



## It Ends with Integration

NESDI FY12 Year in Review Report:

# 2012

Accomplishments of the Navy Environmental  
Sustainability Development to Integration Program



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# Welcome to the Navy Environmental Sustainability Development to Integration (NESDI) program Fiscal Year (FY) 2012 Year in Review report — **It Ends with Integration.**

There are a number of areas that warrant some mention upfront in this annual summary of the program's successes:

### **1. More Integration.**

It has been another productive year for our research and management teams. And like previous years, successful NESDI projects ended with integration. Our ongoing commitment to our end users has allowed us to enjoy more and more success as we transition the results of our efforts into the daily operations of the Fleet.

### **2. Better Coordination.**

Coordination with our resource sponsor—the Chief of Naval Operations Energy and Environmental Readiness Division (CNO N45)—has been strengthened by more involvement from CNO N45's various Subject Matter Experts in the review and approval of the needs we collect and guidance they provide on the projects we sponsor.

### **3. Regular Communication.**

Like that proverbial tree in the forest with no one around to hear it fall, we believe our efforts only resonate with our end users, Fleet personnel, our resource sponsor, and others if they hear from us. So we continue to publish quarterly newsletters, regular *Currents* articles and this annual report, promote our successful

projects at various conferences, and encourage our Principal Investigators to publish the results of their research in scientific journals and magazines. In FY12, we held a comprehensive program review with CNO N45's research, development, testing, and evaluation (RDT&E) Action Officers, branch managers, and Subject Matter Experts.

### **4. Expanded Influence.**

Because of the enhanced management structure, transparency, and accountability of the NESDI program, the NESDI model (our business practices, communication strategy, and website design) was applied to our sister research and development (R&D) program at CNO N45—the Living Marine Resources (LMR) program. By applying the NESDI model to the LMR program, the LMR program was able to more quickly and efficiently stand up its own management team, business processes (including a Standard Operating Procedure), and website.

The Naval Facilities Engineering Command (NAVFAC) also manages three other Navy RDT&E programs outside of the environmental arena—two within the Facilities Improvement area and the third in Directed Energy. The NESDI program has also been influential in establishing business practices for these programs over the year and will continue to leverage process improvements in FY13.



## A WORD FROM THE PROGRAM MANAGER

### 5. Better Management of Expenditures.

Many of NAVFAC's RDT&E programs experienced challenges in FY12 with program execution in general, and particularly with obligation and expenditure rates. Funds distributed under the NESDI program are often referred to as two-year funds; that is, the funds have a lifespan of two years where they must be obligated and expended. NAVFAC Headquarters establishes mid-year and end-of-the-year benchmarks for these funds. Any funds not used within the specified timelines are subject to recall. Over the past several years, the NESDI program has struggled to meet its benchmarks and, in some cases, has failed to meet them. In times of financial strength, the funds were not pulled back for use for other purposes. However in FY12, due to current Department of Defense (DoD) deficits, \$1.4M was removed from the FY14 NESDI budget. If the NESDI program fails to meet its FY13 benchmarks, more cuts can be expected. As a result, monthly expenditure plans have been incorporated into our project planning process. In addition, alternative projects have been identified that could be funded in the event the program's planned execution rates fall short of established benchmarks.

Among our technical project highlights for FY12 are our efforts to:

1. Provide the Navy and the regulatory community pertinent information with which to make scientifically based decisions on the disposition of out-of-service seafloor cables, as well as for the siting and installation of new seafloor cable projects.
2. Help end users in determining whether perchlorate at or near their facilities is of natural or synthetic origin. Identifying the source of perchlorate will guide environmental stewardship programs, and in some cases, help to avoid unnecessary remediation.
3. Demonstrate the application of hydrated lime to Navy venting areas as a Best Management Practice (BMP) to destroy any explosive residue that may potentially reside in surface soils.
4. Quantify and analyze three categories of Military Expendable Material (MEM) found on training ranges, and determine what, if any, threats these materials pose to the environment.
5. Test an electrolytic hard chrome plating process for aircraft components that does not utilize hexavalent chromium, a known carcinogen.

31 March 2012 Benchmark		Status	30 September 2012 Benchmark		Status
<b>Year 1 (FY12)</b>					
Obligations:	65.0%	52.5%	95.0%	92.1%	
Expenditures:	20.0%	5.1%	56.0%	36.5%	
<b>Year 2 (FY11)</b>					
Obligations:	97.5%	96.4%	100.0%	100.0%	
Expenditures:	81.4%	53.0%	88.0%	87.0%	

## A WORD FROM THE PROGRAM MANAGER

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6. Validate an innovative suite of equipment to monitor and assess the impacts of Navy activities on nearby coral communities.
7. Provide information on how bottom sediment may be disturbed and resuspended by propeller wash (the motion of water produced by a ship's propeller) and how potentially contaminated sediments resuspended by propeller wash are transported in Navy harbors.
8. Demonstrate and validate the WinSLAMM stormwater management model to help Navy installation managers identify potential sources of metals—particularly copper and zinc—in stormwater runoff.
9. Provide an improved ability to discern actual ecological risk at sediment remediation sites. The technology also shows promise in surface water applications such as realistic assessment of adverse effects from time-varying stressors.
10. Construct an enhanced wetland to demonstrate and validate on-site reclamation and beneficial reuse of wastewater.

On a more personal note, we transitioned one of SPAWAR's representatives on our management team, the Technology Development Working Group (TDWG), from Stacey Curtis to Pat Earley. Pat assumed his TDWG duties on 1 October 2012. Stacey is to be commended for her many years dedicated to the NESDI program and the TDWG. Her vast knowledge of environmental RDT&E across DoD, the Navy, academia, and industry was an incredible resource for my predecessors

and me. Stacey added great credibility to the program and her expertise will be difficult to replace. Thank you Stacey! Pat brings his own knowledge and expertise and we look forward to a long and healthy relationship with him over the coming years.

Finally, we consistently hear from our customers that training is important to them. As a result, we are working closely with personnel from the Civil Engineer Corps Officers School (CECOS) to develop training classes that promote the integration of our technologies including the Prohibited and Controlled Chemicals List (PCCL) and a number of the stormwater BMPs that the program has developed over the years.

### **Why This Program is Important to the Navy**

The NESDI program provides critical RDT&E with a focus on demonstration, validation, and technology integration support to the environmental shore community.

The NESDI program will continue to strengthen its outreach and remain flexible to address the evolving needs coming from the Fleets, Commander, Navy Installations Command, CNO N45, the Field Engineering Centers, the Fleet Readiness Centers (FRC), Media Field Teams, Functional Working Groups, and other organizations. The NESDI program will work to improve the integration and procurement of environmental technology to meet Fleet needs.



## A WORD FROM THE PROGRAM MANAGER

### How You Can Participate

Technology integration is a challenging undertaking. The NESDI program relies on all Navy personnel to help identify environmental concerns and support the implementation of resultant solutions. We ask that, whenever possible, you find a way to use NESDI products. You can participate in our process and play a vital role by:

- Submitting and validating environmental needs
- Reviewing technologies already in development
- Supporting transition efforts in your organization or at your installation
- Acting as a Principal Investigator on one of our projects
- Providing demonstration sites for our various projects
- Staying up-to-date by regularly visiting our website ([www.nesdi.navy.mil](http://www.nesdi.navy.mil))

### Looking Ahead

In FY13 and beyond, we will focus our energies in the following areas:

#### 1. Stormwater Management.

We will continue to focus on issues pertaining to the efficient management of stormwater programs. Holding a stormwater-focused In-Progress Review (IPR) in the Puget Sound area has already helped bring together our customers, resource sponsor, and researchers, which strengthens the gap between the research and the required integration efforts.

#### 2. NAVAIR Project Integration.

We will conduct an IPR at FRC South East in Jacksonville, Florida in the summer

of FY13 to bring together the Principal Investigators, resource sponsor, and end users of our Naval Air System Command (NAVAIR) projects to promote the successful integration of those projects at FRC South East and the Navy's other two FRCs.

#### 3. Obligation/Expenditure Rate Improvements.

We will continue to pay careful attention to the ongoing execution of all of our funded projects to ensure that our mid-year and end-of-the-year obligation and expenditure benchmarks are achieved.

On behalf of the NESDI program resource sponsor, I would like to thank all of the System Command program participants including the TDWG representatives, Functional Working Group members, and project Principal Investigators, engineers, scientists, and technicians that support the NESDI program.

If you would like to participate in the NESDI program, please contact me or your TDWG representative. And, as always, you can visit the program's website at [www.nesdi.navy.mil](http://www.nesdi.navy.mil).



Leslie Karr, P.E.  
NESDI Program Manager



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## **EXECUTIVE SUMMARY**

In FY12, the NESDI program accomplishments can be described as follows:

- 10:** The number of projects that were successful in demonstrating the use of an innovative technology or collecting critical information
- 69:** The number of needs collected
- 25:** The number of proposals received to address the most highly-ranked needs
- 20:** The number of new projects approved to kick off in FY13
- 11:** The number of Environmental Security Technology Certification Program (ESTCP) leveraged projects in FY12

# It Ends with Integration 2012

The NESDI program had an operating budget of \$5.845M for FY12 with 34 active projects—down from 35 active projects in FY11. Over half of the program’s budget falls under the Regulatory and Base Operations investment area, which reflects the ongoing need to maintain compliance and avoid Notices of Violation, enhance the Navy’s ability to effectively negotiate permits, and provide solutions for new requirements. Approximately a quarter of the program’s budget was dedicated to the Weapon Systems Sustainment, Ship-to-Shore Interface, and Air and Port Operations investment areas. About ten percent of the program’s budget was devoted to range sustainment. Of the resources dedicated across all Environmental Enabling Capabilities (EEC), approximately 11 percent was dedicated for leveraging with ESTCP.

The remaining resources were spent on management and other miscellaneous program costs.

The program continues to rely on dedicated personnel from the Principal Investigators and members of the TDWG, to the site hosts, field coordinators, need submitters, and participants from our resource sponsor organization, CNO N45.

While technology integration is difficult, 10 projects were particularly successful in demonstrating the use of an innovative technology or collecting critical information to enhance the efficiency of environmental management programs across the Navy. These projects are listed in the following table and presented as case studies in this report.



***The NESDI program is demonstrating an innovative suite of equipment to monitor and assess the potential impacts of its activities on the coral surrounding Navy harbors.***



EEC	No.	Project	Number	Description	Principal Investigator
2 (Range Sustainment)	1.	Seafloor Cable Removal	347	This project is focused on providing the Navy and the regulatory community pertinent information with which to make scientifically based decisions on the disposition of out-of-service seafloor cables, as well as for the siting and installation of new seafloor cable projects.	Bill Major
	2.	Implementation of Forensic Approaches to Address Background Perchlorate Source Identification & Characterization at Navy Facilities and Ranges	437	The results of this project will aid end users in determining whether perchlorate at or near their facilities is of natural or synthetic origin. Identifying the source of perchlorate will guide environmental stewardship programs, and in some cases, will help to avoid unnecessary remediation.	Rob George
	3.	Demonstration of Lime Application at Navy Open Detonation Sites	445	This project demonstrated the application of hydrated lime to Navy venting areas as a BMP to destroy any explosive residue that may potentially reside in surface soils.	Joey Trotsky
	4.	Environmental Effects of Military Expendable Material	462	This project is in the process of quantifying and analyzing three categories of MEM commonly found on training ranges, and determining what, if any, threats these materials pose to the environment.	Brandon Swope
3 (Weapon System Maintenance)	5.	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	348	This project team is testing an electrolytic hard chrome plating process for aircraft components that does not utilize hexavalent chromium, a known carcinogen.	Ruben Prado

*(continued on the next page)*

## EXECUTIVE SUMMARY

EEC	No.	Project	Number	Description	Principal Investigator
5 (Regulatory and Base Operations)	6.	Automated Assessment of Coral Reefs	425	This project validated an innovative suite of equipment to monitor and assess the impacts of Navy activities on nearby coral communities. The equipment provides real-time data, eliminating the need for divers to collect this information.	Bill Wild
	7.	Evaluation of Re-suspension Associated with Dredging, Extreme Storm Events and Propeller Wash	448	This project provided information on how bottom sediment may be disturbed and resuspended by propeller wash (the motion of water produced by a ship's propeller) and how potentially contaminated sediments resuspended by propeller wash are transported in Navy harbors.	P.F. Wang
	8.	Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Stormwater Discharges	455	This project demonstrated and validated the WinSLAMM stormwater management model to help Navy installation managers identify potential sources of metals—particularly copper and zinc—in stormwater runoff.	Chuck Katz
	9.	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	459	The technology demonstrated in this project is expected to provide an improved ability to discern actual ecological risk at sediment remediation sites. The technology also shows promise in surface water applications such as realistic assessment of adverse effects from time-varying stressors.	Gunther Rosen
	10.	Tertiary Treatment and Recycling of Wastewater	464	In an effort to reduce potable water consumption, this project team constructed an enhanced wetland to demonstrate and validate on-site reclamation and beneficial reuse of wastewater.	Sonny Maga



Our FY12 needs collection process yielded 69 submittals from across the Navy. After a thorough review, validation, consolidation, and ranking by program personnel, a solicitation for proposals was executed to address 25 needs determined to be priorities by personnel from the program's management team, the TDWG, and resource sponsor, CNO N45.

No.	Need	Command	Title	EEC	Ranking
1.	N-0809-12	NAVFAC	Small Arms Brass Collection on Ranges	2	MEDIUM
2.	N-0826-12	CNO	Non-explosive Venting of Full Scale Non-explosive Practice Munitions	2	HIGH
3.	N-0840-12	NAVSEA	Environmental, Cost and Liability Reduction for Onsite Utilization of Transportable Field Melter Shared Between Pinecastle and Fallon Bombing Ranges for Recycling of Bombing Range Material Potentially Possessing Explosive Hazards	2	MEDIUM
4.	N-0849-12	CNO	Wind Turbine Interference with Ground Radar	2	HIGH
5.	N-0795-12	NAVFAC	Aircraft Wash Rack Oil/Water Separation	3	MEDIUM
6.	N-0802-12	NAVAIR	Demonstrate/Validate Alternatives to Methylene Chloride-based Chemical Paint Stripper	3	MEDIUM
7.	N-0803-12	NAVAIR	Portable Cold Spray Surface Metallization for Localized Repair of Cadmium and Other Sacrificial Coatings	3	MEDIUM
8.	N-0829-12	NAVAIR	Replacement of Film Radiography with Computed Radiography	3	MEDIUM
9.	N-0830-12	NAVSUP	Soiled Shop Towel Processing	3	MEDIUM
10.	N-0834-12	NAVAIR	Demonstrate/Validate Proposed MIL-P-85891 Type VIII Magic Media for Paint Removal of Aircraft Exteriors	3	MEDIUM
11.	N-0808-12	NAVSEA	Biofouling Mitigation for Permanent via Antifouling Elastomers	4	MEDIUM
12.	N-0835-12	NAVSUP	Ship-to-Shore Waste Hazardous Material Minimization—Supply Source Reduction	4	MEDIUM

*(continued on the next page)*

## EXECUTIVE SUMMARY

No.	Need	Command	Title	EEC	Ranking
13.	N-0839-12	Other	Request Review of Alternate Processes or Technologies to Aid in Reducing the Amount of Excess Paints that Become Waste	4	MEDIUM
14.	N-0844-12	CNIC	Aerosolized Irritant System for Removing Invasive Brown Tree Snakes from Outbound Materials	4	MEDIUM
15.	N-0780-12	NAVFAC	Bird and Bat Mortality Estimates at Small Wind Facilities	5	MEDIUM
16.	N-0798-12	NAVFAC	Vapor Intrusion Tool	5	MEDIUM
17.	N-0799-12	NAVFAC	Emerging Drinking Water Constituents of Concern and Marginal Drinking Water Quality at Navy Bases	5	MEDIUM
18.	N-0804-12	NAVFAC	An Initial Decision Report on Coral Reef Transplantation Methods	5	MEDIUM
19.	N-0814-12	NAVFAC	Non-Hazardous Solid Waste Diversion	5	MEDIUM
20.	N-0824-12	CNO	Air Emissions Guidance Tool	5	MEDIUM
21.	N-0827-12	NAVFAC	Effects of Copper on the Behavior of Estuarine Fishes for Effective Management of Sensitive Coastal Species	5	MEDIUM
22.	N-0828-12	NAVSEA	Improve Oily Water Treatment System Processes for Compliance — with National Pollutant Discharge Elimination System Permit Discharge Standards	5	MEDIUM
23.	N-0853-12	NAVFAC	Low Impact Development for Stormwater Run-off Control	5	HIGH
24.	N-0854-12	NAVSEA	Radioactive Material Permit Generation, Management, and Tracking System	5	MEDIUM
25.	N-0855-12	NAVFAC	Municipal Separate Stormwater Sewer System	5	HIGH



## FY13 NEW STARTS

The NESDI program has approved funding for 20 “new starts” for initiation in FY13.

No.	ID	EEC	Title
1.	477	2: Range Sustainment	RAPID RESPONSE: Automated Long-Term Monitoring System for Natural Resource Management
2.	482	2: Range Sustainment	Innovative Cutting Process to Vent Full Scale Non-Explosive Practice Munitions
3.	483	2: Range Sustainment	Transportable Field Melter for Recycling of Bombing Range Material Potentially Presenting an Explosive Hazard
4.	484	3: Weapon System Maintenance	Replacement of Film Radiography with Computed Radiography
5.	485	3: Weapon System Maintenance	Demonstrate/Validate Alternatives to Methylene Chloride-based Chemical Paint Strippers
6.	486	3: Weapon System Maintenance	Qualification of Proposed MIL-P-85891 Type 8 Plastic Media Blast (PMB) as a Replacement for Chemical-based Strippers and Type 5/7 PMB
7.	488	4: Air and Port Operations	Excess Paint Reduction
8.	489	4: Air and Port Operations	Oil Boom Biofouling Control by Mechanical Intervention and Material Technologies
9.	476	5: Regulatory and Base Operations	A Quantitative Decision Framework for Assessing Navy Vapor Intrusion Sites
10.	478	5: Regulatory and Base Operations	Improving Non-Hazardous Solid Waste Diversion
11.	479	5: Regulatory and Base Operations	Remove Copper and Other Heavy Metals from Oily Water Treatment System Discharge for Compliance with NPDES Discharge Standards
12.	480	5: Regulatory and Base Operations	Alternative Metal Hot Cutting Operations For Opacity
13.	481	5: Regulatory and Base Operations	Controlling Opacity During Ship Hull Cutting & Cold Work
14.	487	5: Regulatory and Base Operations	Use of Boron-Doped Diamond Electrodes for Water Treatment
15.	490	5: Regulatory and Base Operations	RAPID RESPONSE: Application of the Marine Biotic Ligand Model for Copper to Evaluate Risks Associated with Olfactory Responses in Salmonids and Forage Fish
16.	491	5: Regulatory and Base Operations	Implementation Strategy for Coral Reef Transplantation Methods
17.	492	5: Regulatory and Base Operations	Capacitive Deionization Water Treatment System
18.	493	5: Regulatory and Base Operations	Low Impact Development for Industrial Areas
19.	494	5: Regulatory and Base Operations	Successful Municipal Separate Storm Sewer System Programs Implemented in the Navy
20.	495	5: Regulatory and Base Operations	Radioactive Material Permit Generation, Management and Tracking System



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## **INTRODUCTION**

### **Mission**

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

The NESDI program is the Navy's environmental shoreside 6.4 RDT&E program. The NESDI technology demonstration and validation program is sponsored by the CNO N45 and managed by NAVFAC. The program is the Navy's complement to DoD's Environmental Security Technology Certification Program, which demonstrates and validates technologies important to the tri-Services, U.S. Environmental Protection Agency (EPA), and Department of Energy.

### The NESDI Program Process

The NESDI program follows a four phase process:

**1 Collect, Validate & Rank Needs.**

During this first phase of the process, the program's management team—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.

**2 Collect, Evaluate & Rank Proposals.**

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

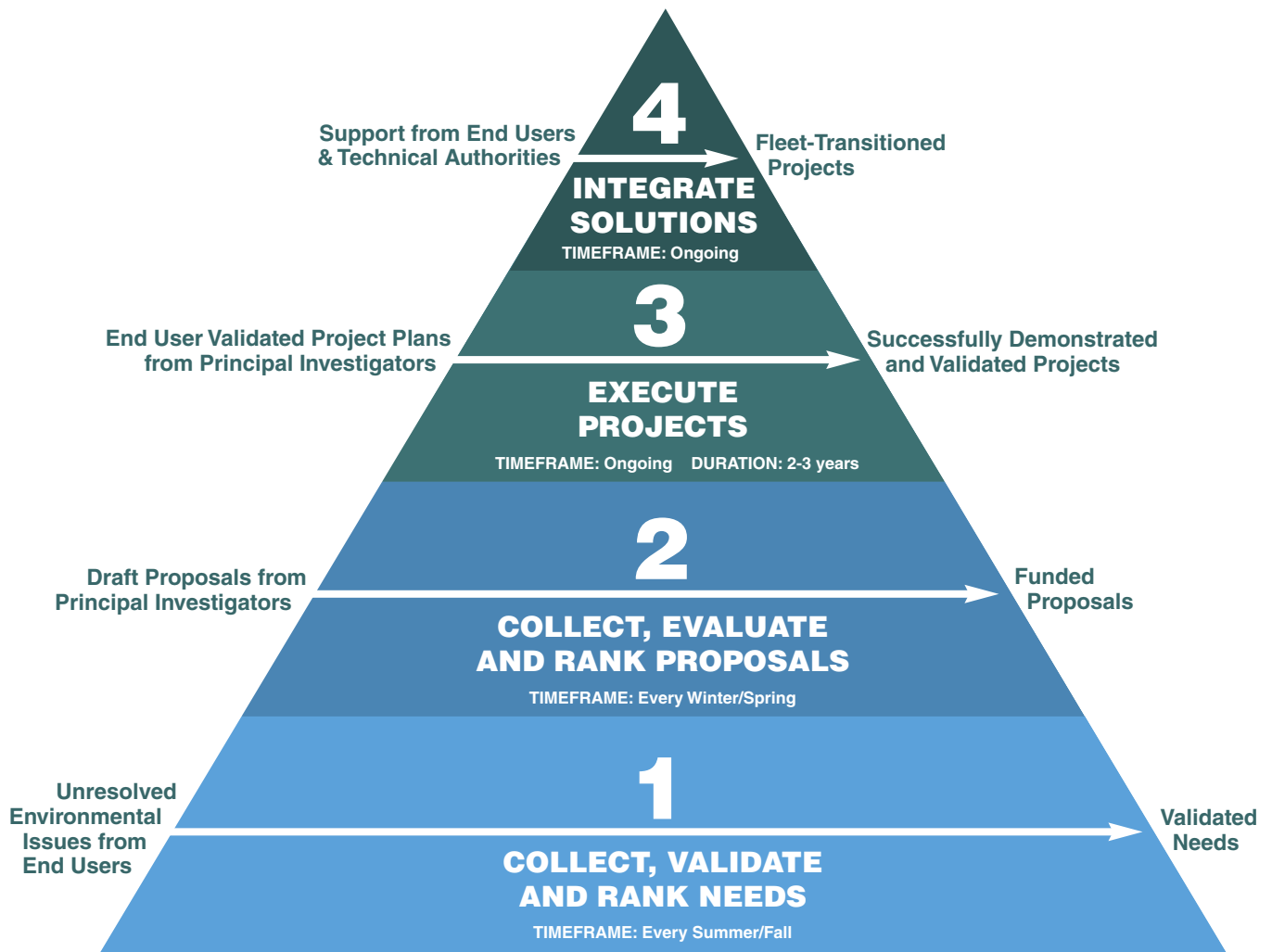
**3 Execute Projects.**

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 intended 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 final phase, the TDWG, Principal Investigators, and technology integration specialists work together to verify that the solutions successfully integrated into the Fleet and weapons system acquisition programs provide the anticipated benefits.

**The following diagram highlights the inputs, outputs, and timeframes associated with each of the above stages.**



The NESDI Program Process

An overview of the program's finances, needs collected, and project funding distribution are presented in the financial review section of this report.



### Priority Investment Areas

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

**1. Range Sustainment (EEC-2).**

Innovations that address environmental impacts and restrictions at Navy ranges to ensure that naval training ranges and munitions testing/manufacturing ranges are fully available and efficiently utilized.

**2. Ship-to-shore Interface (EEC-4).**

Innovative techniques to manage ship hazardous material/waste offload to shore facilities.

**3. Weapon System Sustainment (EEC-3).**

Solutions to reduce the cost of compliance and increase readiness for Fleet maintenance personnel.

**4. Air and Port**

**Operations (EEC-4).**

Approaches for addressing issues pertaining to air and port operations that ensure Fleet readiness.

**5. Regulatory and Base Operations (EEC-5).**

Cost-effective methods for identifying, analyzing, and managing environmental constraints related to current and projected regulatory impacts.

**A program analysis by EEC is presented in detail starting on page 29.**



## Financial Review

The NESDI program has prioritized investments in various EECs based on their potential risk to the Navy mission. The NESDI program has aligned its investment portfolio based on priority, urgency and operational requirements. The table on the following page highlights the approximate breakdown of program investments by EEC.

## FINANCIAL REVIEW

### NESDI Program Funding (by EEC)

EEC	FY09 Project Funding	FY10 Project Funding	FY11 Project Funding	FY12 Project Funding	FY13 Project Funding (Projected) <sup>2</sup>	FY14 Project Funding (Projected)
EEC-2 (Range Sustainment)	1069.0	547.0	614.0	601.8	595.9	270.0
EEC-3 (Weapon Systems Sustainment)	1499.0	980.3	876.0	909.0	1069.0	490.0
EEC-4 (Ship-to-shore Interface and Air & Port Operations)	623.0	467.0	795.5	498.0	860.0	743.0
EEC-5 (Regulatory & Base Operations)	2652.0	2381.0	2579.	3195.2	3831.0	1316.4
Management Costs	1995.0 <sup>1</sup>	975.0	1005.5	565.5	560.0	560.0
Unallocated	0.0	0.0	0.0	0.0	-1087.0	1186.6
ESTCP Leveraging	365.0	95.0	75.5	60.0	20.0	
<b>TOTALS in \$K</b>	<b>5843.0</b>	<b>5715.3</b>	<b>5965.1</b>	<b>5845.0</b>	<b>5888.9</b>	<b>4586.0</b>

1: FY09 management costs include EEC project costs that were reallocated later during transition to a new program manager.

2: FY13 control amount is expected to change due to evolving budgetary constraints.



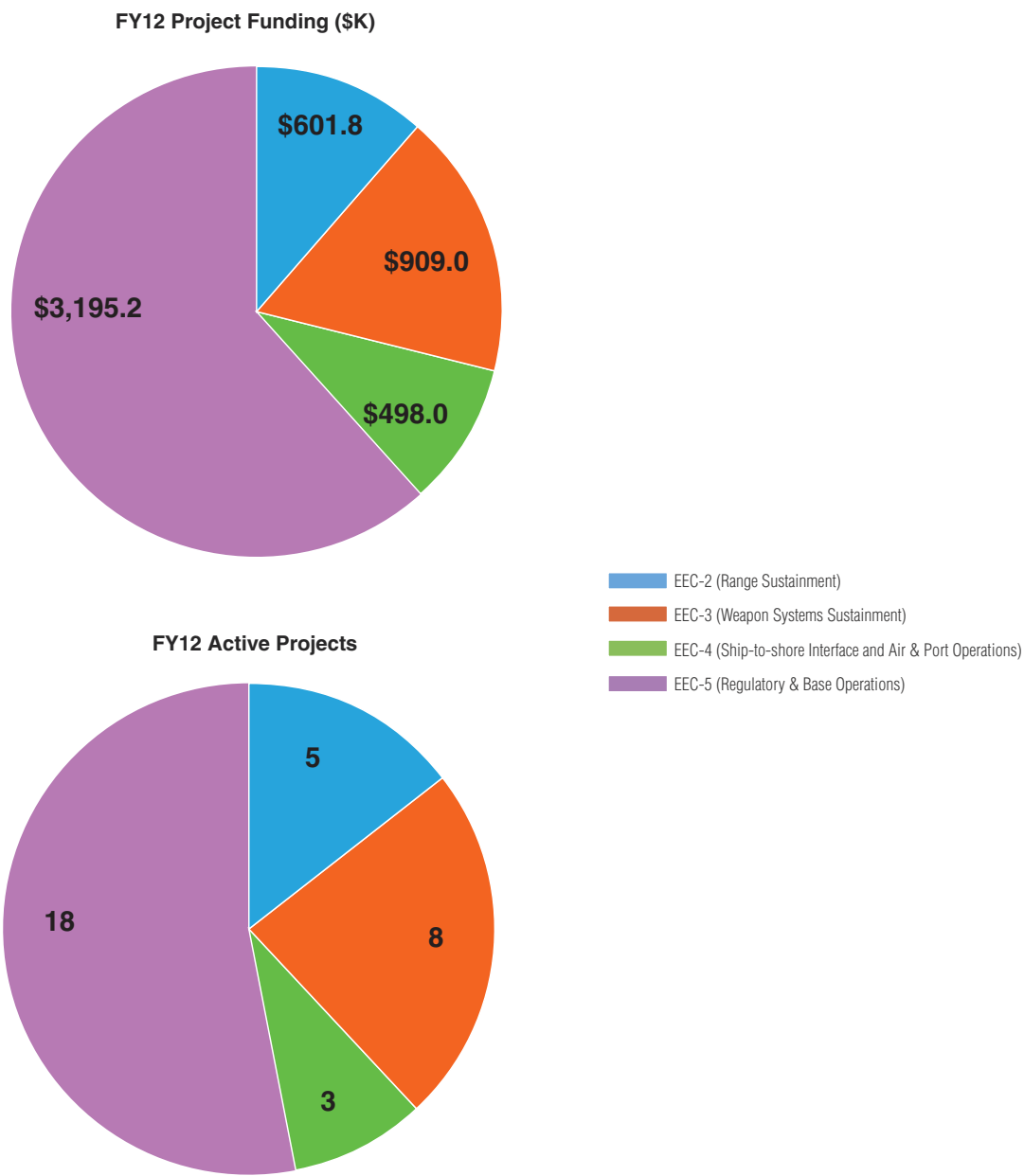
### Obligation & Expenditures

Many of NAVFAC's RDT&E programs experienced challenges in FY12 with program execution, particularly with obligation and expenditure rates. Funds distributed under the NESDI program are often referred to as two-year funds; that is, the funds have a lifespan of two years where they must be obligated and expended. NAVFAC Headquarters establishes mid-year and end-of-the-year benchmarks for these funds. Any funds that are not used within the specified timelines are subject to recall. Over the past several years, the NESDI program has struggled to meet its benchmarks and,

in some cases, has failed to meet those benchmarks. In times of financial strength, the funds were not pulled back for use for other purposes. However, in FY12, due to current DoD deficits, \$1.4M was removed from the FY14 NESDI budget. If the NESDI program fails to meet its FY13 benchmarks, more cuts can be expected. As a result, monthly expenditure plans have been incorporated into our project planning process. In addition, alternative projects have been identified that could be funded in the event the program's planned execution rates fall short of established benchmarks.

	31 March 2012 Benchmark	Status	30 September 2012 Benchmark	Status
<b>Year 1 (FY12)</b>				
Obligations:	65.0%	52.5%	95.0%	92.1%
Expenditures:	20.0%	5.1%	56.0%	36.5%
<b>Year 2 (FY11)</b>				
Obligations:	97.5%	96.4%	100.0%	100.0%
Expenditures:	81.4%	53.0%	88.0%	87.0%

Project Funding & Active Projects in FY12

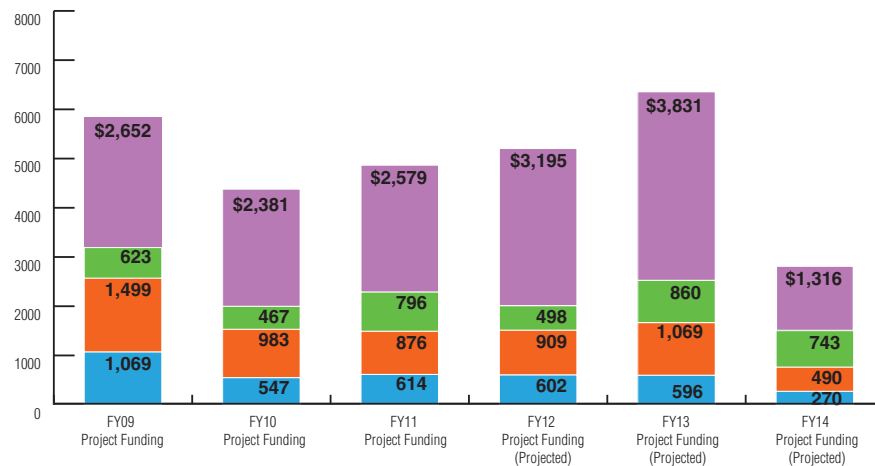




## FINANCIAL REVIEW

### Program Funding (FY09 – FY14)

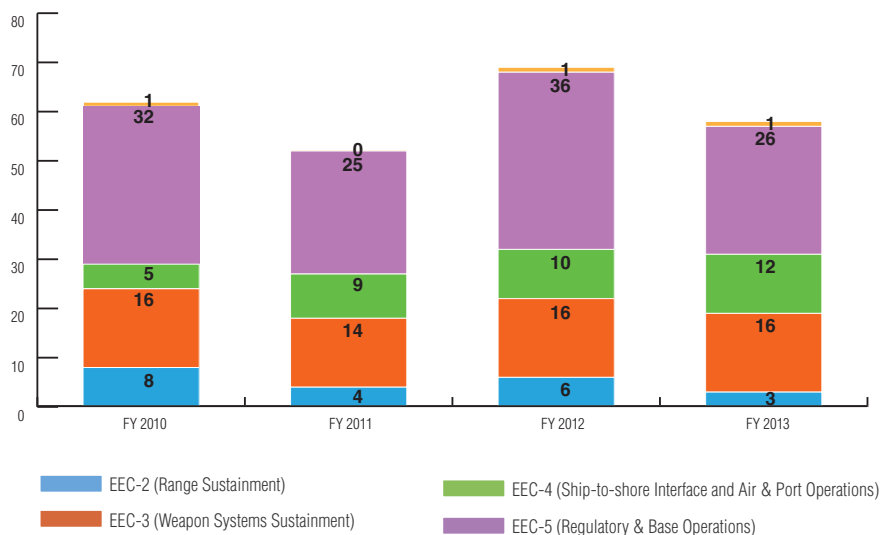
Since FY09, most NESDI investments have been made in Regulatory and Base Operations (EEC-5). Although overall program funding has decreased since FY09, this EEC-5 funding trend is projected to continue throughout FY14 as noted in the charts below.



Note: FY14 project funding projections do not include funding for new start projects.

### Needs Collected (FY10 – FY13)

The needs collected by the NESDI program mimic the program's investments. That is, most needs are collected in Regulatory and Base Operations (EEC-5) and that is where most of the program's investments are, as noted in the chart below.



## FINANCIAL REVIEW

### Leveraged ESTCP Projects (Current Projects & New Starts for FY13)

The projects listed in the following table submitted proposals to and were approved by ESTCP. All 11 of these projects will receive leveraged funding from the NESDI program in the amounts designated in the following table.

No.	ID	Title	EEC	2009 to 2012 ESTCP	2009 to 2012 NESDI	2013 NESDI
1.	462	Environmental Effects of Military Expendable Material	2	20	187.3	126.9
2.	465	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater UXO Sites	2	0	215	185
3.	348	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	3	1371.5	230	60
4.	458	Advanced Non-Chromate Primers & Coatings	3	1400	430	115
5.	448	Evaluation of Re-suspension Associated with Dredging, Extreme Storm Events, and Propeller Wash	5	498	420	0
6.	459	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	5	871	223	94
7.	460	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	5	413	335	25
8.	464	Water Conservation: Tertiary Treatment and Recycling of Wastewater	5	340	205.5	0
9.	476	A Quantitative Decision Framework for Assessing Navy Vapor Intrusion Sites	5	0	264.4	274.7
10.	N/A	Innovative Acoustic Sensor	5	0	0	20
11.	N/A	Smart Water Conservation Systems for Irrigated Landscapes	5	570	40	25
<b>TOTALS in \$K</b>				<b>5483.5</b>	<b>2550.2</b>	<b>925.6</b>



### New Starts by EEC

The NESDI program has approved 20 “new starts” for funding for initiation in FY13.

EEC	FY13 New Starts	Funding of FY13 New Starts (\$K)
EEC-2 (Range Sustainment)	3	224.0
EEC-3 (Weapon Systems Sustainment)	3	270.0
EEC-4 (Ship-to-shore Interface and Air & Port Operations)	2	508.0
EEC-5 (Regulatory & Base Operations)	12	2444.2
<b>TOTAL</b>	<b>20</b>	<b>3446.2</b>

### FY13 New Starts

EEC	No.	ID	Title	2013 Requested	2014 Requested	2015 Requested
<b>2: Range Sustainment</b>	1.	477	RAPID RESPONSE: Automated Long-Term Monitoring System for Natural Resource Management <sup>1</sup>	0.0	0.0	0.0
	2.	482	Innovative Cutting Process to Vent Full Scale Non-Explosive Practice Munitions	124.0	95.0	0.0
	3.	483	Transportable Field Melter for Recycling of Bombing Range Material Potentially Presenting an Explosive Hazard	100.0	95.0	0.0
<b>3: Weapon System Maintenance</b>	4.	484	Replacement of Film Radiography with Computed Radiography	55.0	50.0	0.0
	5.	485	Demonstrate/Validate Alternatives to Methylene Chloride-based Chemical Paint Strippers	130.0	150.0	0.0
	6.	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	85.0	60.0	0.0
<b>4: Air and Port Operations</b>	7.	488	Excess Paint Reduction	204.0	183.0	0.0
	8.	489	Oil Boom Biofouling Control by Mechanical Intervention and Material Technologies	304.0	240.0	65.0

1: Early start project using FY12 funding.

(continued on the next page)



## FY13 New Starts *(continued)*

EEC	No.	ID	Title	2013 Requested	2014 Requested	2015 Requested
5: Regulatory and Base Operations	9.	476	A Quantitative Decision Framework for Assessing Navy Vapor Intrusion Sites	274.7	99.9	19.0
	10.	478	Improving Non-Hazardous Solid Waste Diversion	99.0	252.0	73.5
	11.	479	Remove Copper and Other Heavy Metals from Oily Water Treatment System Discharge for Compliance with NPDES Discharge Standards	224.0	230.0	0.0
	12.	480	Alternative Metal Hot Cutting Operations For Opacity	250.0	0.0	0.0
	13.	481	Controlling Opacity During Ship Hull Cutting & Cold Work	197.0	0.0	0.0
	14.	487	Use of Boron-Doped Diamond Electrodes for Water Treatment	297.0	88.0	0.0
	15.	490	RAPID RESPONSE: Application of the Marine Biotic Ligand Model for Copper to Evaluate Risks Associated with Olfactory Responses in Salmonids and Forage Fish	164.5	111.5	30.8
	16.	491	Implementation Strategy for Coral Reef Transplantation Methods	118.0	35.0	0.0
	17.	492	Capacitive Deionization Water Treatment System	150.0	150.0	125.0
	18.	493	Low Impact Development for Industrial Areas	370.0	150.0	20.0
	19.	494	Successful Municipal Separate Storm Sewer System Programs Implemented in the Navy	100.0	0.0	0.0
	20.	495	Radioactive Material Permit Generation, Management and Tracking System	200.0	0.0	0.0



## Program Analysis

In this section of the Year in Review report, we provide an analysis of program operations over the course of the year, organized by EEC. For each EEC, we provide the following:

- A summary and analysis of the FY12 funding level
- The projected funding level for FY13
- A listing of the active projects in FY12
- A listing of the project closeouts for FY12
- A listing of the needs collected in FY12
- A listing of the new projects to be initiated in FY13
- Case studies of successful projects

PROGRAM ANALYSIS

RANGE SUSTAINMENT (EEC-2)

Range Sustainment (EEC-2)

Background

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:

- 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.
- Toxicity/Bioaccumulation of Munitions Constituents in the Marine Environment.**  
This project resulted in the development of a comprehensive data set on the toxicity of munitions constituents to regulator approved marine species and the definition of their potential for bioaccumulation, cellular level impacts, and trophic transfer. The ultimate goal of this project is to evaluate the long-term environmental effects of leaving unexploded munitions in place and determine whether additional mitigations may be needed.

- Environmental Effects of Military Expendable Material (MEM).**  
This project is assessing the potential environmental impacts from high priority MEMs to provide information necessary to support range complex environmental planning efforts.
- 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.

Summary

FY12 Funding Level:	\$601,800
FY13 Funding Level (projected):	\$595,900
Active Funded Projects in FY12:	5
Needs Collected in FY12:	6
New Starts in FY13:	3



## Active Funded Projects in FY12

No.	ID	Title	Objective
1.	347	Long-term Disposition of Seafloor Cables	To provide the Navy a scientific basis for making sound decisions for balancing long-term disposition of seafloor cables in the marine environment.
2.	437	Implementation of Forensic Approaches to Address Background Perchlorate Source Identification and Characterization at Navy Facilities and Ranges	To develop and implement the approach, tools, and methods to quantify and distinguish the relative levels of naturally occurring perchlorate from those derived from anthropogenic sources.
3.	462	Military Expendable Material (MEM)	To develop and analyze a prioritized list of MEM.
4.	465	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater Unexploded Ordnance Sites	To demonstrate and develop a standard protocol for the use of passive samplers for the in-situ assessment of munitions constituent presence at underwater sites.
5.	471	Site Analysis for the Detection and Classification of Munitions and Explosives of Concern in Shallow Highly Dynamic Underwater Environments	To survey current and potential sites with Navy munitions and explosives of concern contamination and to evaluate remediation technologies.

## Needs Collected in FY12

No.	Need	Command	Title	Ranking	Status
1.	N-0789-12	NAVAIR	Range-related High Resolution Bathymetry Data and Habitat Classification	MEDIUM	Outside NESDI Scope
2.	N-0809-12	NAVFAC	Small Arms Brass Collection on Ranges	MEDIUM	Request NESDI Pre-Proposal
3.	N-0826-12	CNO	Non-explosive Venting of Full Scale Non-explosive Practice Munitions	HIGH	Request NESDI Pre-Proposal
4.	N-0831-12	CNO	Developing a Framework for Decisions on Underwater Munitions Sites	HIGH	Other
5.	N-0840-12	NAVSEA	Environmental, Cost, and Liability Reduction for Onsite Utilization of Transportable Field Melter Shared between Pinecastle and Fallon Bombing Ranges for Recycling of Bombing Range Material Potentially Possessing Explosive Hazards	MEDIUM	Request NESDI Pre-Proposal
6.	N-0849-12	CNO	Wind Turbine Interference with Ground Radar	HIGH	Request NESDI Pre-Proposal

**PROGRAM ANALYSIS****RANGE SUSTAINMENT (EEC-2)****New Starts in FY13**

No.	ID	Title	Objective
1.	477	RAPID RESPONSE: Automated Long-term Monitoring System for Natural Resource Management	To demonstrate an automatic system for long-term, on-site monitoring of environmental parameters in support of natural resource management.
2.	482	Innovative Cutting Process to Vent Full Scale Non-Explosive Practice Munitions	To demonstrate a wire cutting system that will eliminate the need for using explosives to vent practice bombs.
3.	483	Transportable Field Melter for Recycling of Bombing Range Material Potentially Presenting an Explosive Hazard	To demonstrate and validate that a transportable field melter is capable of melting steel range scrap in an economically feasible and environmentally conscious way.

**ESTCP Leveraged Projects**

No.	ID	Title	EEC	ESTCP	To date NESDI	2013 NESDI
1.	462	Environmental Effects of Military Expendable Material	2	20	187.3	126.9
2.	465	Demonstration of Passive Samplers for Assessing Environmentally Realistic Concentrations of Munitions Constituents at Underwater UXO Sites	2	0	215	185

## CASE STUDY

RANGE SUSTAINMENT (EEC-2)

PROJECT NUMBER: 347



Range Sustainment  
EEC-2

# Long-term Disposition of Seafloor Cables



## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)

# Long-term Disposition of Seafloor Cables

**Project Number: 347**

## Project Type: STUDY

The Navy has a vast number of installed seafloor cables—estimates exceed 40,000 nautical miles—that provide numerous functions such as communications, at-sea training, and surveillance. These cables periodically need to be repaired, replaced, and upgraded, and new cables must sometimes be installed to meet the changing requirements of the Navy.

The Navy, along with other federal agencies, has regulatory compliance requirements when installing hardware such as seafloor cables both in near-shore and in deep water environments. In response to the increased installation of commercial communications cables in recent years, regulatory agencies and marine sanctuaries have increased their awareness of and permitting requirements for the installation and removal of seafloor cables. In some cases, this has effectively blocked planned cable installation routes, and required longer and/or additional routes, which can raise project costs significantly.

Current Navy practice is to leave out-of-service cables in place. The potential environmental, financial, and operational impact of removing these seafloor cables can be significant, so it is vital that decisions to remove cables are based on substantial scientific evidence. This project is focused on providing the Navy and the regulatory community with pertinent information with which to make scientifically-based decisions on the disposition of out-of-service seafloor cables, as well as the siting and installation of new seafloor cable projects.

The first task completed under this project was a laboratory study to determine whether seafloor communications cables leach chemicals of concern into the marine environment. Submarine telecommunication cables have an exterior insulation layer that commonly includes a tarry material (to keep the cable in place) which may release toxic organic substances such as

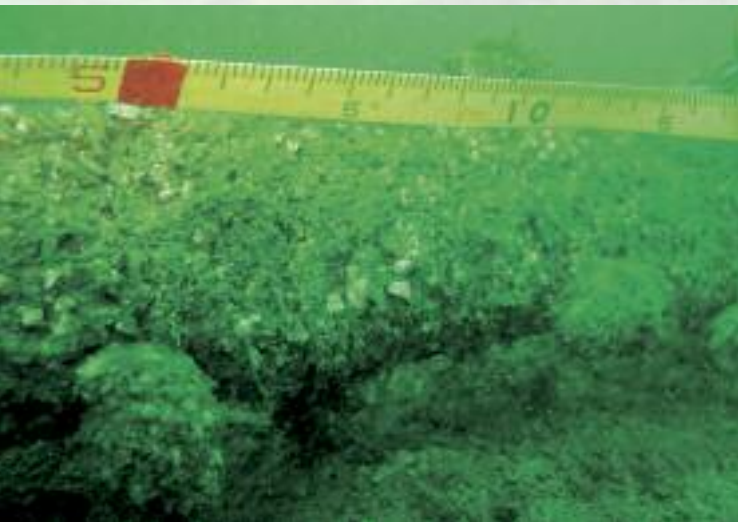
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***The team concluded that PAH contamination was unlikely to be a significant environmental concern.***

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polycyclic aromatic hydrocarbons (PAH). Cable samples in three different weathering states were placed in saltwater aquariums for observation and sampling. Measuring these samples against control samples helped the project team to prepare a model to simulate PAH release in the marine environment. Utilizing this model under a range of scenarios, the team concluded that PAH contamination was unlikely to be a significant environmental concern.

The second task on the team's agenda was to perform an environmental evaluation and biological characterization study to examine and document the effects of removing an existing submarine cable located near shore in the Monterey Bay National Sanctuary. The cable, referred to as the Acoustic Thermometry Ocean Climate (ATOC) cable, was deployed in October 1995 for scientific research and removed in July 2011. The purpose of the environmental investigation was to identify, quantify, and document the adverse impacts of cable placement and removal on the associated and adjacent subtidal marine biological communities. The surveys were designed to document pre- and post-removal conditions, both short- and long-term, with



***Seafloor cables.***



**Seafloor cables.**

respect to changes in the density and diversity of marine invertebrates and algae affixed to and alongside the cable; and to document the level of disturbance propagated from the various removal processes. Standard marine ecology inspection methods including random point contact, quadrats, and band transect methods were employed at the cable site and at a parallel control site separated by several meters. Statistical analyses were applied to the inspection data to discern differences in the cable/control sites and changes due to cable removal.

All dive inspection events in 2011 (May, July and August), indicated that the rocky reef habitat and corresponding biological communities documented to occur along the most inshore portion of the ATOC cable were low in diversity and complexity when compared to nearby marine protected area monitoring locations. The portion of the ATOC cable examined in this investigation, near Pillar Point, is heavily exposed to North Pacific storms. Species observed along the cable path and in adjacent habitat were dominated by filamentous diatoms, barnacles, and other species typically associated with disturbed environments. More complex assemblages containing tunicates, sponges, and bryozoans



***Typical invertebrate community associated with the high relief inshore portions of the ATOC cable, Pillar Point, Half Moon Bay, California.***

Photo credit: Jessie Altstatt

as well as some motile soft body invertebrates (nudibrachs) occurred infrequently and nearly exclusively in association with high relief (greater than 2 meters) rocky substrate not common along the cable path. Cable and control transect inspections, diver observations, and statistical results support the conclusion that the substrate and physical conditions near the bottom, adjacent to the ATOC cable, are not conducive to the development of high species richness or complexity. Natural disturbance events within the shallow subtidal area (less than 60 feet) shape the observed marine communities to a much greater magnitude and spatial extent than potential impacts from the abrasion of the ATOC cable. However, placement of the ATOC cable within this high-energy environment was observed to be significantly detrimental to the function and condition of the cable itself.

## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)



#### *Seafloor cables.*

A one-year post-removal study was also conducted in September 2012. Differences in species diversity and percent cover observed in 2012 relative to 2011 followed expected results based on the ephemeral nature of the dominant species groups and their life histories. Sand percent cover had a net loss at all surveyed transects, exposing increased areas of rock for settlement of previously observed species or groups. Changes in bottom type composition support the conclusion that the habitat undergoes repeated physical disturbance from wave action and scour from long shore transport of sediment. Species diversity showed little change between years, and densities of encrusted invertebrates remained relatively low compared to less disturbed habitats along the central coast. Overall changes to percent cover of biological communities between control and cable (removed) transects were not significant, but the consistency of the results in terms of species diversity, density, and bathymetric



***Nudibranch adjacent to a Scale-Sided Piddock (*Paraphola californica*) observed within low relief rocky habitat of the inshore portions of the ATOC cable, Pillar Point, Half Moon Bay, California.*** Photo credit: Jessie Altstatt

distribution provide solid evidence that the proper methodology is in place to document differences in and/or recovery of previously disturbed areas. The two-year post-removal survey will continue to track the trajectory of the cable (removed) and control biological communities and document the recovery of cable-abraded areas and substrate alteration.

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## CASE STUDY

RANGE SUSTAINMENT (EEC-2)

PROJECT NUMBER: 437



# New Method Distinguishes Naturally Occurring from Manufactured Perchlorate



## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)

# New Method Distinguishes Naturally Occurring from Manufactured Perchlorate

**Project Number:** 437

**Project Type:**  
**DECISION TOOL**

Perchlorate is derived from common salts of perchloric acid ( $\text{HClO}_4$ ), such as ammonium perchlorate, magnesium perchlorate, and strontium perchlorate. Perchlorate salts are found naturally in arid or semi-arid environments and can be formed atmospherically under certain conditions. Perchlorate salts can also be created from synthetically formed or manufactured (anthropogenic) perchlorate, used in a variety of industrial and military applications. Manufactured perchlorate is used as an oxidizer component, and, as a result, most states have identifiable releases of anthropogenic perchlorate. Some common uses of perchlorate include matches, fireworks, pharmaceuticals, fertilizers, explosives, rocket propellants, and munitions.

At high doses, perchlorate exposure can interfere with thyroid function. In 2011, the U.S. Environmental Protection Agency (EPA) determined that perchlorate was a contaminant under criteria from the Safe Water Drinking Act.

Misconceptions abound about the potential for current and historical use of perchlorate to contribute to observed perchlorate levels in groundwater and surface water surrounding naval facilities.

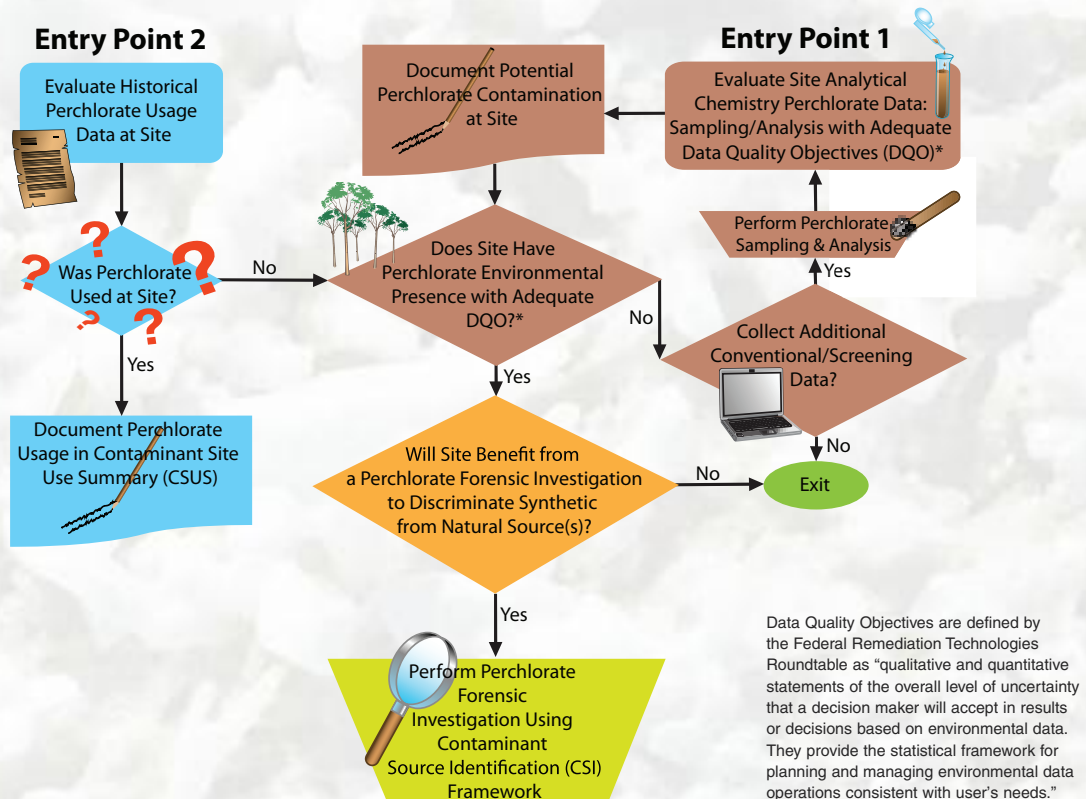


**Taking filtered samples (perchlorate).** Photo credit: Cheryl Cooke

## CUSTOMER TESTIMONIAL

***“This effort to distinguish background perchlorate levels could support the Environmental Remediation, Navy program as well as the Range sustainment program. It is a major Navy issue worthy of the strong support it has received from the NESDI program.”***

—Kim Brown,  
Naval Facilities Engineering Command



## Perchlorate site forensics overview.

To determine whether perchlorate levels around Navy facilities have risen due to natural or anthropogenic reasons, it is necessary to identify

*The NESDI program is developing, validating, and implementing the forensics approach, tools, and methods to quantify and distinguish between naturally occurring and manufactured perchlorate.*

the source of the substance. That is why the NESDI program is developing, validating, and implementing the forensics approach, tools, and methods to

quantify and distinguish between naturally occurring and manufactured perchlorate.

Researchers at Texas Tech University observed that the perchlorate found in groundwater in the Southwest was most strongly correlated with iodate, suggesting atmospheric origin. This led to additional studies that demonstrated that it is possible to form perchlorate in a variety of different atmospheric processes—when high levels of ozone are present with ultraviolet light activation and/or lightning, for example.

## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)



**Typical well.** Photo credit: Cheryl Cooke

The project team, led by personnel from the Space and Naval Warfare Systems Command, Systems Center Pacific and assisted by Naval Facilities Engineering Command Southeast, have identified three sites as having potential for naturally occurring background levels of perchlorate: Naval Air Facility El Centro, California; Pinecastle Range, Florida; and Boardman Range, Oregon.

Preliminary perchlorate source evaluations had been completed under the Range Sustainability Environmental Program Assessment (RSEPA) process for these three sites. Pinecastle Range was selected for purposes of an environmental forensics investigation because a persistent low-level perchlorate signature has been observed in groundwater, which is suspected to originate from a non-Navy source off range.

The following steps were taken for the source evaluation at Pinecastle:

1. Evaluating existing perchlorate source information and conducting forensics perchlorate sampling and analysis.
2. Providing detailed characterization of perchlorate for source identification. In cases where existing data might be ambiguous or confounding, conventional analytical characterizations were performed to quantify perchlorate and other substances known to correlate with perchlorate in key environmental media (i.e. groundwater, soils, plant media).
3. Performing advanced analytical techniques for source identification. This included evaluating substances that can be correlated with naturally occurring perchlorate. For sites with sufficient concentrations of perchlorate in water, soil, and/or plant media, natural perchlorate can be further distinguished from synthetic perchlorate through stable isotopic analyses developed under the Strategic Environmental Research and Development Program. (This project is entitled "Validation of Chlorine and Oxygen Isotope Ratio Analysis to Differentiate Perchlorate Sources and to Document Perchlorate Biodegradation.")



## Contaminant-Site Assessment / Evaluation

CSI with Associated DQO Step



## Contaminant-Source Identification (CSI) Framework

### Problem Identification:

Summarize the problem that will require new environmental data



### Target Assessment:

Identify the decision that requires new data to address the problem

### Design Project Objectives:

Identify new data that needs to be collected, to support the decision based on \*(1) below

### Defensible Study Design:

Evaluate budget vs. scope, boundaries, decision errors, etc.



Conceptual Site Model (CSM)

Contaminant Site Use Summary (CSUS)

What are possible Navy sources?  
What are possible natural sources?  
What are possible non-Navy sources?

What are possible pathways from above sources?

What alteration mechanisms should I be aware of?  
How does this affect the source ID?



### Optimize Design of Field Collection Effort:

- \*(1) Evaluate Existing Data, Perform Data Gap Analysis
- (2) Collect Rapid Screening Data and/or Conventional Data
- (3) Conduct Advanced Chemical Fingerprinting

What Rapid Screening Tools are available? (pros/cons?, cost?, maturity level?)

What Analytical Chemistry Methods are available? (pros/cons?, cost?, maturity level?)

Data Analysis and Presentation



What is the best way to analyze/process the analytical data?

Further Research/Data Gaps

What are the current technology data gaps?

*Site environmental forensics investigation with contaminant source identification (CSI) framework.*

## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)

The background perchlorate source identification (BPSID) approach being demonstrated at Pinecastle Range is anticipated to be complete in FY13. The draft technical guidance document is under

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***Scientifically defensible protocols are being transitioned to site managers who can then perform complete perchlorate background evaluations at their own sites.***

---

initial technical review and these final analytical results will be incorporated into the final technical guidance. This effort will result in a validated process by which any given Navy site can evaluate all known or potential perchlorate sources.

#### Capabilities Gained

Prior to this technical approach, there was no process in place to allow end-users to make informed technical decisions about evaluating perchlorate at their sites, forcing end-users to undertake more costly and time-consuming perchlorate investigations. The approach in this technical guidance will allow end-users to determine in a technically defensible manner what types of perchlorate investigations are realistic, feasible, and can provide meaningful results about the nature of perchlorate at a site. This knowledge is required for determining source attribution, responsibility, and/or appropriate perchlorate background levels from a potential cleanup perspective.

The results of this effort will be disseminated in the form of a technical guidance document, articles in end-user newsletters and magazines, and presentations in focused venues with end-users such as the Range Sustainability Workgroup.

Scientifically defensible protocols are being transitioned to site managers, who can then perform complete perchlorate background evaluations at their own sites. The guidance document provides a forensics analysis framework that can be incorporated into the existing Navy range condition assessment protocol and methodology documents.

Ultimately, the BPSID effort will provide managers with the tools to correctly identify the source of perchlorate, which will guide environmental stewardship programs, and in some cases, will help to avoid costly and unnecessary remediation.

## CUSTOMER TESTIMONIAL

***“Without sound/defensible science on background perchlorate, the Department of Defense will likely be blamed when it is found near our facilities and ranges.”***

—Paul Yaroschak,  
Office of the Secretary of Defense

**Contact:** Robert George • Space and Naval Warfare Systems Command  
619-553-2776 • robert.george@navy.mil

## CASE STUDY

RANGE SUSTAINMENT (EEC-2)

PROJECT NUMBER: 445



Range Sustainment  
EEC-2

# Study Proves Lime is an Effective Neutralizing Agent



## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)

# Study Proves Lime is an Effective Neutralizing Agent

**Project Number: 445**

**Project Type:**  
**NEW TECHNOLOGY**

The Navy uses full-scale practice bombs extensively at many of its land-based test and training ranges. During range clearance operations, these concrete-filled practice bombs are lined up for venting. Venting practice bombs is the process of using Composition 4 (C4) explosive on the bomb to ensure it really is a practice bomb and not filled with explosives. The process also includes checking to see that the signal cartridge has fired, and opening the casing so pressure does not build up during subsequent demilitarization operations.

The explosive in C4 (RDX) makes up around 91 percent of C4 by weight. The Army has found that using C4 explosives, alone and in venting operations, results in a measurable amount of RDX being released to surface soils at Army and Air Force ranges.

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*Off-site migration of munitions constituents can risk regulatory action and jeopardize the Navy's ongoing operation and sustainment of its training ranges.*

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The Army has extensively studied the application of hydrated lime ( $\text{Ca}(\text{OH})_2$ ) on range soils to increase the pH of the soil, causing an alkaline hydrolysis reaction to destroy RDX.



**The venting area at Naval Air Station Fallon.** Photo credit: Joey Trotsky



***Raking in lime at Naval Air Station Fallon.*** Photo credit: Joey Trotsky

This project is demonstrating the application of hydrated lime to Navy venting areas as a Best Management Practice (BMP) to destroy any RDX that may potentially reside in surface soils. Off-site migration of munitions constituents can risk regulatory action and jeopardize the Navy's ongoing operation and sustainment of its training ranges.

The Navy has performed range assessments under the Range Sustainability Environmental Program Assessment (RSEPA) and has concluded that there is no evidence to indicate munitions constituents are migrating off any Navy range. This proactive effort, in support of OPNAV N43's (Fleet Readiness) Operational Range Clearance program, is designed to prevent this possibility.

The overall objective of this project is to produce guidance on how to effectively apply hydrated lime at Navy ranges where venting practice bombs is performed.

The following are technical objectives for this project:

- Validate ability of lime to destroy RDX
- Determine ability to maintain a pH >10.5
- Determine optimal lime dosage
- Determine the ease of use
- Obtain cost and performance data

The project team from the Naval Facilities Engineering and Expeditionary Warfare Center selected two venting sites with different climates to compare the effect of climatic conditions on BMPs—the Pinecastle Bombing Range in Florida and Naval Air Station (NAS) Fallon in California. Collaborating with Army researchers, the team wrote a work plan for both venting sites. After the Navy's Range Sustainment Group reviewed corresponding work plans, nine-month demonstrations were successfully completed at both sites.

At Pinecastle, the treatability study utilized nine 50-pound bags of lime to achieve the target pH level (over 10.5). Based on the literature review, the team determined that maintaining a pH of 10.5 or higher for three to seven days would be sufficient to neutralize the C4. The pH levels at Pinecastle exceeded goals. At the 23-day mark, the pH level was 12 and at the 34-day mark, the pH was measured at 10.5, despite 7.5 inches of rain.

Lessons learned at this site included:

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

## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)



***Raking in lime at the Pinecastle Range Complex.*** Photo credit: Joey Trotsky

At NAS Fallon, five 50-pound bags of lime were used to achieve an initial pH of 11. After eight days, the soil measured 12 pH. After 22 days, however, the pH level had dropped to 9.

The lessons learned from this demonstration included:

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

The only remaining tasks are completion of the final report and guidance. These will discuss how to apply the BMP and will include lessons learned and a summary of the literature search.

As a result of these demonstrations, range managers now have a very inexpensive method to significantly reduce the potential build up of RDX in areas where venting practice bombs is being performed. Pinecastle Range Complex is now being proactive

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***Range managers now have a very inexpensive method to significantly reduce the potential build up of RDX in areas where venting practice bombs is being performed.***

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by using explosive cutting tape to vent practice bombs, which has less RDX than C4. To support a need for performing venting operations without the use of any explosives, a new NESDI project is getting underway utilizing a remote drilling procedure.

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## CASE STUDY

RANGE SUSTAINMENT (EEC-2)

PROJECT NUMBER: 462



# Evaluations of Priority MEMs Accurately Characterize Risk to Navy Training Ranges



## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)

# Evaluations of Priority MEMs Accurately Characterize Risk to Navy Training Ranges

**Project Number: 462**

#### **Project Type: STUDY**

Military expended materials (MEM) are items abandoned in the marine environment after use during Navy training and testing exercises. A better understanding of the potential environmental impacts of these materials is needed to ensure regulatory compliance required for continued, and uninterrupted, training and testing in support of the Navy warfighter.

Expendable equipment includes items such as batteries, buoyancy systems, sonobuoys, artillery, targets, ballast weights, and copper guidance wiring. The Fleet has undertaken efforts to identify and quantify various MEM used during Navy training and testing activities. The expendable materials may contain constituents of

concern (COC) such as lithium bromide, lithium metal and sulfur dioxide, nitrous oxide, carbon monoxide, lithium hydroxide, lead, copper, tungsten, hydrogen cyanide, methane, ammonia, hydrogen sulfide, and sulfur hexafluoride. Assessing the potential environmental impact of select priority MEM will help the Navy's environmental planners to address

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*The goal of this NESDI project is to provide a comprehensive analysis of priority MEM to support regulatory compliance processes.*

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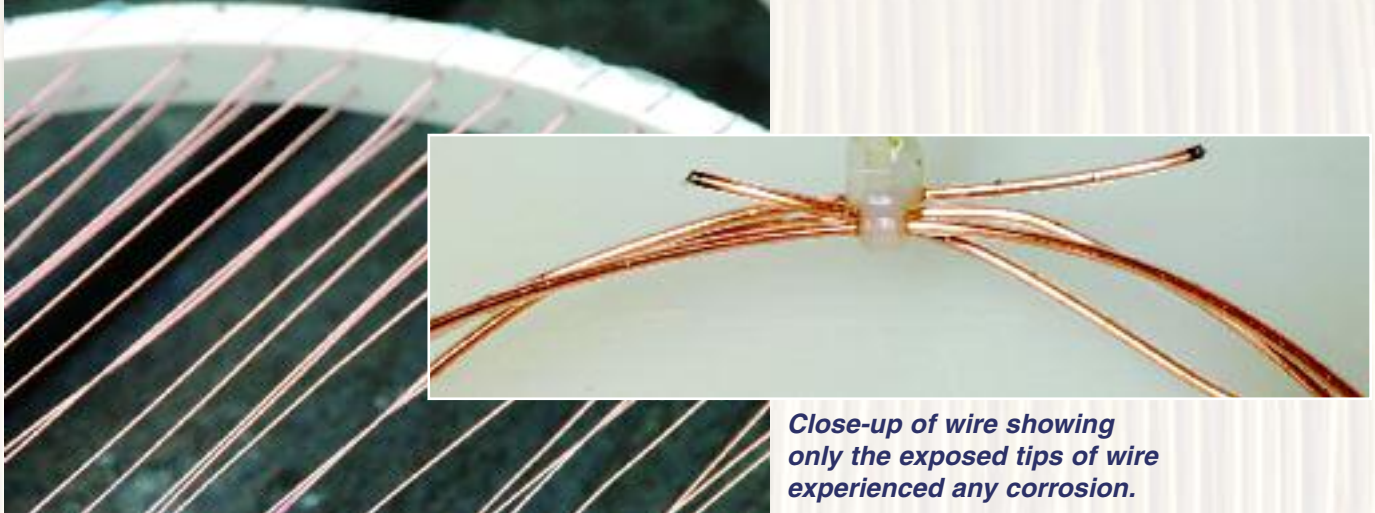
potential MEM risks during current and future regulatory requirements such as the Theater Assessment Program (TAP) Phase II/III Range Complex National Environmental Policy Act (NEPA) documentation including Environmental Impact Statements (EIS) and Overseas Environmental Impact Statements (OEIS).



***The first identified MEM, copper wire, is sometimes used to guide torpedoes such as this one.***

Photo credit: U.S. Navy photo by Mass Communication Specialist 1st Class Ricardo Danan

U.S. Fleet Forces Command (USFF) has initiated a project with personnel from the Naval Facilities Engineering Command, Atlantic Division (NAVFAC LANT) to catalog and quantify the various MEMs and associated COCs at Navy ranges. These efforts have resulted in a comprehensive list of MEMs, their primary components, and associated constituents from a range of sources including mine countermeasures/neutralization, ordnance, targets, sonobuoys, batteries, and floats. Based on the outcome of these findings, input from Fleet personnel, and review of prior regulatory comments several MEM were identified for further analysis. The goal of this NESDI project is to provide a comprehensive analysis of priority MEM to support regulatory compliance processes.



***Uncoated (exposed copper) guidance wire mounted to ring frame before initiation of 180-day in-situ leach rate study.***

Photo credit: Brandon Swope

***Close-up of wire showing only the exposed tips of wire experienced any corrosion.***

Photo credit: Brandon Swope

The first MEM selected for analysis was copper torpedo guidance wire. The analysis for the guidance wire has been completed with a draft technical report available for review. The second MEM selected for analysis was nylon parachutes (or decelerators) used during sonobuoy deployment. Selection of the final MEM for analysis is pending, with input always welcome.

A draft technical report for guidance wire titled, "Copper Based Torpedo Guidance Wire: Applications and Environmental Considerations" has been prepared and is available by request through NESDI or the Principal Investigator (see contact information on page 50). The conceptual approach used in this study was to identify potential impact pathways from torpedo guidance wire to the marine environment and organisms, and evaluate each pathway through empirically derived data and/or best available peer-reviewed literature. The approach focused on site-specific environmental characteristics and marine species relevant to the training areas where copper guidance wire is used. The stressors identified for torpedo guidance wire were both a chemical stressor, leached copper, and a physical stressor,

entanglement hazard. A series of experiments and analyses were carried out to evaluate the various stressors. These included experiments to quantify copper leach rate over time and under various degrees of plastic coating degradation, mechanisms of coating degradation, toxicity testing, guidance wire sinking rate, and breaking strength. Additionally a simple copper and dispersion model was developed to predict water column and sediment concentrations. A list of known marine mammals and sea turtles identified in the range areas was assembled and analyzed with respect to diving and foraging behavior to assess the potential for entanglement.

Evaluation of copper leached into the marine environment as a potential stressor suggests that there is no negative impact to the water column, sediments, and organisms living within these environments. Predicted water column and sediment copper concentrations are below the water quality criteria, sediment guidelines, and predicted toxicity endpoints. Evaluation of the guidance wire as a potential physical stressor suggests that there is an extremely low entanglement potential for

## CASE STUDY

### RANGE SUSTAINMENT (EEC-2)



***The second selected MEM is sonobuoy parachutes. Sonobuoys are dropped from aircraft where they parachute to the surface of the water.***

Photo credit: U.S. Navy photo by Mass Communication Specialist 1st Class Kirk Worley

animals found within the range areas. The physical characteristics of the wire (breaking strength and reluctance to looping or coiling) and sea floor habitat types, coupled with minimal exposure potential to marine mammals (based on diving and foraging behaviors) minimizes any potential entanglement threat. These data suggest that torpedo guidance wire does not present a chemical or physical hazard to the marine environment.

Analysis of the second selected MEM, nylon sonobuoy parachutes, has been initiated. Discussions have taken place with the lead sonobuoy engineer from Naval Air Station Patuxent River and the lead parachute design engineer from China Lake. The team is collecting data on the number of sonobuoy deployments in years past at various training ranges. As part of this analysis NESDI is providing leveraged funding to support elements of a related Environmental Security Technology Certification Program project investigating the potential to use biodegradable parachutes as a one to one replacement for the nylon parachutes. NESDI is helping to support toxicity testing associated with the candidate biodegradable material, polyvinyl alcohol (PVA). Initial toxicity testing has commenced, with preliminary data suggesting the PVA would be an environmentally safe alternative. Future toxicity tests are planned in the coming months.

#### Capabilities Gained

The Navy now has an increased understanding of the potential environmental impacts of the first priority MEM—copper torpedo guidance wire. At the end of the project, much more about the environmental impacts of all three MEMs will be known. This information will be key in supporting decision-making related to Fleet range NEPA documentation and future MEM usage. This project is providing technically defensible data and analysis for assistance during Navy consultation with regulatory agencies.

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***The Navy now has an increased understanding of the potential environmental impacts of the first priority MEM—copper torpedo guidance wire.***

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In particular, this project is providing the technical analysis needed to support the Navy's position regarding MEM, aiding in discussions with the regulatory community, and closing any data gaps related to the TAP Phase II MEM efforts by supporting EIS/OEIS analysis and findings. All three final reports will contain "cut and paste" language to promote easy incorporation of MEM-specific technical data and conclusions into NEPA documentation.

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## Weapon System Sustainment (EEC-3)

### *Background*

In this investment area, the NESDI program sponsors solutions for the Fleet maintainer to reduce the cost of compliance and increase Fleet readiness. Example projects include:

- **Evaluation of Corn Hybrid Polymer Blast Media for the Removal of Coatings from Delicate Substrates.**

This project is validating the use of corn hybrid polymer for the effective repair of aircraft radomes and other delicate substrates. The resulting technology provides an environmentally preferred method to replace chemical strippers and labor-intensive manual coating removal methods.

- **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.

- **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.

- **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.

### *Summary*

<b>FY12 Funding Level:</b>	.....\$909,000
<b>FY13 Funding Level (projected):</b>	.....\$1,069,000
<b>Active Funded Projects in FY12:</b>	.....8
<b>Needs Collected in FY12:</b>	.....16
<b>New Starts in FY13:</b>	.....3

## PROGRAM ANALYSIS

### WEAPON SYSTEM SUSTAINMENT (EEC-3)

#### Active Funded Projects in FY12

No.	ID	Title	Objective
1.	328	Non-Chromated Post Treatments (Trivalent Chrome Post Treatment)	To reduce Navy-wide use of chromate post-treatment coatings by testing and authorizing the trivalent chrome process as a non-chromated replacement. The replacement shall be suitable to the environment, pose no health risk to naval personnel, and have identical or improved performance characteristics compared to chromated post-treatment coating.
2.	348	Nanocrystalline Cobalt (nCoP) Phosphorous Electroplating as a Hard Chrome Alternative	To demonstrate/validate and qualify pulse-electroplating technology for deposition of nCoP coatings as a replacement for Electrolytic Hard Chrome (EHC) plating for both NAVAIR and Naval Sea Systems Command (NAVSEA) systems. This project will be performed in conjunction with ESTCP (WP-0411), utilizing leveraged funding to prioritize Navy-unique requirements. The nCoP coating is an electrodeposited cobalt alloy that employs a plating bath with consumable cobalt anodes.
3.	428	Bio-based Hydraulic and Metal Working Fluids	To develop new specifications for evaluating bio-based metal working fluids. The classes of metal working fluids that will be investigated will include straight oil, soluble oil, semi-synthetic, synthetic, and selected oils based on the pervasiveness of use.
4.	450	Cadmium Tank Electroplating Alternative	To demonstrate and validate DIPSOL IZ-C17+ as an alternative to tank cadmium electroplating on high strength steel/general surfaces within Depot-level maintenance. To validate DIPSOL IZ-264 as an alternative to conventional hexavalent post treatments on the above alkaline zinc-nickel deposit.
5.	451	Navy Demonstration of Cadmium and Hexavalent Chromium Free Electrical Connectors	To expand upon previous laboratory testing by NAVAIR and the Army Tank and Automotive Command "beyond specification" test effort on new connector plating classes in a leveraged effort focused on Navy-relevant field testing of alternatives. Testing will quantify the differences among the new and existing plating classes including MIL-DTL-38999L Class P, T, Z, W (cadmium/chromate controls) including two other new coatings being spearheaded by the Army.
6.	458	Advanced Non-Chromate Primers & Coatings	To evaluate coating systems built from current state-of-the-art non-chromate primers in conjunction with non-chromate metal finishes. Focus on testing leading metal finishing alternatives.
7.	470	Cyanide Waste Reduction of Electroplating and Stripping Processes	To reduce and/or eliminate the use of cyanides at Fleet Readiness Centers by integrating technologies that meet or exceed the performance requirements of current plating systems.
8.	475	Mobile Pier and Facility Wastewater Treatment System	To quantify the extent of escalating costs of wastewater disposal generated from water blasting processes performed at Navy shipyards and test a mobile wastewater treatment system.



## Needs Collected in FY12

No.	Need	Command	Title	Ranking	Status
1.	N-0781-12	Other	Ultraviolet Curable Powder Coatings for Marine Applications	LOW	Other
2.	N-0783-12	NAVAIR	Corrosion Protection for Department of Defense Aircraft Surfaces Without Hexavalent Chromium	LOW	Not Ready For Demonstration/ Validation (Dem/Val)
3.	N-0787-12	NAVAIR	Aqueous Chemical Cleaning Tanks Bath Life Extension and Bath Quality Sustainment	LOW	Other
4.	N-0791-12	NAVFAC	Flammable Debris Off-Gas Treatment	Not Ranked	More Information Required
5.	N-0795-12	NAVFAC	Aircraft Wash Rack Oil/Water Separation	MEDIUM	Request NESDI Pre-Proposal
6.	N-0802-12	NAVAIR	Demonstrate/Validate Alternatives to Methylene Chloride-based Chemical Paint Stripper	MEDIUM	Request NESDI Pre-Proposal
7.	N-0803-12	NAVAIR	Portable Cold Spray Surface Metallization for Localized Repair of Cadmium and Other Sacrificial Coatings	MEDIUM	Request NESDI Pre-Proposal
8.	N-0805-12	NAVAIR	Laser Depainting of Navy Aircraft as an Alternative to Chemical/Media Removal Technology	LOW	Other
9.	N-0807-12	NAVSUP	Biobased Motor Oil Specification	Not Ranked	Outside NESDI Scope
10.	N-0811-12	NAVAIR	Removal of Cadmium Coating on MH-60 Troop Seat Energy Attenuators	LOW	Other
11.	N-0829-12	NAVAIR	Replacement of Film Radiography with Computed Radiography	MEDIUM	Request NESDI Pre-Proposal
12.	N-0830-12	NAVSUP	Soiled Shop Towel Processing	MEDIUM	Request NESDI Pre-Proposal
13.	N-0832-12	NAVAIR	Hexavalent Chrome to Trivalent Chrome	MEDIUM	Not Ready For Dem/Val
14.	N-0834-12	NAVAIR	Demonstrate/Validate Proposed MIL-P-85891 Type VIII Magic Media for Paint Removal of Aircraft Exteriors	MEDIUM	Request NESDI Pre-Proposal
15.	N-0836-12	NAVFAC	Hazardous Air Pollutant/Volatile Organic Compound Free Coatings	MEDIUM	Not Ready For Dem/Val
16.	N-0845-12	NAVSEA	Waste Treatment of Ultra High Pressure Water Jet/Abrasive Hull Cutting Slurry	Not Ranked	More Information Required

## PROGRAM ANALYSIS

### WEAPON SYSTEM SUSTAINMENT (EEC-3)



#### New Starts in FY13

No.	ID	Title	Objective
1.	484	Replacement of Film Radiography with Computed Radiography	To test, evaluate, and demonstrate computed radiography as an effective replacement for film radiography at FRCs.
2.	485	Demonstrate/Validate Alternatives to Methylene Chloride-based Chemical Paint Strippers	To demonstrate and validate alternatives to methylene chloride-based chemical paint strippers.
3.	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.	To demonstrate and validate proposed MIL-P-85891 Type 8 PMB as a replacement for chemical-based strippers and existing Type 5 and 7 PMB.

#### ESTCP Leveraged Projects

No.	ID	Title	To date ESTCP	To date NESDI	2013 NESDI
1.	348	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	1371.5	230	60
2.	458	Advanced Non-Chromate Primers & Coatings	1400	430	115

## CASE STUDY

WEAPON SYSTEM SUSTAINMENT (EEC-3)

PROJECT NUMBER: 348



# Finding a Safer Alternative to Hard Chrome Plating



## CASE STUDY

### WEAPON SYSTEM SUSTAINMENT (EEC-3)

# Finding a Safer Alternative to Hard Chrome Plating

**Project Number: 348**

**Project Type:**  
**TECHNOLOGY REPLACEMENT**

Electrolytic Hard Chrome (EHC) plating is a technique that has been utilized in commercial production for more than 50 years. It is currently used at the Navy's Fleet Readiness Centers (FRCs) to apply hard coatings to a variety of aircraft components. However, the process utilizes hexavalent chromium (Cr6+), a carcinogen. Because of the number of regulations dictating Cr6+ use, the Navy needs an alternative process. NESDI sponsored this project to demonstrate the use of Nanocrystalline Cobalt Phosphorous (nCoP) plating technology as an effective alternative to EHC.

During the EHC plating process, chrome plating tanks emit a Cr6+ mist, which must be ducted away from workers and then removed by scrubbers. Wastes generated from plating operations must be disposed of as hazardous waste. Plating operations must abide by U.S. Environmental Protection Agency (EPA)

emissions standards and Occupational Safety and Health Administration permissible exposure limits.

nCoP alloy plating utilizes pulse plating to create a nanocrystalline structured deposit on the surface of the component. The nCoP coating exhibits properties that are equivalent to, and in many ways better than EHC deposits. Performance

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***This technology is a direct drop-in replacement for the existing EHC process and will only require modification of plating power supplies.***

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testing has shown that the nCoP coatings demonstrate superior salt-fog corrosion and wear behavior as well as enhanced fatigue performance compared to EHC coatings (fatigue and wear testing was performed by the Environmental Security Technology Certification Program). This technology is a direct drop-in replacement for the existing EHC process and will only require modification of plating power supplies.

Significant reductions in energy consumption and increases in throughput can also be achieved with the nCoP process. Unlike EHC, the nCoP process uses no constituents on the EPA list of hazardous materials and does not generate hazardous emissions or by-products.

A project sponsored by the Strategic Environmental Research and Development Program (PP-1152) found that the overall plating efficiency of the nCoP process is greater than 90 percent, compared to less than 35 percent for EHC. The high plating efficiency of the nCoP process leads to approximately five times greater deposition rates with significantly less hydrogen generation. This minimizes the likelihood of hydrogen uptake and subsequent embrittlement of susceptible materials, including high-strength steels. Hydrogen embrittlement is the process by which various metals become brittle and fracture following (often unintentional) exposure to hydrogen during forming or finishing operations.



***Demonstration/validation using T-45 pivot assembly (masking step).***

Photo credit: Ruben Prado



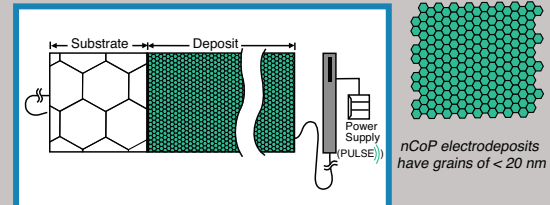
### Demonstration/validation using T-45 pivot assembly (electroclean step).

Photo credit: Ruben Prado

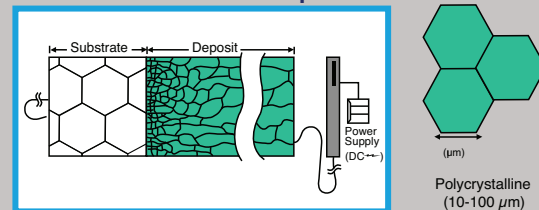
On 8 April, 2009, the Office of the Secretary of Defense released a memo restricting the use of Cr6+ unless no cost-effective alternatives with satisfactory performance were available. nCoP coatings have been identified as the best overall strategy to replace EHC electroplating processes. It is the goal of this project to qualify nCoP for Department of Defense manufacturing and repair.

Fleet Readiness Center Southeast (FRC SE) in Jacksonville, Florida was chosen for the demonstration of this process because it has a plating facility with a demonstration/validation line already in place. The project team developed and demonstrated a nCoP plating tank at FRC SE. Using EHC as a baseline, a set of performance objectives was defined, including: appearance, adhesion, fatigue, hardness, corrosion, hydrogen embrittlement, environmental embrittlement, fluid compatibility, and wear. To date, the component plating process has been completed, and field testing of components has begun with T-45 aircraft arresting gear pivot

#### Nanocrystalline Electrodeposit



#### Conventional Electrodeposit



## CUSTOMER TESTIMONIAL

***“The Nanocrystalline Cobalt Phosphorous plating process is very efficient compared to Hard Chrome Plating since the deposition rates are about five times higher. As such, it allows me to plate more parts in the same amount of time. The process is also easy to operate and maintain and does not require a large learning curve.”***

—Roger Mason, Fleet Readiness Center East

## CASE STUDY

### WEAPON SYSTEM SUSTAINMENT (EEC-3)



#### ***Demonstration/validation using T-45 pivot assembly (nCoP plating).***

Photo credit: Ruben Prado

assemblies. The team is also currently developing a performance military (MIL) specification for nCoP.

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***nCoP coatings have been identified  
as the best overall strategy to replace  
EHC electroplating processes.***

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Remaining tasks for 2013 include technical documentation and the final cost reports, after which technical authorization will be sought. At the end of the project, a step-by-step production process will be defined.

Successful demonstration and validation of the nCoP plating technology will likely lead to its implementation at all three Navy FRCs, reducing environmental and worker safety concerns associated with Cr6+ found in EHC. The process is potentially useful in a wide range of current and new applications like gun barrels, pistons, actuators, and gear surfaces. If successful, it is likely that all services and a number of original equipment manufacturers will pursue the implementation of process tanks at their facilities.

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## PROGRAM ANALYSIS

### SHIP-TO-SHORE INTERFACE AND AIR & PORT OPERATIONS (EEC-4)



## Ship-to-shore Interface and Air & Port Operations (EEC-4)

### *Background*

In this area, the NESDI program invests in innovative techniques to manage ships' hazardous material and waste offload to shore facilities. Example projects in the ship-to-shore interface area are:

- **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.

- **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.

- **Hull Maintenance Shroud.**

This project is leveraging existing technologies to demonstrate a hull shroud which will provide a simple, economical solution for capturing waste streams associated with coating removal and surface preparation during ship repair and painting operations.

### *Summary*

**FY12 Funding Level: .....\$498,000**

**FY13 Funding Level (projected): .....\$860,000**

**Active Funded Projects in FY12: .....3**

**Needs Collected in FY12: .....10**

**New Starts in FY13: .....2**

## PROGRAM ANALYSIS

### SHIP-TO-SHORE INTERFACE AND AIR & PORT OPERATIONS (EEC-4)

#### Active Funded Projects in FY12

No.	ID	Title	Objective
1.	440	Surface Cleaning of Dry Dock Floors	To demonstrate sufficiently capable, convenient, versatile, robust, and cost-effective practical surface cleaning technology for shipyard use to mitigate problematic contaminants in discharges from dry docks and from other possible industrial areas that present similar challenges and opportunities for improvement.
2.	456	Hull Maintenance Shroud	To provide a simple, economical solution to capturing waste streams associated with coating removal and surface preparation during repair and painting operations over water.
3.	467	Methodology to Assess Essential Fish Habitat for Navy Coastal Properties	To gather defensible scientific information on the presence and absence of federally managed fish species in essential fish habitats adjacent to Navy facilities.



***This project is using a robust predictive model to develop quantitative categories for Essential Fish Habitats that support Fleet readiness. Among the species targeted in this effort is the Pacific mackerel.***



## Needs Collected in FY12

No.	Need	Command	Title	Ranking	Status
1.	N-0793-12	NAVFAC	Evaluation and Management of Removed Sea Growth	MEDIUM	Not Ready For Dem/Val
2.	N-0794-12	Other	Diversion of Shipboard Waste at Pierside	MEDIUM	Other
3.	N-0808-12	NAVSEA	Biofouling Mitigation for Permanent Oil Boom via Antifouling Elastomers	MEDIUM	Request NESDI Pre-Proposal
4.	N-0821-12	CNIC	Navy Pier-Side Energy from Waste	Not Ranked	Outside NESDI Scope
5.	N-0835-12	NAVSUP	Ship-to-Shore Waste Hazardous Material Minimization - Supply Source Reduction	MEDIUM	Request NESDI Pre-Proposal
6.	N-0837-12	CNIC	Convert Navy San Diego Shipboard and Other Non-recyclable Plastics to Alternative Fuel	MEDIUM	Not Ready For Dem/Val
7.	N-0839-12	Other	Request Review of Alternate Processes or Technologies to Aid in Reducing the Amount of Excess Paints that Becomes Waste	MEDIUM	Request NESDI Pre-Proposal
8.	N-0842-12	NAVFAC	Desktop RADAR Impact Analysis Tool for Early Identification of Risk Associated with Wind Energy Projects	Not Ranked	Outside NESDI Scope
9.	N-0844-12	CNIC	Aerosolized Irritant System for Removing Invasive Brown Tree Snakes from Outbound Materials	MEDIUM	Request NESDI Pre-Proposal
10.	N-0846-12	NAVSEA	Reduced Generation of Shoreside Managed Waste from Pierside Supported Underwater Ship Husbandry Operations	LOW	Other

## New Starts in FY13

No.	ID	Title	Objective
1.	488	Excess Paint Reduction	To limit the waste disposal burden associated with expired shelf life (ESL) paint by addressing manufacturers' concerns about accepting ESL paint.
2.	489	Oil Boom Biofouling Control by Mechanical Intervention and Material Technologies	To demonstrate and validate the use of an environmentally friendly non-stick coating in conjunction with in-water cleaning to reduce the biofouling of oil booms.

## PROGRAM ANALYSIS

### REGULATORY & BASE OPERATIONS (EEC-5)

## Regulatory & Base Operations (EEC-5)

### *Background*

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:

- **Biodiesel for Ground Tactical Vehicles and Equipment.**

This project established guidelines and limitations for the use of biodiesel with ground tactical vehicles and equipment to reduce hazardous emissions from diesel engines.

- **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.

- **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.

The NESDI program also receives multiple requests each year to help stormwater managers improve stormwater compliance. To address these challenges, the program provides resources to demonstrate and validate commercially available systems as well as emerging systems as possible BMPs to maintain pollutant concentrations below permitted levels. Recent projects include:

- **Electrochemical Detection and Load Reduction of Copper and Zinc in Stormwater Runoff.**

The objectives of this project are to quantify copper and zinc levels in stormwater runoff using electrochemical methods and to track and identify the source.

- **Optimization of the Stormwater Dual Media Filtration System.**

This project is optimizing a stormwater filtration system at the Navy Regional Recycling Center (NRRRC), in San Diego, California so that the system consistently meets National Pollution Discharge Elimination System permit requirements for metals and other pollutants.

- **Stormwater BMP Decision Support Tool Website.**

This web-based system was designed to help users identify the most cost-effective stormwater BMPs to address stormwater runoff requirements.

### *Summary*

**FY12 Funding Level: .....\$3,195,200**

**FY13 Funding Level (projected): .....\$3,831,000**

**Active Funded Projects in FY12: .....18**

**Needs Collected in FY12: .....36**

**New Starts in FY13: .....12**



### Active Funded Projects in FY12

No.	ID	Title	Objective
1.	356	Demonstration of Real-Time Drinking Water Quality Monitoring Technologies	To demonstrate a real-time continuous drinking water quality monitoring system that protects drinking water systems from intentional and unintentional contaminations.
2.	425	Automated Condition Assessment of Coral Reefs	To assist in providing the Navy with an integrated automated system to assess and monitor the health of coral reefs. To provide a method that allows for the timely mitigation of possible adverse impacts to coral reefs resulting from military construction in their vicinity.
3.	446	Demonstration of Physical & Biological Conditioning of Navigational Dredge Material for Beneficial Reuse	To evaluate the effectiveness of conditioning methods on weathered and freshly dredged marine sediment to enhance its beneficial reuse potential.
4.	448	Evaluation of Re-suspension Associated with Dredging, Extreme Storm Events and Propeller Wash	To demonstrate and validate innovative methods to quantify resuspension and recontamination potential of contaminated sediments from propeller wash. To utilize the validated methods to evaluate and quantify the resulting effects from these resuspension events on remedial efforts.
5.	453	Electrochemical Detection and Load Reduction of Copper and Zinc in Stormwater Runoff	To quantify copper and zinc levels in stormwater runoff using electrochemical methods and to track and identify sources of contamination.
6.	454	Optimization of the Stormwater Dual Media Filtration System at the NRRC in San Diego	To optimize performance of the Navy-developed dual media filtration system.
7.	455	Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Stormwater Discharges	To provide Navy facility environmental managers with a stormwater management tool that will allow them to identify and quantify potential sources of stormwater metals as well as quantify the potential reductions expected from a variety of BMP mitigation actions.
8.	457	Compliance with the Emerging Requirements of the Stage II Disinfectant and Disinfection Byproduct Rule	To demonstrate and validate a cost-effective ceramic membrane filtration technology for the removal of disinfectant byproduct precursors (natural organic material, humic and fulvic acids) in Navy drinking water systems.
9.	459	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	To provide an improved ability to discern actual ecological risk at sediment remediation sites, and potentially in surface water applications.

(continued on the next page)

## PROGRAM ANALYSIS

### REGULATORY & BASE OPERATIONS (EEC-5)

#### Active Funded Projects in FY12 *(continued)*

No.	ID	Title	Objective
10.	460	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	To demonstrate and validate reactive amendments for treating contaminated sediments in active Department of Defense harbors.
11.	461	Development of a Collaborative Programmatic Environment, Safety, and Occupational Health Evaluation (PESHE) Document Authoring Tool for All Navy Commands	To provide a web tool which allows for the standardization, collaboration, and quality assurance of all PESHE documents.
12.	463	Methodology for Identifying and Quantifying Metal Pollutant Sources in Stormwater Runoff	To demonstrate and validate a web-based methodology module to assist in identifying and quantifying problematic metal pollutant point sources (points of origin) in stormwater runoff.
13.	464	Tertiary Treatment and Recycling of Wastewater	To demonstrate and validate on-site reclamation and reuse of wastewater using an enhanced manmade wetland.
14.	466	Separation, Detection, and Removal of Munitions and Explosives of Concern/Unexploded Ordnance from Dredged Material Using Physical Separation Methods	To demonstrate an improved process for separating and recovering munitions and explosives of concern from freshly dredged (wet) material using mechanical screens.
15.	468	Low Cost Selective Polymer and Laser Interferometer Real Time Sensors for Detection of Solvents in Contaminated Groundwater Plumes	To demonstrate and validate optical sensor technology to detect groundwater contaminants in real time and to enable remote access to these data.
16.	469	Validation of a Low-tech Stormwater Procedural BMP	To provide an interim solution to remove metals in stormwater runoff through surface cleaning BMPs.
17.	473	Dynamic Mixing Zone Modeling	To use two predictive transport models to develop a strong scientific basis for the designation of mixing zones to meet water quality standards.
18.	474	Toxicity Associated with Polycyclic Aromatic Hydrocarbon (PAH) Used in Clay Targets	To determine the PAH composition of clay targets used at skeet ranges, and to determine the relative bioavailability of PAH in the soil at these ranges.



## Needs Collected in FY12

No.	Need	Command	Title	Ranking	Status
1.	N-0778-12	NAVFAC	Framework for Applying Green Sustainable Approaches to Remediation and Construction	LOW	Other
2.	N-0780-12	NAVFAC	Bird and Bat Mortality Estimates at Small Wind Facilities	MEDIUM	Request NESDI Pre-Proposal
3.	N-0784-12	NAVAIR	Exceed Stormwater Discharge Limits Solution for Parking Lots and Roadways	MEDIUM	Other
4.	N-0785-12	NAVAIR	Department of Defense Navy Industrial Wastewater Treatment Plant Reduction of Chemical Consumption for Wastewater Treatment for Significant Cost Savings	Not Ranked	More Information Required
5.	N-0786-12	NAVAIR	Metric Tools to Evaluate Greenhouse Gases from Fossil and Bio-based Fuel Combustion Sources	Not Ranked	Solution Exists (Other)
6.	N-0790-12	NAVFAC	Stormwater Discharge Minimization	MEDIUM	Other
7.	N-0792-12	NAVFAC	Use of Phase Change Material to Reduce Thermal Loading to Ambient Waters	LOW	More Information Required
8.	N-0797-12	NAVFAC	Vapor Intrusion Evaluation Decision Logic and Navy Vapor Intrusion Database	MEDIUM	Similar/ Duplicate Need, Merge
9.	N-0798-12	NAVFAC	Vapor Intrusion Tool	MEDIUM	Request NESDI Pre-Proposal
10.	N-0799-12	NAVFAC	Emerging Drinking Water Constituents of Concern and Marginal Drinking Water Quality at Navy Bases	MEDIUM	Request NESDI Pre-Proposal
11.	N-0800-12	NAVFAC	Inexpensive and Non-Intrusive Low Impact Development for Stormwater Run-off Control	MEDIUM	Other
12.	N-0801-12	NAVAIR	Trial of Vertical Wind Turbines as a Potential Alternative Energy Source	Not Ranked	Outside NESDI Scope
13.	N-0804-12	NAVFAC	An Initial Decision Report on Coral Reef Transplantation Methods	MEDIUM	Request NESDI Pre-Proposal
14.	N-0806-12	NAVSEA	Development of a Perchlorate-Free Red Transportation Signal Flare	LOW	Solution Exists (Other)
15.	N-0810-12	NAVFAC	Wastewater Treatment Plant Biosolids Reuse	LOW	Other
16.	N-0812-12	NAVAIR	Environmentally Neutral and Energy-efficient Methods to Remediate Department of Defense Installation Sewage and Industrial Wastewater Streams	Not Ranked	Outside NESDI Scope

(continued on the next page)

## PROGRAM ANALYSIS

### REGULATORY & BASE OPERATIONS (EEC-5)

#### Needs Collected in FY12 *(continued)*

No.	Need	Command	Title	Ranking	Status
17.	N-0813-12	NAVFAC	Identify Impact of Water Conservation Measures on Water and Wastewater Infrastructure Systems	LOW	Outside NESDI Scope
18.	N-0814-12	NAVFAC	Non-Hazardous Solid Waste Diversion	MEDIUM	Request NESDI Pre-Proposal
19.	N-0815-12	NAVFAC	Removal/Disposal of Waste Vegetable Oil at Remote Locations	LOW	Solution Exists (Other)
20.	N-0816-12	NAVFAC	Re-use of Cooling Tower Wastewater	Not Valid	Solution Exists (Other)
21.	N-0817-12	NAVFAC	Minimizing the Costs and Volume of Aeration Pond Sludge Requiring Off-site Disposal	Not Valid	Solution Exists (Other)
22.	N-0818-12	NAVFAC	Sustaining Mission Critical Operations while Complying with EPA Requirements for Reciprocating Internal Combustion Engines	Not Ranked	Solution Exists (Other)
23.	N-0819-12	CNIC	San Clemente Island Energy from Waste Study	Not Ranked	Outside NESDI Scope
24.	N-0820-12	CNIC	Navy Base San Diego Energy from Food Waste	Not Ranked	Outside NESDI Scope
25.	N-0823-12	NAVFAC	Integrated Water and Energy Management, Energy Conservation Measure for Submarine Base Kings Bay Cooling Tower Chiller Plant	Not Valid	Solution Exists (Other)
26.	N-0824-12	CNO	Air Emissions Guidance Tool	MEDIUM	Request NESDI Pre-Proposal
27.	N-0825-12	NAVAIR	Naval Air Systems Command Chemical Guidance Database	LOW	Being Addressed By Existing Efforts (NESDI)
28.	N-0827-12	NAVFAC	Effects of Copper on the Behavior of Estuarine Fishes for Effective Management of Sensitive Coastal Species	MEDIUM	Request NESDI Pre-Proposal
29.	N-0828-12	NAVSEA	Improve Oily Water Treatment System Processes for Compliance with NPDES Permit Discharge Standards	MEDIUM	Request NESDI Pre-Proposal
30.	N-0833-12	NAVFAC	Bioretention Swale Stormwater BMP	LOW	Solution Exists (Other)
31.	N-0838-12	NAVFAC	Web Based Emergency Planning Community-Right-To-Know Act Reporting Tool	MEDIUM	Other
32.	N-0841-12	NAVFAC	Rapid Identification of Small Department of Defense Facilities Suitable for Small Wind Energy Projects	Not Ranked	Outside NESDI Scope

*(continued on the next page)*

Needs Collected in FY12 *(continued)*

No.	Need	Command	Title	Ranking	Status
33.	N-0843-12	NAVFAC	Evaluation of Risks Associated with Components of National Environmental Policy Act Planning: Eliminating Non-critical Steps	Not Ranked	Outside NESDI Scope
34.	N-0853-12	NAVFAC	Low Impact Development for Stormwater Run-off Control	HIGH	Request NESDI Pre-Proposal
35.	N-0854-12	NAVSEA	Radioactive Material Permit Generation, Management, and Tracking System	MEDIUM	Request NESDI Pre-Proposal
36.	N-0855-12	NAVFAC	Municipal Separate Stormwater Sewer System	HIGH	Request NESDI Pre-Proposal

## New Starts in FY13

No.	ID	Title	Objective
1.	476	A Quantitative Decision Framework for Assessing Navy Vapor Intrusion Sites	To develop a quantitative framework to improve decision-making and site-management practices for vapor intrusion at Environmental Restoration Program sites.
2.	478	Improving Non-Hazardous Solid Waste Diversion	To identify, demonstrate, and validate one or more management practices/technologies to separate food waste at the source.
3.	479	Remove Copper and Other Heavy Metals from Oily Water Treatment System Discharge for Compliance with NPDES Discharge Standards	To improve the Navy's Oily Water Treatment System processes for compliance with water discharge standards.
4.	480	Alternative Metal Hot Cutting Operations For Opacity	To demonstrate/validate an alternative metal cutting technology for reducing opacity emissions during shipbreaking operations.
5.	481	Controlling Opacity During Ship Hull Cutting & Cold Work	To evaluate a cold cutting technology to reduce particulate opacity during shipbreaking and repair operations.
6.	487	Use of Boron-Doped Diamond Electrodes for Water Treatment	To demonstrate the sustainable use of a boron-doped diamond electrochemical water treatment system for drinking water at remote locations.
7.	490	RAPID RESPONSE: Application of the Marine Biotic Ligand Model for Copper to Evaluate Risks Associated with Olfactory Responses in Salmonids and Forage Fish	To incorporate fish olfactory sensory data into the marine Biotic Ligand Model for copper to validate the model for its protectiveness of emerging species of concern.
8.	491	Implementation Strategy for Coral Reef Transplantation Methods	To describe, review, and prioritize potential transplant technologies that could be used to mitigate impacts to coral reefs.

*(continued on the next page)*

## PROGRAM ANALYSIS

### REGULATORY & BASE OPERATIONS (EEC-5)



#### New Starts in FY13 *(continued)*

No.	ID	Title	Objective
9.	492	Capacitive Deionization Water Treatment System	To challenge-test and improve upon the application of capacitive deionization for the treatment of drinking water at small facilities.
10.	493	Low Impact Development (LID) for Industrial Areas	To evaluate LID practices capable of removing heavy metals from stormwater runoff from industrial areas.
11.	494	Successful Municipal Separate Storm Sewer System (MS4) Programs Implemented in the Navy	To investigate existing technologies used by the public and installations with MS4 permits and compile the information into a decision matrix.
12.	495	Radioactive Material Permit Generation, Management, and Tracking System	To develop and demonstrate a database that will streamline Radiological Affairs Support Office operations and ensure compliance with environmental rules and regulations.

#### ESTCP Leveraged Projects

No.	ID	Title	To date ESTCP	To date NESDI	2013 NESDI
1.	448	Evaluation of Resuspension Associated with Dredging, Extreme Storm Events and Propeller Wash	498.0	420.0	0.0
2.	459	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	871.0	223.0	94.0
3.	460	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	413.0	335.0	25.0
4.	464	Water Conservation: Tertiary Treatment and Recycling of Wastewater	340.0	205.5	0.0
5.	476	A Quantitative Decision Framework for Assessing Navy Vapor Intrusion Sites	0.0	264.4	274.7
6.	N/A	Innovative Acoustic Sensor	0.0	0.0	20.0
7.	N/A	Smart Water	570.0	40.0	25.0

## CASE STUDY

REGULATORY & BASE OPERATIONS (EEC-5)

PROJECT NUMBER: 425



# Automated Assessment of Coral Reefs



## Automated Assessment of Coral Reefs

**Project Number: 425**

**Project Type:**  
**NEW TECHNOLOGY**

The health of coral reefs can be affected by many activities, including wastewater treatment plant discharge, coastal landfills, and stormwater runoff—all of which can release sediment, pollutants and elevated nutrient loads into the water column. Dredging, pier construction and berthing activities at and around naval facilities can resuspend these sediments, and at high concentrations these sediments can impact surrounding coral as well as the sensitive symbiotic organisms (algae) that provide much of the food and oxygen to these corals.



**Surface buoy configuration.**

The NESDI program recognized the need to assess the potential impact of these activities on coral surrounding Navy harbors, and is demonstrating an innovative suite of equipment to monitor and assess the impacts of those activities.

Executive Order 13089 “Protection of Coral Reefs” (1998), the Coral Reef Conservation Act (2000), and the Coral Reef Conservation Amendments Act (2005), all direct Federal agencies to study, restore, and conserve U.S. coral reefs. Furthermore, the Clean Water Act requires that a special aquatic resources assessment be performed to secure permits in the marine and near-shore environments. As a result, the Navy needed to develop the ability to characterize, assess, and monitor the underwater communities near Navy harbors or activities to document compliance with national policy and to ensure that those operations do not degrade the health of nearby coral reefs.

This NESDI project, conducted by personnel from by the Space and Naval Warfare Systems Command, Systems Center Pacific (SSC Pacific) and the

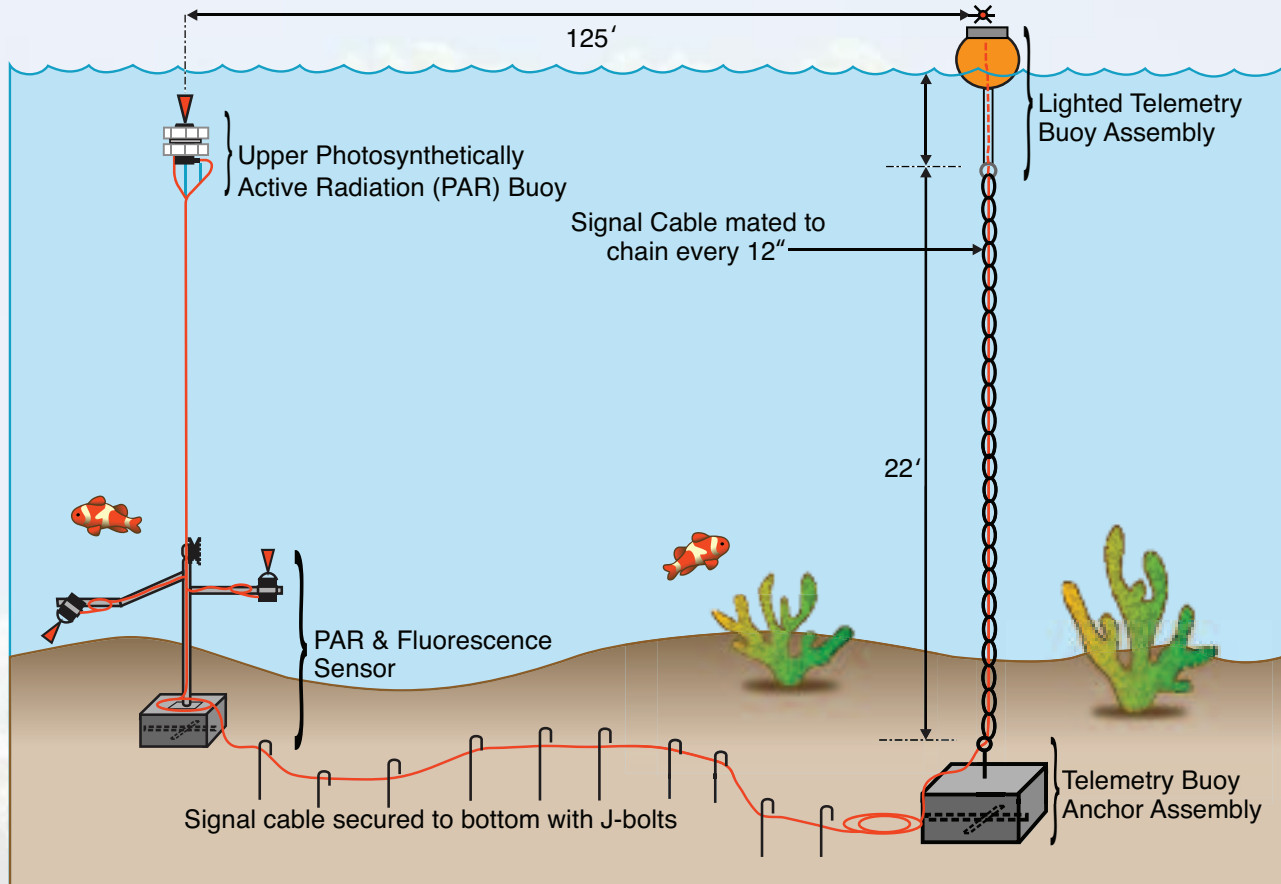
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***The CRMS provides a real-time alarm system that warns when suspended sediment conditions might threaten coral health.***

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Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC) identified, integrated, and demonstrated a combination of commercial, off-the-shelf instruments that provide a real-time alarm system that warns when suspended sediment conditions might threaten coral health.

The prototype system was being tested at Commander U.S. Naval Forces, Marianas Islands in Sasa Bay (Apra Harbor), Guam. Installed in 2009, the Coral Reef Monitoring System (CRMS) is able to generate long-term data on the comparison of coral health at unimpacted and impacted sites. The suite of equipment includes a set of light sensors mounted slightly below the water’s surface and another set slightly above the face of the coral reef, designed to compare the level of incident solar radiation at the surface of the water with that



**Two sets of light sensors compare the level of incident solar radiation at the surface of the water with that reaching the reef.**

reaching the reef. Differences in the amount of sunlight penetrating through the water column is an indication of suspended sediment or plankton in the water when compared to clear water data. Readings are sent directly to the shore from the surface float. An additional sensor collects information on the health of the coral by collecting the naturally occurring fluorescent response of a selected coral's symbiotic algae to the sunlight reaching it.

Over a period of time, the sensors' windows experienced biofouling, so the team recalibrated the biosensors and incorporated wipers to prevent future biofouling. The telemetry function was also enhanced, allowing regular transmissions via cell phone technology rather than via satellite. The improved design was re-installed in September 2011.

Apra Harbor was selected because it was near the then-proposed location for a new pier for aircraft carriers. The construction of the pier has been reconsidered pending further plans regarding the redeployment of personnel from Okinawa to Guam.

The stakeholders focused heavily on their perception that increased turbidity from dredging will have drastic

***The CRMS continues to provide insights showing that the coral species studied are highly resistant to the extreme levels of turbidity found in Apra Harbor.***

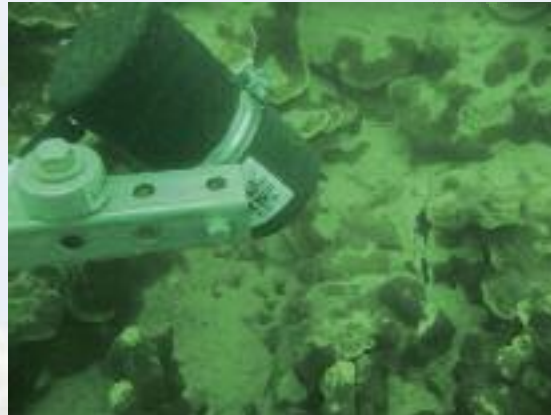
adverse impacts on the corals. The CRMS has provided and continues to provide evidence that the coral species studied are highly resistant to the extreme levels of turbidity found within Apra Harbor.

## CASE STUDY

### REGULATORY & BASE OPERATIONS (EEC-5)



***Coral reef monitoring system installed.***



***Sensor focused on Poritus rus coral head.***

Technology transition options have been discussed with personnel from the environmental office at Naval Base Guam (NBG). NBG is considering leaving the CRMS in place, moving it to a different location, or installing a new, production-grade system. The National Oceanic and Atmospheric Administration (NOAA) has been made aware of the CRMS although substantive talks have yet to take place. Momentum for the use of such a system is expected to increase as a result of the following:

1. The recent decision to fund the transition of Marines from Okinawa to Guam.
2. The pending announcement (expected mid-2013) of the listing of additional threatened or endangered coral reef species, some of which are expected to be found in Apra Harbor. This may include new monitoring requirements from the National Marine Fisheries Service.

Other potential CRMS users within the Navy include Naval Air Station Key West, Naval Base Guantanamo Bay, and Naval Station Pearl Harbor. Technology production for additional CRMS installations will be the responsibility of NAVFAC EXWC.

Regional outreach regarding the system is ongoing. The project's Principal Investigator made a presentation at the Sixth International Coral Reef Symposium in Cairns, Australia in July 2012,

and SSC Pacific is promoting collaboration with the University of Guam on similar aspects of research.

#### **Capabilities Gained**

- This instrumentation provides a means for natural resource managers to monitor and analyze the health of coral reefs to maintain National Environmental Policy Act compliance for dredging and construction operations.
- The system provides real-time monitoring data as required for project mitigation in the marine environment, reducing the time necessary for science divers to collect this information to meet permit requirements.

## CUSTOMER TESTIMONIAL

***“I strongly support retaining the CRMS in Apra Harbor. This is a cost-effective way to obtain critical, cutting edge data that has a direct bearing on potential impacts. This is probably the single most relevant marine ecological data set that should be obtained.”***

—Steve Smith, NAVFAC EXWC,  
Scientific Diving Service

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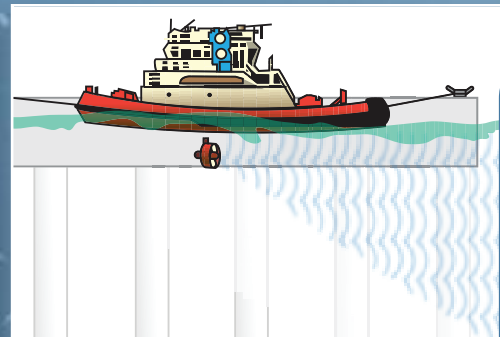
## CASE STUDY

REGULATORY & BASE OPERATIONS (EEC-5)

PROJECT NUMBER: 448



# Study Assesses Impacts of Propeller Wash on Sediment Movement



## Study Assesses Impacts of Propeller Wash on Sediment Movement

**Project Number: 448**

**Project Type:**  
**STUDY**

Significant progress has been made in identifying the scope of contaminated sediments in Navy harbors and waters. However, more information is needed on how bottom sediment may be disturbed and resuspended by propeller wash (the motion of water produced by a ship's propeller) and how potentially contaminated sediments resuspended by propeller wash may be transported in Navy harbors.

This information is needed to evaluate the re-migration and re-contamination potential of sediments at remediated sites. For these reasons, sediment remediation often requires both short-term and long-term monitoring to demonstrate its effectiveness. Sediment resuspension, re-migration,

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***Sediment remediation often requires both short-term and long-term monitoring to demonstrate effectiveness.***

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and re-contamination potentials from propeller wash are key elements during the consideration of sediment remedial options.

This study is a parallel and supplementary study to the ongoing propeller wash project sponsored by Environmental Security Technology Certification Program (ESTCP). The ESTCP project's goal is to design and conduct field studies, while the NESDI project seeks to implement modeling studies. The goal of both of these studies is to quantify the potential of sediment re-suspension and re-contamination from propeller wash in Navy harbors. Led by P.F. Wang from the Space and Naval Warfare Command, Systems Center Pacific, other performers in this project include personnel from ESTCP, U.S. Army Corps of Engineers (ACOE), Naval Facilities Engineering Service Center, and professors from the University of Wisconsin, University of Michigan, and Texas A&M.

The NESDI study is comprised of three components: instrument calibration in a laboratory setting, a field study, and the applications of numerical models.

### CUSTOMER TESTIMONIAL

***“Resuspension of potentially contaminated sediment by propeller wash in Pearl Harbor has been a challenge that is not well documented. The information obtained from this study is critical to the Navy’s remediation effort and will allow for informed decision-making resulting in technically defensible and cost-effective remedial option selection.”***

—Kimberly Markillie,  
Naval Facilities Engineering Command Pacific



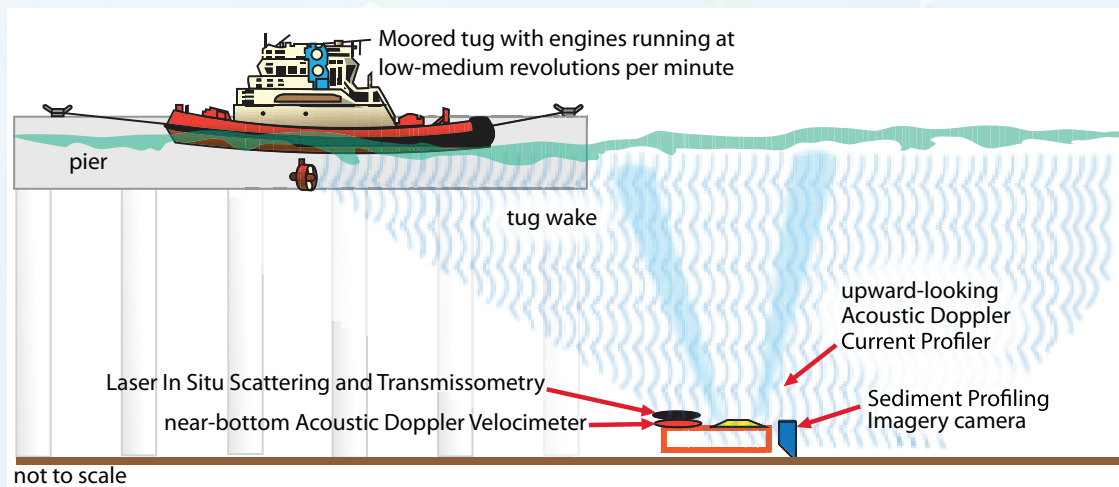
The instruments deployed for the field study have been calibrated in the ACOE's Engineer Research and Development Center propeller tank and include:

- An Acoustic Doppler Current Profiler (ADCP) for outlining currents
- An Acoustic Doppler Velocimeter (ADV) and Particle Image Velocimeter (PIV) for flow measurement near the bottom of the water body
- A Laser In-Situ Scattering and Transmissometry and a Particle Imaging Camera to assess the particle size and settling velocity of the re-suspended sediments

- Sediment Profiling Imagery (SPI) for monitoring changes to the sediment bed before, during, and after resuspension events

The field study consisted of three components:

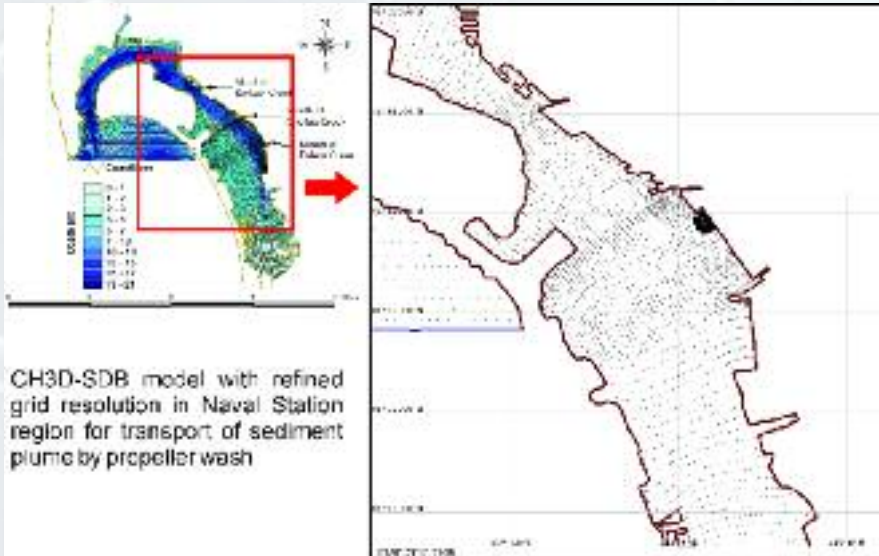
1. Mapping the velocities of wake flows disturbed by propeller wash (velocity mapping)
2. Assessing the resuspension potential of the contaminated sediments (*see below*)
3. Tracking the fate and transport of the sediment plume (*see below*)



***Resuspension potential by propeller wash. The instruments measure near-bottom flow field and sediment bed erosion under conditions of four different propeller speeds. This study aims to correlate sediment erosion dynamics with near-bottom flow field and, thus, with the propeller speeds.***

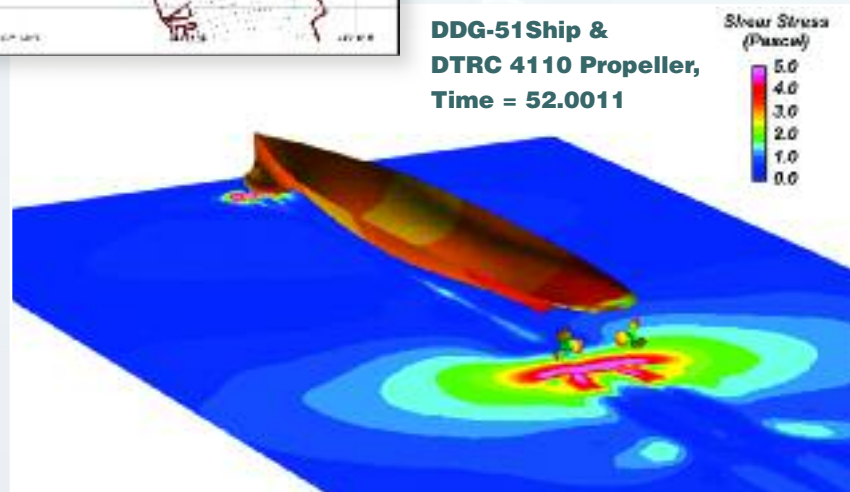
## CASE STUDY

### REGULATORY & BASE OPERATIONS (EEC-5)



*CH3D model for San Diego Bay: Simulation of transport of sediment plume resuspended in Pier 4-5 of San Diego Bay by tugboat. The CH3D model is implemented with refined resolutions near the Naval Station region.*

**DDG-51 Ship &  
DTRC 4110 Propeller,  
Time = 52.0011**



*Model simulated bottom shear stress by DDG1 traveling at 10 knots in 33-foot deep water.*

For the modeling study, the project team implemented and applied two models:

1. A consolidated propeller wash model that includes Maynard's model and the 3D Finite-Analytic Navier-Stokes (FANS) model. Maynard's model simulates velocity flow field disturbed by a rotating propeller. In spite of the fact that several restrictive assumptions are imposed on the model, Maynard's model has been commonly used to estimate propeller-induced jet-flow field.
2. The Navy's Curvilinear Hydrodynamics in 3-dimensions (CH3D) fate and transport model which includes accurate hydrodynamic calculations, including currents and water mass movement in fine resolutions.

The more sophisticated 3D FANS model, simulates the velocity field from rotating propellers and their interactions with the waterway's bottom, twin propellers, and ship wakes.



*Shrouded propeller.*

***Twin shrouded propellers on Navy tugboat.***

Velocity mapping from a Navy tugboat was completed in San Diego Bay, as was a field study of plume mapping and tracking. Results of measured Polycyclic Aromatic Hydrocarbon (PAH) data has been gathered, and metals data are also now available. PAH and metals have been reported at levels that are close to or exceeding water quality criteria. (Note: PAHs occur in the environment due to a variety of reasons, especially from incomplete burning of carbon-containing materials like oil, wood, garbage or coal.)

A fate and transport model was set up for San Diego Bay; and in summer 2012, a field study of resuspension potential was completed in the bay. This was followed shortly by a field study in Pearl Harbor, Hawaii. A third field study is being planned for Sinclair Inlet (Bremerton, Washington) in 2013.

Preliminary results show that two types of Navy vessels are responsible for sediment resuspension

in Navy harbors: deep-draft vessels, such as DDG destroyers and aircraft carriers, and medium-draft vessels, such as tugboats. For deep-draft vessels, the propellers are very close to the bottom of the harbor and the bottom shear stress generated by them will exceed the critical shear stress of the

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***Preliminary results show that two types of Navy vessels are responsible for sediment resuspension in Navy harbors: deep-draft vessels, such as DDG destroyers and aircraft carriers, and medium-draft tugboats.***

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sediment bed at a navigating speed of 5 knots, and therefore, resuspension takes place. For tugboats, the propellers are at about mid-depth, generating flow disturbances in the surface layers of water initially, gradually penetrating down to the sediment bed as propellers crank up speed during tugging.

## CASE STUDY

### REGULATORY & BASE OPERATIONS (EEC-5)



Preliminary analysis of measured data shows that sediment erosions can be closely correlated with near-bottom velocity and shear stress, which are essentially generated by the tugboat's propellers. Field data also show that once sediment is resuspended by propeller wash, it is subject to transport and dispersion by ambient flows. For both San Diego Bay and Pearl Harbor, sediment plumes tend to stay in the water column over several hours (3-5 hours), and Acoustic Back Scattering data reveals a layer of turbidity persisted in the lower half of the water column several hours after the propeller wash event. It is strongly suspected that this layer of turbidity is composed of soft organic substances, which have a lower density compared to the inorganic sediment particles. Further analysis will shed light on this and other phenomena which are shown by the field data.

#### Capabilities Gained

- Improved understanding of major resuspension processes of contaminated sediments in Navy harbors
- Predictive capabilities for potential re-contamination of contaminated sediment remedial sites
- Better understanding of the short-term and long-term impacts on sediment capping stability from the major resuspension processes, and cap stability and effectiveness in reducing transport of contaminated sediments.

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## CASE STUDY

REGULATORY & BASE OPERATIONS (EEC-5)

PROJECT NUMBER: 455



# Calibrated Modeling Tool Identifies Copper & Zinc in Stormwater Discharges, Leads to Sound Management Practices



## Calibrated Modeling Tool Identifies Copper & Zinc in Stormwater Discharges, Leads to Sound Management Practices

**Project Number: 455**

### Project Type: DECISION TOOL

Meeting the industrial stormwater discharge limits for metal contaminants—particularly for copper and zinc—as established by the National Pollutant Discharge Elimination System (NPDES) program can be challenging. Low permitted toxicity levels in the parts-per-billion range can be difficult to achieve.

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*The NESDI program calibrated a widely accepted stormwater model to help identify sources of copper and zinc.*

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To help with this challenge, the NESDI program 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 pavement where they can build up as residue. Without the ability to quantify the magnitude of these substances or their sources, it's difficult to implement sound management practices.

This project sought to quantify relative pollutant sources within individual watersheds or drainage areas at Navy installations using the Source Loading and Management Model for Windows (WinSLAMM).

Chuck Katz, Ernie Arias, Brandon Swope and others from the Space and Naval Warfare Systems Command, Systems Center Pacific (SSC Pacific) teamed up with Dr. Robert Pitt from the University of Alabama—one of the most respected and prolific stormwater researchers in the nation. Dr. Pitt is extremely knowledgeable about small-scale stormwater hydrology systems, treatment technology assessment, and his company's WinSLAMM modeling tool. SSC Pacific personnel have extensive experience in field and analytical tools used in identification and monitoring of metal sources and stormwater contaminants.

This project demonstrated and validated the WinSLAMM stormwater management model to help Navy installation managers identify potential sources of metals—particularly copper and zinc—in stormwater runoff.

Calibration of the WinSLAMM model was successfully completed and results were documented. The calibration assembled data from nine separate drainage areas at seven bases across Navy regions Southwest and Northwest. The drainage areas range in size from 1.5 to 74 acres, with impervious percentages ranging from 44 percent to 100 percent of the total drainage area.

### CUSTOMER TESTIMONIAL

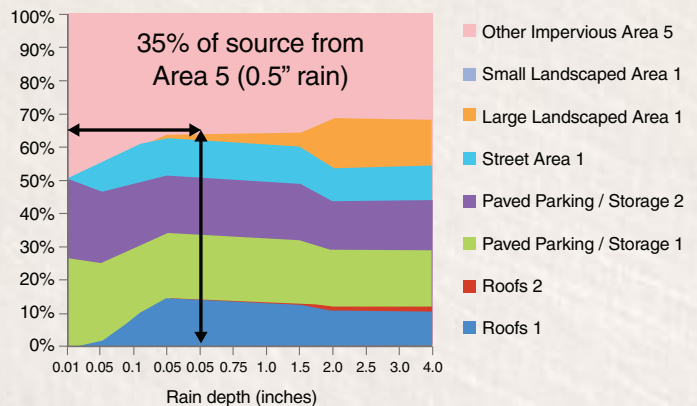
***“I recently attended a demonstration of this project and it is coming along well and should enable stormwater managers to identify and target significant sources of copper and zinc, and other pollutants in stormwater runoff. I see this as a tool to address our permit compliance, support permit negotiations, and also improve planning at Navy installations so that source reduction is always considered in facility planning and design.”***

—Brian Gordon, Naval Facilities Engineering Command Southwest



**Graphical results from WinSLAMM model for Naval Amphibious Base Outfall 9 which shows the drainage area divided into modeled land uses. The chart shows the relative contribution of runoff from each land use as a function of rain depth. In this model result, "Other Impervious Area 5" accounts for 35 percent of the runoff but provides 72 percent of the total suspended particles, 81 percent of the copper, and 63 percent of the zinc. These types of results allow managers to quickly identify the primary source areas to focus their attention.**

### Relative Contributions by Rainfall Total



Each drainage area was characterized using a combination of site visits, available Geographic Information System data, and aerial photos. Model predictions were calibrated against historical data, current samples collected per NPDES methods during the first hour of flow, and a set of full-storm composite monitoring data ranging from six to 38 storm events per drainage area. The model was run iteratively by varying the expected pollutant source loading contributions from each source type to minimize the error between prediction and

measured values for all storm events in each drainage area, and then again for all storms in all drainages.

The results of the calibration effort 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 grabs.

## CASE STUDY

### REGULATORY & BASE OPERATIONS (EEC-5)



These 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 is

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***Using this model will provide managers a solid basis for regulatory negotiations and reduced costs associated with overly restrictive or rapid permit implementation.***

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to develop a model that could be applied at all bases nationwide, regional differences appear to affect the calibrated outcomes.

To date, the model has only been run for the nine drainages that were calibrated in the initial effort. As regional differences appear to affect the calibrated outcomes, more follow-on work is indicated. Follow-on work in 2013 will include validating its use at additional Navy drainages and integrating the model results with leachate data collected from Navy-specific materials and upstream stormwater source data measurements. The model results will be simplified into a spreadsheet-style document for implementation by Navy environmental managers.

#### **Capabilities Gained**

The calibrated WinSLAMM model now provides some Navy installation environmental managers with a validated tool to create sound strategies for mitigating metals in their stormwater discharges. In addition, the tool provides the Navy with the scientific basis for effective stormwater management plans and appropriate implementation schedules to meet their compliance requirements.

Using this model will provide managers a solid basis for regulatory negotiations and reduce costs associated with overly restrictive or rapid permit implementation. The tool will also provide a quantifiable basis for choosing and applying management practices that will work best for specific drainage areas. This can result in streamlining costs to meet compliance requirements and avoiding costs associated with Notices of Violation, abatement orders, and/or lawsuits.

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## CASE STUDY

REGULATORY & BASE OPERATIONS (EEC-5)

PROJECT NUMBER: 459



# SEA Ring Takes a Giant Step Toward Assessing Sediment Remediation



## SEA Ring Takes a Giant Step Toward Assessing Sediment Remediation

**Project Number: 459**

**Project Type:**  
**NEW TECHNOLOGY**

The Department of Defense (DoD) recognizes sediment contamination and management as problems requiring remediation. Various remedies exist, but site-specific variables—including but not limited to—temperature, pH, and salinity, may interfere with their effectiveness. Time-varying sources of contaminant exposure such as groundwater infiltration or stormwater runoff may also pose challenges.

Standard laboratory toxicity testing and chemical analyses may not reflect field conditions. Laboratory testing may inaccurately estimate clean-up goals, potentially affecting human health and the environment. This could impact DoD as it may lead to overly aggressive, costly, and misguided management decisions.

Technologies that improve the in-situ assessment of exposure and response at sediment and surface water sites are needed to determine remedy effectiveness under such adverse effects as stormwater discharges. The objective of this project is to demonstrate, validate, and promote regulatory acceptance of the integrated

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*The objective of this effort is to demonstrate, validate, and promote regulatory acceptance of the integrated in-situ bioassessment tool, the Sediment Ecotoxicity Assessment Ring (SEA Ring).*

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in-situ bioassessment tool, the Sediment Ecotoxicity Assessment Ring (SEA Ring). It will also explore end user accessibility aspects to move the technology toward integration into Navy water and sediment assessment requirements.

This project directly addresses the need to develop site-specific, risk-based clean-up goals as required by Navy policy and guidance, while accounting for the actual bioavailability and site-specific characteristics that the contaminants possess in-situ. This issue could lead to significant costs and environmental ramifications for the Navy. The Navy Environmental Restoration Program estimates that up to 30 percent of its budget supports the cleanup and closing of sediment sites.

The patented SEA Ring was initially developed by a collaboration between the Space and Naval Warfare Systems Command, Systems Center Pacific (SSC Pacific) and the University of Michigan under the Strategic Environmental Research and Development Program (SERDP). The current project is funded by the Environmental Security Testing Certification Program (ESTCP) and leveraged by the NESDI program. Other participants include AMEC Environment and Infrastructure, the U.S. Environmental Protection Agency (EPA), Environmental Response Team, Zebra-Tech, Ltd., Nautilus Environmental, Battelle, and the San Diego State University Research Foundation.

### CUSTOMER TESTIMONIAL

***“This technology has tremendous potential for contributing to accurate and realistic assessments of sediment remedy performance, in addition to other applications. We eagerly await results from the recent baseline field study, and the post remedy monitoring planned at our site.”***

—Mark Wicklein, Naval Facilities  
Engineering Center Northwest



***Water column deployment of first generation SEA Ring near Scripps Institution of Oceanography.***

Photo credit: Rolf Schottle



***Testing sediment recovery success of SEA Ring commercial prototype.***

Photo credit: Gunther Rosen

Sediment Ecosystem Assessment Protocol (SEAP) technology integrates rapid on-site hydrological, chemical, biological, and toxicological measurements

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***SEA Ring is the only in-situ bioassay system that provides simultaneous exposures of common test organisms to contaminants in various exposure compartments.***

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to assess the sediment-water interface, surficial sediment, overlying water, and advective exposure pathways at contaminated sediment sites. The SEA Ring, a central component of SEAP, is an improvement over traditional laboratory-based approaches, particularly for such scenarios as sediment remedy effectiveness and time-varying stressors (stormwater discharges, underwater unexploded ordnance/discarded military munitions, tidally influenced groundwater seepage, or oil spills).

It is the only in-situ bioassay system that provides simultaneous exposures of common test organisms (e.g. benthic invertebrates) to contaminants in various exposure compartments and allows for co-existing collection of chemical data from each exposure compartment.

The SEA Ring is deployed at sites from a boat or pier or by divers, left at the site for two to 28 days (depending on study objectives), and retrieved for analysis, on-site or in the laboratory. The ESTCP and NESDI efforts have resulted in an improvement on the SERDP research prototype instrument. Commercial prototype “(second generation)” SEA Rings are currently being manufactured based on project team-derived design specifications. In addition to requiring specialized construction, the SEA Ring may require divers in deep waters, and is subject to water quality issues associated with biofouling and clogging from sediment particles. This project addresses these and other primary design factors.

## CASE STUDY

### REGULATORY & BASE OPERATIONS (EEC-5)



***Diver deployment of first generation SEA Ring at Scripps Institution of Oceanography.***

Photo credit: Rolf Schottle



***SEA Ring awaiting deployment at Quantico Embayment, near Marine Corps Base Quantico.***

Photo credit: Gunther Rosen

The first units are being validated using various endpoints and a variety of exposure compartments in different DoD-relevant sediment and surface water applications. The NESDI team will support critical components of the projects, including EPA Environmental Technology Verification (in progress); chemical analysis of sediment, tissue and/or passive samplers from site demonstrations; and ESTCP deliverables (technical report, cost, and performance reports).

Refinement of the commercial prototype is ongoing. The first demonstration of the second generation SEA Ring was completed at the Bremerton Naval Complex (August 2012) and Marine Corps Base,

Quantico (October 2012), while a subsequent demonstration was scheduled to take place at Naval Base San Diego (February-March 2013). After the demonstrations, remaining tasks include documentation of performance and protocols, establishment of availability, and collaboration with end-users in order to promote regulatory acceptance.

#### **Capabilities Gained**

This technology is expected to provide an improved ability to discern actual ecological risk at sediment sites. With minor modification, it also shows promise in surface water applications such as realistic assessment of adverse effects from time-varying stressors.

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## CASE STUDY

REGULATORY & BASE OPERATIONS (EEC-5)

PROJECT NUMBER: 464



# Living Machine<sup>®</sup> Cleans Wastewater at Marine Corps Recruit Depot



## Living Machine Cleans Wastewater at Marine Corps Recruit Depot

**Project Number: 464**

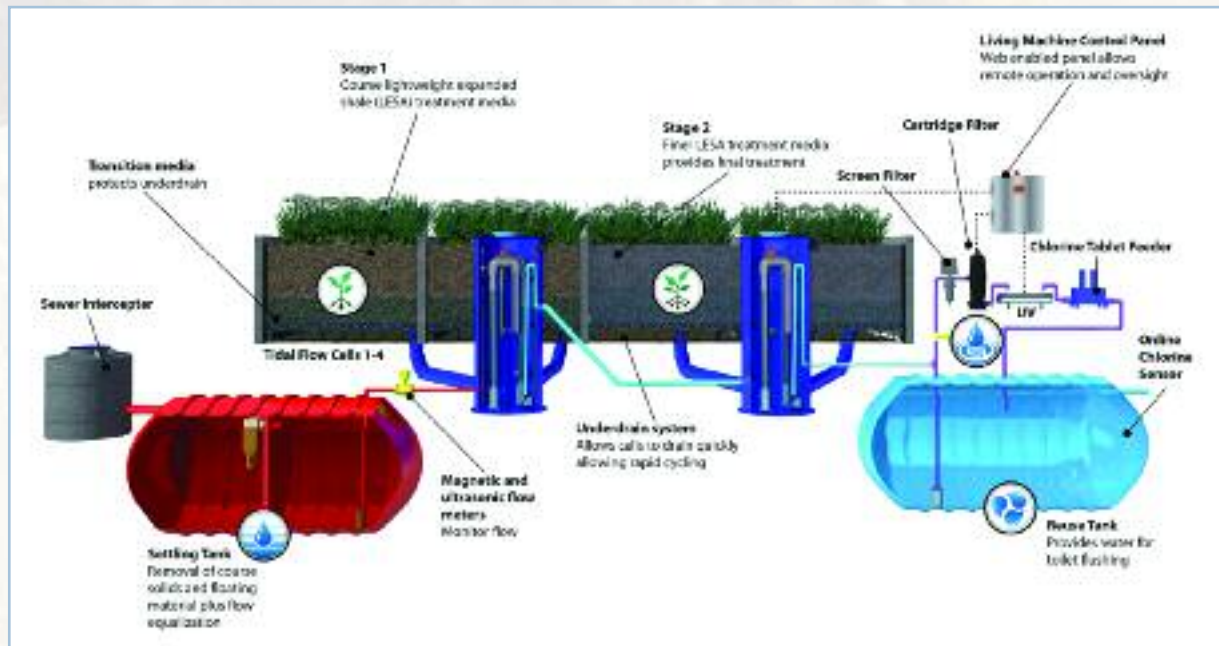
**Project Type:**  
**NEW TECHNOLOGY**

Success of the Navy's mission throughout the world depends largely on a constant and reliable supply of water. However, in some parts of the western U.S., the water supply is increasingly at risk. The City of San Diego, for example, has declared drought emergencies at various times or imposed restrictions on water use.

*Success of the Navy's mission throughout the world depends largely on a constant and reliable supply of water.*

Underground aquifers—the largest groundwater sources—are not being replenished at rates that can support consumption. In addition, pumping water from aquifers is more costly than using surface water. If aquifers are drained faster than they can be replenished, they may become overdrawn and collapse, permanently reducing their storage capacity.

To address the problems associated with water availability and access, water districts are increasingly emphasizing conservation and recycling. While many districts are recycling gray water (water from showers, bathroom sinks and laundry), the localized on-site treatment and recycling of black water (water containing sewage or food waste) is problematic. However, in the face of increasing water restrictions, the on-site treatment and recycling of black water (which comprises anywhere from 50 to 80 percent of residential wastewater) in addition the gray water recycling is an increasingly attractive option. One such wastewater recycling system is under construction at the Marine Corps Recruit Depot (MCRD) in San Diego. The project is a combined effort of the NESDI program, MCRD, and the Environmental Security Technology Certification Program (ESTCP). On-site treatment of black water can extend the use of existing water supplies and eliminate the use of potable water for purposes such as irrigation. It can also reduce the flow to a centralized sewage treatment plant, which in turn increases the treatment plant's capacity. On-site treatment of black water can be integrated into existing or future construction along with corresponding reductions in water and sewer costs.



*The Living Machine.®*



***Aerated tanks are populated with low-maintenance plants and flowers.***

Photo courtesy of Worrell Water Technologies

The Principal Investigator of this project is from the Naval Facilities Engineering and Expeditionary Warfare Center—

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***On-site treatment of black water can extend the use of existing water supplies and eliminate the use of potable water for purposes such as irrigation.***

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formerly the Naval Facilities Engineering Service Center. Other members of the project team are from MCRD, WoodBank Environmental, and Worrell Water Technologies.

The project's objective is to demonstrate and validate on-site reclamation and beneficial reuse of wastewater using a system that mimics and enhances processes that occur naturally in tidal wetlands. Natural and constructed wetlands are widely used to treat non-point sources of contaminants in wastewater. They are also used by the mining industry to recover metals from low-grade ores and restore ecosystems degraded by past practices.

The Living Machine® system by Worrell Water Technologies mimics processes that occur naturally in wetlands by utilizing a series of anaerobic and aerated tanks filled with gravel and populated by bacteria and plants. Passive aeration (from raising and lowering water levels in the cells) promotes microbial growth, and in a short period of time, the surface of the gravel is covered by dense bacterial mats (biofilm) that capture and degrade the bulk of the soluble and particulate organic compounds in the wastewater. Sensors linked to computer controls enhance natural biological processes in a controlled environment and reduce the treatment time. The treatment system is aesthetically pleasing, odor-free, and occupies a reasonably small footprint. It can operate as a stand-alone system or it can be integrated into a larger water treatment and reuse system. The result is nonpotable water appropriate for such uses as irrigation, toilet flushing, industrial wash water, and/or groundwater recharge.

## CASE STUDY

### REGULATORY & BASE OPERATIONS (EEC-5)



***The Living Machine® system at MCRD San Diego.*** Photo credit: Sonny Maga

The Living Machine® system has been installed at MCRD San Diego, a facility that, like the rest of San Diego, is almost entirely dependent on imported water. During the demonstration, long-term performance data will be generated based on data gathered by the system's computer (including pH, oxygen, flow rates, and power consumption) and samples collected and analyzed at two to three week intervals. These data will be compiled, analyzed, and reported at regular intervals so that any operational issues that may arise are rapidly identified and corrected. Effluent water quality goals will meet California regulatory standards for effluent reuse for sub-surface irrigation.

As of October 2012, system installation and hydraulic testing (leak testing) was complete. The biological loading is being performed at 2,000 gallon/day increments to the final system capacity of 10,000 gallons per day. The team has approached the appropriate permitting agencies: the Department of Health, Regional Water Quality Control Board, and the City of San Diego. Remaining tasks include long-term operational testing, collection of cost and performance data, and preparation of a final report.

Long-term performance data will be collected over a period of eight to nine months, with sampling events taking place approximately every three weeks. Performance objectives include comparing water quality of effluent water to influent (incoming) water. The treated water will be tested for total suspended solids, total dissolved solids, and eight other criteria, in line with California reuse requirements.

Qualitative performance objectives include aesthetics (appearance and odor of reclaimed water), ease of installation, and ease of maintenance. If the Living Machine® system meets its performance objectives, projected annual savings for its use are upwards of \$30,000, with a return on investment expected to be less than 10 years.

The final report is expected to be completed by the end of Fiscal Year 2013.

#### Capabilities Gained

One of the primary benefits of on-site water treatment and reuse is a reduction in potable water consumption, which translates into cost and water savings. These savings help facilities to continue providing the training and support at the core of the Department of Defense mission. Additional benefits of on-site water reclamation and reuse include the following:

- Complying with federal water conservation directives (Energy Policy Act of 1992 and Executive Order 13154)
- Contributing to a more consistent and reliable water supply
- Reducing discharge to the sewer, thereby increasing sewage plant capacity. This allows for growth in Navy operations without incurring costly increases in sewage capacity
- Encouraging comprehensive water planning that integrates water and wastewater management
- Reducing freshwater demand, which benefits ecosystems stressed by water withdrawals
- Avoiding new construction (MILCON) of sewage and potable water lines

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## Enhancements to the Program Website

After unveiling the program's consolidated website, program personnel implemented a series of enhancements in FY12. The program website ([www.nesdi.navy.mil](http://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 website also allows personnel from other R&D programs to obtain up-to-date insights into the NESDI program's priorities and ongoing projects.



## Enhancements to the Program Website

The website is simple, efficient, and provides site visitors with quick access to program resources and information. The following enhancements were made to the program website in FY12:

- **Improved Public Awareness of Successful Research Investments.**  
There are many successful projects in which the program has invested. One of NESDI's primary successes is the validation and integration of technologies at one or more sites. Once this occurs, the next logical step is to increase awareness about the availability and applicability of each technology so other organizations can benefit. The following improvements were made to the website to facilitate this progression:
- **Streamlined the process for managing and providing public access to project fact sheets.**  
This resulted in both improved content quality and a larger number of fact sheets available to the public.
- **Implemented public access to project case studies and final reports.**  
This greater level of detail provides potential end users additional support in determining if a technology is suitable for their needs.
- **Improved the capability for users to identify and research projects in their areas of interest.**  
Keyword/phrase searches are now used in lieu of pre-defined category filters with limited applicability to a broad user base.

**This effort contributes to an overarching goal to increase the awareness and impact of the NESDI program throughout the Navy.**



## The Details behind the NESDI Website

### The website 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 as 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.

## Communication Successes

Successful NESDI projects were promoted throughout FY12 in a variety of print and on-line publications including the Navy's own energy and environmental magazine,— *Currents*; the program's quarterly newsletters; electronic fact sheets online at the NESDI website ([www.nesdi.navy.mil](http://www.nesdi.navy.mil)); and a variety of other publications, conferences, and workshops.



### **Currents Articles**

The NESDI program published an article in each issue of *Currents* in FY12, including the following articles:

1. Going Digital: Assessing the Viability of Computed Radiography: Innovative Method for Non-Destructive Testing Has Strengths & Limitations
2. Zero-Valent Zinc Promising Option for Removing TCP from Groundwater: Studies Show Positive Results Removing Recalcitrant Compound from Pendleton Well
3. NESDI Evaluates Technologies to Address Puget Opacity Limits: Cutting Technologies & Enclosures Offer the Most Viable Options for Shipbreaking
4. NESDI Program Puts Green Technologies Into Action: A Better Oil Trajectory Model & Greener Tank Target for Ranges Among New Products
5. NAVFAC EXWC Successfully Demonstrates Real-Time Water Quality Monitoring System: NESDI-Sponsored Effort Designed to Prevent Interruptions from Natural Disasters & Intentionally Destructive Actions



### Fact Sheets

In an ongoing effort to promote the program's active and completed projects, we developed over two dozen online fact sheets that highlight the objectives and accomplishments of NESDI projects.



### 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 FY12.



### Press & the Public Eye

Over the past year, NESDI Principal Investigators have made presentations at a variety of conferences.

The following is just a sampling of those conferences and journals:

- The Advanced Surface Engineering Technologies for a Sustainable Defense conference
- The Integrated Water Security Summit Dedicated to Defense-In-Depth: Innovation and Technology Implementation
- The 25th Symposium of the Groundwater Resources Association of California Series on Groundwater Contaminants
- The 22nd Annual Society of Environmental Toxicity and Chemistry Europe conference
- Navy Shipyard Managers Meeting
- The Aerospace Chromate Elimination meeting
- The Defense Venture Catalyst Initiative
- The Partners in Environmental Technology Symposium and Workshop
- The Sediment Management Seminar
- The Shipyard Occupational Safety, Health, and Environment Director's Meeting
- The 12th International Coral Reef Symposium
- The Tri-service Ecological Risk Assessment Work Group

In addition, NESDI Principal Investigators published the results of their research in *Currents* and a number of scientific journals and magazines including *Environmental Pollution* and *Ground Water Monitoring and Remediation* (article submitted for review and consideration).



## What's Next

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In FY13, NESDI program personnel will continue to engage the program's resource sponsor and end users to ensure that program investments are properly focused and that program-generated technologies are incorporated into the fleet's daily operations. The program has established the following specific goals to be achieved in FY13 and beyond:

**1. Maintain the visibility of the program.**

The NESDI program will continue to provide its resource sponsor with the information it needs to increase visibility of and support for the program across CNO N45 and elsewhere. This will be accomplished via regular programmatic reviews, publication of program successes in *Currents* magazine and other publications, the quarterly on-line publication of a program newsletter, *NESDI News: Highlights & Happenings*, and the use of the NESDI logo and standard language about the program in all conference presentations and posterboards.

**2. Continue to review and update strategic plan and roadmaps.**

Also in FY13, the NESDI program will update its strategic plan and develop roadmaps to target investments in priority areas. Existing roadmaps will be updated in the range and stormwater areas.

The stormwater roadmap was the focus of strategic planning session with Navy subject matter experts and end users held in January and November of 2012.

Although there are no direct ties between the NESDI program and CNO N45's energy security portfolio, communications in this area will continue to find opportunities for collaboration and support in the NEPA and encroachment arenas.



**3. Maintain accountability of project Principal Investigators.**

In an ongoing effort to reduce risk and increase the utility of its projects, NESDI management personnel will continue to monitor and adjust the execution of its active projects as necessary. Project Management Plans have been incorporated into the program as a standard operating procedure for all new start projects.

**4. Continue focus on improved needs collection.**

The NESDI program will continue to improve its needs collection process by:

- a. Holding field visits to improve communication with end users and need submitters.
- b. Pre-screening needs and following up with need submitters for additional insights and clarification before a final ranking occurs.
- c. Designating a technical program liaison with NAVFAC Media Field Teams, the Corrosion Fleet Focus Team, and other field teams.
- d. Communicate requests for needs via *Currents* and our quarterly newsletter.
- e. Liaison with technical representatives from the Strategic Environmental Research and Development Program, ESTCP, and the Office of Naval Research.

**5. Maintain focus on technology integration.**

To promote the successful integration of program-sponsored projects, NESDI program personnel will continue to conduct site visits (including a visit to the FRC South East in Jacksonville, Florida), encourage a focus on technology integration with other partners and activities, and maintain an ongoing dialog with end users to increase their participation in the program's annual IPRs.

**6. Consider out-of-cycle requests for support.**

In the past, out-of-cycle requests have included quick turnaround appeals for technical assistance, funding of high priority projects, development of strategies and protocols for information technology investments, and routine technical support to CNO N45 as needed. The program has instituted a "rapid response" program to address these urgent requests for support which resulted in the funding of two projects that began in FY12—Automated Long-Term Monitoring System for Natural Resource Management (project #477) and Application of the Marine Biotic Ligand Model for Copper to Evaluate Risks Associated with Olfactory Responses in Salmonids and Forage Fish (project #490). But due to a significant reduction in the resources made available to the program in FY14, the NESDI program's ability to entertain these types of requests in FY13 will be severely curtailed.

**7. Enhanced management of obligations and expenditures.**

Since \$1.4M was removed from the FY14 NESDI budget, the program must ensure that its obligation and expenditure rate benchmarks are met to prevent any more cuts. Monthly expenditure plans will continue to be collected and reviewed throughout FY13 and alternative projects identified that could be funded in the event the program's planned execution rates fall short of established benchmarks.

**8. Enhance program website.**

Finally, the NESDI program will continue to enhance its website through improvements to better track financial expenditures, the addition of a repository for final reports, an updated design, and other functional upgrades.



## FY13 Schedule

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### It Ends with Integration

NESDI FY12 Year in Review Report:

# 2012

Accomplishments of the Navy Environmental  
Sustainability Development to Integration Program





No.	What	When
1.	Announce FY13 Needs Solicitation	1 June 2012
2.	Close FY13 Needs Solicitation	1 August 2012
3.	Screen Needs	13-17 September 2012
4.	Evaluate & Rank Needs	10-14 September 2012
5.	Conduct CNO N45 Programmatic Review	26 September 2012
6.	Obtain Sponsor Review & Approval of Needs	17-28 September 2012
7.	Request Pre-proposals	12 October 2012
8.	Close Pre-proposal Collection	14 November 2012
9.	Collect TDWG Comments on Pre-proposals	26 November 2012
10.	Evaluate Pre-proposals	27-30 November 2012
11.	Request Full Proposals	13 December 2012
12.	Collect Full Proposals	21 February 2013
13.	Collect Functional Working Group Comments on Full Proposals	15 March 2013
14.	Collect TDWG Comments on Full Proposals	22 March 2013
15.	Screen Full Proposals	25-29 March 2013
16.	Collect Answers from Principal Investigators to Questions about Full Proposals	29 April 2013
17.	Evaluate Full Proposals	10-14 June 2013 (at East Coast IPR)
18.	Obtain Sponsor Review & Approval of Full Proposals	28 June 2013
19.	Conduct In-Progress Reviews	<i>Stormwater:</i> 28-29 November 2012 (Silverdale, WA)  <i>West:</i> 6-10 May 2013 (Port Hueneme, CA)  <i>East:</i> 10-14 June 2013 (Jacksonville, FL)
20.	Announce New Starts	30 July 2013
21.	Quarterly Status Reports Due	19 October 2012 7 January 2013 1 April 2013 1 July 2013

## For More Information

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](mailto: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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3.	Earley, Pat	SPAWAR	619-553-2768	<a href="mailto:patrick.earley@navy.mil">patrick.earley@navy.mil</a>
4.	Hall, Chaela	CNIC	202-433-4962	<a href="mailto:chaela.hall@navy.mil">chaela.hall@navy.mil</a>
5.	Heath, Jeff	NAVFAC	805-982-1600	<a href="mailto:jeff.heath@navy.mil">jeff.heath@navy.mil</a>
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8.	McVey, Tami	CNIC	202-433-4959	<a href="mailto:tami.mcvey2@navy.mil">tami.mcvey2@navy.mil</a>
9.	Olen, Jerry	SPAWAR	619-553-1443	<a href="mailto:jerry.olen@navy.mil">jerry.olen@navy.mil</a>
10.	Paraskevas, Nick	NAVAIR	301-757-2140	<a href="mailto:nicholas.paraskevas@navy.mil">nicholas.paraskevas@navy.mil</a>
11.	Rasmussen, Eric	NAVAIR	732-323-7481	<a href="mailto:eric.rasmussen@navy.mil">eric.rasmussen@navy.mil</a>
12.	Sugiyama, Barbara	NAVFAC	805-982-1668	<a href="mailto:barbara.sugiyama@navy.mil">barbara.sugiyama@navy.mil</a>
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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 website at [www.nesdi.navy.mil](http://www.nesdi.navy.mil).

Available for download at [www.nesdi.navy.mil](http://www.nesdi.navy.mil).



Document preparation assistance and graphic design services were provided by Bruce McCaffrey Consulting, Inc. under General Services Administration contract number GS-10F-0375K.

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## It Ends with Integration

NESDI FY12 Year in Review Report:

# 2012

Accomplishments of the Navy Environmental  
Sustainability Development to Integration Program



Available for download at [www.nesdi.navy.mil](http://www.nesdi.navy.mil).