

JOHNSTON ATOLL
NATIONAL WILDLIFE REFUGE

CENTRAL PACIFIC OCEAN

ANNUAL NARRATIVE REPORT
Calendar Year 1993

U.S. Department of the Interior
Fish and Wildlife Service
National Wildlife Refuge System

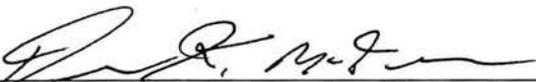
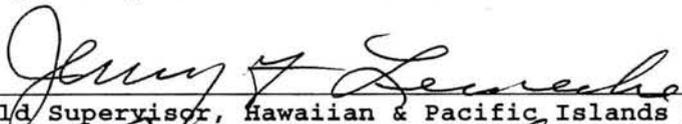
REVIEW AND APPROVALS

JOHNSTON ATOLL NATIONAL WILDLIFE REFUGE

Johnston Atoll, Central Pacific Ocean

ANNUAL NARRATIVE REPORT

Calendar Year 1993

	6/20/96
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	6/27/96
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Johnston Atoll and its four Islands - Johnston Island, North, East and Sand Islands. (P. Lobel)



The first thing arriving personnel see are the military and refuge signs, that indicates the principle agencies in charge. (R. DiRosa)

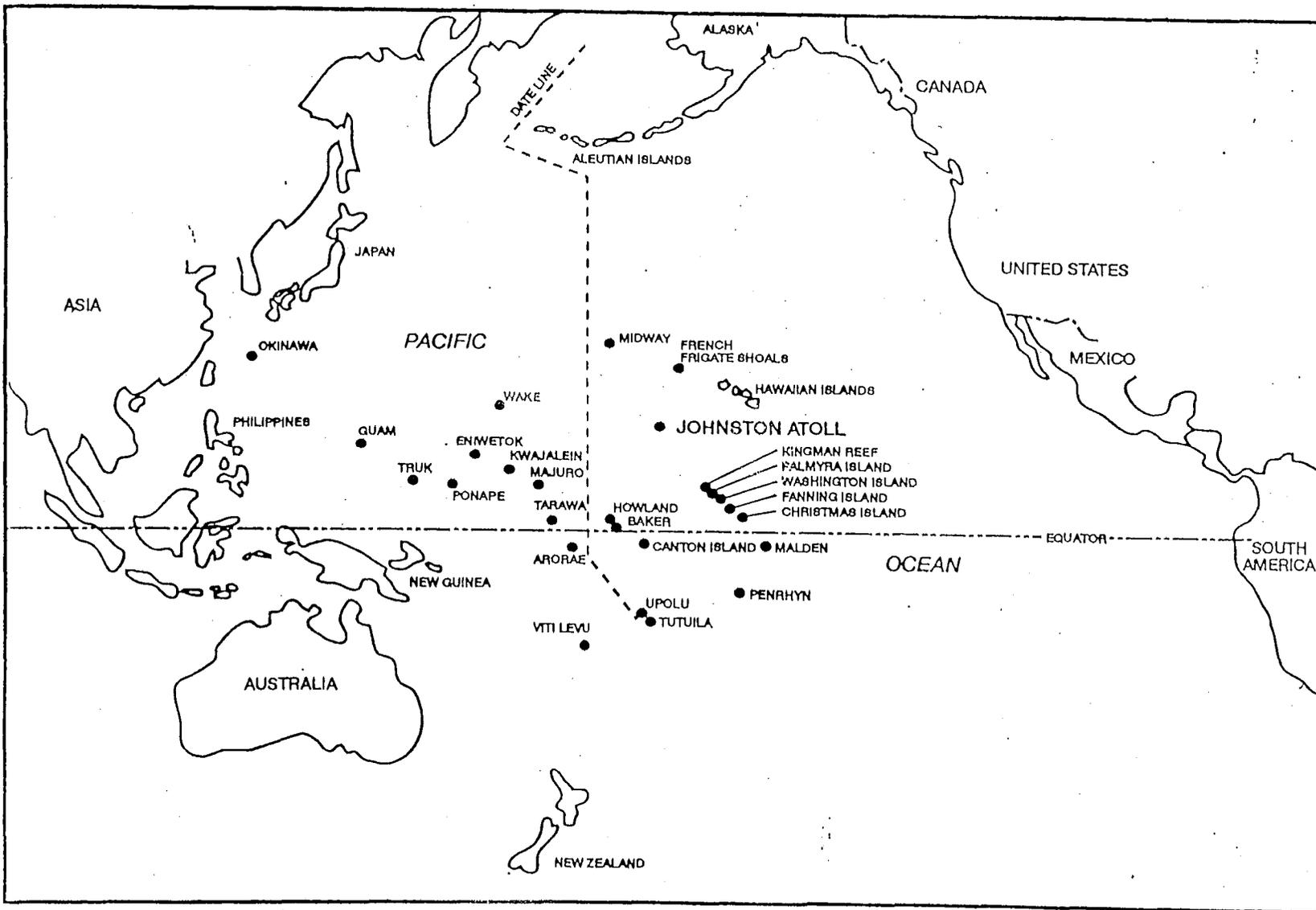


Figure 2. Regional Map

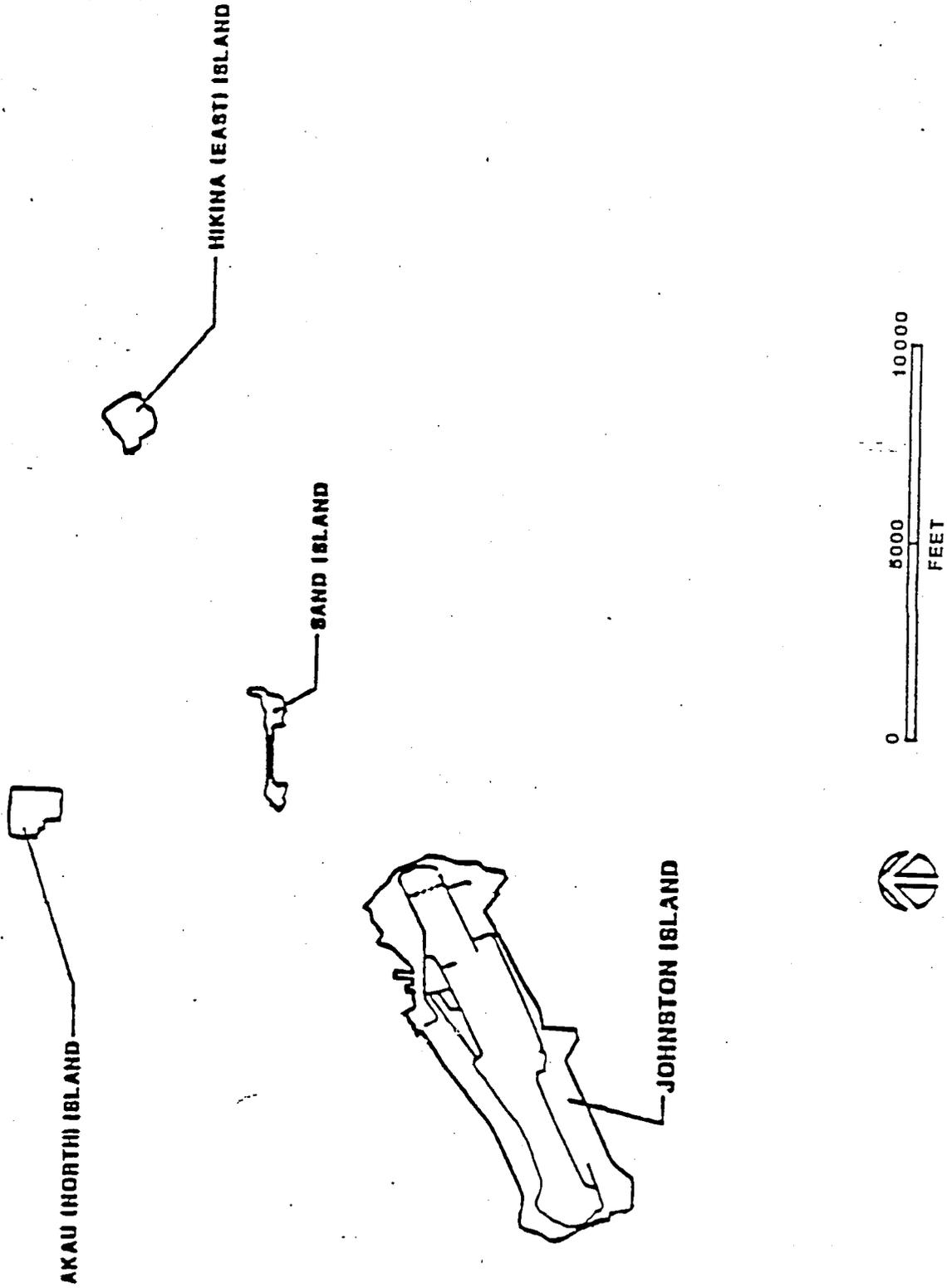


Figure 3. Island Map

INTRODUCTION

Johnston Atoll National Wildlife Refuge is located in the Central Pacific Ocean, 717 nautical miles west southwest of Honolulu, Hawaii and 460 nautical miles south of French Frigate Shoals. Because of the great distances to other islands, Johnston Atoll is one of the most remote atolls in the world. It is the nearest land to over 820,000 square miles of ocean. The Atoll consists of approximately 32,000 acres of coral reef shallows containing four small islands totaling 691 acres. Two of the islands, North and East, were man-made through extensive dredging in the early 1960's. Beginning in the late 1930's, Johnston and Sand Islands were modified and enlarged by dredging and filling, which would continue off and on through the years until the 1960's. Johnston Island is presently inhabited by approximately 1,300 military and civilian contractor personnel while Sand Island was the duty station for 10 Coast Guard personnel who maintained a LORAN C station there until its decommission in July of this year.

Operational control of Johnston Atoll (JA) as a strategic military installation is maintained by the Defense Nuclear Agency (DNA), Department of Defense. The DNA assumed management responsibilities through a permit issued in 1973 by the Air Force for use and occupancy of JA and its facilities. The Air Force had received responsibility for the Atoll from the Navy in 1949. A Memorandum of Agreement between the U.S. Department of Defense (DOD) and the U.S. Department of the Interior (DOI) was signed in 1976 which provided for co-management of the Atoll. The DOI, represented by the FWS, was given primary responsibility and jurisdiction for the protection and preservation of the Atoll's natural resources. The DOD, represented by the DNA, was given responsibility and jurisdiction over the Atoll's human residents and visitors.

The Department of Energy (DOE) maintains a full time representative on the atoll who acts as the Deputy Base Commander but has oversight authority outside of that position. DOE's interest goes back to the 1950's and 1960's when it ran the nuclear atmospheric testing program. It currently is responsible for maintaining the

Atoll's Safe-C status (the ability to return to atmospheric testing) and for maintenance and oversight of Atoll contracts. The DOE is in essence a watchdog over DNA to ensure that DNA does its job of overseeing the island operations contractor, Raytheon Services Nevada (RSN) and other island tenant contractors. All money and contracts go through or come from DOE and are dispersed accordingly. As you might imagine, such an oversight responsibility is not without its local and external conflicts. The DOE has no authority over or oversight function of FWS activities. On the contrary, the Refuge Manager provides information to DOE and/or DNA as the case may be if contractors are not responsive to the FWS.

The U.S. Army uses Johnston Atoll as a storage facility for 6.7% of the nation's stockpile of obsolete chemical weapons. In addition, the Army completed construction of the Johnston Atoll Chemical Agent Demilitarization System (JACADS) in July of 1990 for the destruction of these munitions. It is a hi-tech, computerized, prototype plant utilizing robotics to disassemble the munitions and prepare the components for high temperature incineration. This facility has attracted national and international news coverage and has been responsible for a tripling of the Atoll's population. It has been controversial from day one for a variety of reasons, not the least of which is its potential effect on the environment from stack emissions. Many South Pacific nations, the state of Hawaii and certain environmental groups have been strongly opposed to the operation. The movement of the U.S. stockpile of chemical munitions in West Germany to Johnston Atoll in late 1990 added more fuel to the fire, so to speak. Other major contaminant issues include at least four acres of land contaminated with Herbicide Orange which contain soils with over 450 ppb of dioxin as well as related lagoon contamination, 26 acres contaminated with transuranium elements as a result of three failed nuclear tests in the 1960's and tens of thousands of gallons of subsurface petroleum contamination.

The Refuge was established in 1926 by Executive Order number 4467 of President Calvin Coolidge "as a refuge and breeding ground for native birds." It retained that status even through the major activities of the war years

and the era of nuclear atmospheric testing in the 1950's and 1960's. In 1940 the name of the Atoll was changed from Johnston Island Reservation to Johnston Atoll National Wildlife Refuge. At present, the Refuge is managed as nesting and roosting habitat for 14 species of seabirds, wintering habitat for 5 species of shorebirds, and as habitat for a diverse assemblage of marine animals, including the threatened green sea turtle. One Refuge Manager and one Biologist were stationed on Johnston Atoll during the period of this report. Johnston Atoll National Wildlife Refuge has been identified by the Service as a high priority area for corrective action relating to contaminant issues.

INTRODUCTION

	<u>PAGE</u>
TABLE OF CONTENTS	i
A. <u>HIGHLIGHTS</u>	1
B. <u>CLIMATIC CONDITIONS</u>	1
C. <u>LAND ACQUISITION</u>	
1. Fee Title.	NTR
2. Easements.	NTR
3. Other.	NTR
D. <u>PLANNING</u>	
1. Master Plan.	NTR
2. Management Plan.	3
3. Public Participation	NTR
4. Compliance with Environmental Mandates	6
5. Research and Investigations.	41
E. <u>ADMINISTRATION</u>	
1. Personnel.	46
2. Youth Programs	NTR
3. Other Manpower Programs.	NTR
4. Volunteers Program	46
5. Funding.	46
6. Safety	NTR
7. Technical Assistance	NTR
8. Other Items.	NTR
F. <u>HABITAT MANAGEMENT</u>	
1. General.	52
2. Wetlands	NTR
3. Forests.	NTR
4. Croplands.	NTR
5. Grasslands	NTR

F. HABITAT MANAGEMENT (Cont.)

6.	Other Habitat	53
7.	Grazing	NTR
8.	Haying	NTR
9.	Fire Management	NTR
10.	Pest Control	NTR
11.	Water Rights	NTR
12.	Wilderness and Special Areas	NTR
13.	WPA Easement Monitoring	NTR

G. WILDLIFE

1.	Wildlife Diversity	NTR
2.	Endangered and/or Threatened Species	62
3.	Waterfowl	NTR
4.	Marsh and Water Birds	NTR
5.	Shorebirds, Gulls, Terns and Allied Species	64
6.	Raptors	NTR
7.	Other Migratory Birds	NTR
8.	Game Animals	NTR
9.	Marine Mammals	70
10.	Other Resident Wildlife	NTR
11.	Fisheries Resources	71
12.	Wildlife Propagation and Stocking	NTR
13.	Surplus Animal Disposal	NTR
14.	Scientific Collections	74
15.	Animal Control	NTR
16.	Marking and Banding	74
17.	Disease Prevention and Control	NTR

H. PUBLIC USE

1.	General	75
2.	Outdoor Classrooms - Students	NTR
3.	Outdoor Classrooms - Teachers	NTR
4.	Interpretive Foot Trails	NTR
5.	Interpretive Tour Routes	NTR
6.	Interpretive Exhibits/Demonstrations	NTR
7.	Other Interpretive Programs	76
8.	Hunting	NTR
9.	Fishing	78

H. PUBLIC USE (Cont.)

10.	Trapping	NTR
11.	Wildlife Observation	NTR
12.	Other Wildlife Oriented Recreation	NTR
13.	Camping.	NTR
14.	Picnicking	NTR
15.	Off-Road Vehicling	NTR
16.	Other Non-Wildlife Oriented Recreation	79
17.	Law Enforcement.	79
18.	Cooperating Associations	NTR
19.	Concessions.	NTR

I. EQUIPMENT AND FACILITIES

1.	New Construction	NTR
2.	Rehabilitation	NTR
3.	Major Maintenance.	NTR
4.	Equipment Utilization and Replacement.	80
5.	Communications Systems	80
6.	Energy Conservation.	NTR
7.	Other.	80

J. OTHER ITEMS

1.	Cooperative Programs	NTR
2.	Items of Interest.	81
3.	Credits.	82

K. FEEDBACK

A. HIGHLIGHTS

Hurricane Keoni forced the evacuation of personnel from Johnston Atoll. (Section B).

Arrangements were finalized for Dr. Phillip Lobel (Woods Hole Oceanographic Institution) to establish a marine lab in the abandoned Coast Guard headquarters building on Sand Island. (Section D,5).

Biologist Chris Depkin was hired to replace Biologist Donna O'Daniel. (Section E,1).

Contaminants issues continued to increase in scope and quantity. (Section D,4).

The Army provided additional funds as requested for the operation of the refuge. (Section E,5).

B. CLIMATIC CONDITIONS

Johnston Atoll (JA) has a mild tropical oceanic climate dominated by cooling northeasterly trade winds. Weather observations are taken at the Johnston Island NOAA Weather Station. The yearly mean high temperature was 89° F the yearly mean low was 73°. The rainfall for the year was 18.67 inches, which was 7.85 inches below normal. The most significant weather event was the near hit by hurricane Keoni. On Aug. 14 and 15 all personnel except for a skeleton crew of 100 staying in the safe haven JOC building, were evacuated from JA. The island facilities were made as secure as possible but the worst was anticipated. At the last few hours Keoni veered to the south by 150 miles and brushed by leaving the atoll with rain and 40 to 50 knot winds. Minimal damage was sustained. All personnel were returned by Aug. 18.

TABLE 1. Monthly high and low temperatures and rainfall recorded at Johnston Island during 1993.

Month	Temperature (°F)		Rainfall
	High	Low	
January	85	68	0.47
February	86	69	1.65
March	87	70	0.47
April	88	71	0.68
May	89	72	0.51
June	91	74	1.17
July	92	74	1.34
August	92	73	2.18
September	93	75	2.34
October	91	82	3.28
November	89	71	2.23
December	87	72	2.32

D. PLANNING

1. Master Plan

There is no Master Plan for Johnston Atoll NWR.

2. Management Plan

There is no management plan for the refuge. However, base and refuge regulations govern public actions so that impacts to the resources are minimized. However, there are no data or current studies that can be used to adequately assess marine ecosystem impacts. Adequate data are available for seabirds. Human impacts appear to be negligible on them except for the Coast Guard LORAN tower that has now been removed. A Fisheries Management Plan exists but it is not truly adequate given the increased pressure being placed on lagoon resources and the lack of data.



Johnston Atoll Chemical Agent Destruction System (JACADS) - the controversial facility (and program) that is the heart of Johnston Atoll operations. (R. DiRosa)

The Refuge Manager and Biologist are involved regularly with monitoring the day-to-day operations of the base maintenance and construction contractors and advising them on how to limit their impacts on wildlife habitat. They were also asked to participate in the planning of numerous construction and military activities through the year.

No construction or digging except for emergencies can take place without the authorization of FWS personnel. We must review and sign all internal work orders for such activities to prevent destruction of seabird nest sites and ensure that all considerations have been given to the activities where there are conflicts. The military is required to minimize impacts to wildlife and habitat and mitigate where it must disturb or destroy habitat. Some examples where we get involved are given below. They represent only a small portion of the many activities that involved FWS input to prevent greater conflicts in the future.

The Army conducted two major CAIRA (Contaminants Accident/Incident Response Action) exercises and several smaller maneuvers or exercises. Most of the exercises have to do with keeping the Army personnel (military police and chemical weapons and materials specialists) in a high state of readiness for emergencies. The exercises may involve island personnel only or involve midnight transports bringing large numbers of special operations troops in to simulate a major event. Before each exercise the Manager or Biologist examined the proposed site for nesting seabirds and flagged nest sites or recommended changes to plans or site locations to prevent conflicts. All military personnel were well briefed before each operation to ensure adherence to agreed on procedures. No conflicts resulted from any of the activities which is a credit to the Army's willingness to cooperate and support FWS objectives.

The various contractors were advised and/or monitored on numerous activities including storage of hazardous waste and materials, allocation of storage areas, avoiding destruction of nesting habitat, disposal of construction debris and trash and use of chemicals. The Manager and Biologist make regular checks around the island for improperly stored or deposited debris or activities that are producing or might produce

contamination. Admittedly, this is not their job and the contractors should police themselves, but experience has been a better teacher than expectations. Efforts are being made to change such attitudes and increase the responsibilities of the contractors. There has been some improvement over last year but much more is needed.



JACADS and the necessary support infrastructure and activities leave no doubt that Johnston Island is an industrial complex.
(R. DiRosa)

The Refuge Manager is always included in various committees to provide information or a professional opinion regarding island environmental activities such as recycling, composting of sewage sludge and its disposal, reduction of nontoxic waste and its disposal on the island, etc. This is in large part a result of his being considered an island community leader who possesses authority over many activities and; therefore, resides on the City Council to review many island activities. However, the Manager keeps his nose out of safety, recreational activities, clubs, operations and related decisions that have no bearing or impact on the natural resources of the atoll or the FWS mission. He has been placing more pressure on the military and contractors to be doing what

they are supposed to be doing environmentally and not to expect the FWS to be responsible for solving their problems.



And of course, JACADS and all those support activities need energy. Tens of thousands of gallons of fuel oil and aircraft fuel are imported each month while 100's of thousands of gallons are stored. The potential for disaster is obvious.

(R. DiRosa)

4. Compliance with Environmental Mandates

Contaminants

Contamination, either present, past or future, is a part of life at JA. Being issued and fitted with your very own gas mask adds to the significance of anything new residents or visitors may have heard about JA. Even though JA is the most contaminated piece of soil the FWS manages and despite the storage and destruction of chemical munitions, JA is a far cry from a toxic wasteland as it is often depicted in the media.

Contamination at JA falls into three categories: Past - contamination that we have yet to discover but know the probability is high of finding more, such as old underground storage tanks and lines or existing subsurface petroleum, the

limits of which haven't been determined; present - know contamination and contaminated sites such as the dioxin contaminated, old Agent Orange storage site, plutonium contamination, subsurface petroleum, heavy metals, etc.; future - potential toxic emissions from the JACADS stacks or a chemical accident involving the munitions or a fuel spill from the large storage tanks or a fuel tanker. To complicate the issue, the military contractors either barely have or don't have the necessary skills or equipment to handle certain types of incidents such as a large oil spill. It is somewhat ironic that in the midst of all this contamination, hazardous and many types of nonhazardous waste cannot be disposed of at JA. It must be deactivated if possible or shipped off island to the continental U.S. Temporary or long term storage of some hazardous waste (dioxin contaminated soil and items and chemical weapons) is permitted under existing RCRA permits.

The Manager at JA is extensively involved in contaminants issues by the very nature of his position as somewhat of a watchdog and the fact that there had not been a contaminants specialist until 1992 in Honolulu to represent the Service. The new contaminants specialist based in Honolulu has been overwhelmed with issues. Therefore, the Manager has been a contaminants specialist by default. His knowledge of and involvement in contaminants issues probably far exceeds that of any refuge manager in the continental U.S. (CONUS). Also, the previous biologist who had the functions of a manager was the only "environmentalist" on the island for a long while and had to assume some responsibilities that would not have been acceptable for a manager at a more traditional refuge.

This is a somewhat precarious position since the Service provided little to no guidance in this area until the arrival of the contaminants specialist in the Honolulu Ecological Services office. It had been left up to the Manager to determine liability and, in some cases, accept responsibilities and potential liabilities existing from some activities. The lack of interest and/or ignorance of the Honolulu and Regional Offices about what was (and is) occurring at JA was very surprising and distressing.

In late 1990, the current Manager began the process of defining liability and responsibility for certain activities

and turning those activities over to the responsible parties. In one case, he had to actually begin training the responsible party to do the job. It is a long story about the efforts involved and time spent in doing this. There has been considerable change over the last few years, and the Manager is not regarded as the adversary he once was since a lot of support has been given to his position. The Army and especially DNA have become much more responsive and cooperative.

For a review providing greater depth and history of the following items, refer to the 1991 and 1992 Annual Narratives. Without the necessary background knowledge of many of these areas, the reader can easily jump to erroneous conclusions or improperly question the decisions of those with more experience or knowledge. If the reader has major questions about any activities or their seeming incongruities and decisions that were made then read past documents or call the Refuge Manager.

In 1993, a document was created by the Base contractor that greatly simplified everyone's life who was concerned with contaminants issues. It was the Johnston Atoll Installation Restoration Program Management Action Plan. A much needed and long-time-in-coming document that is a major tool used to provide centralized, coordinated management for many environmental activities on JA. The document concentrates on sites and actions falling under RCRA. Environmental planning information contained in the document will allow it users to compare the installation as it presently exists to the way it should exist under full restoration. The identification and resolution of issues that separate the two is the goal of the restoration strategy; the master schedule will serve as the manifestation of the strategy planning process. The Management Action Plan also identifies issues that impact progress in achieving environmental goals and provides a resolution schedule. The Plan is a living document and subject to change as actions mature or new information is received.

The following is a summary of all major contaminants activities that occurred and which involve the FWS at JA:

Outfall 008

Outfall 008 is the outfall for noncontact cooling water for the Johnston Atoll Chemical Agent Demilitarization System (JACADS) facility. It flows directly into the lagoon and has the potential to affect green sea turtles and/or their habitat and lagoon sealife in the area. The NPDES permit specifies the parameters within which the discharged water can vary from the ambient temperatures. In-the-water data collection points continuously monitor the ambient temperatures in several areas.



The 008 Outfall area has been a source of numerous NPDES violations since JACADS began operating. (R. DiRosa)

Compared to the last two years the manager had little involvement with the 008 Outfall of the NPDES permit. After PMCD accepted full responsibility for the permit and monitoring activities, the Manager was able to withdraw except for occasional backup for underwater sensor extraction and data review. As previously discussed in prior year narratives the NPDES permit was in violation on a number of counts. Almost all violations were corrected except for the need to do real time monitoring of the water adjacent to the outfall. Monitoring was still being accomplished by on site sensors

that had to be extracted at intervals and the data reduced to determine if any problems occurred. Per recommendations and supporting data from the Refuge Manager and Dr. Lobel of WHOI, PMCD submitted to EPA a request to change the permit requirements. Enough information on water temperatures and changes related to tidal fluctuations and good real time monitoring of the effluent temperatures has allowed us to adequately evaluate the situation. EPA is expected to accept the proposal to delete the expensive off shore monitoring of the water temperature adjacent to the outfall in favor of real time monitoring of the effluent before it is discharged. The ambient water temperature sensors located in other areas will remain.

Also, the requirement that the discharged effluent cannot raise the water temperature in the discharge area by more than 1 degree will be changed to allow for a 3 degree variance. This takes into account temperature changes caused by solar heating and tidal fluctuations. Any change in effluent temperature can be correlated to water temperature change in the discharge area. Baseline data on organisms in the area have been gathered so effects can be determined should there be a high temperature discharge of water.

Storm Water Discharge Outfalls

Johnston Island has over 70 storm water outfalls, some of which flow from areas classified as industrial and roads and airfield tarmac. New EPA regulations in 1992 required that all outfalls (not just from industrial areas) be classified and evaluated as to their potential for discharging contaminants. To insure that FWS interests were protected the Manager attended meetings and reviewed documents related to compliance with the new regulations and monitored storm event discharge monitoring. The responsible party for each outfall was identified and each outfall was tested on a regular basis during significant rainfall events.

Sewage Discharges

Johnston Atoll has a sewage treatment plant that treats the island's sewage and separates and retains the sludge. Raw sewage was discharged for decades prior to the completion of

the plant in 1991. The uncontrolled discharges significantly impacted the sealife in the area and resulted in the killing of large amounts of coral and the growth of large algae communities on the south side of Johnston Island. However, the area is open to the sea and receives strong flushing action, and human recreational areas are located on the other side of the island so there was no human health risks. The plant is inadequate for the number of personnel on the island and discharges improperly treated sewage on a regular basis, especially during heavy rains and malfunctions. Refuge personnel monitor the operations and sealife in the area to detect any serious problems or long term changes.

The DNA began exploring corrective actions last year that will in some way expand the capacity of the plant. By the end of 1993 tests to find a solution were in the negotiation and funding stages. Possibilities range from adding different "bugs" at maybe different treatment stages to the very expensive option of physically expanding the plant.

RCRA (RESOURCE CONSERVATION AND RECOVERY ACT)

The number of contaminated sites, better known as Solid Waste Management Units (SWMU), that fall under this act are about 16. The number was reduced this year due to the consolidation of all the subsurface oil contamination sites into one SWMU. The number of SWMUs could increase in the future. A process of consolidating information about the sites and identifying assessment needs and requirements began in 1992. It is expected that all identified sites are subject to investigation and possible corrective action measures as required by the EPA. From an environmental contaminants standpoint and potential to affect the refuge resources the two most important sites (exclusive of JACADS) are the 4-5 acre former Herbicide Orange storage area and the subsurface petroleum contamination. The heavy metal contaminated ash pile from the burn pit is a not too distant third.

Agencies at JA have either or both class A and B permits. The DNA is storing dioxin contaminated earth and materials from the partial cleanup of the old Agent Orange storage area. It cannot be shipped off island since there is no EPA approved process for the disposal of waste contaminated with dioxin,

except for on site incineration. Regulatory requirements and costs make this prohibitive, which is just as well since there is an additional four acres, perhaps to a depth of 30 inches or more, of contaminated soil that must be remediated. The Army is storing and destroying hazardous waste (obsolete chemical munitions) at JA.

The biggest concern from the environmental perspective, especially from Greenpeace, has been the potential impact from possible pollutants being discharged from the stacks of JACADS. The chemicals in question are the organochlorines, dioxins and furans, which could be produced from the burning of mustard gas. The military assures us that virtually nothing but steam escapes from the stacks and JACADS complies with all EPA regulatory requirements, especially TOSCA (Toxic Substances Control Act). EPA inspectors have come and gone at a steady stream since commencement of operations. Nonetheless, Dr. Lobel from WHOI was contracted to study the marine resources for potential effects and gather related baseline data on fishes and, if possible, the microlayer. An important part of his work involves trying to determine what contaminants, mainly furans and dioxins, were present in the marine environment prior to JACADS. This would prevent JACADS from being implicated where it is not at fault. The most obvious problem is the dioxin contamination of sediments and some reef organisms in areas adjacent to the Agent Orange site where contamination continues to seep into the lagoon from the contaminated site. Refuge staff assisted Dr. Lobel with his fish and sediment collections and preparation when necessary. The Manager reviews and comments on all documents related to RCRA and other contaminants issues for the Service.

There are both RCRA Part A and Part B Permits issued to the Defense Nuclear Agency and the Army at Johnston Atoll. The permits involve the storage and destruction of hazardous waste (Army-chemical agents) and the storage of hazardous waste and releases of hazardous waste and the constituents of hazardous waste from several of the 16 identified SWMUs (DNA). SWMUs are sites of contamination that have been identified as needing remediation. The Refuge Manager is in some way involved in almost all aspects of RCRA activities since the waste or remediation activities are affecting or have the potential to affect, in some cases severely so, the refuge's natural

resources. The Manager reviewed and commented on several major documents related to RCRA activities this year. The most noteworthy being the extensive JA Installation Restoration Program Management Action Plan.

Solid Waste Burn Pit

The DNA and the Base Contractor became much more serious in 1992 about considering options for disposing of the contaminated ash. Several options were developed and offered to the Refuge Manager for consideration but were eventually rejected, at least for the time being. They ranged from extracting the lead from the ash on site, to encasing it in a polymer like substance or concrete and placing it on the artificial reef or incorporating it in construction concrete if tests prove the lead would not leach. However, dumping on the artificial reef is itself a very costly alternative. Examination of the issue continued in 1993 with consensus leaning heavily toward encasement in concrete. The only physical action taken to date has been to stabilize the ash. The contractor sprayed sealant over the ash pile in 1992 to prevent the wind from blowing any more of the contaminated ash into the lagoon.

It has been pointed out to the Base contractor that the new segregated ash (clean) pile may not be as pure as has been indicated in contaminants documents. The area is not fenced to prevent illegal dumping and the types of materials placed in the large dumpsters throughout the island are not known or segregated. A variety of chemicals and compounds of concern have been discovered in the past. The contractor has indicated there are plans to correct this. It must be done when the new incinerator is built anyway. See Clean Air Act.

Off Shore Battery Disposal Site

On Earth Day in April the refuge staff and Base command made a surprising discovery in the marina boat basin. We knew the area contained a lot of debris including at least a small number of batteries. A cleanup of the area by SCUBA divers would make a good Earth Day activity and the Base Operations Officer, Lt. Col. Sutton, volunteered to organize it. What we found surprised everyone. On just one side of the MIKE boat



Earthday volunteers assisted in picking up the batteries and some debris. (R. DiRosa)



A large number of batteries was discovered around the old Navy pier and MIKE boat docks. (R. DiRosa)



The volunteers picked up fifty-five car/boat batteries. The batteries were intact so little, if any, lead contamination is expected. (R. DiRosa)

pier (old Navy Pier), 55 lead/acid batteries were recovered. An additional 16 batteries were car/boat batteries but some were much larger. The Refuge Manager documented the cleanup activities. A cursory survey of that area and the opposite side of the pier and Point House area indicated that there were additional batteries present.

During September, 14 lead/acid car batteries were pulled from the opposite side of the pier. All sites were marked. Additional batteries remained within the whole area and a definitive survey is needed. On the basis of these recoveries DNA proposed the boat basin as a new SWMU and the site most likely will be listed as a RCRA site.

DERA (DEFENSE ENVIRONMENTAL RESTORATION ACT)

This is the Department of Defense's equivalent of CERCLA (Comprehensive Environmental Response, Compensation and Liability Act, also known as the Superfund) which addresses cleanup of contamination on DoD lands. Contaminants issues that are being funded by this are the old Herbicide Orange

(Agent Orange) Storage Site and the subsurface petroleum contamination. The Air Force is the responsible party for both of the SWMUs. Money has been appropriated by the Air Force to begin remediation of the sites. Money was appropriated in the 1980's to determine if dioxin contamination from the Herbicide Orange site had reached the lagoon and bioaccumulated in organisms.

Former Herbicide Orange Storage Site (Dioxin Contamination)

By far the most controversial issue is the dioxin contaminated old Agent Orange storage site comprising about four or so acres. A short history of the site is in order. Approximately 1.37 million gallons of Agent Orange were removed from Vietnam at the end of the war and stored at JA. It was not properly stored or monitored by today's standards, and many of the barrels leaked or were mishandled and product spilled. The Agent was later destroyed at sea in the Dutch incinerator ship, Vulcanus.

Studies of soil within the site demonstrated contamination as high as 449 parts per billion (ppb) and perhaps as deep as at least 30 inches. In 1987 the previous biologist/manager developed a plan for monitoring the infiltration of dioxin into the lagoon. Subsequently the Air Force accepted and funded it. The biologist began sample collections of organisms in 1989 for lab analysis. A number of organisms were found to contain detectable levels of contamination.

The new Manager and Biologist continued the sampling procedure soon after their arrival in 1990. Even though the Manager continued the sampling and testing he felt very uncomfortable with the project because there was no good written methodology or protocol for it; work was being done strictly by verbal instruction that the departing biologist had given the present Manager; past organisms had not been properly labelled and there did not seem to be good written justifications of why various organisms had been selected for sampling; and apparently the project had never been reviewed by appropriate authorities or specialists such as ichthyologists, contaminants specialists and/or toxicologists, or higher level FWS personnel. The Manager perceived a certain degree of liability for himself since he was not a specialist in this

area and past documentation was so poorly handled. The Service also was at fault for having shown such a lack of interest and poor oversight in this and other contaminants issues.

Therefore, the Manager enlisted the aid of Dr. Lobel, an ichthyologist from WHOI with a background in marine contamination. He agreed to help at no cost and he and the Manager developed a rationale for sampling certain marine organisms based on their life histories. However, the Air Force funding to continue the sampling and testing was running out and only allowed for the testing of one more batch of collected samples. WHOI possessed the resources to sample specimens for dioxin and furans and agreed to do additional samples analyses during 1992 and seek funding from the Army as this had special relevance to JACADS.

Being able to qualify, and quantify if possible, the limits of dioxin contamination in the lagoon is more important to the Army than it might first appear. The biggest controversy over JACADS, outside of a possible chemical release, is potential contamination from the stack emissions that may contain dioxins and furans. Thus, it is to their advantage to develop baseline data (even belated data) to document any existing contamination from these toxins. By the end of the year the Army had agreed to fund further studies designed by Dr. Lobel to do just that. The Manager was removed from the liability equation; however, he would continue to provide support to Dr. Lobel for sample collections and review of documents.

Assistance was provided to Woods Hole Oceanographic Institution in 1993 with the collection of fish and sediment samples for dioxin and heavy metal analysis. Numerous meetings with the Air Force (responsible party), DNA, WHOI, EPA and others were attended by the Manager and the Honolulu FWS contaminants specialist. The discussions covered remediation options for the site, limits and levels of contamination of lagoon resources, risks to humans and effects on refuge resources. The effort was increased to determine the risk, if any, to human health from the consumption of locally caught fish and, thereby, attempt to limit agency liability by taking appropriate actions. Numerous articles, papers and documents were reviewed and commented on by the Manager. The potential risk to human health through consumption of lagoon fish has

made this a potentially complicated and volatile issue. The Manager works closely with the military commanders to ensure good communications and information dissemination to limit potential liability.

The Refuge Manager had called into question the current regulations regarding no fishing within a certain distance from the contaminated site. The preliminary sampling had shown that marine sediment and organisms were contaminated but the limits and degree of contamination had not been determined. Therefore, the no fishing boundaries were quite arbitrary and were not based on known human health risks and good research data. Furthermore, dioxins and furans had recently been detected in samples collected by the Manager and Dr. Lobel in remote areas of the atoll. This clouded the picture even more. The risks to humans from consumption of marine organisms could have been less or much greater than assumed. Potential liability for the FWS and DNA from failure to have acted in a timely and/or appropriate manner was obvious.

The FWS contaminants specialist in Honolulu used his considerable contacts and persuaded the Agency for Toxic Substances and Disease Registry (ATSDR) to become involved and examine the matter. The Center for Disease Control (CDC) also examined the data from past analyses of fish and sediment samples. The CDC examined the results of recent analyses of fish tissues taken from fish sampled at remote atoll locations. It concluded that the dioxins in the tissues of the fish collected at the remote sites were of a different congeners than those at the Agent Orange storage site. That is, those fish were contaminated by dioxin from some other source, most likely other island activities. That is understandable given the ubiquitous nature of dioxins and the activities that have occurred at JA. The degree of contamination found in some fish taken from the remote sites was very low and did not appear to present a risk to fishermen.

ATSDR examined all available data regarding the history of the site, analyses of organisms and known risks to humans from dioxin. A representative also examined the fishing habits and fish consumption habits of fishermen at JA. Based on its examination of existing data and the feeding habits of humans

at JA, ATSDR concluded that the current fishing restrictions around the dioxin contaminated site were adequate, and there did not appear to be a risk to human health. However, since ATSDR based its analysis on extant data only there was still a degree of uncertainty regarding the issue, and ATSDR recognized the need for more information. The Air Force (responsible party for the SWMU) agreed to fund a more elaborate sampling regime around the site to determine the limits and degree of contamination in the sediments if possible. Dr. Lobel of WHOI will be doing the work. This work will help in developing an ecological risk assessment.

More discussions were held in 1993 by the affected parties regarding site remediation of the contaminated Agent Orange site. No firm resolution for remediation of the site was reached; however, some recent changes in regulations by EPA may make the remediation efforts much easier. It now appears that the possibility of using sunlight to break down the dioxin in a "farming area" type operation is very real. It also would save a considerable amount of money. Previous possibilities for remediation involved everything from temporary measures like capping the site with concrete or digging up eight or so acre feet of contaminated soil and storing it in a large bunker until a special incinerator is built. Virtually all possibilities considered were economically and/or technologically infeasible or regulatorally impossible or offered no long term solutions. And no, JACADS can not be used to incinerate the soil for technical, environmental and political reasons. Nice thought though.

It appears that most, if not all, of the dioxin entering the lagoon is from surface runoff and not through subsurface migration. It was agreed in 1993 that the Air Force will fund better surface containment measures to stop soil and water runoff.

Subsurface Petroleum Contamination

In 1991 the Base contractor, RSN, began a drilling project to determine the quantity of subsurface petroleum contamination. The contamination resulted from numerous underground storage tanks and pipeline leaks and surface spills over about a 45

year period. Estimates of the amount of oil present and degree of contamination continued to fluctuate. It is currently estimated that perhaps as much as 180,000 gals. of fuel have leaked or spilled and contaminated about 4.5 million cubic feet of soil. Evaluations of the contamination continued in 1993. Eighty-five monitoring wells have been installed around Johnston Island. Areas of no suspected contamination have not been tested. Lack of contamination is assumed based on fairly well known past and present industrial practices but this has not been proven.

Remediation actions began in 1992 and continued in 1993. Fifteen product recovery wells have been drilled to aid in remediation. Many of the wells were originally for detection and determination of the extent of subsurface oil contamination. Skimmer pumps have been installed on 12 of these wells. Each pump does not pump out large quantities, but over a period of time the numerous wells may be able to achieve a reasonable degree of extraction to at least aid in bioremediation attempts. The operation is somewhat complicated by the effect the subsurface tidal flow has on raising and lowering the subsurface oil deposits. Migration of the oil has been detected but it is small and has resulted in only one small chronic leak into the lagoon.

Bioremediation is being explored as another cost effective option to dealing with the problem. Analysis has shown that bacteria (oil eating "bugs") are present in the coral "soil" and have been working on the fuel. Plans are to actively inject oxygen or install passive aeration systems and maybe inject additional bacteria to speed up the process. This process is still in a test phase and the project will be considered such, but it has promise.

UNDERGROUND STORAGE TANKS (UST)

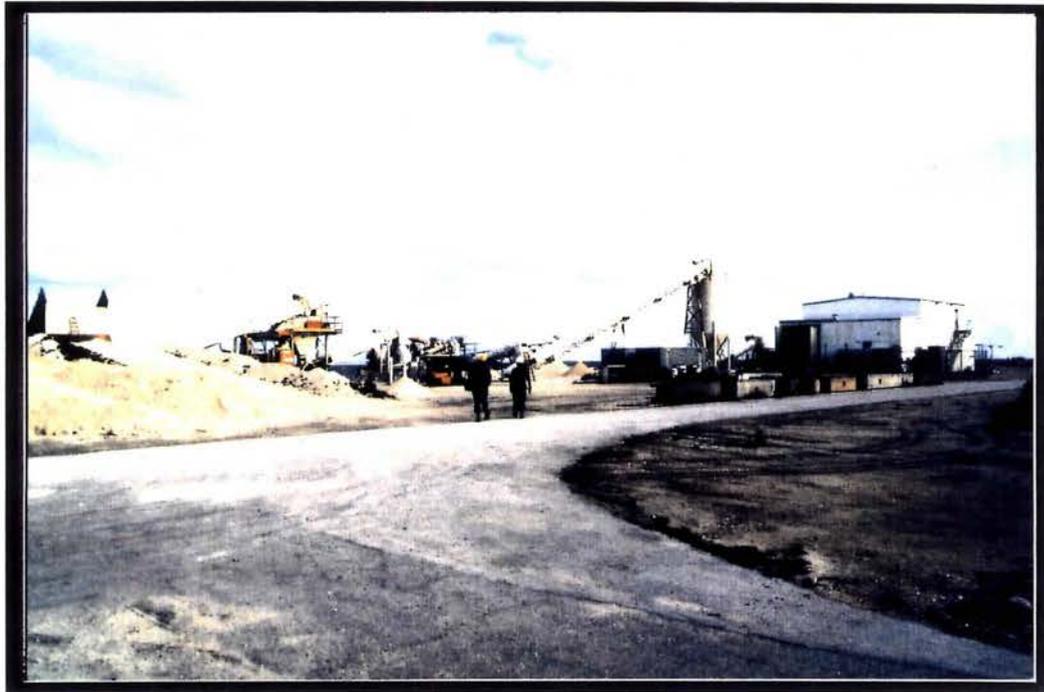
There were no USTs discovered this year. However, there were two old underground fuel lines containing about 1,000 gals. of fuel discovered during construction operations. The Refuge Manager was notified of the intent to insure the lines were sealed and then to leave them in place. He refused to sign the work order and indicated that they now had two essentially very long, fuel containing USTs and probably should treat them

as such. The fuel was removed, and the soil was inspected and tested and found to be clean. The lines were reburied.

PLUTONIUM CONTAMINATION AND SITE REMEDIATION

The contamination is the result of three rocket explosions (one on the launch pad and two in the atmosphere) during the atmospheric nuclear test launches of the 1950's and 1960's at JA. The detonations were not nuclear. Thus, the contamination that resulted was the scattering of radioactive raw plutonium about the islands and launch site. The contamination (other than that which landed in the lagoon) was identified and removed at a later date to be stored in a 26 acre site that contained the launch pad. Contaminated sediment adjacent to the site (much of it had been bulldozed into the lagoon immediately after the launch pad explosion) was retrieved by dredging and also stored on the site. The flesh of lagoon fishes was sampled in the early 1980's to detect any potential radiological contamination. Nothing greater than what could be expected from background radiation was discovered. The risks to humans entering the site are minimal and depending on the nature of the work, only monitoring in and out is all that is required. Plutonium is a alpha particle emitter. Generally, but depending on the nature of the work, no protective clothing is required. We coordinate closely with the project operators because of the large number of Red-tailed Tropicbird nests occurring in the bushes within the site each year. There were 80 tropicbird nests within the site in 1991. That number has been steadily reduced as the site has undergone remediation. By the end of 1993 all remaining bushes that could provide nest cover had been removed to prevent occupancy by nesting birds which would cause conflicts with planned 1994 remediation work. It is expected to take no more than two more years to complete the operation.

Cleanup activity at this site has been funded by DNA as a line item in the budget and does not fall within a special act or fund. It has been deemed to be significantly important a project to warrant such treatment. It is just as well since there is no doubt that significant pressure would have built by now to force the remediation work since it is technically a hazardous waste site. The operation is supervised by an



Plutonium contaminated area and remediation facilities.
(R. DiRosa)



The old Herbicide Orange storage area that is now contaminated
with dioxin. (R. DiRosa)

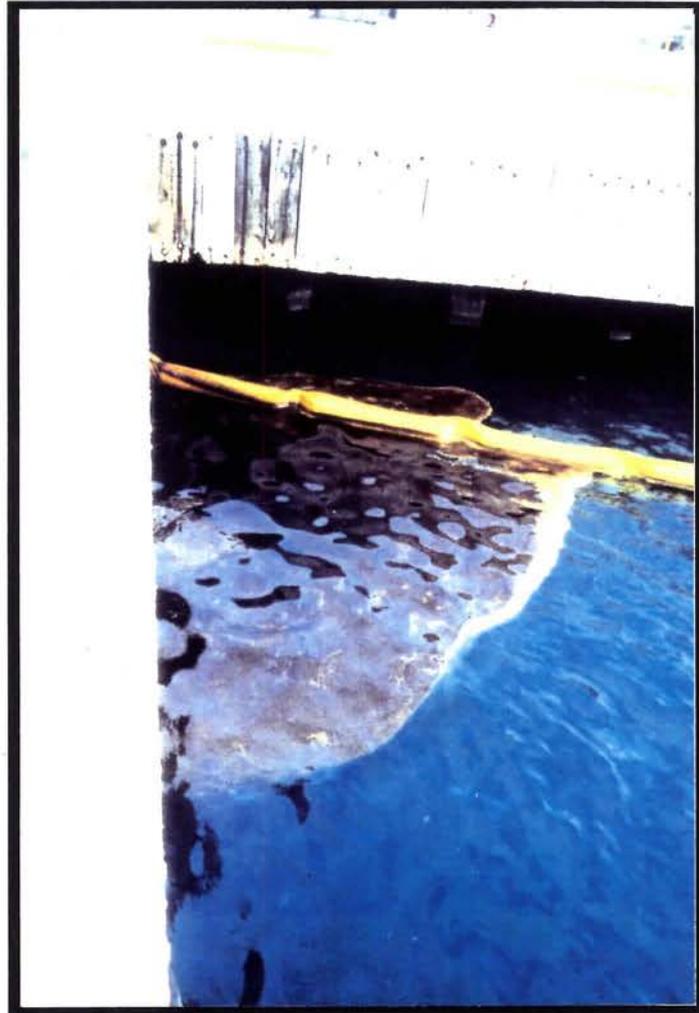
Army Health Physicist who is part of the Field Command Johnston (FCJ) Command Staff.

It is a very interesting operation. It is quite similar to a hi-tech gold placer operation that might detect gold going down the sluice and riffle tray by detectors that could activate gates to shuttle the gold bearing soil off to the side for closer inspection. In this case, it involves radioactive particles and their detections and segregation. It is a prototype operation that has proven successful in previous tests, and this project will determine if the equipment can actually do the job on a large scale. Apparently, there are many such contaminated sites in other countries as well. The actual amount of contamination (plutonium) to be retrieved is unknown but extremely small in relation to the amount of material in which it is contained. The project will be moving perhaps as much as 400,000 cu. yds of "coral soil" through the crushing and detection equipment to find perhaps only a golf ball-sized amount of plutonium. This, of course, is a very rough guesstimate since the amount of fissionable material in a warhead is classified, and the explosions scattered the material over a wide area.

The DNA has sponsored Dr. Lobel to examine the area offshore of the plutonium contaminated site under remediation. As mentioned earlier, the offshore area probably received plutonium contamination when the missile exploded on the launch pad and from the contaminated soil that was bulldozed into the lagoon. There are doubts about the adequacy of previous examinations detecting not much more than background radiation. Dr. Lobel and his graduate students devised an innovative underwater radiation detector. An intensive survey of a very small (3 meter square) but well chosen underwater site turned up three hot particles. One was attached to debris from the rocket that had exploded. The obvious question is that if this small area contained three hot particles then how much contamination does the general area contain? No one is making any statements but DNA personnel appear to be taking it seriously. It does not appear to be a human health hazard. The degree of contamination is unknown, as are the pathways and availability to organisms, thus little is known about potential ecological risks.



Tank 49 and the off-shore containment booms for the chronic subsurface petroleum leak. (R. DiRosa)



The oil from the chronic seepage is concentrated by the wind. It is mopped up by the base contractor (Raytheon Services). (R. DiRosa)

CLEAN AIR ACT

For many years the chosen method of disposal of anything that would burn (and many things that would not) was to toss it into the solid waste burn pit. It continues today; however, the EPA has established that this is unacceptable and the refuse must be incinerated in accordance with federal regulations. An incinerator has been in the design process for quite some time and close to completion by year end. The DNA has been attempting to engage in reducing the waste stream and segregating components to reduce the size and, therefore, cost of the incinerator. Actual starting dates for building and beginning operations are unknown.

Unfortunately, since past burning practices were not very discriminating it has resulted in a RCRA site because of heavy metal contamination of the old ash pile. See Waste Burn Pit, RCRA.

CLEAN WATER ACT

There exists a continuous oil leak (technically a spill) from the seawall into the lagoon in the boat basin area. It is the result of migrating diesel fuel from a large amount of subsurface petroleum contamination in that area. It is a chronic violation of the Clean Water Act. Not until recently has DNA shown a serious interest in dealing with the problem. On Christmas Eve of 1992 an abnormally large leak of old fuel oil from the subsurface petroleum spread out into the ship channel. It was from an area outside the small and inadequate boom that had been established to supposedly contain the chronic leak. As indicated in the 1992 Annual Narrative the Refuge Manager had some real problems getting the Base contractor to respond to the spill and exhibit the appropriate attitude. The Manager's on site actions to initiate containment and subsequent detailed report to the FWS contaminants specialist generated the coup de gras, so to speak, to the old attitudes. The report was sent to EPA and given to the Atoll trustees and military command personnel above the JA level. The FWS contaminants specialist and Refuge Manager addressed the issue in no uncertain terms at the biannual Johnston Atoll Environmental Meeting. The DNA took a whole different view of the situation after that. Additional

containment booms were purchased and a specialist was called in to provide advice on how to best deploy and secure a new boom system that would contain the chronic leak. The system works reasonably well and the oil contained by it is mopped up on a regular basis. There were no further problems from this site.

In addition, the Manager notified the DNA command in 1991 that containment structures around several large petroleum tanks were not in compliance with regulations. They do not contain impermeable bottoms and some of the berms have deteriorated. Furthermore, there are drains that lead directly into the lagoon. Any leaks or discharges would quickly seep into the coral-based substrate and then DNA would be responsible for a RCRA site and/or a discharge into the lagoon. Such spills have occurred in the past.

In 1993 the Base contractor plugged the drains leading into the lagoon from the containment structures, and DNA began requesting funds and help to correct the situation. Despite what we think might be a high priority situation, departments within DoD may think otherwise. At least design funds were on island by the end of 1993. Actual completion or even start of the project could be up to a year away. The Base command recognizes the seriousness of the situation, especially since the Manager has been hounding DNA since 1991. If a large leak or spill (which has occurred in the past) occurred within one of the "containment" structures it could have serious consequences. The oil would percolate through the coral substrate quickly creating a new RCRA site, and if it leached into the lagoon (very possible at the POL tank farm) it would violate the Clean Water Act. If the spill entered green sea turtle feeding areas (which is very possible) it could kill turtles resulting in an Endangered Species Act violation from their failure to easily prevent the problem. A DNA officer best summed up the situation by stating, "if even part of that occurs we are screwed".

It is worth noting that the EPA has never done a thorough inspection of the atoll. Personnel have never inspected for violations of the NPDES or Clean Water Acts.

Oil Spills into Lagoon Waters

As mentioned above, the chronic leak is technically a spill. Other than this there were no reportable spills into lagoon waters.

COAST GUARD ACTIVITIES ON SAND ISLAND (See also Habitat Management)

LORAN Tower Paint Chips

After the decommissioning of the Coast Guard LORAN Station in July and the demolition of the 620 ft. tower in December of 1992 we were able to concentrate on contaminants issues and cleanup. When the tower fell it distributed paint chips along a narrow swath about 250 ft. long and 20 ft. wide. It also buried large numbers of chips below the sand during impact and wind blew chips downwind over a broader area. The problem with the chip distribution was that the paint contained high amounts lead; high enough to make it a hazardous waste. Therefore, the Coast Guard was obligated to clean it up, especially since the area was an active seabird nesting colony and the chips posed a potential danger to the birds.

It is well known that albatross chicks will readily pick up and ingest foreign objects, including paint chips, and die. The remote Hawaiian Islands refuges had good documentation of many chicks dying from ingesting paint chips from Coast Guard buildings. JA doesn't have albatross but there are no data about such activities for our potentially affected species (Sooty Terns, Brown Noddies, Brown Boobies, Wedge-tailed Shearwaters). We had to assume the worst. During the disassembly of the tower after it fell there was an attempt to cleanup as many of the chips by hand as possible but that only scratched the surface, so to speak. Heavy equipment would be needed to extract a lot of the contaminated sand within the tower "strike zone." The Army National Guard Team doing the work on the tower and some of the cleanup had to depart. Plans were made to continue the cleanup of the paint chips later in December with Base contractor labor before the Sooty Terns began nesting in mass. The failure of the Coast Guard and DNA to coordinate well and the occurrence of a major storm event prevented cleanup before the birds returned. Cleanup was postponed until some time in 1993 after the nesting seasons. As luck would have it we never received a break in nesting

activities from the species involved until December of 1993.



The lead contaminated paint chips (orange and some white colors above) from the LORAN Tower held a certain attraction for Brown Noddies and Brown Boobies. They would incorporate the chips into their nests. (R. DiRosa)

The paint chips remained available to the birds through the year. Observations by refuge staff indicated that the adult noddies and boobies incorporated paint chips into their nests as nesting materials. Evidence was strong that the birds were actively selecting for the brightly colored chips. However, there was no evidence that chicks or adults of the various species consumed the chips and/or suffered any adverse effects.

When December rolled around DNA and Coast Guard were to have been well coordinated and the Base contractor was to have been prepared to clean up the chips should there be the predicted break in Sooty Tern nesting activity. The Refuge Manager was off island for November and most of December so he was unable to insure that operations were appropriately planned. Admittedly this was not his job but as is often the case at JA it takes refuge staff involvement to facilitate time sensitive activities. The terns gave us the break we needed but the two

offices were unable to complete the necessary paperwork and have the necessary equipment available, all of which was suppose to have been completed earlier. To make a long story short the cleanup could not be organized before returning nesting terns overwhelmed the area. The cleanup was again postponed until at least spring of 1994 when there might be another break in nesting activity, and DNA and the Coast Guard have their act together.

Underwater Debris and Contamination

During an underwater survey of Sand Island by the Manager and Coast Guard environmental representative, Liz Muller, they discovered a large amount of discarded debris and potentially hazardous waste. The debris and waste were reasonably concentrated in, but scattered about, the NW corner of the island by the wharf and old seaplane landing ramp. Large amounts of debris had been discarded for years by dumping it off the wharf and landing ramp. It was obvious that much of it, especially the hazardous items, was the property of the Coast Guard but much of the debris could have predated the Coast Guard. However, the Coast Guard accepted responsibility for the site.

The hazardous and potentially hazardous items were many lead/acid batteries, some of which weighed 350 lbs., huge electron tubes, capacitors and a transformer. All of these items are used in LORAN station operations. Of particular concern was the large number of partially buried 55 gal. drums scattered about the area and several large UST type steel tanks. No one knew what they may have contained, therefore what might be in the sediments. The miscellaneous debris was composed of everything from the drums to file cabinets and cases, tires, steel cable, telephone-like cable, and assorted metal appliances and small objects. Intact 50 cal. ammunition also was discovered.

Due to conflict of interest the Manager was unable to accept a contract offer from the Coast Guard to survey, map and photographically document the site. However, since he possessed the necessary skills, equipment and experience he was able to use overtime to do the project for the Coast Guard. This saved everyone a considerable amount of time and

money and allowed for a timely initial, cleanup response by the Coast Guard. Divers from the Coast Guard buoy tender Mallow spent a day and a half removing six 55 gal. drums of batteries, enough large electron tubes and capacitors to fill two 55 gal. drums, several pallets of tires and a pile of insulated cable. Still remaining to be hauled out were more cable, tires and a transformer that needs special treatment since it may contain PCBs. The corroded drums, jeep, large tanks and miscellaneous metal debris will remain. It is unsightly (only underwater of course) but it is basically nontoxic, will eventually decay and the cost to remove and dispose of it is inappropriately high for the benefits received. The debris does provide some habitat benefit to marine organisms. Cleanup will resume in 1994.

Based on the Manager's underwater survey and maps, Dr. Lobel of WHOI selected appropriate sites for sediment sampling and analysis to determine if there were contaminants in the marine sediment. Results of this preliminary sampling were not good in that it indicated there were indeed contaminants present but to what degree could not be determined. The Coast Guard agreed to fund a more thorough sediment sampling and testing regime in 1994 to try to determine extent and amount of contamination. The preliminary results found at least detectable levels of the following: lead, mercury, arsenic, cadmium, zinc and PCBs.

Above Water Contaminants

The Coast Guard engaged in removal of tile and insulation containing asbestos from the transmitter building (intended for destruction). Asbestos containing tile remains in the causeway signal building (being converted to a WHOI marine lab by the Army) but it will not become a hazard until the building must be destroyed and disposed. One UST was removed and the surrounding soil was tested. No contamination was found.

Some additional potential contamination remained to be dealt with.

We say potential because the exact status was not determined by the end of the year. In 1988 a Coast Guard barracks on Sand Island was demolished. The rubble was placed along the

had been coated with several layers of paint and it appeared that floor tiles were included in the rubble that was dumped. After finding out about the asbestos in the building tiles and of course the lead containing paint on other materials the Refuge Manager questioned the nature of these items visible on the causeway. Visible tiles and paint on the causeway were sampled and, sure enough, they contained asbestos and lead. The asbestos and lead contents appeared to be low and the asbestos was determined to be nonfriable (even through exposure to the elements increases bioavailability). How many tiles and amount of paint present in the rubble remain undetermined. However, the risks these items posed to humans and the environment was debatable. The cost to remediate the situation (remove and dispose of the rubble or cap the whole area with concrete) would be astronomical considering the potential risk at this point. Whether or not to remediate or leave the site alone was not determined by the end of the year. Leaving it alone appears the best option at this point.



Over the course of many years, the Navy, various contractors and most recently, the Coast Guard, dumped debris off the northwest end of Sand Island. (R. DiRosa)



Much of the debris was relatively benign and mostly composed of various types of metal objects and tires. However... (R. DiRosa)



A lot of it, like batteries weighing up to 350 pounds, wasn't so benign. (R. DiRosa)



Other debris, like 55 gallon drums, hinted of the unthinkable. What did they contain? What do the sediments contain? (R. DiRosa)



Other potential contaminants were a couple of transformers, capacitors, and numerous electron tubes containing beryllium (above). (R. DiRosa)



Coast Guard personnel cleaned up much of the contaminants in 1993. Liz Muller (environmental specialist) and Lt. Ripkey (drive team leader) discuss the day's activities. (R. DiRosa)



Placing one of the large 350 pound batteries into containers. The batteries were used in LORAN operations. (R. DiRosa)

OTHER ITEMS

Chemical Materials Storage Site

As noted above, EPA has never done a atoll-wide, multi-media inspection for environmental regulations compliance. Personnel have mainly concentrated on regulatory factors pertaining to JACADS. In August an EPA team was again due on the island to evaluate JACADS compliance. However, our Honolulu contaminants specialist, Chip Demarest, persuaded them to spend some time with the Refuge Manager and look at some other issues around the island. The Manager briefed them on the history and past problems with contaminants and attitudes, as well as showing them current issues that were being worked. In addition, the Manager had been inquiring of the Base contractor about numerous 55 gal. drums stored and covered with tarps and this seemed like a good time to examine it. On a Sunday afternoon he and Laura Gentile of EPA removed a few tarps for a closer look and what they found surprised them both. Before proceeding, the RSN (base contractor) manager and Environmental Health and Safety Office personnel were located and summoned to the site for a complete evaluation.

Approximately 160, 55 gal. drums in a high state of decay containing unknown compounds were uncovered. Many of the drums had leaked their contents which, luckily, were contained by a small berm lined with rubber matting.

The contents of the drums were obviously unusable especially since some of the volatile components had evaporated leaving hard lumps in the drums. Despite this, RSN personnel tried to assure Ms. Gentile that the products were for sealing runway tarmac and were being used. However, no one knew when some of the stuff was last used, and they could not prove what the contents were since no MSDSs could be located and the drum labels were beyond recognition. In summation, it did not look very good for the contractor and of course the DNA command that is ultimately responsible. The status of the EPA report was unknown at the end of the year. Analysis of the drums' contents indicated the contents were deteriorated surfacing compounds for use on the runway. The materials were over-packed and shipped off the island for disposal. The episode is a classic example of a temporary chemical materials, storage

site that was forgotten. Not having the proper documentation in the files is another issue.

North Island Lead Contamination

The Manager had noted that there was no mention of an abandoned firing range (lead contamination) on North Island in the JA Installation Restoration Program Management Action Plan (IRP) or any other documents. DNA finally decided it was not their responsibility and the site did not appear in the JA IRP because it deals only with RCRA and other sites located on Johnston Island (despite its Johnston Atoll title). It now appears that the site probably belongs to the Army since it would have been the only one likely to have the need for a firing range. The Manager is pursuing this.

Comment

As the Service's on site contaminants representative at the atoll, the Manager keeps constant and open communications with the Army, DOE, DNA, Coast Guard and their contractors to prevent and/or minimize impacts to refuge resources. This is a day-to-day process which may not directly involve contaminants issues. However, the Manager's and Biologist's efforts enhance and facilitate the processes of dealing with these issues on a continuing basis. Not having a reasonably knowledgeable contaminants representative on the atoll would greatly complicate the Service's ability to deal with the complexities of this refuge and its controversial activities. The changing of the military commands every year complicates the issues. This results in a never ending process of educating the commanders and staff officers. The contractors can have a high rate of turnover as well. It is the Refuge Manager's contaminants files and knowledge that maintain the continuity.

The reader has probably noted that there appears no reference to the Biologist when discussing contaminants issues and activities. That is because the biologist does not have experience in this area, nor does she/he have the time. Administering the seabird monitoring, research and volunteer programs and engaging in environmental education along with other duties is a full time, and then some, business. So, not

mentioning her/him in no way lessens the impact she/he has on the Refuge programs. Maintaining the above programs allows the Manager to spend the necessary time on the contaminants issues and related politics.

Epilogue

The Superfund Amendment and Reauthorization Act of 1986 made federal facilities subject to the same Comprehensive Environmental Response, Compensation, and Liability Act requirements as nonfederal facilities. As a result, Johnston Atoll was required to submit a Preliminary Assessment/Site Investigation (PA/SI) report to the EPA. The major objectives of the PA/SI are: 1) To gain an understanding of the nature and degree of the threat posed by the site; 2) to determine the likelihood of a Hazardous Ranking Score (HRS) of 28.5 or greater; and 3) to identify sites in need of immediate response. Sites with an HRS greater than 28.5 are listed on the National Priorities List (NPL). Federal facilities on the NPL are required by law to begin Remedial Investigations and

Feasibility Studies within six months of listing. The PA/SI was prepared and submitted to the EPA in October of 1989. The projected HRS for Johnston Atoll was 52.2 which would make it the highest scoring federal facility in the Pacific.

Current environmental protocols place JA in a unique situation. Since JA was not placed on the NPL in accordance with its HRS score it was one of many sites cited in the lawsuit filed by the Conservation Law Foundation against EPA for failing to comply with statutory requirements under Section 120(d) of CERCLA. EPA had to either place JA on the NPL or place it in the "No Further Remedial Action Planned" category by July 15, 1993. (This is an EPA term and does not imply corrective measures will cease.) Subsequent actions have been based on negotiations among PACAF, DNA and EPA to keep JA off the list, thus allowing remediation to continue under the RCRA protocol already in effect. Placing JA on the NPL would increase the headaches for every one due to regulatory requirements.



Manager DiRosa and EPA representative Gentile uncovered a large number of deteriorated 55 gallon drums containing questionable materials. (R. DiRosa)



The well covered site was a perfect example of a chemical storage area that had been forgotten. (R. DiRosa)



At least the drums werestored on a thick impermeable pad so their contents did not contaminate the soil. (R. DiRosa)

5. Research and Investigations

Two major research projects which were designed to assess potential impacts of the JACADS project on the wildlife resources of the Refuge continued. One seabird research project continued. Marine research projects related to JACADS and contaminants continued as well.

JHN-3-92 Flight Proficiency of Pelagic Tropical Seabirds at JA

This research was conducted by UCLA Ph.D. candidate Lisa Ballance as partial fulfillment for requirements of a Ph.D. degree. The research had four objectives pertaining to four species of seabirds at JA; Sooty Terns, Masked and Red-footed Boobies and Wedge-tailed Shearwaters. The objectives were: 1) To measure field metabolic rates; 2) To measure resting metabolic rates; 3) To quantify the proportion of time an adult spends sitting on the nest and at sea and the proportion of time an adult spends in flight and resting on the water while at sea; 4) To obtain measurements of wing morphology and body mass to calculate wing loading and aspect ratio. Ms. Ballance worked with the following hypothesis: The flight proficiency of a seabird reflects the biological productivity of the waters over which it forages such that species foraging in areas of low productivity will be more efficient fliers than species foraging in areas of high productivity. The work required the use of tritiated water and all necessary clearances from the NRC and the military command were obtained. The field portions of the study were completed in 1992. Ms. Ballance continued her nonfield research and dissertation preparation in 1993.

One of the most interesting findings in her work involved the flight energetics of Red-footed Boobies. Based on her work the power required for flight for her subjects was more than three times lower than the predicted power required for flight obtained from equations based on aerodynamic theory.

JHN-1-93 Seabird Monitoring Studies

The seabird monitoring studies of Seabird Research Inc. were supported by funds from the Army and administered by CEPOD. Their primary goal is to assess and monitor the size and

"health" of marine bird populations throughout the operation of the JACADS project. Ten major questions were posed to achieve these goals: Total and breeding population size of each species, numbers of nests receiving eggs, number of young raised to fledgling, egg size and weight, growth rates of young, types of nest sites, diet, rates and causes of mortality, and susceptibility to human disturbance.

Elizabeth Anne Schreiber and her assistants continued their long term studies. They visit the atoll 2-3 times each year for a few weeks each time during the seabird breeding seasons.

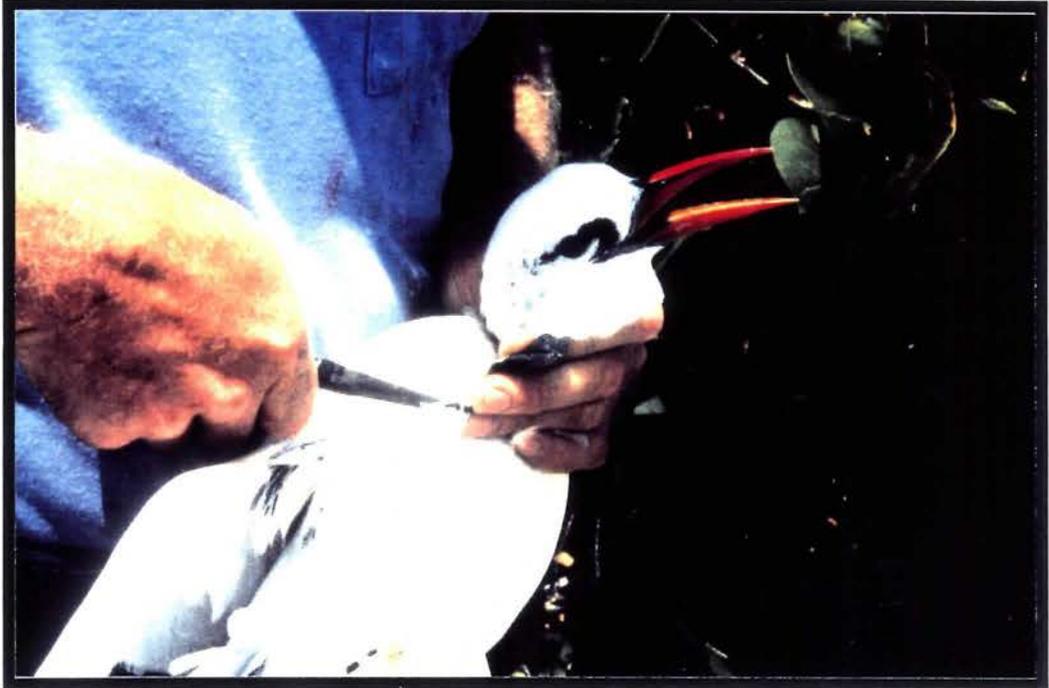
JHN-2-93 Marine Resource Studies

Dr. Phillip Lobel, Woods Hole Oceanographic Institution (WHOI), continued his marine research with funding from PMCD (Army). This included studies of marine fish reproduction, collection of certain benthic feeding fishes to be analyzed for dioxins and furans, and monitoring of selected lagoon resources. Dr. Lobel and PhD candidate graduate students made several visits to the atoll during the year. Work began on converting the decommissioned Coast Guard Signal Building on the causeway of Sand Island into a marine research station under the direction of Dr. Lobel and WHOI. The Army will provide the major operating and rehabilitation funds. Additional funding is expected to come from the DNA and the Air Force for contaminants monitoring and research. The lab is expected to continue operating through the life of JACADS.

Dr. Lobel's work expanded to include marine studies and sampling related to dioxin contamination of the lagoon from the old Agent Orange storage site and plutonium contamination in the lagoon adjacent to the plutonium site. Funding for the work is being provided by the Air force (PACAF) and DNA.

JHN-3-93 Red-tailed Tropicbird, JACADS Impact Monitoring

Refuge staff continued the upwind/downwind monitoring study of the red-tailed tropicbird populations located upwind and downwind of JACADS. This is a special study to gather population data from these two locales to determine if there are any significant trend differences. It also provides baseline population data should there be a chemical accident



Betty Ann Schieber (Seabird Research, Inc.) Returned twice in 1993 to continue her Army funded seabird studies. Of special interest are the Red-Tailed Tropicbirds that must withstand the annual abuse of banding and marking. (R. DiRosa)

resulting in a major chemical agent release.

JHN-4-93 Bulwer's Petrel Breeding Biology

In 1992 Biologist O'Daniel began a breeding biology study of the Bulwer's Petrel along the causeway of Sand Island where the species nests in natural rock crevices. She continued the research during the 1993 breeding season. Nests were located and monitored and individual birds were banded and marked in order to measure incubation interval lengths of adults. Chicks were monitored for fledgling success and overall reproductive success of the species was determined. Vocalization counts were conducted at different times during the night throughout the breeding season to see if they could be used to estimate the number of breeding pairs. Very little is known about this species, and Biologist O'Daniel expects to be able to gather much important and previously unknown information about its life history. Most of the research was conducted on her personal time.

JHN-5-93 Black Noddy Reproductive Success Study Plots

Refuge staff began a Black Noddy reproductive success study this year on Johnston Island. This is part of a coordinated effort among other satellite refuges (Midway Atoll and French Frigate Shoals) to look at regional differences in timing and reproductive effort. The study involved selecting plots and monitoring them every few days to detect; date of first egg, new eggs laid, eggs lost, eggs hatched, chicks lost and chicks fledged. Hatching, fledgling and overall reproductive success can then be determined and compared with results from the other regions.



A deminutive Bulwer's Petrel in front of its nest site.
(R. DiRosa)



Typical Bulwer's Petrel nesting area at Sand Island.
(R. DiRosa)

E. ADMINISTRATION

1. Personnel

The Refuge had a full time staff of two, a permanent refuge manager and a temporary biologist.

Roger Di Rosa, EOD 5/5/90.Refuge Manager, GS-11,
PFT

Donna O'Daniel, EOD 5/10/91.Biologist, GS-7, TFT
Resigned July 23, 1993.

Chris Depkin, EOD 10/18/93Biologist, GS-9, TFT

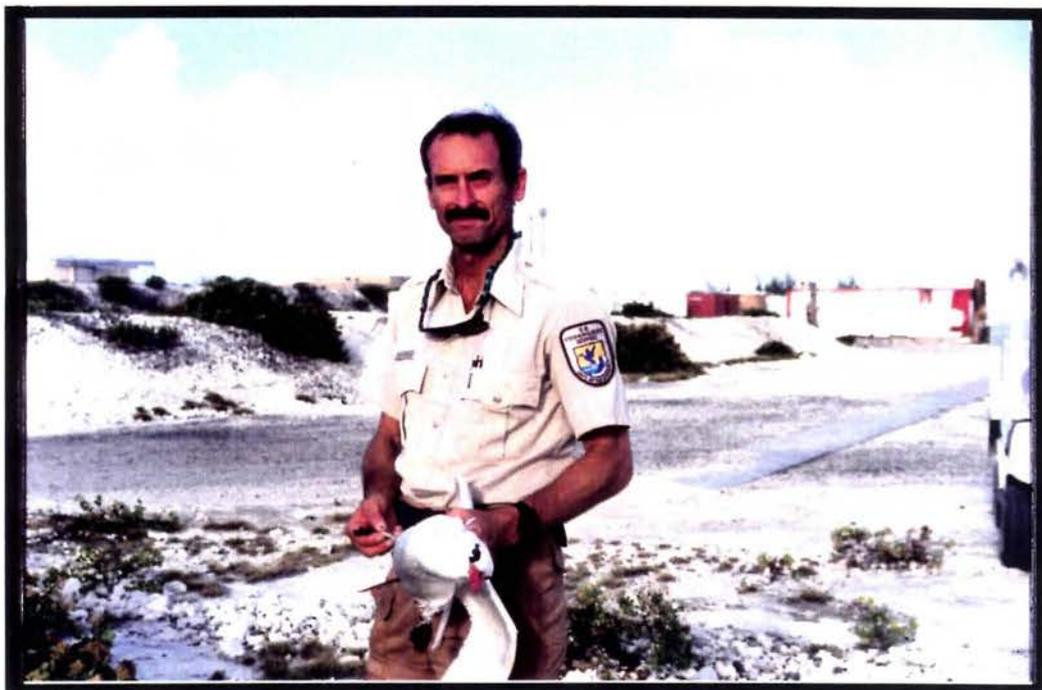
After two years at JA, temporary biologist O'Daniel resigned in order to pursue other interests and biologist Depkin was selected to replace her.

4. Volunteers Program

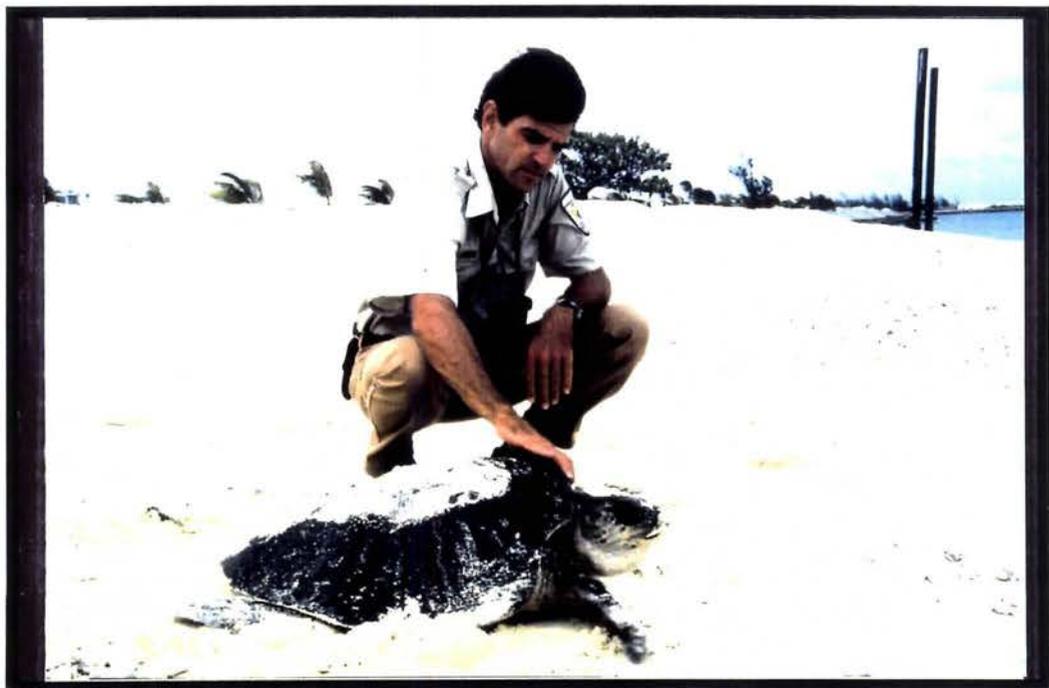
Numerous military and civilian personnel assist the Biologist and Manager with biological surveys and seabird banding duties. All of these individuals expressed a strong interest in natural history and the biology of the species found on the Refuge. Many of the volunteers are used for one or two surveys and the trips provide both aid to the Refuge staff and an opportunity to allow the volunteers to photograph wildlife and receive an interpretive tour. Several proved to be excellent assistants, showing a strong interest and helping on a regular basis. The time that our volunteers donate to the Refuge is especially appreciated since the standard work schedule for island residents is a minimum of 6 days a week, 8-10 hrs a day. Therefore, personal time is limited. The Refuge Biologist maintains and monitors the volunteer program. Volunteers donated 538 hours in 1993 to a wide variety of projects.

5. Funding

As indicated earlier, Johnston Atoll NWR is unique in that operational funding is obtained from several sources, the Army, FWS and DNA. To be more specific, the funds come from



Johnston Atoll NWR Manager Roger DiRosa (C. Depkin)



Johnston Atoll NWR Biologist Chris Depkin. (R. DiRosa)



Our volunteers helped us in many ways in 1993. Dave Thomas often helped with underwater surveys and video. (R. DiRosa)



Bill Freeman's specialty was helping Biologist O'Daniel with Bulwer's Petrel research. He is seen here checking nests. (R. DiRosa)

two divisions of the Army, the Program Manager Chemical Demilitarization (PMCD) and U.S. Army Chemical Activity Pacific (USACAP). PMCD is, you might say, the owner and overseer of JACADS and USACAP deals with the storage, transport and security of the chemical munitions and demilitarization operations. The FWS funds come from the Division of Environmental Contaminants. DNA provides some on island support which is more in the form of direct services than actual funds.



Seasoned volunteers like Debra Caddy and Terry Miller enjoyed banding activities the most. (R. DiRosa)

Funding support is negotiated for each FY with the individual entities. The Honolulu Ecological Services office assists in dealing with the FWS Division of Environmental Contaminants to secure those funds based on contaminants issues and reports from the JA Manager. The JA Refuge Manager deals with the two Army divisions and DNA, which can be quite a challenge since each operates differently and independently of the other. The funds are spent at the discretion of the JA Refuge Manager.

The following was the funding picture for FY 1993:

Total funds from the above sources obligated to JA operations for FY 1993 were \$154,000. This was an increase of \$11,000 over last year's budget and involved an increase in most areas of operations, especially environmental education. The staff is on a higher pay scale at JA than their counterparts stateside due to nonforeign differential and a special salary scale authorized by Congress for government civilians stationed at JA. It attempts to achieve some level of parity with the pay and benefits received by the contractors' employees.

A \$15,000 line item in the budget was the production of an environmental education calendar for CY 1994. To the disappointment of many (especially the Army) we were unable to produce the calendar due to bureaucratic BS and regulatory roadblocks. The money could have been used on other EE items or refuge equipment, but the Army wanted the proposed calendar for its public relations potential. The money was carried over into 1994 in hopes of being able to accomplish the task by other means.

As usual there were problems with receiving all the funds in a timely manner. USACAP was having some funding problems so it cut a deal with PMCD to do some internal back scratching. PMCD would cover some immediate expenses at JA for USACAP and USACAP would agree to cover \$25,000 of PMCD's total contribution to the FWS JA budget. This money would be payable at a later date. The Refuge Manager was unaware of these dealings, and he did not particularly care as long as the total funds were received. As the end of the year drew to a close that missing \$25,000 didn't come and he had to trace it down within USACAP. After a few serious discussions the money was finally received on the last day of the fiscal year and too late to be spent. Due to help from PMCD the 1993 shortfall was covered and the late \$25,000 was carried over into FY 1994. It was the second year this sort of thing has happened. Steps were taken to ensure it does not occur again. There were other budget problems that were internal to PMCD and involved payment to us of too much money. Did we complain? Of course not, but we were kind enough to notify them of the unintentional gift.

The following was the FY-1993 budget summary:

\$50,000.....	USACAP
62,000.....	PMCD
<u>42,000.....</u>	FWS-Contaminants
\$154,000.....	Total Funds

DNA's actual contribution is unknown since billing to the FWS island account by the civilian contractor goes directly to DNA. The Manager is not concerned about this part of the budget since none comes out of the above money and all work or charged supplies are covered. The island support contractor, RSN, performs the service on the refuge vehicles (golf carts) and boats and motors, It also provides heavy or other equipment if necessary for habitat management. It basically comes from a giant slush fund.

Do not let the nice neat figures fool you. The Manager spends a good bit of time negotiating for and obtaining the funds. The biggest problem in 1993 was at the end of FY 1993 and discussed above. Despite such activities it has been getting a bit easier each year.

One problem still exists that needs to be remedied. There is no established document, MOU or otherwise, insuring funding or pathways and, consequently, the money even has been lost at times. This year, a portion of the money from the Army's USACAP division was not even received, despite cajoling from the Manager, until September. The funding for the FWS presence on the Atoll because of JACADS was established by verbal arrangement with a past Army commander. The document that is used as the legal supporting document for the transfer of funds by the Army is an archaic 1976 MOU between the DNA and the FWS that establishes the FWS's responsibility for the natural resources and DNA's responsibility for the people and infrastructure. Bear in mind there was no FWS presence at the time of the MOU, JACADS hadn't even been conceived and the island population was but several hundred. It was mostly a mothballed operation to maintain its SAFEGUARD C status (ability to return to nuclear atmospheric testing capabilities) and for storage of some chemical munitions. The funding pathways and how they work or don't work are somewhat convoluted and difficult for someone without close connections

to understand. Furthermore, they are not well defined. Needless to say, some more work is still needed in this area.

The Army accepted the Manager's FY 1994 proposal for an even larger budget (\$118,000) that would cover their obligation for FWS expenses and proposed EE projects, including the proposed calendar. Funding the biologist position was again the responsibility of the FWS Division of Environmental Contaminants.

FIVE YEAR FUNDING PICTURE
(000's)

Year	1989	1990	1991	1992	1993
Source					
Army	50	70	75	101	100
FWS-Contaminants	33	33	35	42	45
FWS-Complex Off.	<u>20</u>	<u>25</u>	<u>20</u>	<u>--</u>	<u>--</u>
Totals	103k	128k	130k	143k	145k

F. HABITAT MANAGEMENT

1. General

Johnston Atoll provides roosting and breeding grounds for tropical Pacific seabirds and wintering grounds for migratory shorebirds. The coral reef ecosystem is unique in that both Hawaiian and central Pacific organisms are represented. Johnston Atoll is the only land mass available as a roosting and breeding habitat for seabirds in 820,000 square miles of ocean. The importance of Johnston Atoll in the ecology of the central Pacific is far greater than its relatively small land mass would suggest. Within this area, the waters most intensively foraged by birds from Johnston Atoll are probably those to the west where food availability is increased by upwellings and eddies created by the down-current "wake" of the atoll.

The value of the Atoll has expanded from the initial emphasis on seabirds to also recognize the potential uniqueness and

importance of its marine resources. Atolls in general are not well studied but JA is one of the most studied in the world, which is not necessarily saying a whole lot. Even though 302 species of fishes are documented from the atoll it has not undergone a truly thorough survey. Invertebrates is a wide open area for study and given the Atoll's age and isolation, there could be many undescribed species present.

6. Other Habitats

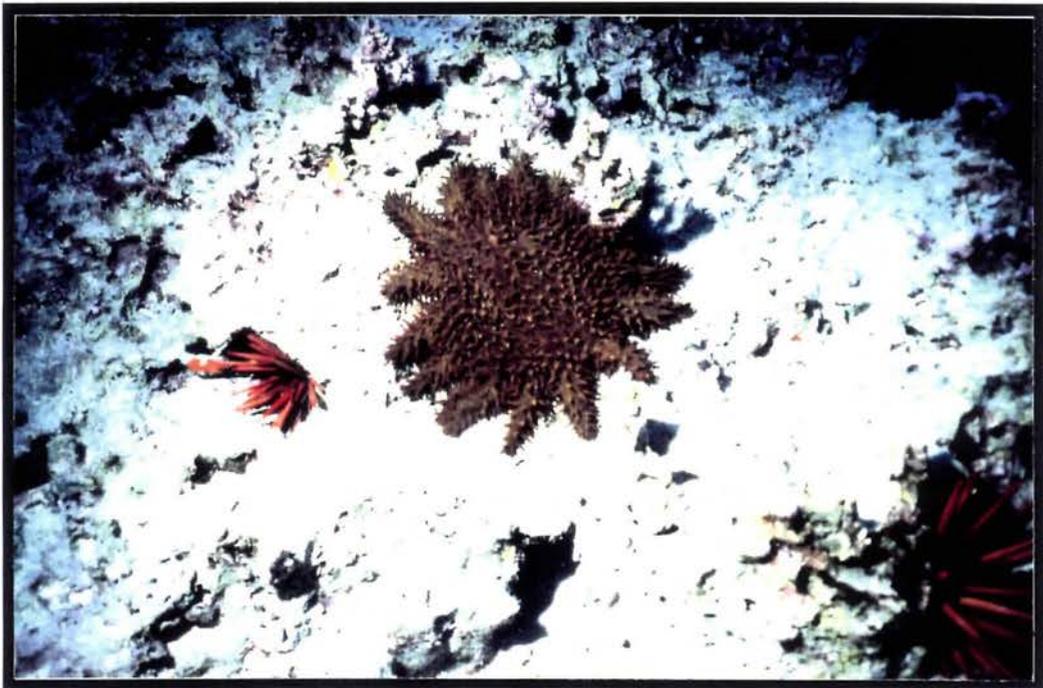
Acropora and Montipora species dominate the coral community, with Acropora cytherea being especially dominant in coverage. This species, commonly called "table coral", can attain 100% coverage in many areas and is probably one of the fastest growing coral species. It also provides an extensive three-dimensional habitat for many fishes. The fish community is dominated by relatively few species of the 302 documented species, which is a result of the Atoll's isolation, size and surrounding sea currents. This also limits the diversity of the coral community which further limits the number and species of fish that might occur at the Atoll. The documented number of species of coral at JA is 33 but only a few make up the major portion of the reef habitat.

Terrestrial habitats, especially shrubs, are a major concern on Johnston Island. The population of Red-tailed Tropicbirds increased this year to approximately 1550 pairs. Seventy-five pairs nested under the bushes in the Plutonium Area in 1992. All bushes in this area were removed in the fall after the tropicbirds had finished nesting so the soil could be remediated. This will have a great impact on the displaced pairs of tropicbirds in 1993 because they use the same bushes year after year. Removal of these bushes may heighten competition for nesting space on Johnston Island.

Artificial Reef

The Refuge Manager is tasked with assessing the biological recruitment and physical configuration of an artificial reef created from vehicles, heavy equipment, assorted steel debris and tanks and large appliances. The Army Corps of Engineers has issued a permit, renewable every three years, to DNA that specifies the type of debris and parameters to be followed

regarding dumping on the reef. All vehicles and equipment placed on the reef are drained of all fluids and burned to remove plastics and residual oils and grease. No tires, plastics, etc. are permitted and only ferrous metal and large concrete debris are dumped. The site was designated in 1985 after discussions with the Service and National Marine Fisheries biologists. The reef lies in 80 ft. of water on a scoured, ancient, hard coral bottom three miles south of Johnston Island and near the edge of the atoll drop-off.



The infamous crown of thorns seastar is a common inhabitant on the reef outside the lagoon. However, it is rarely seen inside the lagoon where the habitat is much richer in food source.
(R. DiRosa)

One reef building attempt was conducted this year. However, like previous years, it did not go quite to plan. A small barge on loan from the Army to DNA had deteriorated to the point of being unsafe so it was moored at the dock at North Island, and there it sank. It remained in place for a year before the squabble over who was really responsible for it was settled. After that a Navy salvage team arrived, patched and refloated it. It was then loaded with appropriately treated vehicles, towed to the artificial reef site and sunk.

The problem in the past has been DNA's attention to detail, that is, attempting to abide by the spirit as well as the intent of the permit. One does not create an artificial reef without vertical buildup and DNA has not achieved that. Furthermore, it is the Manager's opinion that DNA has not been showing good faith in trying to abide with the spirit and



The spotted eagle ray is a common reef inhabitant often seen gliding over the coral reef. (R. DiRosa)

intent of the permit for several reasons. (See discussion of underwater evaluation of reef site in 1992 Annual Narrative.) Without the proper methodology and results, the line between dumping to build an artificial reef and dumping to circumvent federal open ocean dumping restrictions narrows considerably.

The barge loaded with vehicles was regarded as an excellent way to achieve instant vertical buildup. The Manager was asked for suggestions on how to best sink the barge. The recommendations were to weld the bottom vehicles to the barge and draw chains over the pile to hold everything in place. Also, it was recommended to tether the barge to a large concrete block on the ocean floor so that it would sink at the site and not drift with the current. The barge would not sink



Vehicles being prepared prior to placement on the artificial reef. All tires, plastics, floatables, and fluids are removed and the vehicles are burned. That is not water in the photo, but JP-5 jet fuel. (C. Depkin)



The crew became a little over-zealous in burning procedures, to the extreme displeasure of the Base Commander. One thousand gallons of jet fuel was a bit much. (C. Depkin)

quickly since it would be sunk by opening valves and not by the use of explosives. When the Manager inspected the barge prior to the dump he found that the vehicles were only tacked and not welded to the barge, and cargo banding straps, not chains, were used to secure the pile. The Base Commander felt this was adequate despite the urging of the Manager to secure it otherwise.

As predicted, the barge tilted and the vehicles broke loose and scattered about the area with the current. The barge sank on site due to it being tethered to a concrete anchor. No vertical buildup was achieved. The Manager again informed the DNA command that their efforts at reef building left something to be desired, and as before, he offered suggestions that would improve the efforts. As usual DNA paid little attention. However, the permit came up for renewal at the end of the year and the Corp of Engineers only extended it for another year instead of the normal three years. It will be reviewed before another extension is granted.

Sea Turtle Feeding Habitat

By the end of 1990 approximately 220,000 gallons of raw sewage was being discharged daily off the south coast of Johnston Island. A sewage treatment plant was constructed and began operation in 1990 and pretty much eliminated the discharge of raw sewage except during malfunctions and rainstorms. The sewage sludge was treated, dried and retained to be disposed of in an as yet undefined and acceptable manner on island. The full impacts to the sea turtles and other marine organisms from the years of sewage discharge are unknown. However, it considerably altered the coral reef community in the area. The coral was killed and the high nutrient levels contributed to massive algae growth that covered the coral over much of the south coast area.

The area has become a very attractive feeding area for both adult and juvenile green sea turtles that feed exclusively on the algae. The population is estimated at 200 sea turtles based on trend data derived from monthly head counts in select areas as the feeding turtles surface to breathe. The mean number of turtles counted on a monthly basis increased from 31 in 1991 to 43 in 1992. Clearly, the reduction of nutrients

into the ocean due to the sewage treatment plant has not adversely affected the turtles through their forage. We strongly speculate that it will have no affect.

Sand Island

The decommissioning of the Coast Guard Sand Island LORAN Station will provide the seabirds with some additional habitat. The removal of the transmitter building and the basketball court in December will allow vegetation to colonize the sites and create a modest amount of additional habitat. It also means the Sooty Terns can nest all over the transmitter building road to their little hearts' content without disturbance.

East Island

In 1992 just before the LORAN tower was demolished we cleared a number of strips of vegetation on East Island to create good Sooty Tern habitat. We did this in hopes of attracting Sooty Terns intent on nesting away from Sand Island until tower operations could be completed. It worked beautifully. We did the same thing in December of this year just prior to the anticipated transmitter building demolition and paint chip cleanup. It again worked well and delayed nesting activities on Sand Island so the anticipated work could be accomplished, or at least the building removal anyway.



In order to help insure a clear window in Sooty Tern nesting activities on Sand Island, nesting areas were cleared on East island. (C. Depkin)



The strategy was to entice any tern with nesting intentions to East Island first to avoid conflicts with demolition activities on Sand Island. It worked well in the past. (C. Depkin)



The strategy worked well this time too. Literally within hours Sooty Terns began nesting activities. During the dry season, the grass cover is less extensive which provides much more nesting habitat. (C. Depkin)



The old basketball court on the west end of Sand Island also was removed to increase nesting habitat for Red-Tailed Tropicbirds. This was also part of the Coast Guard funded decommissioning and clean-up activities. (C. Depkin)



Coast Guard personnel and Sooty Terns often came into conflict during the bird's breeding season. The sooties wasted no time in occupying the road to the transmitter building when human activities ceased. (R. DiRosa)



The destruction and removal of the transmitter building was the last obstacle to the birds having complete control over the eastern half of Sand Island. (C. Depkin)

G. WILDLIFE

2. Endangered and/or Threatened Species

Hawaiian Monk Seal

Endangered Hawaiian monk seals (Monachus schauinslandi) have historically, at least since 1968, used Johnston Atoll intermittently in very low numbers. They somehow find JA from their normal or traditional haunt, Northwest Hawaiian Islands. Federal laws and military regulations concerning the protection of both monk seals and green sea turtles are stressed to all visitors, as well as to permanent personnel. In 1984, nine monk seals were relocated to JA from Laysan Island in the NW Hawaiian Islands. Since that time, occasional sightings of single animals (very probably unrelated to the introduced nine) have been reported.

What was thought to be the same adult monk seal was sighted intermittently for most of 1993. It seemed to disappear around the end of the summer. This year did not produce the seal sightings that 1992 produced. Nonetheless, these last two years have produced an uncommonly high number of sightings that indicated there may have been as many as three different seals in residence for at least a short period of time. We speculate that this increase in sightings is related to the documented population pressures occurring in their colonies in the outer Hawaiian Islands.

How the seals find JA is another matter. It is unlikely they know JA is here and most probably find us by accident. This makes one wonder about the probability involved in a single seal finding such an isolated place, or there may be a lot more seals than we ever imagined roaming the central Pacific.

Green Sea Turtle

The Refuge supports a population of the threatened green sea turtle (Chelonia mydas). The turtles do not nest at JA, although mating has been observed off the south shore of Johnston Island. They feed extensively on the algae beds located on the south side of Johnston Island. What makes this especially interesting is that the feeding area and high

concentration of turtles lies next to JACADS. This threatened species lives, quite literally, in the shadow of chemical demilitarization.

Turtle monitoring was conducted in 1993, 11 counts being made from a four-meter high tower off the southeastern end of the JACADS peninsula. All turtles sighted from the tower during three 15 minute observation periods in three different locations were counted. Turtle observation along with size and time of observation were recorded on a map. At the end of the count, the observer attempts to discern how many individuals



Green sea turtles are common at Johnston Atoll, especially off the south coast of Johnston Island. However, they tend shy away from divers and rarely give a diver a chance at a photo.

(R. DiRosa)

are present as each active turtle usually surfaces for a breath of air about every five minutes. The mean number counted per observation period has increased each year since initiation of the counts in 1988. This year the average was 45 turtles per survey (range 8-64) and in 1992 it was 43 turtles per survey (range 13-60). It is now almost double the original counts. The increase in mean numbers may be due to an increase in turtles and/or to observers' abilities. The main

observer (refuge manager) changed in May 1990.

In August of 1992 three nesting green sea turtles were captured at French Frigate Shoals (NW Hawaiian Islands) and had satellite linked transmitters attached to their carapaces. Two of the turtles returned to their home foraging areas on the north shore of the island of Oahu. The third turtle possessed tags indicating it was from Johnston Atoll and it made an almost straight line return to the Atoll. The transmitters were placed on turtles at the end of the nesting season to increase the chances of the turtles leaving on their homeward voyage shortly after transmitter attachment.

The Johnston Atoll turtle made the 830 kilometer trip home in about 22 days at an average speed of 1.6 km/hr. Transmissions from this turtle ceased during February 1993, 6 months after deployment of the transmitter.

Humpback Whale

There is little evidence in the historical record of whales and dolphins occurring regularly around Johnston Atoll. However, at least one old whaling ship's log mentions traveling to the "whaling grounds" at Johnston Atoll. There have been documented sightings of the humpback whale (*Megaptera novaeangliae*) in recent years. Numerous sightings occur each winter and in the 1991/1992 winter a mother and a calf were seen. The calf was believed to be too small to have traveled with the mother from calving grounds in the Hawaiian Islands. In the 1993 winter no specific sightings of humpback whale were received. However, several reports of unidentified whales with smaller whales in tow (calves?) were reported. Johnston is obviously important to at least a few humpbacks every year and speculation is that it could be a calving area for this species.

5. Shorebirds, Gulls, Terns, and Allied Species

All four islands of Johnston Atoll are used as roosting and/or breeding grounds for at least some of the 15 species of seabirds using the Refuge (Table 2), as well as an overwintering area for shorebirds (Table 3).

TABLE 2. Populations of nesting seabirds estimated on Johnston Atoll during 1993¹.

SEABIRD SPECIES	BREEDING PAIRS
Bulwer's Petrel	60
Christmas Shearwater	30
Wedge-tailed Shearwater	na
Red-tailed Tropicbird	1900
White-tailed Tropicbird	2
Masked Booby	16
Red-footed Booby	311
Brown Booby	346
Great Frigatebird	69
Sooty Tern	66,000 ²
Gray-backed Tern	258
Brown Noddy	6,000 ³
Black Noddy	190 ³
Blue-gray Noddy	1
White Tern	130 ³

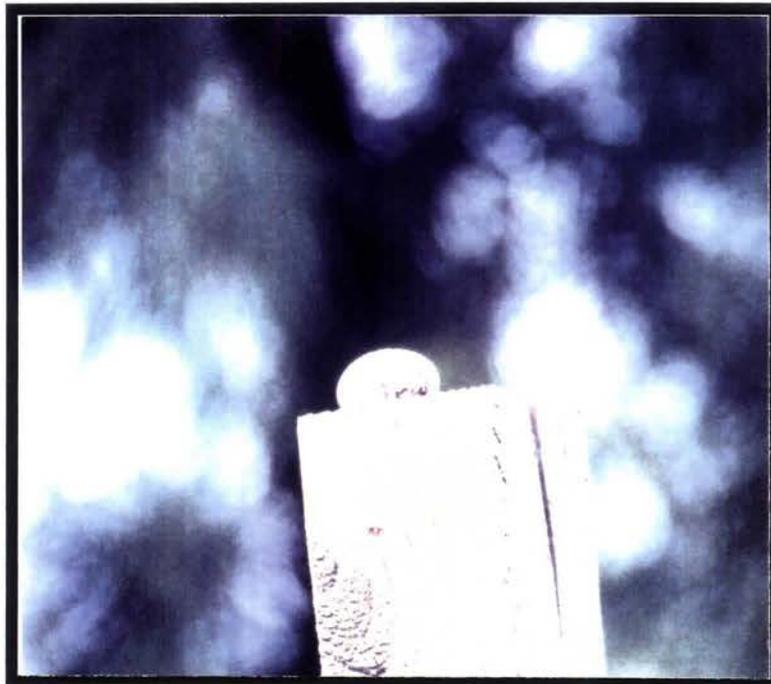
¹Estimates do not include non-breeding and roosting individuals which may be as large as 50 to 100 percent of the breeding populations, and much greater in frigatebirds, red-footed and masked boobies, and white terns.

²Number based on a single high count on one island on one date, the actual breeding population is likely to be considerable higher.

³Numbers based on the highest count of eggs and chicks on a given census day.



The White Tern is a common and much liked species on Johnston island. (R. DiRosa)



The White Tern's propensity for laying eggs on almost anything that will support one (it does not build a nest) causes a few headaches during maintenance or construction activities.
(R.DiRosa)



A mated pair of Red-footed Boobies illustrating the white and brown phases. The *white* phase is far more common. (R. DiRosa)



Combining the two color phases often produces some interestingly colored adult offspring. (R. DiRosa)



Every year, several Blue-Grey Noddy are sighted around Sand Island. This year marked the first time a nest was recorded at the atoll. (R. DiRosa)



The Sooty Tern is the most common species of bird at Johnston Island and nests in dense colonies of many thousands on the outer islands. (R. DiRosa)



The Masked Booby is the least common booby at Johnston Atoll.
(R. DiRosa)



The Bristle-thighed Curlew on Johnston Atoll. (R. DiRosa)

TABLE 3. Highest count of over wintering shorebirds on Johnston Island for 1993 by species.

SHOREBIRD SPECIES	INDIVIDUAL BIRDS ¹
Golden Plover	383
Ruddy Turnstone	198
Bristle-thighed Curlew	23
Sanderling	5
Wandering Tattler	8

¹Numbers are based on the single highest count for each species.

9. Marine Mammals

See G. 2, Endangered and/or Threatened Species for coverage of the humpback whale and Hawaiian monk seal.

Each year for the last several years rare Cuvier's beaked whales (*Ziphius cavirostris*) are sighted in the lagoon or around the island. In 1993, however, there were no reported sightings. Based on past observations we speculate that JA may be a calving (calving females have been observed) and/or feeding area for this rare and little known species.

In 1990 an adult male trapped itself within the confines of the coral heads in the north area of the lagoon. It apparently panicked and mortally wounded itself trying to escape. Biologist Flint and Manager Di Rosa watched it die then towed it to port and preformed a necropsy on it. Since the whale is so rare (known from only 40+ specimens) there was considerable interest in its head which was severed and stored in a walk-in freezer. Dr. Heyning, a well known expert on this animal and based at the Los Angeles Museum, wanted the head for dissection. We had it stored all this time until this year trying to get it shipped to him. It is a story worth telling.

The cost to commercially ship it quickly to Los Angeles was a bit much and the museum did not have that kind of money. You would think that with all the military cargo planes coming to and dead-heading back to the U.S. they could haul it for nothing. Don't bet on it. The logistics turned out to be a

nightmare. The DNA finally decided it could be hauled on a MAC flight. Then they decided we would have to pay for it. Fine. The Refuge Manager opted to pay. Then DNA decided it did not know how to accept the money for this arrangement so it fell through. Ah, but we are a resourceful and sly bunch. With the help of Nancy Miller in DNA headquarters, Albuquerque, we finally came up with a solution. The Refuge staff secured all the necessary paperwork for transport and possession of the item and made an insulated crate made for it. We were in business when a Marine C-130 cargo plane, and really cool pilot, arrived from El Toro and was set to deadhead (no pun intended; oh okay, it was intended) back to Los Angeles. Pilots can carry personal whole luggage as long as there is space. Since the plane was basically empty there was ample space. The pilot was presented with his very own whale head and appropriate paperwork. He then kindly transported it as his personal luggage free of charge to Los Angeles and gave it to museum personnel, who were waiting for him.

11. Fisheries Resources

Each spring, beginning about mid-March and continuing for about two months, grey sharks aggregate in the sandy shallows on the south side of the eastern portion of Sand Island. This phenomenon has been occurring at JA for as long as anyone can remember. The sharks would be easy prey for any line or spear fisherman who would have to do nothing more than stand on the shore to kill them. We feel that the only reason the sharks are still doing this at Sand Island was because the Coast Guard LORAN tower was on the site, and public access was prohibited. This phenomenon is not unique to JA and similar grey shark behavior is known in other remote south pacific islands and protected areas in the Hawaiian Islands.

The refuge staff has constantly heard that the aggregation represents mating and/or pupping activities. The Manager has heard the same from knowledgeable ichthyologists. However, a search of the literature did not turn up much information. Apparently it is a well known phenomenon, but it has been little studied, most probably due to the fact it now mostly occurs only on remote atolls. People have extirpated the sharks in most areas near habitation.

Underwater and terrestrial observations in 1992 by refuge staff proved the theories about pupping or mating activities were incorrect. It was also established that all the sharks were female grey reef sharks and no males were ever present.

Except for the maximum number observed, shark behavior was basically the same as in 1992. The sharks began arriving each day before or around noon regardless of the state of the tide and remained until early evening. They began arriving in a trickle in early-March and gradually increased to maximum number in early April. The number slowly decreased to only several animals by mid-May. The maximum number observed was 30 which lasted about one week. This was quite a surprise since last year's maximum number was 160. We can offer no explanation for the difference.

All sharks were female grey reef sharks of about 4 1/2 feet in length (some bigger, some smaller). No males were ever observed and the females bore no mating wounds so no breeding activity was taking place at any time. No pupping activity was observed and no sharks appeared to be in late stage pregnancy. The sharks were not affected by or curious about the Manager's or Biologist's presence underwater. They were just something to go around. However, they were responsive to auditory, olfactory and visual stimuli. Additional observations will continue next year.

Based on the Manager's two year's of data, Dr. Lobel, Woods Hole Oceanographic Institute, presented a proposal to DoD's Legacy Resource Program for a four year study of the spring aggregations. The proposal was accepted and funded at \$25,000. The research will begin in 1994 and involve short and long term sonic tracking of individuals and measurements of various ambient factors.



The grey sharks returning for their yearly aggregation off the south coast of Sand Island. (R. DiRosa)



All of the aggregating sharks are females but no pupping or mating activity takes place. (R. DiRosa)

14. Scientific Collection

Betty Anne Schreiber, Seabird Research Inc., took the following avian specimens in February 1993 from our stock of euthanized birds and deposited them with the Los Angeles County Museum of Natural History: 1 Christmas Shearwater, 1 Bulwer's Petrel, 3 Red-tailed Tropicbirds, 4 Brown Boobies, 3 Red-footed Boobies, 5 Great Frigatebirds, 3 Sooty Terns, 1 Gray-backed Tern, and 6 Black Noddies.

16. Marking and Banding

The banding effort for 1993 by FWS and other researchers is summarized in table 4.

TABLE 4. Summary of banding accomplishments for 1993.

SPECIES	SEABIRD RESEARCH, INC	FISH and WILDLIFE
Bulwer's Petrel	0	58
Red-tailed Tropicbird	1311	368
White-tailed Tropicbird	0	1
Masked Booby	12	12
Brown Booby	235	185
Red-footed Booby	259	236
Grey-backed Tern	0	258
White Tern	13	53

H. PUBLIC USE

1. General

The population of Johnston Atoll averaged about 1300 military and civilian contractor personnel in 1993. There is no "public" access as such. The Base is a restricted installation and all personnel must be employed at the Atoll or officially visiting and possess an entry authorization from the Base Commander to debark from any ship or plane. Because of the high visibility of JACADS and the chemical operations, the Atoll receives at least monthly visits by general grade officers, Senior Executive Service personnel of the Department of Defense and/or Energy and members of Congress or their staffs. Refuge staff usually have at least some involvement with most of these individuals. Most will receive at least a Refuge tour of the outer islands conducted by the Manager or Biologist. The Manager may provide the individuals with extended briefings on resource and/or contaminants issues and the FWS's role and responsibilities at the Atoll depending on their involvement in these issues.

The following is a list of some of our more noteworthy visitors that the Manager briefed and he and/or the biologist attended functions for and took on tours of the Refuge.

General Miller, DNA Field Commander, Albuquerque, NM and entourage

Nick Aquilina, SES 6, DOE, Los Alamos National Lab, NM

Admiral Houk, U.S. Assistant Surgeon General and
Dr. Harvey Rogers, Center for Disease Control, Atlanta

General Zimmerman, Chaplain of the Army, Pentagon, and entourage

Bob Brittigan, Annette Reeves, both of DNA Albuquerque and
Jean Dixon, DNA Washington D.C.

Mr. Owens, Secretary of the Army for Health and Environment
and Col. Coverstone, Pentagon, accompanied by eight
environmental professionals representing the governors of the

states proposed for JACADS-type facilities.

Ken Tierney, Director of Environmental and Energy Conservation, John Feldman, Corporate Manager Safety and Health, Jeff Axelrod, Corporate Attorney, all of Raytheon Corporation headquarters.

Kirby Williams, Chief of Occupational Safety and Health, Kirkland AFB and 10 OSHA/EPA-like trainees received a special briefing session on contaminants issues and ecological risk assessments.

In addition to the above, there were numerous individuals of lesser importance but still considered VIPs by the military, and highly respected EPA personnel, many of which the Manager personally addressed. The nature of these and many of the above contacts are not to be underestimated. Some, like the visit by Raytheon Corporation executives or the U.S. Asst. Surgeon General, may be the result of contaminants problems (which may be related to new issues uncovered by the Manager) affecting the refuge. The Manager's briefings and/or statements may not reflect well on DNA, the Army or Base contractors. Also, the Manager and Biologist attend the yearly but separate change of command ceremonies for the Army and DNA Commanders at JA. The Manager usually presents an award (plaque) to deserving high grade officers and a short speech at the "end of tour" departure dinners and ceremonies.

7. Other Interpretive Programs

All newly arrived personnel on the Refuge, whether they are visitors or permanently assigned, are presented a 15-minute briefing at the airport terminal by military personnel. Within that "dos and don'ts" briefing is several minutes of short discussion about Johnston Atoll NWR regulations. They also receive a copy of the Refuge brochure. A second briefing for all "newcomers" stationed for more than one month on the Atoll is part of the three-hour introductory program given each Friday. The Biologist or Manager presents a 30-minute slide program about the Refuge, its history and wildlife, reasons for its existence and relationship with the military, and pertinent regulations and reasons for their existence. In addition, each individual receives a copy of the Base

Regulations, which incorporates FWS regulations, regarding the natural resources of the Atoll. The Refuge brochure is basically the only document that visitors have to send to friends and relatives that describes the Atoll. Visitors may have as many copies as they wish.

The Biologist spends a good deal of time administering the volunteer program which has become a great success. We cannot accommodate the number of people who wish to help us with our work. The volunteer program provides us an excellent opportunity to do interpretative work on an intimate basis. It also allows the volunteers a chance to photograph birds in restricted areas under a controlled setting.

The Refuge has outdoor and indoor display areas. The outdoor display is composed of one large sign that is permanently displayed and describes the Refuge and diversity of nesting habitats of the seabirds. The second sign has a display we rotate monthly that features a different species or group of animals each month.

The indoor display is composed of two glass-covered bulletin board type displays in the headquarters building. We change the displays as necessary to feature the latest volunteer activities and selected natural resource topic.

In addition to the above, the Manager and Biologist engage in organized presentations to island residents such as slide programs and lagoon and seabird colonies tours as time permits. All researchers visiting the Atoll are encouraged to make presentations to the Atoll residents about their particular area(s) of expertise or research.

Most high ranking military and civilian dignitaries and their entourages are given a lagoon tour of the outer islands and seabird colonies by the Manager or Biologist. This can take up a lot of time due to the number of dignitaries that come through at times. Usually the time is well spent since we also get to discuss the FWS mission and FWS/military relationship on a more intimate basis. Certain VIPs may be given in depth briefings by the Manager about the various contaminants and natural resource issues. Also, since the Army is funding most of the FWS operation we rarely refuse their requests.

The Refuge Manager addresses press and writers in personal and phone interviews and works with them to produce articles about the Atoll. It is worth noting that he is the only one on the atoll with the authority to address the press without prior approval from supervisors. All others, including the military commanders, must clear at headquarters level. Contractor supervisors are not allowed to address the press.

9. Fishing

Recreational fishing is a popular activity on Johnston Atoll. The University of Hawaii research team estimated almost 7,000 hours of effort were expended in fishing activities in 1989. In previous years, estimates were double that. After termination of the U of H study no estimates have been made. Catches are made from shore and boat using pole and line, throw net, and spear (Hawaiian sling only) while diving. Also, fishing parties organized by the Base Recreational Services Office use the Base's landing crafts ("MIKE" boats) to troll outside the Refuge boundary in deep water for pelagic species such as wahoo, dolphin and tunas.



Fishing is a major form of recreation at Johnston Atoll. The military sponsors weekend deep-sea fishing trips for the island residents. (R. DiRosa)

The atoll's human population as increased considerably as has the fishing pressure on the resource since the University of Hawaii study. The Refuge Fishing Plan is a bit outdated and in need of revision. Data are lacking in all areas to aid in making decisions and regulations.

16. Other Non-wildlife Oriented Recreation

The lagoon is used for a variety of non-wildlife related recreation swimming, sailing, kayaking, water skiing, windsurfing and limited camping on the outer islands. We assume that virtually all snorkeling and SCUBA diving activities are wildlife related.

17. Law Enforcement

The Manager and Biologist have no law enforcement authority on the Refuge because all enforcement authority is vested in the Base Commander and administered by the Base security force. The Base Commander is obligated to enforce all FWS and other federal laws and regulations pertaining to natural resources. The Commander can create a regulation instantly if deemed necessary by him and the Refuge Manager. As a result of the severe punishments involved (possible loss of job and deportation from the island) and the interpretive program, violations of wildlife regulations are rare.

Since Johnston Atoll NWR is also a highly secure military installation we approach punishment for violations of FWS regulations in a different manner from other refuges. On minor violations the Refuge Manager and Commander discuss the violation and agree on a penalty, and the Commander administers it. A "bail schedule" has been agreed to which lists recommended punishments for common natural resource offenses. This helps maintain a degree of continuity and fairness from one commander to the next. On more severe violations such as violations of the Endangered Species Act or Migratory Bird Treaty Act, the Manager reserves the authority to have prosecution handled through the FWS. Military personnel are in additional jeopardy from military regulations.

Only a few minor violations such as unauthorized entry into

closed areas and illegal shark fishing occurred in 1993. The violators had their water recreation privileges suspended for appropriate lengths of time.

I. EQUIPMENT AND FACILITIES

4. Equipment Utilization and Replacement

The refuge vehicles are two golf carts owned by the Service and maintained by the Base contractor.

5. Communications Systems

Refuge operations are basically supported by the Base infrastructure and radio net. One hand-held unit is assigned to us and others are at our disposal as necessary. We operate on the Base channels.

7. Other

The primary FWS facility is the refuge office located in the Joint Operations Center (Base headquarters). The office is adjacent to the offices of the Base Engineer and the Base Commander. It is provided and furnished by DNA so that the Refuge staff is able to work closely with the Base command. All ADP equipment is owned by the FWS. The Joint Operations Center is a four story air-conditioned, over-pressurized building that is secure against hurricane and, of course, gaseous agents.

The FWS maintenance or project needs are basically supported on island by the contractor and costs are billed to a special O&M on island account that is not part of the regular budget negotiated by the Manager every year. It is time consuming to have things accomplished. A written request must be submitted to DNA Engineering who reviews it then passes it to the contractor where it goes through a couple of channels before arriving at the proper office. Everything must be spelled out to insure the project is accomplished properly. If it needs to be done quickly then the Refuge Manager can pull the necessary strings through the Base Commander. The refuge staff also can charge to the above account any items available in the supply warehouse that are needed for projects. The drawback is that

one to several of many items cannot be obtained. Whole boxes or large rolls must be purchased. However, the carpenters, painters and machinists are good to us and will give us many smaller items or quantities to meet our needs.

J. OTHER ITEMS

2. Items of Interest.

Early in the year we received word that the administrative control of Johnston Atoll would be transferred from DNA to the Army. The move, though costly to initiate, actually makes sense. Since Safe Guard C (maintaining JA in mothball status for missile launches should the U.S. return to atmospheric testing of nuclear weapons) was no longer, there was no need for DNA to be at JA. DNA strongly agreed with the change of control since JA is a big administrative headache for it. Changing to Army control would take a year or more since it does things very differently and all existing contracts would have to be renegotiated. The contaminants issues also were a slight stumbling block since the Army had no intention of accepting responsibility. After a field evaluation by Army personnel, Secretary of defense Atwood canceled the transfer order, at least temporarily. It is expected to be resurrected sometime in the future.

North Island contains several sealed buildings in good shape that belong to DOE and were used in the 1960's missile launching and atmospheric nuclear testing program. RSN engineers approached the refuge staff about doing surveys of the buildings for work cost estimates, per DOE's request. They did not want to come into conflict with seabird nesting activities. The refuge staff found this interesting and pursued it through the Base commander and the JA DOE representative. They too found it interesting since neither knew anything about it. The request came from DOE, Los Alamos Lab. We were told that this was nothing unusual since the Lab tends to operate somewhat independently due to its status and high level secret clearance. Nonetheless, a formal request for more information was made and sent up-channel. The reply was rather interesting. We were told it was a "black box" operation and, basically, stuff would go to the island and stuff would come back and all activities would take place

in the buildings, and that was all we needed to know. Since the initial work order indicated potential for expanded and long term operations an additional request for information was made by the Base Commander. Nothing more was heard by year end.

3. Credits

Sections E4, G5 and 16 were written by C. Depkin. The rest was written by R. Di Rosa. Some historical material was copied from previous narratives written by D. Forsell.