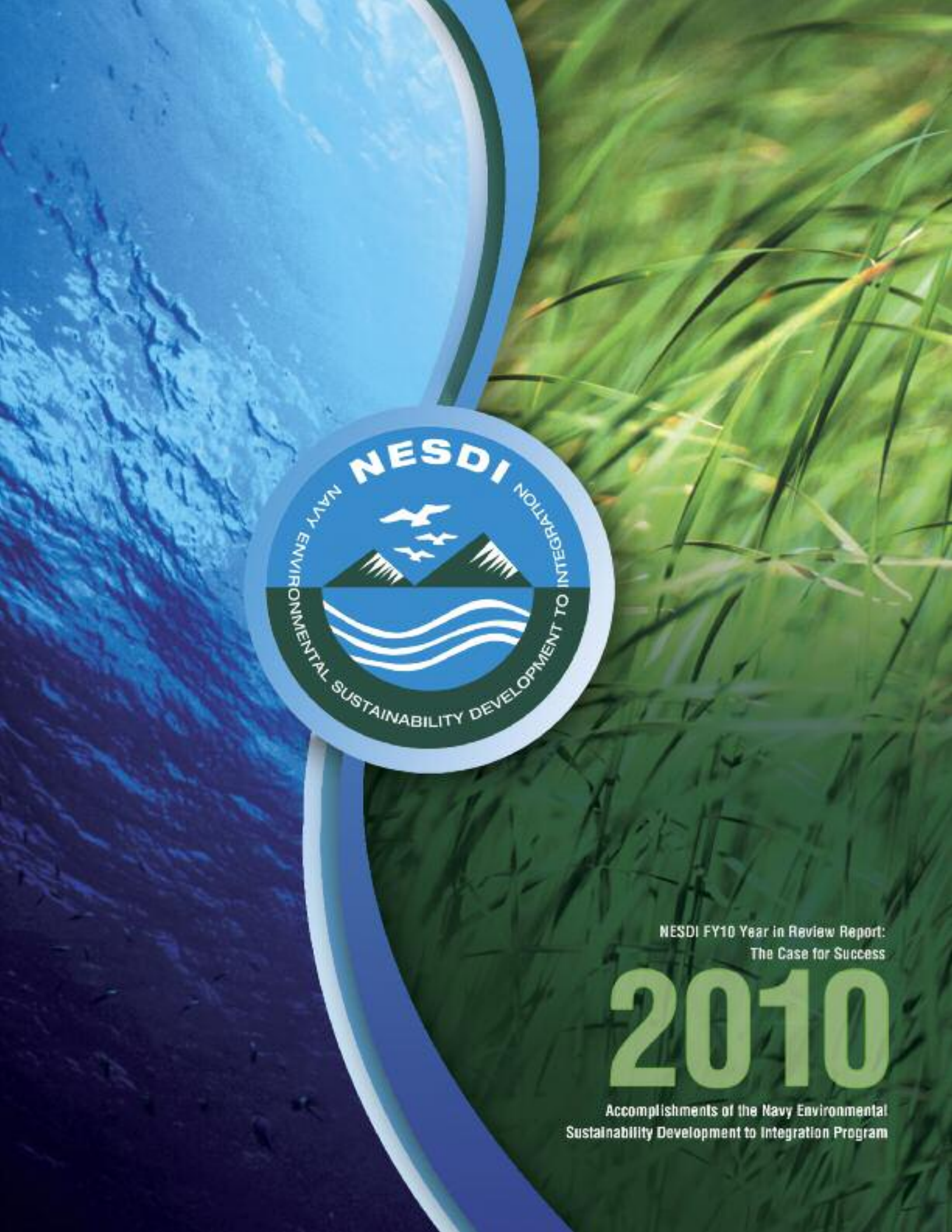

NESDI FY10 Year in Review Report:
The Case for Success

2010

Accomplishments of the Navy Environmental Sustainability Development to Integration Program

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The Case for Success 2010

A WORD FROM THE PROGRAM MANAGER

Welcome to the Fiscal Year (FY) 2010 Year in Review report for the Navy Environmental Sustainability Development to Integration (NESDI) program — The Case for Success.

In August 2009, I was appointed the new manager of the NESDI program and brought to the program my perspective and experience as a seasoned Principal Investigator with a number of research and development programs. I have spent my first year as program manager continuing to streamline operations and addressing other areas that needed attention. Among my priorities are to ensure the timely completion of our projects and the successful transition of project results into fleet operations. To achieve this, we must work together from the field personnel we are engaging to our resource sponsor, the Chief of Naval Operations Energy and Environmental Readiness Division (N45). Increased communication at all levels is vital to achieving success. We all are accountable for the program's success. I have also overseen the development of a long term strategic plan to guide our future program investments.

The technologies, guidance documents and studies highlighted in this report continue to help the Navy protect the environment and support the Fleet through the efficient and effective execution of environmental programs.

To aid the program in meeting these goals, in FY10, Bob Neumann, formerly with the Naval Surface Warfare Center in Carderock, MD joined our resource sponsor organization (N45) as the NESDI Action Officer. Bob's efforts to further integrate the program into N45's priorities and leverage other research and development programs and strategic initiatives are vital to the program's continuing success in difficult financial times. Welcome Bob!

Also in FY10, N45 was realigned to reflect the merger of Task Force Energy with N45's traditional environmental stewardship focus. I expect that the NESDI program's focus will also evolve accordingly in FY11 to accommodate this new portfolio of energy security.

Our Accomplishments

The program's accomplishments include not only our technical achievements, but also our programmatic advancements. We make our *Case for Success* in this year's annual report by highlighting nine projects of distinction. They are active or recently completed projects which have been successfully executed. Additionally we highlight upgrades to the NESDI web site, as well as introduce our program staff, otherwise known as the Technology Development Working Group (TDWG). Each of these components is key to NESDI's continuing and timely programmatic operation, field response, and project execution. Behind each of the projects of distinction is a dedicated Principal Investigator and his/her technical staff. They, along with the many others involved in NESDI projects, are all committed to providing their knowledge and expertise to help the Navy protect the environment and support the Fleet through efficient and effective execution of environmental programs.

Among our project technical highlights for FY10 are our efforts to:

1. Determine the extent of underwater laser usage and to outline a means to assess its environmental impact.
2. Design, develop and demonstrate the Motion Assisted Environmental Enclosure—an improved containment enclosure system to capture overspray from hull painting operations using an aerial work platform.
3. Demonstrate continuous and real-time monitoring technologies that will ensure that high quality drinking water is being delivered onboard Navy installations and provide water security surveillance to guard against the threats of terrorist attacks.

(continued on the next page)

Why This Program is Important to the Navy

The NESDI program provides critical Research, Development, Testing and Evaluation (RDT&E) with a focus on demonstration and 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, N45, the Field Engineering Centers, as well as other organizations. The NESDI program will work to improve the integration and procurement of environmental technology to meet the Fleets needs.

How You Can Participate

Technology integration is a tough undertaking. I would like to reach out to you to help us to be even more successful. The NESDI program relies on all Navy personnel to help identify environmental concerns and support the implementation of resultant solutions. We ask that, wherever possible, you find a way to use NESDI products. Participate in our process—you 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 web site

Looking Ahead

In the near future I anticipate that a number of evolving policy issues and research agendas will further focus and define the NESDI program.

1. The merger of energy and environmental practices within the N45 organization
2. Climate change-related initiatives including greenhouse gas emissions, arctic-related needs and issues associated with the execution of the National Environmental Policy Act
3. Renewable energy research priorities including wind, ocean and solar power, the use and implementation of alternative fuels, waste-to-energy conversion technologies, energy-related environmental planning issues and the intelligent integration of associated technologies into naval operations
4. Technology innovations to reduce waste generation and enhanced management practices at Navy facilities, including green procurement and sustainable infrastructure
5. Other strategic issues as identified by the range, shipyard and aviation communities

Wherever possible, the NESDI program reaches into its user community and other program sponsors to leverage project resources appropriately. The results of these efforts were impressive in FY10 with a total cost sharing of over $2.2 million. This is a testament to the ongoing need for and urgency of the program's investments.

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. As I mentioned earlier, we will be introducing you to our dedicated program personnel—the TDWG. Profiles of individual members are included in this report to give you some idea of the expertise we have on-board to help execute this program. They collectively represent more than 250 years of professional experience! 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 web site at www.nesdi.navy.mil.

I hope that the content in this report inspires you to participate in the program in FY11 and for years to come.

Leslie A. Karr

Leslie Karr, P.E.
NESDI Program Manager

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Accomplishments of the Navy Environmental
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PROGRAM ACCOMPLISHMENTS

In FY10, the NESDI program accomplishments can be described as follows:

9: The number of projects that were successful in demonstrating the use of an innovative technology or collecting critical information

62: The number of needs collected

22: The number of proposals received to address the most highly-ranked needs

13: The number of new projects approved to kick-off in FY11

10: The number of Environmental Security Technology Certification Program (ESTCP) leveraged projects

The Case for Success 2010

PROGRAM ACCOMPLISHMENTS

The NESDI program had an operating budget of $5.718 M for FY10 with 40 active projects—down from 53 active projects in FY09. Over 30 percent 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 25 percent of the program's budget is dedicated to the Weapon Systems Sustainment and Ship-to-Shore Interface and Air and Port Operations Investment Areas. Lastly, seven percent of the program's budget was devoted to range sustainment, and 14 percent for leveraging with ESTCP. Program strengths continue to lie resident with its 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 (N45).

There are 13 approved "new starts" for FY11, pending budget considerations.

While technology transition is difficult, nine projects were called out as projects of distinction in FY10 as described on the following page. These 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, presented as case studies in this report, are:

1. **Containment and Long-Term Monitoring Strategies for Contaminated Sediment Management.**
   This project is generating a suite of integrated containment and monitoring strategies for remediating contaminated sediments and assessing the long-term effectiveness of remedial actions—including a computerized tool to validate the effectiveness of sediment remediation technologies.

2. **Real-Time Drinking Water Quality Monitoring Technology Assures Water Safety.**
   The single most effective way to guard against water contamination is early detection. This project provides continuous, real-time water monitoring to ensure that high-quality drinking water is being delivered.

3. **Pollutant Source Tracking Helps Determine Source of Contaminants.**
   This project helps track contaminants in water to their respective sources, thus simplifying compliance.

4. **Predictive Aquatic Fate & Transport Model Characterizes the True Causes of Pollution.**
   Water bodies listed as impaired must calculate Total Maximum Daily Loads (TMDL) to bring the water body back into compliance with standards. This project utilizes predictive models to accurately calculate TMDLs.

5. **Cadmium Alternatives Navy Specific Testing.**
   Because cadmium acts as an excellent corrosion-preventative, it is widely used on Navy aircraft. However, various current and forthcoming regulations have impacted its use and disposal. This project explores Navy-specific alternatives to cadmium.

6. **Improved Assessment Strategies for Vapor Intrusion.**
   In response to the need to reduce costs and uncertainties associated with vapor intrusion—chemical migration from the ground into a building—a group of experts is identifying existing best practices, knowledge and data gaps, and future research in assessment strategies.

7. **Environmental Effect of Lasers on Biota in the Marine Environment.**
   In an effort to quantify and qualify laser usage in the marine environment, this project set out to determine the extent of underwater laser usage and to outline a means to assess its environmental impact.

8. **Motion Assisted Environmental Enclosure for Capturing Paint Overspray in Dry Docks.**
   This team developed a prototype Motion Assisted Environmental Enclosure to reduce hazardous material discharges generated during hull painting operations in dry docks.

9. **Cleaning Solvents for the 21st Century.**
   As part of the Department of Defense's (DoD) response to eliminating the use of volatile organic compounds and hazardous air pollutants, this project researches and validates alternative cleaning solvents and supported the development of a military specification and validated environmentally-friendly alternatives to PRF-680 (a degreasing solvent).

Fuel Leak Detection

This NESDI project (#333) is demonstrating and validating a new method for fuel cell leak detection on the P-3 Orion fuel tank that does not use Freon—an Ozone Depleting Substance.

Photo Credit: U.S. Navy photo by Mass Communication Specialist 2nd Class Meagan E. Klein

FY11 NEW STARTS

The NESDI program has approved for funding 13 "new starts" for initiation in FY11.

No.	Title	EEC
1.	Environmental Effects of Military Expendable Material	2
2.	Cadmium Tank Electroplating Alternative	3
3.	Demonstration of Cadmium and Hexavalent Chromium Free Electrical Connectors	3
4.	Non-Chrome Primer Evaluations for Aircraft Coatings	3
5.	Demonstration of a Hull Maintenance Shroud	4
6.	Electrochemical Detection and Load Reduction of Copper and Zinc in Storm Water Runoff	5
7.	Innovative Technologies to Control/Reduce Emissions from Metal Cutting Operations	5
8.	Optimization of the Storm Water Dual Media Filtration System at the Navy Regional Recycling Center in San Diego, CA	5
9.	Compliance with the Emerging Requirements of the Stage II Disinfectant and Disinfection Byproduct Rule	5
10.	Methodology for Identifying and Quantifying Metal Pollutant Sources in Storm Water Runoff (ON HOLD)	5
11.	Stormwater Integration Process Development (ON HOLD)	5
12.	Modeling Tool for Navy Facilities to Quantify Sources, Loads, and Mitigation Actions of Metals in Stormwater Discharges	5
13.	Navy-wide Expansion of the Programmatic Environmental, Safety and Health Evaluation Document Authoring Tool	5

In addition to the 13 projects listed above, the NESDI program is expanding the scope of its ongoing *Automated Condition Assessment of Coral Reefs* project to accommodate additional requirements identified by end-users including assessing the effectiveness of modulated ultraviolet light to keep the prototype's optical window clean of fouling.

The Case for Success 2010

INTRODUCTION

MISSION

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

The NESDI program is the Navy's environmental shoreside 6.4 Research, Development, Test and Evaluation (RDT&E) program. The NESDI technology demonstration and validation program is sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division (N45) and managed by the Naval Facilities Engineering Command (NAVFAC). The program is the Navy's complement to the Department of Defense's Environmental Security Technology Certification Program (ESTCP) which conducts demonstration and validation of technologies important to the tri-Services, U.S. Environmental Protection Agency (EPA) and Department of Energy.

Primary Program Objectives

The NESDI program is focused on three primary objectives:

1. **Collect, Validate & Rank Environmental Research and Development (R&D) Needs.**
   The NESDI program expands awareness of opportunities within the Navy shoreside community to encourage and facilitate the submittal of well-defined environmental needs and requirements.

2. **Resolve High Priority Needs.**
   The NESDI program seeks to ensure that program investments and the resulting RDT&E projects maintain a direct and consistent link to the defined needs.

3. **Integrate Solutions & Validate Benefits.**
   The NESDI program also works to maximize the number of program-derived solutions that are successfully integrated into the Fleet and future weapons system acquisitions and verify that the solutions provide the anticipated benefits.

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 areas and Environmental Enabling Capabilities (EEC) 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 for the organizational- and intermediate-level Fleet maintainer to reduce the cost of compliance and increasing Fleet readiness.
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 19.

Strategic Direction

In FY11, the NESDI program will continue to invest in the core areas listed in the previous column. As regulatory scrutiny is increased, the Navy and the NESDI program, in turn, will be challenged to achieve lower discharge requirements, discover alternative materials that are less harmful to the environment, all the while maintaining peak operational performance and readiness.

Down the road, the NESDI program will also engage in emerging issues including climate change initiatives with a strong environmental component, the potential environmental impacts of alternative fuel usage, waste-to-energy conversions, green procurement, the environmental implications associated with sustainable infrastructure projects, and environmental information technology requirements. The program will also help to sustain high value habitats for threatened and endangered species.

Ongoing budget constraints will also require the NESDI to further increase the leveraging of resources from other funding sources and partners to solve common issues.

A critical component of the NESDI program's strategy for technology development is a sound approach for the integration of program technologies into the daily operations of the fleet. This means that the outcome of any NESDI project must be communicated to those who have the responsibility to implement that project—whether the change involves a technology replacement, material substitution, new information or data, or new software. Increasing the awareness of the NESDI program's products is everyone's responsibility and must extend beyond the confines of this final report. Integrating solutions within the NESDI program will help to keep the program and its resources and expertise on solid ground for many years to come.

The Case for Success

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FINANCIAL REVIEW

PROGRAM ACCOMPLISHMENTS

The NESDI program has prioritized investments in various EECs based on their potential risk to the Navy mission and aligned its investment portfolio based on priority, urgency and operational requirement. In this section of the Year in Review report, we highlight the approximate breakdown of program investments by EEC.

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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 below highlights the approximate breakdown of program investments by EEC.

NESDI Program Funding (by EEC)

EEC	FY08 Project Funding	FY09 Project Funding	FY10 Project Funding	FY11 Project Funding (Projected)	FY12 Project Funding (Projected)
EEC-2 (Range Sustainment) [IA1]	1405	1069	397.5	528	150
EEC-3 (Weapon Systems Sustainment) [IA3]	2400	1499	776	820	560
EEC-4 (Ship-to-shore Interface and Air & Port Operations) [IA2]	1800	623	700	750	468
EEC-5 (Regulatory & Base Operations) [IA5]	1900	2652	1741	2310	1535
Management Costs	0 [1]	1995 [2]	975	975	986.25
Unallocated	0	0	355	0	2961.75
ESTCP Leveraging	N/A	N/A	773.5	412	N/A
TOTALS	**7505**	**5843**	**5718**	**5795** [3]	**6661** [4]

in $K

1: FY08 management costs were included in EEC cost numbers.

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

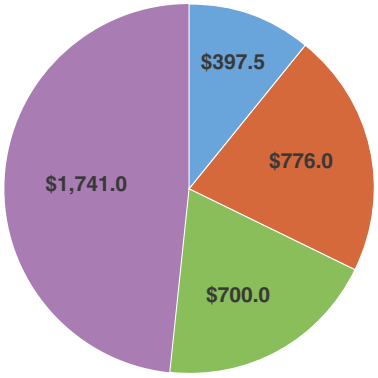
3: Revised control number is 5353. Re-distribution by EEC has yet to be determined.

4: Revised projected control number is 5845. Re-distribution by EEC has yet to be determined.

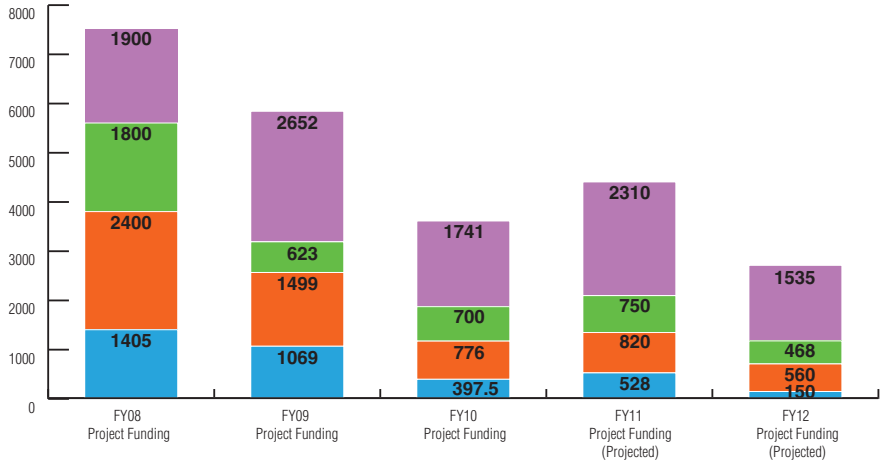
Project Funding (FY08 - FY12)

Since FY08, most NESDI investments have been made in Regulatory and Base Operations, EEC-5. Although overall program funding has decreased since FY08, this trend is projected to continue throughout FY11 and into FY12 as noted in the charts below.

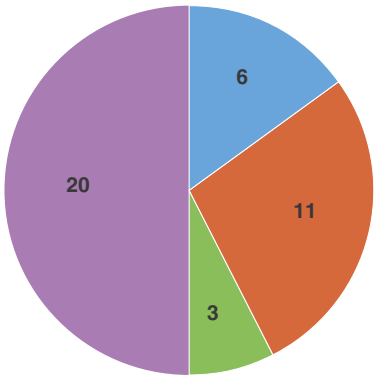
FY10 Project Funding ($K)



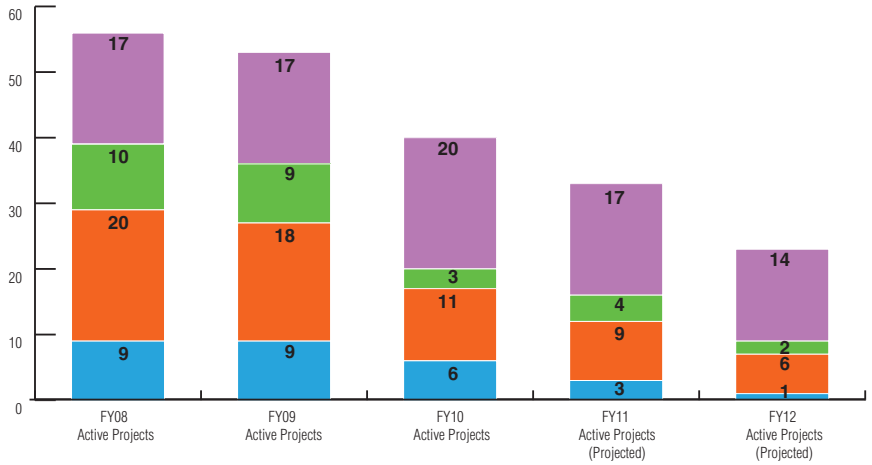
FY08 - FY12 Project Funding ($K)



FY10 Active Projects



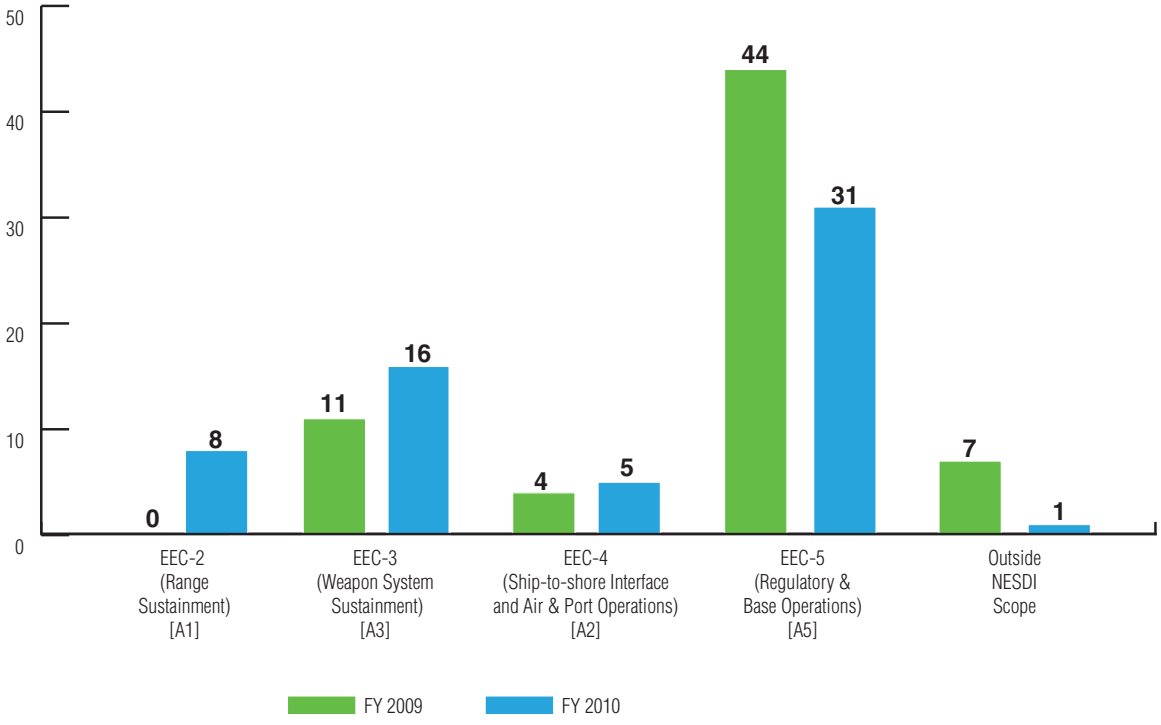
FY08 - FY12 Active Projects



EEC-2 (Range Sustainment) [A1]
EEC-3 (Weapon Systems Sustainment) [A3]
EEC-4 (Ship-to-shore Interface and Air & Port Operations) [A2]
EEC-5 (Regulatory & Base Operations) [A5]

Needs Collected (FY09 - FY10)

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 charts below.



The table below highlights the approximate breakdown of ESTCP investments by EEC.

NESDI & ESTCP Leveraged Funding by Project (FY08 - FY12)

No.	ID	Title	EEC	ESTCP Funding	NESDI Funding (FY08-FY13)
1.	348	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	3	501	190
2.	412	Demonstration of Biodiesel in Ground Tactical Vehicles and Equipment	5	1373	356
3.	448	Evaluation of Resuspension Associated with Dredging, Extreme Storm Events and Propeller Wash	5	983	370
4.	458	Advanced Non-Chromate Primers & Coatings	3	3500	540
5.	N/A	Biological Treatment of Paint	5	800	70
6.	N/A	Smart Water Conservation Systems for Irrigated Landscapes	5	570	35
7.	N/A	Water Conservation: Tertiary Treatment and Recycling of Waste Water	5	1035	195
8.	N/A	Heavy Diesel Hybrid Demonstration	5	801	50
9.	459	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	5	1165	390
10.	460	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	5	1169	270
		TOTAL		**11897**	**2466**
		in $K			

Leveraged ESTCP Projects (New Starts FY11)

The projects listed in the following table submitted proposals to and were approved by ESTCP. Both of these EEC-5 projects will receive leveraged funding from the NESDI program in the amounts designated in the following table.

No.	Title	Total ESTCP Funding	Total NESDI Funding
1.	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	1165	390
2.	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	1169	270
	TOTALS:	**2334**	**660**
	in $K		

New Starts by EEC & Investment Area

The NESDI program has approved for funding 13 "new starts" for initiation in FY11.

EEC	FY11 New Starts	Projected Funding of FY11 New Starts ($K)
EEC-2 (Range Sustainment) [IA1]	1	150
EEC-3 (Weapon Systems Sustainment) [IA3]	3	385
EEC-4 (Ship-to-shore Interface and Air & Port Operations) [IA2]	1	124.5
EEC-5 (Regulatory & Base Operations) [IA5]	8	1570.5
TOTALS	**13**	**2230.0**

The Case for Success 2010

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 FY10 funding level
- The estimated funding level for FY11
- A listing of the active projects in FY10
- A listing of the project closeouts for FY10
- A listing of the needs collected in FY10
- A listing of the new projects to be initiated in FY11
- Case studies of successful projects

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 (MC) in the Marine Environment.** 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 mitigation is needed.

- **Mitigation of Environmental Impacts from the Venting of Full-Scale Practice Bombs at Navy Ranges.** This project seeks to mitigate the environmental impacts from the venting of full-scale practice bombs at Navy ranges. Venting of practice bombs is required to ensure the bomb is inert by exposing the internal filler, ensure all fuses have fired, and to open the casing so pressure does not build up during subsequent demilitarization operations.

Summary

FY10 Funding Level:.....$397,500

FY11 Funding Level (projected): $528,000

Active Funded Projects in FY10:.....5

Needs Collected in FY10: 8

New Starts in FY11: 1

Active Funded Projects in FY10

There were five active NESDI projects in EEC-2 over the course of FY10.

No.	ID	Title	Objective
1.	445	Mitigation of Environmental Impacts from the Venting of Full-Scale Practice Bombs at Navy Ranges	To assess the efficacy of pH adjustment as a practical Best Management Practice (BMP) for venting areas and provide guidance on how to apply the BMP to Navy ranges.
2.	439	Environmental Effects of Lasers on Biota in the Marine Environment	To define the extent and diversity of laser-based systems being used in an underwater environment which may have an effect on the biological community.
3.	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.
4.	418	Mitigation of Underwater Unexploded Ordnance (UXO) Blow-in-Place (BIP) Explosions	To provide DoD with engineering-based methods to safely mitigate the effects of UXO BIP operations.
5.	289	Operational Range Clearance	To provide range managers with a strategy for minimizing range clearance costs while addressing safety requirements by identifying the optimum combination of innovative partnerships, technologies, procedures and equipment that considers key range characteristics including location and utilization.

Thin Film Sulfuric Acid Anodize. This NESDI project (#324) sought to gain approval for the use of Thin Film Sulfuric Acid Anodize (TFSAA) with tri-chromium pretreatment (TCP) seal on naval aircraft to minimize the use of chromate and commercially licensed materials at Fleet Readiness Center (FRC) manufacture and repair facilities. These landing gear components are being coated with TFSAA at FRC Southeast in Jacksonville, Florida.

PROGRAM ANALYSIS

RANGE SUSTAINMENT (EEC-2)

In addition to the five active projects listed on the previous page, there were another four projects in EEC-2 that were at various stages of project closeout in FY10.

No.	ID	Title	Objective
1.	353	Direct-Push and Point-and-Detect, In Situ Sensors for Perchlorate	To develop direct push and point-and-detect sensor systems, for use in the field, to measure perchlorate either for rapid screening and monitoring purposes or for contaminant source characterization of perchlorate in groundwater or surface waters.
2.	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.
3.	258	Toxicity/ Bioaccumulation of Munitions Constituents (MC) in the Marine Environment	To develop a comprehensive data set on toxicity of munitions constituents (MC) on marine species and conclusively define potential bioaccumulation, cellular level impacts, and trophic transfer.
4.	257	Degradation Processes of MC in Marine Matrices (Sediment & Water)	To evaluate the applicability of existing fresh-water data or develop a comprehensive data set regarding the degradation rates, adsorption coefficients and solubility constants of MCs in marine water and sediments.

Demonstration of Physical & Biological Conditioning of Navigational Dredge Material for Beneficial Reuse.
The objective of this NESDI project (#446) is to evaluate the effectiveness of conditioning methods on dredged marine sediment to enhance its beneficial reuse potential.

Raw dredge material before biological conditioning.

Needs Collected in FY10

Of the eight needs collected under this EEC during this reporting period, the NESDI program requested pre-proposals for need N-0698-10 (Evaluating and Modeling Ambient Noise Levels in Navy Harbors) and need N-0687-10 (Environmental Effects of Military Expendable Material) and ultimately funded a project to address need N-0687-10. The program requested more input from the submitting organizations to further clarify the remaining needs for possible action in the future. A list of all eight needs collected is provided below.

No.	Need	Command	Title	Status
1.	N-0661-10	USFF	Surveillance Platform to be Used for Range Surveillance And Clearance	Outside NESDI Scope
2.	N-0679-10	USFF	Optimizing Cable Routes at Navy Underwater Ranges to Minimize Installation Costs and Impacts	Other
3.	N-0687-10	SPAWAR	Environmental Effects of Military Expendable Material	Request Pre-Proposal
4.	N-0698-10	CNIC	Evaluating and Modeling Ambient Noise Levels in Navy Harbors	Request Pre-Proposal
5.	N-0699-10	SPAWAR	Arctic Environmental Gap Analysis/Baseline to Support Fleet/OPNAV Environmental Planning Efforts	More Information Required
6.	N-0701-10	CNIC	Endangered Species GIS Mapping across Installations and Ranges	Outside NESDI Scope
7.	N-0710-10	NAVFAC	Baseline Assessment for Monitoring Potential Environmental Impacts at Navy Sea Ranges	More Information Required
8.	N-0711-10	NAVSEA	Fate and Effects of Propellants in Underwater Environments	More Information Required

New Starts in FY11

In EEC-2, the NESDI program will initiate one project in FY11.

No.	Title
1.	Environmental Effects of Military Expendable Material

The end result—biologically conditioned dredge material.

Compost amendment added to raw dredge material.

CASE STUDY

RANGE SUSTAINMENT (EEC-2)

Environmental Effect of Lasers on Biota in the Marine Environment

Project type
Scientific Report

Project number
439

Project description
The Navy currently uses, and is continuing to develop, laser technology for use in the marine environment. Numerous laser systems are used for various communication, surveillance, and mine detection applications. To date, there has been very little research into the environmental impacts of underwater laser use.

In an effort to quantify and qualify laser usage in the marine environment, the Space and Naval Warfare Systems Command (SPAWAR) -Systems Center Pacific turned to NESDI for financial support. A one-year initial study was funded, the goal of which was to determine the extent of underwater laser usage and to outline a means to assess its environmental impact.

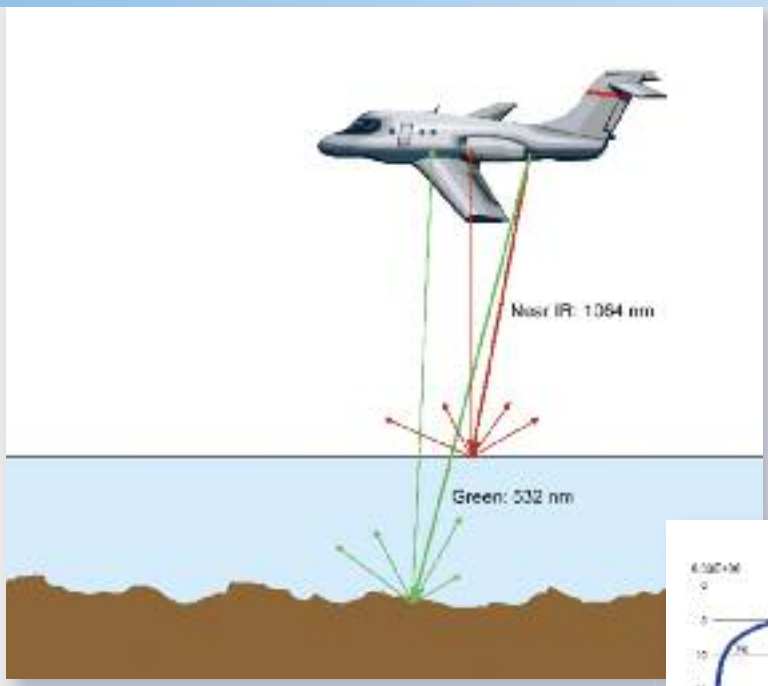
The SPAWAR team's first step was to define which laser systems are being used, in what types of environments, and to what extent. This was accomplished by querying personnel within different functional groups including regulatory and environmental planning offices, mine detection programs, and other research and development entities.

Based on the laser systems identified in the first task, a list of biological communities that may be impacted was defined. The primary biological groups that may be affected were marine mammals, sea turtles, planktonic and benthic communities.

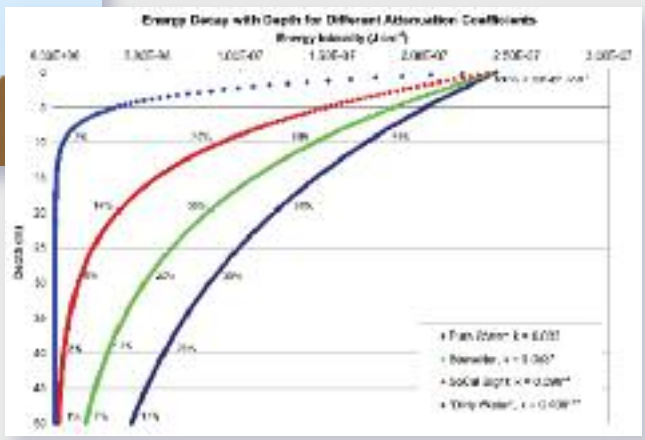
Next, an assessment pathway was developed to evaluate potential risks within each community. The pathway consisted of four components: 1) Laser System Specifications; 2) Exposure Potential; 3) Damage Thresholds; and 4) Potential Impacts. Literature was reviewed for species/group-specific information related to laser exposure, potential damage thresholds and expected impacts. The information was then synthesized to assess impact potential from the various laser systems to each biological group.

Finally, the information gathered was summarized into a technical report titled, Laser System Usage in the Marine Environment: Applications and Environmental Considerations. The report has been completed and is available on-line at the Joint Services Pollution Prevention and Sustainability Technical Library via http://www.p2sustainabilitylibrary.mil/links.aspx?topic=208&linktype=1 (Home > Sustainability > Range Management > Explosives Safety) or http://www.p2sustainabilitylibrary.mil/links.aspx?topic=205&linktype=1 (Home > Sustainability > Natural Resource Protection > Natural Resource Management). Both links require a Common Access Card or valid security certificate.

This study assessed the extent and diversity of the laser-based systems being used in an underwater environment which may have an effect on the biological community and marine life.



General schematic of LiDAR system deployed from an aircraft.



Energy decay of a LiDAR system. The percentages next to the curve represent the energy remaining from the starting surface level.

The report provides a comprehensive picture of the extent and diversity of lasers system usage within the Navy. It also outlines a scientifically defensible assessment pathway which can be used to evaluate laser impacts on the marine biological community.

As new technologies are transferred to the fleet through the acquisition process, it is necessary to identify and mitigate environmental, safety, and occupational health (ESOH) risks associated with the emerging system.

The report provides a comprehensive picture of the extent and diversity of lasers system usage within the Navy.

ESOH risks need to be addressed in compliance documentation related to Programmatic Environment, Safety and Occupational Health Evaluations in the acquisition process, and National Environmental Protection Act compliance, which includes preparing Environmental Impact Statements (EIS) for proposed Navy actions.

For example, current and future training exercises identified in draft EISs for the Southern California and Hawaii Complexes utilize an Airborne Laser Mine Detection System which employs a form of laser technology known as Light Detection and Ranging (LiDAR). Currently, EISs use general information to assess the risk of LiDAR in the marine environment. Scientifically defendable technical data are needed to develop Navy-wide environmental policies for performing EISs for laser activity in marine environments.

The culmination of this work will provide the Navy environmental planning offices with the tools necessary to technically defend EISs as they relate to the use of lasers in the marine environment. The project will provide consistent citable data and strengthen overall documentation preparation. This will safeguard the process of new and emerging technology transfer to the fleet as it pertains to communication and surveillance capabilities, supporting the overall goal of SeaPower21 (the Navy's vision for the 21st Century) and integration into the FORCENet-driven operational system.

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Weapon System Sustainment (EEC-3)

Background
In this investment area, the NESDI program sponsors solutions for the organizational- and intermediate-level Fleet maintainer to reduce the cost of compliance and increasing Fleet readiness. Example projects include:

- **Evaluation of Corn Hybrid Polymer (CHP) Blast Media for the Removal of Coatings from Delicate Substrates.** This NESDI project is validating the use of alternative technologies (including corn hybrid polymer) for the effective repair of aircraft radomes and other delicate substrates. The resultant technologies will provide environmentally preferred methods to replace chemical strippers and labor-intensive manual coating removal methods.

- **Removal of Coke Deposits from F404 Engine Drive Shafts.** This NESDI project successfully demonstrated the use of plastic blast media in a glove box environment to remove coke deposit from the F404 engine shaft thereby eliminating the use of a hazardous cleaning compound (MIL-C-85704) from this maintenance procedure.

- **Developing a Prohibited and Controlled Chemical List (PCCL).** This NESDI project resulted in a computer algorithm that generates a standard target chemical avoidance list that helps ship and shore facility compliance managers achieve their hazardous material minimization goals.

Summary

FY10 Funding Level:.....$776,000
FY11 Funding Level (projected): $820,000
Active Funded Projects in FY10: 11
Needs Collected in FY10: 16
New Starts in FY11: 3

Abiotic In Situ Treatment of 1,2,3-Trichloropropane to Protect Drinking Water Resources.
This NESDI project (#434) is demonstrating that zero-valent zinc (ZVZ) and one particular sulfur-rich formulation of zero-valent iron (known as FeHSA) can be used to treat 1,2,3-trichloropropane in groundwater at Marine Corps Base Camp Pendleton, CA. Each treatment material (zero valent metal) is in two columns in series to facilitate sample collection. The gray columns contain zinc and the black columns contain iron.

Active Funded Projects in FY10

The following 11 projects were active over the course of FY10.

No.	ID	Title	Description
1.	451	Navy Demonstration of Cadmium and Hexavalent Chromium Free Electrical Connectors	To perform Navy/USMC relevant field testing on Navy owned corrosion racks at NASA Kennedy Space Center's harsh beachfront test site in order to provide quality acquisition guidance on the relative performance of connectors.
2.	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.
3.	449	Evaluation of Corn Hybrid Polymer Blast Media for the Removal of Coatings from Delicate Substrates	To provide an effective, environmentally preferred media to remove coatings from difficult, high-value, NAVSEA and NAVAIR delicate substrates, including fiberglass, aluminum, carbon fiber, graphite and Kevlar.
4.	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, and synthetic.
5.	399	Development of a Prohibited and Controlled Chemical List and NAVSEA Target Chemical List	To provide the Navy with standard chemical lists for both weapon platform acquisition programs and facility operations, improving hazardous material management and minimization efforts.
6.	370	Large Paint Facility Flow Rate Computational Fluid Dynamics (CFD) Modeling & Verification	To develop and field verify a CFD model onfirming that a reduced flow rates are sufficient to control cpaint overspray and provide no significant deterioration of health protection.
7.	349	Low Temperature Powder Coating	To demonstrate, validate and successfully implement a low temperature cure powder coating on DoD production hardware.
8.	348	Nanocrystalline Cobalt Phosphorous (nCoP) Electroplating as a Hard Chrome Alternative	To validate/demonstrate nCoP alloy electroplating as a drop-in replacement for hard chromium plating.
9.	333	Fuel Leak Detection	To demonstrate and validate a new method for fuel cell leak detection in the P-3 Orion aircraft.
10.	328	Non-Chromated Post Treatments	To reduce Navy-wide use of chromate post-treatment coatings by testing and authorizing with tri-chromium pretreatment as a non-chromated replacement.
11.	248	Cleaning Solvents for the 21st Century	To develop a framework to systematically identify and qualify compliant alternative cleaners for HAP and VOC containing solvents used in DoD maintenance operations.

In addition to the 11 active projects listed on the previous page, the following six projects were also active but in various stages of project closeout.

No.	ID	Title	Description
1.	433	User Friendly Oxygen Cleaning Alternatives to Navy Oxygen Cleaner (NOC)	To identify and validate effective non-ozone depleting chemical as an alternative to NOC for components.
2.	429	Demonstration of a Single Drum Batch Dense Particle Separator (DPS) for Recycling Plastic Media Beads	To demonstrate a prototype batch DPS that is easy to operate and maintain, compact, low cost and able to meet the recycling requirement established by NAVAIR's Plastic Media Blasting specification for Metallic and Composite Materials (Revision C).
3.	408	Cadmium Alternatives Navy Specific Testing	To conduct Navy-specific tests, utilize test data to identify the most promising coatings, and make implementation recommendations to Navy depots, acquisition programs and Original Equipment Manufacturers (OEM).
4.	405	Citric Acid Passivation	To identify the most the promising formulations and make implementation recommendations to Navy depots, acquisition programs and OEMs.
5.	326	Radome Repair	To evaluate epoxy resin and corn hybrid polymer media as viable procedural alternatives in radome repair.
6.	324	Thin Film Sulfuric Acid Anodize (TFSAA)	To minimize the requirement for use of chromate and commercially licensed materials at private and Fleet Readiness Center (FRC)-level manufacture and repair and qualify TFSAA at NAVAIR FRCs for new acquisition platforms.

Antifouling Oil Boom for Reduced Maintenance and Extended Service Life.
This NESDI project (#413) assessed the feasibility of coatings for permanent oil booms that mitigate antifouling.

Needs Collected in FY10

Of the 16 needs collected in EEC-3 in FY10, four of those needs were ranked highly by NESDI program personnel. Pre-proposals were requested to address three of those needs and three projects will be initiated in FY11.

No.	Need	Command	Title	Status
1.	N-0662-10	NAVAIR	Aviation Hazardous Materials Lists	More Information Required
2.	N-0667-10	NAVAIR	Chrome Plating Replacement	Solution Exists (NESDI)
3.	N-0668-10	NAVAIR	Real Time Video Display Corrosion Detection	Other
4.	N-0669-10	NAVAIR	Cost Effective Paint Stripping	Other
5.	N-0670-10	NAVAIR	HAPS Free/No VOC Coating Systems for Navy & NAVAIR Systems	Solution Exists (Other)
6.	N-0671-10	NAVAIR	Alternative to Lead Solder for Wire Wrapped Oxygen Bottles	Other
7.	N-0672-10	NAVAIR	Cadmium Brush Electroplating Alternative	More Information Required
8.	N-0673-10	NAVAIR	Cadmium Tank Electroplating Alternative	Request Pre-Proposal
9.	N-0674-10	NAVAIR	Alternative Aircraft & Large Component Paint and/or Corrosion Removal Technology Capability	More Information Required
10.	N-0675-10	NAVFAC	Self Healing Powder Coatings	More Information Required
11.	N-0685-10	NAVSEA	Development of an Alternative, Non-Media Methodology for Coatings Removal and Selective Stripping Processes	More Information Required
12.	N-0689-10	NAVAIR	Ground Support Equipment Coatings Maintenance Evaluation	More Information Required
13.	N-0716-10	CNAF	Corrosion Converter/ Preservative for Support Equipment	More Information Required
14.	N-0717-10	NAVAIR	Rhinoliner and Rhinoliner-Like Coatings for Support Equipment	More Information Required
15.	N-0718-10	NAVAIR	Non-Chrome Primer Evaluations for Aircraft Coatings	Request Pre-Proposal
16.	N-0719-10	NAVAIR	Electrical Connectors without Cadmium and/or Hexavalent Chromium	Request Pre-Proposal

Needs Collected in FY10

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4.	N-0669-10	NAVAIR	Cost Effective Paint Stripping	Other
5.	N-0670-10	NAVAIR	HAPS Free/No VOC Coating Systems for Navy & NAVAIR Systems	Solution Exists (Other)
6.	N-0671-10	NAVAIR	Alternative to Lead Solder for Wire Wrapped Oxygen Bottles	Other
7.	N-0672-10	NAVAIR	Cadmium Brush Electroplating Alternative	More Information Required
8.	N-0673-10	NAVAIR	Cadmium Tank Electroplating Alternative	Request Pre-Proposal
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15.	N-0718-10	NAVAIR	Non-Chrome Primer Evaluations for Aircraft Coatings	Request Pre-Proposal
16.	N-0719-10	NAVAIR	Electrical Connectors without Cadmium and/or Hexavalent Chromium	Request Pre-Proposal

New Starts in FY11

In EEC-3, the NESDI program will initiate three projects in FY11.

No.	Title
1.	Cadmium Tank Electroplating Alternative
2.	Navy Demonstration of Cadmium and Hexavalent Chromium Free Electrical Connectors
3.	Non-chrome Primer Evaluations for Aircraft Coatings

ESTCP Leveraged Projects

In EEC-3, for the past several years the NESDI program also was able to leverage resources from ESTCP to support the following two projects.

No.	Title	ESTCP Funding	NESDI Funding (FY08-FY13)
1.	Nanocrystalline Cobalt Phosphorous Electroplating as a Hard Chrome Alternative	501	190
2.	Advanced Non-Chromate Primers & Coatings	3500	540
	TOTAL	**4001**	**730**
	in $K		

Cadmium Alternatives Navy Specific Testing

Project type
New Technology

Project number
408

Project description
The components of Navy aircraft, especially carrier-based aircraft, are exposed to a corrosive environment. It has been Navy practice to use coatings containing cadmium on these components, as cadmium acts as an excellent corrosion-preventative. Cadmium (Cd) also reduces friction, and has useful torque-tension properties. However, as a known carcinogen, it poses risks from both an environmentaland health perspective.

Cd plating is easily removed during depainting operations, resulting in costly disposal of large volumes of waste and concerns with generation of Cd dust. Furthermore, when used in electroplating, Cd has an associated hazard related to the cyanide chemicals in the plating bath. Therefore, despite Cd's performance characteristics, low processing cost, and versatility; the environmental, health, and safety issues associated with its use are significant, and various current and forthcoming regulations impact its use and disposal. The Occupational Safety and Health Administration (OSHA) has imposed a permissible exposure limit to Cd dust, leading to increased compliance costs. In response, the Department of Defense (DoD) initiated efforts to search for alternative coatings and coating processes to Cd plating.

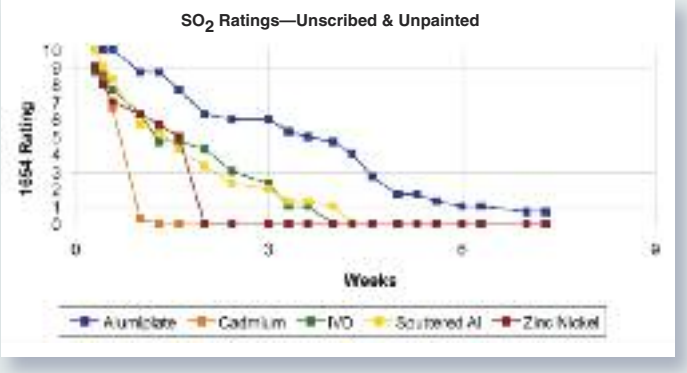
The results of this project allowed the generation of an authorization letter for use of AlumiPlate℠ as a cadmium alternative on high-strength steel.

In early 2004, Concurrent Technologies Corporation (CTC) developed a corresponding test plan for this effort through contract with Air Force Research Laboratory (AFRL). Per AFRL direction, the test protocol was expanded to include input from the Army and Navy. A team was formed consisting of representatives from the Joint Cadmium Alternatives Team (JCAT) as well as new representatives from all of the DoD services, the original equipment manufacturer (OEM) community, and CTC. This reformed team kept the name JCAT, and was managed by Navy personnel from Naval Air Systems Command (NAVAIR) in Patuxent River, MD (PAX).

Due to the unique operating environments of naval aircraft, NAVAIR has specific requirements in addition to those determined by the JCAT, requiring Navy specific testing to be performed. The Navy-specific tests associated with this effort were performed with resources provided by the NESDI program. These included tests for fatigue in air and saltwater environments, stress corrosion cracking, and cyclic sulfur dioxide (SO_2) salt fog corrosion resistance. These tests were performed at PAX, with the exception of brush plating testing, which was performed at Fleet Readiness Center Southeast (FRC-SE) in Jacksonville, FL.

The primary coatings evaluated in this effort included a high-purity aluminum coating known as AlumiPlate℠ and a low hydrogen embrittlement (LHE) Zinc-Nickel (Zn-Ni) coating. These two coatings were compared against the control coatings LHE Cd and ion vapor deposition aluminum (IVD-Al). Repair coatings that were evaluated included brush plated Zn-Ni, brush tin-zinc (Sn-Zn), and spray/brush-applied SermeTel 249/273.

The results of this project allowed the generation of an authorization letter for use of AlumiPlate℠ as a cadmium alternative on high-strength steel. It is expected that AlumiPlate℠ will be used as a replacement technology at the FRC and OEM levels. However, authorization does not cover the use of cadmium alternatives on electrical connectors, fasteners, etc. Further work needs to be performed to determine viable alternatives for these purposes.



Acidified salt spray corrosion resistance testing evaluates the ability of candidate coatings to prevent the corrosion of coated substrates exposed to cyclic SO_2 salt spray. This test best represents an aircraft carrier environment. Results of the SO_2 salt fog corrosion resistance testing indicated that the alternative coatings all performed better than the Cd coating.

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Cleaning Solvents for the 21st Century

Project type
Material Substitution

Project number
248

Project description
To obtain a high degree of cleanliness without corrosion, petroleum-based solvents such as CID A-A-59601 and MIL-PRF-680 B are used for cleaning aerospace platforms and other related equipment. CID A-A-59601 (otherwise known as P-D-680, Stoddard solvent or mineral oil) is a dry cleaning and degreasing solvent that contains hazardous air pollutants (HAP) and volatile organic compounds (VOC). MIL-PRF-680 B is a degreasing solvent that contains the same amount of VOCs but no HAPs.

Before MIL-PRF-680 solvent.

After MIL-PRF-680 solvent.

VOCs released during cleaning operations can contribute to the formation of ground-level ozone, which can impact lung tissue, cause respiratory illness and impact vegetation. HAPs are pollutants that are known or suspected to cause cancer or other serious health effects.

Historically, the primary solvent used for the cleaning of aircraft components has been MILPRF-680 B Type II, which has a VOC content of more than 750 grams per liter (g/L). Alternative processes used to eliminate the VOC emission have utilized aqueous-alkaline solvents. However, these solvents and their associated processes are often ineffective on heavy soils and can result in flash rusting of steel components. It was clear that a new class of organic solvents was needed.

As a result of this effort, a new HAP-free/low-VOC cleaner specification was developed and issued.

Solvent substitution for Department of Defense (DoD) maintenance activities is a complex process that entails a great deal of coordination and testing. In order to successfully replace a current solvent with an environmentally friendly one, a well laid-out plan must first be developed. The Naval Facilities Engineering Service Center (NFESC) contacted and coordinated with other agencies to develop the Joint Service "Solvent Substitution Methodology." An associated database was developed to track and coordinate solvent substitution DoD-wide in order to minimize duplication of efforts. NFESC was also instrumental in the formation of the Joint Service Solvent Substitution Working Group that meets biannually to discuss solvent substitution efforts—an effort sponsored by the NESDI program.

The Materials Engineering Division at Naval Air Systems Command (NAVAIR), Patuxent River, Maryland was tasked with developing an alternative specification for MIL-PRF-680 B to include a qualified products database (QPD).

The U.S. Environmental Protection Agency has established emissions standards for categories and sub-categories of sources that emit or have the potential to emit listed HAPs. In addition, individual states implement various requirements, usually stated in terms of VOC content. In California, the South Coast Air Quality Management District Rule 1171 limits the VOC content in solvents to 25 g/L for immersion cleaning processes or limiting equipment to airtight cleaning systems.

In Connecticut and Maryland, cleaners with VOC content are restricted to having a vapor pressure not greater than one millimeter of mercury (mm Hg) at 20 degrees Celsius (C).

The Aerospace National Emission Standards for Hazardous Air Pollutants states that approved hydrocarbon-based cleaning solvents must have vapor pressures less than 7 mm Hg at 20 degrees C and be HAP free, and hand wipe cleaning solvents must have vapor pressures less than 45 mm Hg. These limits were used as the Type I and Type II classifications in the specification. Type I products are less volatile, and suitable for cleaning light soils such as oils and hydraulic fluids. Type II products are more volatile, yet somewhat more effective on heavy soils such as greases and carbon residues.

The new specification requires that a solvent must:

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

Patuxent River tested several alternative commercial products. The team found three solvents that met the above specifications for Type I. None of the tested solvents met all the requirements for Type II.

To validate the effectiveness of the tested products (Cyclo 147F, QSOL 300 and SB32) in work environments, field testing was conducted on different weapon systems at several Navy, Air Force, Marine Corps and U.S. Coast Guard sites. Each cleaning solvent was tested side-by-side with the current MIL-PRF-680 Type II solvent, cleaning identical parts for the duration of the test. Cleaning techniques such as brush, immersion and wipe cleaning were utilized based on the specified method of cleaning applications.

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

As a result of this effort, a new HAP-Free/low-VOC cleaner specification (MIL-PRF 32295) was developed and issued, which can be used at locations where environmental regulations prohibit the use of CID A-A-59601 and/or MIL-PRF-680 B. The three tested cleaners were qualified to the new specification, and a QPD was generated.

Because none of the tested solvents met the cleaning efficiency requirement for Type II, Patuxent River developed their own cleaner to meet Type II cleaning efficiency. Field testing is still pending. It is anticipated that users in naval aviation, other DoD facilities, and the U.S. Coast Guard will benefit from this new specification as environmental regulations continue to tighten.

Before Cyclo 147F solvent.

After Cyclo 147F solvent.

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

Background
In this area, the NESDI program invests in innovative techniques to manage ship hazardous material/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 resultant solutions will allow shipyards to conduct their core business of maintaining Navy ships with fewer risks associated with environment 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 is demonstrating and integrating a low-cost, modular device that combines semi-autonomous motion with portable containment to maximize operator productivity while capturing paint overspray before it is incorporated into dry dock industrial operations or discharges associated with flooding or storm water runoff into nearby waterways.

The NESDI program also invests in approaches for addressing issues pertaining to air and port operations that ensure Fleet readiness. Example projects in this area include:

- **Comprehensive Environmental Compliance Approach for Cathodic Protection in Caissons and Floating Dry Docks.** This NESDI project is validating a cathodic protection system to achieve effective corrosion prevention while reducing environmental impacts of caisson and floating dry dock ballast discharges.

- **Antifouling Oil Boom for Reduced Maintenance and Extended Service Life.** This NESDI study assessed the feasibility of coatings and other material advancements for permanent oil booms that mitigate biofouling accumulation and enhance compliance through increased reliability, extended life and a reduced maintenance burden.

Summary

FY10 Funding Level:.....$700,000
FY11 Funding Level (projected): $750,000
Active Funded Projects in FY10: 3
Needs Collected in FY10: 5
New Starts in FY11: 1

Active Funded Projects in FY10

There were three active NESDI projects in EEC-4 over the course of FY10.

No.	ID	Title	Objective
1.	456	Hull Maintenance Shroud	To provide a simple, economical solution for capturing waste streams associated with coating removal and surface preparation during repair and painting operations.
2.	441	Motion Assisted Environmental Enclosure (MAEE) for Capturing Paint Overspray in Dry Docks	To demonstrate and integrate a low-cost, modular device that combinessemi-autonomous motion with portable containmentto capture paint overspray in dry dock and enhance environmental compliance.
3.	440	Surface Cleaning of Dry Dock Floors	To select, procure, and integrate proven commercial off-the-shelf technologies to 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.

In addition to the three projects listed above, the following three projects were also active but in various stages of project closeout.

No.	ID	Title	Objective
1.	411	Dredge Spoil Management Alternatives Initiation Decision Report	To identify Navy sites requiring dredging, determine the potential beneficial reuse of the dredged material from these sites, and evaluate the viability of using contaminated dredge spoils as a cement kiln feed stock.
2.	288	NoFoam™ System for Fire Fighting Pumper Trucks Foam Discharge Checks	To demonstrate and validate the effectiveness of the modified NoFoam™ System in eliminating the Aqueous Film Forming Foam (AFFF) wastewater generated during annual testing of fire fighting pumper trucks.
3.	240	No Foam™ System for Aircraft Hangar Fire Suppression System Foam Discharge Checks	To demonstrate and validate the effectiveness of the NoFoam™ System technology in minimizing or eliminating the AFFF generated wastewater from aircraft hangar fire suppression foam system annual discharge checks.

Needs Collected in FY10

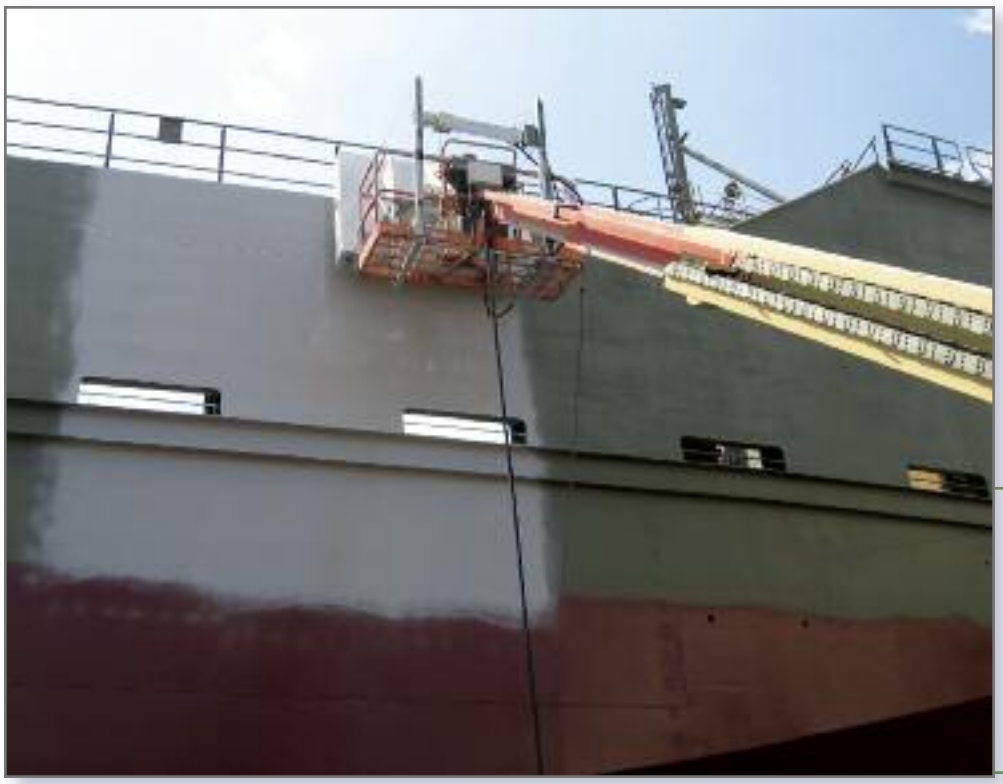
The NESDI program collected five needs in this EEC during FY10. Of those five needs, four needs were ranked "MEDIUM." The final result is one new project to be initiated next fiscal year. The entire list of needs collected in EEC-4 follows.

No.	Need	Command	Title	Status
1.	N-0665-10	NAVAIR	Water Treatment Technology	Being Addressed by Existing Efforts (Other)
2.	N-0677-10	NAVFAC	In Port Hull Maintenance	Request Pre-Proposal
3.	N-0694-10	CNIC	Marine Invasive Species Early Detection and Rapid Response	Request Pre-Proposal
4.	N-0708-10	Navy Region Southwest	Habitat Degradation Evaluation of Non-Traditional Contaminants Related to Pier Side Activities	More Information Required
5.	N-0720-10	NAVSEA	Waste Disposal Cost Model for Navy Surface Ships and Operating Bases	More Information Required

New Starts in FY11

In EEC-4, the NESDI program will initiate one project in FY11.

No.	Title
1.	Demonstrate a Hull Maintenance Shroud to Capture Waste Stream During Repair and Painting Operations



The MAEE control system's micro-computer converts the operator's instructions into precise commands that follow along the ship's hull.

Motion Assisted Environmental Enclosure for Capturing Paint Overspray in Dry Docks

Project type
New Technology

Project number
441

Project description
Navy ships and submarines are subjected to very harsh operating conditions. For this reason, ship hulls require antifouling coatings-some containing heavy metals such as copper and zinc. Although these coatings are critical to the preservation of ship hulls and even contribute to greater fuel efficiency, the heavy metals in the coatings are considered a hazardous material that must be carefully managed.

Current commercial spray painting methods can result in greater than 30 percent (by weight) of the applied paint going to waste through overspray. This overspray can settle onto the dry dock floor and surrounding areas, where it may affect dry dock industrial operations or discharges associated with flooding or storm water runoff into nearby waterways.

In an effort to address these challenges, NESDI sponsored a project by the Naval Surface Warfare Center, Carderock Division (NSWCCD), in conjunction with Concurrent Technologies Corporation (CTC) and NORX, LLC, to develop a prototype Motion Assisted Environmental Enclosure (MAEE) designed to capture paint overspray.

The MAEE concept is a second generation solution developed by the Navy for overspray containment. Previously, NSWCCD developed a prototype Automated Paint Application, Containment and Treatment System (APACTS). The technology was designed to apply paint robotically to hull surfaces in an effort to capture overspray

The MAEE concept is a second generation solution developed by the Navy for overspray containment.

emissions. APACTS was designed to be an automated system utilizing a dome-covered nozzle and a vacuum technology to help minimize overspray at its source. The system, while technically innovative, was costly due to hardware and software complexities. A subset of the motion control technology developed for APACTS has been incorporated into the MAEE system development. MAEE technology replaces some of the complex robotics with a human operator, resulting in a simpler solution at significantly lower cost.

The MAEE is a portable, lightweight enclosure that allows a painter to manually or semi-autonomously apply coatings with conventional spray equipment, on a boom lift or manlift with little or no overspray. The containment unit, or shroud, covers a small portion of the hull, allows operator access to the surface to be painted, draws and circulates air from within the enclosure to contain the overspray, and generates a positive, contact-free seal with the hull to prevent the overspray from escaping. The seal around the shroud is a pressurized zone created by a flow of air similar to an air curtain. Blowers on each side of the operator window clear paint overspray and fumes away from the painter and deposit them into the enclosure's filters.

The operator commands a desired direction and a speed. A system of sensors and computers on the work platform detects the position of the hull as well as the positions of the aerial work platforms' joints. The control system's micro-computer converts the operator's instructions into

precise commands that enable the unit to follow the hull's surface at a fixed standoff distance of four to six inches. As the paint is applied, the shroud constantly moves along the surface, exposing more of the surface to be painted.

To reduce system costs and improve safety, the controller does not require any significant modifications to the boom

Capture efficiency assessments conducted to date indicate that efficiencies on the order of 90 percent were achieved.

lift. Modifications are easily assembled on and off and can be completed in approximately one hour. The boomlift is then readily deployable for other shipyard activities or it may be returned to a rental company in its original state.

The MAEE's versatile, modular design also has the potential to be modified and used for hull hydro-washing operations as well as capturing smoke emissions during hull cutting and welding operations.

The maturing MAEE enclosure technology has been tested and evaluated during four shipyard operational assessments conducted under representative conditions. The evaluations took place between March of 2009 and August of 2010.

Following each test, prototype modifications and refinements were made based upon recommendations from painters or operators trained on the system and management personnel. Blotter tests and high definition

A painter operates the enclosure on its first paint run.

video were used to determine capture efficiency as well as overall system performance. Capture efficiency assessments conducted to date indicate that efficiencies on the order of 90 percent were achieved. The targeted goal is to capture more than 95 percent of the paint overspray.

MAEE technology will require more extensive shipyard testing on challenging hull surface geometries to further refine the system by exposing it to the rigors and full breadth of production level operations needed for full demonstration, validation and integration.

The ultimate goal is to demonstrate a production-ready MAEE that is available to all Navy and commercial shipyards by either purchase or lease agreement.

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

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Regulatory & Base Operations (EEC-5)

Background
In this investment area, the NESDI program develops 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 is establishing guidelines and limitations for the use of biodiesel with ground tactical vehicles and equipment in order to reduce hazardous emissions from diesel engines.

- **Pollutant Source Tracking.** This project is quantifying 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. Failure to distinguish between Navy releases, background conditions, and other non-Navy responsible parties can result in excessive or unnecessary remediation costs on the part of the Navy.

- **Optimization of the Storm Water Dual Media Filtration System.** Optimizing a stormwater filtration system at the Navy Regional Recycling Center (NRRC), San Diego so that the system consistently meets National Pollution Discharge Elimination System permit requirements for metals and other pollutants.

Summary

FY10 Funding Level: $1,741,000
FY11 Funding Level (projected): ...$2,310,000
Active Funded Projects in FY10: 20
Needs Collected in FY10: 32
New Starts in FY11:.....8

Biodiesel for Ground Tactical Vehicles and Equipment.
This NESDI project (#412) is developing guidelines that will provide a low cost method to reduce both greenhouse gas emissions and regulated air pollution emissions.

Active Funded Projects in FY10

There were 15 active NESDI projects in EEC-5 over the course of FY10.

No.	ID	Title	Objective
1.	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 resuspended from dredging, extreme storm events and propeller wash.
2.	447	Chemical Safety Environmental Management System Enterprise (CS-EMS-E)	To develop a hazardous waste management application Phase I Pilot version of CS-EMS-E.
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.	438	Predictive Trajectory Model for Oil Spills for Navy Harbors	To improve the predictive accuracy of the existing oil spill trajectory models in predicting oil trajectory in three Navy harbors and provide a validated modeling tool for the Navy On-Scene Coordinators with accurate information.
5.	435	Waste to Clean Energy (WtCE) IDR	To develop an IDR that will provide cost effective WtCE conversion technologies.
6.	434	Abiotic Treatment of 1,2,3-Trichloropropane (TCP) to Protect Drinking Water Resources	To demonstrate that zero valent zinc can be used to treat TCP in groundwater.
7.	425	Automated Condition Assessment of Coral Reefs	To assist in providing an integrated automated coral reef assessment system to the Navy for the purpose of assessing and monitoring of coral reefs and provide a method to allow for the timely mitigation of possible adverse impacts.
8.	424	Improved Assessment Strategies for Vapor Intrusion	To identify, evaluate, select and demonstrate promising field assessment methodologies for cost-effective reduction of uncertainty in the direct field assessment of exposure associated with the Vapor Intrusion pathway.
9.	412	Biodiesel for Ground Tactical Vehicles and Equipment	To establish guidelines and limitations for use of biodiesel in tactical vehicle and equipment.
10.	400	Vertical Launch System (VLS) Wastewater Treatment System	To develop a cost effective treatment system for removing cadmium, lead, and cyanide in VLS wastewater that meets user requirements.
11.	396	Predictive Aquatic Fate and Transport Model in Support of Total Maximum Daily Load (TMDL) and Compliance	To integrate relevant models into a single, accurate and fast predictive software tool that can be used for addressing most of the Navy's marine and estuarine fate and transport issues under the TMDL umbrella.
12.	364	Pollutant Source Tracking	To accurately quantify Navy contaminant loads by identifying, reviewing, demonstrating, and validating contaminant source tracking technologies and developing a technical framework for Navy water program managers.

No.	ID	Title	Objective
13.	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.
14.	252	Sustainable Naval Facilities	To identify and evaluate a web based assessment tool that NAVFAC can use to reduce the environmental impact of the Navy's existing facilities through the use of sustainable practices, policy, and technology.
15.	135	QwikLite and QwikLite for Sediment -— Re-activated for Technology Transfer of Commercialized Technology	To promote regulatory acceptance and integrate the commercialized QwikLite 200 toxicity test system into existing Navy regulatory programs, providing a rapid and cost saving bioassay for assessing toxicity of discharges, receiving environments, or sediments.

In addition to the 15 funded active projects listed above, there were another five projects in EEC-5 that were in various stages of closure. Some were in the process of collecting and analyzing data for a final report, others were generating authorization letters or user documentation, and some were being re-scoped to address additional, emerging related requirements.

No.	ID	Title	Objective
1.	430	Metals Removal from Stormwater Using Linear Treatment System	To demonstrate/validate the effectiveness of an above-grade linear treatment BMP to remove pollutants from storm water generated at industrial sites.
2.	422	Web-Based Model Server	To convert existing environmental models into a single Web-Based Model Simulation architecture with a common user interface.
3.	377	High Velocity Oxygen Fuel (HVOF) Thermal Spray as an Alternative to Chromium Electroplating on Helicopter Dynamic Components	To demonstrate and validate the use of HVOF coatings as a replacement for hard chromium plating on helicopter dynamic components.
4.	357	Navy Aircraft Deactivation, Demilitarization, and Disposal Assessment	To develop, demonstrate, and transition cost-effective deactivation, demilitarization and disposal methods for legacy aircraft platforms, engines, and components.
5.	46	Containment and Long-Term Monitoring Strategies for Contaminated Sediment Management	To provide the Navy with a suite of integrated containment and monitoring strategies for remediating contaminated sediments and assessing the long-term effectiveness of remedial actions.

Needs Collected in FY10

The NESDI program collected 32 needs in this EEC during FY10. Of those 32 needs, seven needs were ranked "HIGH" and 13 needs were ranked "MEDIUM." The final result is eight new projects to be initiated next fiscal year. The entire list of 32 needs follows.

No.	Need	Command	Title	Status
1.	N-0664-10	NAVFAC	End of Life Disposal for Solar Energy Systems	More Information Required
2.	N-0666-10	NAVFAC	Identifying Navy Installations Most Susceptible to Climate Change Impacts	Request Pre-Proposal
3.	N-0676-10	NAVSEA	Reduction and Control of Emissions During Metal Cutting Operations	Request Pre-Proposal
4.	N-0678-10	Marine Corps	Validation of Stormwater Insert/Vault Separation and Filtration Technologies	More Information Required
5.	N-0680-10	NAVFAC	Effectiveness of Modulated Ultraviolet Light to Clean Optical Windows	Request Pre-Proposal
6.	N-0681-10	NAVFAC	Monitoring of Stormwater Pond	Solution Exists (Other)
7.	N-0682-10	CNIC	Automated Long-Term Monitoring System and Data Management for Natural Resource Management	More Information Required
8.	N-0683-10	NAVFAC	Alternatives For Removal/Disposal of Used Vegetable Oil from Remote Locations	More Information Required
9.	N-0686-10	NAVFAC	Mitigation of Sound During Pile Driving Activities	Request Pre-Proposal
10.	N-0688-10	NAVSEA	Water Jet Waste Water Treatment	Request Pre-Proposal
11.	N-0690-10	NAVFAC	Clean Aircraft Engine Gas Path Faster, Greener and More Efficiently with a T-56 Engine Water Capture Cart at Hanger 50	Solution Exists (Other)
12.	N-0691-10	CNIC	Sustainability Business Plan	Outside NESDI Scope
13.	N-0692-10	NAVFAC	Impacts and Management of Northwest Stormwater Discharges	Request Pre-Proposal
14.	N-0693-10	NAVFAC	Real Time Evaluation of Vapor Intrusion Indoor Air Sources	Other
15.	N-0695-10	NAVFAC	Navy Database On Vapor Intrusion	Other
16.	N-0696-10	NAVFAC	Environmental and Mission Improvements of Current Wash Operations at the Construction Equipment Division	Solution Exists (Other)
17.	N-0697-10	NAVSUP	Navy Green Procurement Tools	More Information Required
18.	N-0700-10	CNIC	Mapping Acoustic Zones of Influence for Navy Operational Activities	Outside NESDI Scope
19.	N-0702-10	NAVSUP	Assessment of Navy Solid Waste Management Infrastructure that Emphasizes Green Products End-Of-Life Alternatives	More Information Required

Needs Collected in FY10 (continued)

No.	Need	Command	Title	Status
20.	N-0703-10	SPAWAR	Implementation of Passive Sampling Devices for Risk Assessment and Long Term Monitoring at Navy Contaminated Sediment Sites	Request Pre-Proposal
21.	N-0704-10	NAVFAC	Safe, Sustainable, and Regulatory Compliant Potable Water Systems For Navy Shore Facilities	Request Pre-Proposal
22.	N-0705-10	NAVFAC	In-Situ Sediment Toxicity Testing for Use in Clean-Up and Compliance	Request Pre-Proposal
23.	N-0706-10	NAVFAC	Waste Oil Disposal with Fuel Recovery	More Information Required
24.	N-0707-10	NAVFAC	Correct Existing Storm and Sanitary Sewer System Equipment Operation at Hanger 50 to Prevent Adverse Environmental Impact of Aqueous Film Forming Foam Suppression System Releases	Other
25.	N-0712-10	NAVFAC	Demonstration/Validation of Delivery/Placement of In Situ Amendments for Contaminated Sediments at Active, Deep Water Navy Sites and Structural Areas	Request Pre-Proposal
26.	N-0713-10	NAVFAC	Copper and Zinc Source Identification, Quantification, and Reduction in Storm Water Discharges	Request Pre-Proposal
27.	N-0714-10	NAVFAC	Food Waste Diversion from Landfill Disposal	More Information Required
28.	N-0715-10	NAVSEA	Applicability of Multi-Incremental Sampling for Ecological Toxicity Testing	Request Pre-Proposal
29.	N-0722-10	NAVFAC	Demonstration/Validation of Bottom Towed Array, Time-Domain Electro-Magnetic Induction Survey Platform for Detection Metallic Anomalies in Shallow Sub Tidal Sediments	Other
30.	N-0724-10	NAVAIR	Track Environmental Requirements in Systems Engineering Technical Reviews	Request Pre-Proposal
31.	N-0725-10	NAVAIR	Make the PESHE DAT Tool Useable to All Navy SYSCOMS	Request Pre-Proposal
32.	N-0726-10	NAVAIR	Development of Environmental Risk Tracker for Weapon System Acquisitions	Request Pre-Proposal

New Starts in FY11

In EEC-5, the NESDI program will initiate eight projects in FY11.

No.	Title
1.	Electrochemical Detection and Load Reduction of Copper and Zinc in Storm Water Runoff
2.	Innovative Technologies to Control/Reduce Emissions from Metal Cutting Operations
3.	Optimization of the Storm Water Dual Media Filtration System at the NRRC in San Diego, CA
4.	Modeling Tool for Navy Facilities to Quantify Sources, Loads & Mitigation Actions of Metals in Stormwater Discharges
5.	Compliance with the Emerging Requirements of the Stage II Disinfectant and Disinfection Byproduct Rule
6.	Methodology for Identifying and Quantifying Metal Pollutant Sources in Storm Water Runoff (ON HOLD)
7.	Stormwater Integration Process Development (ON HOLD)
8.	Navy-wide Expansion of the Programmatic Environmental, Safety and Health Evaluation Document Authoring Tool

In addition to the eight projects listed above, the NESDI program is expanding the scope of its ongoing *Automated Condition Assessment of Coral Reefs* project to accommodate additional requirements identified by end-users including assessing the effectiveness of modulated ultraviolet light to keep the prototype's optical window clean of fouling.

ESTCP Leveraged Projects

In EEC-5, for the past several years the NESDI program also was able to leverage resources from ESTCP to support the following eight projects.

No.	Title	ESTCP Funding	NESDI Funding (FY08-FY13)
1.	Demonstration of Biodiesel in Ground Tactical Vehicles and Equipment	1373	356
2.	Evaluation of Resuspension Associated with Dredging, Extreme Storm Events and Propeller Wash	983	370
3.	Biological Treatment of Paint	800	70
4.	Smart Water Conservation Systems for Irrigated Landscapes	570	35
5.	Water Conservation: Tertiary Treatment and Recycling of Waste Water	1035	195
6.	Heavy Diesel Hybrid Demonstration	801	50
7.	Demonstration and Validation of Sediment Ecotoxicity Assessment Ring Technology for Improved Assessment of Ecological Exposure and Effects	1165	390
8.	Demonstration and Validation of Delivery and Stability of Reactive Amendments for the In Situ Treatment of Contaminated Sediments in Active Navy Harbors	1169	270
	TOTALS:	**7896**	**1736**

in $K

Containment and Long-Term Monitoring Strategies for Contaminated Sediment Management

Project type
Web Site Decision Tool

Project number
46

Project description
Over the last several years, increased environmental scrutiny has led to the identification of numerous contaminated marine sediment sites on military property in the U.S. The Navy and other Services are faced with the challenge of safely remediating these sites in the United States.

Based on more than 200 identified sites on Navy property, the estimated cost to complete remediation of the contaminated sediments is more than one billion dollars—and this does not include the costs associated with post-remediation monitoring efforts.

Post-remediation monitoring is necessary because little is known about the long-term effectiveness of many of the remediation methods used in the marine environment. For instance, one of the most frequent containment strategies is capping, or placing a layer of clean material over the contaminated sediment. In the marine environment, capped sediments can be disrupted by currents, tides, and winds. Standard sediment and water sampling techniques can be problemmatic for this type of monitoring, as they pose the risk of disturbing the integrity of the cap. In addition, conditions such as erosion, future hydrodynamic events, changes to site use and various background factors can impact the remedy.

Site managers understandably have budgetary concerns when initiating remediation monitoring, after having spent millions of dollars on remediation. Of the relatively few sites where monitoring has been implemented, the data gathered has provided little information regarding the long-term effectiveness of the method or methods used.

Because remedy performance, monitoring requirements and risk reduction are not well understood, and because long-term monitoring can be a major financial burden, the NESDI program identified a need for better monitoring strategies and sensors. Working with input from the EPA, the U.S. Army and industry, the NESDI program sponsored the development of a set of standardized assessment and monitoring protocols to validate the effectiveness of remedial technologies.

The process of coring is used to obtain a vertical sediment profile. Coring is used to determine whether there has been any chemical movement through a cap.

Macroinvertebrate sampling is one way to evaluate remediation effectiveness.

ISRAP is now accessible to anyone at www.israp.org.

Personnel from the Space and Naval Warfare Command— Systems Center Pacific were tasked with providing guidance on this issue. Working in partnership with Environ International Corporation, they developed an interactive solution entitled Interactive Sediment Remedy Assessment Portal (ISRAP).

ISRAP provides a general framework for sediment remedy modeling, constructed and populated with a variety of possible monitoring needs and tools to address those needs. At the heart of the ISRAP site is the matrix, an interactive tool designed to assist Remedial Project Managers (RPM) in selecting appropriate remediation methods, understanding

ISRAP provides a general framework for sediment remedy modeling, constructed and populated with a variety of possible monitoring needs and tools to address those needs.

monitoring requirements, and pairing them with effective monitoring tools. The matrix-based tools build on the first four steps of EPA's Monitoring Framework Steps (EPA, 2004). By using the matrix o identify monitoring needs and investigate monitoring tools associated with those needs, RPMs can more easily identify monitoring plan objectives and appropriate monitoring tools developed by the U.S. Environmental Protection Agency.

The matrices provide a decision-making framework with the following objectives:

1. Provide a comprehensive list of monitoring needs
2. Identify monitoring tools associated with each monitoring need
3. Enable a screening-level comparison of tools when several are available for a particular monitoring need
4. Help RPMs focus on key issues associated with site-specific monitoring needs and tools, to facilitate the design of cost-effective and meaningful monitoring plans

ISRAP can also be useful in understanding data needs during Remedial Investigation and Feasibility Studies, especially as they pertain to remedies themselves, and post-remedy monitoring.

In contrast to other guidances or documents, technical information presented in the ISRAP can be updated remotely via online access as information in the dynamic field of sediment monitoring and remediation changes. This is an important distinction in a field where much changes year to year.

ISRAP is currently available to RPMs and the general public at www.israp.org.

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Real-Time Drinking Water Quality Monitoring Technology Assures Water Safety

Project type
Technology

Project number
356

Project description
According to Navy policy and public law, drinking water assessments and emergency response plans must be completed for Navy drinking water systems that serve more than 25 people. These plans must contain recommendations for detecting and deterring disruptions to the drinking water system.

Disruptions to the water supply could be caused by natural events such as earthquakes, accidents, or by intentional tampering. Whatever the cause, any contamination of the water supply impacts mission readiness and the well-being of Navy personnel.

The single most effective way to mitigate water contamination is early detection. However, early detection is unlikely using current water monitoring procedures.

The current practice for water quality compliance is to manually collect samples or laboratory analysis on a weekly or quarterly basis. This practice does not allow water system staff adequate time to respond to changes in water quality and might also miss poor water quality events occurring outside these periodic sampling events. For overseas bases,

This system provides an early warning system to mitigate water safety concerns through real-time monitoring technology combined with automated data communication, reporting and event warnings.

the analysis turnaround time is even longer and the quality of the local water supply is less reliable. A continuous and real-time water contamination detection system coupled with automated notification can help safeguard against abnormal water quality.

To date, the majority of Navy water utilities have not implemented a real-time monitoring strategy due to a lack of proven technologies as well as the associated high costs. The goal of this demonstration

Water quality monitoring equipment panel installed at the Pleasant Valley site, Naval Base Ventura County.

(from left) Ken Kaempffe, Steve Fann, and intern Lauren Kim inspect the water quality monitoring equipment at the Pleasant Valley site, Naval Base Ventura County.

project was to provide managers with a proven technology at a cost-effective price.

This NESDI-sponsored project took place at the Naval Facilities Engineering Command Engineering Service Center (NAVFAC ESC) at Naval Base Ventura County (NBVC), Port Hueneme, CA.

The purpose of the project was threefold:
1. Design of monitoring system
2. Installation and testing of system
3. Monitoring system data analysis

Between Fiscal Year (FY) 2006 and FY 2007, the project team gathered data and compiled a guidance document which assesses various monitoring technologies. Models were constructed and the system was designed using equipment procured from three different manufacturers.

The project team chose two demonstration sites at NBVC, Port Hueneme. Field installation of both systems was completed in 2009, and the one-year demonstration ended in late 2010. An interim report, issued in February 2010 concluded that after some initial calibration and modification, the system has performed with accuracy, and provided continuous measurement of the water turbidity, pH, conductivity, chlorine, Oxidation Reduction Potential (ORP), Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC), Continuous Spectral Data, temperature and pressure.

A final report is in the process of being prepared, and will include updated details on system performance and cost. Initial estimated investment costs for a system are $60,000 for hardware and $30,000 for fabrication and installation. Operation of the system involves quarterly calibrations and weekly system check out. Technical support ($5,000 to $15,000 annually) from vendors is also recommended.

This system provides an early warning system to mitigate water safety concerns through real-time monitoring technology combined with automated data communication, reporting and event warnings. Transitioning plans include conducting a survey of Navy water systems to validate users' needs, investigating interest and leveraging possibilities with the Army and Air Force, and coordination with Anti-Terrorism/Force Protection to integrate contamination monitoring with physical security and surveillance.

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Pollutant Source Tracking Helps Determine Source of Contaminants

Project type
Guidance Document

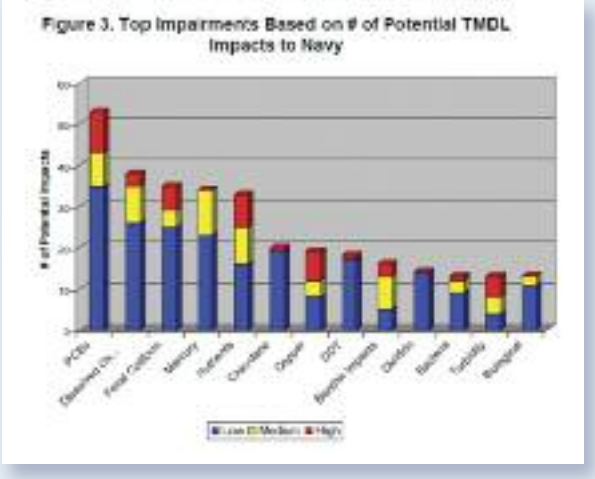
Project number
364

Project description
The nature and extent of pollution from Navy versus industrial sources is often difficult to discern, particularly when both entities share water bodies with complex patterns of contaminant deposition. Water and sediments may contain potential contaminants of concern (COC) from various sources, which confounds assignment of responsibility due to the complex character of COC mixtures.

Often, traditional methods of identification cannot track the contaminants to their respective sources. This complicates compliance in areas such as total maximum daily load (TMDL) analysis and storm water management.

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

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

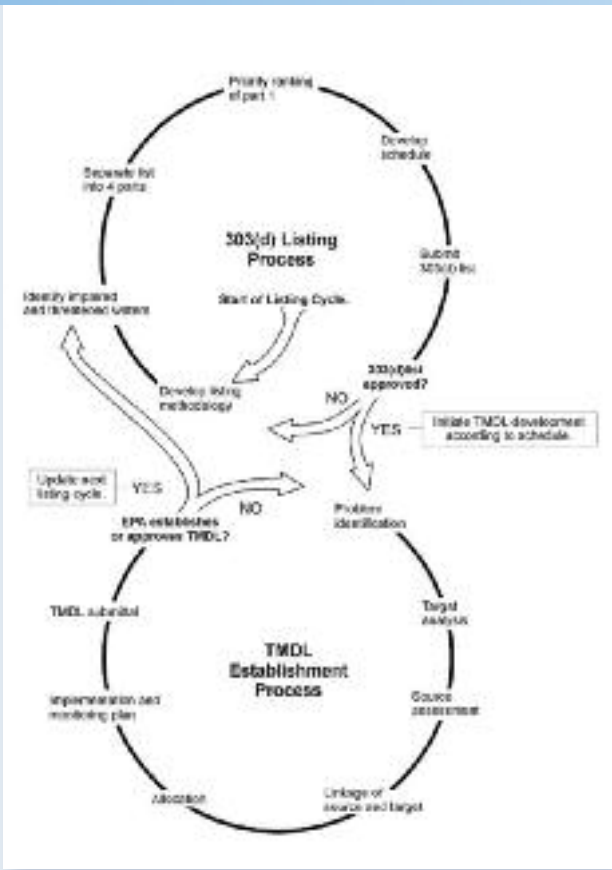


Recognizing and unraveling multiple sources of contamination typically requires more advanced chemical fingerprinting data than is acquired in a conventional Navy study. However, advanced chemical fingerprinting of large numbers of sediments can be cost-prohibitive.

The objective of this project, begun in 2006, is to accurately quantify Navy contaminant loads by identifying, reviewing, demonstrating, and validating source tracking technologies, and to develop a cost-effective technical framework for Navy water program managers to work with.

San Diego Bay Case Study

Copper isotopic ratios can be used to identify trends in seawater for estuaries and harbors that result from anthropogenic and natural geologic sources. For example, in San Diego Bay, isotopic measurements indicated the presence of a source with a more positive isotopic copper ratio than the bay's seawater. To identify this source, a more extensive analysis showed that those samples with a larger isotopic ratio than the ones from bay seawater were from sandy sediments with low copper concentration, which are considered reference sites, and are representative of geologic sources of copper to the bay. This was also supported by the fact that a Standard Reference Material Basalt Hawaii Volcanic Observatory has a copper isotopic ratio more positive than the seawater samples. In contrast, anti-fouling coatings and silty sediments with large concentrations of anthropogenic sources measured closer to zero than those measured in Bay waters. These anthropogenic and natural geologic sources explain the trend in copper isotopic ratios observed in waters of San Diego Bay.



The EPA Guidance on the 303(d) listing process and the TMDL establishment process.

The project team from the Space and Naval Warfare Command—Systems Center Pacific received leveraged assistance from the Strategic Environmental Research and Development Program, the Environmental Security Technology Certification Program, and the NESDI program.

The objective of this project is to accurately quantify Navy contaminant loads by identifying, reviewing, demonstrating, and validating source tracking technologies.

As a starting point, the team consulted a process outlined in a previous Navy report. (For more information, see Stout, S.A., J.M. Leather, and W.E. Corl, 2003. A User's Guide for Determining the Sources of Contaminants in Sediment: A Demonstration Study of PAH Sources in Sediments in the Vicinity of the Norfolk Naval Shipyard, Elizabeth River, Norfolk, VA. SPAWAR Technical Report 1907.) This project dealt with polyaromatic hydrocarbons (PAH), a commonly found organic contaminant at Navy facilities. Many aspects of the process are transferable to use with metals, bacteria, and other organic contaminants such as polychlorinated biphenyls (PCB).

Using this process as well as new research, the team created a user's guide for water program managers.

A first edition of the guide, released in 2008, contains information and analysis for three major contaminant categories: metals, bacteria and organics. For each of these categories, managers are introduced to a checklist of possible causal factors for contaminant release. The guide also educates managers as to the variables that could affect the TMDL; discusses various screening tools and analytical chemistry methods; and identifies data gaps. An update to the guide is now available that incorporates lessons learned during three recent demonstration projects. This can be found on the NESDI website or by contacting the author listed below.

A prioritization report, issued in 2006, listed 631 TMDL impacts to the Navy. This project provides water managers with a tool to help overcome these impacts by enabling them to:

1. Attribute existing contamination loads to support compliance programs
2. Clearly understand the suite of tracking technologies currently available, their strengths and weaknesses, as well as how those technologies can be used to develop management decisions for compliance
3. Use this scientific approach and these tools to prevent arbitrary and burdensome regulatory decisions and actions that negatively impact the Navy

The technical report concluded that more microbial source tracking research support is needed into the nature of fecal indicator organisms and also the reliability of the various methods.

In tracking metal contaminants, it was found that multiple approaches (statistical correlations, concentration gradients, and isotopic measurements) seem to provide better designation of sources. Some of these approaches are less mature than others, and further development is required in order to substantiate their application.

Organic contaminant tracking is a relatively mature field, particularly for PCBs and PAHs, which can be evaluated using methodologies such as rapid sediment screening (RSC) and advanced chemical fingerprinting (ACP). Such approaches have been successfully demonstrated at sites impacted by organic contaminants.

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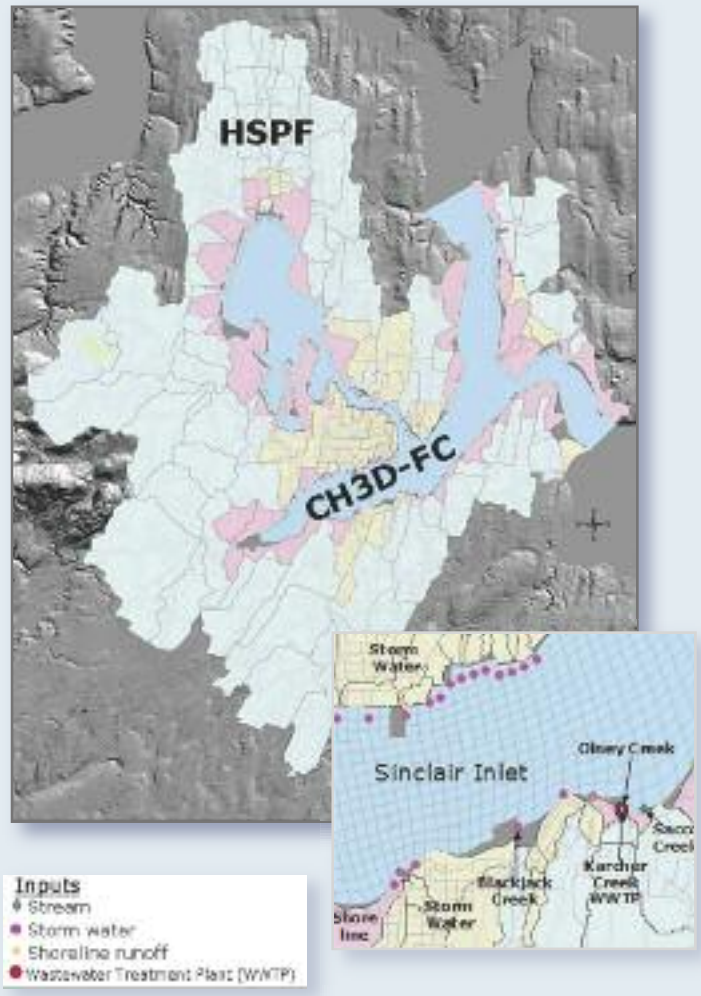
Predictive Aquatic Fate & Transport Model Characterizes the True Causes of Pollution

Project type
Model

Project number
396



Map of the Sinclair and Dyes Inlets showing streams (green watersheds), shorelines (pink watersheds), and stormwater outfalls (yellow watersheds) modeled by HSPF; the numerical grid of the receiving waters modeled by CH3D-FC, and detail of model inputs (inset).

Project description
Under the Clean Water Act (CWA), states are required to identify all water bodies that do not meet water quality standards. For those listed as impaired, water cleanup plans or Total Maximum Daily Loads (TMDL) must be developed to bring the water body back into compliance with standards. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.

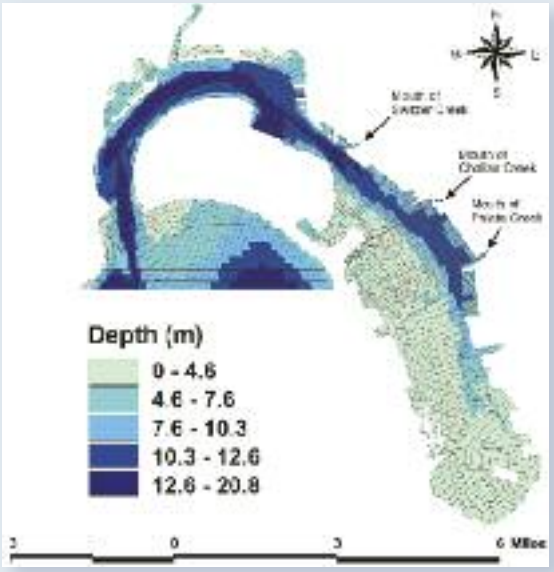
In the absence of scientifically defensible data and information, regulatory agencies may adopt very conservative assumptions and "worst case" scenarios when calculating the TMDL. This can result in regulatory decisions that may not be based on hard scientific evidence.

Many of these regulatory decisions involve tighter requirements on point source generators. ("Point source" refers to pollution that is discharged from a specific location such as a pipe, tunnel, or conduit.) However, there is significant potential for achieving real gains in water quality while spending less on compliance if the true sources of contamination are more accurately characterized. This means considering the contribution from nonpoint sources, such as land runoff, precipitation, atmospheric deposition, drainage and seepage.

Solid, scientifically based, technical approaches are needed to reduce the Navy's environmental liability arising from storm water and TMDL requirements. One such approach is the use of predictive models to accurately calculate TMDLs. These state-of-science computer models will help managers to better understand and more accurately quantify impacts of contaminant loads from both Navy and non-Navy sources.

The creation of such a modeling approach was the goal of this NESDI-funded project. Headed by Space and Naval Warfare Command (SPAWAR)-Systems Center Pacific, the collaborative efforts, such as the Puget Sound Naval Shipyard's Environmental Investment (ENVVEST) project, involved local, state and federal stakeholders.

ENVVEST used a watershed runoff and loading model developed by U.S. Environmental Protection Agency. This Hydrological Simulation Program-FORTRAN (HSPF), was applied to simulate runoffs over the watersheds surrounding Washington State's Sinclair and Dyes Inlets. The 3-D hydrodynamic and fate transport model (CH3D) was also used to simulate the currents driven by tides,



The CH3D model grid for San Diego Bay. Color scale is the bathymetry in meters. Note high density grids in the creek mouth areas.

Stormwater samples from the Sinclair and Dye inlets await analysis at the laboratory.

wind and freshwater inflows. For example, the TMDL study of fecal coliform in Sinclair and Dyes Inlet shows that watershed runoff from the storms would increase fecal coliform concentrations around the mouths of the streams. The elevated fecal coliform concentrations would dissipate within a few days due to hydrodynamic dispersion and fecal coliform die-off from salinity, temperature and Ultraviolet light.

Solid, scientifically based, technical approaches are needed to reduce the Navy's environmental liability arising from storm water and TMDL requirements.

The SPAWAR team utilized the modeling framework developed for the Sinclair and Dyes Inlet and adapted it for use in Navy harbors that face similar TMDL compliance issues. This combination model uses state-of-the-science numerical models, proven for their accuracy, and an efficient code to provide both fine spatial and temporal resolution and long simulation time. To date, it has been successfully applied to watershed systems at Navy facilities in three areas: Sinclair Inlet and Dyes Inlet, Pearl Harbor, and San Diego Bay to address TMDL and related issues for the Navy.

The project team also conducted model simulations to support Washington State Department of Ecology's load and waste load allocations for the fecal coliform bacteria TMDL. The model simulated actual conditions to identify areas that exceeded water quality standards. Simulations were also conducted to calculate the reduction in waste load needed to meet standards.

The integrated watershed monitoring and modeling approach to water quality management continues to help jurisdictions and stakeholders develop water cleanup plans that are focused on real problems, resulting in improvements in water quality.

In addition to the calculation of TMDL, this predictive model may be utilized in National Pollutant Discharge Elimination System (NPDES) discharges and vessel releases in Navy harbors. It could also be used to support better predictions of oil spill trajectories than those currently available. This approach has also proved to be critically important within the Uniform National Discharge Standards (UNDS) program.

Without predictive modeling, millions of dollars will continue to be spent regulating discharges without regard to managing pollution sources in a cost-effective manner, or improving ambient water quality. In order to save money, protect environmental resources, and assure that the fleet can operate without crippling restrictions, it is critical to adopt such state-of-science computer models to better understand and more accurately quantify impacts of contaminant loads from Department of Defense (DoD) sources.

A final report and software package are being prepared for transfer to other Navy and DoD activities.

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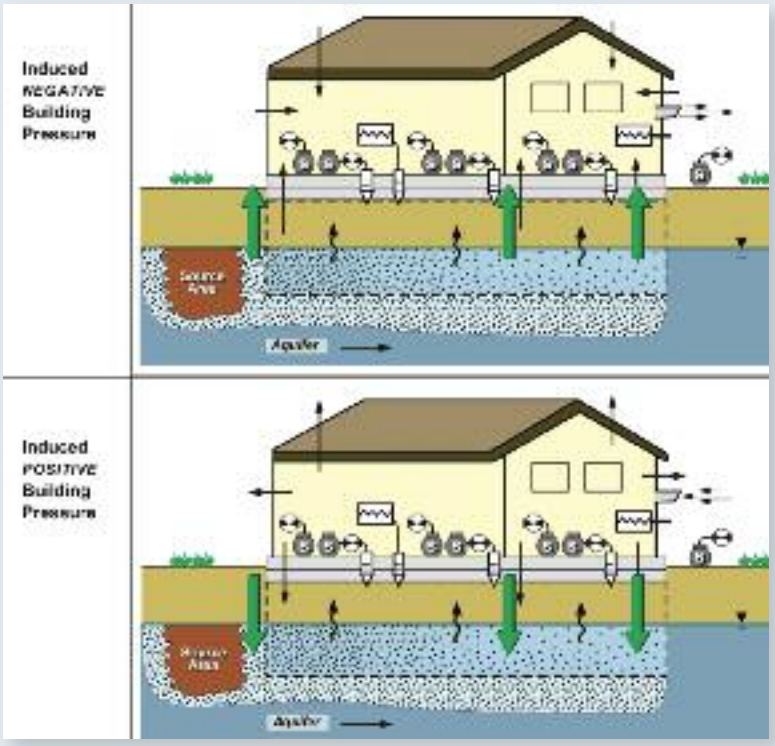
Improved Assessment Strategies for Vapor Intrusion

Project type
Guidance Document

Project number
424



How pressure cycling works.

Project description
Vapor intrusion (VI) is a form of indoor air pollution caused by the migration of chemical vapors from contaminated soil and groundwater into buildings. This exposure pathway has attracted significant attention from regulatory agencies over the past decade in response to several well-publicized cases.

VI assessments are performed during Environmental Restoration, Base Realignment and Closure and at Underground Tank Storage sites. To date, the Navy has spent more than 6.9 million dollars on VI-related costs.

A recent survey of Navy Remedial Project Managers at 97 sites found 25 bases where VI issues are being addressed. The known costs for addressing the issues at these bases ranged from $20,000 to 1.1 million dollars per installation.

Part of the reason for these high costs is the fact that there are many uncertainties involved with the current methods of VI assessment. These uncertainties stem from the unknown relationship between subsurface contaminants in water, soil or soil gas to indoor air concentrations. In other words, if indoor air is found to be contaminated, is it due to subsurface contaminants or other ambient sources within or around the building?

To date, traditional assessments have relied primarily on modeling to predict indoor air exposure levels from subsurface concentrations. However, site-specific conditions limit the ability of these models to provide accurate predictions, generally leading to overly conservative assessments.

The NESDI program has been supporting the Space and Naval Warfare Command-Systems Center Pacific since 2008 on research and development on reducing costs and uncertainties associated with VI assessments. This work is done in partnership with the Naval Facilities Engineering Service Center and industry. A group of subject matter experts was tasked to identify existing best practices, knowledge and data gaps, and future research in VI assessment strategies.

Various types of passive air samplers were used for the demonstration.

A traditional method of sampling sub-slab air includes the Inficon Hapsite® system used with conventional Summa canisters and verification of air pressure difference between in-floor and sub-slab.

In 2009, the team released a technical report offering suggestions for research in the following three focus areas identified by a group of Navy end-users:

- Sub-surface sampling that minimizes intrusive sub-slab sampling
- Indoor air sampling methods to improve VI exposure estimates
- Methods to differentiate between indoor and VI sources

Technical Report 1982 is now available to the public at www. spawar.navy.mil/sti/publications/pubs/tr/1982/tr1982cond.pdf.

This project resulted in a technical report that identifies existing best practices, knowledge and data gaps, and future research in vapor intrusion assessment strategies.

Navy site managers and the public can utilize the technical report for current assessment approaches in these focus areas. The technical report supports improved VI assessments by following a methodology accepted by the regulatory and scientific communities. The recommendations specifically provide direction on collecting groundwater and soil gas samples and conducting field investigations.

Based on the technical report, a project team made up of Navy users determined that the best potential for cost-effective reduction of the overall uncertainty associated with VI assessments is to develop an integrated strategy that combines direct measurement methods with forensic methods to partition background sources. Three critical technologies were identified, including:

1. The use of pressure cycling for differentiation between background and VI
2. The use of quantitative passive samplers for measurement of long-term average indoor air concentrations more representative of health exposures
3. The use of portable analytical systems for the identification of indoor areas of greatest concern

The traditional way to sample indoor air is the large summa canisters sitting on the shelf. The small passive samplers hanging above are a less intrusive option.

Two of these technologies, passive samplers and pressure cycling, are in the process of being demonstrated. The team currently does not have sufficient funding to pursue the third technology. However, a proposal on the demonstration of portable analytical systems has been recently accepted or funding by the Environmental Security Technology Certification Program.

To promote regulatory acceptance, the demonstration of pressure cycling is concurrently verified by the U.S. Environmental Protection Agency's Environmental Technology Verification (ETV) program. A technical quality assurance plan was developed by the ETV team for concurrent verification of the results from the demonstration of pressure cycling technology at Navy installations. Once complete, a final report will be posted at the ETV website for public and regulatory access.

Through the site manager survey conducted by the team, it became apparent that many sites may be eligible for No Further Action with the appropriate data to support such a decision. The potential for return on investment for this project is significant, based on its ability to continue to research and provide cost-effective, accepted solutions to support these decisions.

*All photos taken by Ignacio Rivera.

Tube-style passive samplers known as automated thermal desorption samplers were used to sample sub-slab air.

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The TDWG 2010

PROFILES IN COMMITMENT

THE TECHNOLOGY DEVELOPMENT WORKING GROUP

The members of the TDWG provide a wide range of insights into Navy operations as well as different perspectives regarding the ongoing efforts of other R&D programs—all useful to the NESDI program manager as she tries to oversee the execution of the NESDI program year after year. These TDWG members, with over 250 years of professional experience, have demonstrated an ongoing commitment to the NESDI program for the past several years.

The following profiles provide a glimpse into the expertise and perspectives of all 11 members of the NESDI program's management team as well as our N45 action officer.

Leslie Karr

Organization

Naval Facilities Engineering Command
(Port Hueneme, CA)

Education

- B.S., Biological Sciences,
  University of Southern California
- M.S., Environmental Engineering,
  University of Southern California

Experience

Prior to assuming my current position in 2009, I was a research environmental engineer for the Naval Civil Engineering Laboratory and the Naval Facilities Engineering Service Center for 29 years.

I have been a Principal Investigator for a wide range of emerging issues facing the NAVFAC community, from leak detection systems in bulk fuel tanks at Red Hill, to metal contamination at small arms ranges at Quantico and Camp Pendleton, to dredge sediment beneficial reuse options at Pearl Harbor.

Connections

I became involved with the range community early on with metal contamination from small arms ranges, and most recently from interactions due to the potential contaminants from seafloor communication cables. These projects were complemented with academic relationships to fulfill gaps in the research and provide an unbiased look at the data.

For over 20 years, I have been part of the Science Advisory Board for an International Conference (sponsored by the Association for Environmental Health and Sciences) with ties to current regulatory trends, the industrial application of technology and government sectors. I have also served as a stakeholder for the EPA's Environmental Technology Verification Program (ETV). These connections enable me to see if we are in sync with the rest of the environmental community on RDT&E and compliance issues.

Since I have been a Principal Investigator with the NESDI, SERDP, ESTCP, Legacy, and SBIR programs, I am familiar with the personnel and processes that make RDT&E work-ensuring that the results of your research are implemented into everyday business practices.

Perspective

Since I became a part of the Navy research community, the NESDI program has been the primary environmental RDT&E program that supports in-house Navy expertise. I wanted to use my experience and expertise to add to the program's strengths and increase its credibility in the Navy community. I have seen firsthand where our colleagues in the field are struggling and need help to maintain their environmental compliance status and become more efficient with innovative technologies.

Cindy Webber

Organization

Naval Air Warfare Center—
Weapons Division (China Lake, CA)

Education

- B.S., Chemical Engineering,
  University of California Riverside

Experience

I have worked in the Chemistry Research Department at China Lake since 1998. My laboratory work includes polymer synthesis and scale up and sample preparation for ESTCP demonstration and validation efforts.

In addition to my laboratory work, I have seven years of experience in the environmental field including organizing an annual information exchange of enlisted Sailors and Marines with aviation maintenance roles and environmental responsibilities. I am presently serving as an Environment, Safety, and Occupational Health (ESOH) Coordinator for several acquisition programs including Broad Area Maritime Surveillance (BAMS), Vertical Take-Off and Landing Unmanned Aerial Vehicle (VTUAV), Sidewinder, Joint Air-to-Ground Missile System (JAGM), Joint Standoff Weapon (JSOW), and Consolidated Afloat Networks and Enterprise Systems (CANES).

Connections

I have direct connections through China Lake's research department and am an active participant in the Navy's Corrosion Fleet Focus Team. In my role as an ESOH Coordinator, I have insights into a number of acquisition programs including BAMS, VTUAV, Sidewinder, JAGM, JSOW and CANES. In this capacity, I have written Programmatic Environmental Safety and Health Evaluations, generated documentation in support of the National Environmental Policy Act, and reviewed a range of documents including Hazardous Materials Management Plans and reports and Environmental Assessments.

In addition, I have strong professional relationships with the General Series Maintenance Manual Logistics Element Manager, engineers at all three of the Navy's Fleet Readiness Centers and NAVAIR's Materials Laboratories.

Perspective

The NESDI program has provided our RDT&E personnel with funding to demonstrate, validate, and authorize new materials and processes for a more sustainable Navy. Over the years that I have been involved with the NESDI program, I have seen it dramatically improve its needs collection and project execution processes and speed the transition of its research into the daily operations of the fleet.

Bob Neumann

Organization
Chief of Naval Operations Energy
and Environmental Readiness Division
(Arlington, VA)

Education
- B.S., Mechanical Engineering,
  University of Connecticut
- M.E., Environmental Engineering,
  University of Florida

Experience
I have 21 years of experience with the Navy including five years in the Navy as a Surface Warfare Officer onboard USS Bainbridge (CGN-25) as the electrical officer, reactors control officer, and repair officer. I joined N45 as the RDT&E Action officer in February 2010. Prior to that, I was a Principal Investigator and conducted research on shipboard oil pollution abatement systems at the Naval Surface Warfare Center Carderock. I also have ten years of experience in private industry providing program management and engineering support to N45 and NAVSEA.

Connections
As the N45 RDT&E Action Officer, I interact with representatives from Assistant Secretary of the Navy, the Office of Naval Research, NAVSEA, SPAWAR, Commander, Navy Installations Command, NAVFAC, the Office of the Secretary of Defense, ESTCP, SERDP, and the other services to facilitate the exchange of information related to environmental R&D efforts, needs, and requirements.

Perspective
In my capacity as N45's Action Officer for the RDT&E program, I manage RDT&E issues for Navy shore and range operations; oversee efforts to identify operational capability deficiencies that potentially need RDT&E solutions and use that understanding to develop environmental readiness capability requirements; develop long range strategies/policies, integrated plans, capability plans, budget exhibits, policies, and other supporting documentation to lead the Navy's program and to secure funding for RDT&E projects; and evaluate the overall direction of the Navy and identifies opportunities for RDT&E to support and enhance operational capabilities. The NESDI program allows fleet and Navy installations to remain in compliance with environmental laws and regulations. It provides Navy personnel with the knowledge and credibility to produce validated knowledge, models, and decision tools that support science-based decision making and improve regulatory outcomes. The program develops alternative processes, materials, and equipment that reduce environmental impacts that lead to improved regulatory compliance, fewer operational impacts, and lower lifecycle costs.

Jeff Heath

Organization

Naval Facilities Engineering Command
(Port Hueneme, CA)

Education

- B.S., Civil Engineering,
  Purdue University
- M.B.A., California Lutheran University

Experience

I have over 29 years of experience with the Navy working in various environmental programs including water quality, wastewater treatment, hazardous waste management, solid waste recycling, environmental restoration, and innovative technology transfer. Most of my work has involved the development and demonstration of new technologies, including obtaining EPA approval of a new test method for detecting chlorine residual in wastewater, recycling contaminated sand blast grit to cement kilns, and adapting mining technologies to remove lead from soil at small arms ranges.

Connections

As the environmental program manager and customer liaison for NAVFAC ESC, I review all RDT&E proposals submitted to ESTCP, SERDP and NESDI to ensure they leverage other efforts and resources to the maximum extent possible. I am familiar with NAVFAC operations and priorities and solicit input on technology needs through our Media Field Teams, Product Line Managers, and Business Line Managers.

Perspective

The NESDI program is an excellent way for the Navy to bring new technologies into routine use, reducing the overall cost of environmental compliance for our customers. The NESDI program provides the avenue for our top engineers and scientists to bring environmental innovation and fresh ideas into reality.

Stacey Curtis

Organization

Space and Naval Warfare Systems Command—Systems Center Pacific (San Diego, CA)

Education

- B.S., General Engineering, Oregon State University
- M.B.A./Certificate in Environmental Management, National University

Experience

I have worked for the Navy for over 30 years in a variety of fields including undersea acoustics, at-sea test and evaluation, image and signal processing, data management, environmental science, risk assessment and technology transfer/commercialization. For the past 16 years, I have worked primarily in environmental RDT&E and applied support, including investing marine environmental quality and sediment issues and managing a range of environmental projects under the NESDI program at the Space and Naval Warfare Systems Command (SPAWAR)-Systems Center Pacific (SSC Pacific). I now head the Environmental Assessment and Sustainability Section within SSC Pacific's Environmental Sciences Branch.

Connections

Throughout my career I have worked collaboratively across the RDT&E community within the Navy, Army Corps of Engineers (ACOE) and other agencies including the Department of Energy, the National Oceanographic and Atmospheric Administration and the U.S. Environmental Protection Agency (EPA) as well as academia and the SERDP and ESTCP programs. Over the past 15 years or so, I have provided direct environmental support to NAVFAC through the Ecological Risk Technical Assistance Team, the Risk Assessment Workgroup, and participated in the Tri-service Ecological Risk Assessment Work Group. I serve on the Interstate Technology Regulatory Council Sediment Bioavailability Team and the Steering Committee for the Memorandum of Understanding among SSC Pacific, ACOE and EPA for sediment research.

Perspective

The NESDI program has the ability to demonstrate and validate innovative technologies to address the Navy's environmental challenges and support fleet readiness. Through active interaction among environmental end users, the research and development community and NESDI sponsors, the program can provide valuable solutions to critical environmental issues and help the Navy effectively meet environmental requiremen

Jerry Olen

Organization
Space and Naval Warfare
Systems Command
(San Diego, CA)

Education
- B.S., Environmental Engineering,
  California State University
- M.A., Political Science,
  Midwestern University
- Air Command and Staff College,
  Air University, Maxwell Air Force Base

Experience
I have over 15 years of experience working with both the Air Force and Navy environmental programs with a specific focus on integrating environmental requirements and considerations into Programs of Record (POR). I have worked on environmental issues across all media, ranging from the installation of systems on the seafloor to launching and sustaining assets in space.

Connections
In administering SPAWAR's Environmental Readiness in Acquisition Program, I am able to see how warfighter needs evolve into the development of new technologies. I work across many communities to ensure that environmental considerations are being incorporated into the development and procurements of new systems. I am involved in each SPAWAR POR by reviewing acquisition documentation prior to milestone reviews and during Integrated Logistic Assessments. I work within the Navy range community to facilitate the testing of new systems and the integration of these requirements into the Navy's Phase II Environmental Planning for Navy Military Readiness and Scientific Research Activities At Sea. As a result, I am witness to requirements ranging from the integration of environmental considerations into the design and manufacturing to the issues that have to be mitigated to ensure the successful testing and fielding of these new systems.

Perspective
The NESDI program is a valuable asset to help me solve environmental technical challenges for the many ongoing programs and projects at SPAWAR. Two recent examples include:

1. Researching the use of laser technologies within the marine environment which filled a critical data gap-validating the NEPA sections of our PESHEs for in-water laser use for underwater communications and sensing.
2. Evolving NAVAIR's PESHE Document Authorizing Tool to become a Navy standard. This project will drive efficiencies into PORs requirements to prepare PESHEs and help me more effectively foster consistency and influence program decisions.

The NESDI program continues to be responsive to SPAWAR's environmental technology needs and challenges.

Eric Rasmussen

Organization
Naval Air Warfare Center — Aircraft Division
(Lakehurst, NJ)

Education
- B.S., Chemical Engineering, Rutgers University
- M.S., Chemical Engineering, Rutgers University

Experience
I've been working in the environmental world for the past 18 years. My experience started with the Navy's efforts to phase out the use of Ozone Depleting Substances (ODS) as required by the Montreal Protocol. I supported this phase out effort by developing software systems that helped NAVAIR identify where ODSs were being used in their maintenance processes. I also facilitated the integration of a non-ODS substitute for cleaning oxygen system components on both carrier- and shore-based maintenance shops. Following that effort, I developed an automated tool that supported NAVAIR's effort to identify and reduce hazardous materials in their aircraft maintenance processes. I've been supporting the NESDI program since 2006 through the development of a collaborative work flow web site that captures and serves all aspects of the program's business processes.

Connections
I have developed significant professional relationships with personnel involved in the operation of Fleet maintenance processes especially as it pertains to the use and elimination of hazardous materials across the fleet.

Perspective
From my perspective as a systems and web site developer, the NESDI program provides me with an opportunity to provide software solutions that improve the operation of the program. Ongoing enhancements to the web site allow the program to advance its impact despite reductions in program resources. And the TDWG's team chemistry provides for productive collaborations that further support the good work that the program is doing to protect the environment.

Bruce McCaffrey

Organization
Bruce McCaffrey Consulting, Inc.

Education
- B.A., General Program of Liberal Studies, University of Notre Dame
- M.S., Public Management and Policy, Carnegie-Mellon University
- Organizational Development/ Change Management Certificate, Georgetown University
- Certified Joint Application Design Facilitator

Experience
For over ten years now, I have owned and managed my own small environmental consulting firm which specializes in environmental program management, facilitation and management consulting. I have over 23 years of experience helping to organize and execute environmental and R&D programs for the U.S. Environmental Protection Agency and the U.S. Navy. I am Managing Editor of the Navy's quarterly environmental magazine called *Currents*—sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division (N45). For the past several years, I have provided strategic planning, communications and management consulting support to the NESDI program which has included developing the program's Standard Operating Procedure, helping to execute its business practices and promoting its successes via an annual report and Currents articles.

Connections
As Managing Editor of *Currents*, I have been granted great access to the NESDI program's resource sponsor (N45) as well the folks who manage environmental programs at Naval installations and onboard Navy ships. It has been very beneficial to have insights into N45's priorities to ensure that the NESDI program remains properly focused. It is also helpful to understand the challenges faced by field installation and ship personnel who are critical to the identification and integration of NESDI-sponsored projects.

Perspective
The NESDI program has established a process that works-from the annual solicitation and ranking of needs through to the successful integration of projects into field operations. The program undergoes a healthy amount of critical thinking about where it can increase its impact with the resources it has paired with a commitment to make the changes necessary to realize those impacts.

Bill Hertel

Organization
Naval Surface Warfare Center,
Carderock Division
(West Bethesda, MD)

Education
- B.S., Mechanical Engineering,
  University of Maryland

Experience
I have nearly 22 years of experience developing solutions to Navy environmental and industrial process challenges. I support a wide variety of Navy and DoD environmental projects and programs by serving as a technical committee member or by providing direct technical consultation, topic submissions, needs or other input to program managers, technical warrant holders, principal investigators and Navy contractors. I also execute and oversee RDT&E in applied research through production-level technology development and integration to provide sustainable environmental technology solutions for ship and shoreside applications in areas including niche industrial processes, industrial wastewater processing and treatment and underwater ship husbandry applications. Notable accomplishments include the Navy's trailer stowed refrigerant recovery and recycle system deployed worldwide at over 25 Navy facilities and the Navy's Advanced Underwater Hull Cleaning System.

Connections
I have connections to a wide variety of scientific, technical and programmatic expertise, contacts and facility assets developed through years of relationship building with representatives of the Navy, Army, Air Force, Coast Guard, EPA, Department of Energy, universities, and industry. These relationships are essential to achieving a significant level of support and cooperation from active duty and civilian personnel responsible for policy making, program management, platform and facility asset operation and maintenance, and the direct execution of DoD mission responsibilities. These relationships are key to achieving technology development goals and deploying high quality solutions to the warfighter.

Perspective
I believe that the NESDI program is consistent with my philosophy that outreach to the fleet and the user community is achieved through the support of echelon II Commands and their representatives and guided by CNO policies and directives that identify and prioritize needs and requirements. The NESDI program works proactively and comprehensively with all parties to develop and field robust, sustainable technologies and methodologies that have a direct and positive impact on individual users and the Navy at large.

Barbara Sugiyama

Organization
Naval Facilities Engineering
Command Engineering Service Center
(Port Hueneme, CA)

Education
- B.S., Environmental Engineering,
  Florida Institute of Technology

Experience
I have served as a research environmental engineer for over 20 years where I have been the Principal Investigator on several NESDI, SERDP and ESTCP projects primarily focusing on wetlands as treatment systems, small arms range remediation and underwater ordnance. Most recently, I managed a NESDI project that studied the potential environmental effects of underwater unexploded ordnance. This involved managing five individual projects and a follow-on ESTCP effort.

Connections
The key to managing successful research projects is to assemble a strong research team. I have developed effective research teams that draw technical experts from other Navy activities, the Army Corps of Engineers and private sector contractors. Executing these projects with a focus on teaming has resulted in numerous professional contacts at organizations including the U.S. Army.

Currently I serve as the NAVFAC representative to the ESTCP Resource Conservation and Climate Change Technical Panel as well as the NESDI program's link to the NAVFAC Munitions Response Program Workgroup. I help to ensure that all NESDI projects provide an end-product that is valuable to our customers. I also provide guidance to the NAVFAC Principal Investigators on the execution of their projects.

Perspective
The NESDI program provides a robust pathway for Navy unique environmental issues to be resolved. The program aims to make the end-users part of the research team to ensure that their needs are met.

Lynn Cahoon

Organization
In-Service Support Center-East
(Cherry Point, NC)

Education
- B.S. Professional, Chemistry,
  East Carolina University

Experience
I have 30 years experience working in the aviation industry and have direct interaction with individuals who have initiated and completed a number of RDT&E projects. For the past ten years, I have conducted Fleet visits that provide feedback to the acquisition communities on technology deficiencies our Sailors and Marines face when performing maintenance procedures. They must have the best possible technologies that help them achieve their mission and meet or exceed the governing regulations.

Connections
I reside at one of the Navy's three Fleet Readiness Centers and have direct access to the individuals who can make the necessary changes to industrial processes which will ultimately influence the integration of new technologies and methodologies. I am a proponent for the Sailors and Marines since I work closely at all levels of aviation maintenance. My involvement has led to the introduction of an improved paint gun and equipment cleaner being utilized at all levels of maintenance and a non-chemical means for carbon removal on General Electric F-404 engine drive shafts for use at the Intermediate level of maintenance.

Perspective
The NESDI program collects solicited and unsolicited information from the Fleet and in turn provides Sailors and Marines the technologies they need to support their mission while being environmentally compliant in the process. I am passionate about my involvement with the NESDI effort and feel the Sailors and Marines are getting proven, dependable and robust technologies as a result of our efforts. The fact that all System Commands are involved in the NESDI program lends itself to a more collaborative, open-minded approach for determining the right solution to the challenges at hand.

Nick Paraskevas

Organization
Naval Air Systems Command
(Patuxent River, MD)

Education
- B.S., Aerospace and Ocean Engineering,
  Virginia Polytechnic Institute and State University
  (Virginia Tech)

Experience
I began my career 35 years ago as an aerospace engineer. While at the Naval Surface Warfare Center Carderock, I conducted research on advance ship designs. Fourteen years ago, I became an environmental engineer and oversaw the facility and environmental programs at both SPAWAR and NAVAIR RDT&E centers. My current responsibilities include providing guidance, consultation and environmental planning support to NAVAIR acquisition program managers. I am NAVAIR's subject matter expert in National Environmental Policy Act (NEPA) planning and execution. I serve as NAVAIR's representative on the N45-led NEPA oversight working group and am helping NAVAIR program managers in getting their future RDT&E requirements into the upcoming Navy environmental planning documentation.

Connections
As the deputy of NAVAIR's Environmental Programs Department, I provide technical assistance to NAVAIR acquisition program managers, NAVAIR RDT&E ranges and Fleet Readiness Center communities. Through my insight into their programs, I seek to influence and assist them in meeting their environmental program requirements. I plan, program, budget and oversee environmental compliance funding and execution at the NAVAIR and NAVSEA RDT&E ranges. I meet with aviation program staff and offer advice on how current or upcoming environmental laws and regulations may impact their program cost, schedule and performance.

Perspective
I support the NESDI program because it offers NAVAIR's acquisition community a means to reduce their dependence on hazardous materials. By implementing NESDI proven technologies aviation programs can reduce total ownership costs which reducing environmental program risks.

*All TDWG photos (with the exception of Bob Neumann and Nick Paraskevas) taken by C. Kurt Holter.

The Case for Success 2010

ENHANCEMENTS TO THE PROGRAM WEB SITE

After unveiling the program's consolidated web site in FY06, program personnel implemented a series of enhancements in FY10 to better execute the program. The program web site (www.nesdi.navy.mil) provides a single, centralized repository for information pertaining to the management of the program and execution of program-sponsored projects. The site promotes more efficient management of program information and more timely communication of critical deadlines and other information to key program personnel across the Navy. The web site also allows personnel from other R&D programs to have up-to-date insights into the NESDI program's priorities and ongoing projects. Its simple, efficient, and provides site visitors with quick access to program resources and information.

The following enhancements were made to the program web site in FY10:

- **Track Actions.**
  Due to the quantity and diversity of actions assigned during the course of its daily operations, the program needed a better mechanism for tracking the status of assignments made to program personnel. As a result, an action tracking function was developed to provide a structured process for defining, assigning and tracking actions. This collaborative process automatically notifies personnel once an action has been assigned to them and provides instructions on how to update the action's status using the web site. This function also notifies NESDI program management once progress has been made on a particular action. Global reminders were also incorporated that allow the program manager to alert personnel whose actions need attention. The process is completely automated and embedded into the web site's database so all actions are accomplished within the confines of the web site.

- **Track Technology Integration Efforts & Associated Cost Benefits.**
  Once the program's demonstration and validation efforts are complete, the program's resource sponsor expects Principal Investigators and others to support the transition of the resultant technology into the Navy's ongoing business practices and operations. Given this emphasis, there was an outstanding need to organize and track the progress and costs associated with technology integration efforts and, therefore, an integration component was built into the web site. This function, called the Technology Integration Cost Analysis (TICA), tracks the integration efforts for each project including ongoing status and technical authority. TICA also provides site specific cost analysis data that allows for the generation of a number of calculations including payback, return on investment, and cost effectiveness ratios. These values are calculated using the amount of RDT&E funds invested by year as well as basic cost data including the number of units, inflation, and per unit costs (for the old versus the new technology). TICA now provides program personnel with the ability to quantify the success that the program is having at integrating technologies as well as the cost benefits for each technology or program wide.

- **Incorporate Sponsor Collaboration.**
  Before FY10, much of the participation from the program's sponsor (N45) was accomplished outside of the confines of the web site via discussions, meetings, and e-mails with no easy way to capture the decisions made (with regard to needs, proposals and funding) and the justification for those decisions. As a result, a function was incorporated into the web site that captures participation from the program's resource sponsor in the program's yearly execution cycle-from needs collection through technology transition.

PROGRAM WEB SITE

- **Coordinated Program Requirements with ESTCP.**
  Since the NESDI program is the Navy complement to ESTCP, the NESDI program aligns the data required in its proposals and projects with those of ESTCP. The NESDI web site was modified in FY10 to be more consistent with ESTCP and provide more uniformity for the Principal Investigators and other team members who participate in both programs.

- **Improved Financial Tracking and Reporting.**
  In FY10, the project financial tracking function on the NESDI web site was improved to better define current funding provided and expended as well as planned and future requirements. This enhanced function has enabled the program to provide improved reporting capability from a project- and program-wide perspective.

- **Compiled Program Manual and Updated User Guides.**
  Also in FY10, the NESDI program released a manual containing all of the documents essential to the timely and successful execution of demonstration/ validation (dem/val) projects sponsored by the NESDI program and/or other projects leveraged with funding from other dem/val programs. This manual provides Principal Investigators and other program personnel with the necessary guidance and templates for completing the documentation required for each program project. Among the updates included in this manual are guides for submitting and evaluating needs, submitting and evaluating proposals, writing Project Management Plans, and writing final reports.

- **Completed Project Summaries.**
  To document the results of the program's completed projects, a project summary template was developed and uploaded to the NESDI web site. In FY10, a number of project summaries were finalized using this template and uploaded to the web site.

- **Enhanced Fact Sheet Design.**
  The content and design for the program's on-line project fact sheets were also enhanced in FY10 resulting in 18 fact sheets now available via the NESDI web site.

The Details Behind the NESDI Web Site

The web site serves two primary program requirements:

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

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:

   - Collects and leverages 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.
   - Provides automated feedback services to the submitters of needs and proposals and provides final review results via automated emails.
   - Provides 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.
   - Collects and manages data for research proposals and funded projects such as financial requirements/expenditures, schedule, milestones, and status updates.
   - Provides reporting capability for various metrics which are use to present progress to the program's resource sponsor.

The web site platform utilizes two basic technologies:

1. The client requests and server responses are handled using Microsoft Active Server Pages (ASP) NET.

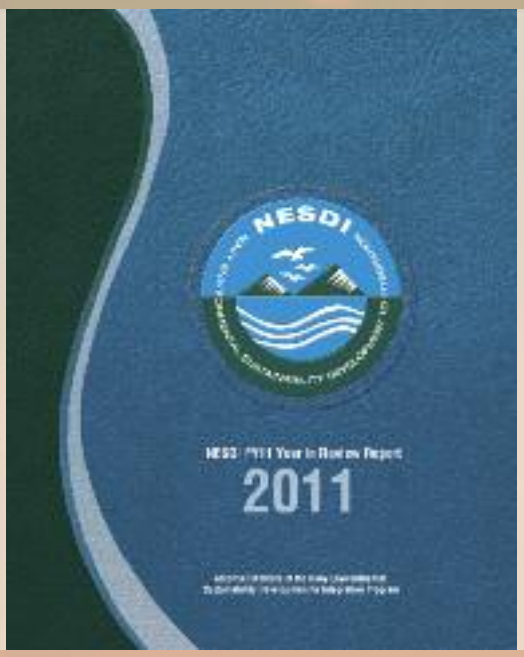
   This is the component that handles information requests from each user and provides the output back to their browser.

2. The database platform used is Microsoft SQL Server 2005 which is the repository for all program data and serves as the retrieval point for all data requests made through the website.

What's next:

PLANS FOR FY11 & BEYOND

In FY11, 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 daily operations of the Fleet.



The program has established the following specific goals to be achieved in FY11 and beyond:

1. **Enhance 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 NESDI across N45 and elsewhere. This will be accomplished via regular programmatic reviews, publication of program successes in *Currents* magazine and other publications, and the initiation of a regular NESDI newsletter.

2. **Continue to develop strategic plan and roadmaps.**
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, stormwater, and climate change areas while a roadmap for the elimination of hexavalent chromium will be developed in conjunction with the draft NAVAIR Engineering Circular on Non-chromate Coatings Systems. Plans are also underway to initiate a roadmap to guide program investments across NAVSEA. Now that N45's environmental readiness and energy security portfolios have merged, a roadmap in the alternative and renewable energy arenas will be discussed.

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.

4. **Improve needs collection.**
NESDI program personnel will take a number of steps in FY11 to further improve its needs collection process:
   a. Initiate field visits to improve communication with end users and need submitters.
   b. Pre-screen needs and follow up with need submitters for additional insights and clarification before a final ranking occurs.
   c. Designate a technical program liaison with NAVFAC Media Field Teams, the Corrosion Fleet Focus Team and other field teams.

5. **Establish and maintain connections with other teams.**
In an effort to foster partnerships and leverage expertise, the NESDI program will also establish and/or maintain connections with other programs and teams including DoD's Materials of Emerging Regulatory Interest Team (MERIT), the Range Sustainability Group, DoD's Legacy program, and ESTCP.

6. **Manage out-of-cycle requests for support.**
Subject to funding availability, the NESDI program will also continue to entertain requests for support that fall outside of its annual business processes. These requests include 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 N45 as needed.

7. **Maintain focus on technology integration.**
To promote the successful integration of program-sponsored projects, NESDI program personnel will conduct site visits, encourage a focus on technology transition with other partners and activities, and maintain an ongoing dialog with end-users to increase their participation in annual program IPRs.

8. **Enhance program web site.**
Finally, the NESDI program will continue to enhance its web site via the addition of a repository for final reports, an updated design and other functional upgrades.

FY11 SCHEDULE

WHAT	OCT	NOV	DEC	JAN	FEB
Announce Needs Solicitation	16 Oct (for FY11)				
Complete Needs Collection Process		18 Nov			
Screen Needs			2 Dec		
Evaluate & Rank Needs				10-14 Jan	
Obtain Sponsor Review & Approval of Needs				17-28 Jan	
Request Pre-proposals					4 Feb
Close Pre-proposal Collection					
Collect Comments on Pre-proposals					
Evaluate Pre-proposals					
Request Full Proposals					
Collect Full Proposals					
Collect Comments on Full Proposals					
Screen Full Proposals					
Evaluate Full Proposals					
Obtain Sponsor Review & Approval of Full Proposals					
Conduct In-Progress Reviews					
Quarterly Status Reports Due	15 Oct			15 Jan	
N45 Programmatic Review	7 Oct			20 Jan	

MAR	APR	MAY	JUNE	JULY	AUG	SEPT
				12 July (for 2012)		
8 Mar						
22 Mar						
28-31 Mar						
	1 April					
			2 June			
			16 June			
			By 21 June			
			28 -30 June			
				22 July		
		West: 16-21 May	East: 20-24 June			
	15 April			15 July		

FOR MORE INFORMATION

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For more information about the operation of the NESDI program, contact Leslie Karr, the program manager, at 805-982-1618 (DSN: 551-1618) and leslie.karr@navy.mil.

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

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The Case for Success

2010

Accomplishments of the Navy Environmental Sustainability Development to Integration Program

Available for download at www.nesdi.navy.mil.