Process & Perspectives

NESDI FY13 Year in Review Report:

2013

Accomplishments of the Navy Environmental Sustainability Development to Integration Program

Process & Perspectives

The mission of the NESDI program is 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.

CONTENTS

A Word from Our Program Manager

Welcome to the Navy Environmental Sustainability Development to Integration (NESDI) program Fiscal Year (FY) 2013 Year in Review report – Process & Perspectives.

Leslie Karr

You should notice two significant changes to our annual report this year. We still report on the successes enjoyed and challenges met by the NESDI program in FY13, but have organized it around the four-stage process we follow to execute the program each year vice Environmental Enabling Capabilities (EEC). The other change is the incorporation of the Technology Development Working Group (TDWG) perspectives on the current state of the NESDI program and its process. These folks are very familiar with the interoperability of the NESDI program and I wanted to share their perspectives with you in this year's report.

Although many programs document their own standard operating procedures (SOP), the NESDI program is truly committed to the consistent and dependable execution of the four phases outlined in its own SOP—from the collection, evaluation and ranking of needs through the successful integration of our projects into the ongoing operations of the Navy. Each year, we generate a new set of needs and proposals and focus our projects on successful execution and ultimate integration into the daily operations of the Fleet. For this reason, we decided to present the results of our FY13 efforts by following the four-phased process that we use to execute the program each year:

1. Collect, Validate and Rank Needs
2. Collect, Validate and Rank Proposals
3. Execute Projects
4. Integrate Solutions

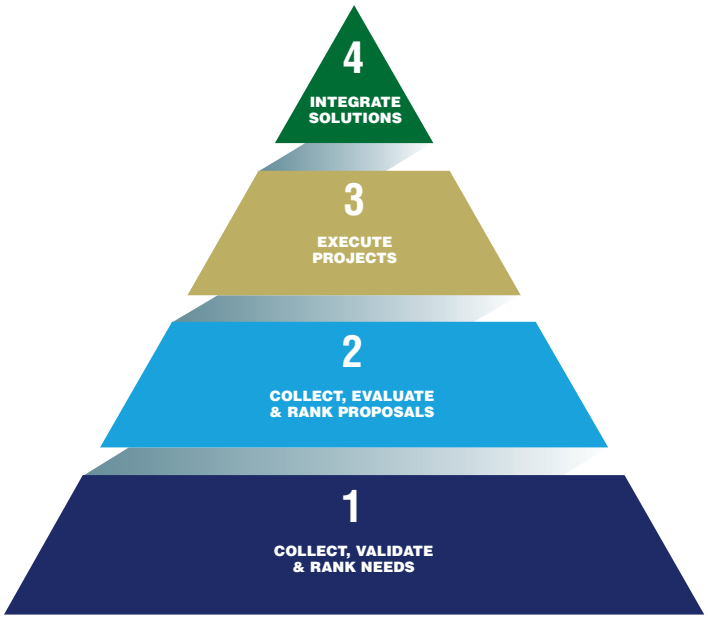
We saw some change in TDWG personnel this year. At the end of the year we said goodbye to Jerry Olen, Nick Paraskevas, Tami McVey, Chaela Hall, and Jeff Heath. I thank each of them for their many years of dedication and hard work. I also want to welcome our newcomers Pat Earley, Dave Brock and John Bendick. I also thank each of you for providing your perspectives to this issue of the NESDI annual report. Additionally you will see perspectives from those who have been with the program for quite a while, Cindy Webber, Bill Hertel, Barbara Sugiyama, Bruce McCaffrey and Lynn Cahoon. You will also see my own perspectives on our NESDI process!

These perspectives, inserted at the appropriate sections throughout this Year in Review report, should provide you with even greater insight into the interworking of the program. Thus the "Perspectives" in our "Process & Perspectives" tagline for this year's report. I hope these perspectives provide you with an even better understanding of the NESDI program — from the folks who know it best. I have benefitted from their wisdom throughout my tenure as the NESDI program manager and I'm sure you will as well.

Summary of Our Successes

The following is a summary of the program successes we enjoyed in FY13:

1. Collected 58 need submittals and solicited proposals to address 20 of those needs.
2. Approved ten "new start" projects for funding for initiation in FY14 and beyond.
3. Held three In-Progress Reviews (IPR):
   a. Stormwater: Silverdale, WA in November 2012
   b. West coast: Port Hueneme, CA in May 2013
   c. East coast: Jacksonville, FL in June 2013



4. Conducted Chief of Naval Operations Energy and Environmental Readiness Division (CNO N45) Programmatic Review in September 2012.
5. Released our annual report, entitled "NESDI FY12 Year in Review Report: It Ends With Integration."
6. Supported the establishment of the Naval Facilities Engineering Command's (NAVFAC) Living Marine Resources (LMR) program including web site, business processes (and SOP) and its first IPR.
7. Supported the development of five project videos.
8. Made some changes to the TDWG membership:
   a. Added John Bendick (from the Naval Supply Systems Command).
   b. Added Pat Earley (from the Space and Naval Warfare Systems Command (SPAWAR)).
   c. Said goodbye to Tami McVey and Chaela Hall (from Commander, Navy Installations Command).
   d. Said goodbye to Jeff Heath (from NAVFAC).
   e. Said goodbye to Jerry Olen (from SPAWAR)—now a member of the LMR program's advisory committee.
   f. Said goodbye to Nick Paraskevas and welcomed Dave Brock (from the Naval Air Systems Command).

Again in FY13, many of the projects sponsored by the NESDI program were successfully completed and integrated into the ongoing operations of the Fleet. These projects are highlighted in the Executive Summary and elsewhere in this Year In Review report.

What's in Store for FY14

Managing Fiscal Challenges

FY14 will be a very challenging year. Our budget has been reduced due to under execution and sequestration. And so we must be flexible, creative and adaptive to the financial realities. While sufficient funding is anticipated for ongoing projects, it will be challenging to manage those ongoing projects in addition to our "new start" projects knowing that FY15 is to be funded at a below optimum figure. Principal Investigators are already planning to slow down execution and stretch out milestones wherever possible in order to keep projects alive. Although proposals will be evaluated in FY14 for possible FY15 start, only a few may be initiated. This will also impact our call for needs and proposals in FY15.

Staying Engaged with Our End Users

The program will continue to incorporate its customer into the process at all stages. Because of the lower funding availability, flexibility to respond to out-of-cycle requests will be impacted. Reduced flexibility to provide leveraged funding will also be seen, such as with efforts funded by the Environmental Security Technology Certification Program (ESTCP) and other programs.

During fiscally challenging times it is difficult to get our end users to think about paying for new technology, even when it saves them money in the long run. We are making progress in this area, however, by providing technical expertise and resources to our customers along the way to ease the transition from the demonstration and validation stage into practice. Often, focused meetings are held between the end user and the Principal Investigator along the path to implementation. The NESDI program facilitates these meetings by bringing a strategy to the table, assigning action items to the various parties, and monitoring and refining the strategy until the integration is complete.

Regardless, the program will continue to provide its expertise to other research and development, test and evaluation programs at NAVFAC as they strive to establish similar businesses processes and best practices.

How You Can Participate

We need the most help to identify outstanding environmental needs in the Fleet and implement the results of our various projects into the ongoing Fleet operations. So, whenever you can, find a way to use the technologies and studies that we sponsor. Specifically, you can participate in our process and play a vital role by doing any or all of the following:

1. Submitting and validating an environmental need.
2. Reviewing the technologies already under development.
3. Supporting the integration of our products in your organization or at your installation.
4. Serving as a Principal Investigator on one of our projects.
5. Providing a demonstration site for one of our projects.
6. Staying up-to-date on our program by visiting our web site (www.nesdi.navy.mil).

And we're always looking for ways to do things better and more efficiently. So if you've got some ideas for us, please contact me or the appropriate member of the TDWG.

So whether it's the NESDI process that you're interested in, or the perspectives provided by some of our key personnel, I hope you find this Year in Review report useful to gain the insights you need into the operation and success of our program in FY13.

Leslie A. Karr, P.E.
NESDI Program Manager
2009-2014

Process & Perspectives

Executive Summary

Executive Summary

Financial Highlights

Program Funding

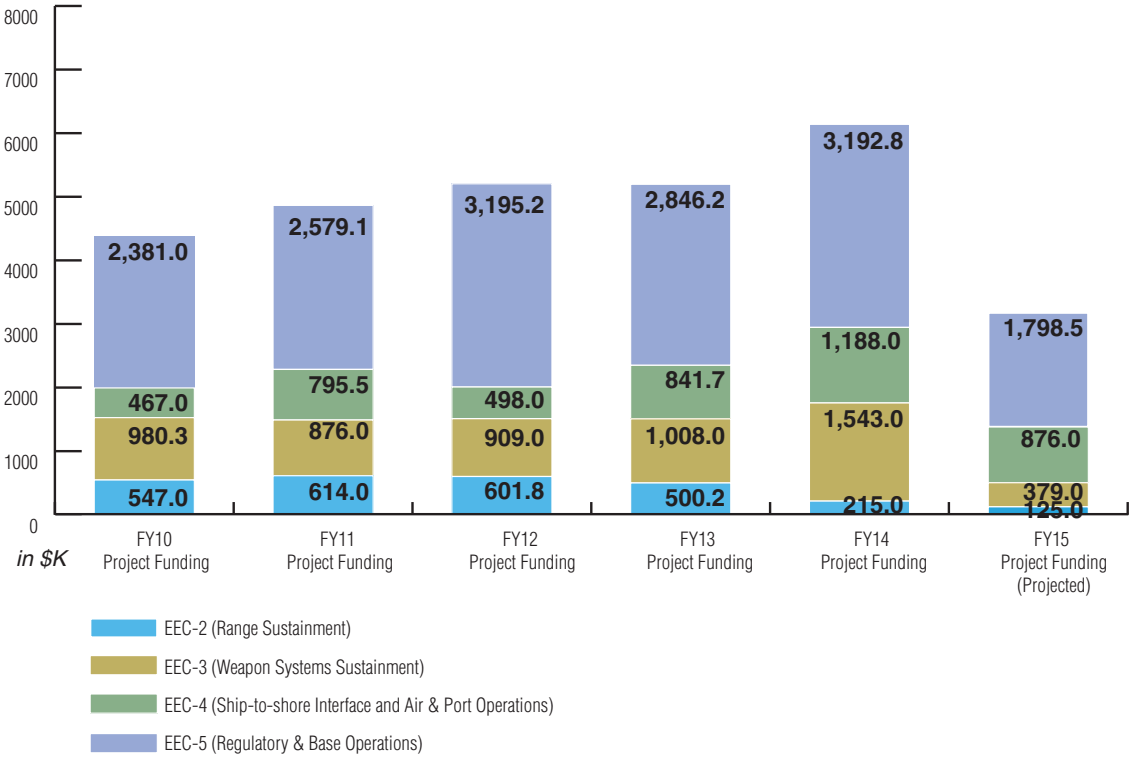
As always, the NESDI program has prioritized its investments based on priorities identified by its end users in the Fleet and potential risk to the Navy mission. The following table summarizes program investments by EEC from FY10 to FY13 and projected expenditures in FY14 and FY15.

EEC	FY10 Program Funding	FY11 Program Funding	FY12 Program Funding	FY13 Program Funding	FY14 Program Funding (Projected)	FY15 Program Funding (Projected)
EEC-2 (Range Sustainment)	547.0	614.0	601.8	500.2	215.0	125.0
EEC-3 (Weapon Systems Sustainment)	980.3	876.0	909.0	1008.0	1543.0	397.0
EEC-4 (Ship-to-shore Interface and Air & Port Operations)	467.0	795.5	498.0	841.7	1188.0	876.0
EEC-5 (Regulatory & Base Operations)	2381.0	2579.1	3195.2	2846.2	3192.8	1798.5
Management Costs	975.0	1005.5	565.5	473.9	347.0	507.0
Unallocated	0.0	0.0	0.0	0.0	(1969.8)	8.5
ESTCP Leveraging	365.0	95.0	75.5	0.0	0.0	0.0
TOTALS	**5715.3**	**5965.1**	**5845.0**	**5670.0**	**4516.0**	**3712.0**

in $K

Entries in EECs reflect ongoing projects only.

Program Funding (FY10 - FY15)



Obligations & Expenditures

Again in FY13, it was challenging to manage the program's budget due to a number of factors including sequestration, furloughs, and travel restrictions. Combined, all of these factors resulted in the following impacts to the program:

1. All contract actions were halted in January 2013.
2. Field visits to support project demonstrations were severely limited or postponed.
3. The amount of labor dollars that could be expended was decreased.

During FY13, the NESDI program was able to increase expenditures over FY12 by 9 percent. However, by the end of the fiscal year we were still only at 44 percent expended (56 percent is the benchmark). Hence the budget for FY14 is reduced to $4.516M. In FY15, the NESDI budget is at an unprecedented low—just $3.712M. The table below provides a summary of the program's financial status and progress toward benchmarks with FY12 and FY13 resources.

	3/31 Benchmark	Where We Were	9/30 Benchmark	Where We Were
Year 1 (FY13) $5.681M ($5,669,652) Revised Control 6/26/13				
• Obligations:	65%	**>65%**	95%	**100%**
• Expenditures:	20%	**18%**	56% $3.180M	**44%*** $2.597M
Year 2 (FY12) $5.845M CONTROL				
• Obligations:	97.5%	**100%**	100%	**100%**
• Expenditures:	81%	**62%**	95% $5.553M	**78%** $4.539M

**Represents a nine percent increase over FY12 (Year 1).*

In FY14, particular attention will be made to each Systems Command's spend plan and adjustments will be made throughout the year to meet benchmarks.

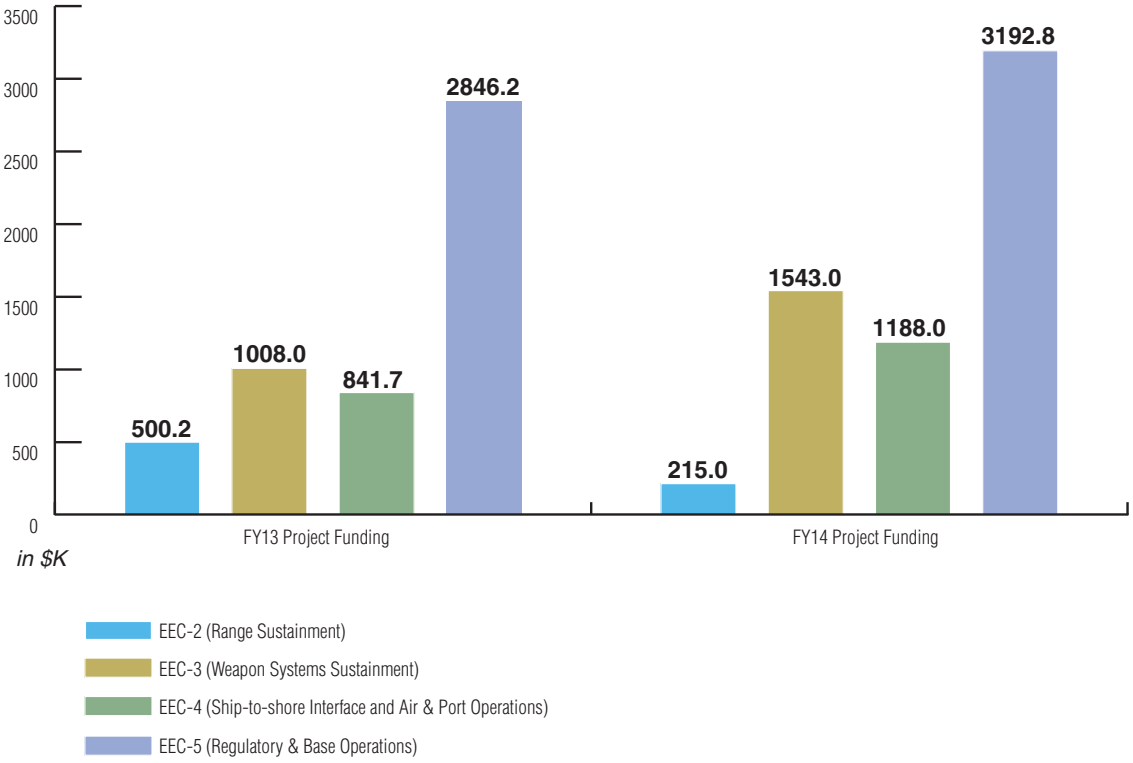
To better understand the challenges associated with meeting our current year expenditures, we conducted an analysis of in-house funding and contract funds. The NESDI program outsources between 30 and 40 percent of its efforts. Knowing this and knowing that contract expenditures are extremely low for year one benchmarks (due to awards being made late in the fiscal year and the billing cycle), nearly all of the expenditures come from in-house expenses. With this knowledge in hand, we can now better estimate how to structure future investments to maximize expenditures that meet benchmarks.

	Contracts ($K)	Contracts % of Control	In-House ($K)	In-House % of Control	Control
FY12 (actual)	2179	37%	3666	63%	5845
FY13 (actual)	1797	32%	3873	68%	5670
FY14 (projected)	1888*	42%	4598*	102%	4516

**Amount requested.*

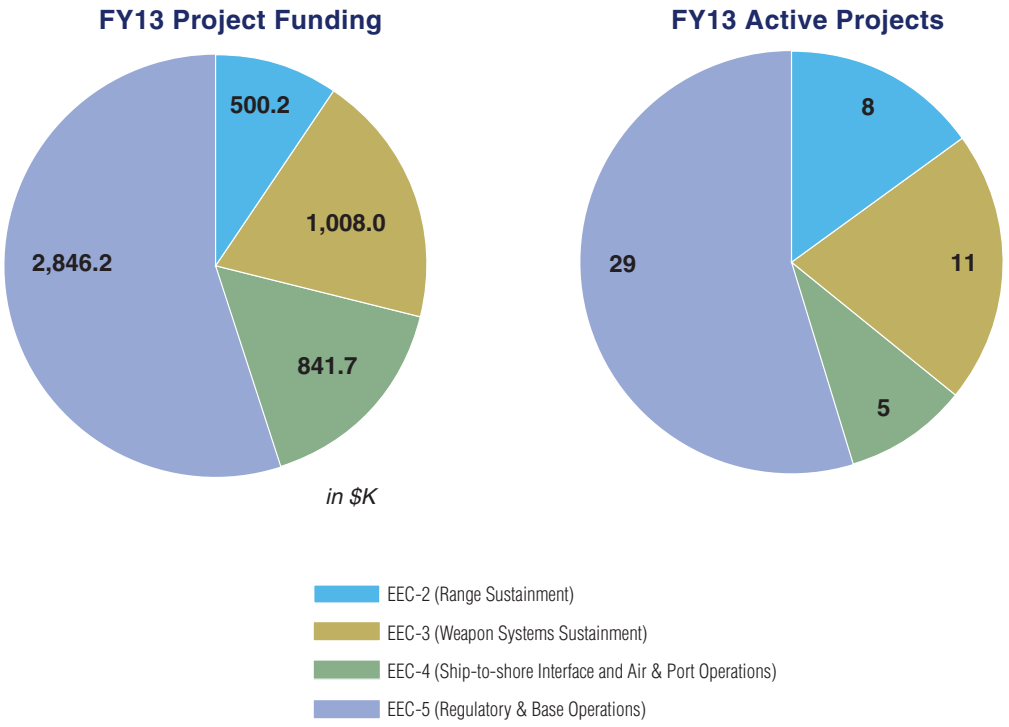
Project Funding: FY13 & FY14

The following graph shows program investments in relationship to EECs. The drop in FY14 funds is not reflected in the FY14 projected funding. But it is anticipated that each EEC will be reduced according to expenditure rates to be determined.



Project Funding & Active Projects

In FY13, project funding was distributed across four EECs as shown in the pie chart on the left below. Active projects in FY13, were distributed by EEC in the pie chart on the right below.



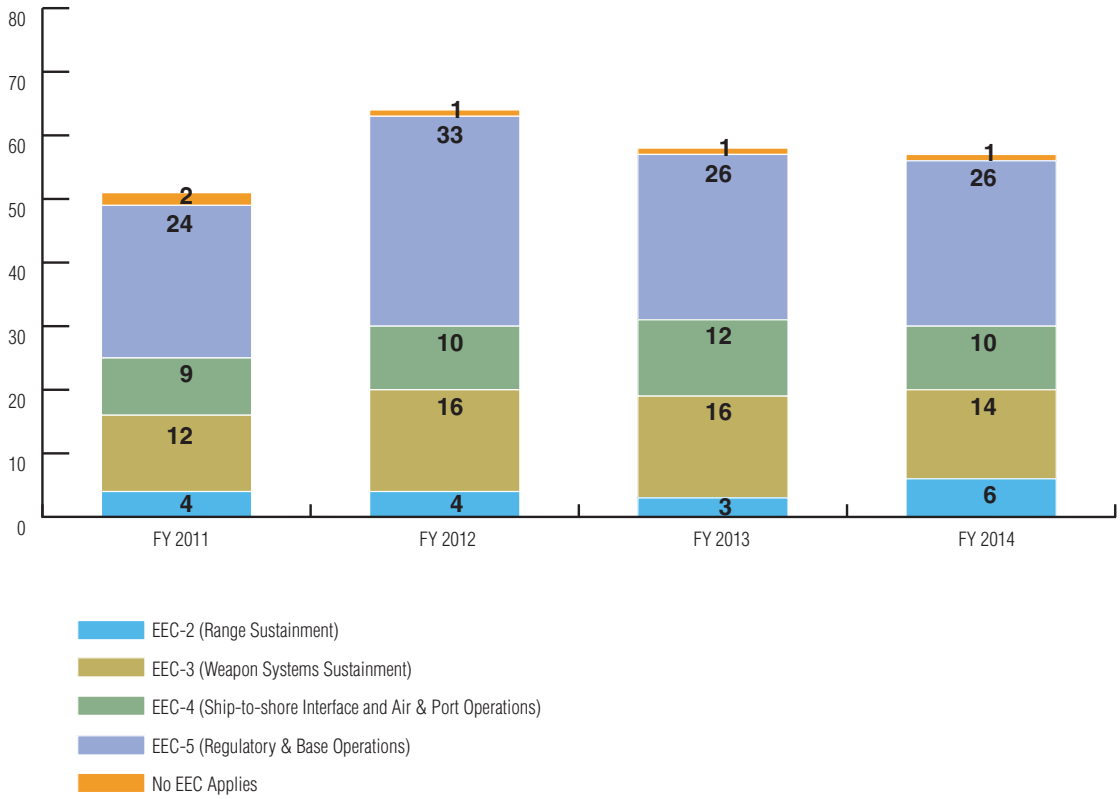
Program Successes

Collected & Ranked Needs

Each year the NESDI program executes a formal process for collecting outstanding environmental needs from the Fleet. Fleet personnel or their representatives actively participated to identify and document various operational challenges.

For FY13, the NESDI program's needs collection process yielded 58 submittals from across the Navy. After a thorough review by program personnel, a solicitation for proposals was executed to address 20 needs determined to be priorities by personnel from the program's management team—the Technology Development Working Group (TDWG)—and resource sponsor—the Chief of Naval Operations Energy and Environmental Readiness Division (CNO N45). Successful proposals resulted in new projects beginning in FY13 and beyond.

The chart below summarizes the number of needs collected by the program from FY11 through FY14.



A summary of all 20 needs for which pre-proposals were requested is provided below:

No.	Need	Command	Title
1.	N-0847-13	NAVFAC	Reduce Wastewater Treatment Plant Salinity
2.	N-0861-13	NAVFAC	Compliance Options Study for National Pollutant Discharge Elimination System (NPDES) for Cooling Water Intake Structures at Existing Facilities
3.	N-0862-13	NAVSEA	NPDES Clean Sampling Techniques
4.	N-0867-13	NAVFAC	Infrastructures Reducing Stormwater Fees
5.	N-0869-13	NAVFAC	Demonstration of Sustainable Remedy For Treating Low pH Aquifer Contaminated with Continuing Source of Chlorinated Ethenes Tetrachloroethene and Trichloroethene from Closed Landfill
6.	N-0870-13	NAVSEA	Biological Fouling Reduction to Ships Cooling Water Systems
7.	N-0871-13	NAVAIR	Low-Volatile Organic Compound and Low-Hazardous Air Pollutant Wipe Solvent and Paint Thinner Demonstration/Validation
8.	N-0874-13	NAVFAC	Alternative Treatment Technology to Pump and Treat for Munitions Constituent-Contaminated Groundwater
9.	N-0876-13	NAVFAC	Improved Methods and Tools for Remedy Selection at Contaminated Sediment Sites
10.	N-0878-13	NAVAIR	Replace Lead Moldings for Sheet Metal Forming with New Technology
11.	N-0880-13	NAVAIR	Filtering Aqueous Plating and Cleaning Shop Chemicals to Extend Bath Life
12.	N-0883-13	NAVAIR	Ultra High Pressure Water Jet System Equipment Procurement and Related Installation
13.	N-0887-13	NAVSEA	Drydock Sediment Management
14.	N-0895-13	NAVAIR	Elimination of Hexavalent Chromium from Aircraft Structural Adhesive Bonding
15.	N-0898-13	NAVSEA	Develop Process and Equipment for Wholesale Removal of Rubber Coating on Submarines
16.	N-0899-13	NAVAIR	De-Painting of Naval Aircraft - Alternative to Chemical/Media Removal Technology
17.	N-0900-13	NAVSEA	Develop Process and Equipment to Capture Smoke Plume from Oxy-Fuel Cutting Torch During Ship Demolition
18.	N-0902-13	NAVAIR	Revised Chromium National Emissions Standard for Hazardous Air Pollutants Housekeeping Compliance
19.	N-0906-13	NAVFAC	Autonomous Underwater Vehicle Monitoring of Marine Environment Contaminants in Harbors and Waterways Impacted by Naval Operations
20.	N-0907-13	NAVFAC	Effective Operation and Maintenance of Stormwater Best Management Practices/Low Impact Development

Initiated "New Start" Projects

The NESDI program approved ten "new start" projects for funding for initiation in FY14 and beyond as highlighted in the tables below:

EEC	FY14 New Starts	Funding of FY14 New Starts ($K)
EEC-2 (Range Sustainment)	0	0.0
EEC-3 (Weapon Systems Sustainment)	2	410.0
EEC-4 (Ship-to-shore Interface and Air & Port Operations)	3	628.0
EEC-5 (Regulatory & Base Operations)	5	1229.5
TOTAL	10	2267.5

ID	Title	2014 Requested	2015 Requested	2016 Requested
EEC-3: Weapon Systems Sustainment				
500	Demonstration of Non-Chromated Adhesive Bond Primer for Metal Repair Bonding	235.0	120.0	0.0
504	Low-VOC and HAP Wipe Solvent and Paint Thinner Demonstration and Validation	175.0	205.0	0.0
EEC-4: Air and Port Operations				
502	Biological-Fouling Reduction to Ships Cooling Water Systems	157.0	210.0	0.0
503	Dry Dock Sediment Management	240.0	345.0	0.0
506	Evaluation and Implementation of Compliance Options for NPDES Cooling Water Intake Structures at Existing Facilities	231.0	256.0	226.0
EEC-5: Regulatory and Base Operations				
497	Evaluation of Low Impact Development Implementation	295.0	180.0	0.0
498	Emissions Capture Technology for Oxy-Fuel Hull Cutting Operations	212.0	257.0	0.0
499	Aerobic Bioaugmentation for Remediation of RDX-Contaminated Groundwater	109.5	351.0	0.0
501	Sustainable Remediation of Low Ph Aquifers and Aquifers With a Continuing Contaminant Source Using Proton Reduction Technology	373.0	267.0	0.0
505	Lifecycle Cost — Operation and Maintenance of Stormwater Best Management Practices (BMP)/Low Impact Development (LID)	240.0	80.0	0.0

Conducted In-Progress Reviews

Again this year, the NESDI program sponsored three In-Progress Reviews (IPR)—one dedicated to stormwater management issues and a second and third IPR held on the west and east coasts to accommodate our end users and Principal Investigators from each coast.

In an effort to address the ongoing challenges of effectively managing stormwater at Navy facilities, the NESDI program convened a meeting of stormwater end users, researchers, and policymakers in Silverdale, Washington in November 2012.

In addition to personnel from the program's resource sponsor organization, CNO N45, end users from across the Puget Sound's Navy community joined NESDI personnel in person and over the phone to ensure existing projects and future investments are properly focused, efficiently executed, and successfully integrated.

Nearly four dozen participants attended or dialed-in to hear briefings about ongoing projects and to provide valuable feedback to Principal Investigators. One of the projects discussed included a new effort to identify sources of copper and zinc in stormwater runoff through the use of a Graphical Information System infrastructure combined with a pollutant transport tool. Another project is applying the marine Biotic Ligand Model for copper, a method that has already been developed and validated for protection of sensitive saltwater organisms, for usage with salmonids and forage fish.

Attendees also toured the Puget Sound Navy Shipyard and Intermediate Maintenance Facility (PSNS&IMF) to see firsthand the environment in which many NESDI projects must operate. The group met with the environmental manager and staff at the shipyard, and most notably, toured the shipbreaking operations in one of the shipyard's dry docks to better understand the challenges associated with opacity (particulate matter emissions) and other issues.

Several NESDI projects have been funded to address this issue. The first, an Initiation Decision Report (IDR), identified the best available alternatives to oxy-fuel cutting to bring daily opacity levels below air quality limits. The IDR recommended the use of MagneGas™ in place of propane for hot cutting and a follow-on project was initiated to demonstrate this technology. Another technology identified by the IDR was cold cutting, a process that eliminates opacity and the basis for another follow-on project. Another NESDI project being conducted aboard PSNS&IMF is experimenting with ways to increase the efficiency and lower the operating cost of one of the shipyard's Oily Water Treatment System.

In May 2013, Principal Investigators from the Naval Facilities Engineering and Expeditionary Warfare Center and the Space and Naval Warfare Command, Systems Center Pacific (SSC Pacific) joined personnel from the NESDI program in Port Hueneme, California to review the progress they have made over the course of the past year.

In June 2013, the NESDI program conducted its final IPR for FY13 in Jacksonville, Florida at the Fleet Readiness Center Southeast (FRCSE). The overall quality of the briefs presented by the Principal Investigators and the influx of new Principal Investigators from both the Naval Air Systems Command and Naval Sea Systems Command (NAVSEA) was well received. One of the week's highlights was seeing the FRCSE-based Principal Investigators in action during the toured of the FRCSE itself as well as the Materials Engineering Laboratory.

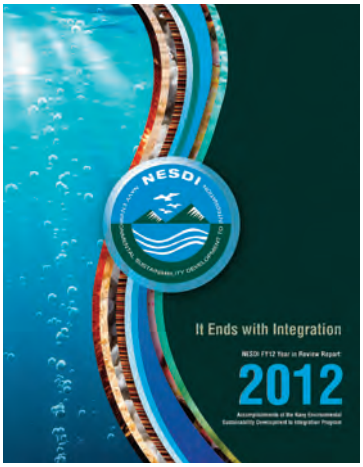
Another highlight of the week was touring the new chemical sludge treatment system at Naval Air Station (NAS) Jacksonville.

Under NESDI project #451 (Determining the Performance of Cadmium- and Hexavalent Chromium-free Electrical Connectors), field testing was conducted on two new connector finishes in an effort to determine the relative performance of these finishes in Navy and Marine Corps applications. Electrical connectors are found on all military aircraft, including the aircraft shown here.

This system consumes significantly less energy than the aerobic digesters previously used for sludge treatment at NAS Jacksonville.

Published an Annual Report

Also in FY13, the NESDI program has released its annual report, entitled "NESDI FY12 Year in Review Report: It Ends With Integration." As the name implies, the NESDI program is committed to promoting its successful projects and, more importantly, integrating the technologies, enhanced industrial processes, and other the results of its projects to the Navy end user community. And the Year in Review Report is one such method for doing so.



The report contains a financial review of program expenditures as well as insights into projects that were particularly successful in demonstrating the use of an innovative technology, or collecting critical information to enhance the efficiency of environmental management programs. From finding a method to distinguish background perchlorate from anthropogenic sources to determining the effects of military expendable materials in the marine environment, the report provides insights into some of the most successful NESDI projects.

Electronic (pdf) versions of this and all previous Year in Review reports can be downloaded from the program's web site at www.nesdi.navy.mil.

Project Successes

Many of the projects sponsored by the NESDI program that were successfully completed and integrated into the ongoing operations of the Fleet in FY13 are highlighted below:

1. For our Non-Chromated Post Treatments project (#328), a data package was submitted to NAVAIR's senior corrosion engineer to support the generation of a NAVAIR authorization letter.

2. Draft and final technical reports were being prepared for our Long Term Disposition of Seafloor Cables project (#347) for submittal to the Marine Resources Support Group (MRSG) and the Naval Seafloor Cable Protection Office for their use.

3. A suite of equipment to capture turbidity data on a continuous basis was successfully demonstrated as part of our Automated Condition Assessment of Coral Reefs project (#425).

4. The methodology associated with our Implementation of Forensic Approaches to Address Background Perchlorate Source Identification and Characterization at Navy Facilities and Ranges project (#437) was field tested at those sites that provided data for use in the development of the methodology. Technical guidance is being drafted that describes a framework and process for site managers to follow when performing a perchlorate background evaluation at their site. Guidance will be used to transition a forensics analysis framework into existing Navy condition assessment protocol and methodology documents.

5. A prototype design of the cleaning vehicle being demonstrated as part of our project #440 (Surface Cleaning of Dry Dock Floors) is complete and its fabrication is ongoing.

6. The results from the pilot project associated with our Demonstration of Physical and Biological Conditioning of Navigational Dredge Material for Beneficial Reuse effort (project #446) were encouraging for the development of a full scale process for the beneficial use of dredged material at Pearl Harbor.

7. Candidate replacements for the connectors containing cadmium and hexavalent chromium included in our Navy Demonstration of Cadmium and Hexavalent Chromium Free Electrical Connectors project (#451) have been identified. This NESDI research spurred on researchers from NAVSEA, the Army and the National Aeronautics and Space Administration's Technology Evaluation for Environmental Risk Mitigation program to conduct their own tests to determine performance differences between connector types. Results from these other evaluations will help to bound the applications and environmental conditions that are suitable for various non-cadmium connector finishes.

8. As part of our Hull Maintenance Shroud project (#456), we received positive feedback and suggested improvements on our prototype shroud from Naval Stations Mayport and San Diego.

9. The reactive amendment was successfully placed at Puget Sound and monitoring is ongoing as part of our Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors project (#460).

10. Efforts in FY13 on our Development of a Collaborative PESHE Document Authoring Tool for All Navy Commands project (#461) resulted in a beta version of the software and a test plan and assembled testers at each Systems Command.

11. A methodology was drafted and is now being validated at a second site as part of our efforts on our Methodology for Identifying and Quantifying Metal Pollutant Sources in Stormwater Runoff project (#463).

12. A final guidance document and research findings for our Methodology to Assess Essential Fish Habitat (EFH) for Navy Coastal Properties project (#467) is being generated and will be made available to the Marine Resources Support Group and uploaded to the CNO N45 environmental planning library. This documentation will also be used to attempt an "undesignation" of EFH in a selected Navy Region Southwest harbor.

13. Efforts in FY13 on our Low Cost Selective Polymer and Laser Interferometer Real Time Sensors for Detection of Solvents in Contaminated Groundwater Plumes project (#468) resulted in the fabrication of the sensor platform and support system.

14. As a result of efforts on our Validation of a Low Tech Stormwater Procedural Best Management Practice project (#469), it was determined that weekly vacuuming and monthly power washing reduced but did not sufficiently mitigate metals (copper and zinc) and toxicity in stormwater runoff to meet permit thresholds. The regulator would not allow the permit to include the application of the best available technologies (rather than specific thresholds). The final report's executive summary will be sent to all Navy bases.

15. A part of our Toxicity Associated with Polycyclic Aromatic Hydrocarbons Used in Clay Targets project (#474), major technical breakthroughs were made in identifying skeet markers in vintage skeet samples and correlating these markers to skeet range field samples.

16. A database design was completed as part of our Quantitative Decision Framework for Assessing Navy Vapor Intrusion Sites project (#476). A discussion of the scope, usability, data identification and data gaps will be included in the final technical memorandum and the population of the database is underway.

17. A final report for our Automated Long-Term Monitoring System for Natural Resource Management rapid response project (#477) will display the data gathered by the system during the demonstration, a cost analysis, lessons learned during the deployment, and notes regarding installation and calibration of the system. The Principal Investigator for this effort also developed a proposal to the Naval Innovative Science and Engineering program for the acquisition of two systems.

18. A study/guidance document which includes a methodology on how bases are managing their Municipal Separate Storm Sewer System (MS4) permits was completed as part of our Successful MS4 Programs Implemented in the Navy project (#494). Final study results and management templates will be posted to the NAVFAC Environmental Management Systems web site and distributed to water program managers via the Water Media Field Team.

19. The team on our Radioactive Material Permit Generation, Management and Tracking System project (#495) worked with the Radiological Affairs Support Office to validate requirements and generated a preliminary design for an automated management system.

In addition to the projects highlighted above, the program made significant investments to support Navy stormwater and natural resource management programs through a variety projects highlighted on the next page and discussed in more detail in the "Execute Projects" section of this report.

Promoting Sound Stormwater Management Programs at Shipyards & Installations

Navy facility environmental managers across the globe are facing a daunting challenge—compliance with increasingly more stringent stormwater discharge requirements. The main contaminants of concern, copper and zinc, are ubiquitous both in Navy stormwater discharges, and virtually all stormwater in urban and industrialized areas. NPDES permits typically include numeric benchmark values for copper and zinc. At many facilities, Navy stormwater managers struggle to meet these levels. Compliance with the toxicity standard and benchmark values could require the installation of infrastructure to collect and treat stormwater runoff or to divert it to the sanitary sewer system at a cost of millions of dollars.

There are many ways to address these challenges, and the NESDI program has sponsored numerous projects including the following to help lighten the compliance burden on stormwater managers across the Fleet:

1. Remove Copper and Other Heavy Metals from Oily Water Treatment System Discharge for Compliance with NPDES Discharge Standards (Project #479)
2. Surface Cleaning of Dry Dock Floors (Project #440)
3. Dry Dock Sediment Management (Project #503)
4. Portable Treatment for Ship Material Removal Processes (Project #475)
5. Motion Assisted Environmental Enclosure for Capturing Paint Overspray in Dry Docks (Project #441)
6. Hull Maintenance Shroud (Project #456)
7. Biological-Fouling Reduction to Ships Cooling Water Systems (Project #502)
8. Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Stormwater Discharges (Project #455)
9. Dynamic Mixing Zone Modeling (Project #473)
10. Optimization of the Stormwater Dual Media Filtration System (Project #454)
11. Methodology for Identifying and Quantifying Metal Pollutant Sources in Stormwater Runoff (Project #463)
12. Validation of a Low Tech Stormwater Procedural Best Management Practice (Project #469)
13. Successful Municipal Separate Storm Sewer System Programs Implemented in the Navy (Project #494)

Employing Low Impact Development Technologies & Features

Low Impact Development (LID) is defined by the U.S. Environmental Protection Agency (EPA) as the process of "preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product." LID technologies include BMPs such as ponds, wetlands, sand filters, infiltration basins, swales, and porous pavement.

The following NESDI projects are applying various LID technologies to help address stormwater compliance issues at various Navy installations:

1. Low Impact Development for Industrial Areas (Project #493)
2. Lifecycle Cost — Operation and Maintenance of Stormwater Best Management Practices/Low Impact Development Features (Project #505)
3. Evaluation of Low Impact Development Implementation (Project #497)

This NESDI project is identifying gaps in the knowledge, technology, and/or capability for various LID development features. The compost mat shown here is designed to reduce the metal loadings associated with stormwater runoff.

Demonstrating a Monitoring System & Providing Analytical Support to Navy Natural Resources Management Programs

Natural resource management on Navy lands is a complex task. The Navy's Environmental Policy Manual (OPNAVINST 5090) states that "natural resources under the stewardship and control of the Navy shall be managed to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity."

Increasingly, this dual focus on sustainability and readiness can pose some difficult challenges. Natural resource managers have had to shift focus from the conservation of one species to multiple species. They have to keep abreast of the best available scientific information and adaptive management techniques.

In the last few years, the NESDI program has sponsored three projects at SSC Pacific to support sound and effective natural resource management. They include the development of an automated long-term monitoring system, a method to more precisely designate essential fish habitats (EFH), and summary guidance on the feasibility of coral reef transplantation.

The NESDI program sponsored a study that is describing, reviewing and prioritizing potential transplant technologies that could be used to mitigate impacts to coral reefs. Here divers are transplanting corals using epoxy. (Photo courtesy of NOAA)

Process & Perspectives

Financial Summary

Financial Summary

Program Funding

As always, the NESDI program has made its investments based on priorities identified by its end users in the Fleet and potential risk to the Navy mission. The following table summarizes program investments by EEC from FY10 to FY13 and projected expenditures in FY14 and FY15.

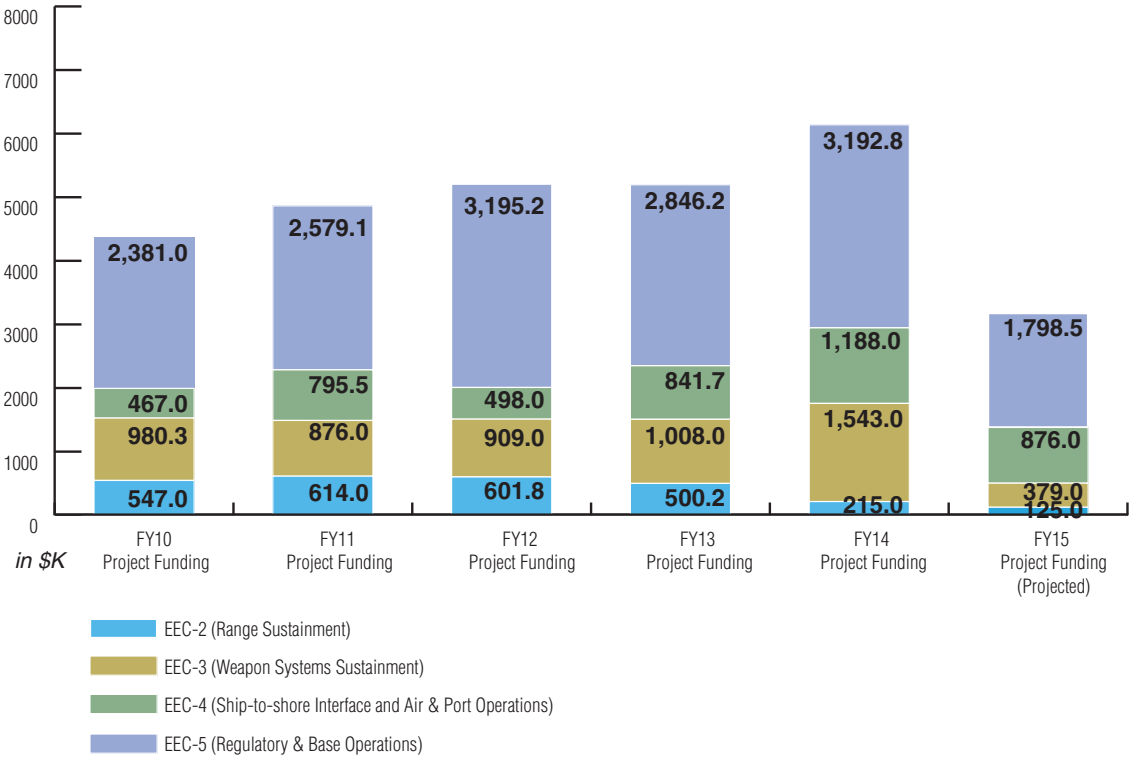
EEC	FY10 Program Funding	FY11 Program Funding	FY12 Program Funding	FY13 Program Funding	FY14 Program Funding (Projected)	FY15 Program Funding (Projected)
EEC-2 (Range Sustainment)	547.0	614.0	601.8	500.2	215.0	125.0
EEC-3 (Weapon Systems Sustainment)	980.3	876.0	909.0	1008.0	1543.0	397.0
EEC-4 (Ship-to-shore Interface and Air & Port Operations)	467.0	795.5	498.0	841.7	1188.0	876.0
EEC-5 (Regulatory & Base Operations)	2381.0	2579.1	3195.2	2846.2	3192.8	1798.5
Management Costs	975.0	1005.5	565.5	473.9	347.0	507.0
Unallocated	0.0	0.0	0.0	0.0	(1969.8)	8.5
ESTCP Leveraging	365.0	95.0	75.5	0.0	0.0	0.0
TOTALS	**5715.3**	**5965.1**	**5845.0**	**5670.0**	**4516.0**	**3712.0**

in $K

Entries in EECs reflect ongoing projects only.

NESDI project #348 (Validating Nanocrystalline Cobalt Phosphorous (nCOP) Electroplating as an Alternative to Hexavalent Chromium Electroplating) is demonstrating and validating pulsed electroplated nCoP alloy coatings as a technically feasible replacement for the current hexavalent chromium plating process. Components for the T-45 and other military vehicles undergo plating using hexavalent chromium.

Program Funding (FY10 - FY15)



Obligations & Expenditures

Again in FY13, it was challenging to manage the program's budget due to a number of factors including sequestration, furloughs, and travel restrictions. Combined, all of these factors resulted in the following impacts to the program:

1. All contract actions were halted in January 2013.
2. Field visits to support project demonstrations were severely limited or postponed.
3. The amount of labor dollars that could be expended was decreased.

During FY13, the NESDI program was able to increase expenditures over FY12 by 9 percent. However, by the end of the fiscal year we were still only at 44 percent expended (56 percent is the benchmark). Hence the budget for FY14 is reduced to $4.516M. In FY15, the NESDI budget is at an unprecedented low—just $3.712M.The table below provides a summary of the program's financial status and progress toward benchmarks with FY12 and FY13 resources.

NESDI project #484 (Replacing Film Radiography with Computed Radiography) is demonstrating computed radiology (CR) as a safer, more efficient alternative to film-based radiology, which produces approximately 120 gallons of hazardous waste per year at Fleet Readiness Center Southeast alone. Ian Hawkins (left), a non-destructive inspection engineer, assists Jesse Dandy, a radiographer, with taping a CR imaging plate to an F/A-18 Hornet wing for inspection of the wing spars in the real-time x-ray vault at FRC Southeast.

	3/31 Benchmark	Where We Were	9/30 Benchmark	Where We Were
Year 1 (FY13) $5.681M ($5,669,652) Revised Control 6/26/13				
• Obligations:	65%	**>65%**	95%	**100%**
• Expenditures:	20%	**18%**	56% $3.180M	**44%*** $2.597M
Year 2 (FY12) $5.845M CONTROL				
• Obligations:	97.5%	**100%**	100%	**100%**
• Expenditures:	81%	**62%**	95% $5.553M	**78%** $4.539M

**Represents a nine percent increase over FY12 (Year 1).*

In FY14, particular attention will be made to each Systems Command's spend plan and adjustments will be made throughout the year to meet benchmarks.

To better understand the challenges associated with meeting our current year expenditures, we conducted an analysis of in-house funding and contract funds. The NESDI program outsources between 30 and 40 percent of its efforts. Knowing this and knowing that contract expenditures are extremely low for year one benchmarks (due to awards being made late in the fiscal year and the billing cycle), nearly all of the expenditures come from in-house expenses. With this knowledge in hand, we can now better estimate how to structure future investments to maximize expenditures that meet benchmarks.

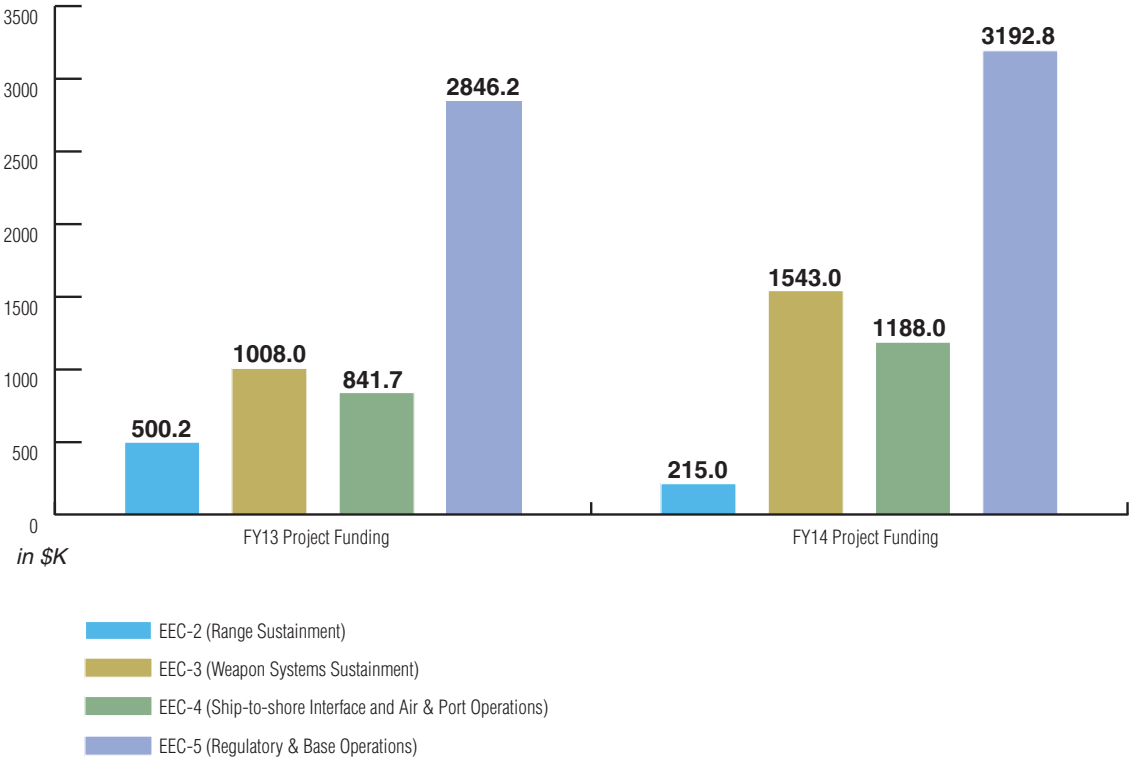
	Contracts ($K)	Contracts % of Control	In-House ($K)	In-House % of Control	Control
FY12 (actual)	2179	37%	3666	63%	5845
FY13 (actual)	1797	32%	3873	68%	5670
FY14 (projected)	1888*	42%	4598*	102%	4516

**Amount requested.*

The use of paint strippers containing hazardous air pollutants and volatile organic compounds has been severely limited in recent years. NESDI project #485 (Validating Alternatives to Methylene Chloride-based Chemical Paint Strippers) headed by Luc Doan is testing and demonstrating suitable alternatives to methylene chloride-based chemical paint strippers. Workers apply an alternative paint stripper candidate to an E-2 Hawkeye rotodome.

Project Funding: FY13 & FY14

The following graph shows program investments in relationship to EECs. The drop in FY14 funds is not reflected in the FY14 projected funding. But it is anticipated that each EEC will be reduced according to expenditure rates to be determined.



This NESDI project (Demonstrating Advanced Non-Chromate Primers and Coatings, project #458 is demonstrating new, state-of-the-art non-chromate replacements for use in primers and coatings for Navy aircraft. The T-44, T-34, T-6 and E-2C are some of the first aircraft to be treated with the new non-chromate primer.

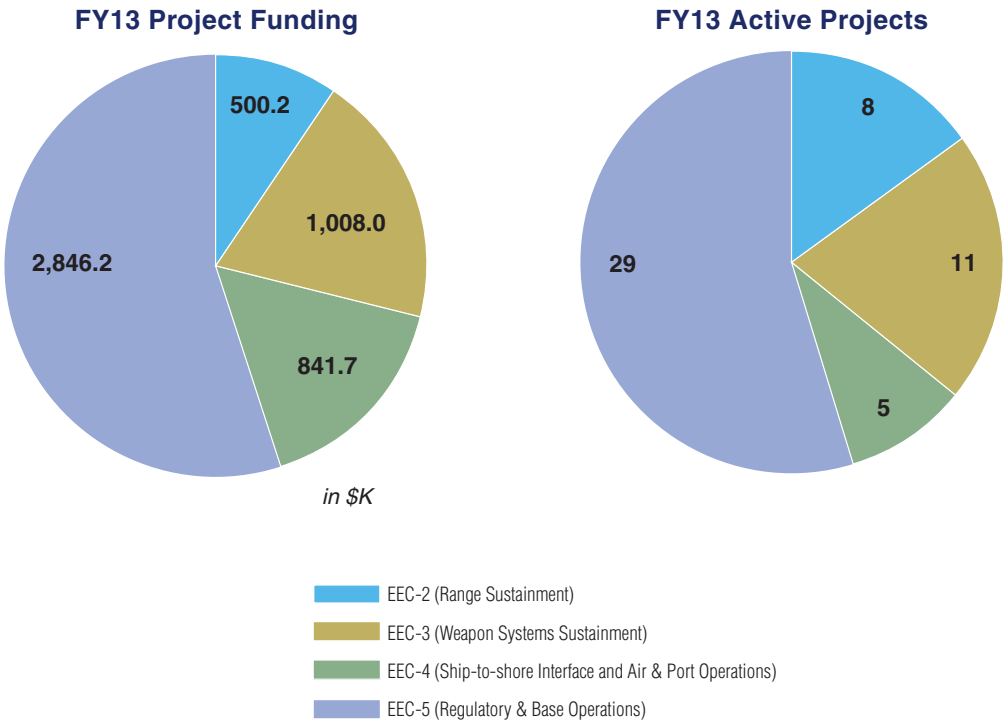
As part of the NESDI program's Reducing Cyanide Waste from Electroplating and Stripping Processes project #470, an alternative to cyanide-based silver electroplating and stripping processes is being tested at the Fleet Readiness Center (FRC) Southeast in Jacksonville, FL which will remove 700 pounds of cyanide yearly from the FRC's waste stream. Kami Downey, a chemist at FRC Southeast, dips an engine part into a silver electroplating solution. Electricity causes a chemical reaction allowing the silver to adhere to the surface of copper, nickel alloy, and steel.

To reduce hazardous waste disposal costs and turnaround time at Fleet Readiness Centers, NESDI project #486 (Qualifying Plastic Media Blast (PMB) as a Replacement for Chemical-based Paint Strippers) is testing a single type of PMB to replace both chemical paint strippers and two existing PMBs. Zak Ross, Principal Investigator, is shown demonstrating/validating type VIII PMB on an aluminum aircraft panel.

NESDI project #328 (Testing Non-Chromated Post-treatments) seeks to eliminate the Navy-wide use of chromated post-treatment coatings for corrosion resistance by testing and authorizing a trivalent chromium process as a non-chromated replacement. Post-treatment coatings are used widely on landing gear for the AV-8B and other aircraft.

Project Funding & Active Projects

In FY13, project funding was distributed across four EECs as shown in the pie chart on the left below. Active projects in FY13, were distributed by EEC in the right pie chart below.



Process & Perspectives

"I supported the NESDI program for so many years because I believe that the program provides a very important function for the Navy's environmental community." Jerry Olen

"The NESDI program provides NAVAIR engineers an opportunity to consider methods and materials that improve weapon systems performance while significantly reducing our environmental impacts." Nick Paraskevas

The NESDI Program Process

The NESDI program executes the same four-phased process each year—a process that consistently ensures the comprehensive collection of outstanding needs from the Fleet through the successful transition of workable solutions into the Navy's shoreside operating environment and its range at-sea testing and training activities.

The NESDI Program Process

The NESDI program executes the same four-phased process each year—a process that consistently ensures the comprehensive collection of outstanding needs from the Fleet through the successful transition of workable solutions into the Navy's shoreside operating environment and its range at-sea testing and training activities. The four phases of that process are summarized below.

1. Collect, Validate & Rank Needs

During this first phase of the process, the program's management team—the Technology Development Working Group (TDWG)—solicits environmental needs from across the Navy's shore community. Once received, the TDWG then validates and ranks those needs based on a variety of criteria including whether the need falls within one of the program's priority investment areas, the pervasiveness of the problem across the Navy, the extent and severity of the associated compliance risk, and the potential impacts on the mission of the Fleet if the need isn't addressed.

2. Collect, Evaluate & Rank Proposals

During this phase of the NESDI program process, the TDWG collects project proposals that address the needs collected in the first phase of the program process. In particular, the TDWG requests, collects and reviews short pre-proposals and the subsequent detailed, full-length project proposals then recommends to the program's resource sponsor (CNO N45) which projects should receive program support.

3. Execute Projects

Once proposals have been selected and funded, the program—through initial planning, ongoing reporting and management oversight—ensures that the projects remain properly focused on the needs they were intending to address.

4. Integrate Solutions

Throughout the project lifecycle, program personnel concentrate on moving the demonstrated technologies and other solutions out of the laboratories and demonstration sites and into the appropriate operational environment. During this fourth and final phase of the NESDI program process, the TDWG, Principal Investigators and technology integration specialists work together to ensure that various solutions are successfully integrated into the Fleet and weapons system acquisition programs and verify that the solutions provide the anticipated benefits.

Throughout this process, the program's targeted customers including need submitters, end users, technical authorities, and other stakeholders, provide valuable input to develop meaningful needs, support the ongoing execution of individual projects and help to ensure the successful integration of products and other solutions.

TDWG representatives, not surprisingly, are some of the NESDI program's staunchest advocates. Pat Earley, one of the Space and Naval Warfare Systems Command's (SPAWAR) representatives on the TDWG said, "I take the time to participate in the NESDI program because, in the present economic climate, this program is one of the last available mechanisms to provide demonstration and validation services to our customers. The NESDI program has a great reputation for facilitating this process and supporting our presence in the scientific community."

Jerry Olen, a departing member of the TDWG from SPAWAR, had similar thoughts. "I supported the NESDI program for so many years because I believe that the program provides a very important function for the Navy's environmental community."

Dave Brock, one of the newest members of the TDWG from NAVAIR, said "By participating in the NESDI program, I hope to improve upon the identification of environmental needs of acquisition program managers and improve the visibility of program Integrated Process Teams to the NESDI program and other solution providers."

Like Dave Brock, John Bendick from the Naval Supply Systems Command (NAVSUP), joined the TDWG during the course of FY13. "As a previous Principal Investigator, I always admired the NESDI program," John said. "The program demonstrated a collective approach via its TDWG and an openness to new ideas from all groups via its needs collection process. It is one of the few (if not the only) Navy environmental working groups that incorporates most Echelon II commands. Most of the other groups in which I participate have a much narrower focus."

John continued, "The pollution prevention programs here at NAVSUP aim to reduce environmental impacts through better sourcing and supply chain management—both ashore and afloat. I am hoping that the NESDI program can help me bridge the gap between material requirement generators and supply departments across the Navy."

Since Bill Hertel, TDWG representative from the Naval Sea Systems Command has been involved with the program, "the program has grown in large part due to the initiative taken by our program manager, increased support from our resource sponsor, outreach by the TDWG, more end user awareness and participation, and the ongoing education of our Principal Investigators." Now Bill takes the time to participate in the NESDI process so that he can advocate for the Fleet and user communities who perform the real work.

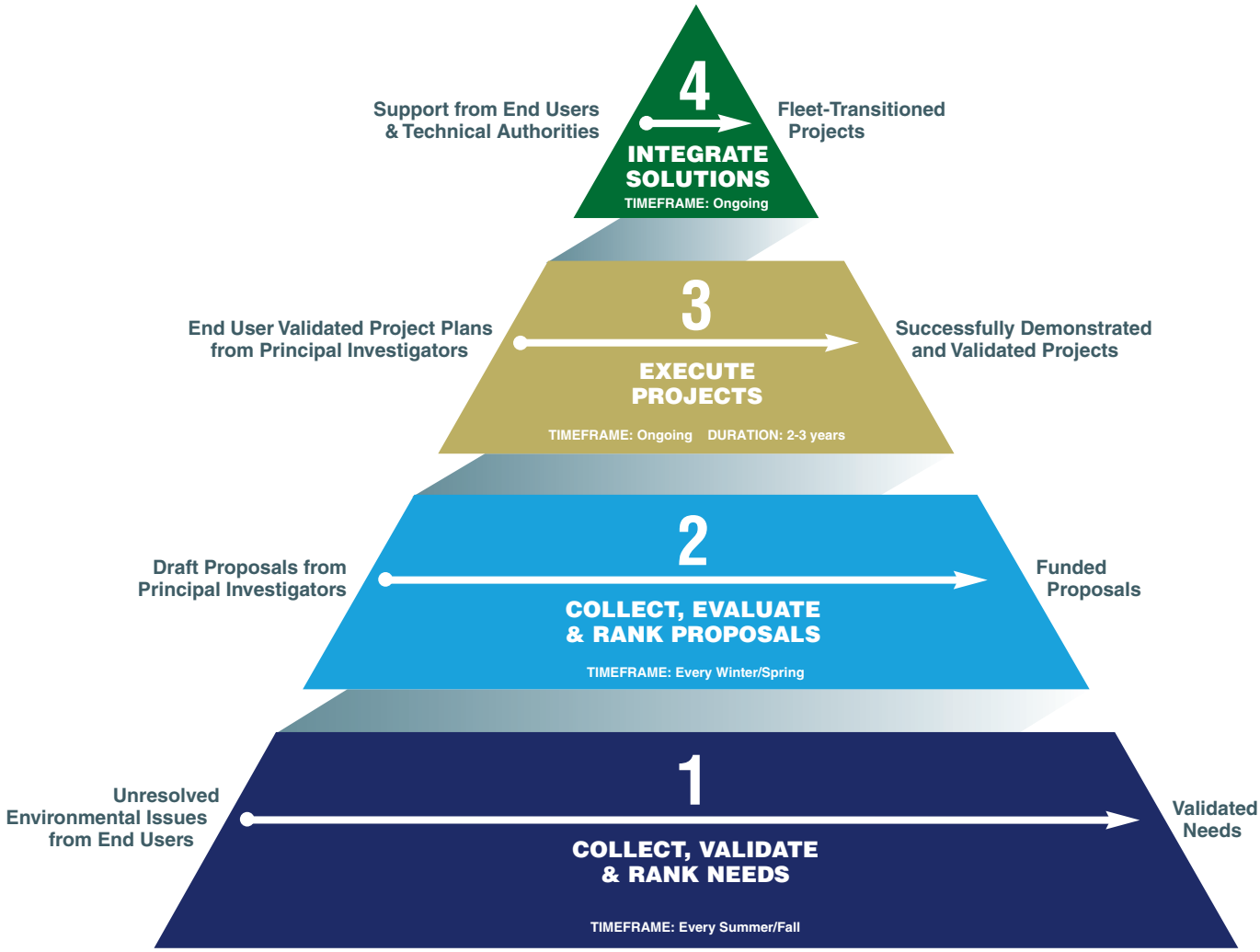
Bob Neumann CNO N45's Research and Development Test and Evaluation (RDT&E) Action Officer added, "The Navy needs new technologies to meet our compliance requirements and reduce the cost of those requirements in the face of serious budget cuts. That's why I take the time to support the NESDI program."

And according to Nick Paraskevas, one of the departing members of the TDWG from NAVAIR, "The NESDI program provides NAVAIR engineers an opportunity to consider methods and materials that improve weapon systems performance while significantly reducing our environmental impacts. Developing these types of materials benefits the Sailors who maintain our aviation platforms as well as the NAVAIR acquisition community that is looking for ways to reduce the costs to operate and support those platforms."

Barbara Sugiyama advocated for the NESDI program's ongoing support to her Command, much like Nick did for NAVAIR. She said, "The NESDI program continues to fund projects that support NAVFAC's mission—strengthening Navy and Marine Corps combat readiness worldwide through facilities lifecycle support focused on the Fleet, fighter, and family. The program is currently sponsoring projects that directly support NAVFAC's focus areas of enabling the warfighter, acting judiciously, and maintaining readiness. Over the past few years, the NESDI program has funded several range sustainability projects that support all three of these focus areas.

The program continues to be focused on cost-conscious solutions based on sound analyses that reinforce fiscal responsibility and produce technologies that allow the Navy to do more with less."

The inputs, outputs and timeframes associated with each of the above stages are highlighted in the following diagram. Outputs from each phase of this process as it was executed throughout FY13 are discussed in the following sections of this report along with additional perspectives from the Program Manager, past and present TDWG members, and representatives from our resource sponsor.



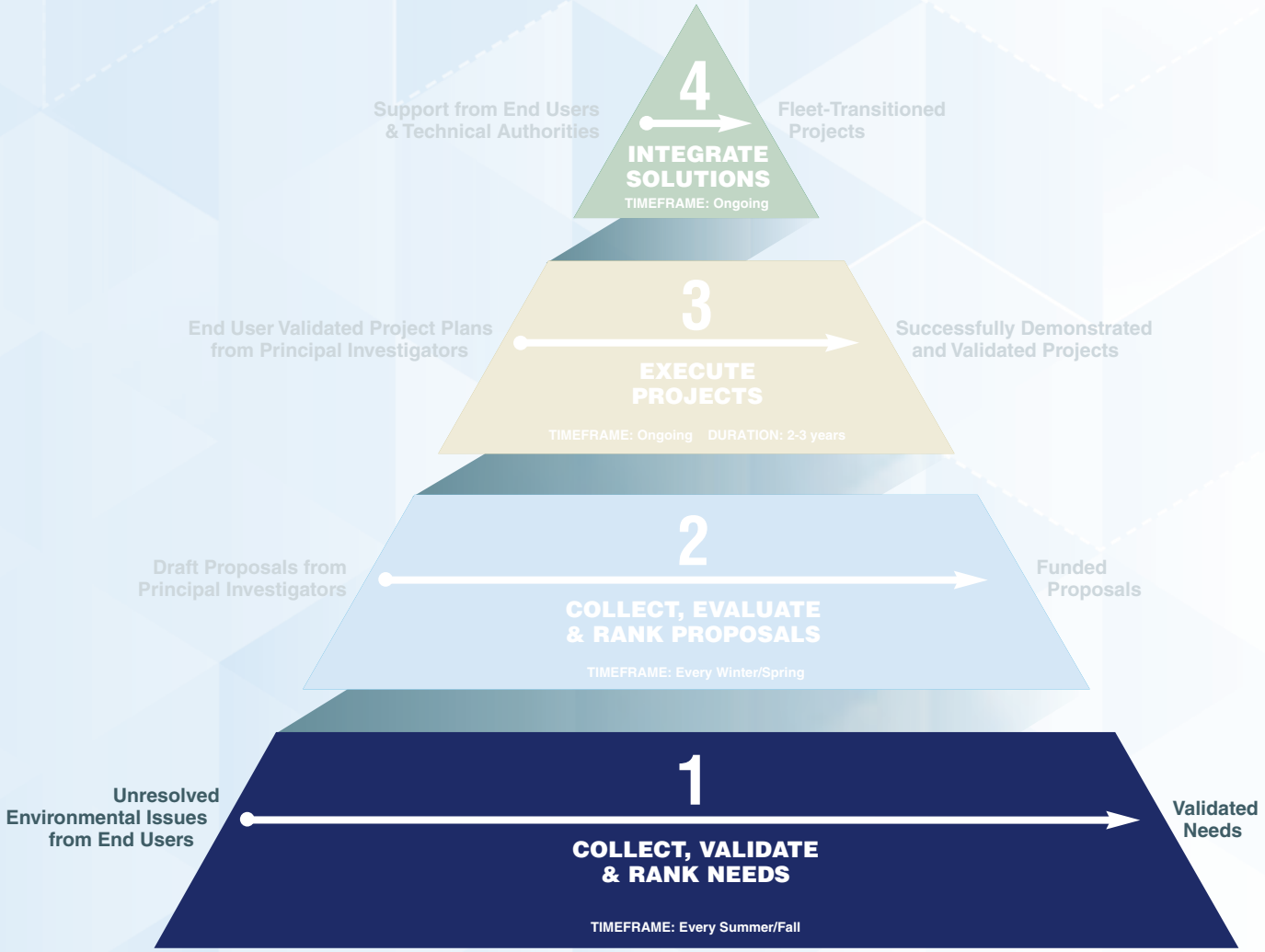
The NESDI Program Process

Process & Perspectives

"The NESDI needs collection process is where the program's validity begins and is further nurtured and made vital through our collaborative efforts." Bill Hertel

"I think we do a good job of validating the needs that we receive. We do a better job than we ever have of contacting the need submitter to get a better and complete picture of the need." Cindy Webber

Collect, Validate & Rank Needs



During this first phase of the process, the TDWG solicits environmental needs from across the Navy's shore community. Once received, the TDWG then validates and ranks those needs based on a variety of criteria including whether the need falls within one of the program's priority investment areas, the pervasiveness of the problem across the Navy, the extent and severity of the associated compliance risk, and the potential impacts on the mission of the Fleet if the need isn't addressed.

Collect, Validate & Rank Needs

In this section of the FY13 NESDI Year in Review report, we discuss the process that was followed and the output that was generated through the execution of the first phase of the program's annual process—the collection, validation and ranking of needs.

Process Overview & Perspectives

During this first phase of the process, the Technology Development Working Group (TDWG) solicits environmental needs from across the Navy's shore community. In addition to the program's formal needs solicitation process, Leslie Karr said that "direct communication during our field visits and subsequent sit down discussions with our end users and environmental liaisons have proven to be very effective. And the fact that everyone has a voice via the web site makes needs submission easy."

"The NESDI needs collection process is where the program's validity begins and is further nurtured and made vital through our collaborative efforts," said Bill Hertel.

According to Jerry Olen, "All of the stages of the NESDI process are valuable and critical to successfully delivering useful technologies or solutions to Navy end users. But the way we collect and rank needs and proposals is especially strong. In fact, the way we review needs coupled with the functionality of the web site are the best parts of our needs collection, evaluation and ranking process."

Bob Neumann agreed with Jerry when he said, "The strongest stage of the NESDI process is the TDWG's review of new needs and ongoing projects. And its most valuable asset is strong program management."

Once received, the TDWG then validates and ranks those needs based on a variety of criteria including whether the need falls within one of the program's priority investment areas, the pervasiveness of the problem across the Navy, the extent and severity of the associated compliance risk, and the potential impacts on the mission of the Fleet if the need isn't addressed.

Summary of Needs Collected, Validated & Ranked in FY13

Each year the NESDI program executes a formal process for collecting outstanding environmental needs from the Fleet. Fleet personnel or their representatives actively participated to identify and document various operational challenges.

To the degree that accurate and true needs are being input via the NESDI program's needs solicitation process, Leslie Karr believes that "the needs of the Systems Commands are being addressed. There are times, however when some needs fall through the cracks—especially those needs that cross organizational and functional boundaries among the Navy's various energy, environmental, occupational safety, and water conservation programs. So it's something we need to be more diligent about."

Lynn Cahoon, one of the TDWG representatives from the Naval Air Systems Command (NAVAIR) believes that the program's needs collection process is pretty straightforward and that needs from NAVAIR are, in fact, being addressed by the program although most of those needs come from Fleet Readiness Centers. "But sometimes those needs are too vague to act on," he said." We may need to get down into the weeds more often—hit more singles than homeruns."

Pat Earley has a slightly different take. "Although I think that our standardized needs submission format and our fixed program schedule work well, the limited availability of resources restricts the program's ability to fully address the needs we receive."

Although Cindy Webber, another TDWG representative from NAVAIR, thinks that the program is meeting NAVAIR's needs, she thinks there are more environmental needs out there and "it would be nice to reach more of the right people with other, true needs."

Bill Hertel feels as though NAVSEA's needs are being addressed by the NESDI program. "But I believe that I advocate for more than one Systems Command. There are never enough useful execution templates or successful integration schemes to be easily replicated for recurring success. This makes the job challenging, worthwhile and tests my ability to be truly effective," he said.

"We have made great strides identifying opportunities with and refining the needs of our users," Bill continued. "This is where critical awareness is gained, relationships are established, and trust is built. With sufficient communication, good temperament and due diligence, long term collaboration and opportunities for solution development and successful integration are more likely. The success, acceptance and recognition of our projects are the greatest credits that can be paid to the program."

Jerry Olen believes that the program's project *Development of a Collaborative PESHE Document Authoring Tool for All Navy Commands* (#461) "is a good example of how my Systems Command's needs are being met by the program."

For FY13, the NESDI program's needs collection process yielded 58 submittals from across the Navy. After a thorough review by program personnel, a solicitation for proposals was executed to address 20 needs determined to be priorities by personnel from the program's management team—the TDWG—and resource sponsor—the Chief of Naval Operations Energy and Environmental Readiness Division (CNO N45). Successful proposals will result in new projects beginning in FY13 and beyond.

A summary of all 58 of the needs collected via the program's FY13 solicitation is provided below:

No.	Need	Command	Title
1.	N-0909-13	NAVFAC	CHRIMP Implementation and Base-Wide Information System
2.	N-0908-13	NAVFAC	Real-Time Drinking Water Contamination Detection System
3.	N-0907-13	NAVFAC	Effective Operation and Maintenance of Stormwater Best Management Practices/Low Impact Development
4.	N-0906-13	NAVFAC	Autonomous Underwater Vehicle Monitoring of Marine Environment Contaminants in Harbors and Waterways Impacted by Naval Operations
5.	N-0905-13	NAVAIR	Evaluation and Demonstration/Validation of Non-Chromated Bond Primer for Structural Metal-to-Metal Adhesive Bonding
6.	N-0904-13	NAVFAC	Pilot Study to Evaluate the Effectiveness Treatment Technologies for Reduction of Trihalomethanes and Formation Potential in a Water System
7.	N-0903-13	NAVAIR	Non-Perfluorooctyl Sulfonate Fume Suppressants
8.	N-0902-13	NAVAIR	Revised Chromium National Emissions Standards for Hazardous Air Pollutants Housekeeping Compliance
9.	N-0901-13	CNIC	Cultural Resource Document Management System
10.	N-0900-13	NAVSEA	Develop Process and Equipment to Capture Smoke Plume from Oxy-Fuel Cutting Torch During Ship Demolition
11.	N-0899-13	NAVAIR	De-Painting of Naval Aircraft — Alternative to Chemical/Media Removal Technology
12.	N-0898-13	NAVSEA	Develop Process and Equipment for Wholesale Removal of Rubber Coating on Submarines
13.	N-0897-13	NAVFAC	Integrated Systems for Energy Harvest from Wastewater Treatment
14.	N-0896-13	NAVFAC	Reduce Potable Water Consumption at Navy Bases
15.	N-0895-13	NAVAIR	Elimination of Hexavalent Chromium from Aircraft Structural Adhesive Bonding
16.	N-0894-13	NAVFAC	Integrated Water Management Strategies to Develop Next Generation Sustainable Desalination Systems
17.	N-0893-13	NAVFAC	Shore-Side Sewage Odor Control from Ship Collection and Holding Tank Off-Load
18.	N-0892-13	NAVFAC	Enterprise Hazardous Waste Database Program
19.	N-0891-13	NAVFAC	Management Tool for Increasing Black Abalone Populations on San Nicolas and San Clemente Island to Support Mission Sustainability
20.	N-0890-13	NAVFAC	Reducing Total Trihalomethanes in a Water Distribution System
21.	N-0889-13	NAVFAC	Oil Containment Boom Cleaning - Wastewater and Solids Management
22.	N-0888-13	NAVFAC	Develop Tools to Meet the Requirements of National Pollutant Discharge Elimination System (NPDES) Pesticide General Permit
23.	N-0887-13	NAVSEA	Drydock Sediment Management
24.	N-0886-13	Other	Training Impact Management During Bird Nesting Season
25.	N-0885-13	NAVSEA	Need to Find a Durable and Effective Membrane or Coating/ Sealant Product to Facilitate Dry Dock Floor Surface Cleaning
26.	N-0884-13	NAVSEA	Identify New Technology to Monitor Copper in Dry Dock Wastewater and Treat Copper to Less than 2.4 Parts Per Billion
27.	N-0883-13	NAVAIR	Ultra High Pressure Water Jet System Equipment Procurement and Related Installation
28.	N-0882-13	NAVAIR	Electro-Magnetic Non-Destructive Inspection for Navy Aircraft Surface and Parts

No.	Need	Command	Title
29.	N-0881-13	NAVAIR	Low Maintenance Wash Rack System
30.	N-0880-13	NAVAIR	Filtering Aqueous Plating and Cleaning Shop Chemicals to Extend Bath Life
31.	N-0878-13	NAVAIR	Replace Lead Moldings for Sheet Metal Forming with New Technology
32.	N-0877-13	NAVAIR	Replace Cadmium Plating on Navy Aircraft Parts
33.	N-0876-13	NAVFAC	Improved Methods and Tools for Remedy Selection at Contaminated Sediment Sites
34.	N-0875-13	NAVFAC	Cost-Effective Remediation at Munitions Response Site: Carrizo Impact Area, Naval Air Facility El Centro
35.	N-0874-13	NAVFAC	Alternative Treatment Technology to Pump and Treat for Munitions Constituent-Contaminated Groundwater
36.	N-0873-13	NAVAIR	Metalast Anodize Processing System to Substitute Trivalent Chrome Sealer for Hexavalent Chrome Sealer
37.	N-0872-13	NAVAIR	Demonstrate Nanocrystalline Cobalt Phosphorous on Specific Navy Aircraft Parts at Fleet Readiness Center Southwest
38.	N-0871-13	NAVAIR	Low-Volatile Organic Compound and Low-Hazardous Air Pollutant Wipe Solvent and Paint Thinner Demonstration and Validation
39.	N-0870-13	NAVSEA	Biological-Fouling Reduction to Ships Cooling Water Systems
40.	N-0869-13	NAVFAC	Demonstration of Sustainable Remedy for Treating Low pH Aquifer Contaminated with Continuing Source of Perchloroethylene (PCE) and Trichloroethylene (TCE) from Closed Landfill
41.	N-0868-13	NAVFAC	Develop Specifications Appropriate for Qualification of Biobased Greases
42.	N-0867-13	NAVFAC	Reduce Stormwater Management Fees
43.	N-0866-13	NAVFAC	Certification of Biobased Precision Cleaners and Solvents
44.	N-0865-13	NAVFAC	New Storage Tank Regulations Require Secondary Containment Even for Mobile Pierside Tankers
45.	N-0864-13	NAVFAC	Pier Side High Pressure Air Compressor Condensate Blow Down Containment
46.	N-0863-13	NAVFAC	Alternative Targets for Remote Operational Ranges
47.	N-0862-13	NAVSEA	NPDES Clean Sampling Techniques
48.	N-0861-13	NAVFAC	Compliance Options Study for NPDES for Cooling Water Intake Structures at Existing Facilities
49.	N-0860-13	CNIC	Bulk Shoreside Oily Water Recycling System
50.	N-0859-13	NAVFAC	Requirement for More Specific and Stringent Lab Protocols when Dealing with Vapor Intrusion Sampling Analysis
51.	N-0858-13	NAVFAC	Environmental Planning and Permitting Requirements Assessment and Analysis for Department of the Navy Ocean Energy Projects
52.	N-0857-13	Other	Hazardous Waste/Material Operational Order
53.	N-0856-13	NAVAIR	Removal of High Velocity Oxygen Fuel Coatings
54.	N-0852-13	NAVFAC	Navy New Construction or Renovation Policy to Use Materials without Asbestos
55.	N-0851-13	NAVFAC	Natural Gas Emergency Generators
56.	N-0850-13	NAVFAC	Jet Noise Reduction
57.	N-0848-13	NAVSEA	Behavioral Effects of High Intensity Noise on Fish
58.	N-0847-13	NAVFAC	Reduce Wastewater Treatment Plant Salinity

Once needs were compiled, the TDWG met to consider all of the needs—determining whether a need was valid (within the scope of the NESDI program, not already being addressed by the program, etc.).

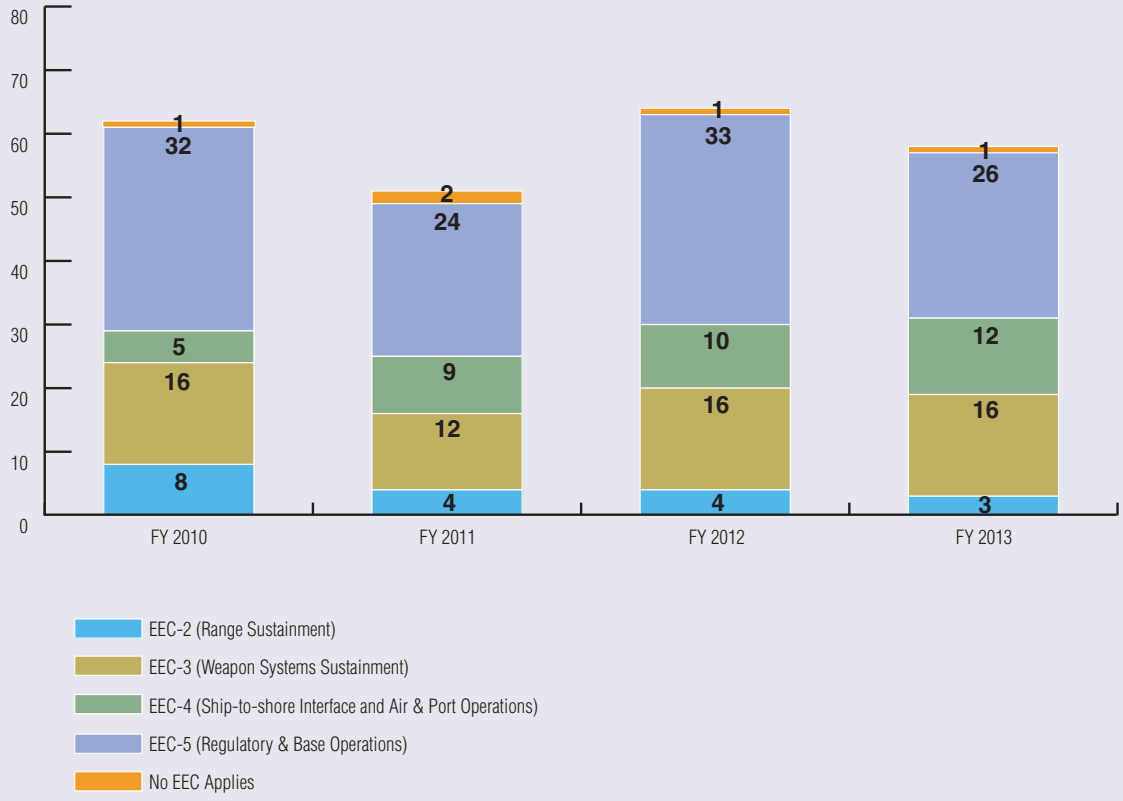
With regard to the validation of needs, Cindy Webber said, "I think we do a good job of validating the needs that we receive. We do a better job than we ever have of contacting the need submitter to get a better and complete picture of the need."

The TDWG then ranked those needs based on the program's investment priorities. Once the TDWG had completed its rankings, those preliminary rankings were passed along to the appropriate Subject Matter Experts (SME) at CNO N45. After a thorough review by the TDWG and approval by CNO N45 SMEs, the following 20 priority Fleet operational needs (with environmental solutions) were selected as the basis for new projects in FY14 and beyond.

No.	Need	Command	Title
1.	N-0847-13	NAVFAC	Reduce Wastewater Treatment Plant Salinity
2.	N-0861-13	NAVFAC	Compliance Options Study for National Pollutant Discharge Elimination System (NPDES) for Cooling Water Intake Structures at Existing Facilities
3.	N-0862-13	NAVSEA	NPDES Clean Sampling Techniques
4.	N-0867-13	NAVFAC	Infrastructures Reducing Stormwater Fees
5.	N-0869-13	NAVFAC	Demonstration of Sustainable Remedy for Treating Low pH Aquifer Contaminated with Continuing Source of Chlorinated Ethenes Tetrachloroethene and Trichloroethene from Closed Landfill
6.	N-0870-13	NAVSEA	Biological Fouling Reduction to Ships Cooling Water Systems
7.	N-0871-13	NAVAIR	Low-Volatile Organic Compound and Low-Hazardous Air Pollutant Wipe Solvent and Paint Thinner Demonstration/Validation
8.	N-0874-13	NAVFAC	Alternative Treatment Technology to Pump and Treat for Munitions Constituent- Contaminated Groundwater
9.	N-0876-13	NAVFAC	Improved Methods and Tools for Remedy Selection at Contaminated Sediment Sites
10.	N-0878-13	NAVAIR	Replace Lead Moldings for Sheet Metal Forming with New Technology
11.	N-0880-13	NAVAIR	Filtering Aqueous Plating and Cleaning Shop Chemicals to Extend Bath Life
12.	N-0883-13	NAVAIR	Ultra High Pressure Water Jet System Equipment Procurement and Related Installation
13.	N-0887-13	NAVSEA	Drydock Sediment Management
14.	N-0895-13	NAVAIR	Elimination of Hexavalent Chromium from Aircraft Structural Adhesive Bonding
15.	N-0898-13	NAVSEA	Develop Process and Equipment for Wholesale Removal of Rubber Coating on Submarines
16.	N-0899-13	NAVAIR	De-Painting of Naval Aircraft - Alternative to Chemical/Media Removal Technology
17.	N-0900-13	NAVSEA	Develop Process and Equipment to Capture Smoke Plume from Oxy-Fuel Cutting Torch During Ship Demolition
18.	N-0902-13	NAVAIR	Revised Chromium National Emissions Standard for Hazardous Air Pollutants Housekeeping Compliance
19.	N-0906-13	NAVFAC	Autonomous Underwater Vehicle Monitoring of Marine Environment Contaminants in Harbors and Waterways Impacted by Naval Operations
20.	N-0907-13	NAVFAC	Effective Operation and Maintenance of Stormwater Best Management Practices/Low Impact Development

FY10 – FY13 Needs Collected

Distribution of needs collected by the NESDI program has been relatively consistent for the past four years—most needs being collected in Regulatory & Base Operations (EEC-5).

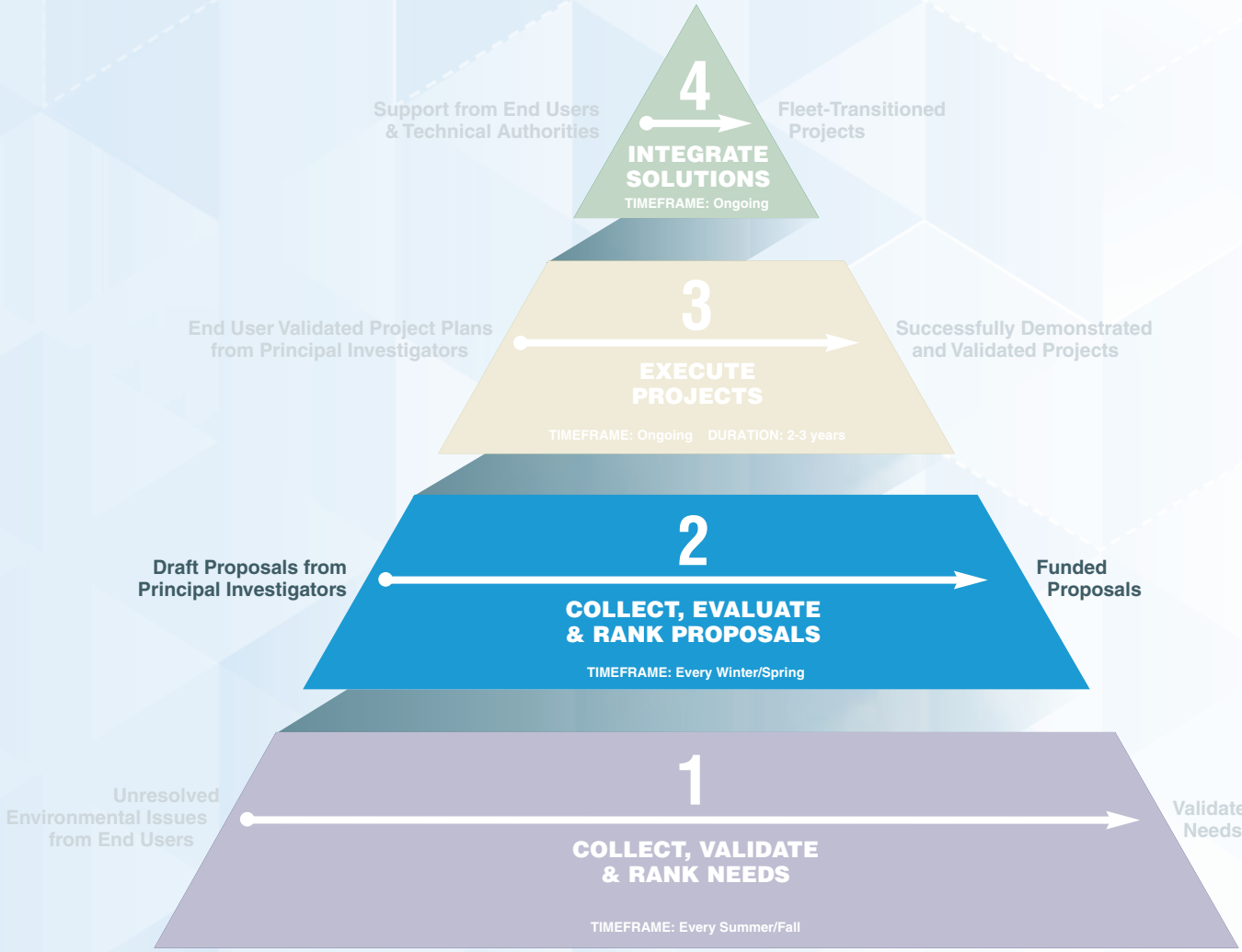


Process & Perspectives

"Our proposal development process allows us to develop professional relationships with our ultimate customers (the end users) and give them the confidence that their issues are important and being considered." Pat Earley

"The effectiveness of our proposal process continues to be borne out in the investments we have made in our shipyards—interests that are often challenging and further complicated by individualized performance requirements, financial priorities, acceptance criteria and approval difficulties." Bill Hertel

Collect, Evaluate & Rank Proposals



During this first phase of the process, the TDWG solicits environmental needs from across the Navy's shore community. Once received, the TDWG then validates and ranks those needs based on a variety of criteria including whether the need falls within one of the program's priority investment areas, the pervasiveness of the problem across the Navy, the extent and severity of the associated compliance risk, and the potential impacts on the mission of the Fleet if the need isn't addressed.

Collect, Evaluate & Rank Proposals

Process Overview & Perspectives

During this second phase of the NESDI program process, the TDWG collects project proposals that address the needs that were collected in the first phase of the program process.

The program first requests, collects and reviews short (one to two pages) pre-proposals to ensure that the proposed project adequately addresses the subject requirements. The program concentrates on technologies that are sufficiently mature for demonstration and validation and support the overall environmental readiness of the Fleet and Navy acquisition communities.

According to Leslie Karr, "Our proposal process is fairly easy and straightforward. It allows time between the pre- and full proposal stage to capture comments from a variety of potential end users. And as long as the Principal Investigator has done their due diligence and put in the effort to clearly communicate the details needed to make a good decision to fund or not fund a particular proposal, then I think our process is pretty forgiving. But paying attention to the details at the outset pays off in the long run."

Pat Earley seems pretty satisfied with the program's proposal management process. "Our proposal process is fairly easy and straightforward with an established evaluation methodology."

He added, "Our proposal development process allows us to develop professional relationships with our ultimate customers (the end users) and give them the confidence that their issues are important and being considered."

Cindy Webber agreed when she said, "Overall, our proposal process—fairly standard for R&D programs—works pretty well."

Bill Hertel believes that we have made great strides in further expanding the input we receive from policymakers and our end users. "This outreach has had a marked influence on the quality of the initial investments made by the program while acting as a means to expand and achieve critical advocacy for our follow-on investment decisions," said Bill.

Bob Neumann is among the policymakers that Bill Hertel is talking about. "Since I have been the RDT&E Action Officer, we have made great progress on increasing the input and participation from the Subject Matter Experts here at CNO N45," said Bob.

With regard to the proposal management process, Jerry Olen said, "Our proposal process works pretty well although I would minimize the number of pre-proposals we request based on the funding that is available."

Pat Earley believes that "some additional template guidance should be developed to avoid the extreme range of details that we see in some of our pre-proposals." From the NAVAIR perspective, Cindy Webber said, "It might make sense to create a gatekeeper system—something the other Systems Commands have already instituted. I think it would help to ensure that we receive all of the information we need to assess the viability of our pre-proposals."

Finally, Bill Hertel said, "The effectiveness of our proposal process continues to be borne out in the investments we have made in our shipyards—interests that are often challenging and further complicated by individualized performance requirements, financial priorities, acceptance criteria and approval difficulties."

Summary of Pre-proposals Requested & Received

In FY13, the NESDI program collected a total of 22 pre-proposals summarized in the table below:

No.	ID	Title	Command	Need Addressed	EEC
1.	187	Dry Dock Sediment Management	NAVSEA	N-0887-13	4
2.	186	Low-VOC and Low-HAP Wipe Solvent and Paint Thinner Demonstration/Validation	NAVAIR	N-0871-13	5
3.	185	Demonstration of Non-Chromated Adhesive Bond Primer for Metal Repair Bonding	NAVAIR	N-0895-13	3
4.	184	Site Specific Training Modules to Incorporate Trace Metal Clean Sampling and Analytical Methods into NPDES Programs	NAVFAC	N-0862-13	5
5.	183	Cavitation Technology for Reducing Biofouling in Seawater Cooling Systems	SPAWAR	N-0870-13	4
6.	182	Identification of Alternative De-Painting Technologies to Chemical and Media Removal Techniques	NAVAIR	N-0899-13	3
7.	181	Autonomous Underwater Vehicle (AUV) Monitoring of Marine Environment Contaminants in Harbors and Waterways Impacted by Naval Operations	NAVFAC	N-0906-13	4
8.	180	Surface Craft Based Water Quality and Harbor Environment Monitoring, Using ROV and AUV Technology Schemes	NAVSEA	N-0906-13	4
9.	179	Lifecycle Cost - Operation and Maintenance of Stormwater BMPs/LID	NAVFAC	N-0907-13	5
10.	178	Evaluation and Implementation of Compliance Options for NPDES Cooling Water Intake Structures at Existing Facilities	SPAWAR	N-0861-13	4
11.	177	Elimination of Ship Cooling Water Discharges During Dock Side Operations	SPAWAR	N-0870-13	4
12.	176	Demonstration of AUVs for Environmental Monitoring	SPAWAR	N-0906-13	4
13.	175	Biological-Fouling Reduction to Ships Cooling Water Systems	NAVFAC	N-0870-13	4
14.	174	Trace-Metal Clean Sampling and Analytical Techniques for NPDES Permits	SPAWAR	N-0862-13	5
15.	173	Dry Dock Sediment Discharge Pump	SPAWAR	N-0887-13	4
16.	172	An Online Decision Support Tool for Selection of Sustainable Remedies at Navy Contaminated Sediment Sites	SPAWAR	N-0876-13	5

(continued)

Summary of Pre-proposals Requested & Received

(continued)

No.	ID	Title	Command	Need Addressed	EEC
17.	171	Aerobic Bioaugmentation for Remediation of RDX-Contaminated Groundwater	NAVFAC	N-0874-13	5
18.	170	Biological-Fouling Reduction to Ships Cooling Water Systems	SPAWAR	N-0870-13	4
19.	169	Emissions Capture Technology for Oxy-Fuel Hull Cutting Operations	NAVSEA	N-0900-13	5
20.	168	Sustainable Remediation of Low Ph Aquifers and Aquifers with a Continuing Contaminant Source Using Proton Reduction Technology	NAVFAC	N-0869-13	5
21.	167	Evaluation of LID Implementation	SPAWAR	N-0907-13	5
22.	166	Demonstration of Microbial Capacitive Desalination for Wastewater and Salinity Treatment	SPAWAR	N-0847-13	5

If a pre-proposal is determined to be sufficiently focused on a viable solution to the targeted need, a more detailed, full proposal (three to five pages) is solicited from the Principal Investigator who submitted the pre-proposal. The full proposal defines quantifiable performance metrics to evaluate the ultimate success of the project and presents baseline data for later comparison to post-integration conditions.

Proposals that address the high priority needs and are judged to be well structured and feasible to implement receive the highest consideration.

Summary of Full Proposals Requested & Received

In FY13, the NESDI program received the following 11 full proposals:

No.	Title	Need ID	EEC	Command	Objective
1.	Dry Dock Sediment Management	N-0887-13	4	NAVSEA	The objective of this project is to deliver and demonstrate a versatile and robust compilation of tools and methods to reduce NPDES permit violations through the collection and removal of contaminant-laden sediment.
2.	Elimination of Ship Cooling Water Discharges During Dock Side Operations	N-0870-13	4	SPAWAR	The objective of this project is to provide an engineering analysis that will make recommendations and provide general specifications for a high performance closed loop cooling tower system capable of eliminating ship cooling water discharges during dock side operations.
3.	Evaluation and Implementation of Compliance Options for NPDES Cooling Water Intake Structures at Existing Facilities	N-0861-13	4	SPAWAR	The objective of this project is to review and evaluate existing cooling water intake systems at three Navy sites that will be impacted by the new U.S. Environmental Protection Agency rule.
4.	Lifecycle Cost — Operation and Maintenance of Stormwater Best Management Practices (BMP) and Low Impact Development (LID)	N-0907-13	5	NAVFAC	The objective of this project is to provide the Navy with an updated stormwater decision support tool that includes detailed lifecycle cost information on the installation, operation, and maintenance of BMPs/LIDs.
5.	Demonstration of Non-Chromated Adhesive Bond Primer for Metal Repair Bonding	N-0895-13	3	NAVAIR	The objective of this project is to verify the performance of the non-chromated primer (BR 6747-1NC) against the control, chromated primer (BR 6747-1).
6.	Aerobic Bioaugmentation for Remediation of RDX-Contaminated Groundwater	N-0874-13	5	NAVFAC	This project will demonstrate an innovative application of bioaugmentation to enhance RDX biodegradation in contaminated groundwater under aerobic conditions.
7.	Low-VOC and Low-HAP Wipe Solvent and Paint Thinner Demonstration and Validation	N-0871-13	3	NAVAIR	The objective of this project is to demonstrate and validate that the low-HAPs, low-VOC thinner developed by the Army Research Laboratory can serve as a “drop-in” solution to the environmental issues associated with MIL-T-81772 materials used in naval aviation coatings and solvent cleaning applications.

(continued)

Summary of Full Proposals Requested & Received

(continued)

No.	Title	Need ID	EEC	Command	Objective
8.	Emissions Capture Technology for Oxy-Fuel Hull Cutting Operations	N-0900-13	5	NAVSEA	The objective of this project is to provide an additional technology for the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS&IMF) to eliminate, reduce or control visible particulate matter emissions/ opacity during ship breaking operations.
9.	Sustainable Remediation of Low Ph Aquifers and Aquifers with a Continuing Contaminant Source Using Proton Reduction Technology	N-0869-13	5	NAVFAC	The objective of this project is to demonstrate a sustainable (solar-powered) technology for treating low pH, low permeability, and/or continuing contaminant source aquifer sites. The system will be constructed in the form of a permeable reactive barrier that will allow biological treatment of the contaminants to regulatory levels and prevent the migration of chlorinated solvents from the demonstration site.
10.	Evaluation of LID Implementation	N-0907-13	5	SPAWAR	The purpose of this project is to demonstrate the effectiveness of LID technology in reducing flow, contaminant loads, and toxicity in stormwater at non-industrial Navy sites.
11.	Biological-Fouling Reduction to Ships Cooling Water Systems	N-0870-13	4	NAVFAC	The objective of this demonstration is to validate the effectiveness, ease of implementation, safety, and cost savings of the innovative i2 bubble infusion technology as a means to significantly reduce the fouling rate and microbiologically influenced corrosion (MIC) within a ship board water system during pier side maintenance.

Summary of "New Start" Projects for FY13

The program then turned its attention to reviewing the 11 full proposals received. This review often involves additional communication with the proposal submitter if additional insights, details, and/or clarification are warranted.

At the end of this review of full proposals, the TDWG generated a ranked list of recommended project "new starts" and sent it to CNO N45 for their final review and approval. The full proposal review process in FY13 resulted in the following 10 recommended project "new starts."

No.	ID	EEC	Title	Command
1.	500	3	Demonstration of Non-Chromated Adhesive Bond Primer for Metal Repair Bonding	NAVAIR
2.	504	3	Low-VOC and Low-HAP Wipe Solvent and Paint Thinner Demonstration and Validation	NAVAIR
3.	502	4	Biological-Fouling Reduction to Ships Cooling Water Systems	NAVFAC
4.	503	4	Dry Dock Sediment Management	NAVSEA
5.	506	4	Evaluation and Implementation of Compliance Options for NPDES Cooling Water Intake Structures at Existing Facilities	SPAWAR
6.	497	5	Evaluation of Low Impact Development Implementation	SPAWAR
7.	498	5	Emissions Capture Technology for Oxy-Fuel Hull Cutting Operations	NAVSEA
8.	499	5	Aerobic Bioaugmentation for Remediation of RDX-Contaminated Groundwater	NAVFAC
9.	501	5	Sustainable Remediation of Low Ph Aquifers and Aquifers with a Continuing Contaminant Source Using Proton Reduction Technology	NAVFAC
10.	505	5	Lifecycle Cost - Operation and Maintenance of Stormwater BMPs/LIDs	NAVFAC

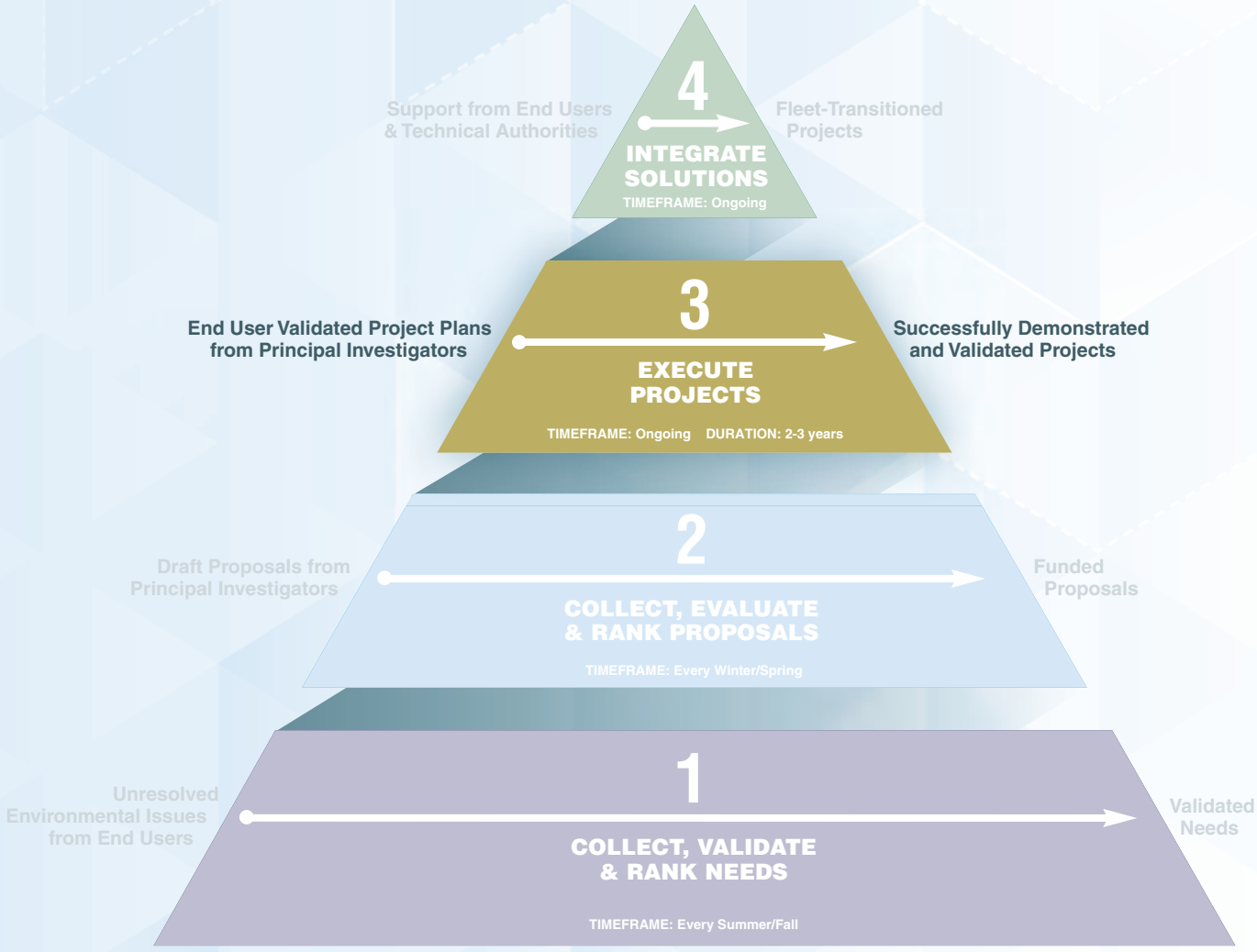
To eliminate the use of cadmium on high-strength steel components, NESDI project #450 (Validating a Zinc-Nickel Alternative to Cadmium Tank Electroplating) is demonstrating and validating an alternative process using alkaline zinc-nickel alloy electroplating. High-strength steel components, such as bushings and landing gear, are found on aircraft such as the P-3, EA-6B, E-2/C-2, SH-60, and F/A-18 series aircraft shown here.

Process & Perspectives

"NESDI management and the TDWG are always willing to help any Principal Investigator with any challenges they may face. Our Principal Investigators are doing an important job and their efforts are appreciated." Cindy Webber

"The program listens, provides flexibility, offers support and engages its resource sponsor, Principal Investigators, and end users to achieve a common goal." Bill Hertel

Execute Projects



Once proposals have been selected and funded, the program—through initial planning, ongoing reporting and management oversight—ensures that the projects remain properly focused on the needs they were intending to address.

Process Overview & Perspectives

Once proposals have been selected and funded, the program—through initial planning, ongoing reporting and management oversight—ensures that the projects remain properly focused on the needs they were intending to address.

"Project execution is difficult in a demonstration/validation environment, however the NESDI program allows for reasonable variances for meeting execution requirements," said Pat Earley. "At the same time, we need to continue to hold our Principal Investigators accountable for the successful integration of their projects," he continued.

Compared to other demonstration and validation programs, Lynn Cahoon believes that "the NESDI program has its act together—so much so that it is being mirrored by other programs."

"To support the execution of its projects, the NESDI program solicits feedback from our Principal Investigators and encourages them throughout the duration of their projects," Lynn explained. "The NESDI program will even provide supplemental resources where warranted to make a project successful where other programs don't seem to care."

"Overall, I think that NESDI projects are fairly well executed. Our annual program reviews go a long way to ensure the successful execution of our projects," said Jerry Olen.

"The program listens, provides flexibility, offers support and engages its resource sponsor, Principal Investigators, and end users to achieve a common goal," said Bill Hertel.

With regard to the efficient and effective execution of individual NESDI projects, Leslie Karr believes that "those Principal Investigators who take the time to plan well, usually execute well."

> ***Those Principal Investigators who take the time to plan well, usually execute well.***
> *—Leslie Karr*

She continued, "Projects that have good team members also tend to execute well. Regulatory issues may change over the course of the project or differ throughout the Navy (by State) which can make execution especially difficult. Project Management Plans and spend plans can help to ensure sound project execution."

Cindy Webber believes that a majority of NESDI projects are very well executed. And, like Leslie Karr, Cindy believes that "projects that are well planned upfront tend to have the highest probability of being completed on time. And well-executed projects seem to be executed by effective Principal Investigators—regardless of the project and subject matter."

With regard to execution, Cindy Webber believes that "NESDI management and the TDWG are always willing to help any Principal Investigator with any challenges they may face. Our Principal Investigators are doing an important job and their efforts are appreciated."

Dave Brock agreed. "The Principal Investigators I have spoken with said that the NESDI program is a good program to work for. And if the program had a central mechanism which could allow its Principal Investigators to more easily obtain supplies and incidental engineering services, it might lead to an even quicker, more efficient execution of projects."

"In these times of reduced opportunity, increased responsibility, diminished budgets and competing needs, it is sometimes challenging for our Principal Investigators to execute their tasks and for end users to engage in efforts that are somewhat outside their immediate area of responsibility," said Bill Hertel. "The degree to which our Principal Investigators are successful depends largely on their individual experience, demeanor, and due diligence. It may also depend on their ability to establish early support from end users, document performance or design requirements, conduct unbiased initial solution sourcing, execute contracted efforts, identify and secure complementary funding, and identify and establish integration pathways."

Pat Earley has seen "increased program transparency and accountability associated with the execution of our projects" since joining the TDWG, while Cindy Webber believes that projects have become more representative and cover all of the Systems Commands since she joined the program. "We have also increased the financial accountability of our projects," claimed Cindy.

"During my time as a TDWG member, I learned how broad environmental needs are across the Navy," said Jerry Olen.

Bill Hertel had this to add. "The program can continue to encourage and support outreach conducted by individual TDWG members, provide ongoing assistance to its Principal Investigators, continue to support the ongoing evolution of its web site as a tool to support program execution and management, support the strong and appropriate selection of Principal Investigators, and advance efforts to increase the awareness and viability of the program's project successes by the greater Navy."

Active Projects 2013

In FY13, the NESDI program supported nearly three dozen active projects ranging from a demonstration a low cost, real time sensor to detect chlorinated solvents to an analysis of copper-based torpedo guidance wire and nylon sonobuoy decelerators (parachutes) to better understand the potential environmental impacts of these Military Expendable Materials. In particular, the following 34 projects were active in FY13.

No.	ID	Title	EEC
1.	347	Long Term Disposition of Seafloor Cables	2
2.	437	Implementation of Forensic Approaches to Address Background Perchlorate Source Identification and Characterization at Navy Facilities and Ranges	2
3.	462	Military Expendable Material	2
4.	465	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater Unexploded Ordnance Sites	2
5.	471	Site Analysis for the Detection and Classification of Munitions and Explosive of Concern in Shallow Highly-Dynamic Underwater Environments	2
6.	328	Non-Chromated Post Treatments	3
7.	348	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	3
8.	428	Bio-based Hydraulic and Metal Working Fluids	3
9.	450	Cadmium Tank Electroplating Alternative	3
10.	451	Navy Demonstration of Cadmium and Hexavalent Chromium Free Electrical Connectors	3
11.	458	Advanced Non-Chromate Primers and Coatings	3
12.	470	Cyanide Waste Reduction of Electroplating and Stripping Processes	3
13.	475	Portable Treatment for Ship Material Removal Processes	3
14.	440	Surface Cleaning of Dry Dock Floors	4
15.	456	Hull Maintenance Shroud	4
16.	467	Methodology to Assess Essential Fish Habitat for Navy Coastal Properties	4
17.	356	Demonstration of Real-Time Drinking Water Quality Monitoring Technologies	5
18.	425	Automated Condition Assessment of Coral Reefs	5
19.	446	Demonstration of Physical and Biological Conditioning of Navigational Dredge Material for Beneficial Reuse	5
20.	448	Evaluation of Re-suspension Associated with Dredging, Extreme Storm Events and Propeller Wash	5
21.	453	Electrochemical Detection and Load Reduction of Copper and Zinc in Stormwater Runoff	5
22.	454	Optimization of the Stormwater Dual Media Filtration System	5
23.	455	Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Stormwater Discharges	5
24.	457	Compliance with the Emerging Requirements of the Stage II Disinfectant and Disinfection Byproduct Rule	5
25.	459	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	5

No.	ID	Title	EEC
26.	460	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	5
27.	461	Development of a Collaborative PESHE Document Authoring Tool for All Navy Commands	5
28.	463	Methodology for Identifying and Quantifying Metal Pollutant Sources in Stormwater Runoff	5
29.	464	Tertiary Treatment and Recycling of Waste Water	5
30.	466	Separation, Detection and Removal of Munitions and Explosives of Concern/ Unexploded Ordnance from Dredged Material Using Physical Separation Methods	5
31.	468	Low Cost Selective Polymer and Laser Interferometer Real Time Sensors for Detection of Solvents in Contaminated Groundwater Plumes	5
32.	469	Validation of a Low Tech Stormwater Procedural Best Management Practice	5
33.	473	Dynamic Mixing Zone Modeling	5
34.	474	Toxicity Associated with Polycyclic Aromatic Hydrocarbon Used in Clay Targets	5

Leslie Karr commented, "I think that many of our range projects are well executed because of the communication that goes on between those Principal Investigators, their customers, and our resource sponsor."

Good project execution is dependent on having the right resources in place in a timely fashion. According to Karr, one of the many things that the program does to support the execution of its projects is to provide the requested funding as quickly as possible. "To ease the burden on the Principal Investigators, we can facilitate the transfer of funds among the project team members. This is why a good spend plan is necessary. We also try to facilitate issue resolution—relying on our TDWG to bring the right people to the table," she said. "The program can also continue to foster good communication between the research team and the end users so any necessary interventions can be done sooner rather than later," she continued.

The Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects (#459) and Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors (#460) are two examples of well-executed NESDI projects, according to Pat Earley. "These projects offer two unique tools to the Navy user community that represent significant cost savings from more traditional approaches," he said.

Good project execution is even more dependent on the Principal Investigator. "The NESDI program needs to continue to match the right Principal Investigator with the right project to ensure that project is well executed," said Lynn Cahoon. "The track records of Principal Investigators and recommendations from the TDWG go a long way to ensure the full integration of our projects," he continued.

Jerry Olen expanded upon Lynn Cahoon's comments. "It is important to educate our Principal Investigators on what constitutes a well-executed project—provide them with specific performance criteria," he said. "Then we should evaluate our investigators based on those execution criteria."

Promoting Sound Stormwater Management Programs at Shipyards & Installations

Navy facility environmental managers across the globe are facing a daunting challenge—compliance with increasingly more stringent stormwater discharge requirements. The main contaminants of concern, copper and zinc, are ubiquitous both in Navy stormwater discharges, and virtually all stormwater in urban and industrialized areas. National Pollutant Discharge Elimination System (NPDES) permits typically include numeric benchmark values for copper and zinc. At many facilities, Navy stormwater managers struggle to meet these levels. Compliance with the toxicity standard and benchmark values could require the installation of infrastructure to collect and treat stormwater runoff or to divert it to the sanitary sewer system at a cost of millions of dollars.

There are many ways to address these challenges, and the NESDI program has sponsored numerous efforts including the following 13 projects to help lighten the compliance burden on stormwater managers across the Fleet:

1. Remove Copper and Other Heavy Metals from Oily Water Treatment System Discharge for Compliance with NPDES Discharge Standards (Project #479)
2. Surface Cleaning of Dry Dock Floors (Project #440)
3. Dry Dock Sediment Management (Project #503)
4. Portable Treatment for Ship Material Removal Processes (Project #475)
5. Motion Assisted Environmental Enclosure for Capturing Paint Overspray in Dry Docks (Project #441)
6. Hull Maintenance Shroud (Project #456)
7. Biological-Fouling Reduction to Ships Cooling Water Systems (Project #502)
8. Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Stormwater Discharges (Project #455)
9. Dynamic Mixing Zone Modeling (Project #473)
10. Optimization of the Stormwater Dual Media Filtration System (Project #454)
11. Methodology for Identifying and Quantifying Metal Pollutant Sources in Stormwater Runoff (Project #463)
12. Validation of a Low Tech Stormwater Procedural Best Management Practice (Project #469)
13. Successful Municipal Separate Storm Sewer System Programs Implemented in the Navy (Project #494)

Remove Copper and Other Heavy Metals from Oily Water Treatment System Discharge for Compliance with NPDES Discharge Standards

The Puget Sound Navy Shipyard and Intermediate Maintenance Facility (PSNS&IMF) has an Oily Water Treatment System (OWTS) that treats wastewater received from various industrial operations, such as from bilges, hydro blasting, ship hull cleaning, and dry dock rainwater runoff. The main contaminants of concern are copper, zinc, nickel, and oil and grease.

The OWTS uses an oil/water separator to remove oil and grease, followed by chemical precipitation, coagulation, and a bag filter to remove heavy metals. The existing treatment technology fails to meet the discharge standard about 50 percent of the time, resulting in the need to discharge into the sanitary sewer. In addition, this process is time-consuming and costly, as the bag filters require frequent replacement due to carried-over polymers.

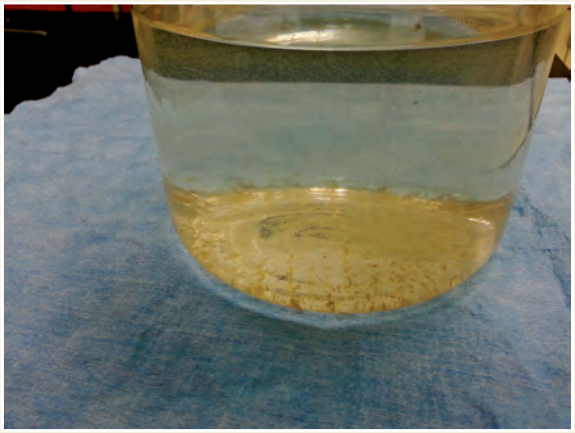
The OWTS needs a process improvement to enhance the copper removal to below 10 parts per billion (ppb) to meet current National Pollutant Discharge Elimination System permit discharge requirements.

This project proposes to enhance the performance of the OWTS by eliminating the use of alum (aluminum sulfate) and polymer during coagulation/flocculation and replacing bag and media filters with ceramic membrane filtration (CMF) technology.

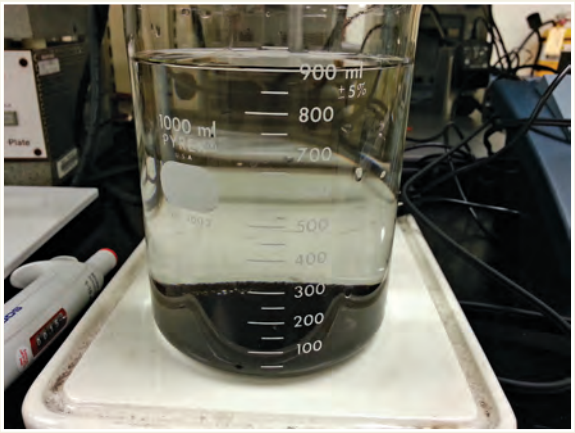
Results of bench scale testing of the proposed ceramic membrane filtration technology show that copper and zinc concentrations were reduced to non-detect levels.

Results of bench scale testing of the proposed CMF technology show that copper and zinc concentrations were reduced to non-detect levels (less than 4 and 6 ppb, respectively). The pilot system is currently being fabricated and field testing began at PSNS&IMF in February 2014.

Technology integration will start immediately when the project is initiated and will include sharing of the system design with installation points of contact to ensure their needs are being incorporated, and delivering a solution that is readily available for integration. The price of acquiring the validated system will be developed and monitored to ensure it is affordable. Any adjustments in the design can then be incorporated during the project development lifecycle to ensure the system is one that installations can afford to install, operate and maintain.



Sample after gravity settlement, no coagulant.



Clarified sample with magnetite.

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Surface Cleaning of Dry Dock Floors

Dry dock rework usually requires ships to be cleaned with high pressure water and then repainted, both of which can release copper and zinc into the dry dock area. Each Navy shipyard has cleanup procedures in place, but fine solids and metal particles accumulate in the cracks of the concrete, drainage channels, and adjacent rail tracks which are not easily accessible for cleanup.

Demonstration conducted in 2007 showed that targeted water jet technology can reduce surface particulate contamination by 90 percent or more by weight.

Surface shown before and after water jet recover process.

This project team recognized the need for a more technical solution for removing fine particulates from the dry dock floor and drainage system.

Personnel from the Naval Surface Warfare Center Carderock Division selected a proven commercial off-the-shelf technology, a Utility Task Vehicle (UTV), to provide water jet surface cleaning technology for this purpose. Water jet vehicle-based surface cleaning is conducted on active ships and at many facility locations, and indications are that excellent performance can be achieved. This self-contained vehicle combines water jet cleaning, vacuum recovery and process water management capability to meet unique dry dock surface cleaning performance requirements. It is expected to be highly capable of collecting solids and fine particles from dry dock floors, pump wells, cross connection channels, trenches, rail tracks and adjacent areas to the dry dock.

This self-contained vehicle combines water jet cleaning, vacuum recovery and process water management capability to meet unique dry dock surface cleaning performance requirements.

Currently, a design modification is underway to convert the UTV's original engine and drive train to hydrostatic power. It will be demonstrated at Puget Sound Navy Shipyard and Intermediate Maintenance Facility in late 2014. Subsequently, sampling and analysis will determine the UTV's effectiveness, and standard operation procedures will be developed. Training and integration efforts are set to begin in late 2015.

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Dry Dock Sediment Management

When a ship enters dry dock for rework, the dock is flooded, requiring water to be drawn from surrounding sources. This water contains solid sediment, which adheres to the dry dock floors and walls after dewatering. It is common for dry dock areas to be covered with a layer of sediment from one to three inches during normal docking evolutions and up to two feet during extended caisson overhaul. At the Puget Sound Navy Shipyard and Intermediate Maintenance Facility (PSNS&IMF), considering the smallest to largest dry docks, the amount of sediment for a one-inch layer would range from 236.6 to 655.5 cubic yards and from 709.9 to 1966.6 cubic yards for a three-inch layer of sediment. To correlate the magnitude of sediment, a single cubic yard is equal to approximately 202 U.S. gallons.

Before repair and maintenance activities are initiated, the dry dock is washed down with fire hoses, leaving residual sediments in the dry dock cross-connect channels, sumps and pumpwells which leach contaminants into the process wastewater and contribute to National Pollutant Discharge Elimination System (NPDES) permit violations. Each dry dock at PSNS&IMF has multiple sand traps to catch contaminants, but the current process doesn't remove/extract either fine or dense particles from these sand traps, nor do these sand traps effectively capture fine particulates that are created during repair and maintenance actions.

When the Nimitz-class aircraft carrier USS John C. Stennis (CVN 74) and other ships enter dry dock at PSNS&IMF and elsewhere, the dry dock is flooded, requiring water to be drawn from surrounding sources. This water contains solid sediment which adheres to the dry dock floors and walls after dewatering. This NESDI project is looking for more efficient ways to capture and remove dry dock sediments by demonstrating a versatile and robust compilation of tools and methods. (U.S. Navy photo by Wendy Hallmark)

Dry Dock Sediment Management

(continued)

Currently in use is a Ditch Witch® machine capable of pumping and collecting the sediment/water slurry, but this unit has a low pumping capacity and the contents must be emptied and shoveled to drums for removal. At this time, the only consistent method of collecting and transporting the sediment is by manually shoveling the contents of the sand traps and channels into drums, which must be craned out of the dry dock in pairs. This process is expectedly arduous and time-consuming.

This project addresses the need for a more efficient way to capture and remove dry dock sediments by demonstrating a versatile and robust compilation of tools and methods.

This project addresses the need for a more efficient way to capture and remove dry dock sediments by demonstrating a versatile and robust compilation of tools and methods. The end goal is to reduce NPDES permit violations, and speed up the process so that production delays can be minimized.

Some technologies being evaluated include an inline passive discharge separator unit that can be configured to eliminate the need to stop and empty the vacuum truck, and a passive dewatering box with the capability of discharging solids into a standard bulk roll-off trailer, or individual containers for speedier disposition. For wide-area rapid cleaning, and to configure for trenches/sand trap evacuation, a commercial off-the-shelf technology cleaning vehicle with a high level of adaptability has been identified as a mobile platform. To eliminate the need to shovel silt manually and to overcome sand trap access challenges, slurry pump technologies will be evaluated. Once candidate technologies are finalized, a go/no go decision will be made (tentatively scheduled for July 2014), equipment will be procured, and a demonstration will be initiated in a working shipyard environment at PSNS&IMF. The last step will be a final report and a training program for shipyard personnel.

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Portable Treatment for Ship Material Removal Processes

Routine work performed at Navy shipyards requires large amounts of fresh water. Processes such as hydro-blasting of ship hull surfaces, paint de-coating, non-skid surface removal and surface preparations, and housekeeping/cleaning all require multiple pumps dispersing water at a rate of 10 gallons per minute. This water can only be used once before it is contaminated and must be treated as wastewater.

The Navy will continue to recognize large contract costs for industrial water (fresh) and its disposal cost. Facilities will continue to lack the assets to handle these intermittent and/or overflow treatment requirements at the point of use or application, and new and future systems may be limited to their capacity to conduct environmental remediation.

In many respects, operations and processes supported at each Navy dry dock are similar in nature, but each dry dock is physically configured to best address the type of ship classes serviced. Thus, no single technology can address all of the various processes, facilities, or waste streams across the Navy. However, a need exists for a mobile platform that can provide basic pre-treatment functions including gross solids removal, treatment, polishing, and waste management.

Over the past five years, personnel from the Naval Surface Warfare Center Carderock Division (NSWCCD) have developed an Advanced Hull Cleaning System (AHCS) for the Naval Sea Systems Command (NAVSEA) Underwater Ship Husbandry Division. The system provides the traditional benefits of open water hull cleaning while providing a means of complying with existing and anticipated environmental regulations governing the cleaning of Navy ships. The AHCS collects, contains, and pre-treats hull coating residues and biofouling.

The knowledge and process treatment experience obtained by NSWCCD personnel in developing this technology, along with the advances made in fine solids removal developed under the Mobile Cleaning, Reclaim, and Recycling System project (#416) will be brought to bear to develop a mobile pier/facility wastewater treatment system. This new system could expand shipyard capabilities and readiness, significantly reduce the amount of fresh water usage and associated costs per operation, and be deployed, operated, and maintained over its lifecycle by existing process personnel.

This new system could expand shipyard capabilities and readiness, significantly reduce the amount of fresh water usage and associated costs per operation, and be deployed, operated, and maintained over its lifecycle by existing process personnel.

After this technology has been sufficiently demonstrated, the project team will work with personnel from NAVSEA headquarters and shipyard business offices to document long-term benefits, garner formal acceptance, and evaluate options for further equipment transition and integration.

First stage testing of the Advanced Hull Cleaning System.

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Motion Assisted Environmental Enclosure for Capturing Paint Overspray in Dry Docks

Meeting the discharge limits for copper at Navy shipyards is challenging due to the presence of heavy-duty copper-based paints used on ships. The use of conventional spray guns to apply these paints can result in 70 to 85 percent of the applied paint going to waste through overspray, which generates air emissions, and settles on the waterways and dry docks. Conventional best management practices have not been sufficient to prevent copper from entering water in the dry docks during spray painting and paint removal activities. Although the Naval Sea Systems Command is evaluating alternative paints that do not contain copper, mitigative measures are needed to eliminate or minimize the amount of copper being released into waters of the United States.

MAEE prototype testing August 2010.

Capture testing was conducted in January 2013 at O.T. Neighoff paint contractors in Maryland.

To address this problem, a team from the Naval Surface Warfare Center Carderock Division (NSWCCD) developed a Motion Assisted Environmental Enclosure (MAEE) for capturing paint overspray. The MAEE is a relatively low cost solution that requires no alteration of existing equipment. The device attaches to a standard aerial work platform. It consists of two components: a motion component that works with the platform's actuators, allowing it to follow the ship's hull without user input; and an environmental enclosure for painting, which is a rectangular tube with a positive air pressure seal around the perimeter that entrains paint overspray particles and deposits them onto filters within the enclosure.

Two rounds of successful testing proved that the MAEE met or exceeded the project goal of a 95 percent capture rate, as well as all performance and safety benchmarks.

Two rounds of successful testing proved that the Motion Assisted Environmental Enclosure met or exceeded the project goal of a 95 percent capture rate, as well as all performance and safety benchmarks.

Though the project is complete, more testing and evaluation is needed in a Navy production environment to harden the design, make performance adjustments, and ready the full-scale prototype for production manufacture and use. NSWCCD will continue to work with the Puget Sound Navy Shipyard and Intermediate Maintenance Facility to schedule prolonged system testing at first availability. NSWCCD will also continue to work with the original equipment manufacturer to ensure their participation in further development.

Procurement and implementation of the technology will be through Navy and commercial shipyard purchase of the equipment, and the training of the equipment operators.

Demonstration at JLG boomlift manufacturer in April 2013.

The MAEE can be assembled on a conventional boom lift in approximately one hour.

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Hull Maintenance Shroud

Current practices to prevent paint, paint chips and abrasives from entering the adjacent water body are subject to environmental limitations (wind) and operator error. Capturing waste from overwater work is a high priority for Navy facilities and is receiving increased attention from States and local regulatory authorities. Failure of the Navy to address contamination of water bodies from surface preparation operations has resulted in the prohibition of such activities requiring more expensive solutions such as utilization of dry docks or temporary solutions such as painting over corrosion.

This project seeks to provide a simple, economical solution to capturing waste streams associated with coating removal and surface preparation during repair and painting operations. This solution will meet the challenges and operational requirements associated with coating repair and maintenance activities over water.

To accomplish this, the project team explored design concepts from some existing commercial off-the-shelf technologies (COTS) that were manufactured for different purposes (e.g. camping tents, spring-release

The prototype shroud was used on the amphibious transport dock ship USS San Diego (LPD 22) in January 2013.

(U.S. Navy photo by Mass Communication Specialist 2nd Class Jonathan P. Idle)

window shades), and created a prototype that would be able to accommodate a vacuum attachment and form a shroud over a work surface while activities such as grinding, chipping, and sanding are performed on the side of a vessel.

The prototype shroud is designed to be portable, inexpensive, and easy-to-use, and can be used concurrently with existing vacuum-assisted, handheld rotary and reciprocating power tools.

The prototype shroud is designed to be portable, inexpensive, and easy-to-use, and can be used concurrently with existing vacuum-assisted, handheld rotary and reciprocating power tools.

Shroud in use on USS San Diego in January 2013.

The shroud was demonstrated in early 2013 at Naval Base San Diego.

This project will leverage design concepts from existing COTS technologies to capture the hazardous wastes associated with in-port surface preparation before those wastes enter the surrounding water body. The resultant shroud will enclose the work surface while activities such as painting, grinding, chipping, and sanding are performed on the side of a vessel.

An initial prototype was tested on USS New Orleans (LPD 18) in 2011. After discussions with the user community, a second prototype was demonstrated in two locations in 2013. Based on user feedback, design modifications are being incorporated.

Once a new prototype has been successfully demonstrated, a manufacturing partner will be identified and individual Navy commands may purchase these units for maintenance activities at their facilities.

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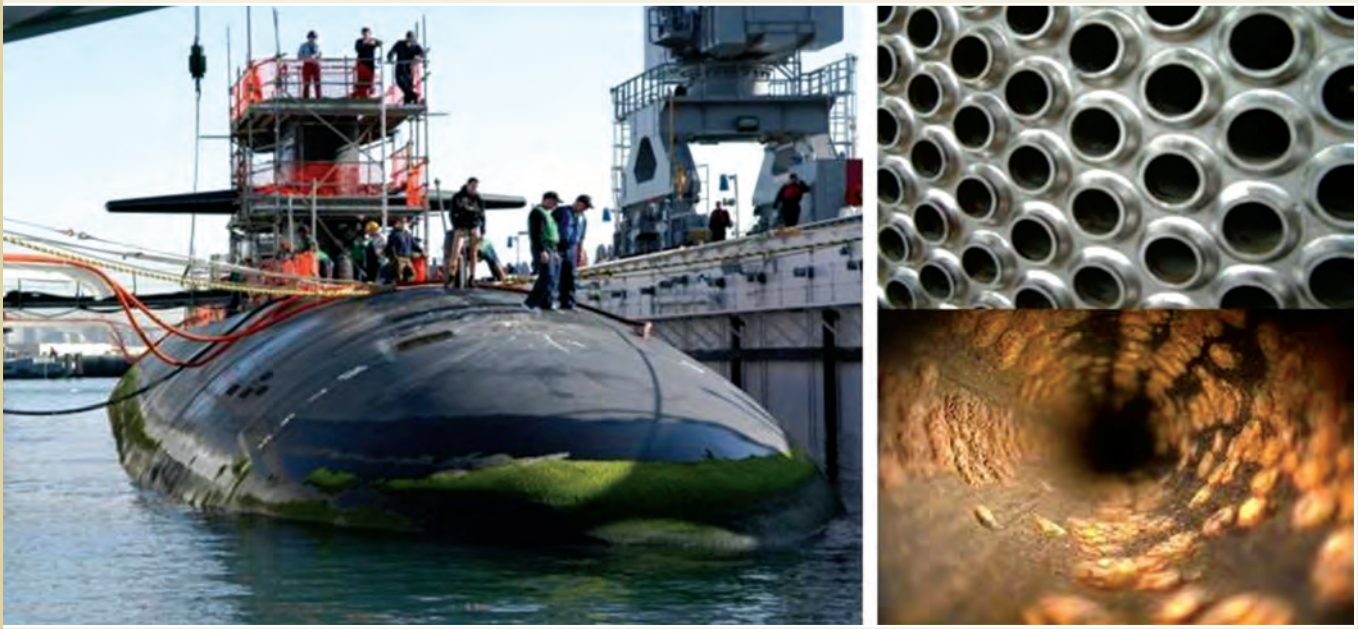
Biological-Fouling Reduction to Ships Cooling Water Systems

Shipboard heat exchangers are used to cool both water and other fluids. When a ship is pierside or in dry dock, these heat exchangers are subject to biofouling unless the cooling water system is cleaned. Early failures and inefficiencies of heat exchangers due to biological fouling corrosion is costly, impacts the Fleet's mission, and may impact their overall readiness.

The current cleaning practice to minimize biological fouling and microbial corrosion (also called microbiologically influenced corrosion (MIC)) employs the use of hazardous and toxic chemicals, including chlorine that can strip metal ions from cooling system surfaces. This is accomplished through portable dockside chlorination units that produce chlorine from seawater in the intake systems of ships. Unfortunately, the free chlorine produced by this process exceeds the allowable limits set by the Clean Water Act as well as hazardous and corrosive air by-products.

This project will demonstrate and validate the effectiveness of an innovative i2 Bubble Infusion (i2BI) technique to reduce biological fouling and MIC. It is an in-situ preventive protocol that uses agitating bubble infusions containing low-dose iodine to prevent and minimize the formation of bacterial colonies on surfaces. The system utilizes a timed infusion of iodinated air bubbles in the cooling water stream entering the ship's cooling system to prevent/reduce foul formation. It has been proven to inactivate waterborne and surface microbes and may disrupt

The i2 Bubble Infusion technique has been proven to inactivate waterborne and surface microbes and may disrupt microbial adhesion; thereby preventing or retarding biofouling in heat exchangers.



Navy ship cooling system fouling and corrosion shown lower right.

A Hull Maintenance Technician Fireman brazes a heat exchanger for a reactor aboard USS Theodore Roosevelt (CVN 71). These heat exchangers are subject to biofouling unless the cooling water system is cleaned.

(U.S. Navy photo by Mass Communication Specialist Seaman Apprentice Joshua Mann)

microbial adhesion; thereby preventing or retarding biofouling in heat exchangers.

As part of the demonstration, it will be shown that when used pierside, the i2BI technology offers environmental, safety and occupational health benefits as compared to the existing electro-chlorination method. Although iodine in liquid form is effective against microbial, protozoan and crustacean challenges, it may have limited use with larger species such as tubeworms and mollusks.

A guidance document for dockside ship maintenance of cooling systems will be made available for use on other Department of Defense facilities and shipboard equipment (both existing and new vessels). The entire i2BI maintenance unit, cartridges, and material will also be established as part of maintenance list in the national stock system. Where appropriate, recommended criteria change requests to design policies (i.e., facilities using cooling towers, heat exchangers, chillers and/or condensers) will be submitted to the Tri-service Facilities Criteria panel.

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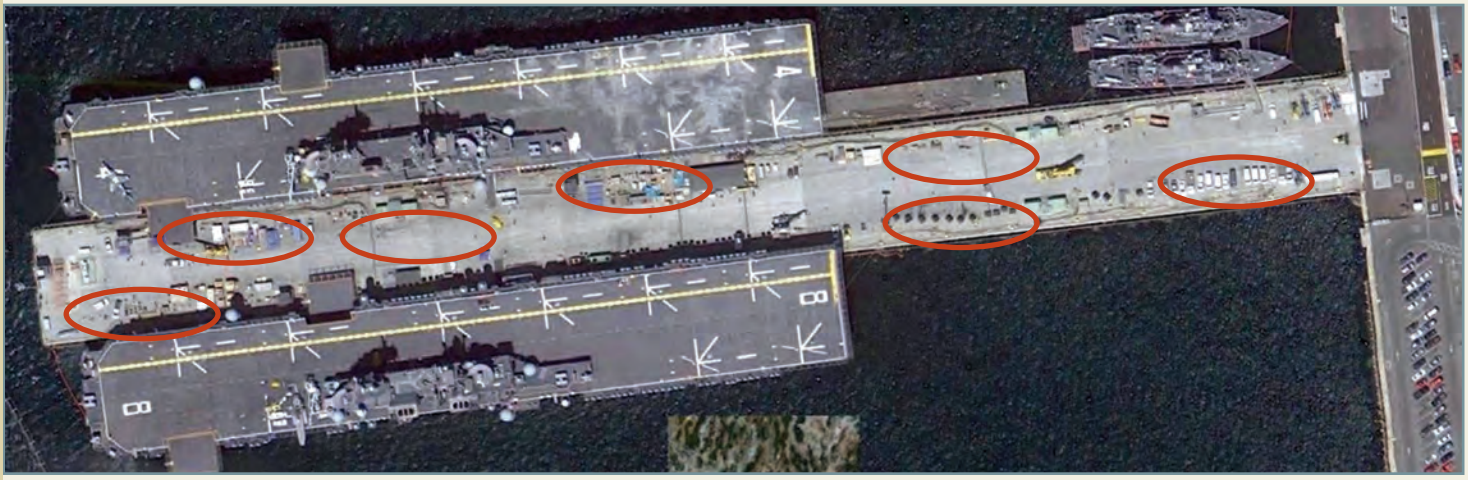
Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Stormwater Discharges

Meeting the industrial stormwater discharge limits for metal contaminants—particularly copper and zinc—as established by the National Pollutant Discharge Elimination System (NPDES) program can be challenging. Compliance with the toxicity standard and benchmark values could require the installation of infrastructure to collect and treat stormwater runoff or to divert the runoff to a sanitary sewer system at great cost. Another option, source reduction/elimination, can be an effective method in reducing copper and zinc in stormwater runoff and is often a much cheaper option than treatment or diversion to sewer. To reduce/eliminate copper and zinc in stormwater discharges the Navy has a need to accurately identify and quantify sources of copper and zinc in drainage areas that are not meeting the acute toxicity standard and benchmark values and then develop best management practices to reduce/eliminate those sources. Toward this goal, this project team calibrated a widely accepted stormwater model to help identify sources of copper and zinc.

Major sources of metal contaminants at naval facilities generally include:

- Automobile brake pad and tire wear
- General atmospheric deposition
- Building materials (such as galvanized fences and roofing)
- Equipment and processes used for common operations such as ship depainting

These sources deposit copper and zinc onto impervious surfaces where they can build up as residue. Without the ability to quantify the magnitude of these substances or their sources, it is difficult to implement sound management practices.



Large differences in runoff can occur even over short distances as a result of localized materials and operations.

The use of a stormwater modeling tool, the Source Loading and Management Model for Windows (WinSLAMM), is helping to quantify relative pollutant sources within individual watersheds or drainage areas at Navy installations.

The use of the Source Loading and Management Model for Windows is helping to quantify relative pollutant sources within individual watersheds or drainage areas at Navy installations.

WinSLAMM was successfully calibrated using data from nine separate drainage areas at seven bases across Navy Region Southwest and Navy Region Northwest. Each drainage area was characterized using a combination of site visits, available Geographic Information System data, and aerial photos. The results of the calibration efforts suggest that the model will provide reasonable predictions for other Navy drainage areas. The main sources of uncertainty in the model results relate to the attempt to model NPDES samples that almost always consist of total metal concentrations measured only in the first fraction of runoff, known as the first-flush, end-of-pipe grab samples. These grab samples do not take into consideration flow, particle size, dissolved metal, or full-storm event mean concentrations. Metal data and model outcomes were affected by the high variability associated with these types of samples.

While the goal was to develop a model that could be applied to all Navy bases, regional differences appear to affect the calibrated outcomes. Therefore, it was determined that the tool needed to be calibrated for additional drainage areas. This was completed for 12 additional drainage areas in 2013. Though this project is complete, the tool validation plan and implementation report is still being compiled. When finished, a calibrated WinSLAMM will provide Navy installation environmental managers with a validated tool, spreadsheet and guidance to support sound strategies for mitigating metals in their own stormwater discharges.

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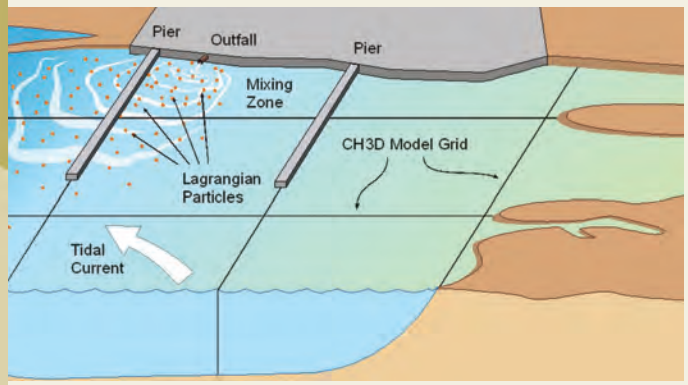
Dynamic Mixing Zone Modeling

Discharge limits imposed by states and/or the U.S. Environmental Protection Agency (EPA) require all discharges to meet water quality standards at the end of the pipe unless a "mixing zone" is granted within the permitting process.

According to the EPA, a mixing zone is "an area where an effluent discharge undergoes initial dilution and is extended to cover the secondary mixing in the ambient water body. A mixing zone is an allocated impact zone where water quality criteria can be exceeded as long as acutely toxic conditions are prevented. (Water quality criteria must be met at the edge of the mixing zone.)" The size of a mixing zone is generally determined by a mixing zone analysis, which calculates and estimates the extent of mixing based on discharge characteristics and ambient water conditions. The critical outputs of a mixing zone analysis are the dilution factors that are used to calculate the reasonable potential to exceed aquatic life- or human health-based water quality criteria and set discharge limits.



A conceptual Lagrangian transport mixing zone model for discharges near Navy piers and facilities.

Dye studies are recommended by technical guidance to validate model predictions. In a dye study, researchers release dye "drifters" into the water to simulate the transport and mixing of water particles within the study zone. Commercial off-the-shelf technology (COTS) mixing zone models are not ideal for simulating dynamic discharges from Navy facilities since these discharges and facilities are located in tidally influenced coastal and estuarine areas, and the discharges are confined and influenced by the pier structures and facilities. An accurate, validated mixing zone analysis is needed to set appropriate discharge limits, keep compliance costs low, and ensure realistic restrictions. As National Pollutant Discharge Elimination System permits are negotiated, regulators need to balance risk management concerns from all stakeholders. Without adequate data from accurate model demonstrations, regulators must rely on the most conservative approaches to ensure environmental protection.

An accurate, validated mixing zone analysis is needed to set appropriate discharge limits, keep compliance costs low, and ensure realistic restrictions.

Currently, model simulations of outfall discharges only consider simple flow and geometry under steady-state conditions. COTS models do not accommodate the effects of tidal action, intermittent discharges, complex geometries (pier, quay walls, bulkheads, etc.) present near the outfall discharges, overlapping discharge plumes, and recirculation flow (tidal ebb and flooding).

An innovative approach to overcoming these issues is to use two existing three-dimensional hydrodynamic models currently in use for Navy harbors (San Diego Bay, Sinclair Inlet, and Pearl Harbor), coupled with a third Lagrangian transport module, which are effective at simulating localized processes along a sharp gradient. The models will be simultaneously set up and calibrated with existing data available for discharges from Puget Sound Navy Shipyard and Intermediate Maintenance Facility (PSNS&IMF) into Sinclair Inlet, Washington. The models will then be verified with data from a dye study of dry dock discharges conducted in 2004 by personnel from the Space and Naval Warfare Systems Command, Systems Center Pacific. Currently, the project team is applying the combined model to conditions in San Diego Bay.

Other tasks to be completed in 2014 include coordination with PSNS&IMF and local regulators and stakeholders to apply dynamic mixing zone analysis to support mixing zone approval during permit negotiation, and EPA's Office of Research and Development to include the dynamic mixing zone model in its water quality tool kit.

A final demonstration and report will also be produced.

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Optimization of the Stormwater Dual Media Filtration System

Most Navy installations have National Pollutant Discharge Elimination System (NPDES) permits for their stormwater discharges. Some of these permits contain effluent (discharge) limits for copper and zinc while other permits contain benchmark values for these metals. Although many common sources of copper and zinc are known including painting/depainting, scrap metal storage, automotive brake dust, tires, metal roofing and other architectural features, galvanized fences and equipment, and atmospheric deposition; tools such as metals sensors and field analytical techniques are needed to assist water program managers with identifying specific areas that contribute to loadings of copper and zinc in stormwater runoff.

More importantly, source control measures and treatment technologies are needed to effectively reduce copper and zinc loadings in stormwater discharges to meet Total Maximum Daily Load waste load allocations, NPDES permit limits, and benchmark values.

To help reduce copper and zinc loadings, this project is optimizing the performance of a dual media filtration system.

To help reduce copper and zinc loadings, this project is optimizing the performance of a dual media filtration system developed by personnel from the Naval Facilities Engineering and Expeditionary Warfare Center. This 240 gallon-per-minute, below-grade structural dual-media filtration system was demonstrated at the Navy Regional Recycling Center in San Diego, California. It is capable of removing particulate and dissolved metals from industrial site stormwater runoff. However, the system performance diminished over time as the technology became blinded with silt and other very fine sediments suspended in the runoff. When a structural filtration system is clogged with silt, it becomes unable to consistently meet NPDES permit requirements for metals and other pollutants.

The project team is improving this system by retrofitting deficient design elements. This will be followed by a demonstration of the new, low-maintenance system which will be capable of filtering both large particles and very fine suspended solids from industrial site stormwater runoff. The demonstration results will be made available in a final report posted on the NESDI web site and the DENIX tool web site at www.denix.osd.mil/tools.

The dual media filtration system. Dual media chambers are shown on the left and float valves are shown on the right.

Pilot scale above grade Dual Media Filtration System.

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Methodology for Identifying and Quantifying Metal Pollutant Sources in Stormwater Runoff

This project is addressing the need for achieving compliance with National Pollutant Discharge Elimination System (NPDES) permits and benchmark action levels for copper and zinc. In recognition that the first step toward reduction or elimination of these metals in stormwater discharges is the accurate identification and quantification of their sources, this project is identifying drainage areas that are not meeting the acute toxicity standard and benchmark values and then develop best management practices (BMP) to reduce or eliminate the contributing sources.

Principal Investigator Edwin Chiang demonstrates the handheld device used during the site characterization.

At Naval Base San Diego, project participants conducted a site characterization to identify potential metal pollutant point sources, particularly copper and zinc. Key information included identification of point sources such as industrial operations, building materials, parking lots, piers, roadways, and outside storage areas. Using Global Positioning System and Geographic Information System (GIS) technology, specific information such as size, material, age and surface area were captured on a generic survey template using a handheld device.

This project is identifying drainage areas that are not meeting the National Pollutant Discharge Elimination System permits and benchmark action levels for copper and zinc then develop best management practices to reduce or eliminate the contributing sources.

The results were imported into the GIS software ArcGIS and Non-Point Source Stormwater Management Toolbar. The toolbar will process the data collected on the survey template, calculate broad range estimates of potential metal concentrations, provide potential material sources, and predict which drainage basins need the most attention. The output data sets from the GIS toolbar can link to existing installation GIS data to help the user visualize pollutant point sources. Potential non-industrial and offsite point sources can also be input into the GIS.

The amphibious assault ship USS Essex (LHD 2) is moored at Naval Base San Diego where participants in this NESDI project conducted a site characterization to identify potential metal pollutant point sources, particularly copper and zinc. (U.S. Navy photo by Senior Chief Mass Communication Specialist Joe Kane)

The methodology will eventually be incorporated into a new secure Navy stormwater decision support tool which will help the user select the most appropriate BMPs and/or non-structural source reduction measures to meet NPDES compliance.

The final methodology, user guide, and installation file for the toolbar will be provided then transitioned by the integration team from the Naval Facilities Engineering and Expeditionary Warfare Center to each of the Navy's regional stormwater managers.

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Validation of a Low Tech Stormwater Procedural Best Management Practice

In the San Diego area, requirements for stormwater discharges now include action levels for copper and zinc and acute toxicity limitations. In addition, the State Water Resources Control Board is developing a statewide policy on toxicity assessments that will require chronic toxicity testing for stormwater discharges subject to National Pollutant Discharge Elimination System (NPDES) permitting. To meet the requirements for stormwater discharges there is a need to determine what best management practices (BMP) will reduce the copper and zinc levels in stormwater discharges.

There are a number of BMPs available that may be able to reduce copper and zinc to levels to meet the toxicity standard, but there has been very little actual toxicity testing performed to validate the BMPs.

This project demonstrated and validated high-pressure wash-down and vacuuming as an effective method of mobilizing and collecting particles and metal contaminants. This is a combination of routine power vacuuming and sweeping, and a high-pressure wash-down followed by a vacuum recovery system to remove contaminants from work areas before a rain event washes them into the water body. This procedure was demonstrated on half of three piers at Naval Base San Diego. Particle monitoring was conducted on both halves of the three piers to evaluate particle and metal reductions. Stormwater samples were collected on both halves of the three piers to determine whether the surface cleaning was sufficient to reduce contaminant concentrations and toxicity below compliance requirements.

This project demonstrated and validated high-pressure wash-down and vacuuming as an effective method of mobilizing and collecting particles and metal contaminants.

Powerwashing technology at work.

The Tennant 7400 sweeper.

Sweeping before and after.

Powerwashing technology.

A post-demonstration analysis determined that the procedure was effective at reducing the total particulate mass on the piers, with reductions between 32 and 72 percent compared to the non-BMP areas. Similarly, copper and zinc concentrations on the piers showed a reduction with the BMP implementation of between 60 and 84 percent compared to the untreated side. Copper and zinc concentrations in stormwater runoff samples collected from the BMP-treated side of the pier showed an average reduction of approximately 40 percent versus the non-BMP side. Although a significant reduction was observed in particle, copper, and zinc loads on the piers, the reduction was not enough to consistently meet the current copper and zinc benchmarks in Naval Base San Diego's NPDES permits.

This project is now complete, and a draft technical report describing the results and implementation strategies for this project is nearing completion.

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Successful Municipal Separate Storm Sewer System Programs Implemented in the Navy

In the near future, it is expected that all military installations will be required to acquire a Municipal Separate Storm Sewer System (MS4) permit and implement specific control measures contained therein.

MS4 permit holders are required to design their stormwater management programs to reduce the discharge of pollutants to the "maximum extent practicable," protect water quality, and satisfy the appropriate water quality requirements of the Clean Water Act. Implementation of these standards requires the development and implementation of Best Management Practices and the achievement of measurable goals to satisfy each of the following six minimum control measures:

1. Public Education and Outreach
2. Public Participation/ Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Control
5. Post-Construction Runoff Control
6. Pollution Prevention/ Good Housekeeping

The Navy has a need for a guidance document to help Navy installations comply with MS4 permit requirements.

Personnel from the Naval Facilities Engineering and Expeditionary Warfare Center identified installations that hold MS4 permits to gain insights into successful methodologies and technologies they used to manage those permits as well as lessons learned that could benefit others who seek to obtain their own permits.

To provide this guidance, personnel from the Naval Facilities Engineering and Expeditionary

Porous pavers used in a parking lot.

For more information about MS4 permit requirements, visit http://cfpub.epa.gov/npdes/stormwater/munic.cfm.

Warfare Center identified installations that hold MS4 permits to gain insights into successful methodologies and technologies they used to manage those permits as well as lessons learned that could benefit others who seek to obtain their own permits. Standard and innovative approaches were compared for their strengths and weaknesses. A table was compiled which compares the costs and acquisition strategies for each of the different methodologies used. Cost specifics include annual fees, initial capital investment, and how time-intensive it is to support execution of a particular technology or methodology. Stormwater managers may then select the most cost-effective strategy to obtain and maintain their own MS4 permits.

A draft guidance document has been completed. The final document will be uploaded to the NAVFAC Environmental Management Systems web site at https://eprportal.cnic.navy.mil/eprwebnet/logon.aspx (username and password required).

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Employing Low Impact Development Technologies & Features

Low Impact Development (LID) is defined by the U.S. Environmental Protection Agency (EPA) as the process of "preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product." LID technologies include best management practices such as ponds, wetlands, sand filters, infiltration basins, swales, and porous pavement.

The following NESDI projects, described on the following pages, are applying various LID technologies to help address stormwater compliance issues at various Navy installations:

1. Low Impact Development for Industrial Areas (Project #493)
2. Lifecycle Cost — Operation and Maintenance of Stormwater Best Management Practices/ Low Impact Development Features (Project #505)
3. Evaluation of Low Impact Development Implementation (Project #497)

Low Impact Development for Industrial Areas

The Navy is challenged with finding feasible and cost-effective methods for controlling stormwater runoff that exceeds National Pollutant Discharge Elimination System (NPDES) permit limits and benchmarks from the operational and non-industrial areas of Navy installations.

Installing a Low Impact Development (LID) feature, such as a detention basin, to help control stormwater runoff from operational areas may be more cost effective than traditional Best Management Practices or treatment methods. However, cost effectiveness and feasibility for individual practices and locations can vary greatly. Many LID features may be too expensive or cause major disruption to the surrounding landscape. Therefore it would be beneficial to know what the associated expectations, effectiveness, costs, and technical limitations are before a LID feature is chosen.

This project is identifying gaps in the knowledge, technology, and/or capability for various LID features.

This project is identifying gaps in the knowledge, technology, and/or capability for various Low Impact Development features.

LID technologies for stormwater treatment have the great advantage of an extremely low operation and maintenance cost. They tend to use free natural processes to remove contaminants from stormwater. Most systems do not have pumps or other mechanical devices that tend to wear out or break over time. Experience has found that in non-industrial areas, LID technologies are the lowest cost method of compliance with discharge regulations.

The project team first completed a literature review in which potential LID technologies were identified. Since there is limited data regarding the responsiveness and effectiveness of LID technologies in the field, the literature review will be updated throughout the life of the project.

The compost mat shown here is designed to reduce the metal loadings associated with stormwater runoff.

Currently, personnel from the Naval Facilities Engineering and Expeditionary Warfare Center are evaluating industrial sites to determine potential demonstration sites for a LID technology. Preference will be given to a Navy unique industrial setting that has detected heavy metals in their stormwater discharges. Once a site has been selected, a “go/no go“ decision by the NESDI program’s Technology Development Working Group will be made prior to the construction of the selected LID feature.

Pending a green light, the project team will install and then operate a selected LID technology. The installation project approval process and acquisition strategy will be documented, and stormwater quality data from the test site(s) will be analyzed to determine performance of the technology. The team will collect samples of soil from site(s) to determine the level of concentration of metals and other contaminants entrained in the soils.

The final report from this project will provide stormwater managers with information regarding selection of an LID technology and be available from Edwin Chiang.

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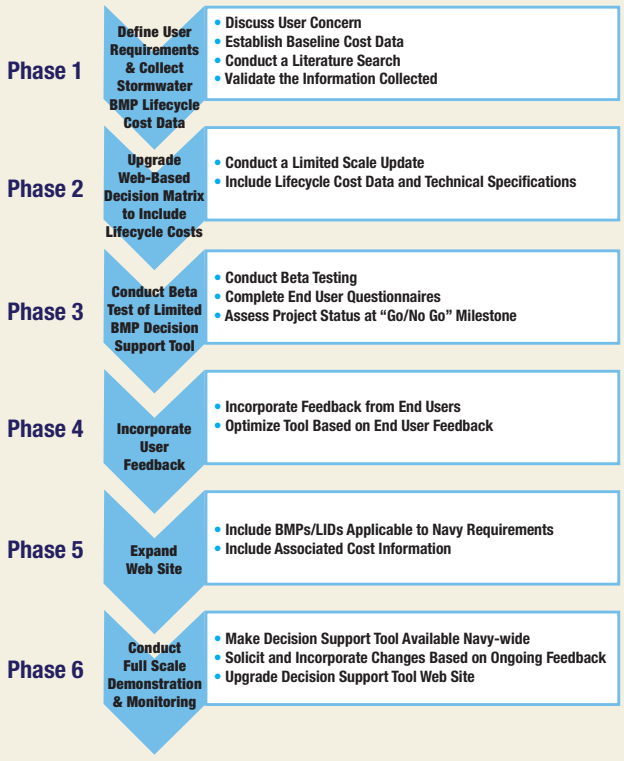
Lifecycle Cost — Operation and Maintenance of Stormwater Best Management Practices/ Low Impact Development Features

Navy installations need guidance on the maintenance requirements and costs for stormwater Best Management Practices (BMP) and Low Impact Development (LID) features to properly select, operate and maintain these systems. Navy installations need to select appropriate systems that will meet their operation and maintenance requirements as well as capital cost, effectiveness, and site requirements. Navy installations also need to understand how to properly operate and maintain these systems, and what their full lifecycle costs will be.

Development of the updated web system will be conducted in 6 phases.



To address the knowledge gaps in these areas, the project team will eventually provide on-line access to information about LID technologies and newer proven commercially available technologies. New and existing BMPs will be updated to include capital, operations, and maintenance costs in an effort to help stormwater managers select technologies that offer both high removal efficiency and good lifecycle cost. These costs and requirements will be determined using up-to-date information compiled from recent and ongoing Department of Defense investments and recent commercial applications.

The project team will eventually provide on-line access to information about Low Impact Development technologies and newer proven commercially available technologies.

The first step will be to identify three BMPs based on user need and a literature review. After updating a matrix with cost information on these three BMPs, a test will be conducted among end users that have emerging stormwater BMP needs. If the Decision Support Tool can recommend applicable BMPs and provide cost information in a user-friendly format, then the project will continue.

The Decision Support Tool will be updated with user feedback, and full cost information will be included for all LID technologies and BMPs that have Navy application.

The Naval Facilities Water Media Field Team will be briefed on the findings of this effort.

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Evaluation of Low Impact Development Implementation

Low Impact Development (LID) features and technologies have been implemented in urban residential and commercial sites around the country for a number of years. However, there are few examples or data evaluating the effectiveness of these techniques at mitigating contaminants or runoff volume when applied to Navy facilities.

Given the requirements to implement LID for new construction at Navy facilities and ever more stringent compliance requirements on stormwater runoff, the Navy must identify if LID can help solve the most basic issues of mitigating contaminants over its exceptionally large expanses of impervious surfaces. This is a Navy-wide facility issue and there is very little data to evaluate the potential for successful LID implementation at Navy sites. This new project was initiated to provide this data.

This project will demonstrate the effectiveness of two types of Low Impact Development technologies at a Navy non-industrial site to mitigate parking lot and roof runoff.

The plan is to demonstrate the effectiveness of two types of LID technologies at a Navy non-industrial site to mitigate parking lot and roof runoff. The site will be chosen so that the area immediately adjacent will have the same characteristics and conditions, and the two areas can be monitored and evaluated against one another using a paired evaluation—LID versus non-LID. The sites will be evaluated for flow, contaminant concentrations, total load, and toxicity over multiple storm events. The type of LID technology demonstrated will be specifically designed (with help from the LID Center in Beltsville, Maryland) for the sites given the unique conditions present and to meet the needs of the facility managers including the Public Works Officer.

This effort will leverage Total Maximum Daily Load stormwater monitoring (flow and contaminants) that is currently being conducted in these drainages by personnel from the Space and Naval Warfare Systems Command, Systems Center Pacific for Navy Region Southwest. The WinSlamm stormwater modeling effort (project #455) will also be used to evaluate contaminant sources and BMP implementation potential.

A technical report will be generated to report on the methods, results, and evaluation of the demonstration. A presentation and report will be provided to Navy Base San Diego stakeholders. The project team will also work with the LID Center to reach a wider government audience including local regulators.

Porous pavers help to reduce stormwater runoff.

Example of a bioretention planter.

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Monitoring System & Analytical Support to Navy Natural Resources Management Programs

Natural resource management on Navy lands is a complex task. The Navy's Environmental Policy Manual (OPNAVINST 5090) states that "natural resources under the stewardship and control of the Navy shall be managed to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity."

Increasingly, this dual focus on sustainability and readiness can pose some difficult challenges. Natural resource managers have had to shift focus from the conservation of one species to multiple species. They have to keep abreast of the best available scientific information and adaptive management techniques.

In the last few years, NESDI has sponsored three projects at Space and Naval Warfare Systems Command, Systems Center Pacific (SSC Pacific) to support sound and effective natural resource management that are described on the following pages.

1. The development of an automated long-term monitoring system (Automated Long-Term Monitoring System for Natural Resource Management (project #477))

2. A method to more precisely designate essential fish habitats (Methodology to Assess Essential Fish Habitat for Navy Coastal Properties (project #467))

3. Summary guidance on the feasibility of coral reef transplantation (Implementation Strategy for Coral Reef Transplantation Methods (project #491))

The NESDI program demonstrated the Coral Reef Monitoring System (CRMS)—an innovative suite of equipment capable of monitoring the ambient conditions around coral ecosystems. The CRMS buoy is shown here.

Automated Long-Term Monitoring System for Natural Resource Management

Long-term monitoring is the most vital data requirement for effective natural resource management at Navy and Marine Corps installations. Access to historical data is imperative in proposing or addressing environmental issues—regulation of industrial discharges where the permitted level of a specific environmental parameter is regulated with respect to ambient conditions is a good example. Historical information will also be indispensable for estimation of effects due to climate change.

Real time environmental information can play an important role in management of shore side activities. Access to this kind of information should provide the basic information required for setting up a long-term monitoring system that will sustain active, instantaneous management of resources.

Long-term time series data serve as a powerful backdrop to all other aspects of monitoring, research, and conceptual modeling about ecosystem structure, function, and interdependencies that take place. The NESDI program identified the need to develop and demonstrate long-term monitoring capabilities for key "ecological indicators" to monitor trends and indicate when action might be warranted.

To meet this need, personnel from the Space and Naval Warfare Systems Command, Systems Center Pacific selected and demonstrated an automatic system deployable in coastal areas such as bays and protected coastal areas for long-term, on-site monitoring of environmental parameters including temperature, salinity, pH and dissolved oxygen.

A commercial off-the-shelf probe and telemetry system, called the Aqua Buoy from In-Situ, Inc. was deployed in San Diego Bay from May to October 2013 for a total of five months.

Personnel from the Space and Naval Warfare Systems Command, Systems Center Pacific selected and demonstrated an automatic system deployable in coastal areas such as bays and protected coastal areas for long-term, on-site monitoring of environmental parameters.

The system provided continuous feedback during this period. With routine maintenance, it performed as expected.

Close up of a dissolved oxygen sensor covered by algae.

Automated Long-Term Monitoring System for Natural Resource Management

(continued)

The Aqua Buoy shown before deployment. (Photo by Ignacio Rivera)

The Aqua Buoy after five months of deployment. (Photo by Ignacio Rivera)

It was the goal of this project to demonstrate that the selected system functioned as expected, and to document specific user instructions, calibration, and maintenance requirements.

The proposed monitoring system will provide continuous long-term background environmental information for managing natural resources in coastal areas. This information is critical for development of Integrated Natural Resource Management Plans, National Environmental Policy Act documentation and other base compliance measures, as well as for the evaluation of management strategies and military construction investments. The use of automated environmental field sensors and monitoring systems can decrease the dependence on laboratory, field, or at-sea monitoring procedures, and will enhance the capabilities for range sustainment by maximizing training and testing requirements within environmental constraints.

The project's final report, soon to be available via the NESDI web site (www.nesdi.navy.mil), displays the data gathered by the system during the demonstration, a cost analysis, lessons learned during the deployment, and notes regarding the installation and calibration of the system.

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Methodology to Assess Essential Fish Habitat for Navy Coastal Properties

Coastal habitats once sustained healthy populations of fishes that did not require heavy regulatory oversight. These days, things have changed. Over a third of our nation's population is living on the coast and people have a strong appetite for seafood. The regulatory agencies have taken notice of this declining resource and are protecting this multi-million dollar industry. Many coastal areas have been classified as Essential Fish Habitat (EFH). The Magnuson-Stevens Fishery Conservation and Management Act designates EFH for ecologically important fishes in areas that are vital for their spawning, breeding, feeding and growing.

The Navy has many coastal operations and installations that occur in waters designated as EFH and has many routine activities and operations that have the potential to impact EFH. As part of the Navy's environmental compliance, they are required to consult with the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Services (NFMS) regarding any potential effects to EFH. These mandatory consultations are costly, and can be frequent depending on the level of activity of an installation or operator. In order to expedite EFH consultations, marine resource managers need to understand how fishes use bays and harbors. This understanding will allow natural resource managers to establish standard management recommendations that can be consistently implemented to coastal installations Navy-wide that have EFH-related management challenges. With consistent management practices in place, the time and effort spent on essential fish habitat consultations with NFMS could be decreased significantly to support range sustainment and mission readiness.

San Diego Bay is a unique and productive habitat for over 80 species of fish. The combination of estuarine, soft bottom and harbor habitats, allows for San Diego Bay fish assemblages to be abundant, diverse and seasonal. As such, San Diego Bay has been designated in its entirety as EFH for several species of fish.

In order to expedite Essential Fish Habitat consultations, marine resource managers need to understand how fishes use bays and harbors.

San Diego Bay is also home to three Naval bases (Naval Base Point Loma, Naval Base Coronado, Naval Base San Diego) with each installation requiring routine in-water infrastructure and maintenance work that requires EFH consultations. This designation places serious limitations on the Navy's ability to efficiently operate and train in San Diego Bay. Key members of the San Diego project team have experience capturing, tagging, and tracking fishes in southern California, which makes San Diego Bay the perfect test site for conducting an essential fish habitat study.

California Halibut were used as a target species for ultrasonic tagging and tracking in San Diego Bay.

Methodology to Assess Essential Fish Habitat for Navy Coastal Properties

(continued)

Marine biologists process a trawl sample for the San Diego Bay fisheries inventory.

EFH guidance requires an assessment of EFH effects based on different levels of an activity's impact. Without data on local fish population density and habitat usage areas, it is impossible for the Navy to accurately identify impacts to EFH. This project was initiated to gather defensible scientific information on the presence and absence of federally managed fish species in habitats adjacent to Navy facilities. The team is using a robust predictive model to develop quantitative categories for EFH that will be incorporated into NMFS' five-year review of designated EFH areas as well as provide new recommendations that can be implemented for Navy facilities.

The first task completed by the project team was to coordinate project efforts with all the stakeholders including installation managers, regulators, operators, resource managers, and National Environmental Policy Act planners. With collaboration between stakeholders in place, the team was able to build upon existing Commander, Naval Installations Command marine biology projects and Naval Facilities Engineering Command Southwest (NAVFAC Southwest) in-house expertise.

With the NAVFAC Southwest partnership in place, the project team began to mobilize efforts to collect data. In order to better understand the complexity of EFH in San Diego Bay, seasonal fisheries inventories were conducted in four distinct ecoregions. The inventory involved catching fishes via three different methods. These data helped the team better understand the areas of San Diego Bay that support significant populations of juvenile fish species.

These practices may decrease the amount of time spent on the Essential Fish Habitat consultation process and could expedite Navy projects, training, and activities that are mission essential.

Additionally, monthly ichthyoplankton trawls were conducted in the same ecoregions during day and night, coupled with the collection of oceanographic data. This effort helped determine larval fish distribution, abundance and seasonality. In order to determine movements of adult fishes and their habitat use, three species (California halibut, barred sand bass, and spotted sand bass) were implanted with ultra-sonic telemetry devices to allow for spatial and temporal tracking throughout San Diego Bay. In addition, hydroacoustic surveys were used to identify biomasses of fishes under piers and docks.

These monitoring efforts have culminated with the creation of a predictive model. This model will be used to predict when and where fish are using EFH, and score the importance of various areas within San Diego Bay. With the ability to indicate areas that are widely used as nurseries and important foraging grounds for adults, the methods used in this project allow for standardized management practices that can be implemented by each individual base or installation. These practices may decrease the amount of time spent on the EFH consultation process and could expedite Navy projects, training, and activities that are mission essential.

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Implementation Strategy for Coral Reef Transplantation Methods

Coral reef ecosystems are among the most complex and biologically diverse ecosystems on earth. The United States contains an estimated 17,000 square kilometers of coral reef habitat, much of it in the vicinity of military facilities. Many laws have been passed that directly address the protection of coral reefs. The 2000 National Action Plan to Conserve Coral Reefs, composed by the National Coral Reef Task Force, states that, if unavoidable impacts still exist after all attempts at avoidance and minimization have been made, then Federal agencies must replace the resource's lost functions through compensatory mitigation. In light of the proposed listing of coral reef species as endangered or threatened by the National Marine Fisheries Service in November of 2012, coral mitigation is steadily becoming an even larger concern for the Navy.

Currently, as part of either their permit, mitigation or monitoring requirements, the Navy is being required to pay for transplant studies at Navy sites, even though there is little indication that they will be successful. Major impacts to Navy strategic mission initiatives are already occurring, as demonstrated by the current coral reef issues arising at U.S. Navy facilities throughout the world.

In 1984, as mitigation for the dredging associated with the construction of the Navy Ammunition Wharf in Outer Apra Harbor, Guam, the Navy created two reef reserve areas—Orote and Haputo Ecological Reserve Areas for a cost of approximately four million dollars. In 2008, the Kilo Wharf extension project forced the Navy to transplant corals that would be directly impacted by the extension to several new sites on Navy submerged lands in Outer Apra Harbor. They were also directed to increase the size of the Orote Ecological Reserve Area as mitigation for impacts to coral from the Wharf Extensions project.

A recent coral mitigation project in October 2011 involving the removal of coral at Naval Air Station Key West, Florida cost the Navy $200,000 to mitigate 461,808 square centimeters (0.011411 acres) of coral colonies, despite having marginal confidence that the mitigation would be successful. In Japan, $150,000 has been dedicated to the construction of an artificial reef—a portion of which could include transplants from existing reefs, again with little indication that this effort will succeed. Up to this point, the success of these and other transplantation projects Navy has been involved with and/or funded has been questionable.

The results of this study will include pertinent information on transplant successes and failures for use in deciding whether or not transplantation should be considered as a viable mitigation effort for use in consultations with the regulatory community.

Other mitigation efforts could be more beneficial, but without substantial data to convince the regulatory community, the Navy continues to rely on transplantation efforts that have been marginal or unsuccessful. There are over 31 Navy and Marine Corps sites that could also be impacted by this issue where the Navy has jurisdiction in coastal waters.

To study coral transplantation methods and feasibility, the NESDI program sponsored a study that is describing, reviewing and prioritizing potential transplant technologies that could be used to mitigate impacts to coral reefs.

Divers transplanting corals back to the reef using epoxy.
(Photo courtesy of NOAA)

Implementation Strategy for Coral Reef Transplantation Methods

(continued)

The results of this study will include pertinent information on transplant successes and failures for use in deciding whether or not transplantation should be considered as a viable mitigation effort for use in consultations with the regulatory community. If transplantation is found to be a viable option, the document will suggest:

1. Transplant methodologies for different species
2. Optimal conditions for transplantation
3. Related issues that affect juvenile to adult coral transplanted colonies
4. An evaluation ofnurseries as precursors to transplanting

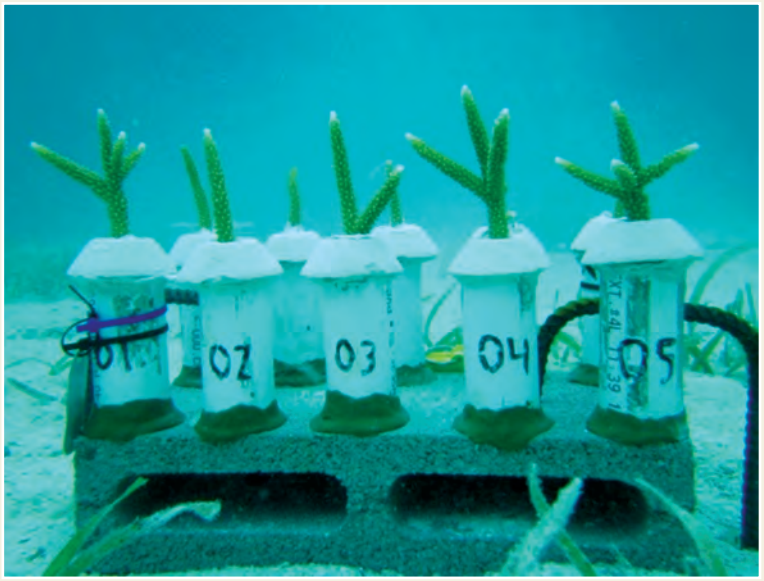
From a biological standpoint, whether coral transplantation is likely to be effective depends on many environmental factors like the water quality, temperature, salinity, turbidity, light, water depth, substrate and coral/algae dynamics. Given the right set of conditions, coral transplantation can be a viable option.

This strategy serves as a roadmap meant to assist users in evaluating their site and its coral transplant requirements, and assess the possibility of biologically successful transplantation projects within their given regulatory requirements.

The implementation of these four strategies supports the evaluation and minimization of environmental constraints on shore readiness, platform operation and force protection, and will provide for cost-effective management of environmental regulatory requirements. This implementation strategy will soon be available via the following on-line resources:

1. The NESDI web site (www.nesdi.navy.mil)
2. The Space and Naval Warfare Systems Command, Systems Center Pacific's environmental sciences web site (http://www.public.navy.mil/spawar/Pacific/ESB/Pages/default.aspx)
3. The DENIX Coral Reef Initiative Database (http://denix.osd.mil/nr/crid/Coral_Reef_Iniative_Database/Home.html)

Capturing coral spawns as part of the reproductive settling transplant method.
(Photo courtesy of NOAA's Southeast Fisheries Sciences Center)



***Acropora cervicornis* nursery in Florida.**
(Photo courtesy of the Rosentiel School of Marine and Atmospheric Sciences, University of Miami)

The CRMS buoy as seen from the surface.

CRMS sensor focused on *Poritus rus* coral head.

In a related effort, the NESDI program recognized the need to assess the potential impact of dredging, berthing, and pier construction on the health of adjacent coral communities. The ability to characterize, assess, and monitor underwater benthic communities associated with Navy sites or activities is required in order to document compliance with promulgated national policy and to ensure that Navy operations do not lead to natural resource degradation, particularly with respect to coral reefs.

To that end, the NESDI program sponsored an effort (Automated Assessment of Coral Reefs (project #425)) to demonstrate an innovative suite of equipment capable of monitoring the ambient conditions (including turbidity) that may impact the health of nearby coral ecosystems as well as collecting associated data about turbidity and other parameters.

A prototype of the Coral Reef Monitoring System (CRMS) was tested at Commander U.S. Naval Forces, Marianas Islands in Sasa Bay (Apra Harbor) Guam. The system demonstrated the equipment configuration required to collect data on turbidity and other ambient conditions found in the harbor. The automated nature of the system eliminates the time-intensive step of having divers collect the same data when it is needed for permit consultations.

A system, like the one demonstrated here, could provide natural resource managers with a means to monitor and analyze the health of coral reefs while allowing the Navy to proceed with the dredging and construction projects necessary to support its fleet of aircraft carriers and other surface ships.

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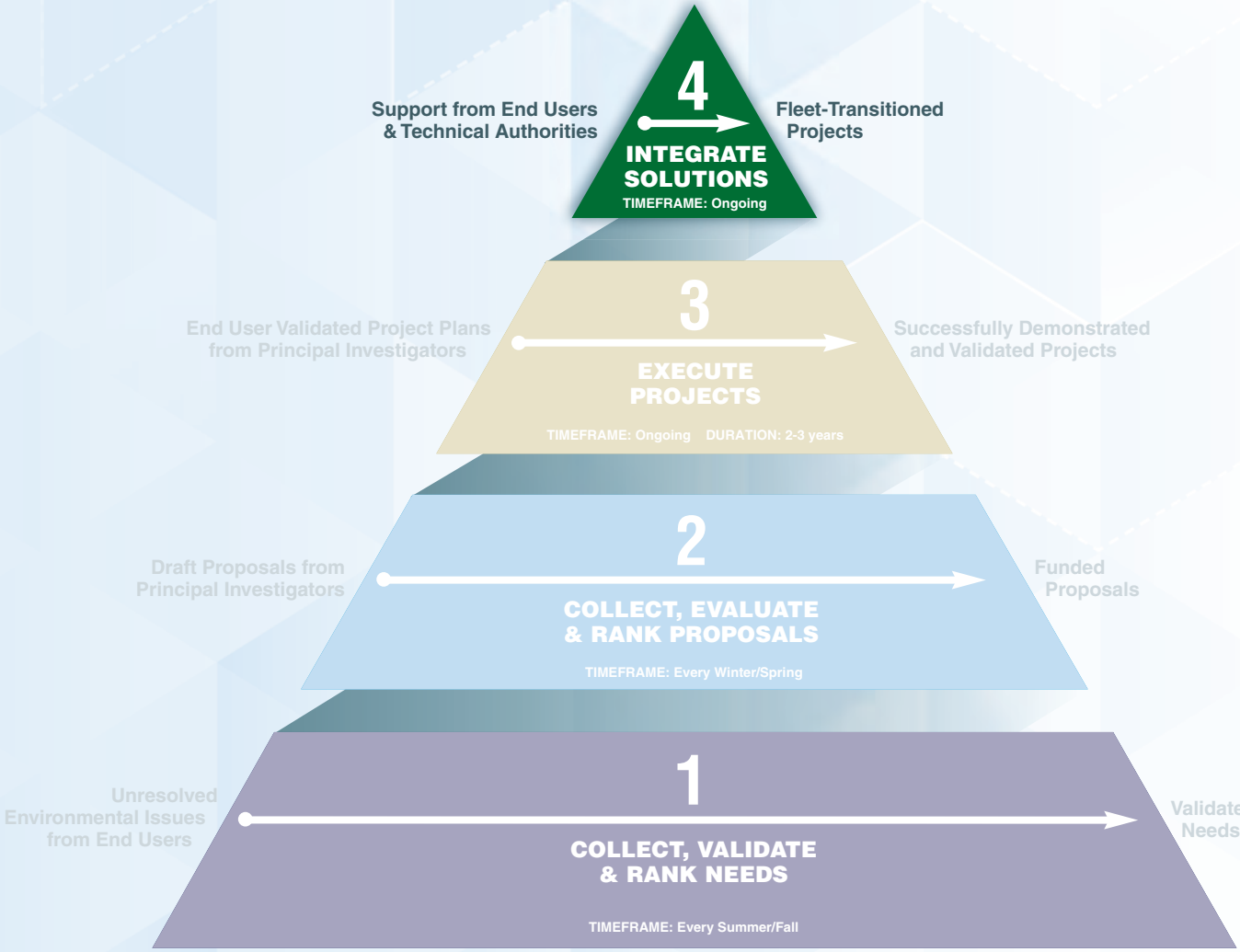
Process & Perspectives

"I think that the integration stage is the most valuable because that's where the customer reaps the benefits and the savings from our newly developed and approved technologies, I believe that our Sailors and Marines need the best possible solution to help them do their jobs. That's why I participate in the NESDI program." Lynn Cahoon

"We get better and better at integrating the results of our projects year after year. We have identified many of the challenges and barriers to integration and now know where to focus our efforts. We have made everyone aware that to integrate you have to be proactive about the process. Thinking 'If you build it, they will come.' is no longer good enough. They won't come if they don't understand the new technology, how to find it, and how to fund it." Leslie Karr

Integrate Solutions



Throughout the project lifecycle, program personnel concentrate on moving the demonstrated technologies and other solutions out of the laboratories and demonstration sites and into the appropriate operational environment. During this fourth and final phase of the NESDI program process, the TDWG, Principal Investigators and technology integration specialists work together to ensure that various solutions are successfully integrated into the Fleet and weapons system acquisition programs and verify that the solutions provide the anticipated benefits.

Process Overview & Perspectives

Throughout the project lifecycle, program personnel concentrate on moving the demonstrated technologies and other solutions out of the laboratories and demonstration sites and into the appropriate operational environment. According to Cindy Webber, "Integration is not an easy thing—it takes a long time. And it's not just a challenge for the NESDI program. A lot of demonstration/validation programs struggle with integration."

Bob Neumann agrees. "Execution is very difficult but extremely important to the continued success of the program," he said. "So we need to continue to engage end users throughout the process and help them plan for integration. We also need to work with those who fund the operation and maintenance activities so that they know what will be required for the successful integration of our technologies."

During this fourth and final phase of the NESDI program process, the TDWG, Principal Investigators and technology integration specialists work together to ensure that various solutions are successfully integrated into the Fleet and weapons system acquisition programs and verify that the solutions provide the anticipated benefits.

"I think that the integration stage is the most valuable because that's where the customer reaps the benefits and the savings from our newly developed and approved technologies," said Lynn Cahoon. "I believe that our Sailors and Marines need the best possible solution to help them do their jobs. That's why I participate in the NESDI program," he continued.

Cindy Webber agreed with Lynn. "What's most valuable to me is when a product is integrated and used."

"We get better and better at integrating the results of our projects year after year," said Leslie Karr. "We have identified many of the challenges and barriers to integration and now know where to focus our efforts. We have made everyone aware that to integrate you have to be proactive about the process. Thinking 'If you build it, they will come.' is no longer good enough. They won't come if they don't understand the new technology, how to find it, and how to fund it."

According to Leslie Karr, "Our range projects are particularly well integrated because the end user was involved the entire time. Funding issues threaten perfect integration—everyone is experiencing financial difficulties right now." This may be why Pat Earley believes that the decision tools and studies sponsored by NESDI program are among the program's biggest successes—they have low or no cost for integration.

"Overall, I think the NESDI program does a good job of integrating our solutions—improving end user participation has helped a lot," said Jerry Olen.

According to Bill Hertel, "The NESDI program has made great strides in transparency and in effectively communicating the results of its successful investments. Although the program has developed the initial framework and tools to facilitate integration efforts, it is ultimately the responsibility of the Principal Investigators to pursue and identify specific pathways with end users that can be verified and strengthened with assistance from TDWG members. The program's integration efforts can be strengthened through early, more effective communication, better requirements identification, frank discussions regarding realistic integration pathways, and more effort to obtain higher level awareness and commitment from transition sponsors and associated platform program managers or technical warrant holders."

"The NESDI program continues to put great effort into relationship building and garnering trust through its annual execution cycle and sponsored outreach efforts. It is essential, however, that our Principal Investigators realize and diligently pursue integration requirements," said Bill.

Lynn Cahoon highlighted two specific projects as integration successes. "I think that our *Fuel Cell Leak Detection* (#333) and *F404 Drive Shaft Cleaning* (#331) projects were particularly well executed. Both technologies are mature and presently in use at some of our Fleet activities," he said. "But one of the things that we could do to ensure that more of our projects are successfully integrated is to make sure we have an advocate at the site where the technology is being tested—an advocate who will be willing to invest time and resources in the technology if it's successful," he continued.

Cindy Webber added the *High Velocity Oxygen Fuel Thermal Spray as an Alternative to Chromium Electroplating on Helicopter Dynamic Components* project (#337) and *Advanced Anodizing Using Process Control Technology* project (#330) to Lynn's list since both are still in use in the Fleet today. Cindy gives credit to the Principal Investigators that got the right people on board up front. "It is all about communication," she said.

Bill Hertel would include the following four projects among those that have been particularly well integrated: *Comprehensive Environmental Compliance Approach for Cathodic Protection in Caissons and Floating Dry Docks* (project #419); *Closed Cycle Ultra High Pressure Water Coating Removal System* (project #132); *Predictive Aquatic Fate and Transport Model in Support of TMDL and Compliance* (project #396); and *Control of Cutting and Arc-Gouging Emissions* (project #47).

Pat Earley believes that the NESDI program is able to provide unique forums (through the IPR process) that enable our user communities to stay engaged at multiple levels. "Although the NESDI program is supportive of getting products ready for integration, the final step is always dependent upon the user community and their available resources," he said. "We need to continue to support the IPR process and the TDWG members to ensure that more of our projects are successfully integrated," he continued.

"It's good to see the NESDI program at work—playing an important role in the overall operations of the Fleet, solving problems," said Cindy Webber. "And it gives me and others insights into problems and solutions that I wouldn't otherwise have," she continued.

Regardless, Bill Hertel believes that many NESDI projects are successful because they:

1. Had a well-established need or influencing regulatory justification
2. Had broad spectrum managerial support
3. Had significant end user buy-in and advocacy
4. Had one or more strong Principal Investigators with well-coordinated and executed project plans that were developed as early as possible
5. Were purpose-driven and incorporated the end user as a significant partner
6. Were well-documented to meet end user and research objectives with solid conclusions, recommendations, action plans and support for follow-on solution implementation
7. Delivered a product or solution that addressed the need and was accepted and used for real benefit.

"To ensure that more of our projects are successfully integrated," Bill said, "the NESDI program can continue to reach out to its end users and all influential command levels to increase the awareness of, participation in, and success of the NESDI program. The program can also continue to promote the "NESDI way" with strong emphasis on nurturing and engaging its Principal Investigators. The program should maintain the investments it continues to make in its web site and other program execution and management tools including its Technology Integration and Cost Analysis tool."

Overall, Bob Neumann believes that "our Principal Investigators are doing a good job executing their projects." Bob also believes that we need to continue to emphasize the development of realistic Plan of Action and Milestones (POAM) and execute according to those POAMs. He said, "If the project schedule slips, our Principal Investigators need to alert our program manager as early as possible so that she can effectively manage the program's overall execution rate."

2013 Project Summary

A number of NESDI projects were particularly successful in FY13 including the 15 projects whose accomplishments are highlighted in the table below. Projects designated with an (*) were closed out during FY13.

No.	ID	Title	Accomplishment
1.	328	Non-Chromated Post Treatments*	• Data package was submitted to NAVAIR's senior corrosion engineer to support the generation of a NAVAIR authorization letter.
2.	437	Implementation of Forensic Approaches to Address Background Perchlorate Source Identification and Characterization at Navy Facilities and Ranges*	• Technical guidance is being drafted that describes a framework and process for site managers to follow when performing a perchlorate background evaluation at their site. • Guidance will be used to transition a forensics analysis framework into existing Navy condition assessment protocol and methodology documents.
3.	440	Surface Cleaning of Dry Dock Floors	• Prototype design of the cleaning vehicle is complete and its fabrication is ongoing.
4.	446	Demonstration of Physical and Biological Conditioning of Navigational Dredge Material for Beneficial Reuse*	• Results from pilot project were encouraging for the development of a full scale process for the beneficial use of dredged material at Pearl Harbor.
5.	451	Navy Demonstration of Cadmium and Hexavalent Chromium Free Electrical Connectors*	• Identified candidate replacements for Cadmium and Hexavalent Chromium.
6.	456	Hull Maintenance Shroud	• Received positive feedback and suggested improvements from Naval Stations Mayport and San Diego on prototype shroud.
7.	460	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors*	• Reactive amendment was successfully placed at Puget Sound. • Monitoring is ongoing.
8.	461	Development of a Collaborative PESHE Document Authoring Tool for All Navy Commands	• Developed a beta version of the software. • Developed a test plan and assembled testers at each Systems Command.
9.	463	Methodology for Identifying and Quantifying Metal Pollutant Sources in Stormwater Runoff*	• Drafted a methodology and now validating that methodology at a second site.
10.	468	Low Cost Selective Polymer and Laser Interferometer Real Time Sensors for Detection of Solvents in Contaminated Groundwater Plumes	• Completed fabrication of sensor platform and support system.

2013 Project Summary (continued)

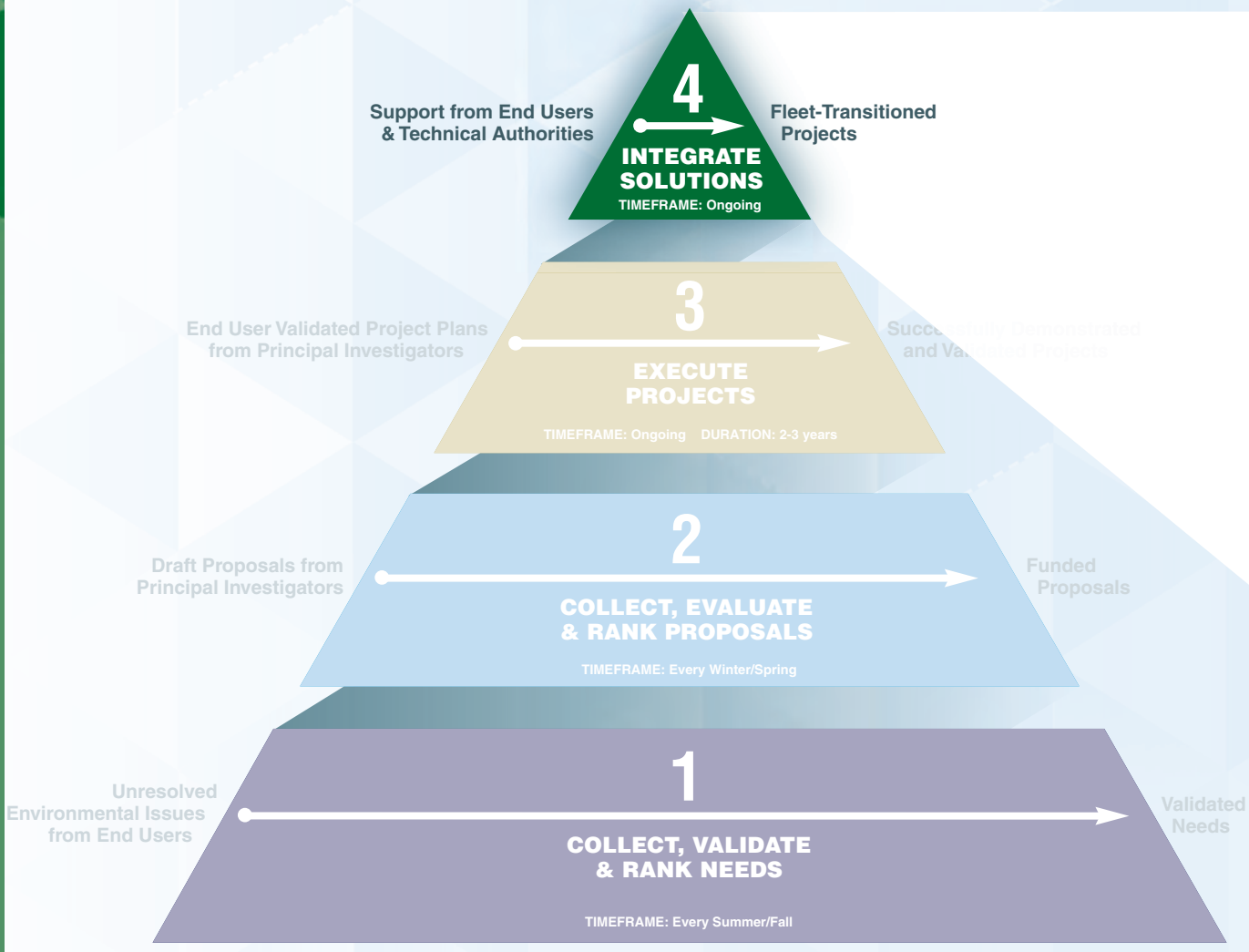
No.	ID	Title	Accomplishment
11.	469	Validation of a Low Tech Stormwater Procedural Best Management Practice*	• Determined that weekly vacuuming and monthly power washing reduced but did not sufficiently mitigate metals (copper and zinc) and toxicity in stormwater runoff to meet permit thresholds. • The regulator would not allow the permit to include the application of the best available technologies (rather than specific thresholds). • The final report's executive summary will be sent to all Navy bases.
12.	474	Toxicity Associated with Polycyclic Aromatic Hydrocarbons Used in Clay Targets	• Major technical breakthroughs were made in identifying skeet markers in vintage skeet samples and correlating these markers to skeet range field samples.
13.	476	A Quantitative Decision Framework for Assessing Navy Vapor Intrusion Sites	• Completed database schema. Scope, usability, data identification and data gaps included in the final technical memorandum. • Populated database will be completed by the end of the fiscal year.
14.	494	Successful Municipal Separate Storm Sewer System (MS4) Programs Implemented in the Navy*	• Completed a study/guidance document which includes a methodology on how bases are managing their MS4 permits (including Naval Construction Battalion Center Gulfport, Naval Support Activity mid-South, and Marine Corps Base Camp Lejeune). • Study is being finalized and management templates will be posted to the NAVFAC EMS web site and distributed to water program managers via the Water MFT.
15.	495	Radioactive Material Permit Generation, Management and Tracking System	• Worked with the Radiological Affairs Support Office to validate requirements and generated a preliminary design for an automated management system.

Projects to be Completed in 2014

The 18 projects in the following table are slotted for completion in FY14.

No.	ID	Title	EEC
1.	462	Environmental Effects of Military Expendable Material	2
2.	465	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater Unexploded Ordnance Sites	2
3.	482	Innovative Cutting Process to Vent Full Scale Non-Explosive Practice Munitions	2
4.	483	Transportable Field Melter for Recycling of Bombing Range Material Potentially Presenting an Explosive Hazard	2
5.	348	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	3
6.	450	Cadmium Tank Electroplating Alternative	3
7.	470	Cyanide Waste Reduction of Electroplating and Stripping Processes	3
8.	484	Replacement of Film Radiography with Computed Radiography	3
9.	486	Qualification of Proposed MIL-P-85891 Type 8 Plastic Media Blast (PMB) as a Replacement for Chemical-based Strippers and Type 5/7 PMB	3
10.	488	Excess Paint Reduction	4
11.	356	Demonstration of Real-Time Drinking Water Quality Monitoring Technologies	5
12.	448	Evaluation of Re-suspension Associated with Dredging, Extreme Storm Events and Propeller Wash	5
13.	457	Compliance with the Emerging Requirements of the Stage II Disinfectant and Disinfection Byproduct Rule	5
14.	459	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	5
15.	473	Dynamic Mixing Zone Modeling	5
16.	479	Remove Copper and Other Heavy Metals from Oily Water Treatment System Discharge for Compliance with NPDES Discharge Standards	5
17.	490	Application of the Marine Biotic Ligand Model for Copper to Evaluate Risks Associated with Olfactory Responses in Salmonids and Forage Fish	5
18.	491	Implementation Strategy for Coral Reef Transplantation Methods	5

Integrate Solutions



Acceptance, Resources & Communication

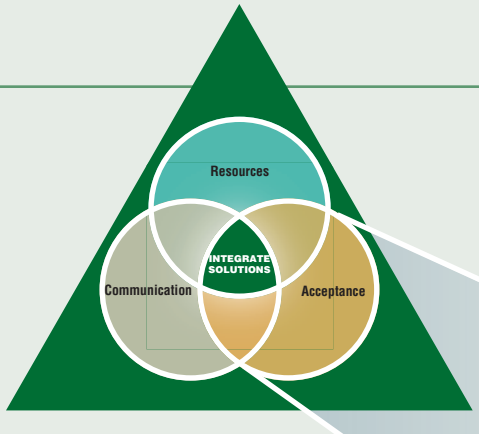
Acceptance, Resources & Communication

More Perspectives from Leslie Karr

Now that we have presented the results that the NESDI program achieved in FY13 via our four stage process, I wanted to provide some additional insights from the program manager's perspective on how to increase the probability of a successful project integration. The mentality of "build it and they will come" no longer works when funding is not available to build it. "Building it" can lead to acceptance, but the project outcome or results still must be communicated and the appropriate resources secured to actually implement or procure the technology. Building it allows the artisans the opportunity to see if it will work in a production environment and gain momentum to make a change. We have numerous technical success stories that are not fully integrated because of certain circumstances or conditions—some of which are totally outside the realm of a Principal Investigator. However, these circumstances or conditions must be identified so the appropriate person(s) can take action. Implementation of technology is difficult so you need to have a roadmap in place at the start and ask for directions along the way.

The directions can come from your team members, other staff resources at your host organizations and elsewhere. Change is a slow process and you must be ready when an opportunity presents itself, so start early and expect detours.

It is the intersection of three factors—Acceptance, Resources and Communication— where I believe you will achieve the greatest integration successes. In fact, I don't believe that you achieve true integration if one of these three factors is missing or largely unaddressed. They are all necessary. So right from the start, start thinking "Acceptance, Resources and Communication" and you'll have a higher probability getting the results of your project integrated into the ongoing operations of today's Navy.



Acceptance

One of the three factors that I believe are critical to ensuring the successful integration of any project is acceptance. By this I mean, who is going to accept and support the results of your efforts? Who is going to be your advocate on the ground? Who is going to assume the daily operation of your new industrial process? Who will use the new material you've developed? Who will sanction the guidance, technical directive or authorization letter that you've drafted? Is it a Technical Warrant Holder? Someone who "owns" a technical or general series manual? Or someone else? Who is the end user, the artisan who has to actually use your new process? Who are the cognizant regulatory personnel who must grant their approval? This may include in-house personnel and outsourced personnel who are necessary to operate the new technology.

The mentality of "build it and they will come" no longer works when funding is not available to build it.

Leslie Karr

Once you have suitable answers to the "who" questions, you need to turn to the "when." When will the results of your efforts, your project need to be accepted? Are there some critical deadlines—many of which are driven by external factors that may be out of your control—with which you should align your efforts? These external factors may be compliance or regulatory drivers or may be tied to an Executive Order.

Finally, "how" will the results of your project—your material, your guidance, your technology, your enhanced industrial process, your software—be accepted? Is a technical directive or authorization letter required? You need to have the answer to the "how" as well before you can expect to start integrating the results of your

efforts. If the "how" is different from the current process, expect a slow response.

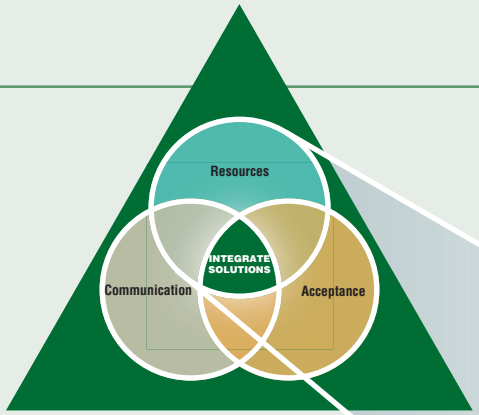
Early on in the planning stage of any of the projects I managed, I asked and got answers to many of the questions posed above. And once I had those answers, I had more confidence that, at the conclusion of my project, its results would be accepted and used by the right people in the right organizations. Crucial throughout the life of a project is developing and maintaining credible relationships. I have seen the tangible results of relationship-building efforts when end users and collaborators participate in our IPRs (either in person or over the phone), or during our field visits, or via emails sent to me.

Crucial throughout the life of a project is developing and maintaining credible relationships.

One formula that has worked fairly well over the past few years involves the needs that have been generated from personnel who manage the Navy's various testing and training ranges. Those needs and the subsequent proposals and end products tend to have a well-defined user community. It is mandated that the community is involved at the need submission stage all the way through the approval of the project proposal and the Project Management Plan and/or demonstration plan. Range personnel tend to be very involved in our demonstrations. See pages 118-119 for more insights into how we manage our efforts for the range community. Our resource sponsor—CNO N45—is also involved throughout the life of our range projects. For all of our success in identifying the needs from the range community and demonstrating valuable technologies, resource availability is not always apparent. This is, in part, due to boundaries between projects that have an environmental, safety, and/or utility component attached to them. It is not always clear who is the ultimate end user of a technology and there may be safety and other factors (like environmental compliance factors) to consider.

In addition to our range projects, the studies that we have sponsored tend to be more successfully integrated, mostly because there are established homes and work groups for those studies. In particular the studies that resulted from our *Military Expendable Equipment* (#462), *Environmental Effects of Lasers on Biota in the Marine Environment* (#439), and *Long Term Disposition of Seafloor Cables* (#347) projects were successfully integrated since there already exists an on-line library for NEPA documentation that houses these studies as well as various work groups that will use the results of the study. Therefore, minimal resources were required to ensure integration beyond the resources required for the study itself. The on-line library addresses the "acceptance" required for these studies. Technical acceptance is often gained through peer reviewed journal articles. The relevant range work groups can also be the primary mechanism for "communicating" the value of these studies and promoting their use.

Our *Advanced Non-Chromate Primers and Coatings* project (#458), even though an active project today, has a great start on the "acceptance" component of integration. The Principal Investigator already knows "who" will be the advocate on the ground—who will accept the material substitution once it has been properly validated. Three Fleet Readiness Centers (in Jacksonville, FL, North



Island, CA, and Cherry Point, NC) along with personnel from the Naval Air Station (NAS) Patuxent River are actively involved in this project that will apply to several different aircraft. They are the "who" that will be accepting and using these new primers and coatings. They know "who" will be authorizing the use of these primers and coatings if the demonstration of these materials is successful. They know "how" it will be accepted beginning with a NAVAIR authorization letter, and followed by the appropriate maintenance manual changes, such as the *Aircraft Weapons Systems Cleaning and Corrosion Control* manual (NAVAIR 01-1A-509).

Another example where "acceptance" was obtained upfront and early is our *F404 Drive Shaft Cleaning* project (#331). (Note: The F404 engine is used to power the F/A-18 "Hornet" aircraft. The fan drive shaft of this engine has a tendency to coke due to the repeated heating and cooling of the engine. The shaft cleaning is accomplished at the Navy's various Fleet Readiness Centers.) Tom Cowherd, the Principal Investigator for this project, identified the "who" very early on. They were the operators at the Intermediate-level F404 engine maintenance shop at Naval Air Station Oceana, Marine Corps Air Station (MCAS) Miramar, and MCAS Iwakuni. The Original Equipment Manufacturer and the F404 engine Fleet Support Team in addition to the environmental personnel on site were also involved in the authorization of this new cleaning process. Due to some unanticipated resource issues, discussed in the following section, the ultimate roll-out of the results of this project—the enhanced cleaning process—was delayed.

Resources

Any project regardless of project type needs resources of one type or another to be successfully implemented. A project may need financial and/or personnel resources to be successfully integrated. Training resources may be required if it is necessary to instruct about a new procedure. Financial resources may be required if a piece of equipment needs to be procured for a shore installation, shipyard or ship.

Any project regardless of project type needs resources of one type or another to be successfully implemented.

The first question you should ask yourself with regard to resources is, who is ultimately responsible for integrating the results of my project? Is it someone at my demonstration site or another field installation? Is it someone who might "own" the process that I am trying to enhance? It might be some of the same people from whom I am hoping to gain acceptance for my product. Sometimes this is not clear. The boundary for the need (and the resultant project) may be fuzzy. The need may have a safety or utility component to it. There may also be an environmental driver behind the need. Safety and environmental issues are often interconnected.

Once it is clear on who would be key to securing resources for your product to ensure its site by site, or Navy-wide integration, you need to turn your energy to "how" to obtain those resources. Should I prepare and submit a Program Objectives Memorandum (POM) or an Environmental Program Requirements (EPR) request? Is there special program funding that I can tap to cover the expenses associated with the integration of my project? Be creative and be persistent. Leveraging different resources is very helpful, since RDT&E funds cannot be used for Navy-wide integration efforts.

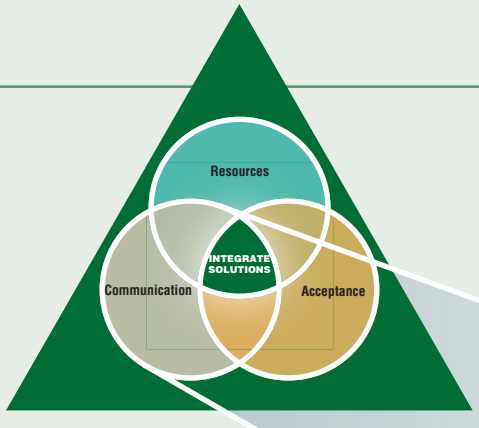
Using our Technology Integration Cost Analysis (TICA) tool can be helpful since it will give you a handle on the economics of your "new" versus the "in place" solution. If this is a new technology where something doesn't already exist, the TICA tool can provide the talking points to go over with potential end users, including the anticipated costs, payback, and return on investment as well as the associated tangible and intangible benefits.

For the *F404 Drive Shaft Cleaning* project, "resources" were a challenge even though the actual cost of the equipment was relatively low (around $20,000). Not only were resources (in the form of actual maintenance personnel) required at the demonstration site, financial resources also posed a challenge to the successful integration of this technology.

To address these "resource" challenges, an implementation package was prepared and funding programmed for the Aircraft Intermediate Maintenance Department (AIMD) at the NAS Oceana using funding from the now defunct Pollution Prevention Equipment Program (PPEP). Unfortunately, the purchase of the necessary equipment was competing with other priorities at the base and, as such, the funding expired before the equipment could be procured and installed at the AIMD.

The integration process began again the following fiscal year with other financial resources in hand (to replace the PPEP resources) and even more persistence from the Fleet Support Team, local environmental departments, and the project's Principal Investigator. Even the second time around, the installation of the equipment was delayed due to challenges incorporating the new equipment into the configuration of the AIMD and gaining access to the necessary electrical service.

Another good example of a project that secured the necessary resources for integration is our *Advanced Sealant Technologies* project (#329). The demonstration of the conductive gaskets was successful and resulted in a NAVAIR authorization letter and an addition to the *Aircraft Weapons Systems Cleaning and Corrosion Contro*l manual. Even after this was completed, aircraft platform maintenance personnel were still hesitant to use the gaskets. So to appease those maintenance personnel and ensure the integration of the conductive gaskets, the Principal Investigator on this project secured leveraged resources from the Defense Logistics Agency to perform more demonstrations on a number of other platforms to gain their acceptance.



Communication

There are many ways to communicate the results of your efforts. It's probably useful to first think about the intended audience for your technology, material, guidance or software. You also need to take some time to consider your messenger—another "who" in this equation. Ideally, you'd like to tap someone with the requisite skills and respect within the communities you are trying to reach. It might be you, another technical team member, your TDWG representative, your supervisor, or a combination of the above. Develop and maintain these relationships throughout the duration of your project.

Change is a slow process and you must be ready when an opportunity presents itself, so start early.

Leslie Karr

There are many ways to communicate the results of your efforts. It's probably useful to first think about the intended audience for your technology, material, guidance or software. You also need to take some time to consider your messenger.

Once you have a good handle on "who" you want to reach with your message and "who" will craft and carry your message about your project results and how they can be used—think about "how" it is best to reach that audience. And it may be a combination of efforts depending on your message and the location of your target audience.

A good start is considering the various mechanisms in the list below:

1. Publish a *Currents* magazine article.
2. Highlight the project in the following NESDI program mechanisms:
   a. Quarterly newsletter *(NESDI News: Highlights & Happenings)*
   b. Annual Year in Review report
   c. Project fact sheets (on the program's web site)
3. Develop a NESDI project video.
4. Publish the results of your project in peer review journals. (This certainly helps when trying to gain "technical acceptance" for the results of your project.)
5. Present the results of your project at conferences, meetings, and teleconferences.
6. Post information about your project to:
   a. CNO N45's environmental planning library
   b. The Defense Technical Information Center
   c. The NESDI web site
7. Issue a DoD Technical Report about your project.
8. Mention the results of your project in the NAVFAC Technology Transition (T2) newsletter (for remediation projects).
9. Send an informational email to a targeted community(s) leveraging EXWC e-projects.
10. Consider a Naval Civil Engineer Corps Officer School or Defense Acquisition University (DAU) course or other training mechanism.

In addition to the communication mechanisms listed above, a wide range of working groups—groups with active members from many different end user communities—can be leveraged to get the word out about the successful results of your project. So, as part of your strategy to communicate the results of your hard work, consider leveraging the connections of the various members of the following working groups:

1. **Range Operations and Sustainment:**
   a. The Range Commanders Council
   b. The Range Support Group
   c. The Underwater Range Sustainment Group

2. **Weapons System Sustainment:**
   a. The NAVSEA Pollution Prevention Working Group
   b. NAVAIR Corrosion Fleet Focus Team (CFFT)
   c. Aerospace Cadmium and Chromium Elimination (ACE) Team
   d. Advanced Surface Engineering Technologies for a Sustainable Defense (ASETS) Defense Conference

3. **Air and Port Operations**
   a. NAVFAC's Clean Air Act (CAA) Working Group
   b. NAVFAC's Clean Water Act (CWA) Working Group
   c. NAVFAC's Total Maximum Daily Load (TMDL) Working Group
   d. The Risk Assessment Working Group (RAW)
   e. The Alternative Restoration Technology Team (ARTT)

4. **Base and Regulatory Compliance**
   a. NAVFAC's CAA Working Group
   b. NAVFAC's CWA Working Group
   c. NAVFAC's Safe Drinking Water Act Working Group
   d. The Petroleum, Oil and Other Hazardous Substances Working Group
   e. The RAW
   f. The ARTT
   g. The Sediments Work Group
   h. The Munitions Response Program Working Group

For the F404 Drive Shaft Cleaning project, installation issues associated with electrical service and the arrangement of new equipment within the configuration of the AIMD were addressed through the persistence of the FST, the NAS Oceana environmental staff person, and the project's Principal Investigator. AIMD maintenance personnel were also trained on the proper use of the new equipment which also helped to ensure its ongoing use. None of this would have been possible without the frequent communication among the project team and with the targeted end users—AIMD maintenance personnel.

The remaining pages of this report provide you with some insights into the process we've customized to effectively reach the range community, the enhancements we've made to our program's web site, the methods we use to promote the successes of the program, and additional details about our priority investment areas.

Know what your end point is even before you start your project.

Leslie Karr

One final bit of advice—know what your end point is even before you start your project. You should identify your desired end point while you are preparing your proposal to address the targeted need. If you don't know what your end point is, then you won't know if you arrived. This has been said many different ways by many different people—but "start with the end in the mind." It's cliché but true. Do everything you can at the inception of your project to understand where you're heading then adopt the three principles above to help you to get there.

Reaching the Range Community

There are inherent safety and operational risks in executing research and development projects on the Navy's training and testing ranges. These risks stem from a number of factors including the materials used in ordnance, the potential of unexploded ordnance on those ranges, and the fact that the ranges are in constant use which makes the access required to conduct the necessary demonstration and validation unusually challenging.

It takes a lot of coordination to carry out a demonstration of sufficient time and duration to yield repeatable results and support sound decision-making. As a result, the NESDI program has customized its four-phased process to accommodate the special requirements of the range community and allow for the efficient transfer of information and technologies between the ranges. In particular, the program has developed a process (represented in the flowchart on the following page) to engage experts in the range community to:

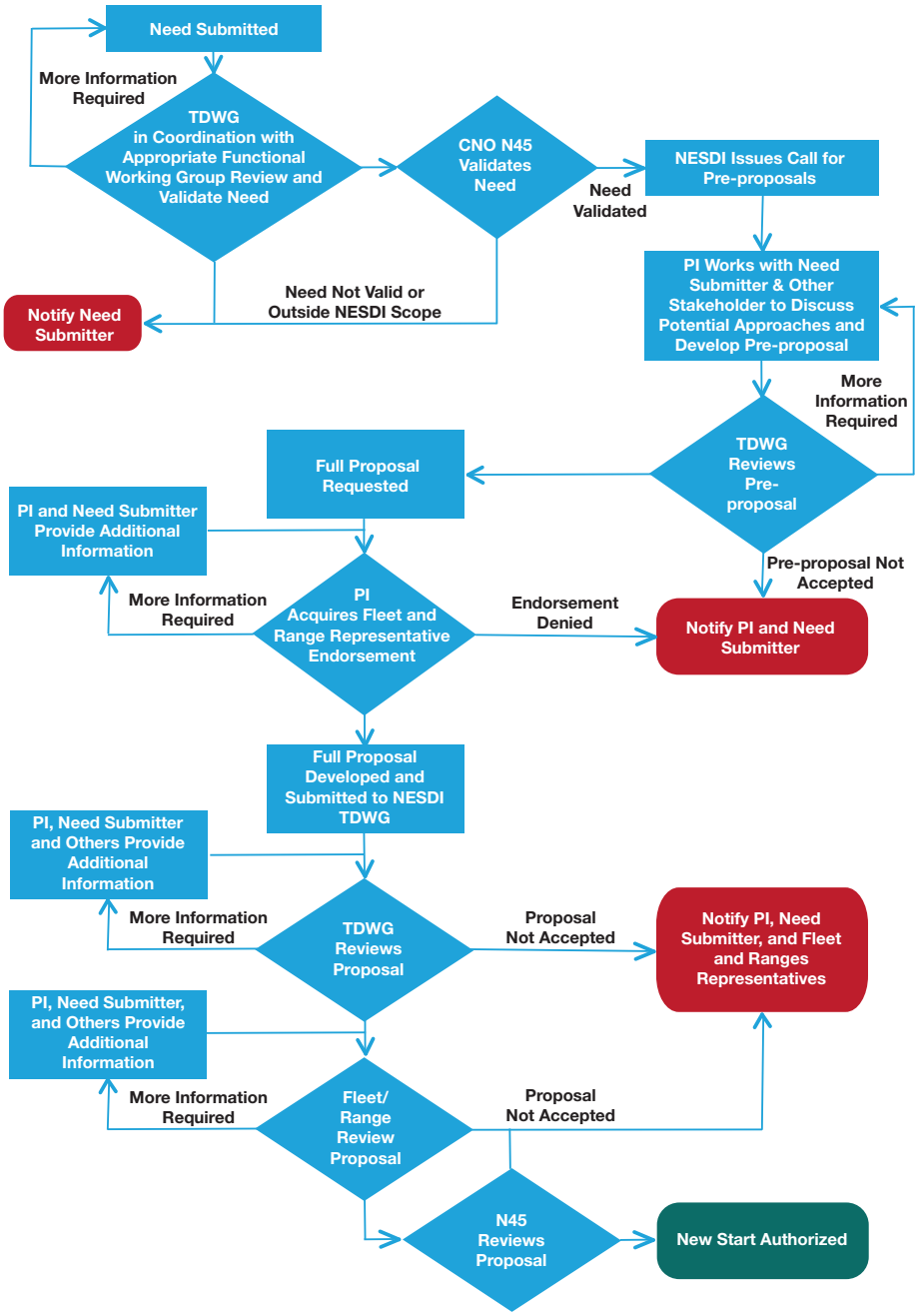
- Determine where the Navy is most at risk.
- Identify gaps in information and technology inherent in Navy ranges.
- Determine how the NESDI program can fill those gaps.
- Demonstrate and validate technologies and create the knowledge to support ongoing range assessments.
- Minimize or eliminate range-related risks.

This NESDI project demonstrated and validated that applying hydrated lime ensures that there is no residual Royal Demolition Explosive remaining in the surface soils of venting sites at two of the Navy's largest air-to-ground ranges.

Raking in lime at the Fallon Range Training Complex. (Photo by Joey Trotsky)

The venting area at the Fallon Range Training Complex. (Photo by Joey Trotsky)

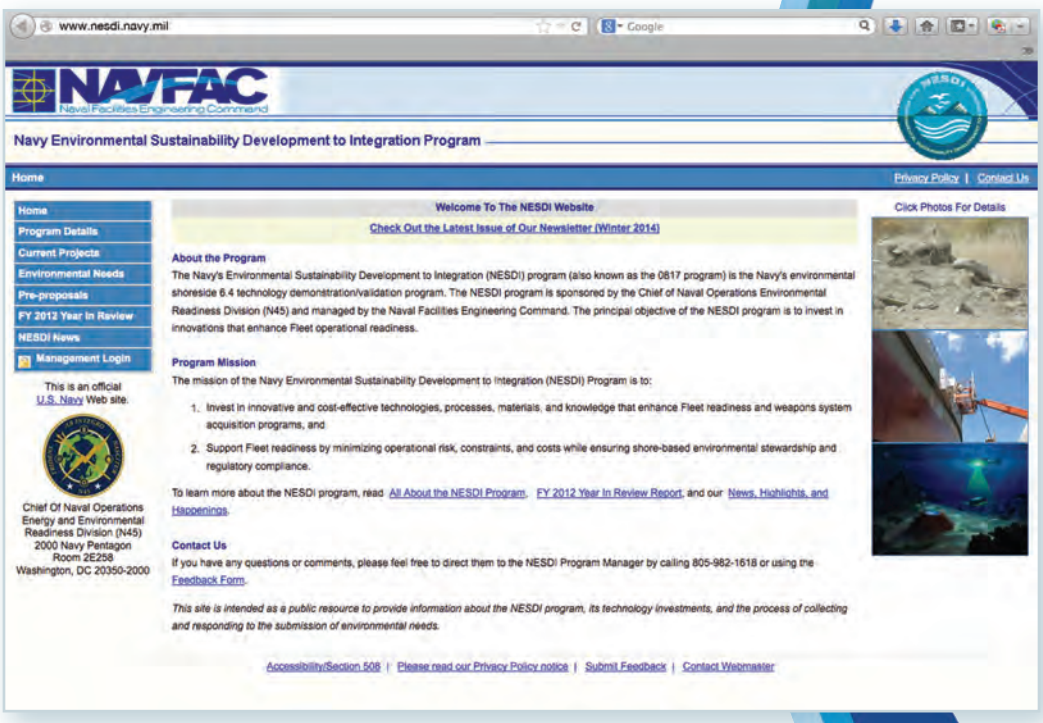
This flowchart represents the customized process that the NESDI program uses to collect needs from the range community and manage the proposals it receives to address those needs.



Enhancing Our Web Site

After unveiling the program's consolidated web site, program personnel implemented a series of enhancements in FY13 to better execute the program.

According to Leslie Karr, "Our web site is invaluable for analyzing each stage of our process and for providing transparency and accountability to our resource sponsor. The analytical power of our web site saves us a lot of time and has provided me with additional insights into how our money is being spent. It also allows for a quick response time back to CNO N45 and NAVFAC Headquarters. Our data truly is at our fingertips."



www.nesdi.navy.mil

The program web site (www.nesdi.navy.mil) provides a single, centralized repository for information pertaining to the management of the program and execution of program sponsored projects. The site promotes efficient management of program information and timely communication of critical deadlines and other information to key program personnel across the Navy. The web site also allows personnel from other R&D programs to obtain up-to-date insights into the NESDI program's priorities and ongoing projects. It's simple, efficient, and provides site visitors with quick access to program resources and information.

The following enhancements were made to the program web site in FY13:

- Increased the types of project content available to the public including videos.
- Implemented changes across the web site to make it compatible in a multitude of browsers including Internet Explorer through version 10, Firefox Mozilla through version 23, and Safari through version 6.

Updated the server, database, and development platforms making the application more secure and keeping up with technology advances. The NESDI web site serves two primary program requirements:

1. **Public Component.**
   The public component (www.nesdi.navy.mil) provides the general public with information about the program's mission, technology investments, and successes. It also serves a single entry point to collect environmental needs and research proposals.

2. **Secure Program Management Component.**
   The secure program management component (www.nesdi.navy.mil/ProjectManagement) is a collaborative work flow application that supports all aspects of the program's business processes. This component is based on multiple account roles so that each user within a particular role has access only to the appropriate functionality and data. Primary functions are as follows:

- Collect and leverage input from management role members to validate/approve submitted environmental needs and their associated research proposals. This input is ultimately used to arrive at program investment decisions.
- Provide automated feedback services to needs and proposals submitters and provide final review results via automated emails.
- Provide automated scheduling services through automated emails. These services notify the appropriate members (based on their user roles) of upcoming deadlines with instructions on how to accomplish their required actions.
- Collect and manage data for research proposals and funded projects such as financial requirements/expenditures, schedule, milestones, and status updates.
- Provide reporting capability for various metrics which are used to present progress to the program's resource sponsor.

Promoting Our Successes

Successful NESDI projects were promoted throughout FY13 in a variety of print and on-line publications including the Navy's own energy and environmental magazine,—*Currents*; the program's quarterly newsletters; fact sheets online at the NESDI web site (www.nesdi.navy.mil); and a variety of other publications, conferences, and workshops.

For people to know about the NESDI program's successes, it is important to tell them about the program's success. "I would argue that if people don't know you're doing something, then you're not doing it," said Bruce McCaffrey, management and communications consultant for the program.

"Our reports, newsletters, and other communication efforts have really helped to increase the visibility of the program," said Cindy Webber.

According to Leslie Karr, "An important part of communication with our sponsor is this Year In Review report and our annual programmatic review. Both of these efforts, a culmination of a year's worth of hard work, help to promote our successes to our resource sponsor and others who have a vested interest in the success of the program. This Year in Review report and our annual programmatic review are top quality, demonstrate an in depth appreciation of our program, and show how easily we can communicate what we did, why we did it, who did it, and how much it cost—what we got for our money."

She continued, "I am happy with the open communication between myself and CNO. I like hearing the perspectives from our subject matter experts at CNO and, in turn, enjoy sharing my perspectives. I also think the NESDI program's credibility is solid. It is increasingly easier for our CNO colleagues to grasp how the program contributes to resolving their needs."

In addition to this Year in Review report, an annual programmatic review, and the program's web site, the NESDI program also supports these other communication products:

1. Quarterly Newsletters
2. Project Videos
3. Project Fact Sheets
4. *Currents* Articles
5. External Publications & Conference Presentations

Quarterly Newsletters

NESDI News: Highlights and Happenings—the program's quarterly electronic publication—brings recent technical achievements and regulatory concerns to the forefront, along with highlights on our technical staff. We published four issues of our newsletter in FY13.

Project Videos

The NESDI program is in the process of releasing five new informational streaming videos detailing both recently validated technologies and those that are currently undergoing demonstration. The videos provide a general overview of the NESDI program before leading into the highlights of the subject technology. They typically contain footage of the Principal Investigator describing the construction and subsequent operation of the technology, along with positive observation and feedback by the demonstration site customer. The videos run four to six minutes in length and provide contact information for interested parties who may want additional information. Upon publishing, these videos will be available on the NESDI web site at www.nesdi.navy.mil.

The technologies showcased in the videos thus far are as follows:

1. *Tertiary Treatment and Recycling of Waste Water* (NESDI project #464)
2. *Real-Time Drinking Water Quality Monitoring Technologies* (NESDI project #356)
3. *Methodology for Identifying and Quantifying Metal Pollutant Sources in Stormwater Runoff* (NESDI project #463)
4. *Optimization of the Stormwater Dual Media Filtration System* (NESDI project #454)
5. *Alternative Tank Target* (NESDI project #289)

The videos were produced by NAVFAC EXWC's Technology Transfer Team. Additional videos are planned for production and expected to be released throughout FY14.

Fact Sheets

In an ongoing effort to promote the program's active and completed projects, we developed dozens of online fact sheets that highlight the objectives and latest progress made by ongoing NESDI projects and the accomplishments of completed projects.

Currents Articles

"The NESDI program supports projects by giving them a direct conduit to our user community via *Currents* magazine—a critical forum when scientific publications are not the most appropriate pathway," said Pat Earley.

The NESDI program published an article in each issue of *Currents* in FY13, including the following articles:

1. NESDI FY13 Needs Solicitation Yields Twenty Priority Needs: Annual Process Once Again Successful at Tapping into Unresolved Environmental Needs
2. NESDI Program Releases FY12 Year in Review Report: Annual Report & Second Stormwater Meeting Close Out Another Successful Year
3. Treating Dredged Sediments for Beneficial Use: Pilot Project Investigates the Feasibility of Using Dredged Material as Soil Product
4. Manmade Wetland at MCRD San Diego Recycles Wastewater: Water Conservation Possible with the Living Machine

Our Priority Investment Areas

The NESDI program makes its primary investments in the following EECs in order of priority:

1. **Range Sustainment (EEC-2).**
   In this area, the NESDI program invests in innovations that address environmental impacts and restrictions to ensure that naval training ranges and munitions testing/manufacturing ranges are fully available and efficiently utilized. Example projects in this area are:

   a. *Environmental Effects of Lasers on Biota in the Marine Environment.*
   This study defined the extent and diversity of laser-based systems being used in an underwater environment and characterized the impacts of those systems on underwater flora and fauna. This study determined that there are no environmental risks associated with the use of those systems. The results of this study are now being accurately and consistently reflected in the National Environmental Policy Act compliance documentation necessary for the fielding of new undersea surveillance and communication systems.

   b. *Demonstration of Lime Application at Navy Open Detonation Sites.*
   This project assessed the efficacy of applying lime for venting areas for practice, full-scale inert bombs to prevent regulatory action and sustain range operations by limiting potential off-site migration of munitions constituents.

   c. *Environmental Effects of Military Expendable Material (MEM).*
   This project assessed the potential environmental impacts from high priority MEMs including torpedo copper guidance wire and sonobuoy decelerators (parachutes) to provide information necessary to support range complex environmental planning efforts.

2. **Weapon System Sustainment (EEC-3).**
   In this area, the NESDI program invests in solutions to reduce the cost of compliance and increase readiness for Fleet maintenance personnel. Example projects include:

   a. *Removal of Coke Deposits from F404 Engine Drive Shafts.*
   This project successfully demonstrated the use of plastic blast media in a glove box environment to remove coke deposits from the F404 engine shaft, thereby eliminating the use of a hazardous cleaning compound from this maintenance procedure. This technology has been installed and is in use at Naval Air Station Oceana.

   b. *Advanced Non-Chromate Primers and Coatings.*
   This project evaluated coating systems built from current state-of-the-art non-chromate primers in conjunction with non-chromate metal finishes with the goal of implementing successfully characterized, demonstrated, and authorized non-chrome primers on naval aviation assets.

   c. *Cadmium Tank Electroplating Alternative*.
   This project is demonstrating and validating an alkaline zinc-nickel alloy electroplating process as an alternative to tank cadmium electroplating on high-strength steel and general surfaces at Fleet Readiness Center-level maintenance facilities. This project is also validating the trivalent chrome process as an alternative to conventional hexavalent post treatments on the above alkaline zinc-nickel deposit.

3. **Ship-to-shore Interface and Air and Port Operations (EEC-4)**. In this area, the NESDI program invests in innovative techniques to manage ship hazardous material/waste offload to shore facilities as well as approaches for addressing issues pertaining to air and port operations that ensure Fleet readiness. Example projects in this investment area are:

   a. *Surface Cleaning of Dry Dock Floors*. This ongoing effort seeks to select, procure, and integrate proven technologies that collect and concentrate solids and fine particles from dry dock floors, pump wells, cross connection channels, trenches, rail tracks, and adjacent areas to the dry dock. The selected solutions will allow shipyards to conduct their core business of maintaining Navy ships with fewer risks associated with environmental compliance and a reduction in the manual labor associated with facility cleaning.

   b. *Motion Assisted Environmental Enclosure for Capturing Paint Overspray in Dry Docks*. This NESDI effort demonstrated a low-cost, modular device that combines semi-autonomous motion with portable containment. This device maximizes operator productivity while capturing paint overspray before it is incorporated into dry dock industrial operations or discharges associated with flooding or stormwater runoff into nearby waterways.

4. **Regulatory and Base Operations (EEC-5)**. In this investment area, the NESDI program sponsors cost-effective methods for identifying, analyzing, and managing environmental constraints related to current and projected regulatory impacts. Example projects include:

   a. *Pollutant Source Tracking.* This project quantified Navy contaminant loads by demonstrating and validating contaminant source tracking technologies and developing a technical framework that enables water program managers to attribute existing contamination loads to support their compliance programs. Inability to distinguish between Navy releases, background conditions, and other non-Navy responsible parties can result in excessive or unnecessary remediation costs for the Navy.

   b. *Improved Assessment Strategies for Vapor Intrusion*. The result of this project was a technical report that identified existing best practices, knowledge and data gaps, and future research in vapor intrusion assessment strategies.

What's in Store for FY14

Managing Fiscal Challenges

FY14 will be a very challenging year. Our budget has been reduced due to under execution and sequestration. And so we must be flexible, creative and adaptive to the financial realities. While sufficient funding is anticipated for ongoing projects, it will be challenging to manage those ongoing projects in addition to our "new start" projects knowing that FY15 is to be funded at a below optimum figure. Principal Investigators are already planning to slow down execution and stretch out milestones wherever possible in order to keep projects alive. Although proposals will be evaluated in FY14 for possible FY15 start, only a few may be initiated. This will also impact our call for needs and proposals in FY15.

Staying Engaged with Our End Users

The program will continue to incorporate its customer into the process at all stages. Because of the lower funding availability, flexibility to respond to out-of-cycle requests will be impacted. Reduced flexibility to provide leveraged funding will also be seen, such as with efforts funded by the Environmental Security Technology Certification Program and other programs.

During fiscally challenging times it is difficult to get our end users to think about paying for new technology, even when it saves them money in the long run. We are making progress in this area, however, by providing technical expertise and resources to our customers along the way to ease the transition from the demonstration and validation stage into practice. Often, side meetings are scheduled at this time or shortly thereafter to further clarify and refine an implementation strategy.

Regardless, the program will continue to provide its expertise to other research and development, test and evaluation programs at the NAVFAC as they strive to establish similar businesses processes and best practices.

Our FY14 Schedule

No.	What	When
1.	Announce FY14 Needs Solicitation	1 June 2013
2.	Close FY14 Needs Solicitation	1 August 2013
3.	Screen Needs	12-23 August 2013
4.	Evaluate & Rank Needs	9-13 September 2013
5.	Obtain Sponsor Review & Approval of Needs	16-27 September 2013
6.	Request Pre-proposals	11 October 2013
7.	Conduct N45 Programmatic Review	21 October 2013
8.	Close Pre-proposal Collection	13 November 2013
9.	Collect TDWG Comments on Pre-proposals	18 November 2013
10.	Evaluate Pre-proposals	18-22 November 2013
11.	Request Full Proposals	12 December 2013
12.	Collect Full Proposals	19 February 2014
13.	Deadline for Functional Working Group Comments on Full Proposals	14 March 2014
14.	Collect TDWG Comments on Full Proposals	21 March 2014
15.	Screen Full Proposals	24-28 March 2014
16.	Deadline for Principal Investigators to Answer Screening Questions	28 April 2014
17.	Conduct In-Progress Reviews	2-6 December 2013 Stormwater IPR (Pearl Harbor, HI)
		5-9 May 2014 West & East Coast IPRs (Port Hueneme, CA)
18.	Evaluate Full Proposals	9-13 June 2014 (at East Coast IPR)
19.	Obtain Sponsor Review & Approval of Full Proposals	3 July 2014
20.	Announce New Starts	30 July 2014
21.	Quarterly Status Reports Due (all Mondays)	7 October 2013 6 January 2014 7 April 2014 7 July 2014

For More Information

According to Leslie Karr, "I enjoy the diverse pool of talented individuals that are part of the NESDI team. And they truly are a team. They are dedicated to their respective positions, whether as a member of the TDWG or as a Principal Investigator. Since becoming program manager a number of years ago, it has been refreshing to gain a better understanding of the needs from the NAVSEA and NAVAIR communities and to get to know many of their Principal Investigators. I have been able to broaden the scope of my knowledge of the Navy's environmental community. And I have enjoyed the new people with whom I have crossed paths. Overall, we can share in the knowledge that we as a team made a difference and continue to make a difference."

For more information about the operation of the NESDI program, contact Leslie Karr at 805-982-1618 (DSN: 551-1618) and leslie.karr@navy.mil. Members of the program's TDWG can be contacted at the following phone numbers and email addresses:

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To get up-to-date information about NESDI-sponsored R&D projects, participate in the ongoing execution of the program, and download an electronic copy (pdf) of this Year in Review report, visit the NESDI program web site at www.nesdi.navy.mil.

Process & Perspectives

"I enjoy the diverse pool of talented individuals that are part of the NESDI team. And they truly are a team. They are dedicated to their respective positions, whether as a member of the TDWG or as a Principal Investigator." Leslie Karr

Members of the NESDI program's management team, some of its Principal Investigators, and FRCSE interns gather outside the FRCSE Commanding Officer's office before touring the facility. From left to right, they are Ruben Prado, Luzmarie Youngers, Cindy Webber, Jack Benfer, Patrick Morrow, Bill Hertel, Ted Green, Pat Earley, Mikaleen Morrell, Leslie Karr, Barbara Sugiyama, Bruce McCaffrey, and Kami Downey.

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Process & Perspectives

NESDI FY13
Year in Review Report:

2013

Accomplishments of the
Navy Environmental Sustainability
Development to Integration Program

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