THE NAVY'S ENERGY & ENVIRONMENTAL MAGAZINE

Currents

fall 2013

Navy Region Hawaii & Housing Partner Launch

First Resident Energy Conservation Program

Plan Encourages & Rewards Energy Conservation at Military Housing

Panama City Engineers Develop Tools to Reduce Energy Consumption

Indian Head to Demolish Navy's Last Coal-Fired Power Plant

Navy Region Southwest Leverages Key Partnerships

NAVY ENERGY ACTION MONTH posters inside!

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Currents

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cover

Hawaii may be paradise to many, but it also has the dubious distinction of having the highest energy rates in the United States. So Navy Region Hawaii was the perfect location for a pilot of the new Resident Energy Conservation Program–created to reduce dependence on foreign oil and other fossil fuels, and reduce the consumption of utilities.

6 Navy Region Hawaii & Housing Partner Launch First Resident Energy Conservation Program
Plan Encourages & Rewards Energy Conservation at Military Housing

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features

18 **Point Mugu's Lead Archaeologist Makes a Significant Find**
Cave May Be the Lone Woman's Cave of San Nicolas Island

22 **Resiliency, Culture Change Focus of 2013 Navy Energy Action Month**
Efforts Bring About Cultural & Behavioral Change

26 **New Methodology Helps to Identify Sources of Pollution**
NESDI Program's Pollutant Source Tracking Effort Supports the Proper Attribution of Contaminant Loads

32 **Navy Region Southwest Leverages Key Partnerships**
Collaborations Center on Endangered Species & Advancing Scientific Research

40 **Panama City Engineers Develop Tools to Reduce Energy Consumption**
Focus is on Forward-Deployed Marine Corps Combat Operations Centers

45 **Indian Head to Demolish Navy's Last Coal-Fired Power Plant**
New Natural Gas Cogeneration Facility Will Cut Energy Use by 50 Percent

50 **Neutralizing RDX in Surface Soils at Two Navy Air-To-Ground Ranges**
NESDI Project Demonstrates Hydrated Lime is an Effective Agent

54 **Indian Head's Human History Spans Millennia**
Man's Presence Dates to the Times of Early Egypt

66 **LMR Program Announces FY14 New Projects**
Projects Include New Data to Support Navy Risk Guidelines & Advancements to Automated Acoustic Signal Processing

departments

4 **N45 Outlook**

16 **Did You Know?**

61 **Best Shot**

62 **Trends of the Environment**

Energy Actions & People in Motion, Despite the Shutdown

WELCOME TO THE fall 2013 issue of *Currents*. Hot issues on my mind as of this writing have been the government shutdown and communication/training in support of Navy energy initiatives. We've also seen some leadership and staff turnovers, and I'll touch briefly on those.

Speaking frankly, the government shutdown has been tough to deal with. It's unfortunate because it really has had an impact on hard-working people, and the financial aspect makes it even more personal. I applaud everyone's professionalism throughout this time, and I'm glad to see that at least a short-term solution is finally in place. The challenge is, while we can continue to work and focus on vital Fleet readiness issues, we still lack a final budget appropriation.

On a more positive note, October was National Energy Action Month. Originally established by presidential proclamation in 2006, the event celebrates our nation's commitment to greater energy security, a strong economy, and a better environment through smart energy choices. From a Navy standpoint, it's a great opportunity to reflect on what each of us can do to conserve energy ashore and afloat. We had planned outreach activities to drive home the message that energy actions can have a major impact on combat capability and resiliency. Unfortunately due to the government shutdown, we weren't able to do as much of this messaging as originally planned. We did distribute a press release on Navy.mil, make downloadable posters available on our social media pages and the Greenfleet website, and spread the word within the Pentagon via posters and digital "InfoNet" displays around the building.

Also in October, we launched the "Did You Know?" energy awareness campaign. Developed by the creative folks at Naval Undersea Warfare Center Newport with our input, the campaign emphasizes key facts about the Department of Navy's energy usage and the importance of embracing culture change to enhance combat capability for the long term. Future "Did You Know?" spots will include vignettes of naval personnel who see the value of energy and relate it to their specific jobs and organization as a whole. You can see the introductory video on our social media pages, the Greenfleet website, and YouTube (http://www.youtube.com/watch?v = 1D8JFu-gpzg). Stay tuned for more campaign elements both online and in *Currents*.

This past quarter we'd been working with the Secretariat, Commander Naval Installations Command, the Fleets, and Marine Corps offices to plan two Secretary of the Navy (SECNAV) energy training events in October. In both Norfolk and San Diego, we envisioned two-day events focused on training and awareness: a day on operational energy and a day on shore energy. The advantages of conducting these in Fleet concentration areas would be (1) cost-effectiveness, since that's where a large percentage of our people and assets are located; and (2) audience, because it's the people closest to the deckplate who are likely to have some of the best ideas for changing practices to reduce energy usage. Due to the government shutdown we've now postponed these events, but we do plan on conducting them in the future.

In September, I had the chance to attend the SECNAV Executive Energy Seminar at the Naval Postgraduate School in Monterey, Ca. It was targeted to flag officers and senior executive service leaders, and was a great learning and collaborative opportunity. We had in-depth discussions about operational practices and the challenge of optimizing them, and about options to rethink how we do some operational tasks to reduce fuel demands. That dialogue reaffirmed my belief that technology alone, while important, is not going to get us all the way there as far as conserving fuel to increase our capability or making the best possible use of the fuel we do burn. This was the second offering of the course, and two more offerings are planned for fiscal year 2014.

Conserving energy ashore remains a focus because it saves money for the long term, but we also need to continually seek energy efficiency solutions that enhance readiness for the Fleet and operational units—and provide commanders flexibility for when they need the fuel. We should challenge our existing practices to find efficiencies that don't detract from operational readiness, but actually increase it. I heard

a quote from Mr. Joe Murphy, Deputy Chief of Staff, Fleet Installations and Environmental Readiness for U.S. Fleet Forces Command, which summarizes this perfectly: "(Navy) energy-saving practices must evolve from 'save energy when you can' to 'save energy unless you can't.' " It's a great quote; I wish I'd thought of it myself.

In the spirit of Mr. Murphy's words, we need to incorporate energy considerations into our existing continuum of training. If a naval officer is going to his or her first command job, he or she should learn the aspects of energy a commander can influence. In navigation school, you should learn how weather and tidal factors affect energy use. Engineers should learn optimal parameters for split plant lineups (engine configurations) from an energy conservation and performance perspective. In this way, classroom training should target specific rates and skills and what we can do in our jobs to be more energy aware, efficient and effective.

Another theme I keep hearing is the value of competition. Naval personnel are competitive by nature, so if we can encourage competition at the waterfront or between the squadrons, it may pay dividends in terms of energy saved and/or new solutions realized.

A stellar example of energy-related training and competition "in action" is the shipboard Incentivized Energy Conservation (i-ENCON) program, which the Naval Sea Systems Command has successfully executed annually since 1999. The program provides training to help ship operators use energy more efficiently and gives cash awards to ships that use less fuel based on their size and mission profile. Using the i-ENCON model with some adjustments for the aviation community, the Naval Air Systems Command and Chief of Naval Air Forces will roll out a similar "Air-ENCON" program across the Fleet in 2014.

We continue to receive energy ideas from Sailors, civilian employees, industry representatives and private citizens via the Greenfleet website (http://greenfleet.dodlive.mil/energy/energy-efficiency-idea). In an effort to streamline our process and route ideas quickly to the technical experts for vetting, we worked with the Navy Warfare Development Command (NWDC) to integrate our site's idea submission functionality with NWDC's online "Collab Lab" tool. The system is fully up and running, and I'm happy to report that it's already saving staff time and more efficiently getting good ideas to the right folks.

I want to add a few words here to welcome Secretary Dennis McGinn as the new Assistant Secretary of the Navy for Energy, Installations and Environment. He came on board in September, and brings a unique perspective as a retired senior flag officer in the Navy as well as a champion for efficient use of energy. We'll be interviewing him for publication in the winter 2014 issue of *Currents*.

Mr. Tom Hicks, who served as the Deputy Assistant Secretary of the Navy for Energy since March 2010, has now taken over as Deputy Under Secretary of the Navy and Deputy Chief Management Officer. It has been a pleasure working with Secretary Hicks on a wide range of issues, and I'm optimistic that he'll remain influential in the energy arena in his new position.

> (Navy) energy-saving practices must evolve from 'save energy when you can' to 'save energy unless you can't.'
>
> *–Mr. Joe Murphy*

Finally, I'll add that our office recently bade farewell to Todd Bowie, one of the plank owners in the Navy's energy program at OPNAV. Over the past three-plus years, Todd brought a wealth of knowledge about new technologies, fuel systems, carbon chains and biofuels to bear for countless briefs and other forms of vital support to Navy leadership. Todd has moved on to a promising position with a consulting firm in Boston, and will be sorely missed. Thanks to Todd for his significant contributions to our Navy team.

And thanks to each of you for your interest in and continued support of the Navy's energy and environmental initiatives. ⚓

Rear Admiral Kevin R. Slates
Director, Chief of Naval Operations Energy and
Environmental Readiness Division

Navy Region Hawaii & Housing Partner Launch

First Resident Energy Conservation Program

Plan Encourages & Rewards Energy Conservation at Military Housing

Hawaii may be paradise to many, but it also has the dubious distinction of having the highest energy rates in the United States. So when it was time for the Department of the Navy (DON) to roll out a new Resident Energy Conservation Program (RECP), Navy Region Hawaii was the perfect location for a pilot program.

Navy Region Hawaii and Forest City discovered that residents in the newly metered homes were using up to three times as much energy as comparable private sector consumers.

The Navy's RECP was created to align with the Department of Defense and DON's energy conservation and energy security initiatives to reduce dependence on foreign oil and other fossil fuels, and to reduce the consumption of utilities.

How RECP Began

Military housing in Hawaii is managed by Forest City Military Communities, LLC, the Public Private Venture (PPV) housing partner with Navy Region Hawaii. Forest City received the contract for constructing and managing military housing in May 2004. Included in the agreement was a provision for residents to self-pay for utilities. The provision follows a 1998 directive from Office of the Secretary of Defense, transferring responsibility for utility payment from PPV management to residents.

Initially, utility payments were included in service members' Basic Allowance for Housing (BAH). The BAH is an allowance for rent, utilities, and renters' insurance included in service members' paychecks. The only problem with the arrangement was that the BAH is calculated based on average prices for rent and utilities in a comparable private sector neighborhood. If residents used more than an "average" amount of electricity, or if rates went up, the housing partnership had to absorb the cost. More partnership funds spent on utilities means less for other uses like taking care of the properties and other neighborhood amenities.

Beginning in 2004, Forest City began to install electric meters in new homes. What they found surprised them.

The Real Cost of Electricity

The working group formed by Navy Region Hawaii and Forest City discovered that residents in the newly metered homes were using up to three times as much energy as comparable private sector consumers.

The partnership realized that a conservation program needed to be developed soon, so in 2009 another working group was formed. This group included the PPV partners, Naval Facilities Engineering Command (NAVFAC) and the PPV partnership in South Carolina, Atlantic Marine Corps Communities (AMCC) at Tri-Command.

The group looked to the Air Force and Army for guidance, as they had already implemented programs similar to the Navy's RECP that transfer responsibility for utilities from the project to the resident. With these programs as blueprints, the group first installed meters in all remaining housing in Hawaii and South Carolina.

PV arrays are standard on this military residence in Mololani.
Forest City Military Communities–Hawaii

They found similar high rates of consumption across the board. This was primarily because of the lack of a connection between the residents' rent and the amount of electricity consumed. In particular, there was no information being provided to a resident about their individual consumption, and no program to hold them accountable for the amount of electricity they consumed. The working group determined that the program would need to include a monthly statement that simply explained to residents how much electricity they were using and how that compared to their peers in their neighborhood and then hold them accountable to pay for excess usage.

FAR LEFT: Information Systems Technician 1st Class (IT1) Joshua Brown, assigned to Joint Base Pearl Harbor-Hickam, checks the air filter in his air-conditioning unit during routine maintenance. The Navy's RECP was created to align with the Department of Defense and DON's energy conservation and energy security initiatives to reduce dependence on foreign oil and other fossil fuels and to reduce the consumption of electricity.

LEFT: IT1 Joshua Brown plugs in his electronic devices using a type of power surge known to reduce wasted stand-by energy.

MC2 Nardel Gervacio

Judy Brown, wife of IT1 Joshua Brown, closes the window blinds to prevent heat from entering and keep their home cool.

MC2 Nardel Gervacio

IT1 Joshua Brown and his family pose for a portrait in front of their residence. Brown and his family maintain an energy-conscious lifestyle and take steps to create a home that uses less electricity.

MC2 Nardel Gervacio

Under the RECP, residents who use more than the calculated average amount of power for their home's "like-type group" pay an additional amount. (Housing units are classified into like-type groups by neighborhood, size, and year built.) Conversely, a resident's monthly usage is under the normal usage band, which is the average of a like-type group of homes plus and minus a buffer currently set at 10 percent, they receive a rebate. Wounded Warriors and Exceptional Family members, as well as military residents with a significant health condition that drives excess usage, may request a waiver for the program.

Following the conclusion of the joint working group's effort and adoption of the RECP by the DON, the pilot RECP was begun at Navy Region Hawaii, Marine Corps Base Hawaii, and AMCC at Tri-Command in South Carolina. The results of the one-year pilot program were very encouraging—a nearly ten percent decrease in electricity throughout the year.

The pilot program in Hawaii created a utility cost avoidance in excess of $1 million in its first year due to lower electricity consumption. By not spending this $1 million on utilities, the partnership was able to use these savings for

If a resident's monthly usage is under the normal usage band, which is the average of a like-type group of homes plus and minus a buffer currently set at 10 percent, they receive a rebate.

offsetting higher utility rates as well as investment savings for future neighborhood repair and improvement projects.

How It Works

Forest City calculated a monthly energy use average for each like type group of housing, including approximately 6,000 Hawaii PPV homes. In South Carolina, a similar average was established by AMCC at Tri-Command. Every month, metered utility data are collected from all military tenant-occupied homes in the like-type groups to develop an average usage.

For several months prior to the implementation of 'live billing,' residents received mock electricity bills to alert them as to how their electricity consumption compared to the monthly average for their like-type group. When the program went live, residents were allowed a 20 percent buffer before any action was triggered with respect to their consumption—that is, residents whose monthly utility consumption was 20 percent above or below the normal usage band for their like-type group would not incur a charge or receive a rebate (credit).

In October 2012, after 21 months with a 20 percent buffer, the buffer zone was narrowed to 10 percent above and below the average monthly usage. This was done in an effort to encourage further conservation, and to better align the DON's RECP with the Air Force, Army, and Marine Corps. (The Army program utilizes a buffer as low as five percent in some locations). Residents receive a rebate (credit) if they are 10 percent or more below the normal usage band, or pay an out-of-pocket charge if they use more than 110 percent of the average.

About 50 percent of Forest City residences are new construction, incorporating energy-efficient features throughout.
Forest City Military Communities–Hawaii

This Net Zero home in Catlin Park, Hawaii was a team effort between Forest City and the Department of Energy. The home produces more energy than it uses over the course of a year.
Forest City Military Communities–Hawaii

As residents modified their energy consumption habits (i.e., adjusting thermostats and turning off unnecessary lighting and idle electronics), average energy usage steadily declined. By January 2013, two years into the RECP, Hawaii Navy residents had on average decreased their electricity

Saving Energy All Across Hawaii

Hawaii's near perfect weather makes it an ideal location for solar energy production. A pair of projects in Navy Region Hawaii are taking full advantage of this plentiful natural resource.

In late 2012, Forest City completed construction of the largest utility-scale solar farm on Oahu. The 1.23-megawatt solar farm lies on Navy land on the Pearl City Peninsula. Hoku Solar installed more than 4,300 photovoltaic panels at the utility-scale solar farm, which will provide electricity to 150 to 250 military homes. The project was Forest City's fourth utility-scale solar farm on Oahu, and was a partnership with NAVFAC, Hawaiian Electric, and American Savings Bank.

In January 2013, the Navy completed an environmental assessment for a 5-megawatt solar array in West Oahu. The $30 million project, Kalaeloa Renewable Energy Park, will consist of 21,000 photovoltaic panels on 20 acres next to a former Marine Corps' landing strip. Kalaeloa Ventures, LLC will sell the energy to the Hawaiian Electric Company through a 20-year power purchase agreement. The solar park will help to power approximately 1,000 homes per year.

In addition to energy savings achieved through changes in energy consumption in military housing, Navy Region Hawaii is also realizing savings through more energy efficient buildings.

Leadership in Energy and Environmental Design (LEED) is a program that provides third-party verification buildings have achieved a certain level of energy efficiency.

Marine Corps Base Hawaii has achieved or targeted LEED certification for several properties managed by Forest City. These include:

- Waikulu neighborhood: LEED certified for neighborhood development
- Camp H. M. Smith: LEED Gold certified for homes
- Mololani: LEED Platinum certified for homes
- Phase IV Completion Project: targeting LEED Silver certification for homes
- Kaneohe Bay Management Office: targeting LEED Silver certification

Navy Halsey Terrace Neighborhood Community Center

The Halsey Terrace neighborhood was one of the first five neighborhoods transferred into the PPV entity in Hawaii in April 2004. This 477-housing unit neighborhood was completely demolished and rebuilt. Included in the neighborhood was a new two-building community center and swimming pool.

With savings built up during the reconstruction of the neighborhood, Forest City purchased a PV system to place on the roof of the two community center buildings. Because of the high price of electricity in Hawaii, the investment in the PV system was certain to have a favorable payback.

The electricity generated by the PV system today helps to offset the electricity purchased for the houses in this neighborhood. The PPV project owns the system, so all of the electricity generated over the 20-year expected life expectancy is "free" to the project. The 107-kilowatt system produces about 14,000 kWh per month, which is equivalent to the consumption of approximately 15 houses. As electricity consumption decreases over time in response to the RECP and other initiatives, the number of houses supplied by this system is expected to go up.

Forest City Energy Smart Initiative

In an effort to help move Forest City Navy and Marine Corps families toward a more efficient lifestyle, Hawaii Energy is partnering with Forest City on an energy conservation campaign. As mentioned above, the initiative included the development of targeted messages delivered to new and old residents of Forest City. The goal of the initiative is achieve a minimum 1.5 percent energy reduction per home per year. The program kicked off in May 2012, and achieved instant results. Forest City residents reduced total energy consumption by 674,956 kWh during June and July 2012.

Air conditioning used far and away the most kilowatt hours.

consumption by 10.5 percent from a starting point of 1,300 kilowatt hours (kWH) for the month of January 2011 to an average of 1,130 kWH for the month of January 2013.

Saving Specifics

The Forest City PPV had assistance from the University of Hawaii School of Architecture and Hawaii Energy in developing guidelines for reducing consumption. The school monitored electricity use at 10 Forest City residences at a time on a revolving 30-day schedule to determine what the largest offenders were in terms of energy use. Not surprisingly, air conditioning used far and away the most kilowatt hours. In second place was hot water—which was a bit of a surprise as units are furnished with solar hot water systems. In third place was the collective effect of plug loads (i.e., small appliances, entertainment systems).

The results of this study resulted in a printed guide for all new Forest City residents covering simple, yet effective energy conservation methods. This guide, plus smaller reminders strategically located in the housing units themselves, provide new and continuing residents with the road map for quicker conservation and for starting their lease term with a lower baseline at the outset.

During the University of Hawaii study, it was determined that some residents were defeating the solar heater's timer function, resulting in higher electricity costs. This prompted Hawaii Energy to initiate a follow-on study at Forest City by installing detailed hot water monitoring in 15 homes. This monitoring program is still underway.

"The key to helping program participants change their energy-use behavior is through regular and consistent education (of both residents and staff) about how to most easily save electricity," said Will Boudra, vice president of development at Forest City.

The PV arrays on this community center generate about 14,000 kWh of power per month.
Forest City Military Communities–Hawaii

This 1.23-megawatt solar farm on Oahu will provide electricity to 150 to 250 military homes.

"The first time we see a prospective military resident is when they come to the leasing office to look for a house," said Boudra. "At that time, they begin to hear the PPV project energy conservation message."

Then when someone from the leasing team takes them to see a house, they hear the conservation message again:

1. Go easy on the air conditioning.
2. Make the best use of the solar thermal domestic hot water system.
3. Be mindful of the cumulative effect of unnecessary plug loads.

Damage Controlman (DC1) Amy Lynn Huitrado, assigned to Joint Base Pearl Harbor-Hickam, checks the status of an electric water heater time switch during a routine check. The time switch allows the customer to shift electricity use into the 'off-peak' time periods in an attempt to save utility costs. DC1 Huitrado and her family maintain an energy conscious lifestyle and take steps to create a home that uses less electricity and fewer fossil fuels. The Navy's RECP kicked off in May 2012, and achieved instant results. Forest City residents reduced total energy consumption by 674,956 kWh during June and July 2012.
MC2 Nardel Gervacio

DC1 Huitrado checks the status of energy use on e-gauge, which can be used to monitor whole-house consumption.
MC2 Nardel Gervacio

"These messages are repeated during subsequent follow-on contact with property management and maintenance associates," Boudra said.

Residents' Reactions

A series of community meetings were held with residents both at the RECP inception in the summer and fall of 2010 and again in the summer and fall of 2012, as the buffer was narrowed from 20 percent to 10 percent. These community meetings were co-hosted by Navy Region Hawaii, Joint Base Pearl Harbor-Hickam, and Forest City leadership, and provided an effective forum both to further educate the PPV residents on the objectives and mechanics of the program and to answer residents' questions about the program. (A town hall meeting was also conducted in South Carolina.)

DC1 Huitrado poses for a portrait in front of her residence.
MC2 Nardel Gervacio

In addition to conserving hot water, lighting, and appliance use, adjustments to home thermostats can be an important energy saver.

As might be expected, resident reactions to Navy Region Hawaii's RECP have been somewhat mixed. However, according to Boudra, two years into the program, the number of people receiving a rebate is about the same as the number of people paying an overage.

Elizabeth Tsan, stationed at Pearl Harbor, moved into Forest City around the time the "test billing" period was beginning. She and her husband have consistently stayed $70 to $90 below the buffer zone each month. "We never had a problem staying within the buffer zone because we were very conscientious about saving money, she stated. "We unplug everything except the microwave," she said, adding that she uses the clock on the microwave to ensure she'll get to work on time.

Tsan also line-dries clothing instead of using the dryer, opens up windows whenever possible instead of using air conditioning, and makes frequent use of a charcoal grill instead of the oven.

Tsan feels that the program is "pretty good," but hopes that eventually everyone can stay in the buffer zone so that no one has to pay more than anyone else.

DC1 Amy Huitrado, also moved into Forest City housing during the test billing period. This was her first experience with PPV housing, so she was used to paying her own utilities. What she wasn't used to was the high cost of electricity in Hawaii.

One of the energy-saving features of this Forest City residence in Pa Honua is solar-powered hot water.
Forest City Military Communities–Hawaii

The Marine Corps Base Hawaii housing office and its solar array.
Forest City Military Communities–Hawaii

"We don't turn the air conditioner on unless it's eighty degrees or more," she stated. "We use ceiling fans." DC1 Huitrado says that she and her husband usually qualify for a rebate if they don't use air conditioning. If they do, they normally stay within the buffer. But, she added, "If we have company, we pay."

Other energy-saving measures the couple employ include using lamps instead of overhead lights, unplugging everything, and making sure all light bulbs are energy-efficient. As one of the homes being monitored

When Will the RECP Program Start at My Installation?

The current roll out schedule for Phase I of the RECP includes units that have individual electric and gas meters and processes in place to bill residents. Follow-on phasing timelines are yet to be scheduled:

- Hawaii: Live billing started January 2011 (96 percent of homes)
- Southeast (FL, GA, MS, SC, TX): Live billing started April 2013 (88 percent of homes)
- New Orleans (LA): Live billing was expected to start September 2013 (79 percent of homes)
- Midwest (IL, TN): Live billing was expected to start September 2013 (80 percent of homes)
- Northwest (WA): Live billing started August 2013 (80 percent of homes)
- Southwest (CA, NV): Live billing expected to start October 2013 (42 percent of homes)
- Mid-Atlantic (DC, MD, VA, WV): Live billing expected to start October 2013 (100 percent of homes)
- Northeast (CT, ME, NJ, NY, RI): Live billing expected to start October 2013 (50 percent of homes)

For more information about when the RECP will roll out for a specific Navy installation or neighborhood, contact your local Housing Service Center.

Source: www.cnic.navy.mil/ffr/housing/recp.html

by the University of Hawaii project, the couple has the advantage of seeing what items in their home use the most energy. This knowledge prompted them to cut down on dryer use ("it uses a ton of power," she stated), and using a toaster oven instead of the regular range.

DC1 Huitrado is a resident advisor for her neighborhood, which means she brings neighbors' concerns to Forest City management, and keeps them informed of new developments.

"The bills are coming down," she said. "But the cost of power is going way up next year." Though suppliers' costs are poised to spike in 2014, DC1 Huitrado also voiced optimism that Forest City is trying to help. "They're hoping to install PV panels on all the homes here, which should bring the costs down," she said.

In short, DC1 Huitrado has been pleased with her experience in PPV housing. "I'm grateful for what I have—a nice house and yard."

The RECP Expands

As a result of the pilot program's success, Commander, Navy Installations Command (CNIC) began rolling out the program to the rest of the DON's PPV housing that is metered and ready in October 2012. The rollout mandates that all projects will use a 10 percent buffer above and below the average monthly electricity usage by Navy PPV residents.

One of those locations is Naval District Washington, where the mock billing period began July 1, 2013. Residents will receive mock bills for three months so that they can evaluate their home energy consumption before live billing begins on October 1, 2013.

In a video message to the Fleet, Vice Admiral William French, CNIC, stated, "It's important to note that you and your family will reap the benefits of the money that is saved by this program—first with the refund from energy savings you and your family create by staying below the average normal usage rate, and second, the vast majority of the RECP cost savings will be reinvested back into the local PPV community to sustain high-quality homes and neighborhood amenities such as playgrounds, facilities and landscaping."

The RECP will have no impact on residents' BAH. According to CNIC, an allowance for normal utilities is a part of the BAH, which includes allowances for utilities, gas or other heating fuels, and water/sewer. The BAH includes the cost of utilities based on averages from residents living in the private

The RECP is intended to encourage residents to achieve normal usage and to reward them for conservation beyond normal expectations.

sector. The RECP is intended to encourage residents to achieve normal usage and to reward them for conservation beyond normal expectations.

CNIC recommends that those who wish to conserve make easy changes around the house. In addition to conserving hot water, lighting, and appliance use, adjustments to home thermostats can be an important energy saver. For example, in the winter months, setting the thermostat any higher than 70 degrees has the possibility to add more than seven percent to the bill.

Residents should also check and change their air filters because clogged filters make heating and cooling systems work harder. The proper use of ceiling fans helps circulate air to aid heating or cooling. And sealing windows and doorways can also help conserve on heating and cooling.

"Over the years we all have become attached to our 'extras' like a second or third refrigerator or freezer, year-round air-conditioning, and multiple entertainment systems," says Boudra. "Private sector residents in Hawaii quickly learn to curb their customary use of electricity. PPV residents are learning to do the same."

A list of frequently asked questions, tips on saving energy, and other communications about the program can be found by visiting www.cnic.navy.mil/ffr/housing/recp.html.

This residence in the Radford Terrace neighborhood benefits from the cooling effects of tree shading.
Forest City Military Communities–Hawaii

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DID YOU KNOW?

- The Navy currently accounts for 22% of the Department of Defense's (DoD) total petroleum consumption.
- The Coso Geothermal Field and Power Plant Complex at Naval Air Weapons Station China Lake, CA can supply power for a community of 200,000 people at its current power output of 170 megawatts supplied to the electric grid.
- 75% of energy consumed by the DoD is 'operational energy' for training, moving, & sustaining military forces and weapons platforms.
- A typical two-hour flight of an F/A-18 Super Hornet uses as many gallons of fuel as four U.S. citizens in a year.
- Stern flaps improve hydrodynamic performance and have shown a fuel savings of up to 5%.

ENERGY SECURITY ENHANCES COMBAT CAPABILITY

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Point Mugu's Lead Archaeologist Makes a Significant Find

Cave May Be the Lone Woman's Cave of San Nicolas Island

LATE LAST YEAR, Navy archaeologist Steven Schwartz discovered a hidden cave on San Nicolas Island which he believes may be the Lone Woman's.

For more than 20 years Schwartz has been looking for the home of the Lone Woman, the inspiration for Scott O'Dell's 1960 Newbery Medal-winning novel *The Island of the Blue Dolphins*. The book is based on the abandonment and retrieval of an American Indian woman who lived alone on San Nicolas Island for 18 years (from 1835 to 1853), and Schwartz believes the cave he's uncovered may answer the question that has long eluded researchers: "How did she live for those 18 years?"

There are a number of sources that discuss cave sites on San Nicolas Island showing evidence of Indian occupation, but only one cave site had been discovered—the "Cave of the Whales." The Cave of the Whales contains pictographs and petroglyphs primarily depicting sea life such as killer whales. There is little evidence of occupation within the cave as this cave floor is located just above the high tide line, and during stormy weather waves would crash in making habitation unlikely.

During archaeological surveys conducted in recent decades, no cave site other than the Cave of the Whales had been located. This led to the conclusion that if there was a cave where the Lone Woman lived, it had either collapsed or been buried in the intervening decades.

During research into the ranching history of the island, a map was located which clarified the question of a second cave site. A U.S. Coast and Geodetic Survey map by Stehman Forney in the summer of 1879 clearly shows the location of the "Indian Cave." This cave is near, but definitely distinct from the Cave of the Whales. The map shows a survey station, named "Cave," using the normal symbol for a survey station, but near this, the annotation "Indian Cave" without the survey station symbol appears

The 1879 U.S. Coast and Geodetic Survey map by Stehman Forney showing the location of the "Indian Cave."
Scott Byram

The Basics About San Nicolas Island

SAN NICOLAS ISLAND is located in the Pacific Ocean off the coast of Southern California, 60 miles south of Point Mugu. About nine miles long and three miles wide, the 14,562-acre island has been owned by the Navy since 1933 and serves as a weapons testing and training facility. San Nicolas Island is critical to performing the Naval Air Systems Command (NAVAIR) Sea Range's mission and provides a cornerstone for supporting a wide variety of test, evaluation, training and experimentation operations, including surface-to-air, surface-to-surface, air-to-air, air-to-surface, missile defense, fleet training, and large-scale joint experimentation scenarios. In conjunction with Navy Region Southwest's environmental team, the NAVAIR Range Sustainability Office, which includes archaeologists and environmental protection personnel, ensures that the testing can be conducted without compromising any of the island's resources whether historical, the flora or the fauna.

San Nicolas Island.
U.S. Navy photo

to denote a specific place name. This map established the clear location of a second cave and erased all notions of the two caves being separate references to the same geographic feature.

During the next 20 years, various attempts were made to locate the cave. The map, while detailed, did not aid in the search of the cave because of the complex nature of the shoreline and the scale of the map.

"It was not possible to locate one specific spot as the location of the Indian Cave," Schwartz said. "There were at least four topographic features in the immediate vicinity that could be evidence of a collapsed or buried cave."

Surface surveys and auger and shovel sampling were conducted at all four locations with no success.

A recently obtained copy of the field notes which accompany the 1879 U.S. Coast Survey map from Scott Byram, a researcher at University of California, Berkeley, provided a more specific location for the cave and precise distance and bearing from the "Cave" survey station to the "Indian Cave" survey station.

With this very specific location and some help from California State University, Los Angeles (CSLA) students, the cave was finally located in early 2012. This involved clearing vegetation and removing some recently deposited sediments that were filling the cave. Excavations proceeded down to where a rounded sandstone boulder was found, likely indicating the floor of the cave. At that point, work by the team stopped so as not to impact the deposit or begin excavation without the proper approvals.

Entrance to cave site uncovered by a team from NAWCWD Point Mugu, with assistance from CSULA students, on San Nicolas Island.
Richard Gutenberg

Entrance to cave site .
Richard Gutenberg

As the site was being cleaned up for photographs, a glass bottle was recovered from the bottom of the cleared area. The bottle is a Gothic-style condiment bottle that dates between 1840 and 1865. Such a date would be consistent with the cave's use by the Lone Woman.

The thought that the cave was actually the home of the Lone Woman of San Nicolas Island for those 18 lonely years brought Schwartz and the team to the question, "So what did she do for 18 years?" The team hopes this cave site will provide an answer once work resumes.

"It's very rare in archaeology to be able to pinpoint any find to a specific individual," Schwartz said. "To have such a narrow time period that you're looking at is exactly what we need to pinpoint the context of these finds. It's just something you never see around here."

The cave is currently referred to as the "Lost Indian Cave" due to the fact that its location was lost for many years. Once it can be firmly estab-

Steve Schwartz, who discovered the cave, points to an area above the cave entrance where the dig began.
Patricia Sauers

A gothic-style condiment bottle recovered from the cave entrance.
Steve Schwartz

lished that it was the home of the Lone Woman of San Nicolas Island, it may then be referred to as the "Lone Woman Cave."

"Our Navy archeologists work incredibly hard and are dedicated to being good stewards of the natural and cultural resources on San Nicolas Island," said Patricia Sauers, of the NAVAIR Range Department. "Their efforts allow the Naval Air Warfare Center Weapons Division (NAWCWD) Point Mugu to continue its use of the island for testing in support of the warfighter. Having read the book in grade school and seeing the valuable history being discovered throughout the years on the island, I am inspired by the integrity of our folks working on this project and their continued perseverance in piecing together the true story of the Lone Woman as well as the many other untold stories on San Nicolas Island." ⚓

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Resiliency, Culture Change Focus of 2013 Navy Energy Action Month

Efforts Bring About Cultural & Behavioral Change

IN HIS PROCLAMATION this year, President Obama declared October National Energy Action Month and issued a call to action for all Americans to work together to achieve greater energy security.

Navy commands worldwide participate in Energy Action Month to share information on energy efficiency, highlight Navy's successful energy initiatives, and foster an energy-aware culture. The goal of 2013 Navy Energy Action Month efforts is to bring about cultural and behavioral change that enables energy security and resiliency.

As part of these efforts to change culture, the Navy launched a video that describes a new information campaign to inspire energy behavior change and awareness among the Navy workforce. The campaign's theme, "Did You Know?" highlights the importance of energy to the Navy's mission. The video can be viewed here: http://youtu.be/1D8JFu-gpzg.

Energy security and mission success go hand-in-hand for the Navy. "Energy is our greatest enabler and our greatest vulnerability," explained Rear Admiral Kevin Slates, director of the Chief of Naval Operations (CNO) Energy and Environmental Readiness Division. "Our combat capability is directly tied to the energy we have available."

The Department of Defense (DoD) accounts for 80 percent of the Federal government's energy consumption. The Navy accounts for 22 percent of DoD's total petroleum consumption; 84 percent of this figure is consumed in fleet operations. These rates of consumption represent strategic and operational vulnerabilities. By making more energy efficient choices, the Navy can increase capability, reduce vulnerabilities, and enhance resiliency.

"We deliver 1.25 billion gallons of fuel worldwide to operators annually. This represents an Achilles' heel in operators," explains Captain James Goudreau, director of CNO's Energy Coordination Office. "Our efforts are focused on technology changing behavior to provide options for increased payload, range, or endurance, thus giving commanders greater operational flexibility."

The Department of the Navy is also providing energy-awareness training opportunities for fleet Sailors and aviators,

Boatswain's Mate 2nd Class Kerik Vargas switches his lights to high efficient light bulbs as part of an energy conservation initiative at Commander, Navy Region Hawaii.
MC2 Mark Logico

TAKE ACTION NOW

SAVE ENERGY TO INCREASE CAPABILITY

Navy Energy Action Month
October 2013

http://greenfleet.dodlive.mil/energy

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U.S. DEPARTMENT OF THE NAVY ENERGY SECURITY

TAKE ACTION NOW

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U.S. DEPARTMENT OF THE NAVY ENERGY SECURITY

Energy is our greatest enabler and our greatest vulnerability.

–Rear Admiral Kevin Slates

Marine Corps expeditionary operators, and shore energy managers. The training sessions will focus on energy savings practices, culture change, and increasing awareness of energy use.

At the Pentagon, Navy Energy Action Month posters and electronic displays will increase awareness of Navy energy initiatives. Energy Action Month is also a great opportunity to highlight ways Sailors and civilian personnel can reduce energy consumption. For lists of ideas, visit http://dld.bz/energy-action-month.

How are you taking action to save energy? What does energy resiliency mean to you? Join the conversation at #NavyEnergy.

Do you have ideas on how the Navy can take action to save energy? The Navy wants to hear them! The new Collab Lab tool, developed by Navy Warfare Development Center, allows individuals and institutions to submit energy efficiency ideas, comment on ideas posted by others, and vote on the ideas already posted. Become part of the solution and submit your energy ideas on the Collab Lab page at http://dld.bz/collab-lab.

For more information and resources, visit the Navy Energy Action Month webpage at http://dld.bz/energy-action-month. ⚓

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Be Part of the Navy's Best Magazine • Submit Your Story by 17 January

Have some good news about your energy or environmental program? Want to share it with others? *Currents* is the place to do it. *Currents*, the Navy's official energy and environmental magazine, has won first place in the Navy's Chief of Information Merit awards competition three times. And it's people like you and the stories you submit that make *Currents* the best magazine in the Navy.

Your experiences take on new meaning when you share them with the *Currents* readership and on Facebook.

So if you have a story that you'd like us to promote in our spring 2014 issue, submit your text and images by Friday, 17 January 2014. Any submissions received after this date will be considered for our summer 2014 issue.

You can get a copy of the *Currents* article template by sending an email to Bruce McCaffrey, our Managing Editor, at brucemccaffrey@sbcglobal.net. This template has proven to be a tremendous asset in helping us edit and track your article submissions. And don't worry. If writing isn't one of your strengths, we'll handle all of the editing necessary to get your submission into publishable form.

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

As a reminder, your Public Affairs Officer must approve your article before we can consider it for inclusion in the magazine.

Don't forget to "like" us on Facebook at www.facebook/navycurrents. *Currents*' Facebook page helps expand the reach of the magazine and spread the news about all the great work you're doing as the Navy's energy and environmental guardians. And your experiences take on new meaning when you share them with *Currents* readers and on Facebook.

Currents Deadlines

Spring 2014 Issue: Friday, 17 January 2014
Summer 2014 Issue: Friday, 18 April 2014
Fall 2014 Issue: Friday, 18 July 2014
Winter 2015 Issue: Friday, 17 October 2014

You can also refer to your *Currents* calendar for reminders about these deadlines.

New Methodology Helps to Identify Sources of Pollution

NESDI Program's Pollutant Source Tracking Effort Supports the Proper Attribution of Contaminant Loads

WHEN A BODY of water is deemed contaminated by the U.S. Environmental Protection Agency (EPA), the polluters are responsible for initiating cleanup. However, when multiple entities share that body of water, the responsibility becomes difficult to assign. This is worsened when contamination is the result of historical discharges of unknown origin. Sediments and water may contain potential contaminants of concern (COC) from multiple sources as well as non-point sources (land runoff, precipitation, etc.). The complexities of such COC mixtures confound assignment of responsibility for mitigation.

Under section 303(d) of the Clean Water Act, states and territories are required to develop lists of waters that are too polluted or otherwise degraded to meet water quality standards. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDL) for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.

Although the TMDL determines how much of a pollutant is in the water and associated sediment, it is only an indication of how much contaminant the water can accept from all sources while still meeting the stated criteria. In the absence of defensible source information, the Navy, often considered a high profile discharger by the civilian sector, can be held responsible for a disproportionate share of the source pollutant burden, even if that amount of pollutant did not originate from the Navy.

A Challenging Problem

Recognizing and unraveling multiple sources of contamination requires advanced chemical fingerprinting data of large numbers of samples, which can be cost-prohibitive. Thus, the need exists for a cost-effective process by which naval facilities can collect the data needed to recognize and distinguish between different sources of contamination in sediments and water proximal to former or existing Navy facilities.

The Navy can be held responsible for a disproportionate share of the source pollutant burden, even if that amount of pollutant did not originate from the Navy.

In 2006, the Navy Environmental Sustainability Development to Integration (NESDI) program co-sponsored a project aimed at solving this problem. The project's goals were to identify, review, demonstrate, and validate pollutant source tracking technologies, and to develop a

cost-effective technical framework for Navy water program managers to work with.

The project team from the Space and Naval Warfare Systems Center Pacific (SSC Pacific) received leveraged assistance from NESDI, the Strategic Environmental Research and Development Program (SERDP), and the Environmental Security Technology Certification Program (ESTCP).

As a starting point, the team consulted a process outlined in a previous Navy report (Stout et al., 2003). This project dealt with polyaromatic hydrocarbons (PAH), a commonly found organic contaminant at Navy facilities. Many aspects of this process are transferable to use with metals, bacteria, and other organic contaminants such as polychlorinated biphenyls (PCB).

Using this process and a suite of environmental forensic techniques, the team demonstrated and validated a Pollutant Source Tracking (PST) process for metals, bacteria, and organics, and compiled technical guidance for Remedial Project Managers and others to use.

Environmental Forensics

The general approach followed a process outlined in *Environmental Forensics* by Robert Morrison (2000). Dr. Morrison coined the term "environmental forensics" and defines it as "the review and interpretation of scientific data for the purpose of identifying the source and age of contaminant releases." The techniques used in this process may include aerial photograph interpretation, underground storage tank corrosion models, a literature review to identify the date when a chemical or additive became commercially available, association of a particular chemical with a manufacturing process, chemical profiling (fingerprinting), chemical degradation models, and contaminant transport modeling. The technical guidance produced by the project team focused primarily on chemical fingerprinting, but also touched on other key forensic techniques as needed.

PST is broadly applicable to many types of classes of environmental contaminants such as metals, organics, biologicals, and other inorganics, though the approach for specific contaminants can be different. The contaminants studied by the project team in the case studies include copper, bacteria, and PCBs, although only copper and PCBs had sufficient data for case studies. These substances were both high-priority contaminants and good candidates for source tracking.

Metals Source Tracking

There are many explanations for the presence of metals in an aquatic environment. There are natural sources, including leaching from minerals with high metal concentration, atmospheric transport, and deposition of metal-laden particles. There are also anthropogenic (synthetic or man-made) sources such as industrial and municipal effluent discharges, stormwater runoff, or leaching from antifouling paints.

Metal concentration gradients can help identify trends in seawater for estuaries and harbors that result from both anthropogenic and natural geologic sources. In San Diego Bay, environmental concentration monitoring has indicated the presence of elevated copper levels in the water. Though some amount of copper is present in all bodies of water, elevated levels increase the regulatory pressure for capturing and treating stormwater.

The Basics About the NESDI Program

THE NESDI PROGRAM seeks to provide solutions by demonstrating, validating and integrating innovative technologies, processes, materials, and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Fleet readiness. The program accomplishes this mission through the evaluation of cost-effective technologies, processes, materials and knowledge that enhance environmental readiness of naval shore activities and ensure they can be integrated into weapons system acquisition programs.

The NESDI program is sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division and managed by the Naval Facilities Engineering Command (NAVFAC) out of the Naval Facilities Engineering and Expeditionary Warfare Center in Port Hueneme, California. The program is the Navy's complement to ESTCP which conducts demonstration and validation of technologies important to the tri-Services, U.S. Environmental Protection Agency and Department of Energy.

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.

Metal concentration gradients can help identify trends in seawater for estuaries and harbors that result from both anthropogenic and natural geologic sources.

Compliance related to the TMDL process is expected to further impact capturing and treating stormwater.

In an effort to identify the source of the elevated copper levels, the project team performed a case study in San Diego Bay. Using an extensive collection of water samples collected for a previous SERDP project (CP-1156: "Fate and Ecological Effects of Copper and Zinc in Estuarine Environments: A Multi Disciplinary Program"), the team evaluated the distribution of many different metals, focusing on concentration gradients. They then looked for associations with sources of the metals identified, and used various statistical analyses to make sense of the data. Finally, the team used isotopic ratios to map metal sources. The team was able to identify an anthropogenic source for the copper (antifouling coatings) as well as a geological source (natural silty sediments). The copper from antifouling coatings can be attributed to several sources including hull coatings on pleasure craft and Naval vessels.

Bacteria Source Tracking

The process of identifying sources of bacterial pollution is a difficult one but one that is necessary to resolve compliance issues and target complete remedial actions. Certain bacteria and viruses serve as indicators for a wide range of pathogens, and these organisms are those targeted for microbial (bacterial) forensics (EPA, 2002b). The most likely use of microbial source tracking by Navy managers is during TMDL implementation, and involves the identification of fecal bacteria.

The Navy has a large presence on the water, but there are numerous other sources of discharge.
© Google Maps 2013

Bacterial source tracking is much more complicated than metals tracking because the science is much less mature. Even in the best case scenario, bacterial source tracking mechanisms are only accurate about sixty percent of the time.

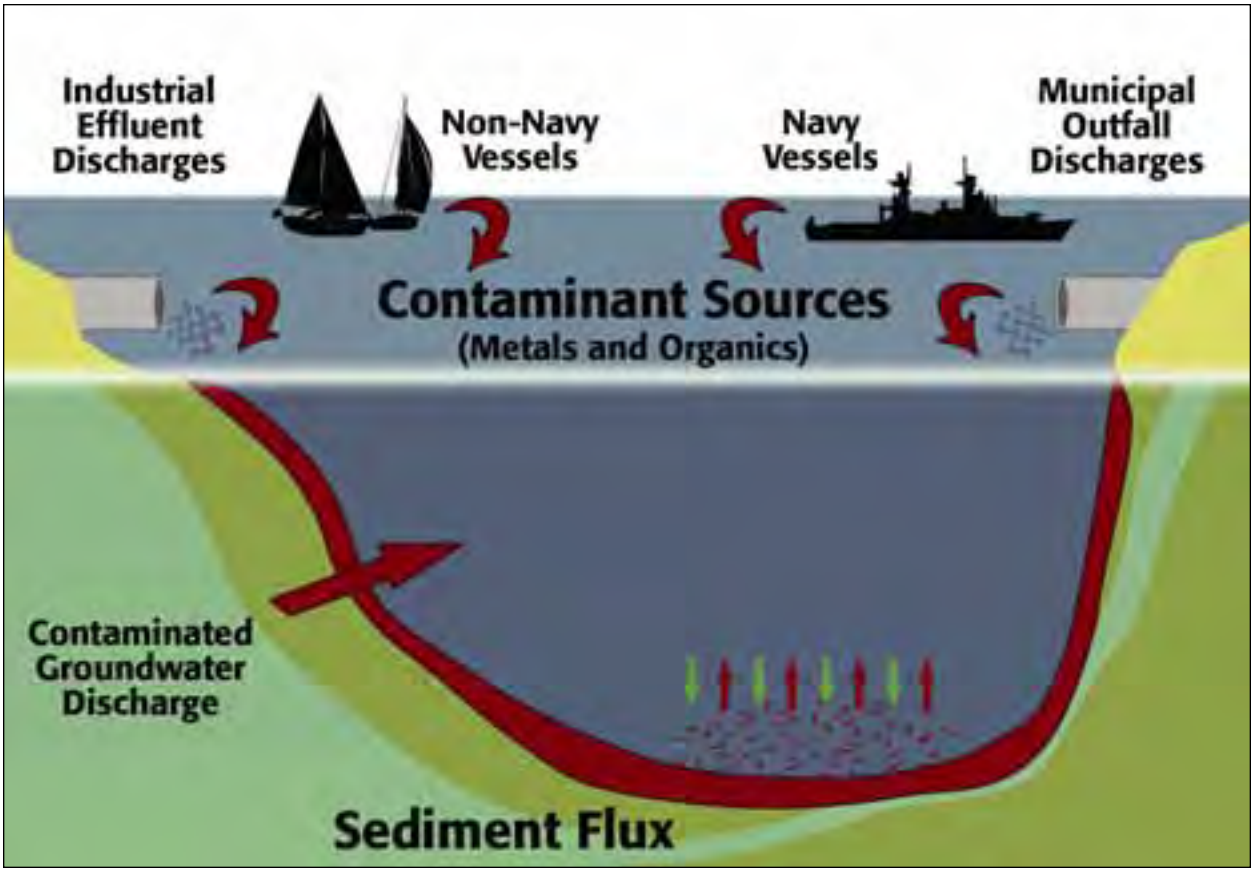
Because of the data gaps in this area, the team did not perform a demonstration. Instead, they recommended the formation of a user group to perform the following steps:

- Study current research and development (R&D) efforts across the field
- Choose two or three of the most promising R&D efforts
- Fund efforts to establish a knowledge management system
- Fund laboratories to perform R&D on several fronts

At the conclusion of this process (approximately two to three years) the group would pick one methodology and seek funds to support a five to 10 year project.

Organics Source Tracking

In 2006, NAVFAC issued a TMDL Prioritization Report listing the main COCs for their compliance program, and PCBs topped the list. PCBs are a class of chlorinated organic compounds that were produced commercially by Monsanto from 1930 to 1977 under the trade name Aroclor. PCBs were used in a wide



Examples of point and non-point sources of copper in San Diego Bay, CA. Point sources are those with well-defined physical discharges, while non-point sources are not physically well defined. In this figure, non-point sources include runoff from urbanized/industrialized areas, both civil and military.

array of industrial applications. Their stability results in a long environmental life, and they are often found residing in sediments. The standard approach to compliance and cleanup has been to assign blame to the source closest to the contamination, which may or may not be accurate.

Studies aimed at identifying the sources of PCB contamination in sediments have been conducted for the past decade or so, utilizing some form of multivariate statistical analysis.

For this study, the project team chose the now-shuttered Hunters Point Shipyard south of San Francisco. Due to the regulatory Remedial Investigation (RI) and Feasibility Study (FS) associated with the base closure, there was a large amount of PCB data available to leverage for this project. The team utilized data and information generated under an ESTCP project entitled "Integrated Forensics Approach to Fingerprint PCB Sources using Rapid Sediment Characterization (RSC) and Advanced Chemical Fingerprinting (ACF)." RSC is a way to quickly characterize contaminated sediments at marine sites. Advanced chemical fingerprinting identifies a unique chemical pattern in the data to help determine its specific PCB composition. This, in turn, helps narrow down its source.

This combined RSC and ACF approach was used at Hunters Point. The preliminary RSC (field screening) indicated that two types of Aroclor, located in two distinct areas, were responsible for most of the contamination. Advanced chemical fingerprinting helped to identify possible sources of the contamination. It was determined that the two sources were different mixtures of Aroclor 1254 and 1260 emanating from old sewer outfalls and a former landfill.

The User's Guide

The main goal of this project was the creation of a user's guide that would help program managers address the cleanup and compliance issues related to contaminants in the marine environment. The guide outlines the

Though naval vessels and pleasure craft both use copper in hull coatings, pleasure craft were found to contribute the most to elevated copper levels in San Diego Bay.
Rob George

various steps and processes that may be needed for successful identification of each class of contaminant. As there are many possible contaminant formulations, there are nearly as many specific approaches to identifying them. This user's guide will help managers clearly understand the suite of tracking technologies currently available, their strengths and weaknesses, and how those technologies can be used to develop management decisions for compliance issues. This scientifically defensible approach will help prevent arbitrary and burdensome regulatory decisions and actions that negatively impact the Navy.

The user's guide assists managers with answering such questions as:

- What are possible Navy sources of contamination?
- What alteration mechanisms should I be aware of?
- What rapid screening tools are available?
- What analytical chemistry methods are available?
- What is the best way to analyze/process my data?
- What are the data/technology gaps?

(Note: Alteration mechanisms include advection, dispersion, and adsorption which can contribute to the spatial and temporal changes in contaminant concentrations observed in the marine environment.)

Lessons Learned

Lessons learned during the two case studies above are included in the user's guide, along with a summary of an earlier bacterial source tracking study. Synopses of these case studies are included below.

Virginia Beach

In 2007, a TMDL investigation was instigated to determine the reason for elevated bacteria levels at Naval Air Station Oceana, Virginia Beach, Virginia. This study determined that horse manure from a stable on-base was the main culprit, contributing 92 percent of the contaminant. Monthly sampling was performed over a

The Hunters Point project was a success because researchers were able to pinpoint two distinct source areas of PCB contamination, using methods that will serve as a framework for program managers facing similar situations.

10-month period and intensive sampling was performed three times a week in historical wet months. The user's guide summarizes and analyzes the lessons learned as the result of this project. Suggestions for best management practices regarding fertilizer were discussed as were weaknesses such as insufficient sampling and the wisdom of performing the intensive sampling only during the wet months.

Hunters Point

The Hunters Point project was a success because researchers were able to pinpoint two distinct source areas of PCB contamination, using methods that will serve as a framework for program managers facing similar situations. These methods can quantitatively apportion contaminants among multiple sources, but this often requires historical site information that is hard to obtain. However, the project illustrated the importance of experienced forensic technicians and high-quality data.

The former Hunters Point Shipyard is located in South San Francisco.

And perhaps even more importantly, illustrated the need for presenting the results in a fair, accurate, and easy-to-understand format.

San Diego

The team identified various tracking and fingerprinting approaches for the identification of the original source of metals, in the aquatic environment, including:

- Concentration gradients
- Association of the metal with a specific source
- Differentiation of sources using statistical analysis
- Application of fate and transport models for the elucidation of sources and effects
- Fingerprinting the sources with isotopic ratios (although this technology is immature and there are important data gaps in this area).

The successful application of any of these approaches is determined by the characteristics of the area of study.

What's Next

Along with the second demonstration site, in the Ashtabula River in Ohio, the PCB fingerprinting case studies can be investigated further on the ESTCP web site by visiting www.serdp-estcp.org and entering "200826" in the search box.

The PST process was included in the 2013 Remediation Innovative Technology Seminar series, and in other seminars and webinars. The user's guide is available directly from SSC Pacific and will be available for download soon. ⚓

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Navy Region Southwest Leverages Key Partnerships

Collaborations Center on Endangered Species & Advancing Scientific Research

A NUMBER OF partnerships between the Navy and various academic and nonprofit entities is making southern and central California a hotspot for environmental stewardship and advanced technology development.

On San Nicolas Island, part of Naval Base Ventura County (NBVC), the Navy hosts a range of research programs and data stations operated by multiple academic collaborators.

"The U.S. Navy is committed to meeting its mission of protecting our nation as the world's premier sea force, but we are also committed to being good stewards of the environment. We make every effort to protect the resources in our care," said Capt. Larry Vasquez, NBVC's commanding officer. "By partnering and sharing information with other federal agencies and learning institutions, we can expand our knowledge and improve both our operational performance and our environmental understanding."

The Scripps Institution of Oceanography at the University of California, San Diego, has partnered with the Navy and the Marine Corps on numerous projects over the years. In many cases, the scientists benefit from access to secure deployment areas, and their military hosts are the recipients of information that aids at-sea rescues and vessel navigation; enables compliance with clean air standards, and even lends itself to battlespace advantage.

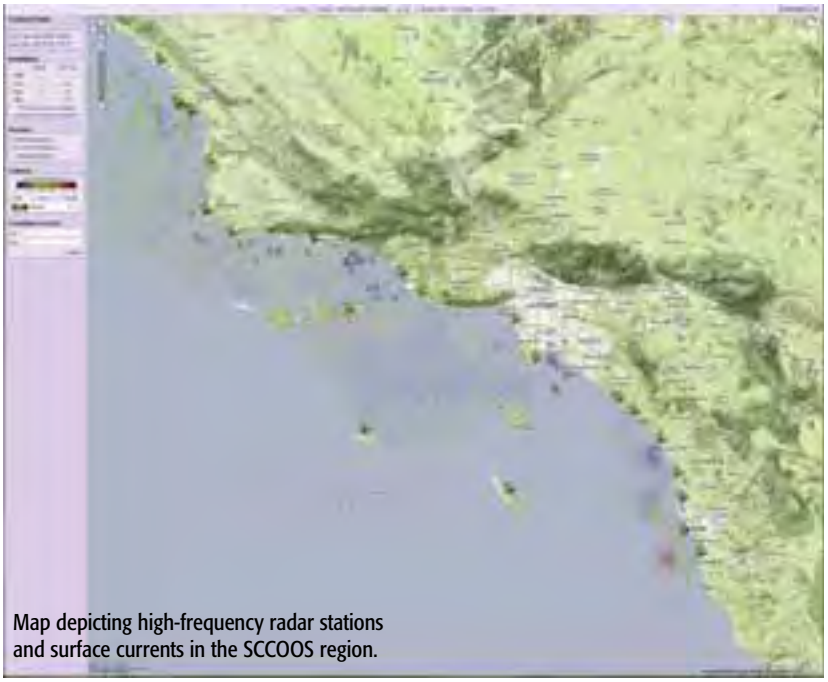
The Coastal Data Information Program (CDIP) based at Scripps has partnered with the Navy since the 1990s at what is now NBVC Point Mugu to operate a series of wave buoys around San Nicolas Island. These buoys support both developmental and operational test and evaluation of Navy systems. The westward buoys also provide the outer boundary conditions for nowcast (present time) and forecast wave models. Data is accessible to anyone, and is posted in real-time at http://cdip.ucsd.edu.

There are two Scripps surface current mapping systems at Marine Corps Base Camp Pendleton, and individual systems at Naval Base Point Loma, San Clemente Island, NBVC Point Mugu, and San Nicolas Island. These

stations contribute to an overall network of approximately 50 high frequency (HF) radar systems along the California coast. The offshore deployments fill important gaps and are required for resolving surface current measurements along the Southern California coast, according to Lisa Hazard, operations manager, Coastal Observing Research and Development Center. "Collaborations with the U.S. Navy, Coast Guard, and Marine Corps allow us to maintain surface current mapping systems in areas we otherwise wouldn't have access to," said Hazard.

The surface current mapping stations have provided critical data on the direction and speed of ocean surface currents during responses to oil spills and blooms of potentially hazardous algae. They guide the navigation of vessels in and out of California's busiest ports and are made available to the public through the Southern California Coastal Ocean Observing System (SCCOOS). To access SCCOOS data, go to www.sccoos.org/data/observations.

Lee Eddington, a meteorologist in the Geophysics Branch at the Naval Air Warfare Center Weapons Division (NAWCWD) at NBVC, approached SCCOOS scientists with a proposal to site HF radar stations on Navy property at San Nicolas Island four years ago. He saw how the Navy could use the HF radar-derived surface current maps to improve calculations of the drift of floating objects. "All the areas of offshore waters that we test in are covered," said Eddington. "There are not many places you can place this offshore, so it was an ideal location."



Map depicting high-frequency radar stations and surface currents in the SCCOOS region.

Atmospheric Rivers

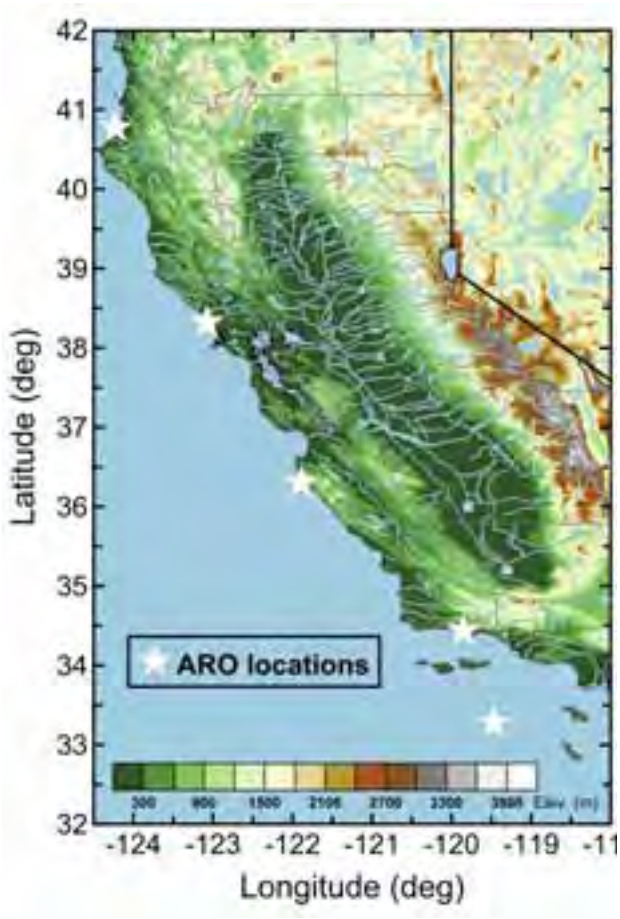
San Nicolas Island is also home to the model for an observatory network designed to track a climate phenomenon scientists have only identified in the past decade. Atmospheric rivers are tight flows of water vapor in the atmosphere that are periodically channeled over central and northern California. These flows can carry an amount of water more than 10 times greater than the flow of the Mississippi River, and have the capacity to bring unrelenting rainstorms that cause catastrophic flooding in western states.

Researchers say there is reason to believe that climate change will produce more atmospheric river patterns. In 2010, the California Department of Water Resources signed an agreement with National Oceanic and Atmospheric Administration (NOAA) to install four Atmospheric River Observatories along the mainland California coast, including one at the Point Sur Naval Facility. The coastal observatories will give weather forecasters, emergency managers, and water resource experts detailed information about incoming storms such as winds and water content.

The coastal observatories will give weather forecasters, emergency managers, and water resource experts detailed information about incoming storms such as winds and water content.

The four coastal observatories will include:

- A Doppler wind profiling radar, which reveals the speed and direction of winds at several altitudes aloft
- A technique for extracting critical information from wind profiler data—the level in the atmosphere where falling snow turns to rain
- Global positioning system water vapor instruments, which measure the total amount of water vapor above the site
- Standard meteorological instruments (relative humidity, temperature, pressure, rain gauge)



Locations of the four Atmospheric River Observatories.
Allen White

Environmental Collaborations

Navy environmentalists also rely on volunteer and nonprofit groups to help manage their ever-growing conservation and restoration programs. At NBVC San Nicolas Island, a pair of efforts are combating invasive plant species and non-native feral cats.

NBVC environmentalists have partnered with Channel Islands Restoration (CIR) to combat invasive plant species and to help control erosion, which is also a major concern on San Nicolas Island. CIR is a nonprofit organization dedicated to restoring the natural state and beauty of the Channel Islands, of which San Nicolas Island is one.

Volunteers from CIR have spent years visiting the island; working closely with the Navy to identify and remove invasive plants by hand.

In 2012, the partnership established a greenhouse on San Nicolas Island, which the Navy now uses to grow and nurture native plant species for replanting; combating the effect of erosion and the lasting effects of sheep grazing, which occurred nearly 70 years ago.

"Our goal is to have native plant stock ready to go at any time," said Valarie Vartanian, NBVC natural resource specialist. "Some plants grow very slowly, so this whole process is going to take some time." By partnering with CIR, the Navy increases its ability to cover wide swathes of land and quickly replant them with native species. This is critical at San Nicolas Island, which encompasses over 14,000 acres over 60 miles from the mainland.

San Nicolas Island is also home to several endangered species whose lives are in even greater peril because of a large popular of feral cats, which were initially brought to the island as pets in the 1950s.

By 2004, it was clear that the feral cats were harming the ecology of San Nicolas Island. As predators, they were eating whatever they found in the nests of cormorants, gulls and other seabirds, and they were targeting native mice, federally threatened Western Snowy Plovers, and federally endangered Island Night Lizards, which are found

on three of the Channel Islands and nowhere else in the world.

The cats were also competing with the island fox for often-scarce food resources. The island fox, an emblematic species not only for San Nicolas Island but also for the rest of the Channel Islands, has experienced significant population fluctuations in the past. Declines in fox populations on the island have coincided with peaks in the cat population.

But rounding up the cats isn't an easy proposition, as Dan Shide, head of the environmental division for NBVC, and Navy biologist Grace Smith explained. No one knew how many there were or exactly where each one lived, and no one had tried a poisonless eradication on an island this large—eight miles long by three miles wide, and 14,562 acres in total.

Volunteers from Channel Islands Restoration remove invasive plant species at San Nicolas Island, part of an ongoing partnership with Navy environmentalists from NBVC.
Channel Islands Restoration

The planning stage alone took four years and involved an unprecedented partnership between the Navy, Island Conservation, the Institute for Wildlife Studies, the Humane Society, and the Montrose Settlements Trustee Council; which paid for the $3 million project through fines collected from companies that in the past had illegally used dichlorodiphenyltrichloroethane (DDT), polychlorinated biphenyls (PCB), and other seabird-harming chemicals.

Over the next six months, 66 cats were trapped, with 59 of them going to a Humane Society facility near San Diego. Three of the cats were pregnant, so in the end, 10 kittens were also removed from the island and adopted.

What was believed to be the last cat was removed in June of 2010. Monitoring continued for another six months, but no more were found. Successful removal was declared in December of 2011.

"The cooperation of everyone involved was fantastic, and the successful results will influence future projects all over the world," said Chad Hanson, project manager for Island Conservation.

San Clemente Loggerhead Shrike

In 1990, a Navy biologist contacted the San Diego Zoo for assistance in protecting a federally endangered bird. The bird was the San Clemente Loggerhead Shrike (*Lanius ludovicianus mearnsi*), a subspecies on the edge of extinction, found only on the Navy's San Clemente Island (SCI). The shrike had been listed as critically endangered in 1977; its numbers had dwindled due to massive habitat destruction caused by the grazing of sheep and goats introduced by ranchers in the early 1900s. "The Navy went through the process of formal consultation with the U.S. Fish and Wildlife Service (USFWS) and as a result developed a very rigorous and robust program to recover this bird," said Melissa Booker, the Navy's Wildlife Biologist for SCI.

Since that first year, biologists from the San Diego Zoo and the Navy have worked together to recover this small songbird through a captive breeding program. It wasn't an easy task, because it meant developing methods to artificially incubate the shrike's eggs, and even more difficult, hand-rear the tiny featherless chicks from hatch. Three clutches of eggs were removed from wild shrike nests on SCI in 1991, and 10 young shrikes were successfully reared. These birds became the nucleus of a captive shrike flock.

The cooperation of everyone involved was fantastic, and the successful results will influence future projects all over the world.

—Chad Hanson

THIS PAGE, CLOCKWISE FROM TOP RIGHT: One of five wild chicks brought in for hand-rearing after losing their parents to predation. The chicks were hand-fed for 24 hours and then fostered. *(Meghan McFarland)*; Five rescued wild chicks. Each head is colored to identify them individually. *(Jaelean Carrero)*; The same five chicks after placement in the nest of their captive foster parents. *(Jaelean Carrero)*; Once the hand-reared chick's eyes open, it is fed using a shrike puppet. *(Susan Hammerly)*; An adult shrike perched by his cached lizard. *(Daniel Clark)*

THIS PAGE, CLOCKWISE FROM TOP RIGHT: These two- to three-day-old chicks were hatched and reared in the on-island captive breeding aviaries. Since 2001, most chicks have been reared by parent birds. *(Kathy De Falco)*; Two chicks caught up for color banding, wait together in a transport bag. *(Susan Hammerly)*; Three parent-reared chicks near fledging in a nest in one of the flight cages. *(Jaelean Carrero)*; Two hand-reared nestlings are eager for their food. *(Susan Hammerly)*; A hand-reared shrike fledgling that is nearing independence. *(Susan Hammerly)*; A wild fledgling, offspring of the most successful released shrikes. *(Susan Farabaugh)*

Jeffrey Grabon launches a global drifter buoy into the Pacific Ocean from the amphibious dock landing ship USS Pearl Harbor (LSD 52) while underway for Pacific Partnership 2013. The buoy, belonging to the Scripps Institution of Oceanography, is used to measure ocean currents up to 15 meters in depth, sea surface temperatures, and atmospheric pressure. Pacific Partnership is the largest disaster response-preparation mission in the Indo-Asia-Pacific region.
MC1 Lowell Whitman

"The captive population was moved to the island in 1993, so the captive birds would be acclimated to SCI's weather and habitat," said Dr. Susan Farabaugh, Conservation Program Manager at the San Diego Zoo's Institute for Conservation Research, who has worked on the project since 1999. "We had to find the best way to house them, to pair them, to feed them, and to prepare them for release to the wild," Farabaugh said. "In general, our guide was to mimic in captivity the way the bird lived in the wild." For example, they mimicked the seasonal movements of the wild birds when pairing the captives. They provided a diet to most closely resemble the wild shrike's diet of insects, and small vertebrates (i.e., lizards and live mice). They also kept careful records of everything (what worked and what didn't work), and established a behavioral monitoring program to assess the birds' mate choice, to monitor their breeding activities, and to assess their flight and foraging skills. They kept track of the genetic diversity of the captive population and later the wild as well, in a studbook of all the birds on the island.

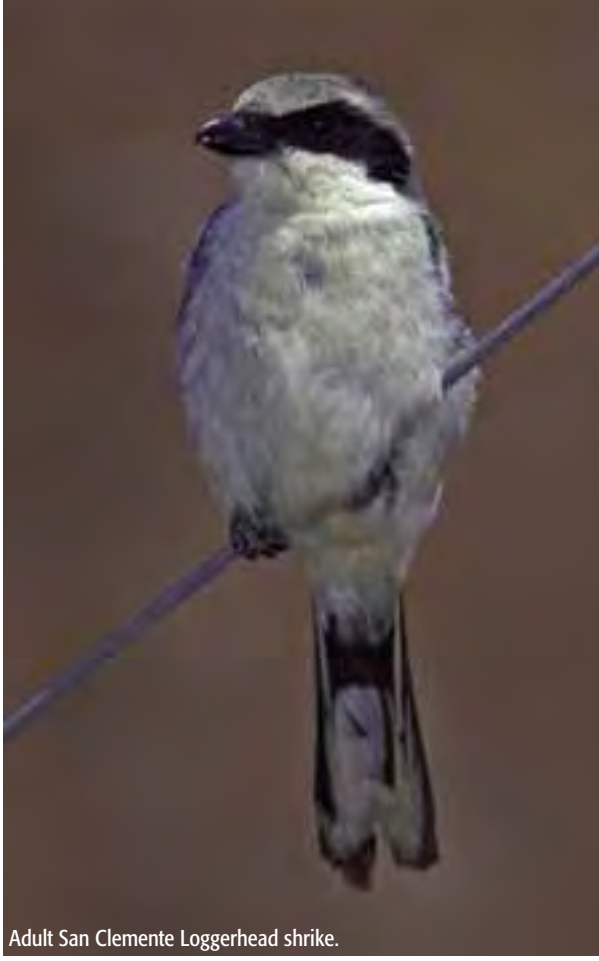
Despite these early efforts, in the mid-nineties, the San Clemente Loggerhead Shrike had the distinction of being named North America's rarest bird. The American Bird Conservancy met with Navy officials and voiced their concerns about the shrike's impending extinction.

Aerial view of Mugu lagoon at NBVC Point Mugu. The protected wetlands at NBVC Point Mugu are home to a diverse ecosystem that includes many endangered and threatened species.
John Burke

Under the Endangered Species Act, the Navy is required, as a federal agency, to assess any action that could affect any endangered species. Due to concerns over the shrike's status and possible effects of fire, some fairly significant restrictions were placed on the ship-to-shore live firing range. These included constraints placed on the types of incendiary rounds allowed on the bombing

The strongly hooked bill of the shrike allows this small bird to kill and dismember its vertebrate prey.

Kathy De Falco



Adult San Clemente Loggerhead shrike.

range at SCI, and limited training days to allow for shrike monitoring on non-live fire days.

The Navy and the San Diego Zoo learned rapidly how to improve the captive breeding program. While none of the birds bred and released in the 1990s survived, by 2000 there was progress. The captive breeding project transitioned from hand rearing to allow captive shrike parents to raise their own chicks, and then eventually to fostering abandoned eggs and chicks into existing nests in captivity. Release techniques also changed to include supplemental feeding of birds at their release site and allowing pairs of birds to make a nest in a cage—then their chicks could fledge (leave the nest) and fly directly into the wild. Captive-raised birds were placed in a cage near single wild birds and if it was a "match" they would be released to breed in the wild. The whole captive breeding and release process is all carefully planned to match birds that will provide the best genetic diversity; and currently almost all, if not all birds in the wild can be traced to a captive ancestor.

"Chicks reared by parent shrikes, natural parents or fosters, are more wary than hand-reared," said Farabaugh, "and this is likely due to their witnessing the vigorous anti-predator behavior that their parents direct at the zoo staff and any island predators that come near the aviaries."

This program has evolved, but one aspect of the approach has not changed: the zoo and the other shrike contractors work as a collaborative group, guided by the Navy biologists with input from the U.S. Fish and Wildlife Service.

"Everything we did, every protocol change, was discussed with the Navy biologists and the other members of the shrike recovery effort," said Farabaugh. This collaborative approach has been very successful. "The shrike population that was as few as 14 individuals in 1998 has grown significantly. At present there are 67 wild breeding pairs," said Booker.

The wild population is doing so well that the end of the captive breeding program is likely in sight, but that won't end the collaboration of the zoo and the Navy. Other zoo biologists are working with other endangered species that occur on Navy and Marine bases, including the Least Tern, Snowy Plover, California pocket mouse, and Desert Tortoise to name a few.

"The U.S. Navy is committed to meeting its mission of protecting our nation as the world's premier sea force, but we are also committed to being good stewards of the environment," said Capt. Larry Vasquez, commanding officer, Naval Base Ventura County. "We make every effort to protect the resources in our care. By partnering and sharing information with other federal agencies and learning institutions, we can expand our knowledge and improve both our operational performance and our environmental understanding. Partnerships enhance our capabilities in every way."

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Panama City Engineers Develop Tools to Reduce Energy Consumption

Focus is on Forward-Deployed Marine Corps Combat Operations Centers

NAVAL SURFACE WARFARE Center Panama City Division (NSWC PCD) engineers are developing tools to enable U.S. Marine Expeditionary Forces (MEF) to more accurately predict energy consumption needs and reduce energy consumption before boots hit the ground.

NSWC PCD's Expeditionary Energy Evaluation and Integration (E3I) team of engineers were asked by the Marine Corps Systems Command (MARCORSYCOM) to find ways to reduce energy consumption of Marine Corps Combat Operations Centers (COC). MARCORSYCOM acquires and provides lifecycle support of ground weapon and information technology systems that U.S. Marines rely on to fight and win.

tions provided by the vendors of those shelters. The E3I engineers thought there was a better way. The first problem to be addressed was the prediction of the shelter heat transfer. Researchers sought to understand how shelters absorb heat and then how best to reduce the heat absorbed.

In July 2012, Gorin visited the National Renewable Energy Laboratory (NREL), located in Golden, Colorado, to determine if they may be able to help. What he found was a heat transfer model being used for building evaluations, but would it work for shelters? They decided to give it a try. NREL conducted the modeling and NSWC

> Leaders from the Marine Corps Systems Command and Panama City analyzed the Combat Operations Centers where almost 70 percent of all the energy was being used to heat and cool the shelters.

Together, leaders from MARCORSYCOM and NSWC PCD analyzed the COCs where almost 70 percent of all the energy was being used to heat and cool the shelters.

"Shelters could be anything that Marines live in, including tents, plywood buildings, or other temporary housing," said NSWC PCD E3I Team Lead and Senior Systems Engineer Steve Gorin. "In this case, we are talking about military style tents."

Additionally, all previous predictions of the energy usage of the shelters were based on specifications or calcula-

PCD conducted the validation testing. Not only did the model work, but it proved to be very accurate—predicting the correct temperature inside the tent within one degree Celsius.

Given the shelter modeling, a large part of the energy consumption (70 percent) could be accurately modeled. But how about the other 30 percent? The engineers determined the power consumption of a wide range of equipment used inside a shelter, such as computers, lights, displays, printers, shredders or communication equipment could be easily measured but they were concerned

NSWC PCD's expeditionary energy compound runs completely on solar power and uses fossil fuels as needed. A commercial-off-the-shelf water fountain offers researchers potable water captured from moisture in the air. Sensors are placed inside and outside the tents to capture radiant barrier and heat readings.

Ron Newsome

about the heat output of the equipment. Any heat output by the equipment required additional air conditioning. Two E3I team members, Dr. Tanisha Booker and Dr. Lee Fry, came up with a solution—measure the heat output with a calorimeter.

A calorimeter is an instrument used for measuring the quantity of heat absorbed or released by matter when it undergoes a chemical reaction or physical change. In this case, it was a well-insulated box in which a piece of equipment (computer, light, etc.) was placed and turned on and temperatures of air flowing in and out of the box was measured so that the heat generated by the equipment could be calculated. After a search however, Booker and Fry couldn't find a calorimeter that would allow the equipment to be measured. So they designed and built one.

The Basics About the National Renewable Energy Laboratory

NREL IS THE U.S. Department of Energy's primary national laboratory for renewable energy and energy efficiency research and development. NREL develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals. The laboratory's emphasis is on a comprehensive energy approach that encompasses the relationship among key systems including:

- Fuel production
- Transportation
- The built environment
- Electricity generation and delivery

For more information, visit www.nrel.gov.

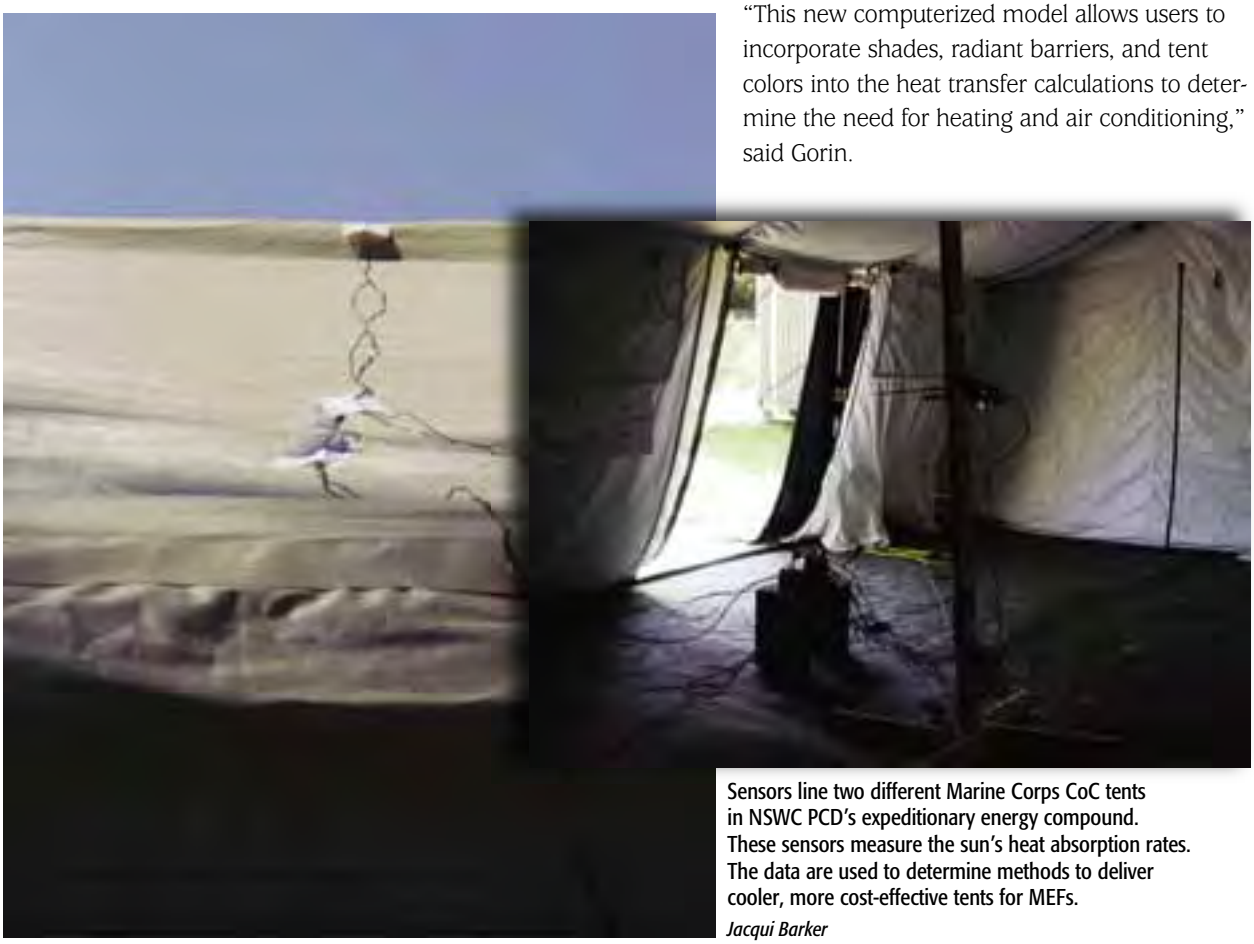
Gorin's team has built an expeditionary energy compound in Panama City, Florida, run entirely by solar power that incorporates energy technologies that has the potential to further improve field tactics.

"We measured the heat output in a laboratory environment using a calorimeter that we created. We measured pieces of equipment within a shelter that might be used in an operational environment, such as computers, monitors, and lights," said Gorin.

The goal was to reduce energy consumption. Since heat and cooling of the shelter was where the majority of the energy was being consumed, improving the energy efficiency of the shelter seemed like a good place to start. Since the shelter model is bound by the Laws of Physics, physics-based variables such as shelter material, colors, radiant barriers, air vents, shades, and air infiltration rates can be varied to determine their effects.

The engineers evaluated variances, one being how much air is being lost due to air gaps in the shelter assembly and the opening of the door flaps. What they discovered with a tracer gas test is that the rate of infiltration (of heat into the shelter) was 10 times greater with one door unzipped than when the tent was sealed. NREL modeled a shelter with a radiant barrier and the model predicted a 26 percent heating or air conditioning saving for a year with a radiant barrier than without a radiant barrier. Radiant barriers, or reflective barriers, inhibit heat transfer by thermal radiation. They are like the reflector that is used in your car to keep it cool. Further efforts are underway to determine other means to further reduce energy consumption.

"This new computerized model allows users to incorporate shades, radiant barriers, and tent colors into the heat transfer calculations to determine the need for heating and air conditioning," said Gorin.



Sensors line two different Marine Corps CoC tents in NSWC PCD's expeditionary energy compound. These sensors measure the sun's heat absorption rates. The data are used to determine methods to deliver cooler, more cost-effective tents for MEFs.
Jacqui Barker

NSWC PCD engineers Bob Backus (left) and Ray Sheffield (right) use a handheld thermal imaging device to determine heat levels inside a tent being used for energy absorption and monitoring research conducted at NSWC PCD.

Jacqui Barker

NSWC PCD engineer Dr. Lee Frye uses a hand held thermal imaging device to determine heat output levels inside the Warfare Center's expeditionary energy compound.

Jacqui Barker

Lights in the expeditionary energy compound are powered by solar panels.

Jacqui Barker

Since the model utilizes a weather input file, it can predict tent temperatures anywhere in the world, thus allowing field units to predict supply needs before they deploy. Gorin said that the new algorithm and model have been shared with the U.S. Marine Corps and the U.S. Army for their consideration.

Gorin's E3I team has expanded their efforts now that they have a computerized model that allows them to predict energy consumption in theater. To date, Gorin's team has built an expeditionary energy compound in Panama City, Florida, run entirely by solar power that incorporates energy technologies that has the potential to further improve field tactics.

"We're also looking at hybrid energy systems that will enable the U.S. Marines and the Army to match their supplies to demand," he said. "Unlike your house where you only pay for the energy you consume, the military fires up a generator that frequently is lightly loaded and

The Basics About Naval Surface Warfare Center Panama City Division: Technical Center of Excellence for Littoral Warfare and Coastal Defense

THE TECHNICAL CENTER of Excellence for Littoral Warfare and Coastal Defense at NSWC PCD conducts research, development, test and evaluation, and in-service support of mine warfare systems, mines, naval special warfare systems, diving and life support systems, amphibious/expeditionary maneuver warfare systems, and other missions that occur primarily in coastal (littoral) regions.

NSWC PCD exists to understand the technical dimensions of warfighter requirements, to collaborate with industry, academia and other Warfare Centers to develop solutions and certify that safe and effective solutions are achieved. NSWC PCD engineers provide a bridge between the warfighter and the technical community, rapidly respond to the warfighter, provide objective advice to naval leadership, and make naval programs successful.

For more information, visit www.navsea.navy.mil/nswc/panamacity/pages/mission.aspx.

NSWC PCD's E3I team conducts expeditionary energy research to determine ways to reduce energy consumption by first understanding how shelters absorb heat. An example of a successful heat reduction experiment includes the use of an Ultra Lightweight Camouflage Net System over the top of a shelter tent.

wastes energy. The hybrid system's aim is to use the generators efficiently by turning the generators off when not needed and using stored or renewable power."

The NSWC PCD's E3I team is comprised of four engineers—Steve Gorin, Dr. Tanisha Booker, Dr. Lee Fry, and Steve Naud. The E3I team is also collaborating with NSWC Carderock engineer Eric Shields, and NSWC Crane Ken Burt to complete the Analysis of Alternatives for Hybrid Power Systems that will result in new power systems for the U.S. Marines. One of the hybrid solutions under consideration is a U.S. Army microgrid that utilizes six, 60-kilowatt generators that are switched on and off as needed. NSWC PCD is expected to receive one U.S. Army microgrid for project testing in the fall of 2013.

Read more about the U.S. Marine Corps Systems Command at www.marcorsyscom.marines.mil. ⚓

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Indian Head to Demolish Navy's Last Coal-Fired Power Plant

New Natural Gas Cogeneration Facility Will Cut Energy Use by 50 Percent

A GROUND-BREAKING ceremony on July 9, 2013 celebrated the start of construction for a $62 million project that will both decrease energy costs for military commands on Naval Support Facility (NSF) Indian Head, Maryland, and demolish the last remaining coal-fired power plant operated by the Navy.

The project will modernize utility services on NSF Indian Head that are critical to sustaining key mission capabilities on the installation. It will provide the installation with decentralized steam and a 3.5 megawatt co-generation facility for electricity and steam.

"Energy efficiency is critical as the Navy seeks to meet half of its energy needs through alternative sources by 2020," said Hicks. "What you see here is a project that is going to save the Navy $7.5 million a year in the tough fiscal environment that we're in and that we're going to be facing for several years, if not a decade or more. We're going to need projects like this that deliver those types of savings."

"This project will fundamentally transform the steam distribution system at Indian Head," said Capt. Peter Nette, commanding officer for Naval Support Activity South Potomac, as he welcomed guests in the opening program for the ground-breaking event.

> Ashore, it's about reducing our vulnerabilities associated with increasingly brittle electric grids and modernizing our system to be more resilient, more efficient.
>
> *–Former Deputy Assistant Secretary of the Navy for Energy Thomas Hicks*

Former Deputy Assistant Secretary of the Navy for Energy Thomas Hicks praised the project for its cost savings and efficiencies, as well as its strategic value.

"What it's about is improving our capabilities in the fleet—our combat capabilities, our warfighting capabilities—by reducing our vulnerabilities to increasingly volatile fuel costs. Ashore, [it's about] reducing our vulnerabilities associated with increasingly brittle electric grids and modernizing our system to be more resilient, more efficient," said Hicks.

"This utility is essential to specific mission capabilities on NSF Indian Head that are critical to our nation's armed forces," added Nette.

A combination natural gas turbine and heat recovery steam generator will replace the installation's Goddard Power Plant. Constructed in 1957, the Goddard Power Plant generates steam, compressed air and approximately

The Navy coordinated an environmental assessment with federal and state resource agencies to evaluate the potential impacts of the proposed project on the human environment.

67 percent of the electric power used at NSF Indian Head. The power plant requires frequent costly repairs and maintenance. Because of the outdated equipment, both steam production and steam transmission have become unreliable, directly affecting the mission of the supported commands on NSF Indian Head.

Capt. Kenneth Branch, commanding officer of Naval Facilities and Engineering Command Washington (NAVFACWASH), said maintenance of the aging facility was a "constant battle" and praised the cost savings that the project will provide.

"This project stood the test of every single accountant that went after it; the numbers are there. If you truck coal and you lose steam over 30 miles [of line], the numbers are there," argued Branch.

Branch highlighted the environmental benefits of the project and thanked the state of Maryland for its cooperation as the Navy worked to meet rigorous environmental standards.

"I am pleased we have plans and an agreement with Maryland to cease our coal-fired emissions soon," he said. "The Navy's commitment to the environment and the Chesapeake's health is strong and stronger today with this project. Thank you to the state of Maryland for your support to make it happen."

To become compliant with new Clean Air Act standards, the Goddard Power Plant would require extensive upgrades. Once the new natural gas facilities are completed, the deactivation and demolition of the Goddard Power Plant will result in a significant reduction in environmental impacts.

The new system will cut energy use by 50 percent, water consumption by 75 percent, and steam requirements by 80 percent, resulting in approximately $7.5 million savings each year.

Natural gas, a cleaner and more efficient fuel source, will serve as the primary fuel for the new steam- and power-generation facilities.

The Goddard Power Plant, the last coal-fired power facility operated by the Navy, will be demolished and replaced with a natural gas cogeneration facility.
Gary Wagner

A ground-breaking ceremony starts the construction of a $62 million project that will decrease energy costs for military commands on NSF Indian Head and demolish the last remaining coal-fired power plant operated by the Navy. The project will modernize utility services critical to sustaining key mission capabilities on the installation, and will provide a decentralized steam and a 3.5 megawatt co-generation facility.
Andrew Revelos

The Navy's commitment to the environment and the Chesapeake's health is strong and stronger today with this project.

—Captain Kenneth Branch

NSF Indian Head currently does not have any natural gas distribution infrastructure, and the nearest natural gas supply line is located approximately five miles northeast of the installation in the Bryans Road, Maryland community. The project will include the construction of a new natural gas transmission line from Bryans Road to NSF Indian Head.

"This new project will save millions of dollars for the Navy and allow us to be better stewards of the local environment," said Branch.

"This is a great success for not only Naval District Washington and NAVFACWASH, it's a tribute to the Chief of Naval Operation's Task Force Energy and Secretary of the Navy's energy and environmental focus," said Branch. "Each year with the current plant, we're moving 46 million pounds of coal more than 400 miles by rail, barge and finally truck to Indian Head."

The Navy coordinated an environmental assessment with federal and state resource agencies to evaluate the potential impacts of the proposed project on the human environment. The assessment highlighted adverse effects to historic properties at NSF Indian Head, including the demolition of three buildings, seven miles of steam lines, and 5,000 feet of railroad tracks that have been determined eligible for listing on the National Register of Historic Places.

In accordance with Section 106 of the National Historic Preservation Act, the Navy notified the Advisory Council on Historic Preservation, the Maryland Historical Trust's State Historic Preservation Officer (SHPO) and federally recognized tribes of these adverse effects. Documentation is underway to mitigate the adverse effects to historic buildings within the Naval Powder Factory and Extrusion Plant Historic Districts on the installation.

The Navy and SHPO have completed a memorandum of agreement regarding the military construction project, and a separate agreement for the disposal of excess railroad tracks associated with NSF Indian Head. These agreements include appropriate stipulations to alleviate the remaining adverse effects to historic resources.

The Navy completed the environmental assessment and signed a finding of no significant impact on September 21, 2012. The military construction contract was awarded to Clark Construction and The Bell Company on September 28 of the same year. ⚓

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EXPLORE NAE

NAVY ACOUSTIC

Navy training must be realistic while at the same time, minimizing impacts to marine mammals. Navy scientists and biologists rely on an advanced modeling tool - NAEMO - to estimate impacts of its activities.

Now YOU can navigate NAEMO,

EMO

EFFECTS MODEL

This fall, the Navy is launching its interactive NAEMO website. The website walks you through the model and features a series of videos and in-depth technical tips, white papers, and additional resources.

Check out the page online and on your smart phone at

www.naemo.us

the Navy Acoustic Effects Model.

Neutralizing RDX in Surface Soils at Two Navy Air-To-Ground Ranges

NESDI Project Demonstrates Hydrated Lime is an Effective Agent

A RECENTLY COMPLETED effort by the Navy Environmental Sustainability Development to Integration (NESDI) program has performed demonstrations and treatability studies to:

- Demonstrate and validate that applying hydrated lime ensures that there is no residual Royal Demolition Explosive (RDX) remaining in the surface soils of venting sites at two of the Navy's largest air-to-ground ranges.
- Show range managers firsthand how the hydrated lime is properly applied.
- Produce guidance on how to apply hydrated lime effectively.

The Navy uses full-scale practice bombs extensively at most of its land-based test and training ranges. During range clearance operations, these bombs are brought and consolidated in a designated area where they are lined up for venting. Venting of practice bombs consists of using composition C4 explosives on the bomb to ensure the bomb is inert, verify the signal cartridge has fired, and open the casing so pressure does not build up during subsequent demilitarization operations.

The primary constituent in composition C4 is the explosive, which makes up approximately 91 percent of composition C4 by weight. The Army observed using composition C4 explosives, alone and in venting operations, releases RDX to surface soils at Army and Air Force ranges.

The Fallon Training Range Complex (FTRC) venting area.

Raking in lime at FTRC.

This project demonstrated the application of hydrated lime to Navy venting areas as a best management practice to destroy any RDX that may potentially reside in surface soils. This effort supports the Navy's Operational Range Clearance (ORC) program.

The Navy has performed range assessments under the Range Sustainability Environmental Program Assessment program and has concluded that there is no evidence to indicate munitions constituents are migrating off any Navy range.

The Army has extensively studied the application of hydrated lime ($Ca(OH)_2$) on range soils to increase the pH of the soil, causing an alkaline hydrolysis reaction to destroy RDX and produce an environmentally friendly end result. This method is being used successfully on hand grenade ranges at Fort Jackson, South Carolina, the U.S. Military Academy at West Point, and at open detonation areas on Camp Edwards, Massachusetts and Aberdeen Proving Ground, Maryland.

The Test Sites

The test site locations were the Fallon Training Range Complex, Nevada and the Pinecastle Range Complex, Florida.

The two locations have very different climates and soil types, which afforded an opportunity to compare and contrast methodologies.

The Basics About the NESDI Program

THE NESDI PROGRAM seeks to provide solutions by demonstrating, validating and integrating innovative technologies, processes, materials, and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Fleet readiness. The program accomplishes this mission through the evaluation of cost-effective technologies, processes, materials and knowledge that enhance environmental readiness of naval shore activities and ensure they can be integrated into weapons system acquisition programs.

The NESDI program is sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division and managed by the Naval Facilities Engineering Command at the Naval Facilities Engineering and Expeditionary Warfare Center in Port Hueneme, California. The program is the Navy's complement to the Department of Defense's Environmental Security Technology Certification Program which conducts demonstration and validation of technologies important to the tri-Services, U.S. Environmental Protection Agency, and U.S. Department of Energy.

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.

Because soil geochemistry is the single most important factor in determining success of the alkaline hydrolysis of RDX in soil, a treatability study was performed for each demonstration site. These tests allowed team members to determine how much lime would be needed and how often lime should be reapplied. The studies, performed by the Engineer Research and Development Center Environmental Laboratory (ERDC/EL), also verified what the team had learned in a literature review—that a pH of 10.5 or greater was necessary to destroy any RDX in the soil taken from the demonstration sites. Because of the differences in soil geochemistry, different amounts of lime were required to achieve the desired results in each location.

So as not to disrupt regular range operations, the demonstration was performed at a nearby location on each range, using identical soil. The demonstration was performed first at Pinecastle in July 2011. The range manager was able to see firsthand how to apply the lime and take pH readings. An expert in this technology from ERDC/EL was also on hand to demonstrate the most efficient way to apply the lime.

The range manager measured the pH of the soil for the next few days. The pH levels at Pinecastle exceeded the goal of maintaining a pH of less than or equal to 10.5 for three to seven days. At the 23-day mark, the pH level was 12 and at the 34-day mark, the pH was measured at 10.5, despite 7.5 inches of rain.

"The lime was a very effective neutralizing agent," said Arthur "Lee" Shults, ORC program manager at the Pinecastle Range Complex. "The pH level of the soil remained longer than I expected. This lime application process is an inexpensive means of controlling the residual RDX from C-4 venting operations."

Lessons learned from the demonstration at the Pinecastle site include:

- A rake is sufficient for distributing lime. There is no need to till the lime into the soil.
- Small berms were used to help keep the lime in place.
- The pH levels don't rapidly diminish in the heavy rain.

In March 2012, a second demonstration was conducted at FTRC. While the pH levels met the target level of 10.5 or higher for three to seven days, the results were not quite as impressive as those at Pinecastle. After eight days, the soil measured 12 pH, but after 22 days, the pH level had dropped to 9.

The venting area at the Pinecastle Range Complex.

Raking in lime at the Pinecastle Range Complex.

The lessons learned from this demonstration included:

- High winds can blow the lime away.
- Water is needed to prevent the lime from escaping.
- A wider rake with shorter tines worked better on hard packed soil.

Two New NESDI Projects to Address Ongoing Challenges on Navy Ranges

THE NESDI PROGRAM has recently initiated two more projects to address ongoing challenges on Navy ranges.

1. **NESDI Project #483** (Transportable Field Melter for Recycling of Bombing Range Material Potentially Presenting An Explosive Hazard) will demonstrate and validate that a transportable field melter is capable of melting range scrap in an economically feasible and environmentally conscious way.
2. **NESDI Project #482** (Innovative Drilling Process to Vent Full Scale Non-Explosive Practice Munitions) will demonstrate at the Pinecastle Range Complex a remotely operated bomb drilling system that will eliminate the need for using explosives to vent practice bombs. Venting practice bombs by using a drill will eliminate the need to use composition C4 and prevent RDX residue from potentially being released to surface soils.

Final Report

The final report includes a description of the treatability studies, demonstrations, and cost analysis. The report also lists the necessary equipment and techniques for applying the lime, and a Material Safety Data Sheet. Members of the Department of Defense range community may request a copy of the final report from Joey Trotsky at the information provided below.

Conclusion

No other prominent alternative technology has been identified that can quickly, effectively, inexpensively, and safely destroy RDX as well as hydrated lime. As a result of these demonstrations, range managers now have a very inexpensive method to significantly reduce the potential buildup of RDX in areas where the venting of practice bombs is being performed. This will ensure that human health will not be compromised and range operations will not be interrupted due to RDX contamination of groundwater. ⚓

Photos by Joey Trotsky.

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Indian Head's Human History Spans Millennia

Man's Presence Dates to the Times of Early Egypt

IT IS HARD to believe that man's presence at Indian Head is older than the Egyptian pyramids. Archeological surveys at Naval Support Facility (NSF) Indian Head, Maryland indicate that Native American Indians occupied Cornwallis Neck and Stump Neck since 10,000 years BP (before present) and continued through the early 1800s.

The earliest recorded occupation dates back to the Paleo-Indian period (9000 to 7500 B.C.). To date, NSF Indian Head has documented over 120 archeological sites, ranging from small flakes and early pottery to a European "contact site" known as the Posey Site. It is named after Calvert Posey who was an engineer at Indian Head in the early 1960s.

After an explosion at one of the buildings, Calvert Posey began looking for artifacts. Based upon his early collections, the significance of the site was revealed. With approximately 28,118 artifacts recovered at the site, crucial information is revealed on the first contact between Europeans and the local Indians at the Posey site. It is believed that this initial contact occurred sometime between 1648 and 1670.

Evidence of trading—such as glass beads, clay pipes and copper—is prevalent throughout the Posey Site, indicating that the European settlers traded their goods for items such as food, animal skins, and pottery made by Native Americans.

The Native Americans incorporated the goods received from the Europeans into their daily lives in the form of copper points for arrows and ceremonial pieces and glass beads for decoration and trade.

A fragment of ancient pottery discovered at NSF Indian Head's Stump Neck Annex during an archeology dig conducted in April 2013. The pottery is an example of Popes Creek Net Impressed pottery made from roughly 500 B.C. to 300 A.D. The clay of Popes Creek vessels was generally mixed with lots of sand, and the pots fired at a low temperature. This meant that they were somewhat fragile, so intact examples are extremely uncommon. Archeologists said it was very unusual to find such a large fragment.

Andrew Revelos

The ecosystems of today are dramatically different than those of the distant past. Archeological scholars believe that the sea level was about 100 feet lower than it was 10,000 years ago. The people occupying the area at that time would have had access to significantly different resources than those found at the Posey Site today.

As the water levels rose, the characteristics of the Potomac River changed. During the Late Archaic Period (4000 to 1000 B.C.), camps were established adjacent to major waterways to use the varied resources associated with river systems. These resources would have included fish, wildlife and a variety of plants.

A sample of some of the artifacts found at NSF Indian Head's Stump Neck Annex during the archeology dig. *Andrew Revelos*

With an increase in available food resources, the Native Americans developed the use of ground steatite bowls (stone bowls). These bowls were largely shaped by carving but grinding and polishing were also used as part of the process. Steatite bowls were a major change in food cooking. They are recognized as the first portable cooking containers that are found archeologically.

These vessels are a precursor of the ceramic bowls that were developed by Native Americans during the Woodland Period, and are considered a primary marker between the Archaic Period and the Woodland Period.

The appearance of ceramic technology marks the advent of the Woodland Period (1000 B.C. to 1600 A.D.). Two types of ceramic ware common to the Early and Middle Woodland sites are the Accokeek and Popes Creek types. The Accokeek has a cord impression on the vessel while the Popes Creek has a net impression. Recent archeological surveys on Stump Neck revealed examples of the Popes Creek ware.

The Middle and Late Woodland Period saw an evolution of a diversified hunting and gathering system that was made possible by the increasingly complex riverine environment of the Chesapeake Bay.

Trapping fresh and salt water fish, hunting small animals, the developing of corn horticulture, and gathering other plant resources were all part of the subsistence patterns of the Woodland people.

These behavioral changes led to the development of large permanent and semi-permanent stockade villages. Two such villages, Moyaone and the Potomac Creek sites, are located near Indian Head.

During this time, there were also significant changes in the projectile points used in weaponry. The development and use of the bow and arrow necessitated the adoption of small triangular projectile points as opposed to larger stone points used on spears. This allowed for more efficient hunting of larger game such as deer and elk.

The establishment of horticulture and large villages during the Woodland Period provided the social and economic stimulus necessary to support the increase in the population of Native Americans in the region. As the population increased, so did the demand on the local resources. It is believed that this may have led to competition and inter-tribal hostility between villages and tribes after 1300 A.D. This is indicated by the appearance of tall, strong defensive fences made of logs or stakes around villages prior to the arrival of Europeans. It is apparent that only the larger or more important villages, or those along the cultural borders, had such walls, which are known as palisades.

Early English accounts described these villages as ranging in size from 12 to 25 houses. It is believed that these villages were occasionally moved due to agricultural practices that depleted the soil after several years of use. Other factors contributing to village relocation included the exhaustion of local sources of fauna, wood, and other plants due to intensive hunting and gathering within a limited area around the village.

Semi-permanent villages often served as base camps and were part of a settlement pattern that residents would use

CONTINUED ON PAGE 59

Native American Archeological Site Confirms Early Trade with Europeans: Evidence of Robust Colonial Commerce Uncovered at Naval Support Facility Indian Head

IN THE EARLY 1960s, a chemist at what is now NSF Indian Head, was the first to notice the remnants of artifacts of an ancient American Indian village on the installation, which apparently had been uncovered following a non-fatal explosion that occurred in 1957.

The late Calvert R. Posey was an amateur archeologist and very interested in the history of early European settlement around Indian Head. But what he found would come to jar long-held beliefs about where European and Native American societies first came together in the New World.

"He (Posey) first began poking around the place during his lunch breaks with a few friends," said Sara Rivers-Cofield of Maryland's Jefferson Patterson Park and Museum, part of the Old Line State's Department of Planning activity that excavated the site.

"He began finding stuff such as iron nails, copper, buttons, glass beads, lead shot and clay items such as pipes and pottery. It was determined to be one of the first contact sites (between the Europeans settlers and Indians) where trading took place in Maryland."

In 1985, the site was tested by William Barse as part of a much larger archaeological survey of NSF Indian Head. The site was investigated more extensively in 1996 by staff from the Jefferson Patterson Park and Museum, under the direction of Julia King and Edward Chaney.

The location was estimated to be more than 300 years old, meaning that around 1650, American Indians and the European settlers were getting along fairly well in their relationships. This relationship resulted in spirited trading with one another as the Europeans were changing Indian life with the introduction of new goods and technologies and Indians were teaching Europeans how to survive in the wilderness, living off of Maryland's abundant agricultural, game and fish bounties.

Rivers-Cofield said that archeologists can determine a lot about the early societies from the ancient remains, such as their dietary habits.

"The animal bones found indicate that they ate a lot of fish and wild animals such as deer," she said.

Also learned was how Old World technology was affecting Native American culture.

"What is also interesting is that (the Indians) were taking in copper from the Europeans…probably an old pot or a kettle that had a hole in it, and remaking it into tools and projectile points (arrow heads)," she said.

ABOVE: The copper points recovered by archeologists at the Posey site show that the people who lived there experimented with different point shapes and styles.

LEFT: Artifacts from the Posey site show the presence of European items, traditional Indian goods, and artifacts that were made by Indians using materials from Europe. Top row: copper points, stone points and ceramic rims sherds made by Posey's inhabitants. Middle row: copper scraps, imported white clay pipes, locally made pipe, shell beads, nails and copper cones. Bottom row: German stoneware ceramics, iron knife fragment, European-style bone comb and two bone needles or awls.

Maryland Archaeological Conservation Laboratory

She noted that copper, "probably obtained from the settlers as trade for pelts, hides or food items," gave the Native Americans at the Posey site particular status as it was a rare item in the New World before European contact. Not only could copper be made into weaponry and tools, it could also be ornamental and worn on clothing.

Rivers-Cofield also said that the variety of copper point types recovered at the Posey site indicates that there was experimentation made with the metal. In one case, she noted in a review written about the site, two scrap fragments were folded over each other to make a barbed point.

Other points were made by snipping sheet copper into isosceles triangles or small equilateral triangles. She pointed out that while some of the points have holes in them, others do not. Other archaeological examples indicate that once completed, these copper points were then probably attached to hardwood arrow shafts with fine sinew and glue they manufactured from game killed.

According to a comparative study of colonial Chesapeake culture–cited on line at www.chesapeakearchaeology.org–research "suggests that the Indians living at Posey were likely members of the Mattawoman petty chiefdom, a component group of the Piscataway Indians."

The research found that, although there is no evidence any Europeans were living in the area by the mid-1600s, "Nancotamon, one of the great men of Mattawoman, came before the Maryland Provincial Council in October 1665 and asked what his people should do, whether they should 'remove further into the woods or to remain upon the land where they now or lately lived,' presumably in this portion of Charles County."

In response, the council "ordered the metes and bounds of the "ould (old) habitations"

Excavations on NSF Indian Head between the mid-1980s and late 1990s uncovered substantial evidence of some of the earliest trading activity between Europeans and Native American Indians. This 1996 photo shows staff from the Jefferson Patterson Park and Museum at work at what has become known as the Posey site.

Maryland Archaeological Conservation Laboratory

of the Mattawoman Indians surveyed, and, in the interest of peace and safety, forbade any Englishman from taking up lands within those boundaries. The Council further declared that any Englishman so settling risked imprisonment.

Apparently, the governmental council worked hard for a while in protecting their host's lands and preserving peace between the European settlers and the Indians. But that all changed when, what would become "Maryland Gold," significantly increased in demand back in Europe and tobacco became a way to prosperity for New World fortune seekers. In 1695, due to the need to develop more land to produce tobacco, the council began trying to persuade the Indian inhabitants to allow more production of tobacco, and by 1700 the Posey site is believed to have been abandoned by the Indians.

In late 2009, the state of Maryland officially displayed the artifacts of the Posey site as Charles County cut the ribbon on the installation of a temporary archaeology exhibit in the lobby of the Charles County Government building in La Plata.

The exhibit was developed in partnership with the Maryland Historical Trust, the Maryland Archaeological Conservation Laboratory (MAC Lab), NSF Indian Head, and Charles County's Department of Economic Development and Tourism. A grant from the Institute for Museum, Preservation, Archaeology Research and Training provided a stipend for a St. Mary's College of Maryland student intern to research artifacts and to work with museum staff to develop and install it for Charles County's citizens and visitors.

"The Maryland Historical Trust and the Maryland Archaeological Conservation Laboratory were pleased to work with Charles County on this exciting project that highlights some of the county's buried past," said Dr. Patricia Samford, Director of the MAC Lab.

"Our long-term goal is to place archaeological exhibits in every county in Maryland, and we are delighted that Charles County was willing to be our pilot for this statewide project," Samford continued.

This exhibition, meant to be a model for other Maryland counties, showcased local and state history through artifacts that the public does not usually have the opportunity to see.

The History Behind Naval Support Facility Indian Head

TODAY'S MILITARY COMMUNITY on board NSF Indian Head represents a diverse and strategically important mix of research and development activities, alongside operational support programs that are protecting the U.S. homeland from terrorist threats, as well as serving U.S. Navy, Marine Corps, Air Force and Army forces deployed worldwide on a daily basis. In addition to its military value, the Indian Head Navy installation makes a significant economic contribution to the local community by serving as one of Charles County, Maryland's largest employers.

The Indian Head Navy installation makes a significant economic contribution to the local community by serving as one of Charles County's largest employers.

The base was founded in 1890 as the Naval Proving Ground and was the Navy's first established presence in southern Maryland. By 1913, the base gradually moved away from the simple proving of guns and armor to include standardization of shells and powder. In 1915, an ammonium picrate plant was opened to expand the chemical research program, both routine and experimental. When the United States entered World War I in 1917, the Naval Powder Factory was a major producer of smokeless powder for the Navy. After 1921, Indian Head was no longer designated as the "Naval Proving Ground" but was referred to as the "Naval Powder Factory." The facility shifted from a naval gun proving ground to a chemical factory, research laboratory and explosives factory.

In 1947, the Bureau of Ordnance agreed to the establishment of a set of pilot plants at Indian Head that would have the capacity to produce experimental new propellants for naval research use: a nitroglycerin pilot plant, a plant to produce varied nitrogen-content nitrocellulose, a plant for mixing and rolling experimental lots of solvent and solventless propellant, and a fourth plant for experimental production of cast propulsion units. During the 1950s, the Korean conflict provided the impetus for the factory's stepped up explosive and propellant production. Building on work done at the facility's Patterson Pilot Plant during the 1940s, the factory began to produce missile fuel for the long-range Polaris missile and smaller rockets and later, propellants for emergency ejection mechanisms.

In 1958, reflecting its new mission and direction, the base officially became the Naval Propellant Plant. In 1966, because of the diversification from propellants into related fields of chemistry, engineering and production contract management, the base changed its name, becoming the Naval Ordnance Station (NOS). The mid to late-1960s were characterized by the production of

The Basics About the Maryland Archaeological Conservation Laboratory

THE MAC LAB is a state-of-the-art archaeological research, conservation, and curation facility located at Jefferson Patterson Park & Museum, the State Museum of Archaeology, in southern Maryland. The MAC Lab serves as a clearinghouse for archaeological collections recovered from land-based and underwater projects conducted by State and Federal agencies throughout Maryland. The MAC Lab also houses a number of major collections acquired through private donation to the Maryland Historical Trust. All of these collections are available for research, education, and exhibit purposes to students, scholars, museum curators, and educators. For more information, visit www.jefpat.org/mac_lab.html.

such products as the plastic explosive C-3 in 1965, an updated Zuni rocket in 1966, Polaris casting powder from 1961 through 1967, Poseidon casting powder (C-3) in 1967, and composite propellant and explosive processing.

Recognizing the achievement of the station, the Naval Sea Systems Command reconstituted several of the previously acquired agency roles as official "centers of excellence" for the Navy. This meant that the Navy would not duplicate the effort elsewhere and would treat the facility as the primary collection of experts in a particular area. NOS acquired the "center of excellence" designation by mid-1989 for six technologies: guns, rockets and missiles, energetic chemicals, ordnance devices (Cartridge Actuated Devices/Propellant Actuated Devices), missile weapon simulators, explosive process development engineering, and explosive safety, occupational safety and health, and environmental protection.

Installation management of the Navy base at Indian Head transferred to Commander Navy Installation Command in 2003 with the stand-up of this new Echelon II command, charged with providing shore installation management services to all Navy activities. All naval installations within the National Capital Region aligned with Naval District Washington, and on November 3, 2005, the Indian Head base was renamed as Naval Support Facility Indian Head with the commissioning of Naval Support Activity South Potomac as the installation's host command.

Major commands currently residing on NSF Indian Head include the Naval Surface Warfare Center Indian Head Explosive Ordnance Disposal Technology Division, the Naval Ordnance Safety and Security Activity, the Naval Sea Logistics Center Indian Head Detachment, the Joint Interoperability Test Command, and the Marine Corps Chemical Biological Incident Response Force.

CONTINUED FROM PAGE 55

throughout the year to take advantage of the changing flora and fauna. The archeological finds at Indian Head indicate the use of base camps but not large permanent villages.

The Posey Site is a permanent site, but is small in nature. Due to the lack of a palisade or other defensive architecture, it is often referred to as a "hamlet." Archeologists speculate that the Posey Site could have played several different roles. The first one was that it served as a buffer between the colonists and the Native American populations in the "Old Pomunky Town" and other villages located to the north.

Mary Patton, crew chief for the Louis Berger Group, sifts through soil in search of artifacts during an archeology dig at NSF Indian Head's Stump Neck Annex in April 2013.
Andrew Revelos

Jason Shellenhamer, field supervisor for the Louis Berger Group, points out differences in soil strata visible in an excavated sample pit during an archeological survey conducted in April 2013 on NSF Indian Head's Stump Neck Annex. Identifying the soil strata is important in archeological work since it can assist archeologists in determining the age of recovered artifacts and the archeological period. For this reason, archaeologists excavate stratigraphically, or one layer at a time, removing all soil from one time period before excavating the layers that preceded it. Archeologists are then able to compare results from various dig sites on one location. This provides a better interpretation of the recovered artifacts from the same soil layer.

Andrew Revelos

A second purpose was its use as a site to exploit trading with the European settlers by reprocessing goods acquired from them. This is believed possible due to its location on the Mattawoman River and its proximity to colonial settlements. Artifacts recovered indicate that these Native Americans utilized copper, ceramics, clay pipes, metal working tools, lead shot and other imported material.

A third use of the Posey Site may have been the European settlers' need for cleared land in order to begin farming activities.

These scenarios are all possible, but until further historical and archeological research is completed, the true answer remains elusive.

The evidence from the Posey Site suggests that the Native Americans who lived in the area into the 18th century had well-developed strategies for survival. This conclusion is based upon the integration of elements from the traditional lifestyles with colonial lifestyles as well as the production of goods and/or services for use in a developing market economy.

Information gathered from the Posey Site indicates that the local Native Americans modified various aspects of their traditional technology for use in trade, and the survival of maintaining certain aspects of their traditional lifestyles. This adaptation was a response to a rapidly changing economic, political, cultural and demographic environment.

In 1665, due to the increasing European population in southern Maryland and the decline of the Native American population, the governor of Maryland set aside all of the land between the Mattawoman and Piscataway, Creeks which included Cornwallis Neck. This reservation was occupied by numerous local tribes including the Nacotchtanks, who moved from the Washington, D.C. area. The Maryland law, also known as the Indian Reservation Agreement, stated that white men could not establish residence within three miles of an Indian settlement.

By 1720, the local Indian population dropped dramatically, from 8,400 at the time of the first European settlement in St. Mary's county in 1634 to less than 200 in Southern Maryland. Of these, it is estimated that only 30 Native Americans were living on Cornwallis Neck.

Although there is no specific reason for the decline, several factors, including disease, war with the Susquehannocks, and abandonment of the area over broken treaties, contributed to the steep drop in the Native American population. In 1861, the Susquehannocks conducted a war raid in to Charles County. It is believed that many of the surviving Indians traveled to the fortified Indian village known as Fort Zekiah, located in the interior of Charles County. The fort existed from 1680 to 1692 when it was abandoned.

Archeological sites at Indian Head continue to reveal glimpses into the Native American lifestyles that existed and flourished for centuries. The Navy continues to fulfill its responsibility of surveying and gathering data on the historic and prehistoric occupation of NSF Indian Head. The collection of this information will provide a valuable insight in to the way of life of those that preceded our arrival.

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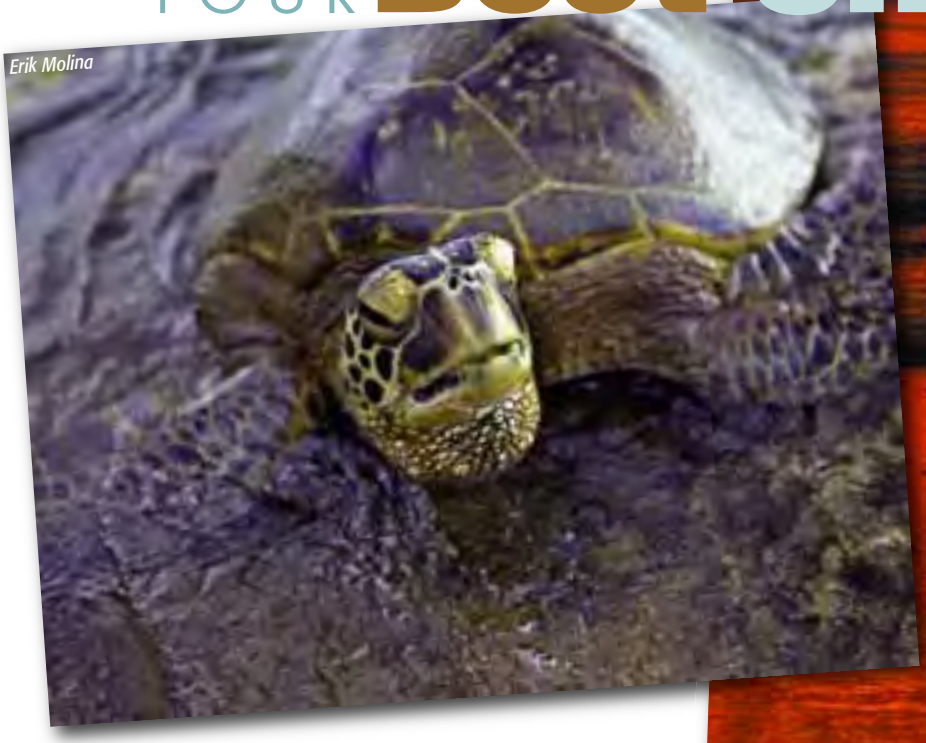

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Fiscal Year 2012 CNO Environmental Awards Goes Green Via Innovative VTC Ceremony

Efforts of Fiscal Year 2012 Winners Highlight Navy's Environmental Commitment

ON JULY 11, 2013 winners of the Fiscal Year (FY) 2012 Chief of Naval Operations (CNO) Environmental Awards program were recognized via a Video Teleconference (VTC) ceremony held at the Pentagon. This was the first time the awards ceremony had been held via VTC, rather than an in-person ceremony, since the awards were established in 1994.

"It shows that sustainability comes in a lot of different forms and it happens around the world around the clock," said Vice Admiral (VADM) Philip Cullom, Deputy Chief of Naval Operations for Fleet Readiness and Logistics, during the virtual award ceremony.

The annual CNO Environmental Awards program honors military and civilian men and women for their contributions towards the Navy's environmental stewardship mission. The awards are usually presented at the U.S. Navy Memorial in Washington, D.C., but this year's fiscal climate forced event organizers to think outside the box. The VTC ceremony significantly reduced the annual event's environmental footprint and saved more than $200,000.

"It's… really environmentally smart, so we're trying to live it as well as just talk about what we've been doing, affecting and changing the way we do our business in an entirely different way," said Cullom. Eighteen participant sites dialed in from around the world to be individually recognized during the half hour ceremony.

VADM Cullom and Rear Admiral (RADM) Kevin Slates, Director, Chief of Naval Operations Energy and Environmental Readiness Division, commended the winners for their sustained commitment to environmental excellence. RADM Slates announced the winners and gave a brief summary of each of their achievements, highlighting the diversity of the Navy's environmental program.

The awards recognize exceptional environmental stewardship by Navy ships, installations, and people and acknowledges organizations, individuals, and teams. Environmental subject matter experts and representatives from environmental non-governmental organizations reviewed nominations from commands around the world. Thirty winners in 11 award categories were selected.

Winners from around the world dialed into the VTC ceremony. RADM Kevin Slates announced winners and briefly described their achievements.

CNO Admiral Greenert (center) congratulated the winners of the FY 2012 Environmental Awards. Also attending the ceremony, were (left to right), Mr. Ralph Cantral (Director, Coastal America Partnership/Senior Advisor to NOAA); Mr. Donald Schregardus (DASN (Environment)); Mr. Roger Natsuhara (Principal Deputy ASN (Energy, Installations, & Environment); VADM Philip Cullom; RADM Kevin Slates; Mr. John Conger (Acting Deputy Under Secretary of Defense for Installations and Environment); and Ms. Anne Rathmell Davis (Deputy Commander/Executive Director, CNIC).

Competition categories for FY12 included natural resources conservation (large installation); cultural resources management (installation and individual/team); environmental quality (industrial installation, overseas installation, and small ship); sustainability (non-industrial installation and individual/team); environmental restoration (installation); environmental excellence in weapon system acquisition; small program (individual/team); and environmental planning (team).

CNO Admiral Jonathan Greenert congratulated the winners for their continuing dedication to improve environmental readiness and conservation efforts and reiterated that the VTC ceremony in no way undermines the winners' tremendous achievements.

"What you do is amazingly important," said CNO Admiral Jonathan Greenert, addressing the award winners. "You ensure that we can train, and that we have good relationships with our neighbors, civic groups and governments. We have to do this right, show our responsibility, and take care of the environment."

A complete list of winners along with their submission packages can be found at this link: http://greenfleet.dodlive.mil/environment/awards/cno-environmental-awards/fy12-winners. For more news from the Chief of Naval Operations Energy and Environmental Readiness Division, visit http://greenfleet.dodlive.mil/environment.

Photos by MC1 Peter D. Lawlor.

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Panama City's Shoreline Restoration Project Recognized for Partnership Efforts

Environmental Division Wins 2013 EPA's Gulf Guardian Award

THE NAVAL SUPPORT Activity (NSA) Panama City Public Works Department Environmental Division was recently awarded the 2013 Gulf Guardian Award for their restoration efforts along the installation shoreline. Sponsored by the U.S. Environmental Protection Agency's (EPA) Gulf of Mexico program, the award recognizes environmental excellence in preserving healthy and resilient coasts along the Gulf of Mexico. This is the first time a Navy Region Southeast installation has won this coveted award.

Completed in July 2011, the project installed a living shoreline along 2,800 feet of NSA Panama City's shoreline. Oyster reefs, 175 of them, were constructed with recycled oyster shells to dissipate incoming wave energy from the bay helping to protect the 22,000 salt marsh grasses that were then planted along the shoreline.

The project addressed years of erosion from natural and man-made causes along the NSA Panama City St. Andrew Bay shoreline, utilizing this living shoreline technique versus armored coastline of rip-rap or concrete sea walls. The Environmental Division took the initiative to help protect one of the few remaining pristine bays with significant sea grass beds remaining in northwest Florida. In doing so, juvenile habitats and foraging grounds for local fish and other estuarine species of St. Andrew Bay and the Gulf of Mexico are enhanced and protected from contaminants.

The Environmental Division received the first place award in the partnership category as they partnered with the local community hosting 28 events from October 2010 to July 2011 cleaning up the shoreline, installing oyster reefs and planting the grasses. Volunteers ranged from high

Proper grass planting techniques are demonstrated for NSA Panama City personnel and environmental science students from two local high schools by Florida Department of Environmental Protection Ecosystem Restoration Specialists during a Living Shoreline Restoration project event. The Living Shoreline project restored 2,800 linear-feet of shoreline at three locations on base, installed 175 oyster reefs utilizing recycled oyster shell, and planted 22,000 donated marsh grasses. 2.5 acres of estuarine habitat were created with 2,840 volunteer labor hours at 28 events during a 9-month period.
MC2 David Didier

Wading birds enjoy a tasty treat at the newly installed Living Shoreline at NSA Panama City. The installation found an innovative way to address years of erosion along the shoreline of St. Andrew Bay, one of the few remaining pristine bays with significant sea grass beds in northwest Florida. A Living Shoreline protects and enhances juvenile habitats for the fish that inhabit the bay and for birds that utilize the shallow foraging grounds.
Jonnie Smallman

school students in advanced science classes, volunteers from local environmental organizations, Navy and Air Force military and civilian personnel, plus 100 students from eight universities that volunteered as an alternative Spring Break. Over 600 volunteers donated an astounding total of 2,840 hours in support of the project.

A model for other military and private landowners, this project resulted in the Environmental Division receiving the 2012 Secretary of Navy award for Natural Resource Conservation for Small Installations. "For a five member environmental staff to maintain daily compliance yet facilitate such a large collaborative effort to restore more than 20 percent of its shoreline sets a good example to larger military installations. This self-sustaining project was not compliance driven but driven by the imagination and support of its numerous ambitious partners" said Mike Clayton, NSA Panama City's Environmental Program Manager.

The Gulf Guardian Awards were created in 2000 to recognize extraordinary environmental stewardship towards protecting the Gulf of Mexico in Florida, Alabama, Mississippi, Louisiana, and Texas. The awards recognize efforts within the 31 States that comprise the Gulf of Mexico watershed and recognize successful cooperative projects between the U.S., Mexico and the Caribbean.

For more information about the Gulf Guardian Awards, visit www.epa.gov/gmpo/gulfguard/about-ggawards.html.

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LMR Program Announces FY14 New Projects

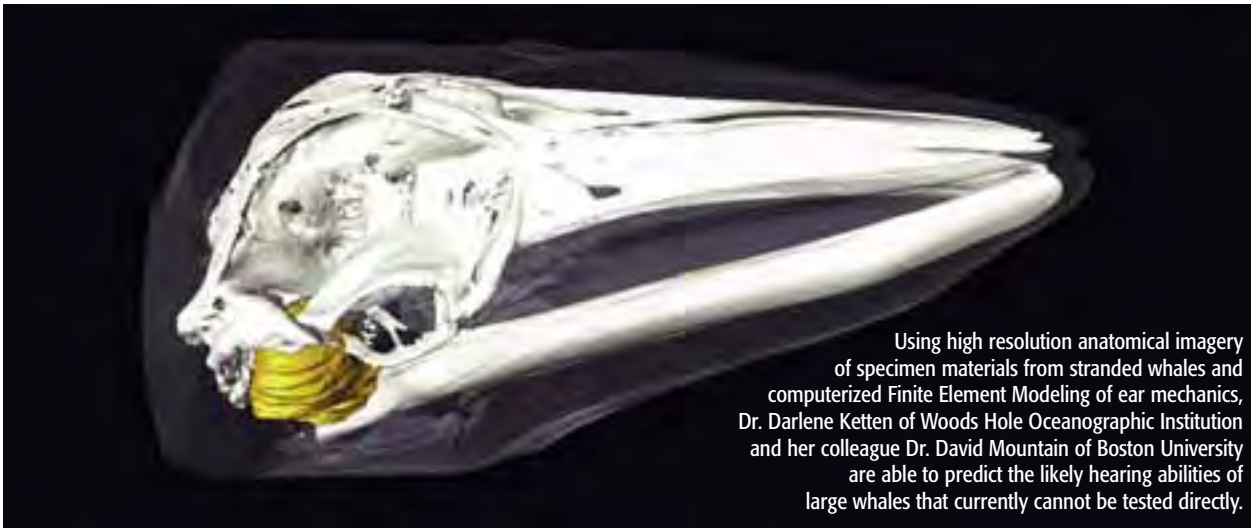
Projects Include New Data to Support Navy Risk Guidelines & Advancements to Automated Acoustic Signal Processing

THE NAVY'S LIVING Marine Resources (LMR) program has announced its new start projects for Fiscal Year (FY) 2014 which include an effort to derive large whale hearing data from anatomical information as well as a project to develop testing data sets for new signal processing tools used to analyze Navy passive acoustic monitoring (PAM) data.

For the past several months, the program's executive board—the Living Marine Resources Advisory Committee (LMRAC)—has been busy reviewing pre- and full proposals. Proposals were submitted by Navy personnel, other federal agencies, academic institutions and private industry in response to the following six priority needs identified by the program earlier in the year:

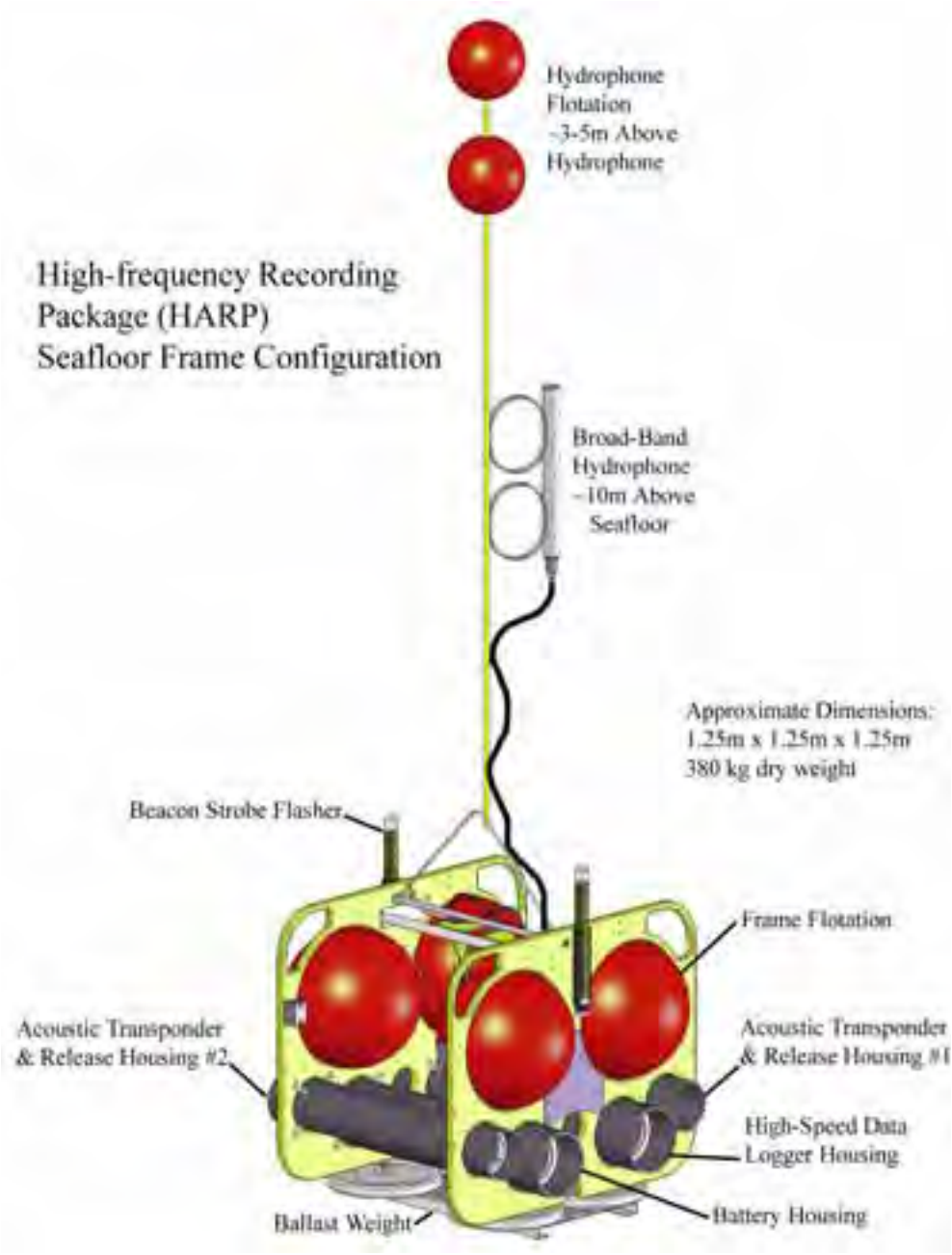
1. Demonstration of PAM Technology (need no. N-0006-13)
2. Behavioral Responses of Marine Mammals to Navy Sound Sources (need no. N-0011-13)
3. Hearing and Auditory System Information for Hearing-Based Risk Criteria (need no. N-0012-13)
4. Demonstration and Evaluation of Platform-Independent Improvements to Automated Signal Processing of PAM Data (need no. N-0020-13)
5. Capability Development for Hearing Measurements (need no. N-0029-13)
6. Assessing and Mitigating the Effects of Construction Noise on Living Marine Resources (need no. N-0001-13)

The six selected needs were incor porated into a Broad Agency Announcement that was released on March 7, 2013. The LMR website (www.lmr.navy.mil) received 105



Using high resolution anatomical imagery of specimen materials from stranded whales and computerized Finite Element Modeling of ear mechanics, Dr. Darlene Ketten of Woods Hole Oceanographic Institution and her colleague Dr. David Mountain of Boston University are able to predict the likely hearing abilities of large whales that currently cannot be tested directly.

The 2014 IPR will be held January 14–16, 2014 at the Naval Facilities Engineering and Expeditionary Warfare Center in Port Hueneme, California.



John Hildebrand and his colleagues at the Scripps Institution of Oceanography have developed the HARP for required Navy range acoustic monitoring. Under LMR support a new longer-lived, higher storage capacity HARP will be developed and demonstrated. New designs must stand up to challenging deep-sea conditions and not generate system noise that can interfere with recordings of animal sounds.

pre-proposals, of which 30 were selected for development into full proposals after extensive review by a team of independent expert reviewers (the program's Technical Review Committee (TRC)) and the LMRAC. After further TRC and LMRAC review, the LMRAC selected 12 proposals for new starts in FY14, contingent on the availability of funds.

Next on the LMR program schedule will be the review of submitted needs for FY15 proposal solicitation and an annual In-Progress Review (IPR). Each year, the LMR program holds an IPR to assess the progress made by its Principal Investigators on their respective projects.

The IPR will also help to acquaint Navy stakeholders with advances in scientific capability supported by the LMR program, prepare the Principal Investigators and appropriate Navy commands for work product transition to Navy application, and acquaint the research community more directly with the Navy's needs.

The 2014 IPR will be held January 14–16, 2014 at the Naval Facilities Engineering and Expeditionary Warfare Center in Port Hueneme, California.

CONTINUED ON PAGE 70

NO.	PROPOSAL NO.	TITLE	PRINCIPAL INVESTIGATOR & ORGANIZATION	OBJECTIVE
1.	3	Integrated Real-Time Autonomous Passive Acoustic Monitoring System for US Navy Operational Use	*Abbott* OASIS, Inc.	The objective of this project is to demonstrate the potential for a powered autonomous underwater vehicle to provide reduced-cost acoustic monitoring and survey capabilities for Navy at-sea activities, improving coverage and reducing cost of at-sea data collection.
2.	11	The Effects of Noise on Marine Mammals– A Book	*Erbe* Curtin University	The objective of this project is to provide an updated review of scientific information relevant to the effects of underwater sound.
3.	13	Simple Performance-Characterized Automatic Detection of Marine Mammal Sounds	*Mellinger* Oregon State University	The objective of this project is to develop user interfaces and training courses to facilitate usage of the Ishmael signal processing toolkit by Navy staff and contractors, reducing the need for expensive external expert staffing.
4.	14	Demonstration of Commercially Available High-Performance PAM Glider and Profiler Float	*Matsumoto* Oregon State University	The objective of this project is to compare two new alternative PAM technologies, gliders and drifting floating systems to assess cost and performance relative to existing Navy PAM systems (moored, towed, other).
5.	19	Development of Automated Whistle and Click Detectors and Classifiers for Odontocete Species in the Pacific and Atlantic Oceans	*Oswald* BioWaves, Inc.	The objective of this project is to follow up a successful demonstration of an improved Real-time Odontocete Call Classification Algorithm (ROCCA) dolphin acoustic classifier with tailored regional applications at Navy sites of interest (including the Southern California Range Complex (SOCAL), Atlantic Fleet Training and Testing area, Pacific Missile Range Facility, and the Mariana Islands Range Complex).
6.	21	Database and Metrics for Testing Automated Signal Processing for Passive Acoustic Monitoring in Naval Training Ranges	*Hildebrand* Scripps Institution of Oceanography	The objective of this project is to develop and maintain a test data set for assessing new PAM signal processing systems to generate cost and performance metrics for new signal processing tools under consideration by LMR and the Navy.

NO.	PROPOSAL NO.	TITLE	PRINCIPAL INVESTIGATOR & ORGANIZATION	OBJECTIVE
7.	22	Improving the Navy's Automated Methods for Passive Underwater Acoustic Monitoring of Marine Mammals	*Helble* Scripps Institution of Oceanography	The objective of this project is to develop a suite of automated signal conditioning tools that can be used to normalize data sets from different ambient acoustic regimes prior to submitting the normalized data to standardized automated signal processing systems in a process similar to that applied in tactical acoustic system signal processing.
8.	27	Atomic Force Microscopy to Finite Element Modeling (FEM): Comprehensive Models of Hearing in Critical Species for Mitigating Sound Impacts	*Ketten* Woods Hole Oceanographic Institution	The objective of this project is to use anatomical data and sophisticated computer models of auditory function to derive hearing data for species that otherwise cannot be tested directly, such as large whales.
9.	28	Analysis and Modeling for SOCAL Behavioral Response Study (BRS)	*Joseph* Naval Postgraduate School	The objective of this project is to provide key services to the multi-partner SOCAL BRS (2010-2015). Services include sound field modeling for the SOCAL study area and post-doctoral data analyses for species.
10.	29	Proposed Acoustical Society of America Standards on Towed Passive Acoustic Monitoring and Mitigation Systems	*Thode* Scripps Institute of Oceanography	The objective of this project is to provide community standards for hardware and software requirements for PAM systems, starting with towed PAM. Community standards are an important part of establishing acceptance of Navy data by the regulator and public.
11.	32	Electrophysiological Correlates of Subjective Loudness in Marine Mammals	*Finneran* Space and Naval Warfare Systems Command–Systems Center Pacific	The objective of this project is to calibrate a new means of establishing subjective loudness for regulatory hearing weighting functions, using evoked potential methods instead of trained animal behavior, thus reducing the cost of obtaining data and enabling data to be obtained rapidly from more species and more individuals of each species.
12.	33	Technology Demonstration for Fleet Passive Acoustic Monitoring	*Hildebrand* Scripps Institution of Oceanography	The objective of this project is to develop, demonstrate and evaluate improvements to the High-frequency Acoustic Recording Package (HARP) moored PAM systems widely used by Navy for monitoring compliance, and then compare the updated HARP system with other comparable PAM systems for cost and performance.

LMRAC Membership

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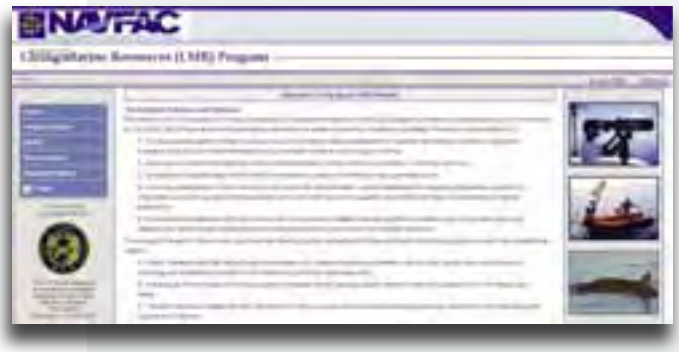
CONTINUED FROM PAGE 67

Sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division (CNO N45), the LMR program achieves its mission by:

- Providing science-based information to support Navy environmental effects assessments for its at-sea activities.
- Improving knowledge of the ecology and population dynamics of marine species of concern.
- Developing the scientific basis for the criteria and thresholds to measure the biological effects of Navy generated sound.
- Improving understanding of underwater sound and sound field characterization unique to assessing the biological consequences of underwater sound (as opposed to tactical applications of underwater sound or propagation loss modeling for military communications or tactical applications).
- Developing technologies and methods to mitigate and monitor environmental consequences to living marine resources resulting from naval activities at sea. ⚓

For More Insights

FOR MORE INSIGHTS into the LMR program, visit www.lmr.navy.mil.



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