scans the beach from the Pill Box, Frigate Point, and Rusty Bucket. While at Rusty Bucket (time 2:20 pm), he notices a set of fresh foot prints going down the beach 300 ft, then they turn around and come back. Since there are no National Marine Fisheries Service Monk Seal biologists currently on Sand Island walking closed beaches to monitor monk seals, he assumes they

must be from the visitors. He makes a note to talk to the visitors and their tour leader at dinner to tell them about his findings and go over the closed beach boundaries. He finishes his closed beach survey at 255 pm. Next, Christenson walks down to the open beach to where the seals and the temporary seal/turtle signs are located. At 310 pm, he observes 11 visitors swimming in the water 500 ft away from the seals and one visitor photographing the seals about 30 ft away from them. The seals lift their heads and vocalize and the visitor retreats (time 315 pm). Christenson quickly walks toward the visitor (now 200 ft from the seals) and gives a verbal warning that they approached the seals too closely and once again goes over the rules. Christenson talks to the tour leader and the visitors at dinner about this issue. Christenson finishes his survey at 330 pm.

line no. note	Date	Time Begin	Time End	Observer	Data Type	No. People	Loc. 1	loc. 2	Re-source	No.	Dis-turb	Dis-Turb Type1	Dis-turb Type2	Action Taken	Result
example															
1N	27-Jan-07	1100	1125	B. Christenson	IE1	0	SBO	01	HAMS	2	0	X	x	x	x
2N	27-Jan-07	1400	1455	B. Christenson	RS1	0	SBC	05	CLBE	1	1	F2	x	AV	VW
3N	27-Jan-07	1510	1530	B. Christenson	IE1	11	SBO	01	HAMS	2	0	X	x	x	x
4Y	27-Jan-07	1510	1515	B. Christenson	IE2	1	SBO	01	HAMS	2	1	AP1	1	DC	VW

In this example, the data is filled in as previously explained using the data codes. The only difference is that the column “Disturbance Type 2” is used because it is necessary to record the visitor disturbance and the how the animal responded. In this case the visitor approached the animal to within 75 ft so a “AP1” is recorded in the “Disturbance Type 1” box and the seal responded by vocalizing which is recorded as a “1” in the “Disturbance Type 2” box.

National Marine Fisheries Service Patrols and Surveys

The National Marine Fisheries Service (NMFS) typically has 1-2 biologists stationed at Midway Atoll for about 6 months each year. They conduct monk seal and sea turtle surveys by walking the beaches of Sand, Eastern, and Spit Islands several times a week. They have a federal endangered species permit for their work and are trained to look for seals and turtles on the closed beaches without significant disturbance. Although the observations are not required, if the NMFS biologists encounter a visitor program disturbance while conducting their surveys and would like to report it to the Service, they will have the opportunity to do so using the Service monitoring form. They will have the opportunity to collaborate with refuge staff on what observations to look for and how to fill out the monitoring form. They will give monitoring forms to refuge staff once a week, unless a disturbance is observed, in which case, the form will be given to the refuge staff that day. This will allow refuge staff to speak with visitors and guides about disturbances on the same day that they are discovered.

Results Format

At least annually, the refuge will summarize the results of the VSP Monitoring Program in a series of tables that answer the original research questions presented earlier in the document (Tables 1-6). Information in the tables and results section will include: 1) the total number of visitors travelling to Midway Atoll each year, 2) total number of flights, cruise ship visits, lagoon boat trips, and kayak trips, 3) the total number of people observed under the monitoring program, 4) the total number of disturbance events documented, 5) number of people

trespassing on closed beaches, 6) number of nonnative species discovered during inspections, and 7) coral, cetacean, Monk Seal, Short-tailed Albatross, and Laysan Duck disturbances.

Table 1. Summary of total number of people visiting Midway Atoll, number of people observed under the monitoring program, and total number of disturbance events documented and where the events occurred.

	Total No. Visitors	Total No. Flights	Total No. Cruise Ships	Total No. Lagoon Boat Trips	Total No. Kayak Trips	No. People monitored	Total No. of Disturb. Events	Action Taken				Result			
								DC	CP	NA	NW	WW	CT	NR	UN
Sand															
Eastern															
Spit															
Lagoon Open water															
Lagoon Reef															
Pelagic															
Total															

Codes: CP = call refuge personnel, DC = direct contact, NA = No Action, VW = Verbal warning, WW = written warning, CT = citation, and NR = no result.

Question: Are visitors accidentally or purposely visiting closed beaches on Sand, Eastern and Spit Islands?

Table 2. Summary of trespassing on closed beaches.

	Footprints < 30 m in length	Footprints > 30 m in length	People found Walking	People swimming	People kayaking Too close	Boating too close
Sand						
Eastern						
Spit						
Total						

Question: Are visitors introducing nonnative species to the refuge?

Table 3. Summary of inspections for non-native species.

	No. visitors to Midway	No. of people inspected	No. of bags or containers inspected	No. of seeds found	No. of plants and invertebrates found	No. of animals found
Total						

Question: Are visitors or boats used in the visitor program damaging coral?

Table 4. Summary of coral damage.

	No. visitors to Midway	No. of people observed	No. of snorkel trips	No. of people standing on coral	No. of people breaking coral	No. of anchoring events on coral

Total						
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Are cruise ships, visitor small boats, and swimmers disturbing whale and dolphins?

Table 5. Summary of disturbance to whales and dolphins.

	No. of people observed	No. of visitor boat trips	No. of cruise ship visits	No. Animals seen	No Disturb	Flee Change Direct	Approach To close	Struck By vessel
Whales								
Dolphins								

Questions:

Do visitors disturb Hawaiian Monk Seals?

Do visitors disturb Green Sea Turtles?

Do visitors disturb Short-tailed Albatrosses?

Do visitors disturb Laysan Ducks?

Table 6. Summary of disturbance to seals, turtles, Short-tailed Albatrosses, and Laysan Ducks.

	No. of people observed	No. Animals seen	No Disturb	Code 0	Code 1	Code 2	Code 3	Code 4	Code U
Seals									
Turtles									
STAL									
LADU									

Codes: Animal merely raised its head or looked at person = 0, Animal vocalized, gestured, or moved less than or equal to 2 body lengths = 1, Animal alerted to person and moved more than 2 body lengths =2, Animal alerted to person and fled = 3, unknown, did not observe = U).

Discussion

The results of the monitoring program will be shared with the National Oceanic and Atmospheric Administration (NOAA) Fisheries Pacific Islands Regional Office and the biological experts working within the Papahānaumokuākea Marine National Monument so they can track disturbances. Their opinions will be used to determine if disturbance is significant or not. The Service will also seek advice from this group on how to mitigate disturbance. Some changes could include: better signage, more effective visitor orientations, altering tour routes, altering visitor activities, increasing inspections for nonnative species, etc.

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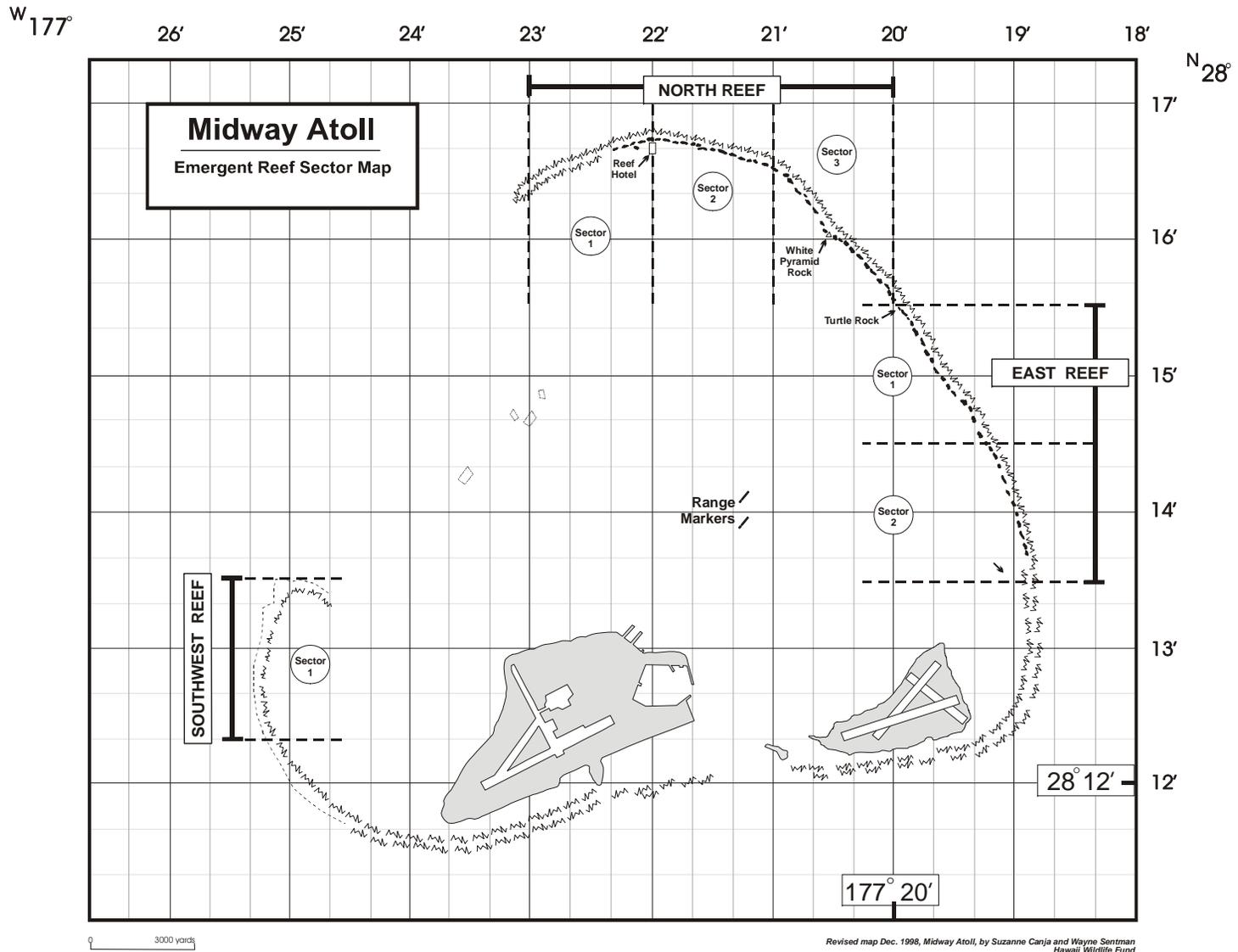
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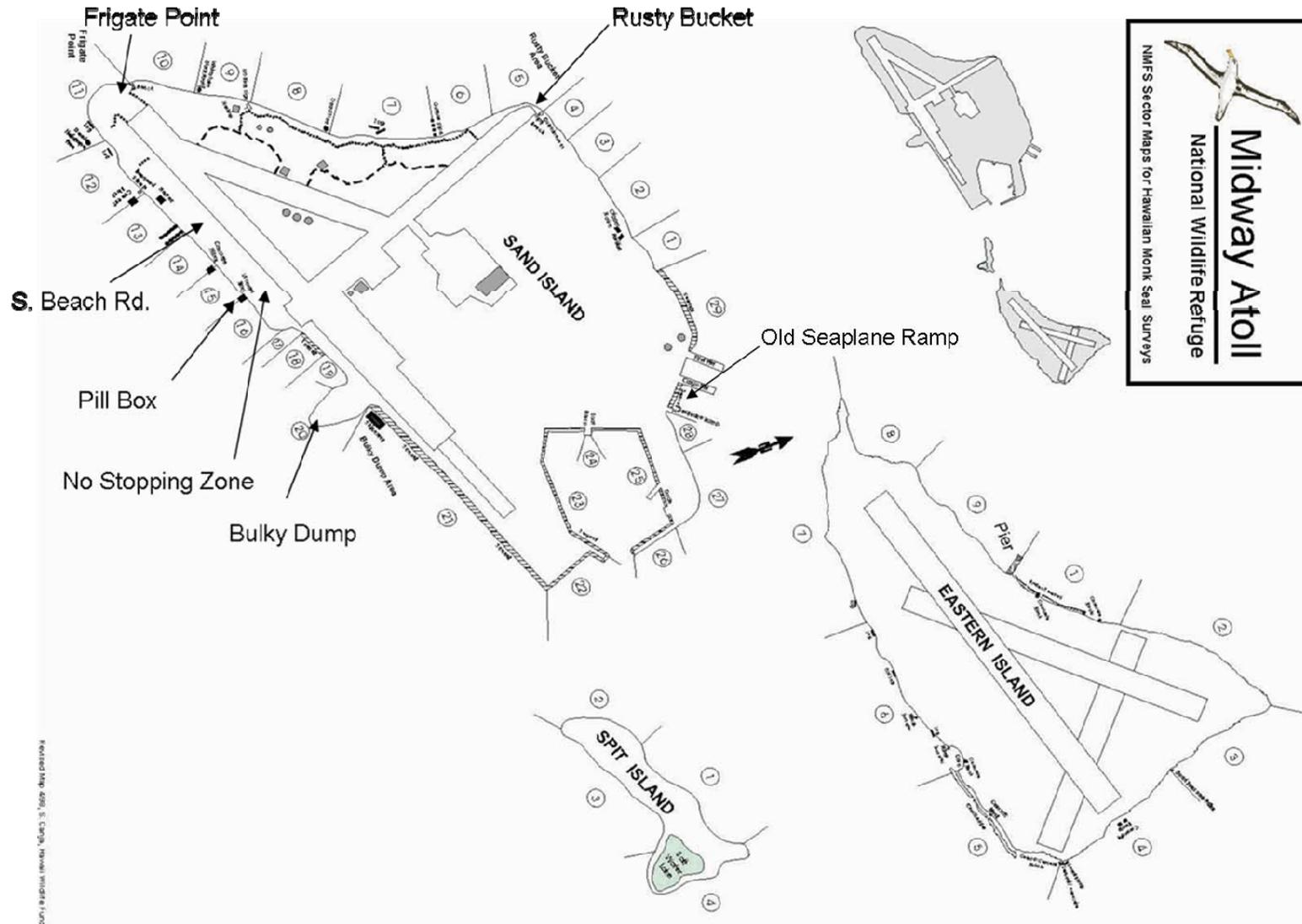
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Appendix 1. Sand Island Monk Seal sector map (Canja 2000).



Appendix 2. Sector Maps of Sand, Eastern, and Spit Islands (Beach Portion).



Appendix 3. List of codes used on Excel spreadsheet defining event types, locations, disturbance level to seals, and actions and results (Canja 2000).

Locations	Type Patrol	Type Event	Action Taken	Disturbance Level to Seal
CP -Cargo pier beach	F -Foot Patrol	FP -Footprints	CLE -Call Law Enforcement	0 -Seal merely raised its head or looked at person.
TB -Turtle Beach	C -Cart	V -Vehicle/tracks	CRB -Call Refuge Biologist	1 -Seal vocalized, gestured, or moved less or equal to 2 body lengths.
BD - Bulky Dump	B -Bike	B -Bike/Bike tracks	CRM -Call Refuge Manager	2 -Seal alerted to person and moved more than 2 body lengths.
BH -Boat House	O -Other	P -Person on Closed Beach	CRP -Call Refuge Personnel	3 -Seal alerted to person and fled into water.
SPR -Seaplane Ramp	People Contact	PM0 -Person 0-10ft from seal	DC -Direct Contact	U -Unknown, did not observe.
GS -Garbage Scow	Seen - total # seen	PM1 -Person 10-20ft from seal	NA -No Action	X -No disturbance.
FPL -Frigate Point	Contact - total # spoke with	PM2 -Person 20-40ft from seal	X -No Data needed	
WBT -West Beach Trail		PM3 -Person 40-60ft from seal	Result	
CT -Cart Trail		PM4 -Person 60-80ft from seal	VW -Verbal warning	
RB -Rusty Bucket		PM5 -Person 80-100ft from seal	WW -Written warning	
PVB -Pavilion Beach		O -Other	CIT -Citation	
			NR -No Result	
			X -No Data needed	

Note on locations:

FPL- Seals are included here if inside the public area or within 100 ft of bench.

RB, WBT- Seals are included here if laying in public areas or within 100ft of public areas.

GS, PVB, SPR, TB, CB, BH- Seals are included here every time they are present.

BD- Seals are included here if laying up high in vegetation or near/on road. Not counted if down on beach below berm.

Appendix 4. Total disturbance events documented by month (Canja 2000).

Total # of Events documented by Month	Open Beaches		Closed Beaches						Totals Events
	Approaches to Seals 0-100ft		Footprints on Closed Beaches		Person on Closed Beaches		Bike Tracks on Closed Beaches		
	Events	# people involved	Events	# of sectors found in	Events	# people involved	Events	# of sectors found in	
March	3	6	3	15	0	0	0	0	6
April	10	17	5	11	1	1	0	0	16
May	2	2	10	17	3	3	0	0	15
June	12	26	8	10	2	4	0	0	22
July	7	17	2	6	2	3	1	2	12
August	8	16	1	1	2	2	0	0	11
September	0	0	2	3	1	1	0	0	3
Totals	42	84	31	63	11	14	1	2	85

Appendix 5. Locations (sectors) of disturbance events on Sand Island (Canja 2000).

OPEN AREAS

Unknown or No Disturbance Events to Seals	Sand Island Sectors Numbers									
	Open Areas	Open/Closed	Closed Beaches					Open Areas		
	1-4	5	5	6-10	11	12-18	19	20-21	Cargo Pier Beach	Seaplane Ramp
Approaches to seals										
0-20ft	4								2	
20-60ft	7			1			1	3	4	
60ft-100ft	2	3					1			
Totals	13	3		1			2	3	6	

Known Disturbance Events to Seals	Sand Island Sectors Numbers									
	Open Areas	Open/Closed	Closed Beaches					Open Areas		
	1-4	5	5	6-10	11	12-18	19	20-21	Cargo Pier Beach	Seaplane Ramp
Approaches to seals										
0-20ft	2									
20-60ft	2	1					1		1	
60ft-100ft	4						2		1	
Totals	8	1					3		2	

CLOSED AREAS

Unknown Disturbance Events to Seals	Sand Island Sectors Numbers									
	Open Areas	Open/Closed	Closed Beaches					Open Areas		
	1-4	5	5	6-10	11	12-18	19	20-21	Cargo Pier Beach	Seaplane Ramp
Footprints	n/a	n/a	11	17	12	22	1	n/a	n/a	n/a
Bike tracks	n/a	n/a		1	1			n/a	n/a	n/a
Persons on beach	n/a	n/a	2	2	2	2	2	n/a	1	n/a
Totals	n/a	n/a	13	20	15	24	3	n/a	1	n/a

Appendix 6. Approaches to seals closer than 100 ft and levels of disturbance documented (Canja 2000).

Approaches to Seals on Sand Island																					
ID	Size	Sex	0 - 10 ft.			10 - 20 ft.			20 - 40 ft.			40 - 60 ft.			60 - 80 ft.			80 - 100 ft.			Sectors of Disturbances
			# Event	# people	Disturb level	# Event	# people	Disturb level	# Event	# people	Disturb level	# Event	# people	Disturb level	# Event	# people	Disturb level	# Event	# people	Disturb level	
RH02	W	F							1	1	N										29
RH04	W	F							1	1	U										2
RH06	W	M	1	2	1																1
RH10	W	M							1	2	U				1	2	0				29
RY08	J2	F				1	1	N	1	1	0				1	2	0				4, 5
RY04	S3	M							1	1	N										4
RY18	J2	M							1E	2	N										29
RQ14	S4	F							1G	1	U										21
RP06	S4	F							1	2	0				1J	2	U				19, 5
RC10	S4	F													1	1	2				19, 5
															1J	2	U				
R100	A	F													1H	3	U	1	2	N	4, 5
															1	1	U				
YG37	A	F													1D	1	U				5, 1
															1	5	3				
RZ00	A	M													1D	1	U				5
BS36	A	M				1	3	U													1
BN44	A	M													1K	2	0				19
KZ96	A	F							1E	2	N				1K	2	0				19, 29, 4
									1	1	U				1H	3	U				
									1a	3	U	1f	1	2	1f	5	2				
R2AC	A	F	1	1	U	1	1	U	1a	3	U	1	1	N	1	7	3	1f	3	2	2, 3, 4, 29
			1	2	3				1b	1	U	1a	1	U	1	1	0				
									1	1	3			U	1b	1	U				
Unknown	J1	M							1G	1	U										21
Unknown	A	U							1	2	U										19
Unknown	U	U																1	1	U	19
Unknown	A	U							1	2	U										4
Unknown	A	U	1	1	U																29
Unknown	A	U										1	1	U							3
Unknown	U	U										1	1	U							6
Unknown	U	U							1	1	N										21
Unknown	U	U							1	3	U										4
Unknown	U	U							1	1	U										29
Unknown	U	U										1	3	N							21

Identical letters next to a number in the event column indicate one event. At times this includes two different seals.

Total number Events: 42
 Total number of ID seals: 17
 Total number of non Id'ed seals: 11

Totals: Level 0 disturbances: 7 Level 3 disturbance: 4
 Level 1 disturbances: 1 Unknown disturbance: 22
 Level 2 disturbance: 2 No disturbance: 6

Appendix 7. Actions and results to disturbance events on public access and closed areas (Canja 2000).

Months	Number of Events	Action Taken				Result			
		DC	CLE/CRP	NA	VW	WW	CIT	NR	UN
March	6	2	3	3	2	0	0	4	0
April	16	8	3	6	8	0	0	8	0
May	15	3	1	12	3	0	0	12	0
June	22	11	0	11	11	0	0	11	0
July	12	5	5	2	6	0	0	5	1
August	11	7	2	3	8	0	0	3	0
Sept	3	1	0	2	1	0	0	2	0
Totals	85	37	14	39	39	0	0	45	1

DC-Direct Contact

NA-No Action

CIT-Citation

CLE-Call Law Enforcement

VW-Verbal warning

NR-No Result

CRP-Call Refuge Personel

WW-Written warning

UN-Unknown

Note: The majority of the NA and NR numbers are a result of documenting footprints on closed beaches.

Appendix 9. Instructions and list of codes used on Excel spreadsheets for VSP monitoring.

Date: Current date (i.e. 10 Oct 2007).

Time Begin: Time observation or event was initiated in military time (i.e. 0800).

Time End: Time observation or event ended in military time. If not appropriate for an end time, use X = data not needed here.

Observer: First initial and last name.

Data type and number: Type in the type of data plus a number. The first entry for a particular event will be “1”. If only one line of data is needed to record the information, then only a “1” is used. If more than one line is needed, then use a new sequential number for each line.

Arrival of Flight = AF1, AF2, AF3..., Arrival of Cruise ship = AC1..., Arrival of sale boat = AS1..., Refuge Staff Survey = RS1..., Refuge Staff Incidental Event, = IE1..., National Marine Fisheries Service seal/turtle survey = NM1..., Inspection = IS..., Flight = FT1..., Walking Tour = WT1..., Cruise Ship = CS1..., Snorkel Trip = ST1..., Boat Trip = BT1..., Kayak Trip = KT1..., Cart Trip = CT1....

Number of People: Write down number of people observed.

Location 1: Sand Island Interior Open Area = SIO, Sand Island Interior Closed Area = SIC, Sand Island Beach Closed Area = SBC, Sand Island Beach Open Area = SBO, Spit Island Beach Closed Area = PBC, Spit Island Beach Open Area because of a guided tour = PBO, Spit Island Interior Closed Area = PIC, Spit Island Interior Open Area because of a Tour = PIO, Eastern Island Interior Closed Area = EIC, Eastern Island Interior Open Area because of a tour = EIO, Eastern Island Beach Closed Area = EBC, Eastern Island Beach Open Area because of a tour = EBO, Lagoon Open Water = LOW, North Reef = NR, East Reef = ER, Southwest Reef = SR, Pelagic = P, Honolulu = HL, On Cruise Ship = OC, On Vessel = OV, Midway Airport = MA, Harbor = HA, Channel = CH, Lagoon near Spit = LS, Lagoon Near Eastern = LE, Lagoon near Range Markers = LR, Lagoon off of North Beach = LN, Lagoon Wells Harbor = LW.

Location 2. Sector number (See Appendices 1, 2, 9 – 11) or building name or location name (i.e. 01).(Beach sectors on Sand Island 01 to 29, Land Sectors on Sand Island 01 to 50, Beach Sectors on Eastern Island 01 to 09, Land Sectors on Eastern Island 01 to 09, Beach Sector on Spit Island 01 to 04, Land Sectors on Spit Island 01 to 04, North Reef sectors 01 to 03, East Reef sectors 01 to 02, Southwest Reef sectors 01 (Appendices 1, 2, 9-11).

Resource: closed beach = CLBE, non-native species = NNSP, coral = CORL, whale unknown Species = WHUN, dolphin unknown species = DOUN, Spinner Dolphin = SPDO, Hawaiian Monk Seal = HAMS, Hawaiian Green Sea Turtle = HGST, Short-tailed Albatross = STAL, Laysan

Duck = LADU, or the 4-digit code for non-listed, migratory bird species (i.e. Bonin Petrel = BOPE, Laysan Albatross (*Phoebastria immutabilis*) = LAAL, Black-footed Albatross (*Phoebastria immutabilis*) = BFAL, Red-tailed Tropic Bird (*Phaethon rubricauda*) = RTTR, Wedge-tailed Shearwater (*Puffinus pacificus*) = WTSH, etc.).

No. (Number of animals, coral, non-native species): Record the number.

Disturbance: Disturbance or discovery event. No = 0. Yes = 1.

Disturbance Type 1 or 2:

X = data not needed here.

Closed beach: Footprints < 30 m length found = F1, footprints found > 30 m in length = F2, person found walking on beach = PW, person found swimming = PS, person found kayaking too close = PK, boat too close to closed beach = BB.

Non-native species: 1 = seeds found in/on shoes, clothes, field gear, 2 = animals (invertebrates and vertebrates) found in/on shoes, clothes, field gear, 3 = Other non-native species such as algae etc. found in/on shoes, clothes, field gear.

Coral: 1 = person standing on live coral, 2 = person observed breaking off coral, 3 = anchor breaking live coral.

Whale: Disturbance Type 1: vessel or swimmers touch animal = AP0, vessel or swimmers approach animal < 75 ft = AP1, vessel or swimmers approach animal 75-150 ft. = AP2, **Disturbance Type 2 (Animal response):** No Disturbance = 0, animal changes direction = 1, animal leaves the area = 2, animal becomes aggressive = 3, animal injured = 4, animal mortality = 5, unknown = U.

Dolphin: Disturbance Type 1: vessel or swimmers touch animal = AP0, vessel or swimmers approach animal < 75 ft = AP1, vessel or swimmers approach animal 75-150 ft. = AP2, **Disturbance Type 2 (Animal response):** No Disturbance = 0, animal changes direction = 1, animal leaves the area = 2, animal becomes aggressive = 3, animal injured = 4, animal mortality = 5, unknown = U.

Seal: Disturbance Type 1: person/vessel touches animal = AP0, person/vessel approaches animal < 75 ft = AP1, person/vessel approaches animal 75-150 ft. = AP2, **Disturbance Type 2 (Animal response):** animal doesn't seem to notice person or merely raised its head or looked at person = 0, animal vocalized, gestured, or moved less than or equal to 2 body lengths = 1, animal alerted to person and moved more than 2 body lengths = 2, animal alerted to person and fled into the water = 3, visitor caused injury = 4, visitor caused mortality = 5, unknown = U.

Turtle: Disturbance Type 1: person/vessel touches animal = AP0, person/vessel approaches animal < 75 ft = AP1, person/vessel approaches animal 75-150 ft. = AP2, **Disturbance Type 2 (Animal response):** animal doesn't seem to notice person or merely raised its head or looked at person = 0, animal gestured, or moved less than or equal to 2 body lengths = 1, animal alerted to person and moved more than 2 body lengths =2, animal alerted to person and fled into the water = 3, visitor caused injury = 4, visitor caused mortality = 5, unknown = U.

Short-tailed Albatross (STAL): Disturbance Type 1: person/vessel touches animal = AP0, person/vessel approaches animal < 75 ft = AP1, person/vessel approaches animal 75-150 ft. = AP2, **Disturbance Type 2 (Animal response):** animal doesn't seem to notice person or merely raised its head or looked at person = 0, animal vocalized, gestured, or moved less than or equal to 2 body lengths = 1, animal alerted to person and moved more than 2 body lengths =2, animal alerted to person and flies away = 3, visitor caused injury = 4, visitor caused mortality = 5, unknown = U.

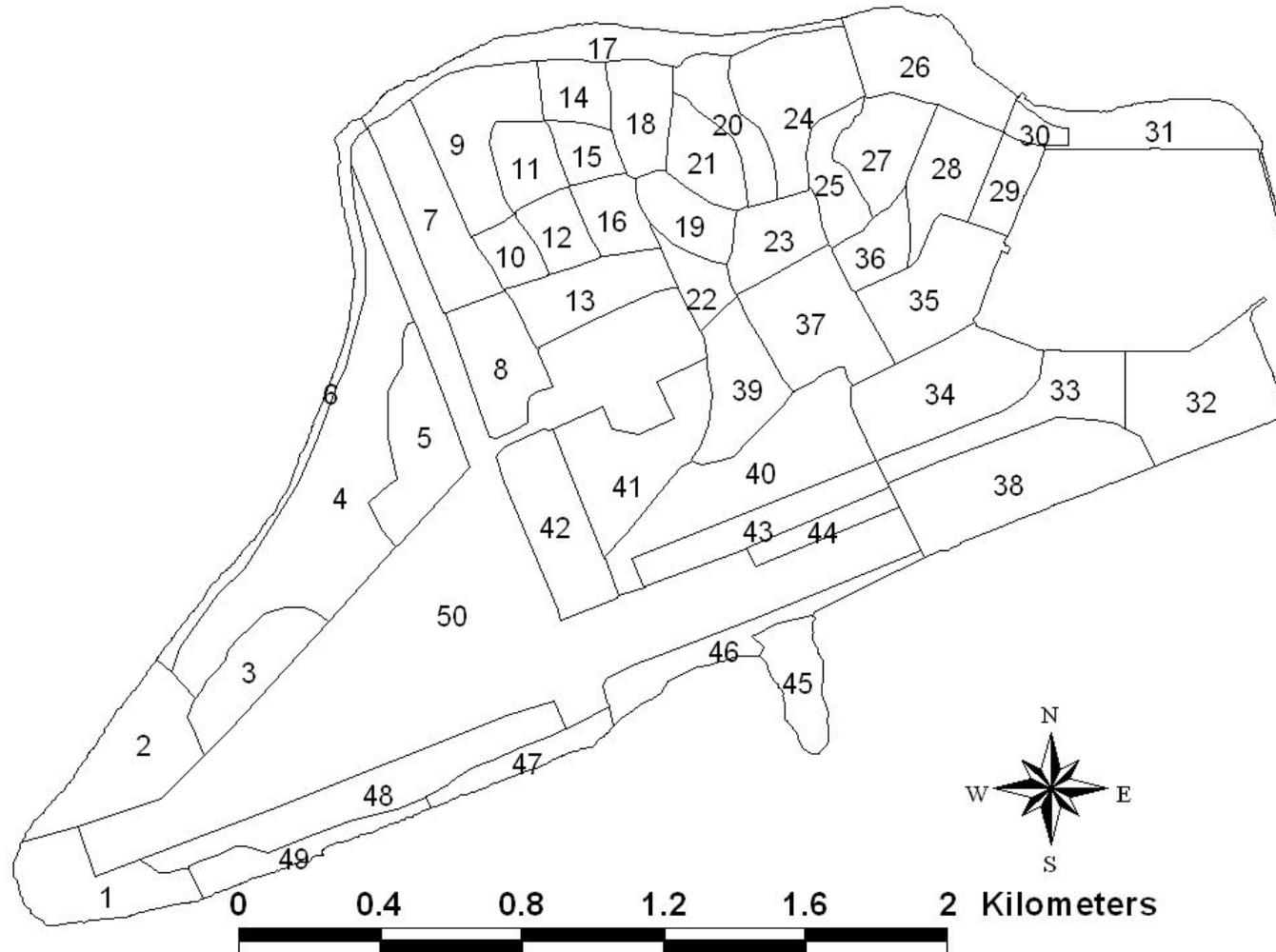
Laysan Duck (LADU): Disturbance Type 1: person/vessel touches animal = AP0, person/vessel approaches animal < 75 ft = AP1, person/vessel approaches animal 75-150 ft. = AP2, **Disturbance Type 2 (Animal response):** animal doesn't seem to notice person or merely raised its head or looked at person = 0, animal vocalized, gestured, or moved less than or equal to 2 body lengths = 1, animal alerted to person and moved more than 2 body lengths =2, animal alerted to person and flies away = 3, visitor caused injury = 4, visitor caused mortality = 5, unknown = U.

Migratory Bird Species: bird injured due to visitor program = 4, bird mortality due to visitor program = 5, unknown = U.

Action Taken: CP = call refuge personnel, DC = direct contact with the visitor when a disturbance is observed, AV = Advise Visitor Group of the Issue at a later time, NA = No Action, NI = Non-native species removed, photographed, and incinerated, X = data not needed here.

Result: VW = Verbal warning, WW = written warning, CT = citation, NR = no result, X = data not needed here.

Appendix 10. Sector Map of Sand Island (Interior Portion).



Appendix 11. Sector Maps for Eastern and Spit Islands (Interior Portion).

