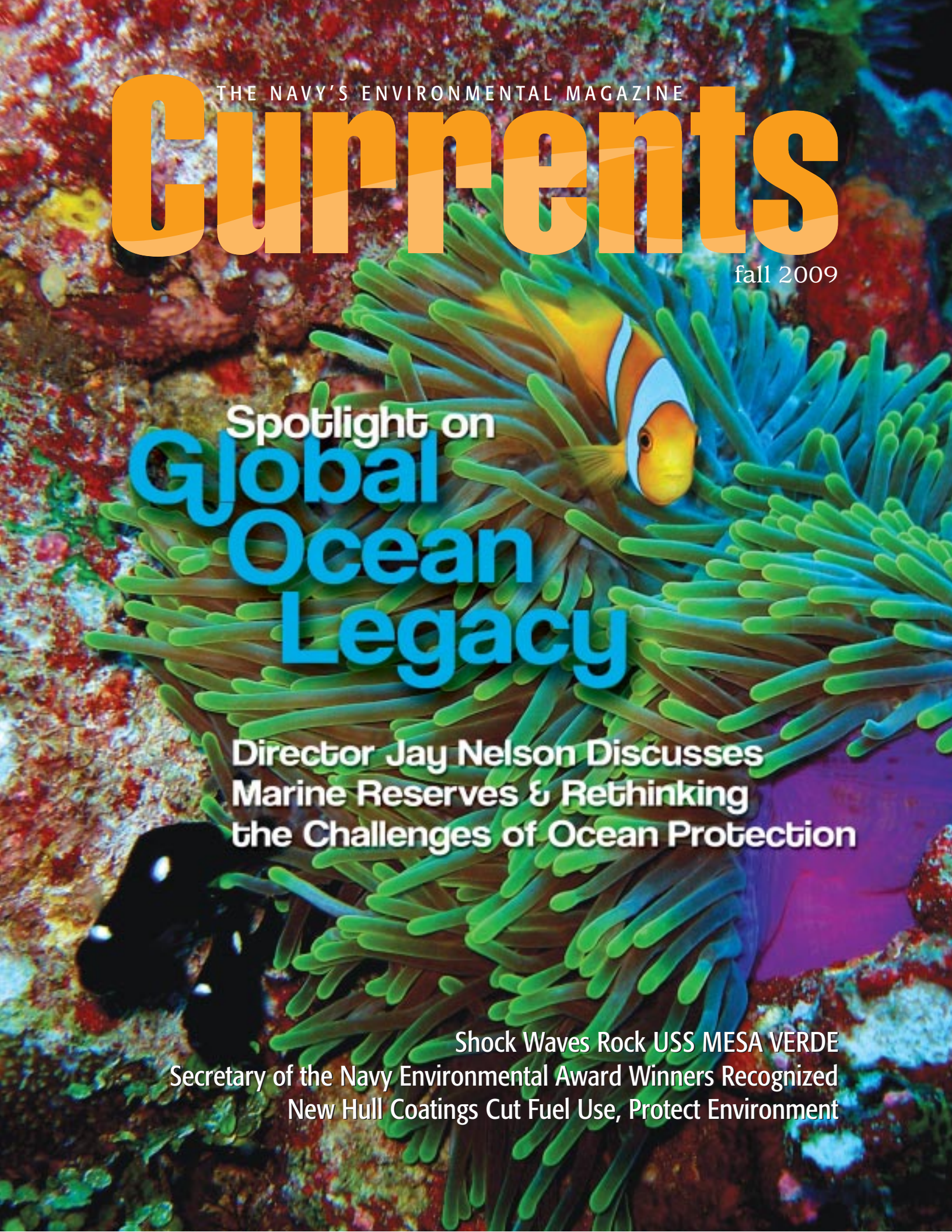
THE NAVY'S ENVIRONMENTAL MAGAZINE

Currents

fall 2009



Spotlight on Global Ocean Legacy

Director Jay Nelson Discusses Marine Reserves & Rethinking the Challenges of Ocean Protection

Shock Waves Rock USS MESA VERDE

Secretary of the Navy Environmental Award Winners Recognized

New Hull Coatings Cut Fuel Use, Protect Environment

THE NAVY'S ENVIRONMENTAL MAGAZINE

Currents

Chief of Naval Operations
Environmental Readiness Division

cover

The Chagos anemonefish is found only in the Chagos Islands, located in the central Indian Ocean 1,000 miles south of India. In the spotlight for this issue of *Currents*, Jay Nelson, Director of Global Ocean Legacy, discusses the designations of marine reserves including efforts to set aside large expanses of the ocean surrounding the Chagos Islands to protect the reefs, fish populations and other resources that sustain the entire region.

Al Harris

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Former USS HARRY S. TRUMAN Commander Takes the Helm at N45

HELLO FROM WASHINGTON! I took over as the new director of the Chief of Naval Operations Environmental Readiness Division (N45) this past June, and saw an issue of *Currents* for the first time just a few weeks ago. I was impressed with the depth and breadth of programs discussed there and I am confident this fall 2009 issue will impress you with its content as well. I would like to use this column to introduce myself and my priorities, and talk briefly about some of the front burner issues N45 and the Navy are working at this moment.

Learning the Ropes

I'm honored and excited to come to N45 to serve as director. I just completed my 29th year in the Navy, and probably the pinnacle of my career: commanding the USS HARRY S. TRUMAN, our nation's finest aircraft carrier. As I think there would be for any naval officer who stepped off of a ship and into a policy position, there will be an adjustment period for me as I come fully up to speed on the issues we're addressing here. Coming from the operational side, it's interesting to get an in-depth look at how the Navy is working to fulfill our obligations for national security and remain in compliance with environmental laws. I say that because throughout my naval career, I've dealt with issues specifically pertaining to the environment.

Protecting the Environment Underway

I remember back in the early 1980s when we became more proactive in managing pollutants. As an aviator on the flight line, I saw equipment and procedures coming online to protect the ocean from oil and other chemicals, and to control paint emissions. I remember looking at the drains in the flight line and seeing the "fish seal," a visual reminder that the drain goes directly into the water. In my tours as executive officer and commanding officer of USS LASALLE and then TRUMAN, I had compliance obligations such as monitoring our waste stream, managing where and when we could discharge at sea, and posting watch standers to look out for and record sightings of marine mammals.

Most naval officers love being out to sea and love the ocean itself, and I'm no exception. There's just nothing like it, and it can be hard to explain to those who haven't been there. When you're underway and you see dolphins playing off your bow, it's an unforgettable experience. As I've steamed through the waterways surrounding many U.S. ports, I've learned to appreciate how beautiful those areas often are, and want to maintain that beauty for my kids and future generations.

Environmental Stewardship: A CNO Priority

My first day here at N45, I attended a luncheon with the Chief of Naval Operations (CNO). It was a discussion that followed a "grand underway tour" of the USS HARRY S. TRUMAN for representatives from the National Oceanic and Atmospheric Administration, the Office of Management and Budget, and the White House Council on Environmental Quality. During the luncheon, the CNO said 'the Navy is a good steward of the environment. We want to continue to be so, and we want to be recognized as such.'

As I've steamed through the waterways surrounding many U.S. ports, I've learned to appreciate how beautiful those areas often are, and want to maintain that beauty for my kids and future generations.

For me, it was important to get the vision directly from the CNO that environmental readiness is a serious priority.

Non-Government Organization Outreach

Recognizing that vision, one might ask, how do we get there? One way is to engage with non-government organizations (NGO). Our office recently hosted an informal meeting

with representatives from the NGO community to discuss their concerns about the location of an Undersea Warfare Training Range (USWTR) off the coast of Florida. With participation from U.S. Fleet Forces Command and the Office of the Assistant Secretary of the Navy for Installations and Environment, the meeting was an opportunity for the environmental groups to voice concerns directly to senior Navy leadership. USWTR subject matter experts clarified the operational reasons for building the range at that location, and described the marine mammal monitoring, data collection and protective measures the range will employ.

110 million dollars to marine mammal research over the past five years. As we continue that research, we will seek advice and suggestions from the environmental community on how to focus it most effectively.

Trusting the Experts

I appreciate the scope of expertise here at N45, and the volume of quality work folks here are doing. Out in the fleet I only saw a small piece of that work that directly affected my ship, but it's great to see firsthand the many hard-working environmental professionals who helped me train and operate at sea and who continue to carry that torch for other ship commanders.

Something that is not widely known, and that we need to continue to communicate, is that the Navy is one of the country's premier advocates of scientific research on marine mammals.

I will continue to promote Navy-NGO interactions into the future. The discussions they foster will enable the NGO environmental community to better understand what we do and why it's important—not just for us as a naval entity, but for the protection of our nation and its citizens. We also want to hear their concerns, learn from them, and in turn become better environmental stewards.

Top Priorities

In the short time that I've been at N45, I can tell you that there is a lot of important environmental work happening right now. Some of our top priorities include NGO outreach efforts (as I mentioned earlier), completing our environmental analyses for our at-sea ranges, environmental clean up and marine mammal research.

We are working with the National Marine Fisheries Service (NMFS) to complete the Navy's current round of range and operating area Environmental Impact Statements (EIS) so we can continue training at sea. As part of those EISs, we're working to provide NMFS with more accurate data for biological assessments and team with them to improve our process for completing those documents in a timely manner.

In order to provide accurate data for our EISs, we need solid research. Something that is not widely known, and that we need to continue to communicate, is that the Navy is one of the country's premier advocates of scientific research on marine mammals. In fact, the Navy has committed over

I believe people, in general, want to do the right thing and will work hard toward that end. So far, I haven't been disappointed.

Value of Communication

You may have noticed that communication is mentioned throughout this column. Communication is one of most important things we can do as naval leaders. At the shipboard level, communicating to your crew what you're doing for the day, week, and month, and ultimately what the Navy is doing in general, helps Sailors prepare and react in a more positive manner. I believe that holds true with the NGO community and general public as well—I don't think you can communicate enough with them. The more we talk about the positive things the Navy does, the better off we'll be. I intend to continue the communication efforts begun, and help develop approaches to deliver that information as frequently and effectively as possible.

I look forward to working toward a successful year of military readiness, environmental compliance and stewardship. ⚓

All the best,
Rear Admiral (Select) Herman A. Shelanski
Director, Environmental Readiness Division


Spotlight on
Global
Ocean
Legacy

Director Jay Nelson Discusses Marine Reserves & Rethinking the Challenges of Ocean Protection

IN THE SPOTLIGHT for this issue of *Currents* is Jay Nelson, Director of Global Ocean Legacy, a project of the Pew Environment Group. This is the third in a series of interviews with representatives of environmental non-governmental organizations (NGO) intended to broaden our understanding of the NGO community and to enhance Navy-NGO environmental cooperation and partnerships.

The following telephone interview was conducted on 14 August 2009 by Kathy Kelley, Contributing Writer, *Currents*.

Currents: Good morning and thanks for taking the time to talk with us today. Let's start by talking about your background.

Jay Nelson: Well, I used to be a scientist. I have a Master's degree in animal behavior. I worked on and off for about a decade with the Alaska Department of Fish and Game and the U.S. Fish & Wildlife Service. In the late 1980s, I got involved in environmental politics and I worked in Washington D.C. and elsewhere for a number of conservation groups—mostly Alaska conservation groups on forestry and marine issues. I also worked for the Governor of Alaska in the 1990s. I came to the Pew Environment Group initially in 1999. I have worked on and off for them for about a decade now.

I should also mention that my father was in the Navy in World War II and retired as a Navy Reserve commander. My uncle was part of the naval invasion force on Saipan and my brother also served in the Navy in Vietnam. So you might say I feel a certain loyalty to the Navy.

Currents: What are your responsibilities as Director of Global Ocean Legacy?

Nelson: First off, let me explain what Global Ocean Legacy is. We're a partnership of a number of different organizations and foundations. Our job—and mine—is to identify sites around the world that are suitable and possible to protect as large marine reserves, while also keeping in mind the interests of our partners.

We started in 2007 to identify sites that we considered biologically significant, which were located in political jurisdictions that had a history of conservation. In other words, places where there is some reasonable likelihood that the government might be interested in creating such a reserve. We identified four sites initially: one in the U.S., one in Australian waters, one in New Zealand waters and one in the waters of the U.K.

Currents: Could you describe the process of site selection?

Nelson: Well, initially we conducted a survey of places that might be worthy of and capable of protection. We came up with a wide variety of sites, but in the end, our criteria were based on biology along with geological, cultural and historic factors. For example, the site we're looking at in Australia is the Coral Sea, where there was a major battle in World War II. In fact, the U.S.S. LEXINGTON aircraft carrier was sunk in that area, and still lies on the ocean floor. So that's a site that has both historical and biological importance.

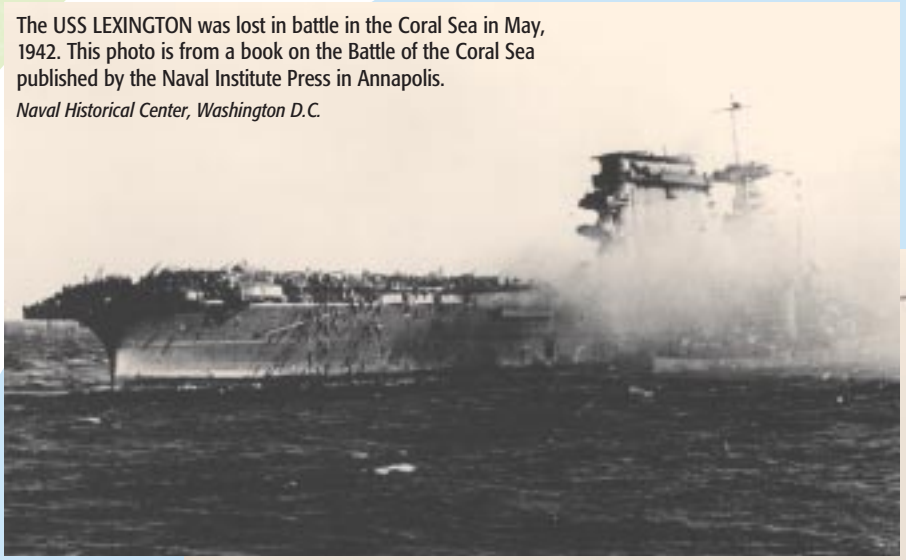
Outside the EEZ there are limited regulations, and monitoring and enforcement are challenging at best.

We limited our search to areas within the Exclusive Economic Zone (EEZ) of nations primarily because outside of that, there are limited regulations and monitoring and

enforcement are challenging at best. (Note: The EEZ is the 200-mile zone in which the world's governments exercise some control. Outside the EEZ is international water.) Within the EEZ of a nation, there is at least an opportunity to deal with a specific government that can make a decision and has a coast guard or some capacity for monitoring and enforcement.

Currents: How did the Global Ocean Legacy come to be?

Nelson: Well, the Pew Environment Group has a long history of projects in the marine area. In fact the largest part of our environmental work is in marine conservation. We concentrate mainly on fisheries, because over time we've been able to determine that the biggest direct impact on the health of the oceans that was within our ability to influence was extraction of living marine resources—fishing in particular. There are other issues: pollution, coastal development, and of course now, climate change—which have potential to have a large and direct impact on the oceans—but the removal of marine life from the ocean has been



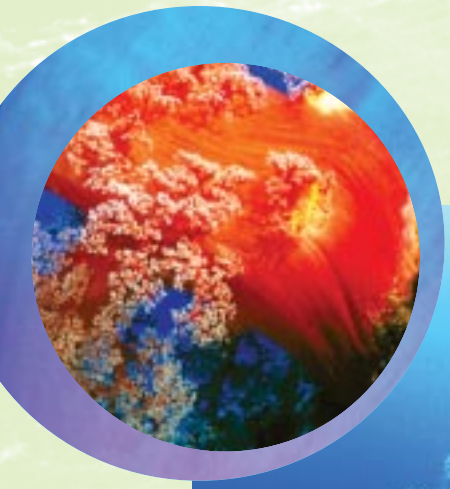
The USS LEXINGTON was lost in battle in the Coral Sea in May, 1942. This photo is from a book on the Battle of the Coral Sea published by the Naval Institute Press in Annapolis.
Naval Historical Center, Washington D.C.

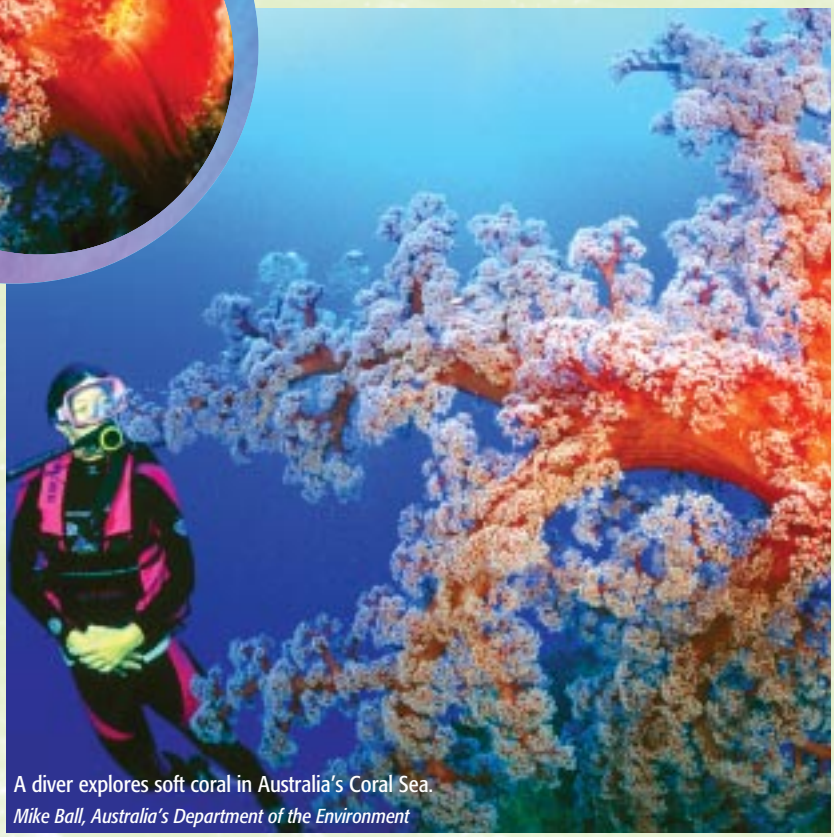
USS LEXINGTON plane pitched from deck due to explosion.
Sea Power Centre–Australia

The Basics About Global Ocean Legacy

GLOBAL OCEAN LEGACY is a five-year project of the Pew Environment Group, the conservation arm of Pew Charitable Trust. An outgrowth of Pew's work towards creating a marine reserve in Hawaii (Papahànaumokuàkea National Monument), Global Ocean Legacy seeks to help create "world-scale marine reserves, where no fishing or other extractive activity is allowed." Through legislation and consciousness-raising, Global Ocean Legacy hopes to do for the sea what national parks have done on land.

To read more about Global Ocean Legacy, visit www.globaloceanlegacy.org.





A diver explores soft coral in Australia's Coral Sea.
Mike Ball, Australia's Department of the Environment

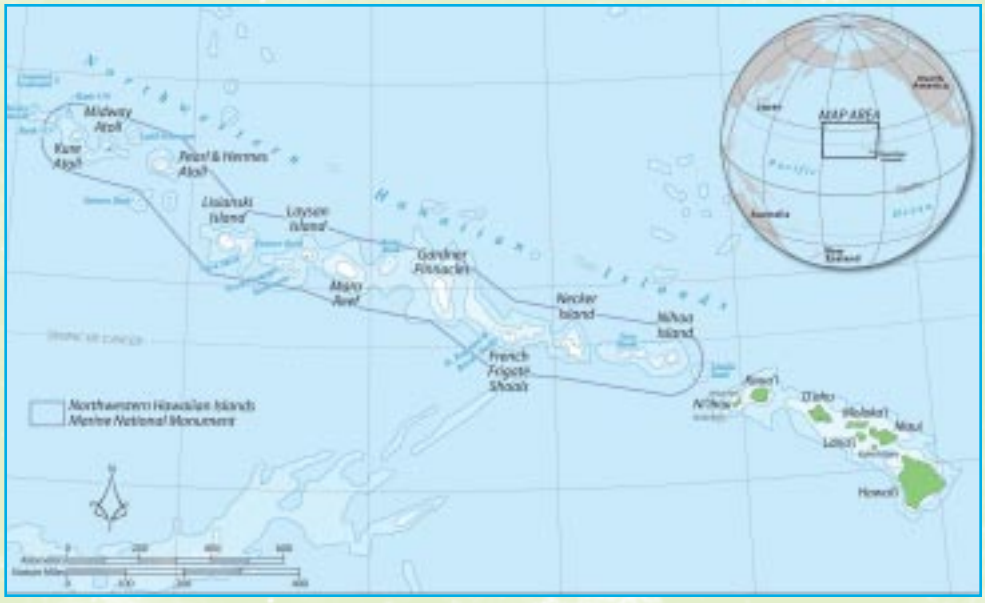
depleting the historic abundance of oceans globally for years now.

The one mechanism for restoring or maintaining ocean health is to set aside areas as "no take" or "no extraction" reserves. Traditionally, the Pew Environment Group hasn't worked in this area, but in the mid 2000s we became aware of an effort that was underway to create a reserve in the Northwest Hawaiian Islands. So we worked on that for a couple of years, which ultimately led to President Bush declaring the Papahànaumokuàkea Marine National Monument there in June 2006.

That became the largest no-take marine reserve on the planet . It has the advantage of being under U.S. jurisdiction, which means that monitoring and enforcement is relatively competent and relatively good compared to many other nations.

After we finished that project—which we viewed as a kind of one-time effort—our managing director Josh Reichert and I talked about going forward. He suspected that there were other places around the globe where you could create very large marine reserves, just as had been done on land in the 19th century.

The whole land conservation movement started with Yellowstone National Park in 1872. At the time, setting aside and protecting a large area of land was a completely new concept—but within a few years of its creation many, if not most, of the countries around the world had created national parks. It really became a movement. People realized that the world is limited—land space is limited—and it was necessary to set aside some of these areas to protect the historical, geological, biological and other features before it was too late.



Designation of the Papahànaumokuàkea Marine National Monument.

Chambered nautilus in red whip coral. The chambered nautilus is an ancient species that inhabits the Coral Sea.
Jürgen Freund

Silica rich chimney formations on the summit of Giggenbach submarine volcano are evidence of warm springs that were active at this site off the Kermadec Islands, New Zealand in the past. These submarine volcanoes are considered to be internationally important because they comprise outstanding examples of major stages of the Earth's evolution.

New Zealand-American Submarine Ring of Fire 2005 Exploration, NOAA Vents Program.

That happened 140 years ago on land, but in the ocean it really hasn't happened. I think that's partly because there's easy accessibility to every corner of the ocean. And how do you restrict that? We suspected that there were areas of the earth that were candidates for large-scale conservation and if we were successful at doing it once or twice, then maybe it could set off a sort of "rethinking"—a rethinking about how people view the oceans and perhaps improve conservation throughout the world.

Currents: Do you think that's happened yet? Has your work influenced the creation of any marine reserves elsewhere?

Nelson: Well, yes and no. There have long been small areas set aside for marine parks, but we're thinking on a bigger scale. For example, the ocean is 70 percent of the earth, but only 0.08 percent of the oceans are designated as highly protected. Now in contrast, seventy five times as much land—almost six percent—is in designated no-take parks.

Part of our goal is to redress that neglect of our oceans. Any one of the sites that we're working on would more than double that figure.

I will say that everyone we've worked with in Australia, New Zealand and Great Britain—all the government officials and NGOs who have some official connection to the ocean—took notice when President Bush designated the marine monuments in the Pacific last January and the Papahànaumokuàkea Monument in 2006. They all recognize these monument designations as significant events and it has led to a rethinking in those countries about their own conservation efforts and whether they should be doing something similar. So, I don't know that it has led to an outcome yet, but I do think it has led to a rethinking of how people look at the ocean.

Currents: Your web site states that "our aim over the next five years is to establish three to four large-scale, world-class no-take marine reserves that will provide ecosystem-scale benefits and help conserve our global marine heritage." Is that still your timeframe and how is it coming along?

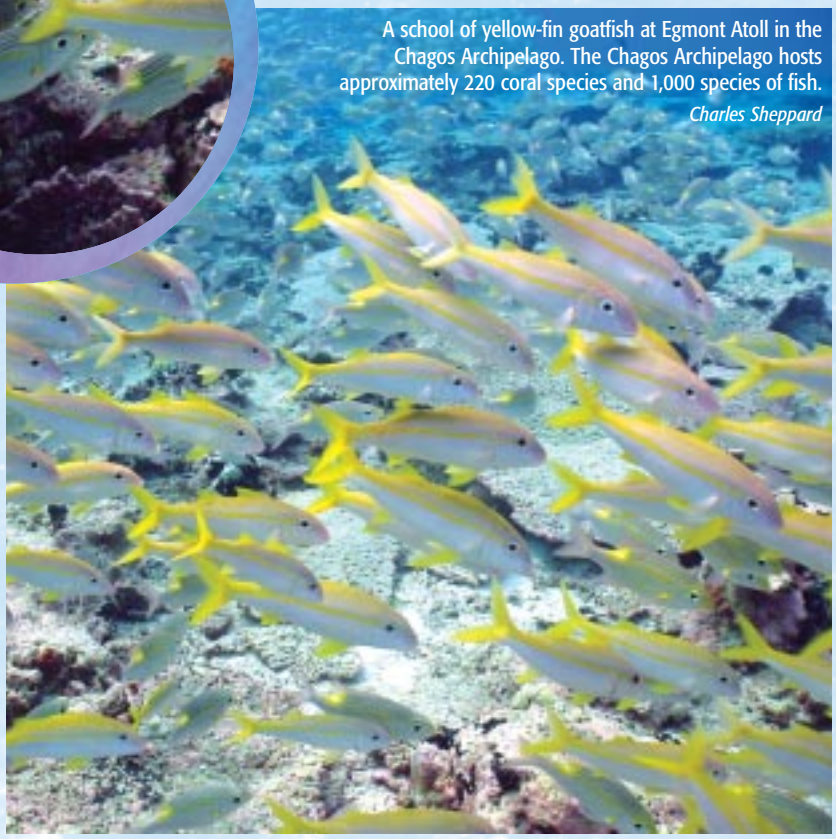
Only 0.08 percent of the oceans are designated as highly protected. Seventy five times as much land—almost six percent—is in designated no-take parks.

Nelson: Yes, it's still our goal. And the four areas where we have worked on are the Marianas Trench, which President Bush designated as a monument in January 2009; Australia's portion of the Coral Sea, a very large area; the Kermadec islands off the northern coast of New Zealand; and the Chagos Islands, which are a U.K.

Aircraft carrier USS SARATOGA (CV-60) at NSF Diego Garcia.
PH1 P.D. Goodrich

territory in the Indian Ocean. The Navy has a strong interest in the Chagos Islands because Naval Support Facility (NSF) Diego Garcia is located there. It's an amazing archipelago. There are about 55 islands, and except for the inhabitants on Diego Garcia, it's uninhabited. It's almost certainly the most unspoiled tropical archipelago on the planet primarily because the impact of humans over the last several hundred years has been so limited. There have always been so few people there, and it hasn't even been thoroughly explored. It includes a lot of deep ocean trench and all kinds of geological features that indicate that there probably are varied, unusual and perhaps unknown fauna on the bottom of the ocean.

The Chagos Islands sit in the middle of the Indian Ocean—almost equidistant between Indonesia and the east coast of Africa. Scientists have been looking at the species that reside there—they are related to both countries. It's believed that the Islands are a larval source for species in Africa because currents flow in that direction. So the Islands are a kind of a stepping stone between Asia and Africa. And because the reefs are so healthy—the population of fish and other resources are so healthy—it's likely benefiting the entire rim of the Indian Ocean. The Islands are sitting on the body of water that probably has one of the highest populations in



A school of yellow-fin goatfish at Egmont Atoll in the Chagos Archipelago. The Chagos Archipelago hosts approximately 220 coral species and 1,000 species of fish.
Charles Sheppard

the world along its coastline and whose reefs are some of the most threatened in the world, along the coasts of Africa, India and Indonesia. All those places are under severe stress from overpopulation—so having a largely uninhabited and unspoiled archipelago in the middle of that is something of a global gem that can help sustain the entire region.

Currents: If this reserve were to be established in the Chagos Islands, how do you see that affecting NSF Diego Garcia?

Nelson: Well, we have talked to the British government about creating a reserve around these islands, and we believe that there is some interest on their part in doing so. One of the issues, of course is the Navy base and the Navy's use of the area. Our proposal from the very beginning makes it clear that we have no interest in impacting Navy operations in any way.

The area Chagos Islands and the surrounding waters are over 500,000 square kilometers, which is enormous, and the Diego Garcia military base is towards the southern end of this area. The vast portion of this area is over hundreds of miles from the base.

Our long-term concern for the area is extraction of resources, including fisheries, and in the long run, mining. Although there is no deep-sea mining in the world today, it's possible as terrestrial sources become more and more depleted. Mining in a place like this would be a little bit like using Yellowstone Park for geothermal or the Grand Canyon for hydro power. You could do it, but it's not the right place. Our main interest is in protecting the Chagos Islands from extractive activities.

Scientists have told us that the waters around Diego Garcia are clean—as clean as can be found anywhere. So I think the current environmental management by the British government and their partnership with the U.S. military is good.

Currents: Have you partnered with the Department of Defense and the Navy in particular on any of your projects?

Nelson: Well, we certainly talked to them in the past. We had conversations with Don Schregardus when he was the Deputy Assistant Secretary of the Navy for Environment regarding our work in the Pacific on the Marianas Trench Marine National Monument. We've also interacted with B.J. Penn, Assistant Secretary of the Navy for Installations and the Environment. We have worked with and tried to keep the Navy advised of what we were doing to the extent that our activities might intersect with theirs.

We have no interest in impacting Navy operations (on Diego Garcia) in any way.

There's another area in which we've worked in parallel. Both the Pew Environment Group and the Navy have been working towards getting the Law of the Sea Treaty ratified by the U.S. Senate.

NOAA Research Vessel *Hi'ialakai* at Uracus Island, northernmost island of the Mariana Islands.
Robert Schroeder

Currents: Could you talk a little bit about that?

Nelson: The Law of the Sea Treaty has been in force for a long time, over 25 years, but it has never been ratified by the U.S. government. Even though we have viewed it as sort of customary law and have adhered to the principles in the treaty, until we ratify it we don't have a seat at the table when important decisions are made. We have been working with a number of organizations—oil companies, the Navy, a lot of other businesses and environmental NGOs—to get the treaty ratified. It has a lot of implications for the future use of the oceans since it is the treaty under which the 200-mile limit was established. It also allows for nations to claim resources beyond their 200-mile limit, which we won't be in a position to do until the Senate ratifies it. I think it would strengthen U.S. claims in the Arctic, which is an area where the U.S. Navy has great interest, especially as the Arctic becomes more ice-free. There are eight nations that have made claims in Arctic waters, so the Law of the Sea Treaty would strengthen our negotiating position and ability to argue for our claims in the Arctic.

Currents: Since the Navy has such a large presence in the oceans of the world, do you think that Global Ocean Legacy and the Navy are suited to become partners in some capacity?

Nelson: Yes. We are very interested in engaging with the Navy in each nation in which we have proposed marine reserves. Since we work within the EEZ of various nations, decisions regarding the waters are under the control of that nation. But as you point out, because the Navy has such a large presence in the world, there almost always is some connection to the Navy.

Navy personnel, better than most people, understand the sea—particularly the blue water—and understand humanity's dependence on the ocean and its role in providing us with food, transportation, commerce, communications and defense. Navy personnel have a more visceral understanding of the fragility of the oceans and the need to protect them. Most of the rest of us obtain our marine experience from visiting the shore.

One of the issues that is challenging for us and the Navy pertains to the Marianas Trench Marine National Monument in the Pacific (see our sidebar entitled "The Basics About the Marianas Trench National Monument").

The Basics About the Marianas Trench Marine National Monument

ON 6 JANUARY 2009, then-President George W. Bush established the Marianas Trench Marine National Monument under the authority of the Antiquities Act of 1906 which protects places of historic or scientific significance. The Marianas Trench Marine National Monument consists of approximately 95,216 square miles of submerged lands and waters of the Mariana Archipelago. It includes three units: the Islands Unit, the waters and submerged lands of the three northernmost Mariana Islands; the Volcanic Unit, the submerged lands within 1 nautical mile of 21 designated volcanic sites; and the Trench Unit, the submerged lands extending from the northern limit of the Exclusive Economic Zone of the United States in the Commonwealth of the Northern Mariana Islands (CNMI) to the southern limit of the Exclusive Economic Zone of the United States in the Territory of Guam.

Additional information and a fact sheet are available at www.fws.gov/marianastrenchmarinemonument.

A mussel biomass adorns the lava ridges at the crest of submarine NW Eifuku volcano north of Uracus near the Marianas Trench Marine National Monument. These seven-inch mussels are so densely massed that they obscure the bottom. The white galatheid crabs are 2.5 inches long.

INOAA Submarine Ring of Fire 2004 Exploration and the NOAA Vents Program

There was considerable concern in the Navy that the reserves set aside by the U.S. government would potentially restrict Navy activities in the area. There are provisions in the monument declaration that would protect the Navy's interests, but I know there are concerns about whether those provisions are sufficient. I understand why it's an issue for the Navy. There is concern that these provisions will restrict the Navy's ability to operate in the ocean and could constrain their ability to carry out their mission. And if the Navy is constrained in U.S. waters, certainly nations that are unfavorable to our interests could use environmental protections as an excuse to constrain freedom of the seas. Freedom of the seas has a long history around the globe and as the world's oceans become more carefully managed and controlled, it impacts freedom and the use of the seas. Any kind of zoning will have an impact. So I understand the Navy's concerns regarding the reserves that we're proposing. A special purpose zone could impact naval operations. It's a tough issue for the Navy and I understand that.

As an NGO, we don't have much say in how these zones are determined because the waters belong to one nation or another. Even if we have a point of view, our point of view may not prevail. That's something the Navy will probably have to deal with on a daily basis for the next 200 years.

Currents: You've talked a little bit about the challenges you face as an organization: overfishing and climate change. Do you think that climate change is poised to become the number one issue for you?

Nelson: Well, climate change is going to happen. It *is* happening. And even if the governments of the world were to come to a solution right now to halt it, the changes that have been put into motion already are going to carry on for another century or more. So in many ways, there's not much we can do about this except mitigate future impacts by severely curtailing greenhouse gas emissions. In 1998, there was a global warming incident in the Indian Ocean where ocean temperatures got so hot that they became lethal to coral reefs. As you know, there's a symbiotic relationship between the coral and the algae that lives in the corals. It is this algae that gives coral their color. The algae produce the food for the coral and keep the coral healthy, but at some point when the temperature gets hot enough, the coral expels the algae from their cells and you end up with bleached coral which looks white. That's actually the true color of coral without the algae. If the algae don't come back to the coral, the coral dies because it has no food source.

There was a warming incident where virtually all the coral in the Indian Ocean bleached, lost their algae, and many of the coral died.

Boobie on Middle Brother Island, Chagos Archipelago.
Al Harris

More About the Chagos Islands

LOCATED IN THE middle of the Indian Ocean, the Chagos Islands is unquestionably one of the most remote and unspoiled marine environments on the planet. A part of the British Indian Ocean Territory, the islands have been uninhabited for the last 40 years, home only to NSF Diego Garcia.

Global Ocean Legacy has joined with British conservation organizations, the Royal Society for the Protection of Birds, the Zoological Society and the Linnean Society to promote the designation of the area as a no-take marine reserve. If approved, the reserve would top out at 210,000 square miles.

There are numerous geological and biological features that justify the decision to seek such a designation. One of them is the Great Chagos Bank, which, at approximately 100 miles across, is the largest atoll in the world. There are also rare seabird colonies, sea turtles and a number of endangered marine animal species.

Efforts to designate the area as a marine park are complicated not only by the presence of Diego Garcia, but by the displaced residents of the Islands. According to the British Indian Ocean web site, approximately 1,000 Chagossians were relocated from the Chagos Islands when the Diego Garcia military base was established in the late 1960s. Some of these individuals and their descendents are seeking a return to the islands. Refugee organizations and the British government are at odds over whether, or on what conditions any of them should be allowed to return.

So there was a warming incident where virtually all the coral in the Indian Ocean bleached, lost their algae and many of the coral died.

The coral reefs that responded and recovered the fastest and best were in the Chagos Islands. This happened because those reefs had no other harmful stressors. In areas where there is pollution or sediment runoff or where fisheries are depleted, those factors can cause reefs to be less resilient to stress. You get high amounts of algae growing—unhealthy algae that smother the reefs. Reefs also get smothered by runoff, which happens fairly frequently where there is a lot of development. Also, when you remove certain fish from the reefs, like sharks—sharks actually help keep reefs healthy by the fish that they eat—the reef becomes less resilient to stress. So in the absence of all these stress factors, the coral reefs off the Chagos Islands were able to recover quicker and almost completely.

So, yes, I do think that climate change poses the biggest long-term threat to the oceans. We believe that designating large areas of the ocean where species have an opportunity to fight one-on-one with global warming gives them the best chance of maintaining their health. But even those areas we put into reserves will be affected by things like acidification of the ocean—

The Chagos Archipelago provides habitat for a rich diversity of seabirds in the Indian Ocean.
Al Harris

Tubeworm found at the submarine volcanoes in northernmost range of the Northern Mariana Islands. The tubeworm bushes here were up to one meter tall.
NOAA Submarine Ring of Fire 2004 Exploration and the NOAA Vents Program

the amount of carbon dioxide the oceans are absorbing is increasing its acidity making it more difficult for coral reefs to survive.

In highly acidic water, the calcium carbonate, which is what reefs are comprised of, gets dissolved and so reefs may not be able to form as easily. The other problem is sea level rise. As the world's ice melts and the sea levels rise, this puts the reefs deeper into the water. Speculation is that it will submerge entire islands including some island nations in the Pacific. So all these things will go on regardless. But if we don't set some areas aside to protect them from the immediate impacts of human activities, then we won't have any control sites where we can actually identify which changes are the result of climate change and which can be attributed to other events. A big part of our reasoning for setting aside some of these areas around the globe has to do with scientific work and research.

Currents: Do you feel that there's some urgency among the governments of the world to address climate change?

Nelson: Yes. It's not as if it's escaped the notice of millions of people that climate change is a big issue. There are enormous economic and political forces at work. As far as Global Ocean Legacy is concerned, we have a limited ability to influence the debate on climate change—but we do have the ability to get nations used to the idea of setting aside large reserves that might be extremely important to the survival of our oceans in 100 years.

Currents: With regard to the Papahànaumokuàkea reserve in Hawaii, has there been any change in that ecosystem since that has become a protected area?

Nelson: Well, that's unlikely at this stage. One of the compromises that was made during the designation, and a fair one I think, was that the fisheries within the confines of the reserve could continue to operate for five years. So the operation of those fisheries will not change until June 2011. The one thing that changed is the amount of money spent on research and education—there's additional federal funding for outreach, planning and management of the reserve. So once the wheels of the government get in motion, they realize that they're holding onto this resource and learn how to manage it, the health of the area will begin to improve.

Currents: Can you talk a little about what kind of research is going on in Hawaii?

The amount of carbon dioxide the oceans are absorbing is increasing its acidity making it more difficult for coral reefs to survive.

Nelson: There's a lot of work on endangered Hawaiian monk seals. They're a very interesting animal. They're a tropical seal, closely linked

A six-inch purple anemone clings to a pumice rock along the east crater wall of a submarine volcano in the Mariana Trench.
NOAA Submarine Ring of Fire 2004 Exploration and the NOAA Vents Program

to coral reefs. There are only three species of monk seals in the world: one in the Caribbean, which is extinct; one in the Mediterranean, which is very close to extinction; and the Hawaiian monk seal, which is endangered. So a good bit of the research is about this animal. There is also research on the seabird populations. For instance, almost 90 percent of the world's population of Laysan Albatross nests in the Hawaiian Islands.

Also there are a variety of coral reef studies. Generally, the research that's being done in the northwest Hawaiian Islands is the kind of research that can only be done in a place that is protected and unspoiled. The purpose of the research is to look at what's happening there and compare it to other parts of the Pacific that are more degraded. So the reserve is a unique laboratory which can be used for specific purposes. It's a rare and important commodity for science.

Currents: Is there anything else you'd like *Currents* readers to know about?

Nelson: Well, I did want to mention something about our style of work. We're a little different than other NGOs in that we don't have a very large staff overseas and we don't intend to have much staff in other nations. We partner with local conservation groups in whatever country we're in. This is somewhat important in terms of how our work goes forward because we use the knowledge, skills and political sensitivities of local conservation groups and local NGOs to help us work with governments in other nations. I think sometimes people get confused about our role as an NGO. We can suggest things, work with governments and others to help them to recognize the importance of their natural resources, but ultimately we don't have any decision-making power.

A good example is our work on the Marianas Trench Marine National Monument. It constantly amazes me that the U.S. government had, within its jurisdiction, the Marianas Trench—the deepest point on the globe. It's as if the United States had owned Mt. Everest and not noticed it.

And here it was 140 years after we set up our first national park—no government agency had even considered protections or recognition of the Marianas Trench. Part of our role is to find places that people, for whatever reason, may have overlooked and try to get them to recognize their global environmental significance.

Currents: Well, thank you very much for your time and good luck to you.

Nelson: Thanks very much.

Shock Waves Rock USS MESA VERDE

Explosives Test Ship's Survivability Without Harming Marine Life

FOR THE FIRST time in seven years, the U.S. Navy conducted a full ship shock trial of a U.S. Naval vessel at sea. From July through September 2008, the USS MESA VERDE (LPD 19) was the subject of a survivability test off the coast of Jacksonville, FL. MESA VERDE was chosen to represent the San Antonio (LPD 17) class of amphibious transport dock ships. The last Navy full ship shock trial was conducted on the destroyer USS WINSTON S. CHURCHILL in 2001.

Shock trials are evaluated as one means of meeting the requirement for realistic survivability testing and to ensure safety and combat readiness.

Shock Trial Background

Each new class (or major upgrade) of U.S. Navy ships must undergo testing to assess the survivability of the hull and the ship's systems, and to evaluate the ship's capability to protect the crew from an underwater explosion. Federal law requires "realistic survivability testing of a covered system to ensure the vulnerability of that system under combat conditions is known." To comply with this code, the Navy has developed a Live Fire Test and Evaluation Program that includes computer modeling and analysis, individual component testing and at-sea shock trials. For each new class of warships constructed by the Navy, full-scale shock trials are evaluated as one means of meeting the requirement for realistic survivability testing and to ensure safety and combat readiness.

The at-sea component of the shock trial is important to gather data on the survivability of the ship when it is subjected to realistic explosive events. A shock trial consists of a series of underwater detonations that propagate a shock wave through the ship's hull under controlled conditions. The effects of the shock wave on the ship's hull, equipment and personnel safety features are then evaluated. This information is used by the Navy to validate or improve the survivability of the ship class, thereby reducing the risk of injury to the crew and damage to or loss of the ship.

The MESA VERDE Shock Trial consisted of three detonations of a nominal 10,000 pound charge. The trial occurred over an eight week period from July to September 2008, approximately 100 nautical miles off the coast of Naval Station Mayport, FL. During each shock event, the charge was towed alongside MESA VERDE below the water's surface. With each detonation, the charge was moved closer to the hull to assess the severity of impacts to the ship's systems.

Description of USS MESA VERDE

MESA VERDE is the third ship constructed in the San Antonio class. The class serves as the replacement of four classes of amphibious ships that have reached the end of their service life: LPD 4, LSD 36, LKA 113 and LST 1179. Currently, the ship class is planned to consist of 11 vessels. The San Antonio class is an amphibious transport dock ship designed to meet the lift requirements of the Marine Air-Ground Task Force. It is designed to support embarking, transporting and landing elements of a Marine landing force in an assault by helicopters, landing craft and amphibious vehicles.

MESA VERDE is manned by a 360-person crew with the ability to

The amphibious transport dock ship USS MESA VERDE (LPD 19).

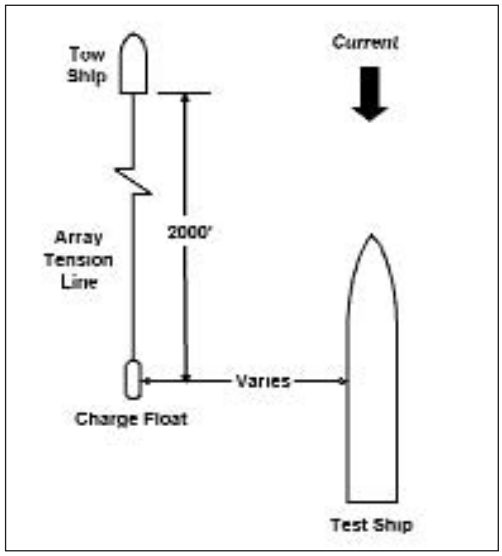
support a surge of 800 Marines. The ship is approximately 24,900 tons fully loaded and capable of landing up to four CH-46 Sea Knight helicopters or up to two MV-22 Osprey tilt rotor aircraft simultaneously with room to spot four MV-22s on deck and one in the hanger. MESA VERDE can carry two Landing Craft Air Cushion (LCAC) platforms or one Landing Craft Utility (LCU) and 14 Advanced Amphibious Assault Vehicles. Powered by four turbocharged marine Colt-Pielstick Diesels, the vessel is 684 feet long and reaches speeds of over 20 knots.

Building the Team

To successfully execute a shock trial, the Navy must draw on resources and expertise from a myriad of sources, regardless of command, civilian/military status or contractor/government employment. The success of the teaming relationship has a direct impact on the overall success of the shock trial. The MESA VERDE shock trial team consisted of five directors reporting to the Shock Trial Officer:

- Combat Systems;
- Explosive Operations and Shock Response Instrumentation;
- Hull, Mechanical and Electrical;
- Logistics; and
- Environmental Protective Measures.

Each director was responsible for the operations within their team as well as the successful communication and partnering with the other teams for data consistency and trial execution. For the MESA VERDE shock trial, successful teaming was most apparent on shot day. Shock trial directors and the crew worked with one another to ensure vessel traffic had cleared the area, the charge could be armed safely, shock equipment and personnel were



Explosive operations configuration.

prepared, and environmental conditions were clear.

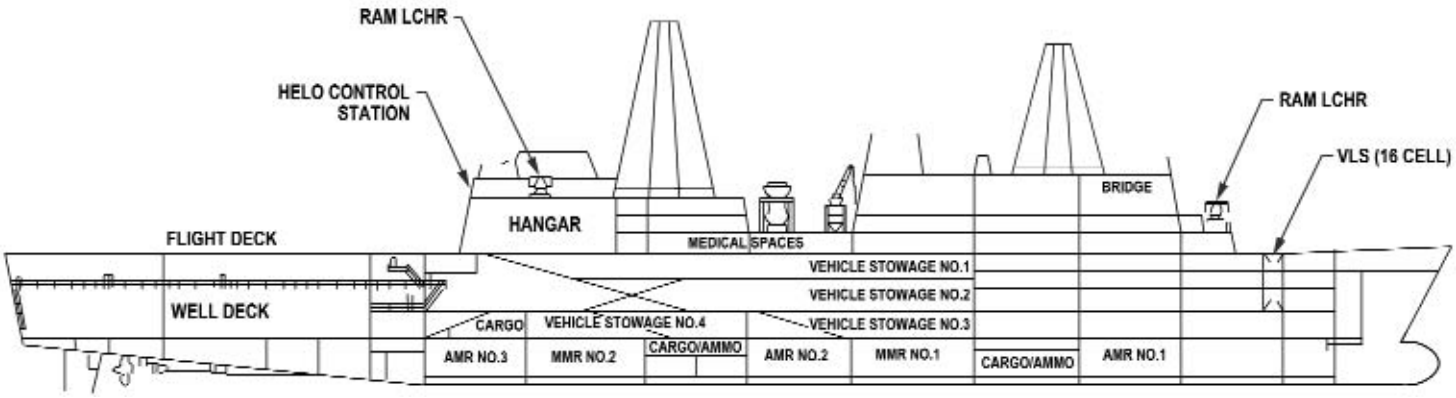
The Environmental Team

The environmental component of the shock trial was separated into two phases. The first phase was environmental planning, and the second phase was monitoring and mitigation execution.

The environmental team's responsibilities were determined well in advance of the shock trial. Roles and responsibilities, location, time, mitigation measures and final reporting requirements were evaluated in environmental compliance documentation and permitting negotiations with the regulatory agency—the National Marine Fisheries Service (NMFS).

Environmental Planning and Compliance–Phase One

Environmental planning began in 2003. The Navy and NMFS signed an agreement assigning NMFS a cooperating agency role for the proposed action (shock trial) as defined by the National Environmental Policy Act (NEPA). The Navy also consulted with NMFS under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA).



LPD 17 ship class design.

Shot 1: 16 August 2008. Marine mammal sightings: Pilot whales, bottlenose and unidentified dolphins.
Shot held during countdown due to marine mammal sighting in safety range.
Shot detonated at 3:15 pm after animals were spotted outside safety range.

Under NEPA regulations, the Navy held public scoping meetings in 2004. The purpose of these meetings was to introduce the proposed action (shock trial) to the general public and to allow public involvement in addressing the issues related to the trial. Public, federal, state and local agencies were also invited to attend. Public comments were addressed in the Draft Environmental Impact Statement (DEIS) published in 2007. The DEIS described alternatives for site location and season for the shock trial and provided analysis of impacts to the environment from the actual shock event. The DEIS also evaluated a "no action" alternative and component testing, modeling and simulation, but these alternatives did not fulfill the Navy's Live Fire Test and Evaluation requirement. Three site locations were selected for analysis based on the following criteria:

- Individual Tempo of Operations Requirements,
- Geographic location,
- Nominal water depth (at least 600 feet),
- Proximity to a ship industrial facility (120 nautical miles),
- Proximity to Navy assets/ships (120 nautical miles),
- Proximity to an airfield for support aircraft (120 nautical miles),
- Proximity to an ordnance loading station (200 nautical miles),
- Ship traffic,
- Weather, and
- Gulf stream avoidance.

To successfully execute a shock trial, the Navy must draw on resources and expertise from a myriad of sources.

Norfolk, VA; Pensacola, FL; and Mayport, FL were the three site locations determined to meet the operational requirements. Environmental criteria were also evaluated for each site by season including species abundance and densities, climate, currents, shipwrecks, sanctuaries, oil platforms, unexploded ordnance and artificial reefs. A quantitative analysis and modeling was used to determine potential impacts to marine mammals and sea turtles. Modeling predicted

Shot 2: 26 August 2008. Marine sightings: sea turtles, unidentified dolphins, large Sargassum rafts. No shot delays due to animal sightings. Shot detonation at 5:01 pm.

potential exposure to sound pressure or energy created by the detonations. Taking all this data into consideration, it was determined that the preferred location was off the coast of Mayport during the spring and summer.

The DEIS was published in October 2007 for public review. Additional opportunity for public comment was provided during public hearings held in November 2008 in Norfolk, Pensacola and Mayport. A total of seven comments were received and addressed in the final EIS published in May 2008.

The EIS Record of Decision (ROD) was signed in July 2008 by Vice Admiral David Architzel, principal deputy, Assistant Secretary of the Navy for Research, Development and Acquisition. Under MMPA, NMFS issued a letter of authorization for incidental take of marine mammals to the Navy and the final rule was published in the Federal Register. Under ESA, NMFS issued a biological opinion and incidental take statement. These documents provided independent analysis of the data provided in the EIS and concurred with the Navy's proposed mitigation measures to reduce possible impacts to endangered species, threatened species, marine mammals and critical habitat.

Environmental Monitoring and Mitigation–Phase Two

The mitigation measures outlined in the environmental compliance documentation were used to prepare a marine mammal and sea turtle protective measures plan. This plan was developed and executed by an environmental team comprised of personnel from the following organizations:

1. The Naval Sea Systems Command;
2. Naval Surface Warfare Center Panama City;
3. Booz Allen Hamilton;
4. Coastwise Consulting; Environmental Aviation, Inc.;
5. Seaward Services, Inc.; and
6. BAE Systems.

This team of contractors and government personnel provided the expertise to quickly decipher and execute environmental requirements while remaining respectful of other shock trial responsibilities.

The plan required a Beaufort Sea State level of three or better (maximum two-foot waves and maximum wind speed of seven to ten knots) for aerial and

shipboard monitoring. The team designated a 3.5 nautical mile safety zone around MESA VERDE. No marine mammals could be sighted within the safety zone at the time of detonation.

Preparation

The lead scientist analyzed sea surface temperatures and sea state conditions for the test area (within 120 nautical miles of the coast of Mayport) weeks prior to the first shock event scheduled for late July 2008. These data were used to determine favorable locations to conduct aerial observations several days prior to the first detonation. Two sites were identified as potential shock locations. These locations proved to have low marine mammal densities, were in sufficiently deep water and avoided the Gulf Stream's western edge.

Aerial surveys were conducted prior to each detonation, on shot day and after each detonation. A Marine Animal Response Team (MART) ship was required to conduct marine mammal observations the day of and after each detonation, and shipboard observers on MESA VERDE were used the day of each detonation. In total, there were three aerial observers, three MART observers and six MESA VERDE observers. Pilot whales, one sperm whale, loggerhead sea turtles, green sea turtles, Risso's dolphins, bottlenose dolphins, and dolphins belonging to the genus Stenella were observed over the course of the shock trial. (NOTE: Atlantic spotted dolphins, pantropical spotted dolphins, striped dolphins and spinner dolphins are similar in appearance and difficult to identify to the species level.) The robust planning and pre-shot aerial surveys gave the lead scientist indications of possible anomalies that may have existed at the proposed shot location. For example, the sighting of a sperm whale off the coast of Mayport in July 2008 was an unusual event and observers were sensitized to the possibility of additional sightings.

Shot Day Execution

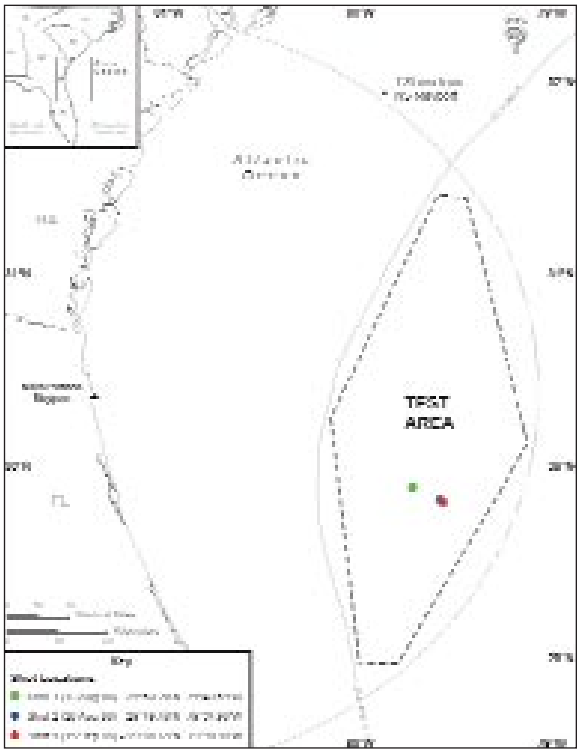
The shock trial experienced several postponements due to mechanical issues and weather delays (Hurricane Hanna, Hurricane Ike and Tropical Storm Fay). However, all shock trials were completed by September 2008.

On each shot day, all animal or Sargassum raft sightings were reported to the lead scientist on board MESA VERDE. Sargassum rafts are free-floating mats of seaweed found in open waters, and are an important habitat for marine life. Each sighting was entered into the Marine Animal Tracking System (MATS). Ship speed, current and animal behavior were also logged into MATS so that animal movement over time could be estimated. These sightings were then re-acquired by the survey team and location was adjusted on MATS. (See our sidebar entitled "MATS Provides Leading Edge Animal Tracking" for more information on MATS.)

The MART observers, aerial observers and MESA VERDE shipboard observers began marine mammal surveys at least two hours prior to the planned detonation. The lead scientist worked closely with the shock trial officer and the explosives boat crew to ensure the marine mammal surveys were completed prior to the detonation.

At the time of detonation, the MART and aerial team assumed positions at

No injured or dead marine animals were observed or associated with the MESA VERDE Shock Trial.



Locations of shock trial detonations within test area.

Shot 3: 13 September 2008. Shot delayed from 12 September 2008 due to sea conditions. Marine sightings: none. Shot detonation at 1:05 pm.

least five nautical miles from the MESA VERDE. Their locations were confirmed before the detonation could occur.

The lead scientist gave the decision to execute the detonation. The explosion would have been postponed if any marine mammals, sea turtles, large Sargassum rafts, debris lines or large concentrations of jelly fish were seen within the safety range. Debris lines are floating concentrations of debris which often support marine life, and should not be disturbed.

After detonation and the "all-clear" signal was given, MESA VERDE observers conducted surveys for any injured or killed marine animals. The MART ship and aerial observers moved to the detonation site and also began looking for injured or dead marine animals.

The MART and aerial team followed the current for the remaining daylight

MATS Provides Leading Edge Animal Tracking

MATS PROVIDES A graphic display allowing the user to pinpoint the location of marine animals relative to the safety zone.

The MATS program depicts the safety range and buffer zone as concentric circles around the moving detonation point. If marine animals or turtles are spotted by the shipboard and aerial survey teams (or detected by the acoustic tracking system), the lead scientist onboard ship enters them into the MATS program and it immediately displays the animal's position relative to the detonation point. This enables the lead scientist to certify a "clear" range for detonation or declare the range "fouled" within seconds of receiving a new contact report. MATS also provides the Shock Trial Test Officer and the Commanding Officer with relative marine life bearings if a change to the ship's course is required.

The MATS application interfaces with a hand held Global Positioning System (GPS) through a computer serial COM port. The GPS unit feeds the ship's latitude, longitude, speed and heading information to the application. The lead scientist enters the sighting information, including species, location, estimated speed and swim direction of every animal or group of animals detected. In support of the LPD 19 shock trial, MATS was improved to project the approximate area where previously spotted cetaceans would most likely resurface.

The Navy is currently considering expanding the use of MATS to track marine animals in other applications.

USS MESA VERDE (LPD 19).

hours (a minimum of three hours). These surveys continued for at least two days following each detonation. No injured or dead marine animals were observed or associated with the MESA VERDE Shock Trial.

Data Analysis & Reporting

As required by NEPA and permitting documentation, aerial and MART surveys were conducted for an extended period of time after the last detonation. The MART continued surveys for four days, following the Gulf Stream from the shot location and aerial observations continued for five days. The surveys were halted prior to the seven day permit requirement, however due to poor weather conditions. NMFS and the Navy agreed the safety of the crew was paramount and the deviation from the mitigation plan was warranted. As with the previous two detonations, no injured or dead animals were found. Results from the mitigation plan were summarized in the After-Action Mitigation Report submitted to NMFS in December 2008 and are available on the MESA VERDE EIS website at www.mesaverdeeis.com.

The environmental mitigation report will also be included in the final MESA VERDE full ship shock trial report. This report is currently in draft and will provide detailed survivability analysis of MESA VERDE and the San Antonio ship class. Lessons learned from all aspects of the shock trial will be used for future ship designs, in-service improvements and future testing requirements. The successful execution of the shock trial's environmental component provided the Navy an opportunity to further our fighting capabilities and the safety of our sailors in an environmentally sound manner. ⚓

Photos by Program Executive Office—Ships

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Navy Opens First Sustainable Interior Showroom

NRSW Leads the Way in Sustainable Office Spaces

NAVY REGION SOUTHWEST (NRSW) has completed the construction of and held a ribbon cutting ceremony for the Navy's first sustainable showroom featuring sustainable products for interior office furniture and finishes as well as exterior pedestrian areas.

Creation of the showroom was a joint venture between the NRSW Environmental Office and the Naval Facilities Engineering Command (NAVFAC) Interior Design Team. The Sustainable Interior Showroom (SIS) consists of a demonstration area, resource education center and product library displaying sustainable choices for products commonly required for building interiors. The SIS was created to support NRSW's efforts to achieve zero net waste by 2035. The showroom enables visitors to examine and test sustainable products as well as gather information to streamline their purchasing processes while satisfying multiple vendor bid and green procurement requirements.

The SIS was developed with General Services Administration (GSA) vendors to assist the Navy in developing an environmentally green showcase at minimal cost with maximum impact. Centrally located in downtown San Diego, CA, the showroom is conveniently accessible to multiple military installations as well as other government agencies and local companies involved in the San Diego Regional Sustainability Partnership. GSA vendor donation of sustainable floor displays and models was cost-effective for the Navy and allows vendors to update their display area as product lines, technology and environmental standards change. The showroom has three main sections:

1. Cubicle workstations where the interior designers sit,
2. A functional "non-private" conference room that can be scheduled for meetings and presentations, and
3. An exterior courtyard displaying new concrete technology and outdoor lunch area.

Present at the NRSW SIS ribbon cutting ceremony were (from left) CAPT Steve Wirsching, NAVFAC Southwest Commanding Officer; Admiral Len Hering, Commander, NRSW; LT Colonel Gregory Martin, Wounded Warrior Battalion–West Commanding Officer; California State Senator Denise Ducheny, (D-San Diego); and CAPT Glenn Robillard, Fleet Industrial Supply Center San Diego Commanding Officer.

Kitchenette featuring sustainable cabinetry, counters, LED lighting, removable wall system, Energy Star™ appliances and engineered flooring.

All products in the SIS are used daily, testing the durability of the products.

The SIS demonstration area was designed to allow end users the opportunity to "test drive" furniture, floor covering and wall applications prior to determining which products best meet their requirements for their work space application. The NRSW Environmental Office and NAVFAC interior designers partnered to ensure sustainable requirements were defined. The interior designers, through extensive product analysis, determined minimum sustainable requirements and evaluated all Naval Supply Systems Command Blanket Purchase Agreement holders for systems furniture, ergonomic seating, wood casegoods and movable walls. Product analyses are available for clients to help them make informed decisions and compare products. Under Federal Acquisition Regulation requirements, all GSA procurements need to complete a market analysis and comparison of three price quotations. The showroom data will assist clients in this process.

The showroom is the only location available to the client where they can compare the major systems furniture manufacturers and ergonomic seating side by side with the technical expertise of the interior designers to explain the differences. Showcased items include sustainable furniture that:

- Allows for quick and easy reconfiguration;
- Is manufactured from materials emitting zero or minimal toxins; and
- Is manufactured entirely from recycled, recyclable or rapidly renewable materials.

More durable than traditional furniture, sustainable products furniture typically come with warranties of ten or more years, protecting the initial investment made by the Navy. Long-term warranties enable vendors to come on-site for repairs, reducing the likelihood of discarding furniture that is broken or missing parts

Alternative flooring options demonstrate natural wear and highlight ease of repair or replacement. Carpet tiles can be replaced individually reducing the need to remove an entire room of carpet when only a portion of it is worn, discolored or damaged. Other flooring options, such as bamboo, engineered wood flooring or polished concrete colored with stain demonstrates product durability, ease of cleaning, improvement of indoor air quality and cost effective alternatives to carpet.

Indoor air quality demonstration area displays raised flooring with under-floor ventilation. Raised flooring can accommodate an under floor pressurized Heating, Ventilation and Air Conditioning (HVAC) system giving individual users control of heating and cooling which can be 30 percent more energy efficient than conventional HVAC. Other indoor air quality products include low-Volatile Organic Compound paint. Two different movable wall systems are displayed. Movable walls are the sustainable alternative to standard drywall construction. They are 40 percent faster to install and recon-

The GSA SIS reference library—
the largest in the Navy.

figure. Approximately 98 percent of the product can be relocated, reused or reconfigured.

Energy efficient options for lighting such as Light Emitting Diodes (LED) production, task lighting and cast lighting, provides hands-on display of lighting options. Energy efficient low-e windows and doors were included in the display, and design elements include effective use of natural light. Glass cubicle panels were added to maximize natural daylighting throughout the showroom. As lighting technology changes, the SIS provides the opportunity to quickly upgrade the display area, ensuring new purchases optimize the newest energy conservation efforts.

A sustainable office that
maximizes natural daylight.

The showroom also extends into the exterior areas featuring permeable concrete to allow rainwater to absorb into the ground instead of washing across concrete areas as stormwater runoff. The outdoor area also displays lightweight recycled concrete Eco-Lite panels which screen out unsightly mechanical equipment and provide sound dampening. Other features include various concrete surface applications, outdoor recycled plastic furniture, xeriscape plants, recycled content planter boxes, as well as recycled content awnings and shade screens. The initial concept design was developed by NAVFAC Southwest landscape architects.

The SIS was completed through the use of donated products from over 70 participants and contributors. NRSW modeled the showroom after the concept created by the Army and

Outdoor area featuring porous concrete, recycled content furniture and lightweight EcoWall panels.

GSA. The NRSW Environmental Office and NAVFAC Southwest interior designers solicited GSA vendor participation for sustainable products to be demonstrated in the showroom. Vendors signed Bailment Agreements authorized by NRSW Office of General Council to allow for the vendor display of products in the showroom.

Since opening, the showroom has given tours regularly several times per day. Many government agencies, local businesses and schools have toured the showroom to gain insights into implementing sustainability through sound, environmentally friendly project design. Through partnership with the San Diego Regional Sustainability Partnership, several businesses have taken design elements and specific product information to modify their interior design projects. Baseline recommendations for implementing sustainability by changing all lighting to more efficient LED and only utilize recycled carpet tiles have been well received. The showroom displays educated users on various options to build a greener office space.

Partnering with NRSW will help to preserve the environment for future generations. Tours to the public are offered by appointment. Additional opportunities for scheduled tours are available to accommodate visiting dignitaries, senior corporate officials and other government agencies. The NRSW Environmental Office contacts are Peter Kennedy (619-532-2350) and Suzanne Smith (619-532-2284). The NAVFAC interior design contacts are Lisa Demulder (619-532-3733) and Stephanie Asenbauer (619-532-2477). ⚓

Photos by Barry Orell

For More Info

FOR MORE INSIGHTS into xeriscaping, see our article entitled "Pearl Harbor Navy Exchange Employs Practical Landscape Design: Xeriscaping to Help Region Meet Water Reduction Mandates " in the spring 2009 issue of *Currents*. You can browse the *Currents* archive at the Naval Air Systems Command's environmental web site at www.enviro-navair.navy.mil/currents. You can also find the magazine on Facebook by searching for "US Navy Currents magazine."

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CNO Recognizes Exceptional Environmental Stewardship

Asks Winners to Carry Message to Additional Commands, Inspire Them to Follow

THE CHIEF OF Naval Operations (CNO) presented the Fiscal Year 2008 CNO Environmental Awards on 28 May 2009 at the Navy Memorial in Washington, DC.

Admiral Gary Roughead, CNO, presented 29 awards to Navy ships, installations and individuals or teams for their exceptional environmental stewardship.

"What happens in our environment and to our natural resources is a matter of national security. What happens in our environment cannot be dealt with at some later date; it must be addressed now, and we must keep it on our minds constantly," Roughead said. "The bases, ships and Sailors that we recognize and honor today are doing just that."

The CNO said that taking care of the environment is an inherent part of the Navy's culture.

"Perhaps more than any other service, than any other profession, a Sailor is intimately linked to the environment, and our interest in preserving that environment goes far back in our history," Roughead said.

The CNO applauded the winners and said they are not only conserving resources, reducing pollution, recycling, and maintaining the local environment around them, but they are

Master of Ceremonies Rear Admiral Larry Rice, then-Director, CNO Environmental Readiness Division, welcomed the winners and distinguished visitors at the CNO Environmental Awards ceremony, introduced the CNO, Admiral Gary Roughead, and narrated the awards presentation.

The CNO, Admiral Gary Roughead, delivers remarks during the Fiscal Year 2008 CNO Environmental Awards ceremony at the U.S. Navy Memorial and Naval Heritage Center in Washington, DC.

What happens in our environment and to our natural resources is a matter of national security. What happens in our environment cannot be dealt with at some later date; it must be addressed now, and we must keep it on our minds constantly.

Admiral Gary Roughead, CNO

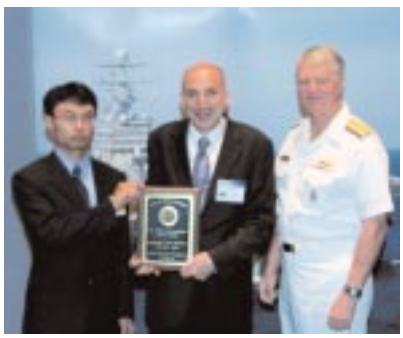
also markedly restoring crucial habitats and endangered species. He said it wasn't just up to the winners to be conscious of the environment around them.

For More Insights

FOR MORE INSIGHTS into the FY2008 CNO Environmental Award winners and their accomplishments, read our article entitled, "Fifteenth Annual CNO Environmental Awards Recognize Exceptional Stewardship: Efforts of 2008 Winners Highlight the Range of the Navy's Commitment," in the summer 2009 issue of *Currents*. You can browse the *Currents* archive or subscribe to the magazine via the Naval Air Systems Command's environmental web site at www.enviro-navair.navy.mil/currents.










Environmental Awards


Environmental Awards




Chief of Naval Operations
Environmental Awards




ABOVE AND PREVIOUS PAGE: FY08 CNO environmental award winners receive their awards from the CNO, Admiral Gary Roughead.

> Perhaps more than any other service, than any other profession, a Sailor is intimately linked to the environment, and our interest in preserving that environment goes far back in our history.
>
> *Admiral Gary Roughead, CNO*

"We must all continue down the path that they have set. It must be a focus for all of our commands. Today we're going to recognize those who really have stood apart, but as I said last year when we were together for these awards—the group here has to carry that message forward and has to share the lessons, their passion, their interest and their objectives with other commands in our Navy writ large," Roughead said.

The annual CNO Environmental Awards program recognizes Navy people, ships and installations for their outstanding environmental stewardship. The 29 winners were selected in the following categories: natural resources conservation large installation, cultural resources management installation, cultural resources management individual or team, environmental quality industrial installation, environmental quality overseas installation, environmental quality small ship, pollution prevention non-industrial installation, pollution prevention individual or team, environmental restoration installation and environmental planning team.

This article was written by Mass Communication Specialist 2nd Class (SW) Rebekah Blowers, CNO Public Affairs, and originally appeared on the Navy Newsstand site (at www.navy.mil) as story number NNS090528-07.

Photos by Ben Zweig

CNO Awards

FOR THE COMPLETE text of the remarks delivered by Admiral Gary Roughead, at the CNO Environmental Awards ceremony, visit www.navy.mil then select "Navy Leadership" then "Chief of Naval Operations" then "More Speeches" then "Remarks as delivered by Chief of Naval Operations, Adm. Gary Roughead at the CNO Environmental Awards Ceremony in Washington, D.C.—28 May 2009."

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New Hull Coatings Cut Fuel Use, Protect Environment

Office of Naval Research Exploring Cutting-edge Technologies

U.S. NAVAL WARSHIPS and submarines rely on critical design factors such as top speed, acceleration and hydroacoustic stealth to achieve their mission. Biofouling, caused by a host of marine organisms attaching themselves to a ship's hull, dramatically reduces ship performance and costs the U.S. Navy millions of dollars each year in added fuel consumption and extensive maintenance efforts.

Researchers are learning from nature how to combat the problem. The Office of Naval Research (ONR) is currently exploring two emerging technologies that may be effective at biofouling prevention with much less environmental impact than traditional biocides.

A Tale of Two Coasts

On the East Coast, ONR is funding research at the University of Florida where Anthony Brennan, professor of material science and engineering, has been investigating why some marine animals, such as whales, harbor barnacles and others, such as sharks, stay relatively clean. Brennan discovered that the unique pattern of shark skin contributed to its ability to fend-off microorganisms.

"What you see is this cross pattern which repeats itself all the way across," Brennan said. "So when organisms come along, they are unable to find a position which is stable for them to land."

With this insight, Brennan started modeling shark skin patterns in his laboratory. The idea led to the development of a new biomimetic technology called Sharklet, which has shown extremely positive results in inhibiting marine growth. The significance of his work really hit home during a visit to Pearl Harbor.

"I saw a Navy ship going by . . . flowing with green algae," Brennan said. "I thought, 'that's why we are doing this research, to stop that biofouling . . . to give our Navy the ability to perform at a higher level.'"

The biodiversity of different ocean environments also creates unique challenges. So, across the country on the West Coast, ONR is working with Shaoyi Jiang, Boeing-Roundhill professor at the University of Washington, on biofouling prevention coatings that incorporate zwitterionic, or mixed-charge, compounds with ions that alternate perfectly between positive and negative charges.

"Unlike antifouling coating, our coating does not leach any biocides," said Jiang. "Unlike the fouling and release coating, our coating is also effective even on stationary surfaces."

Zwitterionic compounds are stable and easy to handle in both laboratory and field tests. They've shown excellent resistance to the attachment of biomolecules and microorganisms. The result is that naturally occurring proteins, bacteria, algae, barnacles and tube worms do not bind to this unique surface.

"The ultimate solution is to stop the barnacle settlement process before it happens," says Steve McElvany, program manager for ONR´s Environment Quality program. "We are really trying to look very far forward to get the ultimate solution that's good for the U.S. Navy and the oceans."

Inventive biofouling prevention systems will help conserve fuel, minimize the Navy's carbon footprint, reduce the risk of transporting invasive aquatic species and prevent toxic biocides from entering surrounding environments.

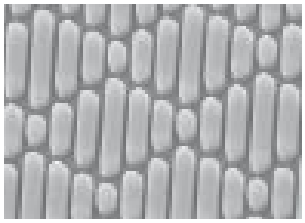
Benefits for the Navy

ONR's innovation in hull coatings will optimize ship performance with an eye toward environmental stewardship. Inventive biofouling prevention systems will help conserve fuel, minimize the Navy's carbon footprint, reduce the risk of transporting invasive aquatic species and prevent toxic biocides from entering surrounding environments.

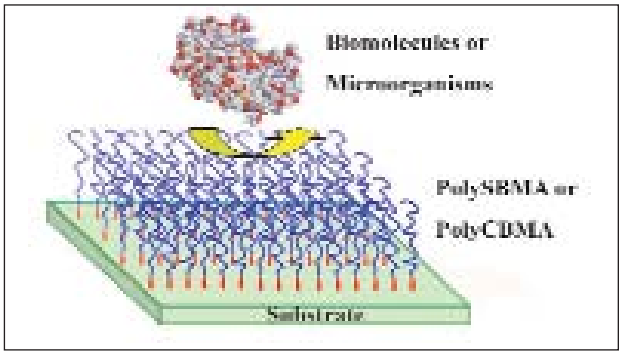
Ships affected by biofilm—the mildest version of biofoul—can add up to 20 percent drag. Once barnacles and other large organisms begin to attach, the drag can increase to more than 60 percent. This increases fuel consumption and resulting green house gas emissions.

Benefits Beyond

In the same manner in which the attachment of marine organisms fouls marine vessels, airborne microorganisms attach to surfaces, colonize, and can become destructive on land. Both the Sharklet pattern and Zwitterionic coating inhibit the settlement of barnacles and also inhibit the growth of bacteria.



The unique pattern of Sharklet makes microorganisms unable to attach themselves.
Sharklet Technologies



Uniformly mixed charged groups in zwitterionic materials resist biomolecules and microorganisms.
Dr. Shaoyi Jiang

This unique attribute has applications in hospitals and high-touch areas in health care where it is critical to inhibit the survival and transference of bacteria to protect patients from infections. Future applications for ONR-funded marine biofouling prevention technologies may be in the design of medical devices or hygienic surfaces found in hospitals and food preparation areas.

"This technology spreads beyond the hull of the ship . . . there is a great opportunity to extend this technology to the public," said Brennan.

The Need for Improvement

The Naval Surface Warfare Center at Carderock, MD estimates that biofouling reduces vessel speed by up to 10 percent. Vessels can require as much as a 40 percent increase in fuel consumption to counter the added drag. For the Navy, that translates into roughly one billion dollars annually in extra fuel costs and maintenance to keep its ships free of barnacles, oysters, algae and other debris.

Previous biofouling prevention methods used toxic coatings, or biocides, to clear barnacle colonies from the ship exteriors. Although effective in the short-term, biocides can take a toll on the environment.

Tributylin (TBT)-based ship paints were the principal marine antifouling agent until relatively recently. Developed in the 1970's, these paints were found to cause irreversible damage to marine life, leading to a global ban in 1998. The introduction of TBT into the marine environment impacted everything from the sex characteristics of small aquatic life to the hearing of whales. The Navy discontinued use of TBT in the 1990's, well before the international ban.

Today, nearly 70 percent of the world's industrial shipping and recreational boating fleet use copper-based paints as an antifouling strategy. These bottom paints are designed to slowly release, or leach, copper into surface waters to kill and slow the growth of microorganisms. As a result of the leaching, copper and other

Regular barnacle removal and hull cleaning contributes to a reduced lifespan for the ship.
Photographer's Mate 3rd Class Erika Jones

metals have sometimes compounded to toxic levels within our ocean, lake and waterway floors. Studies show that dissolved copper in many harbors and waterways affect the growth, development and reproduction of marine life as well as impact humans who work in those environments or eat the fish and crustaceans caught in contaminated waters.

Current environmentally acceptable antifouling coatings of interest to the Navy are low copper, copper-free, and foul-release coatings, which do not contain biocides. All anti-fouling coating systems must comply with current and future federal, state and local air emission regulations. They must eliminate or significantly reduce copper emissions, be U.S. Environmental Protection Agency registered, and obtain approval from the Navy and Marine Corps Public Health Center.

ONR: Reaching New Heights

By discovering how nature beats the barnacle naturally, ONR is pioneering an environmentally friendly way of optimizing vessel performance and dramatically reducing fuel costs. And that's where ONR's investment in biofouling prevention technologies has made significant gains.

Jiang and Brennan acknowledged the open environment and multidisciplinary research approach that ONR and its program managers encourage from principal investigators.

"The ONR program provides an excellent environment and infrastructure for collaborations," said Jiang. "ONR has brought together biologists, geneticists, chemists, material engineers, chemical engineers, physicists and we end up sharing. It says a lot about our Navy to have that forethought to reach beyond what everybody sees in front of them and go for something new and innovative that will help the Navy and benefit the world."

Chris Dettmar also contributed to this article.

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Florida Forever Protects Land Adjacent to NAS Whiting Field

Acquisition Conserves Land, Protects Military Mission

FLORIDA GOVERNOR CHARLIE Crist and the Florida Cabinet recently approved the purchase of nearly 1,400 acres in the Clear Creek/Whiting Field Florida Forever project – building on the connection between Naval Air Station (NAS) Whiting Field and Blackwater River State Forest in Santa Rosa County. The property, to be purchased from The Nature Conservancy, will be managed by the Florida Division of Forestry as part of the Blackwater River State Forest.

"This acquisition completes 30 percent of the Clear Creek/Whiting Field Florida Forever project—one of the top projects on the Florida Forever 'A' priority list," said Florida Department of Environmental Protection (DEP) Secretary Michael W. Sole. "By helping to create a conservation land buffer to NAS Whiting Field, protecting surrounding water bodies and allowing for expanded recreation opportunities, this acquisition benefits Florida's environment, national security, residents and future generations."

In addition to connecting NAS Whiting Field with the Blackwater River State Forest, this acquisition will protect Big Coldwater Creek and Earnest Mill Creek, tributaries that flow into Blackwater River, an Outstanding Florida Water, and will allow for the creation of an off-highway vehicle trail system. An Outstanding Florida Water is water designated worthy of special protection because of its natural attributes. The protection of this land will also ensure that encroachment along NAS Whiting Field is prevented. DEP, The Nature Conservancy and Santa Rosa County have an ongoing collaboration with the Department of Defense (DoD) to protect areas that optimize conservation, recreation and military training benefits at NAS Whiting Field and nearby Eglin Air Force Base (AFB).

"This purchase could not have been accomplished singularly—it is the collective effort of a partnership between Whiting Field, Santa Rosa County, the Florida Division of Forestry and Florida Department of Environmental Protection and The Nature Conservancy," said Callie DeHaven, Public Lands Acquisition Manager for The Nature Conservancy. "Coldwater Creek is a stellar regional conservation and recreation resource and the military mission of Whiting Field is supremely important to national security as well as important to the economy of the region."

> By adding precious land, natural resources and recreational value to the Blackwater River State Forest, this acquisition is a great benefit to the people of Florida.
>
> *Jim Karels, Division of Forestry Director*

The Clear Creek/Whiting Field Florida Forever project connects to a portion of the Blackwater River State Forest, one of the state's largest natural areas,

and provides habitat for many endangered and threatened plants and animals, including gopher tortoises, southeastern weasel, white-topped pitcher plant, spoon-leaved sundew, panhandle lily and the hairy-peduncled beakrush. Located near Milton in Santa Rosa County, the majority of the project consists of upland pine forests, sand hills and mature and young pine plantations.

"By adding precious land, natural resources and recreational value to the Blackwater River State Forest, this acquisition is a great benefit to the people of Florida," said Division of Forestry Director, Jim Karels. "Conserving this habitat safeguards water ways, protects wildlife and guarantees the preservation of this property as a public open space for future generations to enjoy."

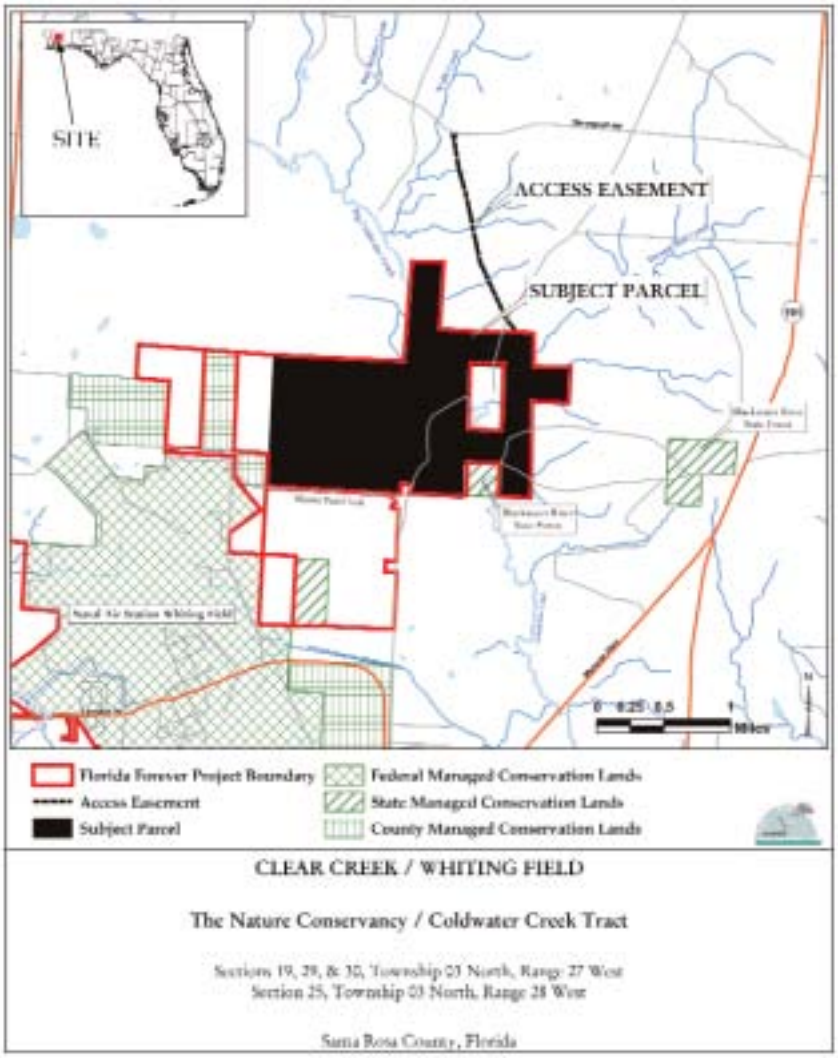
To date, the state has invested more than $900 million to acquire more than half a million acres around military bases such as Eglin AFB and Naval Outlying Landing Field (OLF) Whitehouse. By preventing incompatible encroachment around military bases, through Florida Forever, the amount of contiguous land for wildlife protection and recreational opportunities increases. In return, the military can continue its training missions to ensure the safety of all Americans.

"NAS Whiting Field relies heavily on its partnership with the state of Florida, and we share a commitment to national security and environmental protection," said Captain Enrique Sadsad, Commanding Officer. "This acquisition furthers that commitment by protecting the land uses surrounding Whiting Field—preventing development that could compromise the Navy's mission and conserving the area's natural resources."

Additional Florida Forever land acquisitions near military installations include:

- Eglin AFB, Okaloosa County
  More than 11,000 acres of the Yellow River Ravines Florida Forever project were acquired in October 2007. Located to the north of Eglin AFB, the acquisition provides a wildlife corridor connection from Eglin AFB through Blackwater River State Forest up through the Conecuh National Forest in Southern Alabama.

- Naval OLF Whitehouse, Duval County
  More than 1,650 acres were acquired in June 2006. This acquisition is in the Northeast Florida Timberlands and Watershed Reserve Florida Forever project. The importance of this acquisition, located on the east side of Naval OLF Whitehouse, is to not only prevent development encroachment for the field, but also protect the gopher tortoise and other natural wildlife found in the area. This property provides a connection from the



The parcels acquired in the Clear Creek/Whiting Field Florida Forever purchase.
Source: Courtesy of Florida DEP (www.dep.state.fl.us/secretary/news/2009/06/files/creek.pdf)

The Nature Conservancy's Partnership with the Navy

IN 2002, CONGRESS gave DoD the authority to put land outside of Navy shore installations under protection from incompatible development. Many of the areas identified by the Navy are also areas of interest to The Nature Conservancy. This shared interest has led to a successful encroachment partnering program between the two entities, which is explored in greater depth in the Spring 2009 issue of *Currents*.

That issue contains an interview with Bob Barnes, Senior Policy Advisor (Department of Defense) for The Nature Conservancy, who discusses the effective working relationship between by The Nature Conservancy and the Navy, including an effort to protect the land surrounding NAS Whiting Field.

"In the area of encroachment partnering, our work to support the partnership between the Navy and state and local governments in Florida to protect Whiting Field has been highly successful," said Barnes. "A lot of valuable habitat is protected there, making some great connections to avoid fragmentation of corridors and so forth. Whiting Field is the Navy's primary rotary wing training area. It was really becoming threatened by development in the area. So it's been a true success story."

To read the *Currents* interview with Bob Barnes in its entirety, visit www.enviro-navair.navy.mil/currents.

original Cary State Forest boundary to the Jacksonville Baldwin Rail Trail.

- Eglin AFB, Walton County

  More than 16,000 acres were protected by DEP acquiring a conservation easement in April 2005. The acquisition is in the Nokuse Plantation Florida Forever project located on the east side of Eglin AFB. In 2007 more than 1,000 gopher tortoises were relocated from St. Johns County to Nokuse Plantation and nearly 650,000 longleaf pine seedlings were planted.

Of the 110 projects currently on the Florida Forever list, 27 of them, or one out of every four, has some relation to the military. Florida was the first state in the nation to partner with DoD under the federal Readiness and Environmental Protection Initiative funds for the dual purpose of environmental protection and national defense. The Florida Panhandle alone is home to five U.S. Air Force and Navy installations and represents one of the largest open air military training areas in the United States. Strategically important for homeland security, the region is also a known biological "hot spot" ideal for preservation and recreation.

The Florida Forever program established by the Florida Legislature in 1999 conserves environmentally sensitive land, restores waterways and preserves important cultural and historical resources. For more information on the Florida Forever program, visit www.dep.state.fl.us/lands/fl_forever.htm. ⚓

Note: This article was largely derived from an article that originally appeared in the 9 June 2009 issue of The San Rosa's Press Gazette. For more information about the Press Gazette visit www.srpressgazette.com. Used with permission.

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Fleet Divers Salvage Russian Submarine

Vessel Emerges After Months in the Providence River

AS DUSK APPROACHED on 25 July 2008, the Juliett 484, a 2,400-ton former Soviet guided missile submarine, smelly and covered with sea growth, broke free from the muddy bottom and resurfaced after 15 months beneath the Providence River. After endeavoring for almost two months to refloat the sub, the salvage team, led by Mobile Diving Salvage Unit (MDSU) TWO and supported by the Office of the Supervisor of Salvage (SUPSALV), Army, Navy Reserve and British personnel, looked on with satisfaction and knew that the project's end was near.

Then in 2002, the Saratoga Museum Foundation, Inc. purchased the vessel; opening it to the public as a museum at Collier Point Park in Providence, RI.

A nor'easter on 17 April 2007, served as the catalyst for the sub's sinking. At the storm's height, the pressure hull—the sub's internal hull—began taking on water, which led to progressive flooding as water cascaded to the other internal spaces. After approximately 30 hours, the vessel sank. Later, surveys would show that she came to rest at about a 45 degree port list, with half of her hull buried into the river's muddy bottom. The pressure hull was fully flooded with over 600,000 gallons of water.

When the museum requested Department of Defense assistance, the Secretary of Defense's Innovative Readiness Training (IRT) Program viewed the chance to refloat J-484 as an ideal training opportunity. IRT funds civil-military projects geared to improve unit level training while concurrently benefiting U.S. communities. For the Navy's salvage community, a chance to refloat a sunken submarine is among the rarest and most valuable training possible. The Providence community would benefit in that they would regain access to a valuable waterfront asset. The IRT Program agreed to sponsor and fund the salvage effort.

MDSU TWO agreed to lead the project. To assist, the Little Creek-based salvors assembled a team that included SUPSALV, the Army's 569th Dive Company, Navy Reserve, and a Landing Craft Utility (LCU) and crew from the Expeditionary Support Unit. Even the British pitched in, sending two salvors for technical support.

The diesel-powered Juliett 484 (J-484), known to the Soviets as K-77, led a colorful life.

The diesel-powered Juliett 484 (J-484), known to the Soviets as K-77, led a colorful life. After her cold war service and the fall of the Soviet Union, the Russian government sold the vessel to a Finnish businessman who turned J-484 into a bar and restaurant. The businessman later listed her for auction on E-bay, with a starting price of $1 million. Without serious bidders, Juliett 484 was then leased for the movie *K-19: The Widowmaker* starring Harrison Ford and Liam Neeson where she "played" the ill-fated K-19 submarine.

Refloating and stabilizing the sub proved to be a formidable undertaking. The greatest challenge was the complete lack of technical documentation available on the submarine given that the Russian Federation still considered such information to be classified. Further, the museum had not adequately tracked the vessel's condition prior to the sinking. The most essential pre-sinking information such as the vessel's displacement (mass), and other technical data was unknown. Any plan to raise the submarine had to be robust enough

Staff Sergeant Prater supervises an initial assessment dive.
Chief Machinist Mate MMC Eric Lippmann

to account for a wide range of possible conditions.

This is where the SUPSALV Naval Sea Systems Command Supervisor of Salvage and Diving engineers came in. Taking the lead in the salvage plan development, they used naval architecture calculations and salvage modeling with Program of Ship Salvage Engineering (POSSE) software to develop an executable salvage plan. Although this project was considered a "heavy" salvage operation which typically calls for derrick barges, tugs and other leased equipment, budget restrictions made it necessary to turn to the expertise of Fleet Divers and Emergency Ship Salvage Material (ESSM) equipment such as pumps, patches and salvage pontoons. Engineers also designed specialized equipment to patch the pressure hull, monitor the ship's condition, and attach salvage pontoons.

Over the next year, to improve the salvage plan, several surveys were conducted. Chief Warrant Officer (CWO) 4 Pete Sharpe led a team in Providence that conducted a thorough post-sinking salvage survey and harnessed cable pullers to the hull to stabilize the vessel. Commander Chip Chase led a team of engineers to Peenemunde, Germany to survey Juliett 461, the last floating vessel of the class. Master Diver (MDV) Arne Phillips led a team of MDSU TWO and Army divers during a fit test of pressure hull patches.

In June 2008, with preparations complete, the salvage team assembled in Providence. The operation required one of the most extensive deployments of ESSM gear to date, transporting 18 tractor trailers full of equipment to provide everything from pullers to generators to pollution gear to floating barges. The gear included six beach gear "legs", each leg consisting of a 7,200-pound anchor, 20 feet of chain and 200 feet of wire rope. After meeting with the Coast Guard, state environmental agencies, and the museum, it was time for the divers to hat up.

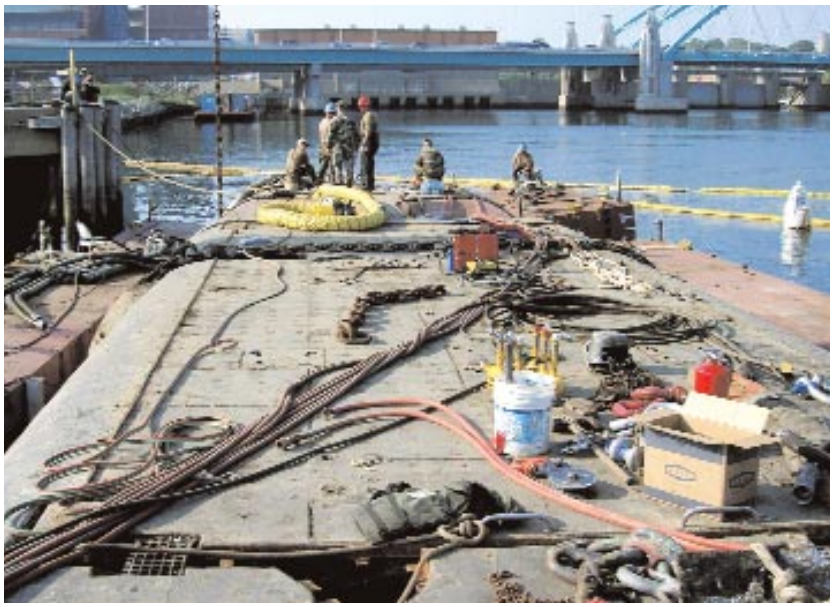
The first goal was to right the submarine within its muddy underwater cradle; about a 45 degree starboard rotation. To do this, divers harnessed six beach gear legs with pullers high on the vessel's hull to provide over 10,000

Divers operating from a joint Navy/Army dive side enter the water from the bow of an LCU.
(MMC) Eric Lippmann

foot-tons of righting moment (torque). When this was insufficient to move the submarine, it was determined that the pressure hull would have to be partially dewatered; not an easy task. To accomplish this, divers placed 4-inch hydraulic pumps in the bottom of each of the eight watertight compartments within the pressure hull.

This called for challenging dive profiles. Divers had to traverse cramped, dark, and oil-coated compartments at a 45 degree list and descend two decks within the pressure hull in near zero visibility while managing equipment, umbilicals, and over 4,000 feet of hydraulic and discharge hoses in order to set each pump. Each dive's success was critical to the overall project, given that if even one of the eight pumps was not in place and operational, the vessel could not fully resurface.

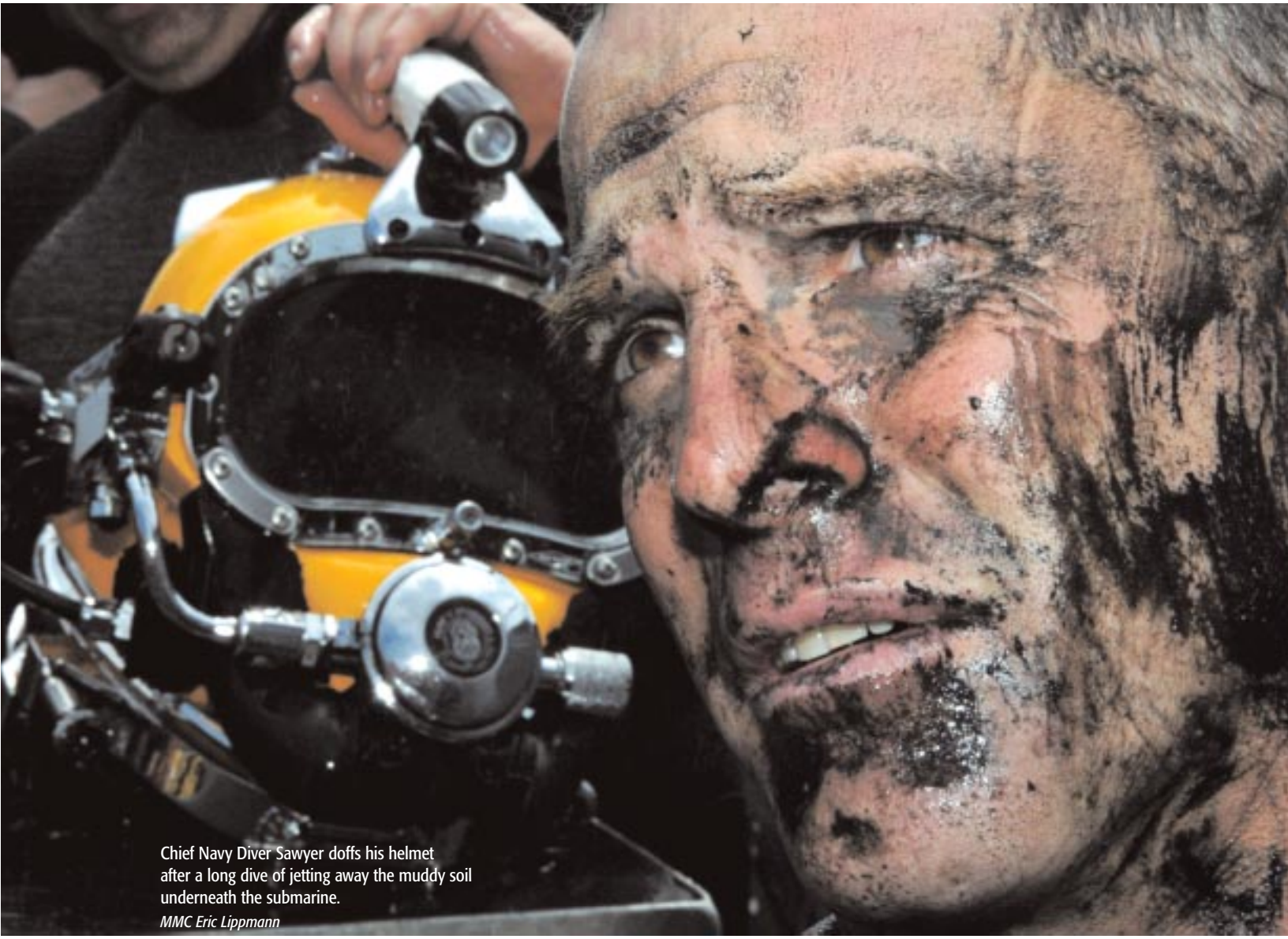
After divers set each pump, pulling operations began. Through a combination of six hydraulic cable pullers operating in tandem, dewatering the pressure hull, and dewatering four large missile tubes, the salvage team reduced the vessel's ground reaction and imparted enough rotation to bring the vessel back to a near zero list. This was the first concrete sign that the project could be completed successfully and allowed the salvors to begin preparations for refloating the sub.



In late August 2008, salvors installed four steel modular barges near the stern to improve the vessel's stability.
Frank Lennon

The next step, installing salvage pontoons along the vessel's hull, ultimately proved to be the most difficult. The pontoons were needed to impart enough buoyancy to bring the submarine to the surface after dewatering the pressure hull. These pontoons augmented the submarine's ballast tanks which had deteriorated due to advanced corrosion (in many locations, divers could actually poke holes in the tanks with their fingers). For the pontoons to provide enough buoyancy to replace the ballast tanks, most of the sub's hull had to be surrounded with these inflatable bags.

To meet the workload demand, the salvage team divided into two shifts to allow for 24-hour, 7-day-a-week operations. Often, two surface-supplied dive teams and one Self-Contained Underwater Breathing Apparatus (SCUBA) team were operating simultaneously. Significant bottom time was required because of the vast amount of underwater labor required to set the pontoons. Divers had to make ten tunnels underneath the vessel's hull using a combination of jetting and air lift operations. Lifting straps had to be passed through each tunnel to connect the pontoons to the hull and complete the salvage pontoon lift system. To pass each strap, divers often had to dig almost 20 feet beneath the coal-crusted river bottom to tunnel across and underneath the sub only by feel. All told, divers even-



Chief Navy Diver Sawyer doffs his helmet after a long dive of jetting away the muddy soil underneath the submarine.
MMC Eric Lippmann

J-484's sail emerges as salvors right the sub with cable pullers.
MMC Eric Lippmann

tually installed ten salvage pontoons and 16 large lift bags for a total of over 400 tons of buoyant force.

When the day arrived to refloat the sub, many questions were still unanswered. Would the untested salvage pontoon system hold together? Were all the hull leaks sealed? Did engineers accurately estimate the amount of lift needed for refloat? Would the submarine be able to overcome the suction effect caused by the mud cradling the vessel? What MDV John Coffelt referred to as a summer's worth of "extremely hard work, frustration, sweat, and tears" was on the line.

Six hours after starting the dewatering pumps and inflating pontoons, the questions were answered. At 6:02 p.m. on 25 July 2008, almost on cue, J-484 lifted off the river bottom and returned to surface as onlookers cheered and the local news stations broadcast the event live. The vessel took about ten seconds to transit the water column; resurfacing bow first and stable.

Further stabilization efforts were required. Divers entered the pressure hull to change out hydraulic pumps and dewater most of the internal tanks and voids. More durable and reliable steel pontoons were installed near the vessel's stern to replace the temporary flotation devices. By the project's end, divers logged over 700 dives and 1,500 hours of bottom time.

The summer's efforts culminated on 6 September 2008, when, with the Coast Guard's concurrence, the submarine met MDSU TWO's turnover criteria, and custody of the vessel was officially transferred to the museum.

In terms of training and execution, the salvage of the Juliett 484 was nothing short of a monumental team win. On a strategic level, the project demonstrated the strength of the interdepen-

J-484 rapidly returns to the surface 10 seconds after leaving the river bottom.

With J-484's listing sail in the background, a diver returns to the surface after attaching rigging to a salvage pontoon near the vessel's stern.

dent components that make up the Navy salvage capability. On a personal level, this was a rare opportunity for Sailors and Soldiers, all of whom provided important if not critical contributions. CWO 2 Kasztelan may have said it best: "Recovering a 300-foot Soviet sub is never easy, but I am deeply proud of the guys. They accomplished the mission, gave back to the community, and learned along the way. This truly was an experience of a lifetime."

Note: This article was adapted from an article that first appeared in Faceplate, a newsletter published by the Office of Supervisor of Salvage and Diving Director of Ocean Engineering. Used with permission.

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Gulf of Alaska Transect Survey Fills Data Gaps

Survey Captures Information on the Presence of Marine Mammals

MARINE BIOLOGISTS FROM the U.S. Navy, the National Oceanic and Atmospheric Administration (NOAA) and Cascadia Research gathered on a brisk April 2009 morning in Kodiak, Alaska to stage a research project in the Gulf of Alaska (GOA) Navy exercise area.

The GOA Navy exercise area is a vast region of ocean encompassing 42,146 nautical square miles within the Northeast Pacific Ocean. This area holds high strategic value to the U.S. Navy as a training area due to its unique oceanographic conditions and proximity to military forces. Though historic whaling records have shown the occurrence of various marine mammals in this region, the current species composition and abundances are virtually unknown from this offshore area. With this in mind, the Gulf of Alaska Line Transect Survey (GOALS 2009) was designed to fill in this knowledge gap. Through a cooperative agreement among the U.S. Navy, NOAA's National Marine Mammal Laboratory (NMML) and Cascadia Research, a marine mammal survey was conducted in the GOA Navy Exercise Area from 10 to 20 April 2009 aboard the NOAA Research Ship Oscar Dyson.

During daylight hours, experienced visual observers from Cascadia Research and NMML stood rotating watches using high powered binoculars called "Bigeyes" through which marine mammals could be detected miles away. In addition, a passive acoustic array consisting of multiple hydrophones was towed along continuously listening and recording underwater sounds throughout the survey. Acoustic technicians from NMML, stood rotating four-hour watches to monitor the acoustic array.

For the next ten days, marine mammal observers visually spotted and counted eight species of cetaceans including Humpback whales, Fin whales, Minke whales, Gray whales, Killer whales, Dall's porpoises, Harbor porpoises and Pacific white sided dolphins. In addition, the acoustic technicians detected and recorded Sperm whales and Killer whales. Toward the end of the survey, a storm came through the area with 40 knot winds creating rough seas for three consecutive days making it impossible to sight marine mammals and suspending the visual survey. Fortunately, the acoustic survey continued unabated due to the unique acoustic quietness of this research ship.

During the survey, the team was successful in approaching groups of Killer whales for photographing the unique dorsal fin patterns to be used in cataloging individual whales. At the end of the cruise, the team was treated to two perfect days of transiting through the Shumagin Islands, where they continued to survey opportunistically for marine mammals outside of the Navy exercise area, enroute to Dutch Harbor, the starting point of the next mission for the Oscar Dyson.

One large male and three juvenile killer whales (*Orcinus orca)* traveling together in the GOA Navy Exercise Area.

A pair of fin whales (*Balaenoptera physalus*) from the GOA Navy Exercise Area.

The GOALS 2009 survey was successful in gathering more data on the marine mammal species present in this largely unexplored area and providing information critical to assessing the environmental impacts of naval activities. These results were presented to and shared with the scientific community at the biennial meeting of the Society of Marine Mammalogists in Quebec City in October 2009.

Photos by Brenda Rone

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FRCSW Electric Cart Gets Solar Powered Kick

Solar Panel Augmentation Reduces Time Required to Charge Battery

THE ENVIRONMENTAL PROGRAM Office within the Industrial Relations Compliance Department aboard Fleet Readiness Center Southwest (FRCSW) has recently installed a solar panel atop one of its two electric carts to decrease the amount of time and money spent recharging the vehicle's battery.

"We had this (solar panel) idea around since last November. So Dan Conley, one of our environmental engineers, researched it and found a solar panel conversion kit on the internet. It cost $1,500. Different kits are available for the most common golf cart brands," said FRCSW deputy director for Industrial Compliance Operations Department Michele Marien.

According to its manufacturer, Sunray, a standard electric cart with a solar panel conversion will gain approximately 30 percent in distance on a single battery charge.

"Previously, the golf cart required charging at least once a week; but that dropped to just once in the first five weeks of operation following the conversion," Marien noted.

The solar panel has a 20-year lifespan and can provide up to three amperes to the cart's 48-volt battery.

Weighing approximately 34 pounds and about six feet in length, the panel was installed on the cart in roughly four hours by electricians from the support equipment (SE) shop.

Environmental engineer Mark Weir cleans the solar cell panel of the FRCSW Environmental Program Office's electric cart which was recently augmented with solar power. The solar conversion is expected to gain a 30 percent increase in distance from a single battery charge.

Joe Feliciano

"The only issue we had was using a different mounting bracket than what came with the kit. That was really no problem at all," said SE shop project officer Lee Gochnour.

Marien said, "The modified cart can do the same speed as any electric cart and doesn't require any special maintenance. So far, the solar panel seems to be working really well and we're very happy with it. I think we may buy another one." ⚓

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BE PART OF OUR SPRING ISSUE

Submissions Are Due by 22 January

We're already planning our spring 2010 issue. And you can be a part of it! If you have a story that you want us to consider, you need to submit your final text and images by 22 January 2010.

Your chances of being published in *Currents* are dramatically increased if you follow our article template. Simply request this easy-to-use template by sending an email to Bruce McCaffrey, our Managing Editor, at brucemccaffrey@sbcglobal.net.

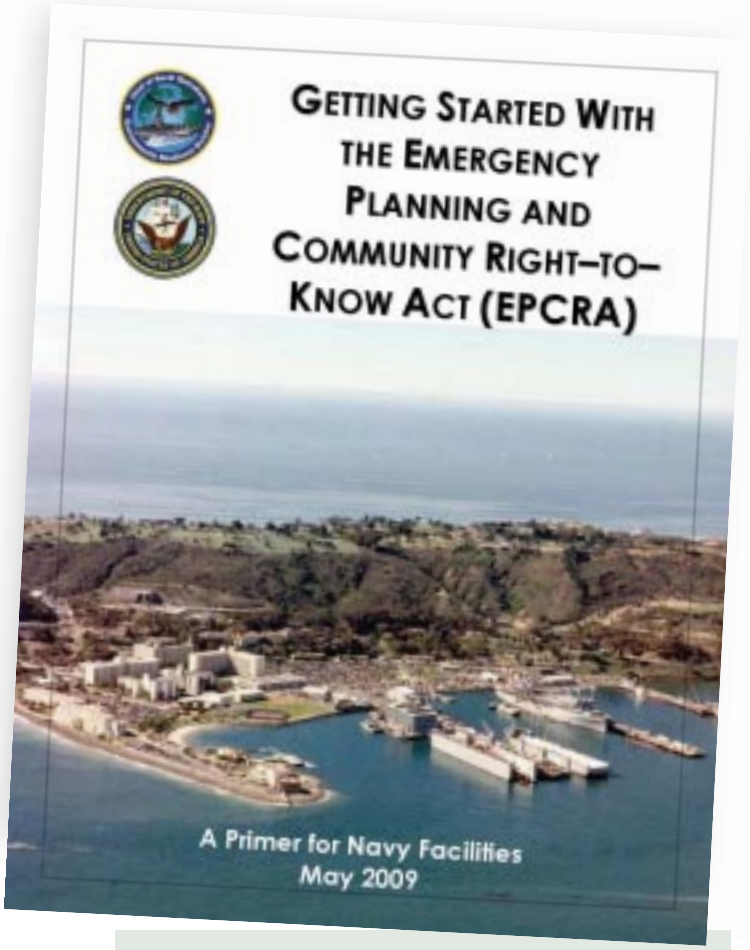
Bruce is available at 773-376-6200 if you have any questions or would like to discuss your story ideas.

We look forward to reading your stories about all the great work you're doing as the Navy's stewards of the environment. Because *Currents* is of, by and for you!

New EPCRA Resource for Environmental Managers Now Available

N45 Guidance Helps to Ensure Proper Planning & Compliance

THE CHIEF OF Naval Operations Environmental Readiness Division (CNO N45) recently released a guidebook entitled "Getting Started with the Emergency Planning and Community Right-to-Know." This easy-to-understand document provides Navy environmental personnel with practical guidance on the emergency Planning and Community Right-to-Know Act (EPCRA) reporting requirements to ensure proper planning and compliance. This version has been updated to incorporate the Department of Defense's Consolidated EPCRA Policy and the OPNAVINST 5090.1C, "Environmental Readiness Program Manual" requirements. In addition, the guide has been formatted to provide summary tables, helpful hints, and sample calculations.



The guide has been formatted to provide summary tables, helpful hints, and sample calculations.

The document encompasses all applicable EPCRA reporting requirements including:

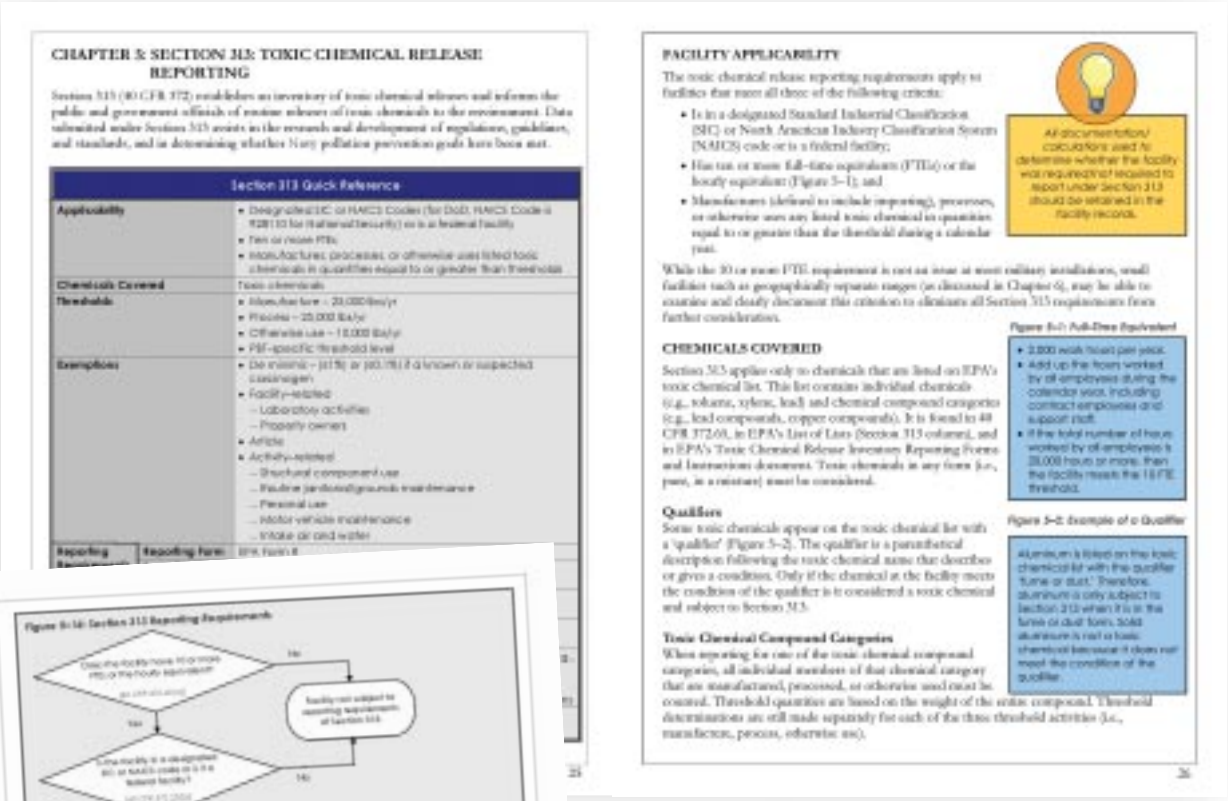
- Emergency Planning (Section 302);
- Emergency Release Notification (Section 304);
- Hazardous Chemical Inventory Reporting (Sections 311/312); and
- Toxic Chemical Release Reporting (Section 313).

The guide also provides additional EPCRA resources and compliance checklists that can be used as general starting points for EPCRA compliance efforts.

You may request a copy of "Getting Starting with EPCRA" from Lisa Lambrecht at

Key Topics in Getting Started with EPCRA

- Summary of EPCRA Requirements
- Quick Reference for each EPCRA Section Including:
  - Applicability
  - Chemicals Covered
  - Thresholds
  - Exemptions
  - Reporting Requirements
  - Commonly Reported Chemicals
  - Important Notes
  - Sample Reports/Checklists
- Sample Calculations
- Flow Diagrams of Reporting Requirements
- Sample Forms and Letters
- EPCRA Compliance Checklists



CHAPTER 5: SECTION 313: TOXIC CHEMICAL RELEASE REPORTING

Section 313 Quick Reference

Applicability	• Designated SIC or NAICS Codes (for DoD, NAICS Code is 928110 for National Security) or is a federal facility • Ten or more FTEs • Manufactures, processes, or otherwise uses listed toxic chemicals in quantities equal to or greater than threshold
Chemicals Covered	Toxic chemicals
Thresholds	• Manufacture – 25,000 lbs/yr • Process – 25,000 lbs/yr • Otherwise use – 10,000 lbs/yr • PBT-specific threshold level
Exemptions	• De minimis – 1% or 0.1% if a known or suspected carcinogen • Facility-related – Laboratory activities – Property owners • Article • Activity-related – Structural component use – Routine janitorial/grounds maintenance – Personal use – Motor vehicle maintenance – Intake air and water
Reporting	Reporting Form: EPA Form R

FACILITY APPLICABILITY

The toxic chemical release reporting requirements apply to facilities that meet all three of the following criteria:

- Is in a designated Standard Industrial Classification (SIC) or North American Industry Classification System (NAICS) code or is a federal facility;
- Has ten or more full-time equivalents (FTEs) or the hourly equivalent (Figure 5–1); and
- Manufactures (defined to include importing), processes, or otherwise uses any listed toxic chemical in quantities equal to or greater than the threshold during a calendar year.

All documentation/calculations used to determine whether the facility was required/not required to report under Section 313 should be retained in the facility records.

While the 10 or more FTE requirement is not an issue at most military installations, small facilities such as geographically separate ranges (as discussed in Chapter 6), may be able to examine and clearly document this criterion to eliminate all Section 313 requirements from further consideration.

Figure 5-1: Full-Time Equivalent

- 2,000 work hours per year.
- Add up the hours worked by all employees during the calendar year, including contract employees and support staff.
- If the total number of hours worked by all employees is 20,000 hours or more, then the facility meets the 10 FTE threshold.

CHEMICALS COVERED

Section 313 applies only to chemicals that are listed on EPA's toxic chemical list. This list contains individual chemicals (e.g., toluene, xylene, lead) and chemical compound categories (e.g., lead compounds, copper compounds). It is found in 40 CFR 372.65, in EPA's List of Lists (Section 313 column), and in EPA's Toxic Chemical Release Inventory Reporting Forms and Instructions document. Toxic chemicals in any form (i.e., pure, in a mixture) must be considered.

Qualifiers

Some toxic chemicals appear on the toxic chemical list with a 'qualifier' (Figure 5–2). The qualifier is a parenthetical description following the toxic chemical name that describes or gives a condition. Only if the chemical at the facility meets the condition of the qualifier is it considered a toxic chemical and subject to Section 313.

Figure 5-2: Example of a Qualifier

Aluminum is listed on the toxic chemical list with the qualifier 'fume or dust.' Therefore, aluminum is only subject to Section 313 when it is in the fume or dust form. Solid aluminum is not a toxic chemical because it does not meet the condition of the qualifier.

Toxic Chemical Compound Categories

When reporting for one of the toxic chemical compound categories, all individual members of that chemical category that are manufactured, processed, or otherwise used must be counted. Threshold quantities are based on the weight of the entire compound. Threshold determinations are still made separately for each of the three threshold activities (i.e., manufacture, process, otherwise use).

Figure 5-1d: Section 313 Reporting Requirements

Upcoming EPCRA Training Opportunities

CECOS WILL CONDUCT EPCRA web conference training in October, November and December 2009 emphasizing emergency planning, emergency release notification, Material Safety Data Sheet reporting requirements, Tier I/Tier II reporting requirements, toxic chemical release reporting, and information required for EPCRA compliance. Refresher courses on EPCRA Sections 311/312 will be held in January 2010 and on EPCRA Section 313 in March 2010. You can access the training at www.netc.navy.mil/centers/csfe/cecos/.

Lisa_Lambrecht@urscorp.com or download an electronic version from the sites below:

- The Naval Facilities Engineering Command's Enterprise Document Library at https://portal.navfac.navy.mil/portal/page/portal/NAVFAC/NAVFAC_DOCS_PP
- The Naval Civil Engineer Corps Officers School web site at http://www.cecosweb.com/handouts/EPCRA/Getting_started_with_EPCRA.pdf
- The Toxic Release Inventory-Data Delivery System web page at https://dod-tridds.org/tri-web/ (login required). ⚓

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Searching for Fuel Alternatives

Looking for an Alternative Tactical Fuel to Power the Fleet

AN ALGAE-POWERED NAVY ship? Maybe. For decades the U.S. has struggled with its reliance on foreign oil to fuel our economy, homes, businesses, factories, schools and even our military.

That reliance will now be challenged by a task force created this past year by Admiral Gary Roughead, Chief of Naval Operations (CNO). His Task Force Energy is working to redefine and optimize how the Navy puts energy to use, and a big part of its goal is to develop alternatives to petroleum-based fuels used to power warships and planes.

The task force is now studying new technologies, alternative sources and renewable products to make tactical fuels more secure and environmentally friendly, and to reduce dependence on foreign oil.

Nearly 60 percent of the petroleum used in the U.S. in 2007 was imported, according to the U.S. Energy Information Administration. Numbers provided by the task force show the Department of Defense (DoD) consumes nearly two percent of the petroleum used in the U.S., and the Navy uses roughly a third of that DoD portion. The nation, as a whole, consumes 20.5 million barrels of oil per day; the Navy uses roughly 120,000 barrels per day.

"Some of that petroleum may come from countries that are not necessarily our strongest allies," said Rick Kamin, fuels lead for the Navy Energy Coordination Office.

The volatile nature of oil prices causes headaches for the Navy as well. The Navy's fuel costs can range from $1 billion to more than $5 billion annually due to changing oil prices.

"Energy availability costs and security are at the forefront of the challenges faced by our Nation, Department of Defense, and Navy," Admiral Roughead wrote in December 2008. "Energy is essential for developing and employing our combat capability in support of National Defense."

"DoD is not a market maker," said CAPT Jim Brown, Director of the Navy Energy Coordination Office in Arlington, VA. But as the largest government and individual consumer of petroleum, it can serve as a technology leader.

An alternative fuels working group is helping to develop and define what alternative fuels the Navy may use in the future to power ships and aircraft. The team is tasked with developing and implementing the Navy's alternative fuels strategy. "Alternative" means something besides oil-based fuel, such as algae and non-food crops that can be turned into fuels that meet current rigorous specifications.

"We're developing the processes, test requirements and protocols to approve alternative fuels," Kamin said. "And then we'll execute those protocols to get the most promising alternative fuels into our JP-5 and F-76 specifications."

JP-5 and F-76 are the main fuels, respectively, for aircraft and ships. Research and testing could lead the Navy to widen the specifications for those fuels to allow production from more than just the conventional petroleum that currently meets specifications.

There are a number of potential benefits to alternative fuel sources, such as the possibility of growing them in the U.S., which means jobs and security, and producing them closer to where they are used, which means security and savings. The U.S. would have better control over the feedstocks used to make our fuel, Kamin noted.

When a cutting edge fuel meets specifications and passes testing, it will most likely first be introduced as a blend with existing petroleum based fuel.

"Our goal in the Alternative Fuels Working Group is to reduce the amount of petroleum-based fuel that we use," said LCDR Craig Bishop, Fleet Fuels Officer for U.S. Fleet Forces Command in Norfolk, VA, and a member of the working group.

Approximately a dozen biofuels have been tested over the past year at the Navy's Fuels and Lubricants Laboratory in Patuxent River, MD. These fuels have been derived from bio sources such as algae oil, jatropha and soy.

Kelly Schindler

"We are looking at alternative fuels that perform in the aircraft, gas turbines and diesel generators the same way traditional fuels perform," he said.

"If we have done our job properly, the Sailor will not notice the difference," said Kamin. "It will all be JP-5 when it gets to the ship, and they'll only know it as JP-5m."

The goal is to lessen dependence on foreign oil through sharing science and strategies with industry, academia, fellow agencies, other branches of the military and allied nations. Along the way, there will be protocols, research and a lot of testing to ensure the fuel of tomorrow is not only environmentally friendly and strategically secure, but a safe and reliable power source for the Fleet.

"It's got to be renewable," Bishop said. "That's really what we're focusing on—renewable sources of energy."

According to the Navy Energy Coordination Office, the Navy plans to have testing and certification completed on the most promising alternative fuel candidates no later than 2013.

The Navy is working with General Electric, which manufactures the Super Hornet's F414 engine, to test prospective fuels. "Super Hornet-maker Boeing is also conducting tests to determine whether the fuels are compatible with the plane's existing parts," Kamin said.

Alternative fuels will need to meet vitally important specifications, such as flash point and lubricity, and must not interact negatively with anything they touch along the path from refinery to use. The Office of Naval Research is leading work to understand the chemistry of potential fuels.

"If your car has a problem with today's biodiesel, your car will stall," Kamin said. "That's not a good thing for a ship or an aircraft. We have to make sure the risk is very low, obviously, and the probability of success is very high."

Another problem with today's biofuels is the amount of energy required to produce them. The Navy is very careful about managing its energy Return On Investment (e-ROI), CAPT Brown said. In other words, the amount of energy required to produce the fuel must only be a fraction of the energy content of the fuel produced.

Many first generation biofuels—those derived from sugar, starch, vegetable oil or animal fats—have an e-ROI problem in that they require almost as much energy to produce as the energy of the fuel itself.

Additionally, the crops required to produce adequate amounts of fuel take a substantial toll on food supplies and biodiversity. Traditional fossil fuels such as oil remain more cost effective with only a negligible increase in greenhouse gas emissions.

Second generation biofuels seek to negate these shortcomings. Because they rely on non-food crops and parts of crops, their drain on food supplies is minimal. This leads to a decrease in greenhouse gas emissions as more biofuel can be sustainably produced.

"The Navy has made it very clear to us that they're not interested in first generation fuels," said Mike Epstein, leader of alternative fuels at GE Aviation. "They are looking for something that's soft environmentally, more sustainable, and that has a much more favorable energy harvest."

One such alternative fuel that GE is testing for the Navy is hydrotreated renewable jet fuel, which is made from converted triglyceride oil that is found in many plant species.

"The process to convert these oils into a jet fuel like mixture is fairly conventional," Epstein said. "It uses a lot of typical industry processes and is not incredibly expensive."

Another potential fuel is camelina, an oilseed crop that, unlike many of today's biofuels, does not have the drawbacks of intensive farming and excess pesticide and fertilizer use, nor does it drain the world's food supply like corn-based ethanol. It can also be grown on vast tracts of semi-arid land in the Great Plains area of the U.S.

"The Navy has a very defined qualification program before a fuel is given unrestricted use," Epstein said. "At the end of our program, they will have a JP-5 blend that they can use as JP-5. We're probably a couple of years away from qualification, but once the Navy is prepared to fully use the fuel by going through rigorous testing, the supply will ramp up. From there, it's anybody's guess how fast it takes off." ⚓

Chris Dettmar also contributed to this article.

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The Return of Ding

Cooperative Efforts Lead to Rescue & Return of Kauai Green Turtle

PERSONNEL FROM THE Navy, Federal government and the State of Hawaii teamed up to rescue, repair and release a badly injured green sea turtle at the Pacific Missile Range Facility (PMRF)—culminated by the 130-mile return journey accomplished by the 300-pound female.

Hawaii is widely known for its beautiful beaches, breath-taking scenery, spectacular weather, and abundant sea life. People come from all over the world to watch whales, dolphins and sea turtles swimming freely in its waters. Because of so much attention, these creatures are sometimes involved in life-threatening accidents. In May 2009, after one such accident, a green turtle death was avoided when a female turtle was found injured, bleeding and lying on the sand at the outfall of Nohili Ditch, along the PMRF shoreline at Barking Sands, Kauai, HI. The cooperation and dedication of the U.S. Navy, the state of Hawaii Department of Land and Natural Resources (DLNR), and the U.S. Department of Agriculture (USDA) helped save the life of a turtle affectionately named "Ding" by her first responders.

Speeding boats and their razor-sharp propellers are responsible for half-a-dozen vessel-related turtle deaths a year in Kauai waters, according to Don Heacock, aquatic biologist with the state DLNR Division of Aquatic Resources, and one of Ding's first responders.

The turtle, weighing in excess of 300 pounds, was flown to Oahu, endured three hours of surgery to repair her cracked shell, or carapace, and other injuries, and released back into the wild only days after her rescue.

On 13 May 2009, CAPT Aaron Cudnohufsky, left, commanding officer of PMRF, Barking Sands, along with other volunteers removes an injured green sea turtle from the shores of Nohili at PMRF.

Green sea turtles are listed as a threatened species under the Endangered Species Act. They rest and bask on the ocean's surface and are regularly seen in shoreline areas where coral, reefs and rocks provide ample food sources and shelter from their main predators—tiger sharks. One such area is "Nohili Ditch" located at PMRF.

The green turtles have access to the nutrients that wash out with the silt which creates a habitat good for the limu (seaweed) that grow attached to the bench in the tidal zone. John Burger, an environmental specialist and Range Sustainment Support Environmental Coordinator at PMRF, has observed the green turtles feeding on the benches within 30 feet of the outfall.

Green turtles also seem to prefer the turbidity around the outfall because it provides cover from the sharks that like to eat smaller turtles.

The turtle suffered one propeller strike near the middle of her carapace and the most-damaging blow was near the bottom of her shell, close to her pelvis, which severed the top of the carapace and exposed the turtle's spinal column.

"Ding" was initially discovered at Nohili Ditch by Jason Shimauchi of the USDA's Animal and Plant Health Inspection Service. Shimauchi is one of two technicians assigned to PMRF primarily for the purposes of the Bird Aircraft Strike Hazard program which is responsible for reducing and ultimately eliminating aircraft collisions with birds. They're also responsible for predator control of two wedge-tailed shearwater colonies located on Barking Sands that are protected under the Migratory Bird Treaty Act.

Shimauchi, Peter Silva and others monitored the turtle, which had injuries consistent with contact with a boat propeller, until Heacock arrived. During the wait for Heacock, Shimauchi and PMRF Range Sustainment Support Coordinator Dennis Rowley found themselves herding Ding much like cowboys herd cattle—she was determined to swim her way back out to sea. If Shimauchi and Rowley had not waded into waist-deep water to "head her off at the pass," Ding would surely have met her demise—tiger sharks are able to detect blood in the water as far as ten miles away.

Initially, PMRF Public Affairs Officer Tom Clements and the Commanding Officer of PMRF, Capt. Aaron Cudnohufsky,

arrived only to monitor the situation, but when it was determined that the turtle weighed more than an NFL lineman, it was "all hands on deck" to lift her onto a PMRF security all-terrain vehicle for transportation off the beach.

Ding was estimated by Heacock to be between 50 and 80 years old. (The only way to estimate the age of a living turtle is by weight—she was well over 300 pounds.) Because Ding was so heavy, it took five men to carry her. Once Ding was moved out of the shore break, she was transported down the beach, up the berm and to Heacock's waiting DLNR truck.

Heacock later constructed a suitable crate for shipment—nothing standard could accommodate Ding's weight and girth. After being monitored by Heacock on Kauai overnight, the turtle was airlifted to Oahu on Aloha Air Cargo, spent three hours in surgery, then released back into the ocean off Kaneohe, Oahu.

Dr. George Balazs, leader of the Marine Turtle Research Program at the National Oceanic and Atmospheric Administration's (NOAA) Pacific Islands Fisheries Science Center of Oahu, and NOAA contract veterinarian Dr. Robert Morris used stainless steel pins, epoxy and a fiberglass sheet to fix her carapace and were also able to repair her internal damage. The finishing touches on Dr. Morris' fine wire-suturing and acrylic work included a few strips of fiberglass cloth and resin. A day later, after giving her antibiotics and observing that she was "full of energy" following the operation, the doctors decided that it would be best for Ding to get back into the water and feed in her natural habitat. Ding was trucked from the veterinarian facility to Kaneohe Beach Park where she was released. The turtle swam out slowly, took three breaths, and then dove out of sight, carrying her official name of "UAI" emblazoned on her carapace by a rototool and white paint.

For any threatened or endangered species of animal, it's adult females that are vital to ensure their sustainability. Accordingly, the doctors who treated Ding went to great lengths to save this turtle.

And, since green turtles can be territorial, the Kauai rescuers were hopeful this one would return to Nohili, although this seemed unlikely at first. Still, all were on the lookout for the letters "UAI" stenciled on her carapace and tagged fins.

Clements nicknamed the turtle Ding after the fiberglass that the veterinarians used to repair a portion of her damaged shell. It's similar to the fiberglass that is used to fix "dings" in surfboards.

Ding heads back out to sea after a brief haul-out on the sand at Nohili ditch on 29 July 2009, sporting her "UAI" logo and fiberglass-patched shell.

Ding feels strongly about her Garden Island home, and almost miraculously, she was found once again resting on the sand at Nohili Ditch on 24 July, just ten weeks after being released more than 130 miles away at Kaneohe Beach Park. She was found basking in the mid-morning sun by Silva, one of the first responders to her injuries in May. The air was sizzling with excitement after the original responders were notified of her return to PMRF. Cudnohufsky commented that he was elated to see the positive results of the combined efforts and was amazed that she found her way back home after being airlifted over so many miles of land and sea.

Simple research will show many examples of the U.S. Navy and its Sailors going above and beyond the call of duty to not only better understand the maritime environment they share with marine mammals, but to also come to the aid of stricken creatures.

For example, USS ESSEX, while on a deployment to the Persian Gulf, saved three green turtles caught in a fisherman's net. Pearl Harbor sailors combed the shoreline and bushes near Chun's Reef on the North Shore and removed trash and debris that posed a threat to endangered turtles and other marine mammals, and the Naval Station plans on installing propeller guards on all small boats under Pearl Harbor's control as well as the water taxis that frequent the historic base. Sailors aboard USS MILIUS successfully rescued a green turtle from another fisherman's net in the Arabian Gulf. U.S. Navy hospital corpsmen stationed at Camp Lejeune routinely volunteer their services at Sea Turtle Rescue and Rehabilitation Centers in North Carolina. ⚓

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SERDP & ESTCP Announce Plans for Annual Technical Symposium & FY 2011 Solicitations

Symposium Offers Comprehensive Technical Program & Training Opportunities

THE PARTNERS IN Environmental Technology Technical Symposium and Workshop, sponsored by the Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP), will be held 1–3 December 2009, at the Marriott Wardman Park Hotel in Washington, D.C.

Plenary Session

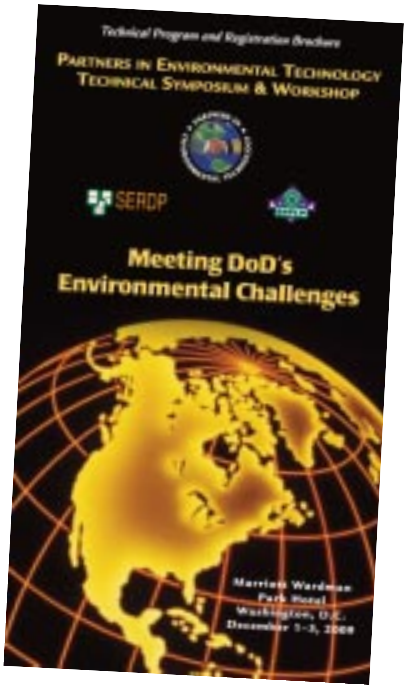
The Symposium and Workshop will commence with presentations by three distinguished plenary session speakers—Dr. Dorothy Robyn, the new Deputy Under Secretary of Defense for Installations & Environment; Lieutenant General Robert Van Antwerp, U.S. Army Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers; and Dr. Peter Kareiva, Chief Scientist and Director of Science for The Nature Conservancy, who will discuss emerging environmental challenges facing the Department of Defense (DoD). Also, as part of the plenary session, SERDP and ESTCP Principal Investigators who have helped DoD achieve its mission while improving its environmental performance will be honored as the SERDP and ESTCP Project-of-the-Year Awards are announced.

Technical Program

A comprehensive technical program consisting of concurrent technical sessions and short courses covering a variety of scientific and technical topics will follow the plenary session.

Technical Sessions

Eleven technical sessions will highlight research and innovative technologies that assist the DoD in addressing increasingly complex environmental and mission sustainability challenges. Following are this year's topics.



- Amendments for Contaminated Sediment Caps
- Field Applications of Advanced Diagnostic Tools
- Risk-Based Contaminant Management on Active Training Ranges
- Classification Methods for Military Munitions Response (Two-Part Session)
- Ecology and Management of DoD Coastal and Estuarine Ecosystems
- Challenges Associated with Regional Predictions of Climate Change Impacts
- DoD Greenhouse Gas Emissions: Land Use and the Installation Carbon Footprint
- Aircraft Emissions: Future Impacts and Alternative Fuels
- Emerging Contaminants—From Assessment to Action
- Environmentally Sustainable Energetics

To view the lineup of speakers and their topics for each technical session, visit www.serdp-estcp.org/symposium.

Short Courses

Short courses will offer unique training opportunities on recent advancements in select technologies and

Eleven technical sessions will highlight research and innovative technologies that assist the DoD in addressing increasingly complex environmental and mission sustainability challenges.

Proposals will be sought within all focus areas and projects will be selected through a competitive process open to both federal and non-federal submissions.

approaches in environmental restoration and munitions management. Professional development hours will be offered for participation in short courses. Attendance for these short courses will be limited, and advanced registration for each short course is required. Following are this year's short course topics.

- Geophysical System Verification—Alternative to Geophysical Prove-Outs
- Visual Sample Plan—Unexploded Ordnance Module (Full Day Course)
- Long-Term Monitoring Optimization
- Tools for Management of Chlorinated Solvent-Contaminated Sites (Full Day Course)
- Multi-Increment Sampling Applications for Environmental Remediation

Other Symposium Highlights

Attendees will have numerous opportunities to tour approximately 400 posters and exhibit booths and network with approximately 1,000 environmental professionals. Technical exchange networking receptions will be held both Tuesday and Wednesday evening.

Solicitations to Be Released Beginning in October

SERDP will be seeking proposals in response to its Fiscal Year (FY 2011) Core Solicitation and SERDP Exploratory Development Solicitation, which are scheduled to be released on or about 29 October 2009. Proposals will be sought within all focus areas (Environmental Restoration, Munitions Management, Sustainable Infrastructure, and Weapons Systems and Platforms), and projects will be selected through a competitive process open to both federal and non-federal submissions. Upon release of the solicitations, detailed instructions and the Statements of Need will be available on the SERDP web site (www.serdp.org) under Funding Opportunities.

The FY 2011 ESTCP solicitation will be released on or about 7 January 2010. This solicitation will request proposals related to each of the ESTCP focus areas (Environmental Restoration, Munitions Management, Sustainable Infrastructure, and Weapons Systems and Platforms). Technology demonstrations are open to both the federal and non-federal sectors, and projects will be selected through a competitive process. Information about the solicitation process is available on the ESTCP web site (www.estcp.org) under the Opportunities link.

SERDP is DoD's environmental science and technology program, planned and executed in partnership with the Department of Energy and the U.S. Environmental Protection Agency, with participation by numerous other federal and non-federal organizations. ESTCP is DoD's environmental technology demonstration and validation program. Its goal is to identify, demonstrate, and transfer technologies that address DoD's highest priority environmental requirements. Both programs address DoD environmental needs in the Environmental Restoration, Munitions Management, Sustainable Infrastructure, and Weapons Systems and Platforms focus areas.

For More Information

For additional information about the symposium, please visit www.serdp-estcp.org/symposium, send an e-mail to partners@hgl.com, or call the contact line at 703-736-4548. For information about the SERDP or ESTCP proposal solicitations, please visit www.serdp.org or www.estcp.org.

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Secretary of the Navy Environmental Award Winners Recognized

Awards Acknowledge the "Best of the Best"

THE ASSISTANT SECRETARY of the Navy for Installations & Environment presented the annual Department of the Navy Environmental Awards to 15 Navy and Marine Corps commands during a ceremony in their honor on 28 May 2009 at the Navy Memorial in Washington.

The annual Secretary of the Navy (SECNAV) Environmental Awards program recognizes Navy and Marine Corps individuals, teams, ships and installations for exceptional environmental stewardship. Competition categories include natural resources conservation, cultural resources management, environmental quality, pollution prevention and environmental restoration.

Nominees for the awards are provided by the Chief of Naval Operations and the Commandant of the Marine Corps.

"In a very real sense, these awards recognize the best of the best," commented Donald R. Schregardus, the Deputy Assistant Secretary of the Navy for Environment, who also served as emcee for the event.

From Marine Corps Air Station Yuma, AZ, to Fleet Readiness Center Southeast (FRCSE), to the USNS BRIDGE (AOE 10), the 15 winning commands represented a diverse cross-section of the department's mission areas.

The awardees collectively saved taxpayers millions of dollars, re-used or recycled thousands of pounds of waste, eliminated significant quantities of hazardous materials and reduced energy consumption by millions of kilowatt-hours—all the while successfully accomplishing their missions.

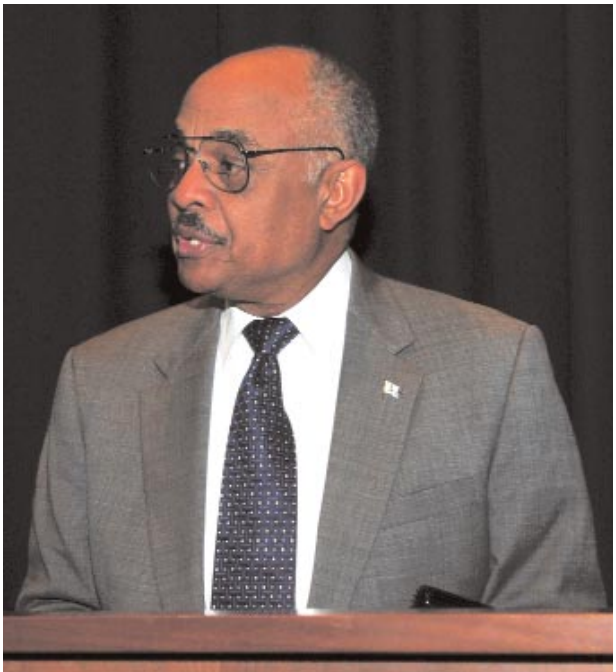
They also demonstrated that endangered species populations can flourish aboard active military installations, as they have, for example, at Naval Base Coronado, CA.

In addition to natural resources stewardship, the winning commands also exemplified the department's commitment to preserving the cultural and historic resources onboard its domestic and overseas installations. Camp Smedley D. Butler and U.S. Fleet Activities Yokosuka, for example, were both honored for working closely with Japanese officials on historic artifacts discovered on base property.

> In a very real sense, these awards recognize the best of the best.
>
> *Donald R. Schregardus, Deputy Assistant Secretary of the Navy for Environment*

"The department is investing a billion dollars per year toward environmental stewardship," explained BJ Penn, the Assistant Secretary of the Navy for Installations & Environment, to an audience of 200 attendees. "But it's not just money that makes these programs successful. It's an even more powerful asset—people."

Chuck Fox, the U.S. Environmental Protection Agency's (EPA) senior advisor to the Administrator on the Chesapeake Bay, served as keynote



Mr. BJ Penn, Assistant Secretary of the Navy for Installations & Environment, addresses the audience at the SECNAV Environmental Awards ceremony.

speaker during the ceremony. Recently appointed to the position by President Barak Obama, he is responsible for EPA's overall Chesapeake Bay restoration program.

During his speech, Fox discussed the importance of intelligently managing the environmental impact of development near major bodies of water. As in the case of the Chesapeake Bay, he explained, these bodies of water are too often inundated with lethal amounts of pollutant run-off.

While enthusiastically praising the department for its commitment to environmental stewardship, Fox expressed his desire for an increase in federal environmental leadership.

"It cannot be assumed that our children's children will enjoy the same environmental wonders we enjoy today," he cautioned.

Sounding a similar note during his remarks, Penn urged the attendees to continue striving toward greater natural resources sustainability.

"I hope you're ready to roll up your sleeves," he said. "More work remains to be done, and we need the type of leadership we're honoring here today."

The winners of the SECNAV environmental awards went on to compete for the Secretary of Defense Environmental Awards. The Department of Defense (DoD) ceremony took place in the Pentagon auditorium on 3 June 2009. During the ceremony, Vice President Joe Biden presented an award for pollution prevention excellence to Naval Air Station (NAS) Whidbey Island of Oak Harbor, WA.

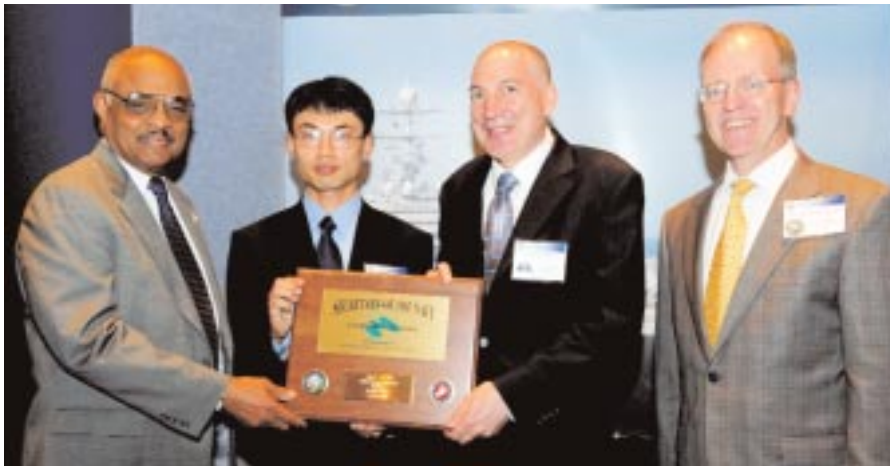
Commander Fleet Activities, Yokosuka, Japan

Cultural Resources Management—Installation

Commander Fleet Activities Yokosuka (CFAY) is the largest overseas U.S. naval installation in the world. Located on more than 1,700 acres of land just inside Tokyo Bay, CFAY provides services for 27,000 military and civilian personnel, 80 tenant commands, and 11 forward-deployed vessels. The station's physical plant includes 1,500 buildings, 8,200 feet of berth, and 233 million gallons of petroleum oil and lubricants storage. CFAY works closely with U.S. and Japanese officials to meet stringent U.S. and Japanese environmental protection standards.

CFAY achieved the following in Fiscal Years (FY) 2007 and 2008:

- Provided over 2,200 opportunities each year for cultural interaction among American and Japanese families. In addition to guided historical tours, CFAY also maintained an Installation History Resource



Mr. Ronald Rossetti and Mr. Yoshiaki Kanazawa of CFAY accept the SECNAV Environmental Award in the Cultural Resources Management–Installation category from Mr. BJ Penn, Assistant Secretary of the Navy for Installations & Environment, and Mr. Donald R. Schregardus, Deputy Assistant Secretary of the Navy for Environment.

Center that houses more than 25,000 artifacts. The Center is regularly visited by researchers, tourists, residents and students of all ages.

- Renovated the Yokosuka District Headquarters Office. As part of the project, CFAY personnel removed the original copper ceiling panels from the office and donated them to the Yokosuka City Museum.
- Collaborated with Japanese historical experts to update CFAY's historical buildings list. The update included the addition of a scoring system that will enable CFAY personnel to quickly identify historical buildings and their level of significance.
- Located dozens of historical artifacts and donated them to Japanese authorities, preserving the items and promoting their availability to researchers and the general public.
- Developed and promoted more than 12 volunteer installation-beautification and monument-cleaning events, saving money while promoting cultural resources management and education.

Marine Corps Recruit Depot Parris Island

Cultural Resources Management—Installation and Team/Individual

Marine Corps Recruit Depot Parris Island makes Marines. The "Cradle to the Corps" prides itself on diligently protecting national treasures while accomplishing its mission. The second oldest post in the Corps, Parris Island's approximately 1,900 active duty personnel and 900 civilians transform roughly 20,000 recruits into new U.S. Marines each year.

Mr. David Smoot, Dr. Bryan Howard, Ms. Johnsie Nabors, Dr. Stephen Wise and COL Jim Becker accept the SECNAV Environmental Awards in the Cultural Resources Management–Installation and Cultural Resources Management–Individual or Team categories from Mr. BJ Penn, Major General Edward Usher, Deputy Commandant of the Marine Corps, Installations & Logistics, and Mr. Donald R. Schregardus.

Parris Island stewards many unique cultural and archaeological resources. The Depot's Integrated Cultural Resources Management Plan (ICRMP) covers 8,100 acres of land and marsh. The Cultural Resources Management (CRM) office also supports quality of life by providing educational opportunities through a variety of programs.

Major projects in this period include support of several "Grow the Force" initiatives, efforts to finalize agreements with 16 Native American tribes, revisions to the Depot Master Plan and work with other governmental offices to ensure environmental compliance for privatization ventures.

By offering a diverse array of opportunities to learn about cultural resources, the entire installation benefits from improved relations with the surrounding community.

One of the Depot's most successful awareness events this year was the first "Iron Mike Bike Tour." The event encouraged military families and the public to participate in a bicycle tour highlighting many of the Depot's most significant historical and cultural resources. Public response was overwhelmingly positive, and local media coverage reflected very positively on the Depot's preservation efforts.

Local schools have come to rely on the CRM staff to provide field trip opportunities for students studying a variety of topics, including Native Americans, the Spanish period of South Carolina, and plantation life in the region before the Civil War. Parris Island has earned its reputation as a focal point of heritage tourism in the region.

Navy Region Hawaii

Cultural Resources Management—Team/Individual

The Navy's Cultural Resources Team in Hawaii is a diverse group comprised of personnel from the Naval Facilities Engineering Command (NAVFAC) Hawaii, NAVFAC Pacific, and the staff of the Commander of Navy Region Hawaii. Throughout history, many significant military and native Hawaiian events have taken place on Navy lands in Oahu and Kauai. This rich historical past creates many challenges for the team in managing the historic properties while supporting the modern Navy mission.

The team has worked on a number of initiatives to enhance the management of cultural resources. Some of

the more noteworthy accomplishments include the update of the Pearl Harbor ICRMP, which was completed in 2008. This plan comprehends more than 10,000 facilities on over 23,000 acres of land. Another significant initiative, the Cultural Landscape Report and Historic Assets Management Plan, will greatly improve the integration of historic properties management and mission requirements. The group also developed a protocol to manage the design-build projects on historic facilities. This initiative will enhance the accomplishment of design-build projects on historic facilities.

The Cultural Resources Team continues to build strong working relationships with historic partners and native Hawaiian organizations. For example, the annual Makahiki celebration is held annually on Navy property by the Oahu Council of Hawaiian Civic Clubs. All of these initiatives have greatly improved the management of cultural resources on Navy lands in Hawaii.

Ms. Elizabeth Nashold and Rear Admiral Dixon Smith accept the SECNAV Environmental Award in the Cultural Resources Management–Individual or Team category from Mr. BJ Penn, Vice Admiral Michael Loose, Deputy Chief of Naval Operations, Fleet Readiness and Logistics, and Mr. Donald R. Schregardus.

USNS BRIDGE (T-AOE-10)

Environmental Quality—Small Ship

USNS BRIDGE is the last of the SUPPLY class Fast Combat Support Ships. It provides fuel, cargo, ammunition, mail, freight, and provisions to the U.S. Navy and its foreign allies underway. The ship is currently operated by a compliment of 170 civilian mariners.

During the award period, BRIDGE successfully transferred 182.7 million gallons of fuel without a spill. In addition to complying with the Navy's environmental regulations, BRIDGE also voluntarily complies with U.S. and International pollution prevention regulations applicable to commercial vessels.

BRIDGE implemented a Safety Management System (SMS) in voluntary compliance with the International Maritime Organization's International Management Code for the Safe Operation of Ships and for Pollution Prevention. SMS is the Military Sealift Command's risk management tool for preventing pollution incidents. Aboard BRIDGE, SMS procedures reflect best practices provided by experienced shipboard staff, which are then reviewed and approved by a steering committee composed of senior shipboard and shoreside personnel.

BRIDGE derived immeasurable benefits to its organizational culture through the creation of the Environmental Improvement Officer position, which is unique to BRIDGE and rotates monthly among key officers.

BRIDGE's Chief Engineer optimized boiler operations to reduce fuel consumption by 1,000 gallons per day. This resulted in a cost savings of

First Officer Tom Guidice and Rear Admiral Robert Reilly accept the SECNAV Environmental Award in the Environmental Quality–Small Ship category.

over $900,000 per year and reduced carbon emissions by more than 4,000 tons annually. This is equivalent to taking over 565 cars off the road each year.

Fleet Readiness Center East

Environmental Quality—Industrial Installation

The Fleet Readiness Center East (FRC East) is an industrial aircraft maintenance, manufacture and repair facility located aboard the Marine Corps Air Station Cherry Point in Havelock, NC. The Command employs about 4,000 civilian, military and contractor personnel and is the largest industrial employer in North Carolina.

Through its Environmental Management System (EMS), sophisticated monitoring, continuous process improvement and aggressive recycling, FRC East achieved the following in FY07 and FY08:

- On one helicopter line alone, the sheet metal trade saved over $575,000 in time and hazardous materials annually.
- By using smaller paint kits and more efficient paint guns, FRCE reduced paint usage by 16 percent. A commitment to reducing paint usage levels facility-wide yielded reduction increases of 30 percent in FY08.
- Reduced chromic acid use by over 50 percent compared to FY04 levels. It also reduced Varsol (a petroleum solvent used for general cleaning) use by installing recycling booths to replace the single-use units. This yielded a reduction of 41 percent over FY04 levels.
- Reduced waste water usage by 11 percent over FY06 levels. FRC East recycled over 700 tons in FY07 and over 780 tons in FY08. FY 08 Solid Waste Recycling: metal—365 tons; paper—94 tons; cardboard—143 tons; plastic—14 tons; wood—156 tons; toner cartridges—11 tons.
- Eliminated 1,250 hours of weekend overtime and 2,340 regular labor hours per year for an annual savings of $108,000.

Mr. Dan Miller, Ms. Amy Morgan, Ms. Lisa Merrell, COL David Smith, Mr. Edward Childs and Mr. Garry Newton accept the SECNAV Environmental Award in the Environmental Quality–Industrial Installation category.

Naval Support Activity Bahrain

Environmental Quality—Overseas

Over the past two years, Naval Support Activity (NSA) Bahrain's environmental programs continued to improve and expand. The environmental program successfully reduced hazardous waste and improved military readiness in a high-tempo operational environment. The program enabled NSA Bahrain, the Commander of the Fifth Fleet, and approximately 80 tenant command stakeholders to adopt environmental management techniques that promote environmental protection and mission accomplishment. The environmental program has consistently succeeded in achieving environmental excellence using scarce resources and has dedicated the organization to improving environmental quality in the installation's operations. The program team also exported its expertise and lessons learned to support Camp Lemonier, in Djibouti, on the Horn of Africa.

During the past two years, the Environmental Department responded to more than 1,000 service calls supporting 158 U.S. Navy and coalition ships. It processed more than 5,000 drums of shipboard used hazardous materials offloaded in Bahrain and the United Arab Emirates (UAE). The recycling programs in Bahrain and the UAE have diverted over 1,100 tons of otherwise hazardous waste and reduced disposal cost by over $2.5 million.

NSA Bahrain's EMS implementation efforts are nearing their conclusion and are on track for full conformance in advance of the 30 September 2009 deadline. EMS enhancements planned for 2009 will integrate energy, water and transportation-related initiatives, consistent with the performance goals of Executive Order 13423.

Mr. Ted Zagrobelny, Mr. David Curfman, Mr. Awni Almasri and CAPT David Sasek accept the SECNAV Environmental Award in the Environmental Quality–Overseas Installation category.

Marine Corps Base Camp Butler

Environmental Quality—Overseas

Marine Corps Base (MCB) Camp Smedley D. Butler is the base support command for U.S. Marine Corps ground forces on the islands of Okinawa and Honshu, Japan. MCB Butler facilities span 45,276 acres. They are occupied by approximately 14,000 military personnel, 6,000 civilian workers, and over 9,000 dependents residing in base housing. Approximately 260 species at the camp are rare, threatened or endangered. Significant archaeological sites, some dating back 6,000 years, dot the complex.

MCB Butler provides, in English and Japanese, outstanding environmental education, professional development, and awareness training to its Marines, U.S. and Japanese civilians and other DoD personnel.

MCB Butler routinely partners and shares data with the Okinawa Prefecture Government and local municipalities to protect natural and cultural resources. In 2007, MCB Butler worked closely with the local Japanese Cultural Resources Management Authority on the rare discovery of prehistoric architecture while still facilitating the construction of an important MCB Butler project. The camp also partnered with the Japanese government to remove the mongoose predator threat from Okinawa's native and rare species.

In 2008, MCB Butler's Recycling Center processed more than 2,000 tons of recyclable items, a significant increase over the 1,600 tons it recycled in 2007 and the 1,300 tons it recycled in 2006.

Mr. Craig Sakai accepts the SECNAV Environmental Award in the Environmental Quality–Overseas Installation category.

Naval Base Ventura County

Environmental Restoration—Installation

Naval Base Ventura County is composed of three operating facilities—Point Mugu, Port Hueneme and San Nicolas Island. Point Mugu consists of 4,500 acres, including Laguna Peak; it is bordered by parkland, duck hunting clubs and intensively farmed agricultural lands. Port Hueneme covers more than 1,600 acres, and San Nicolas Island is approximately 13,370 acres.

During FY07 and FY08, Naval Base Ventura County's Environmental Restoration Program was extremely successful in meeting its four major objectives:

- Restore contaminated lands. The Port Hueneme Dredging Project uses a confined aquatic disposal cell installed in the harbor floor to isolate 327,000 cubic yards of contaminated sediment under a cap of sand and gravel. This solution will allow future maintenance dredging to proceed without having to deal with contaminated sediment and saves $27 million over the only other viable alternative. Benefits include restoration of the harbor, clean-up of the sediment and the addition of sand to the beach.

Mr. Daniel Shide, Mr. Steve Granade, Mr. Reza Ghanei and CDR Peter Hanlon accept the SECNAV Environmental Award in the Environmental Restoration–Installation category.

- Reduce human health risks at contaminated industrial sites. Eight of fifteen installation restoration sites at Point Mugu have begun implementation of remedial actions.
- Reduce ecological risk for restoration and enhancement of habitats. Mugu Lagoon is monitored to meet water quality standards that protect aquatic life and drinking water. The risk-reduction undertaken so far is expected to save $34.5 million.
- Perform effective clean-ups with minimum environmental impact.

Marine Corps Air Station Cherry Point

Environmental Restoration—Installation

Environmental Quality—Industrial Installation

Marine Corps Air Station (MCAS) Cherry Point is home to over 10,600 Marines and Sailors and 5,500 civilian employees. It covers 13,164 acres, with an additional 15,980 acres in outlying support areas. Many species of migratory birds inhabit the station's estuarine environment, which is also a vital nursery for coastal shore birds and marine life.

Mr. Will Potter and Mr. Dale McFarland accept the SECNAV Environmental Awards in the Environmental Quality–Industrial Installation category and the Environmental Restoration–Installation category.

MCAS Cherry Point has embraced innovative and effective partnering, site management, investigation, and clean-up techniques to create a program that protects human health and the environment, supports the installation mission, and promotes efficient and cost-effective site closure. In 2007 and 2008, restoration initiatives generated over $400,000 in savings for the Air Station's operational account and over $2.75 million in savings for the restoration program while meeting closure requirements at 11 sites.

Cherry Point's Installation Restoration team faces significant clean-up challenges stemming primarily from historical activities. Its hydrogeological, industrial and ecological settings create unique resource-protection and human health concerns. The Air Station and several nearby municipalities rely on the groundwater underlying the facility for their drinking water supply, and the surrounding estuarine environment is vitally important to the local commercial fishing industry.

The Air Station's Installation Restoration team established a facility to blend used oil with petroleum recovered during clean-up projects. As much as 100,000 gallons of blended product is provided to the central heating plant each year, reducing the annual heating bill by $400,000. The restoration team schedules restoration work on the third shift to reduce disruption to on-base industrial activities. It also provides assistance following aircraft mishaps to

minimize environmental impacts and clean-up costs during recovery and investigation. It then supervises the site restoration activities.

Naval Base Coronado

Natural Resources Conservation—Large Installation

Naval Base Coronado (NBC) consists of seven geographically separate installations including NAS North Island, Naval Amphibious Base Coronado, Silver Strand Training Complex, Naval Outlying Landing Field Imperial Beach, Remote Training Site Warner Springs, La Posta Mountain Warfare Training Center, and San Clemente Island Range Complex. NBC provides logistical support and quality of life services for the operating forces of the Navy, enabling them to achieve the highest level of combat readiness.

The base's natural resources program manages some of most diverse ecosystems in the U.S. The seven NBC installations represent 42,573 acres of land and water and are distributed over an area of 3,380 square miles in San Diego and Los Angeles Counties in southern California. Two separate Integrated Natural Resources Management Plans (INRMP) help manage the base's complex natural resources.

CAPT James Alger, Ms. Tammy Conkle, Ms. Tiffany Shepherd, Ms. Melissa Booker and Mr. Luis Perez accept the SECNAV Environmental Award in the Natural Resources Conservation–Large Installation category.

NBC's comprehensive and multifaceted conservation program is focused primarily on the management of 25 federally listed species and their habitats in a manner compatible with military operations. With minimal impact on training operations, the base sustained population increases of three federally threatened or endangered species—the San Clemente Loggerhead Shrike, the California least tern and the western snowy plover.

NBC biologists recently consulted with the U.S. Fish and Wildlife Service to develop effective conservation measures in preparation for the expansion of Navy training areas in the Southern California area. Flourishing species on active Navy ranges, including the only shore-bombardment facility in the service, testify to the success of the base's conservation program.

The NBC conservation model provides a vivid example of the successful coexistence of training and natural resources.

Mr. William Rogers, Mr. Gary Haught, Mr. Danny Marshburn, Mr. John Townson, CAPT Jeffrey Voltz, COL Richard Flatau and Mr. Paul Bonifice accept the SECNAV Environmental Award in the Natural Resources Conservation–Large Installation category.

Marine Corps Base Camp Lejeune

Natural Resource Conservation—Large Installation

Spread out over 156,000 acres, Camp Lejeune is the largest Marine Corps installation on the eastern seaboard. Located on the North Carolina coast, it provides services to 41,000 military personnel and 4,500 civilian employees. It is the home of the II Marine Expeditionary Force and supports the Marine Corps's most complete expeditionary training program. Camp Lejeune also provides habitat for eight federally protected species.

Camp Lejeune achieved the following in FYs 2007 and 2008:

- Signed a revised INRMP with the U.S. Fish and Wildlife Service, the NC Wildlife Resources Commission, and the NC Division of Marine Fisheries. The plan improves military training opportunities while also providing a greater level of protection for sensitive species.
- Restored longleaf pine on 521 acres and improved red-cockaded woodpecker habitat on 626 acres of upland pine by removing undesirable hardwoods. Initiated timber harvest on 4,527 acres to improve habitat.
- Developed new management tools such as the Burning Priority Model, the Ecosystem Management Model, the Electronic Fish and Wildlife Conservation Tracking System, and the Annual Habitat Enhancement and Sustainability Plan for red-cockaded woodpeckers.
- Partnered on a daily basis with personnel from state and federal agencies and non-governmental organizations. Formal cooperative agreements and/or Memoranda of Understanding have been established with the U.S. Department of Agriculture Forest Service, the NC Division of Forest Resources, The Nature Conservancy, the NC Coastal Land Trust, the NC Wildlife Resources Commission and others.
- Merited selection by the Strategic Environmental Research and Development Program to be the site of the Defense Coastal/Estuarine Research Program. Unique within DoD, this program supports ecological monitoring and research by over 40 scientists and researchers from universities and institutes around the country. The decision support systems developed by the program will be exported to all DoD components.

Ms. Kassandra Gale and CDR Matthew Miller accept the SECNAV Environmental Award in the Pollution Prevention–Non-Industrial Installation category.

Naval Air Station Whidbey Island

Pollution Prevention—Non-Industrial Installation

NAS Whidbey Island is home to the Navy's EA-18G and EA-6B electronic attack squadrons, P-3C/EP-3 maritime patrol squadrons, and the Fleet Readiness Center Northwest (FRCNW). Covering 7,000 acres of land, the Station provides services to 8,796 military personnel, approximately 2,400 civilians and contractors, 46 tenant commands, and 20 aircraft squadrons and maintenance activities.

NAS Whidbey Island's combined pollution prevention efforts resulted in substantial reductions of hazardous waste, solid waste, air and water contaminants and many other types of pollutants.

NAS Whidbey Island achieved the following in FYs 2007 and 2008:

- Implemented an EMS to increase the Station's capability to track ongoing environmental program requirements. This aided in maintaining a high level of compliance. As a result, no Notices of Violation were issued during the 12 external agency audits conducted in FY07 and FY08.
- Diverted from landfills 100 percent of the Station's biosolids through biosolid composting at the Whidbey Recycle and Compost Center. This saved the station $50,000 annually on disposal costs. A total of 517 tons were processed from FY06 through FY08. The composted final product is used on unimproved grounds to enhance vegetation and ground stabilization.
- Decreased greenhouse gas emissions by 780 tons in FY08 by replacing old equipment with more efficient combustion and air conditioning systems.

NAS Whidbey Island also won the FY08 Secretary of Defense Environmental Award in this category.

Marine Corps Air Station Yuma

Pollution Prevention—Non-Industrial Installation

MCAS Yuma is the busiest air station in the Marine Corps. It provides aviation ranges, facilities and services that support the operating forces and its tenant commands and activities. Staffed by an organization of highly-skilled and motivated Marines, Sailors, and civilians, the Air Station also operates the 2.8 million acre Bob Stump Training Range Complex.

Mr. Christian Kost, Mr. David Rodriguez, COL Mark Werth and Mr. William Shepherd accept the SECNAV Environmental Award in the Pollution Prevention–Non-Industrial Installation category.

MCAS Yuma achieved the following in FYs 2007 and 2008:

- Met environmental reporting requirements at a substantial cost savings. Its Hazardous Material Management System (HMMS) has led to a 32 percent reduction of received hazardous material items since implementation. The HMMS Waste Module automatically tracks all hazardous materials and waste transactions, reducing waste-disposal costs and improving manifest-tracking and the quality of environmental reporting. Since implementation of the module in FY07, the installation has reduced waste by 19 percent.
- Significantly reduced water consumption. MCAS Yuma implemented water conservation practices to conform with Executive Order 13423 requirements and developed a number of water-efficiency projects. It also operated top-quality wastewater treatment systems on aircraft and mission-support facility wash racks.
- Saved energy and prevented pollution by installing photovoltaic devices on sunshades and rooftop locations to provide renewable energy and improved comfort for building occupants.
- Processed, demilitarized and recycled 405 tons of munitions and range-related debris. MCAS Yuma's Range Sustainment Program is incorporated into its EMS and effectively balances training and sustainment on one of DoD's most valued training ranges.

Fleet Readiness Center Southeast

Pollution Prevention—Team/Individual

FRCSE is the largest tenant command aboard NAS Jacksonville. It is also the largest industrial employer in Northeast Florida and Southeast Georgia. FRCSE is one of six Fleet Readiness Centers devoted to the maintenance, repair and overhaul of aircraft, engines, and aeronautical components for platforms such as the F-18, EA-6B, H-60, P-3, A-10 and S-3.

Through a variety of process improvements, FRCSE achieved the following in FYs 2007 and 2008:

- Reduced hazardous waste by 500,000 pounds per year, saving over five million dollars. Reduced the need to treat over one million gallons of water.

CAPT Paul Sohl, Mr. David Stricklin, Mr. Bob Vines, Mr. Peter Gallant, Mr. Thomas Cowherd, CAPT Tim Matthews and Mr. Garry Newton accept the SECNAV Environmental Award in the Pollution Prevention–Team/Individual category.

- Reduced personnel exposures to chrome, shortening production process time while ensuring environmental, safety and occupational health compliance. Reduced the amount of abrasive media used for paint and corrosion removal, reducing personnel exposure to cadmium. Reduced media consumption by 40 percent and hazardous waste by 92,000 pounds, saving $150,000 per year.
- Reduced the amount of liquid paint waste by more than five percent using a closed-loop filtration system. Reduced hazardous waste by more than 8,700 pounds, saving $22,000 per year. Saved more than 17 drums of solvent at a cost savings of $10,000.
- Saved, through energy-efficient lighting projects, more than 1,098,862 kilowatt hours. This reduced greenhouse gas emissions of CO_2 by 764 tons per year and saved more than $100,000.
- Recycled 20 tons of lead-acid batteries, 184 tons of paper and 200 tons of oil; FRCSE also recovered 3,250 pounds of Halon 1301.

Marine Air-Ground Task Force Training Command Twenty-Nine Palms

Pollution Prevention—Team/Individual

The Marine Air-Ground Task Force Training Command (MCAGCC) Twenty-Nine Palms is the largest live-fire and maneuver training facility in the Marine Corps. Its Pollution Prevention Program supports cutting-edge training for over 40,000 Marines annually while complying with Executive Order 13423 for the elimination or minimization of hazardous substances, enhancement of energy conservation, green procurement and increased alternative fuel vehicles usage.

COL Wes Weston and Mr. Jim Lessard accept the SECNAV Environmental Award in the Environmental Excellence in Pollution Prevention–Team/Individual category.

MCAGCC Twenty-Nine Palms achieved the following in FYs 2007 and 2008.

- Treated petroleum-contaminated soils on-site at its 2,500-cubic yard Bio-Remediation Facility.
- Procured numerous weapons-cleaning systems employing ultrasonic or aqueous-based parts-cleaning technology that eliminated approximately 1.5 metric tons of used cleaning solvents.
- The Range Sustainment Branch is the only unit of its kind in the Marine Corps. It diverted from landfill disposal 1.2 million pounds of solid waste that were demilitarized to a safe state suitable for reuse or sale.
- MCAGCC's Hazardous Waste Minimization Program established several hazardous waste reduction initiatives that eliminated or reduced several hazardous waste streams. The program is responsible for returning approximately $893,000 of reclaimed, new and unused hazardous material to tenant commands and Marine units aboard the installation. This avoided $235,000 in hazardous waste disposal fees. During 2008, MCAGCC established an Executive Order 13423, pollution prevention initiative working group, which ensures the installation strictly complies with the executive order and actively pursues new methods to reduce its environmental footprint.
- MCAGCC has also implemented a pollution prevention initiative that will eliminate during 2009 the use of plastic shopping bags at its Marine Corps Community Services and Defense Commissary Agency facilities. ⚓

All photos by MC2 Dustin Gates

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Sailor Dedicated to Navy & the Environment

Jay Thompson Met Jacques Cousteau, Teaches Kids About Wildlife

WHEN MASTER-AT-ARMS FIRST Class (MA1) Jay Thompson arrived in Manhattan this past May to provide security for New York Fleet Week, he and his Maritime Expeditionary Security Squadron 6 (MSRON-6) security team were well prepared for the crowds of people standing in line to tour the USS IWO JIMA (LHD-1) on Pier 88 and the USS ROOSEVELT (DDG-80) on the adjacent pier. He was not prepared for, but was excited to see, was the U.S. Navy's environmental programs exhibit that greeted visitors as they walked off the brow of the amphibious assault ship.

"I freaked out when I came around the corner and saw you guys with the plastic disks!" said Thompson. "I wasn't sure what we were doing with those, or which companies were getting them."

Thompson was referring to the sample plastic waste processor (PWP) disks on display at the Navy environmental booth. Chief of Naval Operations Environmental Readiness Division (N45) outreach team members used the disks as visual aids to explain how the Navy compresses and stores plastics at sea, and is now beginning to recycle some disks with the help of a waste-to-energy conver-

New York Fleet Week visitors stand in line to tour the USS IWO JIMA (LHD-7).

sion company in Norfolk, VA. Thompson was among the first sailors who began processing plastic aboard ships back in the early 1990's.

"My senior chief called me one day—I was on the USS NASHVILLE (LPD 13), and I was an SH3 (Ship's Serviceman Third Class) at the time. The Navy was beginning to sort their plastic, and he asked me to be in charge. I jumped on that in a heartbeat!"

Thompson also met and had correspondence with ocean exploration pioneer Jacques Cousteau.

"When I was doing the plastics program, my wife and I were living on a houseboat over by Little Creek Amphibious Base (Virginia). I joined the Cousteau Society—I thought it was a great organization to belong to," he said. "I wrote to Cousteau and told him about my job and how great it was, and he actually put some of that (information) in his magazine. He sent me a photo, and I hung it on the wall. It was pretty cool."

"Later on in my lifetime he sent me a flag off The Calypso (Cousteau's research vessel) to fly on my boat.

MA1 Jay Thompson talks about his Navy career, meeting ocean exploration pioneer Jacques Cousteau, and teaching children about the environment.

I've been around a long time, and you couldn't ask for a better job than the Navy. I'm the oldest guy in my detachment, and I can teach these guys a lot of stuff if they stick around.

Jay Thompson, Master-At-Arms First Class

He was a very intelligent man, and actually took the time out of his busy schedule to write me a letter. That meant a lot to me, especially being in the military," he said.

He stayed in contact with Cousteau, and eventually the two met in Marseilles, France, where Cousteau invited him aboard The Calypso. Later on, when The Calypso was damaged by an accident in Singapore Harbor, Thompson sent a donation to Cousteau. "I sent him… all I could afford to send at the time," he said. "Cousteau turned around and sent me a piece of wood off The Calypso. I thought that was the greatest thing I'd ever had somebody do."

Thompson's environmental awareness was also a catalyst for collecting taxidermic animal specimens. He has used these specimens as teaching aids to help children learn about the environment.

Kenneth Hess, public affairs contractor to N45, explains to New York Fleet Week visitors how U.S. Navy ships compress and store plastic at sea.

"The Navy has a program where every Friday, people can volunteer to go out to schools to read to kids," he said. "Instead of just reading, I actually had stuffed animals, real ones, that I collected from game wardens. I'd take them into the school and teach kids about the animals and their habitats."

"Later on it got more involved, and I'd talk about how much oil was spilled during the Exxon Valdez (incident) and how many animals were killed. Little kids don't understand that, but when you break it down, like how many barrels of oil fits on a football field, and how many football fields it takes to fill up a tanker truck, they understand," he said.

As a result of MA1 Thompson's school outreach efforts, he won a Williamsburg Chamber of Commerce Citizen of the Year award in 2002.

As a boy growing up on his grandparents' farm in Frankfort, Indiana, he saw the fish slowly disappear from area creeks, and learned the impact that communities can have on the environment.

"We've come so close (to causing extinction)…the buffalo, wolves too," he said. "When something goes extinct, you can't bring it back. It's like the rainforest, being chopped down every day. My kids aren't going see a lot of things they should see if we don't do something about it. What are they going to have later down the road? It's important."

Thompson loves the Navy. Over his 20-plus years in the service, he has rappelled out of helicopters, trained police dogs, worked on surface ships, and traveled overseas and around the U.S. on security missions.

"I've been around a long time, and you couldn't ask for a better job than the Navy," he said. I'm the oldest guy in my detachment, and I can teach these guys a lot of stuff if they stick around."

In addition to his interest in mentoring younger sailors, Thompson appreciates the natural environment and is glad to see the Navy making a difference there too.

"With the plastics program, recycling, and other projects, I'm really proud to see what the Navy's done for the environment. I mean that!" ⚓

Justin Saunders contributed to this article.

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NAVFAC ESC Demonstrating Real-time Drinking Water Contamination Detection System

System Provides for Continuous Monitoring of Water Quality & Early Warnings

NAVY WATER SYSTEM managers/operators will soon have a new robust real-time drinking water contamination detection system to continuously monitor their water to ensure that high quality drinking water is being delivered to their customers and provide water security surveillance to guard against the threats of terrorist attacks on water systems.

Recent developments in water monitoring technologies will soon allow water system managers to have access to their water quality data in real-time and receive timely automated notifications if abnormal water quality is detected to ensure the best-quality drinking water is being delivered. The Naval Facilities Engineering Service Center is currently demonstrating real-time drinking water contamination detection system at Naval Base Ventura County in Port Hueneme, CA. The results of this demonstration will be documented in an interim report due out in the fall of 2009. This report will provide the technical data needed to procure, install and operate these detection systems.

Potable water systems are a part of the critical infrastructure of our nation, as designated by Presidential Directive 68. A Government Accounting Office (GAO) study (GAO-04-29) identified drinking water distribution systems as the most vulnerable among various components of water systems due to their large number of access points, ease of access and the difficulty in detecting contaminants. The Navy must be able to provide safe drinking water in sufficient quantity to its installations in order to accomplish its missions. The inability to monitor water quality in real-time could hinder the Navy from this objective.

Contamination of water systems may be caused by natural events (e.g. earthquakes), unintentional acts (e.g. spills, cross connections), or intentional acts (e.g. sabotage), all of which threaten mission readiness, the well being of Navy personnel and their families living or working at military installations. The most effective measure to mitigate water contamination threats is to detect contamination early enough to allow for a timely response. Real-time water quality monitoring coupled with automated notification or mitigation systems could address this deficiency. However, the majority of Navy water utilities have not implemented a real-time monitoring strategy due to a lack of proven technologies as well as the associated high costs. Navy water infrastructure managers need cost-effective real-time monitoring technologies for improving water quality compliance and water system operations as well as reducing risks to water security.

> The most effective measure to mitigate water contamination threats is to detect contamination early enough to allow for a timely response.

Water Quality

A major water quality concern for Navy drinking water systems is

Prototype water monitoring system at field site.

compliance with the Surface Water Treatment Rule, Long Term 2 Enhanced Surface Water Treatment Rule and the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2). These rules regulate microbiological and chemical levels in drinking water to ensure that water systems have adequate disinfection while keeping the disinfection-by-products below regulated levels.

The current practice for water quality compliance is to manually collect grab samples for laboratory analysis on a weekly or quarterly basis. This practice does not allow water system staff adequate time to respond to changes in water quality and might also miss many poor water quality events occurring outside "normal" sampling events. For oversea or forward bases, manual sampling leaves the water system more vulnerable as the laboratory analysis turnaround time is longer and the quality of the local water supply is less reliable. A continuous and real-time water contamination detection system can help safeguard against abnormal water quality.

Water Security

Homeland Security Presidential Directive (HSPD) 7 established national policy to enhance the protection of our nation's critical infrastructures and key resources against terrorist acts. Although the Navy has performed Vulnerability Assessments and implemented physical security measures, deliberate contamination can still occur by hostile forces through introducing biologics or other hazardous compounds into water distribution systems. Physical security measures, such as cameras, fences and lights, may provide a first-line of defense but an early water contamination detection system is needed as a further defense against water security risks.

Technical Description

The system consists of a robust suite of commercial water quality sensors,

The Basics About the NESDI Program

THE NESDI PROGRAM, sponsored by the Chief of Naval Operations Environmental Readiness Division and managed by the Naval Facilities Engineering Command, supports Fleet readiness by minimizing operational risk, constraints and costs while ensuring shore-based environmental stewardship and regulatory compliance. The program seeks to accomplish this mission by investing in innovative and cost-effective technologies, processes, materials and knowledge that enhance environmental readiness of naval shore activities and weapons system acquisition programs.

The NESDI program validates Fleet environmental requirements, develops proven environmentally beneficial solutions and facilitates integration of solutions to the Fleet.

For more information, visit the NESDI program web site at www.nesdi.navy.mil or contact Leslie Karr, the NESDI Program Manager at 805-982-1618, DSN: 551-1618 or leslie.karr@navy.mil.

controllers, an industrial personal computer (IPC) and a data communication system. The demo project evaluates water sensors from HACH, ATI and S::CAN. Water quality parameters monitored include: pH, conductivity, turbidity, chlorine residual (total, combined and free), nitrate, ammonia, total organic compounds, dissolved organic compounds, continuous Ultra-Violet Spectral Data (200 to 700 nanometers) and water temperatures. Monitoring data are recorded every minute and are transmitted wirelessly through a wireless modem to a centralized server for data analysis (spectral fingerprint matching, differential data analysis). Monitoring data and data analysis results can be accessed real-time at local work stations through secured web access. Furthermore, an automated text message will be transmitted to operational staff's cell phone for appropriate actions if an event is detected.

Water sensors, controllers, IPC and communication devices are housed in a six-foot by six-foot by two-foot National Electrical Manufacturers Association enclosure. Estimated investment costs for a system are: $60,000 for hardware, $30,000 for fabrication and installation. Operation of the system involves quarterly calibrations and weekly system check out. Technical support ($5,000 to $15,000 annually) from vendors is also recommended.

Navy water infrastructure managers need cost-effective real-time monitoring technologies for improving water quality compliance and water system operations as well as reducing risks to water security.

The project is being demonstrated under the Navy's Environmental Sustainability Development to Integration (NESDI) program. The project team completed field installation of two systems in mid-June 2009 and started a one-year demonstration. An interim report is expected by November 2009 and should provide enough performance data to assist activities in system procurement.

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NAVAIR Finds Alternatives for Petroleum-Based Solvents

Low-VOC, HAP-Free Solvents Meet New Environmental Regulations

ENGINEERS FROM THE Naval Air Systems Command (NAVAIR) have identified three non-aqueous, low-Volatile Organic Compounds (VOC) and Hazardous Air Pollutant (HAP)-free solvents as alternatives to CID A-A-59601 (formerly P-D-680)/ MIL-PRF-680 solvents to meet new environmental regulations.

To obtain a high degree of cleanliness without corrosion, petroleum-based solvents such as CID A-A-59601 (P-D-680, a dry cleaning and degreasing solvent) and MIL-PRF-680 (a degreasing solvent) are used for cleaning aerospace platforms and other related equipment. P-D-680 contains HAPs and VOCs, which cause health and environmental problems. VOCs are released during cleaning operations, contributing to the formation of ground-level ozone (photochemical smog), which can damage lung tissue, cause respiratory illness and damage vegetation.

MIL-PRF-680 B contains the same amount of VOC as CID A-A-59601 but without the HAPs. CID A-A-59601 solvent, commonly called Stoddard Solvent or mineral spirits, is a widely-used, man-made organic solvent that comes from the refining of crude oil. Cold solvent cleaning of aircraft components is performed at Organizational-, Intermediate- and Depot-levels and usually takes place in either spray sinks or batch loaded dip tanks. Historically, the primary solvent used for these applications has been MIL-PRF-680 B Type II, which has a VOC content of more than 750 grams per liter (g/L). Alternative processes, used to eliminate the VOC emission, are immersion cleaning with cold or hot water-based products, heated high-pressure spray washing using water-based products and exempt solvent cleaning. Water-based processes are often ineffective on heavy soils and can result in flash rusting of steel components.

Under Title III of the 1990 Clean Air Act amendments, the U.S. Environmental Protection Agency (EPA) established emissions standards for categories and sub-categories of sources that emit or have the potential to emit listed HAPs. In addition, Air Pollution Control Districts in California implement the most stringent requirements, usually stated in terms of VOC content, such as the South Coast Air Quality Management District (SCAQMD) Rule 1171.

Since MIL-PRF-680 B and CID A-A-59601 are the only materials authorized by the applicable maintenance manuals to clean engine parts, an approved alternative is necessary to meet the new environmental regulations.

The SCAQMD has imposed restrictions limiting the VOC content in solvents to 25 g/L for immersion cleaning processes or limiting equipment to airtight cleaning systems. This ruling impacts multiple naval aviation cleaning operations. Under the new rule, neither MIL-PRF-680 B nor CID A-A-59601 will be allowed in solvent degreasing operations in the SCAQMD. Since MIL-PRF-680 B and CID A-A-59601 are the only materials

authorized by the applicable maintenance manuals to clean engine parts, an approved alternative is necessary to meet the new environmental regulations.

In order to identify a solvent that meets the new regulations, NAVAIR's Materials Engineering Division at Patuxent River, MD, recently tested several candidate commercial products. While the product testing was ongoing, a new specification MIL-PRF-32295 entitled "Cleaner, Non-Aqueous, Low-VOC, HAP-Free" was developed to address environmental regulations that prohibit the use of MIL-PRF-680 B and CID A-A-59601. Because exempt VOC and non-exempt VOC cleaners exist, the specification was first developed to qualify non-exempt VOC types of cleaners. Since the Aerospace National Emission Standards for Hazardous Air Pollutants (NESHAP) states that immersion-cleaning solvents must have vapor pressures less than seven millimeters of mercury (mm Hg), and wipe cleaning solvents must have vapor pressures less than 45 mm Hg, these limits were used as the Type I and Type II classifications in the specification. The cleaning effectiveness of the candidates tested led NAVAIR engineers to further describe Type I products as suitable for cleaning light soils such as oils and hydraulic fluids and Type II products as suitable for cleaning heavy soils such as greases and carbon residues. The new specification requires that a solvent must:

- Be free of HAPs,
- Contain no more than 25 g/L of VOCs,
- Be effective on grease and oil,
- Not contain ozone-depleting substances (ODS),
- Be non-toxic,
- Be compatible with metals and non-metals, and
- Be safe to use.

The acceptance criteria for selecting alternative solvents include the following properties:

- Low-VOC (less than 25 g/L) or exempt solvent
- HAP-free
- Effective (cleaning efficiency equivalent to MIL-PRF-680 cleaner)
- Non-ODS
- High Flash Point greater than 140 degrees Fahrenheit
- Non-Corrosive
- Compatible with metals and non-metals
- Non-toxic
- Non-offensive odor
- Cost effective
- Recyclable
- Fast drying

Currently, the three solvent products listed below have met the qualification requirements of MIL-PRF-32295 Type I. These products have vapor pressures as low as one mm Hg and zero VOC contents; therefore, they meet the most stringent environmental regulations. Presently, MIL-PRF-32295 is under revision to include an exempt class of solvents.

MIL-PRF-32295 TYPE I SOLVENTS

Product	Manufacturer
QSOL 300	SafetyKleen Baltimore, MD 21230
Cyclo 147F	Clearco Products Bensalem, PA 19020
SB32	Fluid Momentive Friendly, WV 26146

National Stock Numbers have been assigned to these products as follows:

- 1 Gallon: 6850-01-576-2676
- 5 Gallon: 6850-01-576-2765
- 55 Gallon: 6850-01-576-2736

The Type I products are estimated to address a significant amount of the parts cleaned by CID A-A-59601/MIL-PRF-680 solvents at NAVAIR and Marine Corps facilities. No new candidates tested to date have met all the requirements for Type II. As a result, efforts are underway at Patuxent River to develop a new cleaner to meet the Type II requirements. In addition, MIL-PRF-32295 is under revision to include an exempt class of solvents. Because the three products above are also considered exempt from the current environmental rules, they will be re-qualified to the new class once the revision is complete.

To validate the effectiveness of the tested products in work environments (Cyclo 147F, QSOL 300 and SB32), field-

FIELD TEST SITES

Site	Shop	Soil	Part	Solvent	Contact
Fleet Readiness Center East, Cherry Point, NC	Hydraulic, Engine	Oil, Hydraulic, Light Grease	Blade Shock, Roller Bearing	Cyclo- 147F	Megan Goold
Fleet Readiness Center Southeast, Jacksonville, FL	Engine, Wheels	Oil, Hydraulic, Light Grease	P3 Torque Wheels	Cyclo- 147F	Luzmarie Guzman-Santiago
Fleet Readiness Center West, Naval Air Station North Island, San Diego, CA	H-60 Integrated Maintenance Center	Oil, Hydraulic, Light Grease	Floor Board Rollers	Cyclo- 147F, QSOL- 300	Luc Doan
Camp Pendleton, CA	Armory	Dust, Dirt, Carbon	Weapon Parts	QSOL -300	Josh Brody
Coast Guard, Elizabeth City, NC	Transmission	Oil, Hydraulic	Gearbox, Shaft, Parts	QSOL- 300	Mike Hanson
Andrews Air Force Base, MD	Bearing	Grease	Roller Bearing	SB-32	Michael Megyesy
Naval Station, Norfolk, VA	Wheels Patch Test	Light Grease Hydraulic	Wheels Hydraulic System	SB-32	Nathan Richard, Jeff Edlund

testing was conducted on different weapon systems at several Navy, Air Force, Marine Corps and U.S. Coast Guard sites over the past several months. Each cleaning solvent was tested side-by-side with the current MIL-PRF-680 Type II solvent, cleaning identical parts for the duration of the test. Cleaning techniques such as brush, immersion and wipe cleaning were utilized based on the specified method of cleaning applications.

Photographs of the parts were taken before and after cleaning to compare the effectiveness of the tested cleaners to the control.

At each testing site, one cleaner was used in cleaning certain parts at one of the maintenance shops such as hydraulic, engine, wheels and bearing shops. The field test evaluation criteria were based on the type of platform, cleaning effectiveness, the photographs before and after the cleaning, compatibility with metals and non-metals, type of soil, drying time, residue, odor and squadron recommendations. The reports received from all testing sites showed successful results with positive feedback ("good" comments) from all users of the new products.

Before Cyclo 147F solvent.

After Cyclo 147F solvent.

Before MIL-PRF-680 solvent.

After MIL-PRF-680 solvent.

This effort was initiated to identify alternative replacement for CID A-A-59601/MIL-PRF-680 solvents to meet the new environmental regulations. As a result of this effort, a new specification for low-VOC cleaners was developed and issued, which can be used at locations where environmental regulations prohibit the use of CID A-A-59601 and/or MIL-PRF-680 B. Three cleaners were qualified to the new specification, and field-tested in relevant operating environments. It is anticipated that users in naval aviation, other Department of Defense facilities, and the U.S. Coast Guard will benefit from this new specification as environmental regulations continue to tighten.

Financial support for this effort was provided by the Defense Logistics Agency's Aviation Engineering Directorate, Hazardous Information Management Division—Hazardous Minimization and Green Products.

All photos by Megan Goold

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Developments of Interest: January to June 2009

THIS ARTICLE HIGHLIGHTS significant environmental regulatory changes and indicators suggesting future changes to the regulatory landscape.

Ocean Acidification

A group of the world's experts on ocean chemistry and marine ecosystems issued a declaration on 30 January 2009 calling for immediate action on carbon dioxide (CO_2) emissions to avoid further damage to the oceans. The Monaco Declaration is the outcome of the second "The Ocean in a High-CO_2 World" international symposium held in Monaco in October 2008. Visit http://www.ocean-acidification.net for more information. Ocean acidification is a relatively new field of study, with 62 percent of the research papers on the subject published since 2004.

The ocean absorbs approximately one-fourth of the CO_2 added to the atmosphere from human activities each year. When CO_2 dissolves in water, carbonic acid is formed. This phenomenon, called ocean acidification, is decreasing the ability of many marine organisms to build their shells and skeletal structure. Calcifying organisms that may be affected include components of the phytoplankton and the zooplankton—a major food source for fish and other animals.

While climate change and its impacts have significant uncertainties, the chemical changes occurring in the ocean as a result of increasing atmospheric CO_2 are observable now and highly predictable into the future. Ocean acidification is not a peripheral climate issue—it is the other CO_2 problem. Ocean acidification can be controlled only by limiting future atmospheric CO_2 levels.

- U.S. Environmental Protection Agency (EPA) Commits to Review Ocean Acidification Impacts under Clean Water Act (27-January-2009)
  http://www.biologicaldiversity.org/news/press_releases/2009/ocean-acidification-01-27-2009.html
  http://edocket.access.gpo.gov/2009/E9-8638.htm
- Ocean Acidification Lawsuit Filed Against EPA (14-May-09)
  http://www.biologicaldiversity.org/news/press_releases/2009/ocean-acidification-05-14-2009.html

Other Regulatory & Environmental News Items

Additional regulatory and environmental news items of interest in 2009 include:

- EPA Mandatory Greenhouse Gas Reporting Rule Proposed (10-April-09)
  http://edocket.access.gpo.gov/2009/E9-5711.htm
- EPA Issues Finding that Greenhouse Gases Pose Threat to Public Health and Welfare (24-April-09)
  http://edocket.access.gpo.gov/2009/E9-9339.htm
- California Granted Clean Air Act Waiver to Regulate Greenhouse Gas Emissions from Motor Vehicles (08-July-09)
  http://edocket.access.gpo.gov/2009/E9-15943.htm
- Hexavalent Chromium Established as Carcinogenic by Chronic Oral Exposure (31-December-08)
- National Toxicology Program Scientists Have Released a Two-Year Animal Study
  http://www.environmentalhealthnews.org/ehs/news/chromium-in-drinking-water

While climate change and its impacts have significant uncertainties, the chemical changes occurring in the ocean as a result of increasing atmospheric CO_2 are observable now and highly predictable into the future.

- U.S. Department of Agriculture Publishes a Study of Documenting How Mercury Gets into Tuna (01-May-09)
  "Mercury sources, distribution and bioavailability in the North Pacific Ocean"
  http://toxics.usgs.gov/highlights/pacific_mercury.html
- Administration Proposes Binding International Mercury Treaty (17-February-09)
  http://www.google.com/hostednews/ap/article/ALeqM5gjEHXtGOtiZbKdW-N6hBmp5vCl9gD96CPBTO0
- Perfluorooctane Sulfonate (PFOS) and Eight Other Chemicals Added to Persistent Organic Pollutants Convention (13-May-09)
  http://chm.pops.int/Convention/Pressrelease/COP4Geneva9May2009/tabid/542/language/en-US/Default.aspx
- EPA Provisional Health Advisory for PFOA/Perfluorooctanoic Acid in Drinking Water (08-January-09)
  http://eartotheground.typepad.com/weblog/2009/01/epa-sets-provisional-health-advisory-for-pfoa-and-pfos-levels-are-heavily-criticized-as-not-protecti.html
- EPA Standard for Particulate Matter 2.5 Overturned as Insufficiently Stringent (24-February-09)
  U.S. Court of Appeals, District of Columbia Circuit, http://latimesblogs.latimes.com/greenspace/2009/02/soot-pollution.html
- Secondary National Ambient Air Quality Standards (NAAQS) for Oxides of Nitrogen (NO_x) and Oxides of Sulfur Likely to Be Tightened? (17-June-09)
  The current level of the secondary Nitrogen Dioxide NAAQS indicator is 0.053 parts per million as an annual arithmetic mean (same as primary). The report rather strongly suggests that secondary NAAQS for NOx are likely to be further tightened.
  http://www.epa.gov/ttn/naaqs/standards/no2so2sec/data/2nddraftNOxSOxREAJune2009MainContent.pdf
  http://edocket.access.gpo.gov/2009/E9-14238.htm
- Court Rejects Regional Ozone Regional Cap and Trade Provisions of 8-Hour Ozone NAAQS (10-July-09)
  http://www.earthjustice.org/library/legal_docs/ozone-court-opinion.pdf, The U.S. Court of Appeals for the DC Circuit
- Executive Order for Chesapeake Bay Protection and Restoration—EO 13508 (12-May-09)
  http://edocket.access.gpo.gov/2009/E9-11547.htm
- President Establishes Temporary Interagency Ocean Policy Task Force (17-June-09)
  http://edocket.access.gpo.gov/2009/E9-14338.htm
- National Pollutant Discharge Elimination System Discharge Monitoring Report—Online Submission to EPA Available (24-June-09)
  http://edocket.access.gpo.gov/2009/E9-14868.htm
- Navy Green Procurement Guidance (11-March-09)
  http://www.p2sustainabilitylibrary.mil/p2_documents/don_gpp_implementationguide020509.pdf
- Office of the Federal Environmental Executive Green Procurement Product Category Spreadsheet (19-June-09)
  http://www.fedcenter.gov/Documents/index.cfm?id=11767&pge_id=1854
- Department of Defense (DoD) Instruction 4715.17, Environmental Management Systems (06-May-09)
  http://www.dtic.mil/whs/directives/corres/pdf/471517p.pdf
- EPA Interim Health Advisory Recommending 15 micrograms per liter Limit for Perchlorate in Drinking Water (08-January-09)
  http://www.epa.gov/safewater/contaminants/unregulated/perchlorate.html
- DoD Perchlorate Release Management Policy—Memorandum (22-April-09)
  http://www.p2sustainabilitylibrary.mil/p2_documents/dod_perchlorate_policy042009.pdf
- Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual Finalized (16-January-09)
  http://edocket.access.gpo.gov/2009/E9-975.htm

The Naval Facilities Engineering Service Center (NFESC) provides a free Weekly Federal Regulatory Summary that DoD personnel or contractors supporting DoD may receive by e-mail. To subscribe or unsubscribe, please contact the NFESC Regulatory Support Desk at NFESCRegulatorySupportDesk@navy.mil or 805-982-2640.

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Innovative Navy Programs Limit Landfilling & Reduce Costs

NAVFAC Hawaii Finds New Solutions to Old Problems

A CULTURE OF innovation and sustainability is being rewarded at Naval Facilities Engineering Command (NAVFAC) Hawaii, as bioremediation projects help cut costs and establish the Navy as a leader in environmental responsibility.

This ongoing culture of sustainability has achieved great success producing several innovative facilities including a Biosolids Treatment Facility, Oily Waste Treatment Facility, Paint Remediation Facility, and Sediment Remediation and Reclamation. Each of these projects benefited from financial investments and sponsorship provided by NAVFAC Hawaii. The Oily Waste Treatment Facility, Paint Remediation Facility and Sediment Remediation and Reclamation project received additional sponsorship and investment from the Department of Defense's (DoD) Environmental Security Technology Certification Program (ESTCP) and the Navy Environmental Sustainability Development to Integration (NESDI) Program. A team approach involving engineers from NAVFAC Hawaii and NAVFAC Engineering Service Center (ESC) have developed and demonstrated the viability and effectiveness of numerous innovative and sustainable technologies.

NAVFAC Hawaii scientists and engineers have built upon successful remediation efforts at a Biosolids Treatment Facility, using similar chemistry to create an Oily Waste Treatment Facility and a treatment facility for solvent-based paint that is soon to come on-line. Personnel from NAVFAC ESC, located in Port Hueneme, CA, have provided engineers to conduct the research, development, testing and evaluation that were necessary to develop these new biotechnologies. Together, NAVFAC employees and their contractors are creating new ways to handle large amounts of the Navy's industrial waste.

"These programs demonstrate the Department of Defense and Navy's commitment to the environment and sustainable practices because we are going the extra step," said Steven Christiansen, NAVFAC Hawaii supervisory chemist who has been involved in these projects from the beginning. "We're developing innovative technologies that better protect the environment, while saving the Navy money."

Biosolids Treatment Facility

A change in federal environmental regulations prompted the creation of the Navy's Biosolids Treatment Facility at Kalaeloa (formerly Barbers Point) in 1996. These new regulations required biosolids, or sewage sludge, to be reused. Instead of sending the solid matter that remains after sewage is processed through a wastewater treatment plant to a landfill, this facility composts the former waste.

On a 25-acre site, potentially harmful and hazardous chemicals are broken down by cultivating microbial or bacterial activity. The biosolids treatment process has two phases which can take about three months to complete. In Phase I, the sewage sludge is mixed with green waste, such as tree trimmings and grass clippings. Water is added and the mixture is placed in a pile over special aeration pipes that provide oxygen to the microbes that naturally exist in the mixture. Large fans are used to blow air through the aeration pipes into the pile of material approximately six feet high, for a minimum of 21 days. During this time, all pathogen and vector requirements, as set forth by federal and state regulations, are met.

An overview of the NAVFAC Hawaii Biosolids Treatment Facility showing various mixing areas and composting and curing piles.
Denise Emsley

In Phase II, the pre-compost mixture is then sifted to separate the larger pieces of material which are reused in the mixing of the next new aeration pile, and the rest is transferred to a curing area. This material is once again piled as high as six feet into a row with a length of 100 feet or more. Because the microbial process produces significant heat (temperatures greater than 190 degrees Fahrenheit), these piles are periodically watered and turned over allowing air to reach the inner core of the pile. This phase takes about ten weeks. The result is rich compost soil that is given or sold to DoD agencies on Oahu at minimal cost.

Oily Waste Treatment Facility

When establishing the Biosolids Treatment Facility for sewage sludge, the Navy had to handle biosolids that contained Total Petroleum Hydrocarbon (TPH) content. Normally, TPH content is not present in this type of material, but because of events that happened at Pearl Harbor during World War II, oil present in the ground seeps into the Navy's wastewater collection system. As a result, new processing techniques and parameters were developed that allowed for the successful treatment of these constituents during composting, meeting all regulatory requirements. The chemists involved in the development of the biosolids treatment recog-

A trommel screen sifts composted material at NAVFAC Hawaii's Biosolids Treatment Facility, Kalaeloa, Oahu.
Denise Emsley

NAVFAC Hawaii's Wastewater Treatment Plant Operators Edgardo Neri (left) and Whitney Menchavez (right) transfer oily waste from a pump truck to a holding tank at the Oily Waste Remediation Facility, Pearl Harbor.
James Johnson

nized that other wastes could be biodegraded or treated with this simple low-cost technology.

In 2004, a pilot study was initiated by NAVFAC ESC at NAVFAC Hawaii's Bilge Water Facility at Pearl Harbor, to determine if larger and more concentrated amounts of oily sludge from petroleum tanks could be effectively treated using microbes in a Sequencing Batch Reactor (SBR) system. NAVFAC ESC engineers performed technology research, development, testing and evaluation of the technology in order to facilitate and enable progress with developing the technology.

"Using the microbes that were developed in the composting process was the key to success with this next endeavor," said Dennis Chang supervisory environmental engineer. "We knew the use of microbes was successful at the Biosolids Treatment Facility and that gave us confidence to move forward."

Initially, the effort to remediate oily waste was low cost. Engineers from NAVFAC Hawaii and NAVFAC ESC used old components and excess tanks from around Pearl Harbor to build a prototype reactor. This equipment was set up at a site that became the Oily Waste Treatment Facility at Pearl Harbor. Microbes that had been identified as effective in remediating oily waste in the sewage at Kalaeloa were transplanted to the SBR.

"Several operational difficulties were encountered during the processing of the first few waste streams," said Vernon Kam, a NAVFAC Hawaii chemist who worked on the project and is now responsible for the daily operation of the treatment system. "But modifications of the process that included control of foaming, more thorough mixing, and the addition of nutrients that supported a more robust bacterial population demonstrated the potential of on-site bacterial remediation."

The process has been improved and updated, and the microbes have become more effective so that the remediation process for a shipment of oily waste takes only four days to complete. The Oily Waste Treatment Facility is now a full-scale operation with a 10,000-gallon reactor that is already planned for expansion.

Preliminary estimates indicate this innovative process will allow the Navy to process petroleum tank sludge at a cost savings of between $.90 and $7.10 per gallon (depending on specific transportation and regulated storage requirements).

Paint Remediation Facility

Another hazardous waste generated at Pearl Harbor that requires expensive shipping and storage fees is excess paint. The Pearl Harbor Naval Shipyard (PHNSY) disposes of thousands of gallons of paint each year. In 2005, NAVFAC tasked NAVFAC ESC with investigating methods for excess solvent base paint disposal that would reduce costs and the liability associated with off site disposal. Given the costs of processing excess paint, and the success with remediating biosolids and oily waste, Naval Station Pearl Harbor was selected as the demonstration site for developing a process performing remediation of solvent-based paint.

NAVFAC Hawaii's Oily Waste Remediation Facility at Pearl Harbor.
Denise Emsley

Dr. Frederick Goetz (left) a microbiologist contractor and Vernon Kam (right) a NAVFAC Hawaii chemist, show off the successful results of a batch of remediated oily waste. Dr. Goetz is holding the final product after remediation.
James Johnson

NAVFAC ESC Environmental Engineer Tom Torres places paint cans into the facility's can crusher.
James Johnson

Solvent-based paint includes ingredients such as polyester, polyurethane and epoxy. Solvents and resins found in these paint formulations are biodegradable, but special considerations have to be made for remediation.

The Navy's special solvent-based Paint Remediation Facility at Pearl Harbor is a semi-automated process which first drains and crushes one- to five-gallon paint cans. The paint is placed into a mixing tank where it is combined with water and emulsified.

The emulsified liquid is added to a bioreactor, where the microbes are contained and a mixture of nutrients are added to support the break down of all organic compounds found in solvent based paint. Once the biological process is started, the reactor is filled with water to the operating level and the treatment cycle begins. The treatment takes about four days, during which samples are taken every day to evaluate the performance of the process. Activated carbon is used to polish the water prior to discharging it into the sewer.

During the process, Volatile Organic Compounds (VOC) are emitted from the reactor and processed through a biofilter and polished with activated carbon before allowed to be emitted to the atmosphere. These VOCs are harmful to the atmosphere and human life. The system captures these compounds found in the exhaust gas and passes them through a biofilter system. The biofilter system is composed of biocubes (filled with compost), a humidifier, blower, 1,000-pound carbon bed and a control panel.

"One of the many challenges we face is monitoring the decomposition of the paint due to the vast number of organic intermediates being generated in the process," said Tom Torres, a chemical engineer at NAVFAC ESC.

This experimental project is expected to be completed and a final presentation for review will be given at the end of Fiscal Year 2009.

Sediment Remediation & Reclamation

Periodic dredging of Pearl Harbor and other Navy and civilian harbors is an ongoing operation that generates millions of cubic yards of sediment. In the past, dredged material was simply dumped in the ocean or disposed of on land in a Confined Disposal Facility (CDF). However,

Jenny Lagerquist, a contracted environmental engineer with NAVFAC ESC, checks for VOCs.
James Johnson

ocean dumping is increasingly restricted, and land in Hawaii for a CDF is either not available or extremely expensive.

To address this problem, NAVFAC Hawaii again teamed up with NAVFAC ESC to demonstrate the potential for remediating and reusing dredged sediment that is found unsuitable for ocean disposal. A test project is currently underway using a test cell, with a capacity of 2,000 cubic yards at the Biosolids Treatment Facility area at Kalaeloa, where sediment is blended with compost, flooded with water (to reduce the salinity) and planted with wetland plants. The compost helps promote bacterial and plant growth and improves the properties of the clay rich sediment. The bacteria and plants remediate organic contami-

Three plant species are planted by personnel from NAVFAC ESC at a specially prepared cell that was lined with plastic before the sediment and compost mixture was installed.
Denise Emsley

Dr. Frederick Goetz, a microbiologist contractor, carefully plants one of approximately 1,500 plants in the sediment test cell at Kalaeloa, Oahu.
Denise Emsley

Once the plants are in place, they are carefully watered by NAVFAC Hawaii's Biosolids Treatment Facility Manager Lonnie Felisse.
Denise Emsley

Approximately seven months after planting, Lonnie Felisse, NAVFAC Hawaii's Biosolids Treatment Facility manager, stands among the tall cattails which thrived in the test cell.
James Johnson

nants and reduce the bioavailability of more difficult contaminants. The end-product is being tested for beneficial reuse in upland areas. As with other green technologies, this approach offers the potential for considerable cost savings and the treatment cell is reusable.

Bioremediation is the Answer

Bioremediation programs are proving to be cost-effective and environmentally friendly solutions for handling various types of hazardous waste at Naval Station Pearl Harbor and have potential to do the same for DoD installations world-wide.

Each year, DoD disposes of eight million pounds of hazardous waste paint and the Navy sends millions of pounds of oily waste to regulated landfills. The producers of these wastes are taking notice of the cost-savings of remediation and implementing programs of their own.

Contaminated soil remediation facilities similar to the one at Kalaeloa have been created at Camp Pendleton, CA and Naval Air Station Whidbey Island, WA. The Scranton Army Ammunition Plant, in Scranton, PA, recently installed an oily sludge reactor.

"Navy and other DoD facilities are recognizing the benefits of using these 'green' approaches," said Dr. Frederick Goetz, a NAVFAC ESC contractor. "I think we will see these programs grow and yield positive results in the years to come."

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