

# 2018

## YEAR IN REVIEW REPORT



Accomplishments of the

**NAVY ENVIRONMENTAL SUSTAINABILITY  
DEVELOPMENT TO INTEGRATION PROGRAM**



## CONTENTS

Mission of the NESDI Program . . . . .	1
A Word From Our Program Manager . . . 2	
Financial Highlights . . . . .	4
The NESDI Program Process . . . . .	6
1. Collect, Validate & Rank Needs	
2. Collect, Evaluate & Rank Proposals	
3. Execute Projects	
4. Integrate Solutions	
Results of Our FY18	
Needs Solicitation . . . . .	8
Our FY18 Project Accomplishments . . . 9	
Our FY19 Schedule . . . . .	50
Promoting Our Successes . . . . .	51
For More Information . . . . .	52



## MISSION OF THE NESDI PROGRAM

The mission of the NESDI program is to provide solutions by demonstrating, validating and integrating innovative technologies, processes and materials; and filling knowledge gaps to minimize operational environmental risks, constraints and costs while ensuring Navy readiness and lethality. 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 Research, Development, Test & Evaluation (6.4) program. The NESDI technology demonstration and validation program is sponsored by the Chief of Naval Operations Energy and Environmental Readiness Division (OPNAV N45) and managed by the Naval Facilities Engineering Command (NAVFAC). The program is the Navy's complement to the Environmental Security Technology Certification Program which demonstrates and validates technologies important to the tri-Services, U.S. Environmental Protection Agency and the Department of Energy.





## A WORD FROM THE PROGRAM MANAGER

Welcome to the Navy Environmental Sustainability Development to Integration (NESDI) program's fiscal year (FY) 2018 Year in Review report.



Ken Kaempffe

This report summarizes the efforts of our many NESDI project team members from across the Navy—efforts critical to the program's success again in 2018.

This Year in Review report is in a different format compared to previous years' reports. This year we are providing a snapshot of all of the active projects in our portfolio. This report highlights accomplishments of 51 projects being executed across a wide range of subject areas—all addressing difficult and persistent environmental issues facing the Navy.

As Program Manager, together with our governing board—the Technology Development Working Group (TDWG)—and our resource sponsor (OPNAV N45), I have worked to shape the NESDI portfolio to ensure the Navy receives the maximum benefit from the investment of what is typically around five million dollars per year. I think that we have been effective in addressing a wide range of issues by awarding projects that will have the greatest positive end result. To inform you of the breadth of our work, here is a list of some of the more successful projects that are highlighted in this report:

1. Demonstration of Non-Chromated Adhesive Bond Primer for Metal Repair Bonding (project no. 500)
2. Low-VOC and Low-HAP Wipe Solvent and Paint Thinner Demonstration/Validation (project no. 504)
3. Demonstration of New Strategies for Enhanced Monitored Natural Recovery at Navy Sediment Sites (project no. 522)
4. Integrated Diagnostic Stormwater Monitoring with Passive Sampling (project no. 523)
5. Structure-function Relationship and Environmental Behavior of Per- and Polyfluorochemicals from Aqueous Film Forming Foams (project no. 527)
6. Analysis of Regulated Garbage Management Processes to Ensure Compliance with Animal and Plant Health Inspection Service Regulations (project no. 533)
7. Using a Forward-Looking Infrared Camera for Advanced Discharge Characterization (project no. 539)
8. Smart Electronic Tools for Navy Environmental Compliance Monitoring and Reporting (project no. 540)
9. Naval Air Systems Command Solutions for Engine Washing (project no. 542)
10. In-situ Treatment of 1,4-Dioxane Using Enhanced Biodegradation (project no. 545)
11. Study of Waste Management and Minimization for Aqueous Film Forming Foam Wastewater (project no. 553)
12. Elimination of Hexavalent Chromium from Magnesium Conversion Coating Processes at Fleet Readiness Centers (project no. 562)



Of course, none of this can happen without our Principal Investigators—the individuals who perform the most difficult and challenging work. NESDI projects are executed and transitioned by our many expert investigators. Those investigators are typically Navy civilian employees with degrees in engineering or science and many of them have advanced degrees. Many project teams include subject matter experts from the contracting community and/or academic institutions. Our team, built over many years, allows us to address difficult environmental issues in the most cost effective and technically sound manner. Our Principal Investigators work often behind the scenes to ensure that the Navy can accomplish its mission today and in the future.

You can read more about our projects by selecting the projects tab on our website at:

- Our public website (that will transition to a NAVFAC site in 2019):  
<https://navysustainability.dodlive.mil/environment/nesdi>
- Our restricted site which requires a Common Access Card:  
<https://epl.navfac.navy.mil/nesdi>

As the Navy's 6.4 environmental technology demonstration and validation program, the NESDI program will continue to address the Navy's imminent environmental challenges in FY19 and beyond.

### How You Can Participate

We need the most help identifying environmental requirements and implementing the results of our various projects into the ongoing operations of the Navy.

So, whenever you can, find a way to use the technologies we demonstrate and the research that we sponsor. Specifically, you can participate in our process and play a vital role by doing any or all of the following:

1. Submitting an environmental need by the end of July of each year at <https://epl.navfac.navy.mil/nesdi/Needs.aspx>
2. Reviewing technologies as they are being development and providing input to the Principal Investigators and the TDWG.
3. Supporting the integration of our products in your organization or at your installation.
4. Serving as a Principal Investigator on one of our projects.
5. Providing a demonstration site for one of our projects.
6. Staying up-to-date on program activities by regularly visiting our websites.

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

I hope you find this Year in Review report to be a valuable resource as you search for additional insights into our projects and the overall operation and continued success of our program in FY19 and beyond.

Ken Kaempffe  
Program Manager  
[ken.kaempffe@navy.mil](mailto:ken.kaempffe@navy.mil)





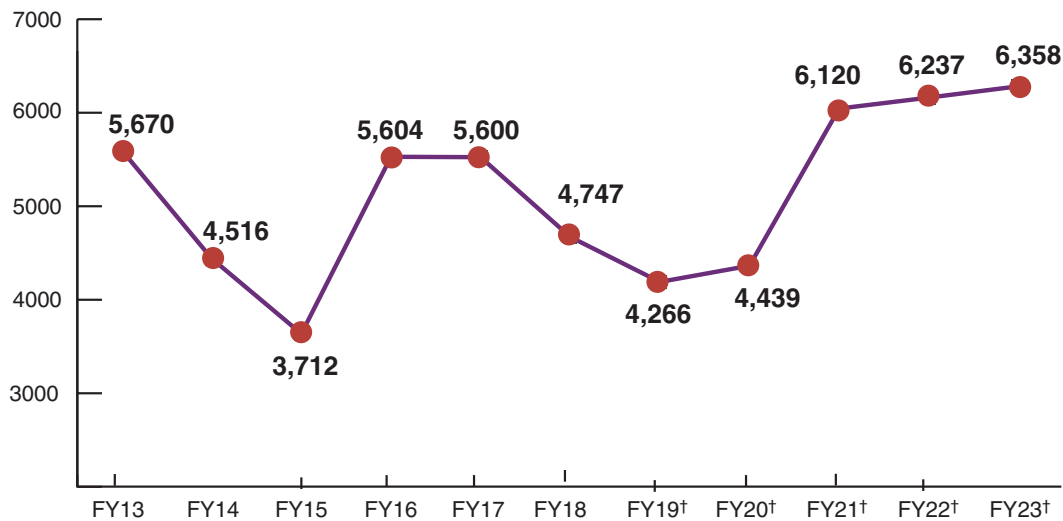
## FINANCIAL HIGHLIGHTS

### Program Funding

Each year, the NESDI program establishes its investments based on the requirements identified by its end users from across the Navy and potential risk to the Navy mission.

The chart below shows the evolution of the program's actual funding levels from fiscal year (FY) 2013 through FY18, as well as projected funding levels from FY19 through FY23.

PROGRAM FUNDING (FY13 – FY23)



† Projected

Funding in thousands of dollars

Graph does not show Congressional Add in FY18 in the amount of 598K.

Total funding received in FY18 including the Congressional Add is 5,345K.

Future year funding based on 2020 DON RDOC NESDI Budget Exhibit dated 11 June 2018.

### Our Investment Areas

The NESDI program makes its primary investments in the following four Environmental Enabling Capabilities (EEC) areas.

#### 1. EEC 2: Maximize Training & Testing Requirements Within Environmental Constraints

Investments in this area 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.

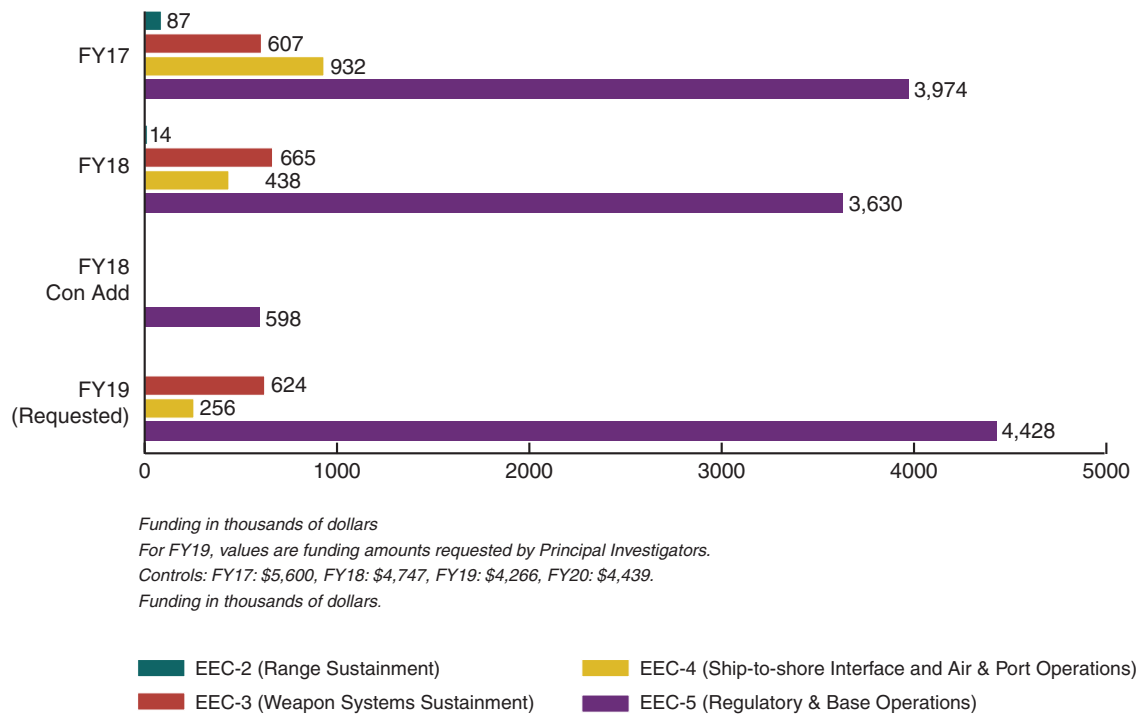
#### 2. EEC 3: Platform Repair & Maintenance with Minimal Environmental Impact.

These investments focus on identifying systems and processes that minimize or eliminate environmental hazards in critical repair and maintenance operations both ashore and afloat.



The following graphic summarizes program funding trends from FY17 through FY19 by Environmental Enabling Capability (EEC).

#### PROGRAM FUNDING BY EEC (FY17 – FY19)



### 3. EEC 4: Support Shore

#### Readiness within Environmental Constraints

Investments in this area provide cost effective services at naval bases and air facilities in compliance with environmental regulations.

### 4. EEC 5: Cost-Effective

#### Management of Environmental Regulatory Requirements.

These investments provide cost-effective methods for identifying, analyzing, and managing environmental constraints related to current and projected regulatory impacts.



## THE NESDI PROGRAM PROCESS

Each year, the NESDI program typically executes a four-phase process to ensure the comprehensive collection of outstanding needs from across the Navy through the successful transition of workable solutions into the Navy's shoreside operating environment and its range testing and training activities. Although budget limitations prevented the program from collecting proposals and launching "new start" projects in FY18, the four phases of the program's management process are described below.

### 1. Collect, Validate

#### & Rank Needs

During this first phase of the annual management process executed by the NESDI program, our management team—the Technology Development Working Group (TDWG)—solicits environmental needs from across the Navy's shore community. Once these are received, the TDWG validates and ranks them based on a variety of criteria including whether the need falls within one of the program's priority investment areas, how pervasive the problem is in the Navy, the extent and severity of the associated compliance risk, and the potential impacts on the mission of the Navy if the need isn't addressed.

### 2. Collect, Evaluate

#### & Rank Proposals

During this second phase of the program's annual management process and if resources allow, the TDWG collects project proposals that address the needs collected in the first phase of the process. In particular, the TDWG first requests, collects and reviews short "pre-proposals," and then requests more detailed, full-length project proposals. The TDWG then recommends to the program's resource sponsor (OPNAV N45) which projects should receive program support.

### 3. Execute Projects

Once proposals have been selected and funded, the program ensures during this third phase of its annual management process that the "new start" projects are effectively launched and remain properly focused on the needs they were intending to address through initial planning, ongoing reporting and management oversight.

### 4. Integrate Solutions

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

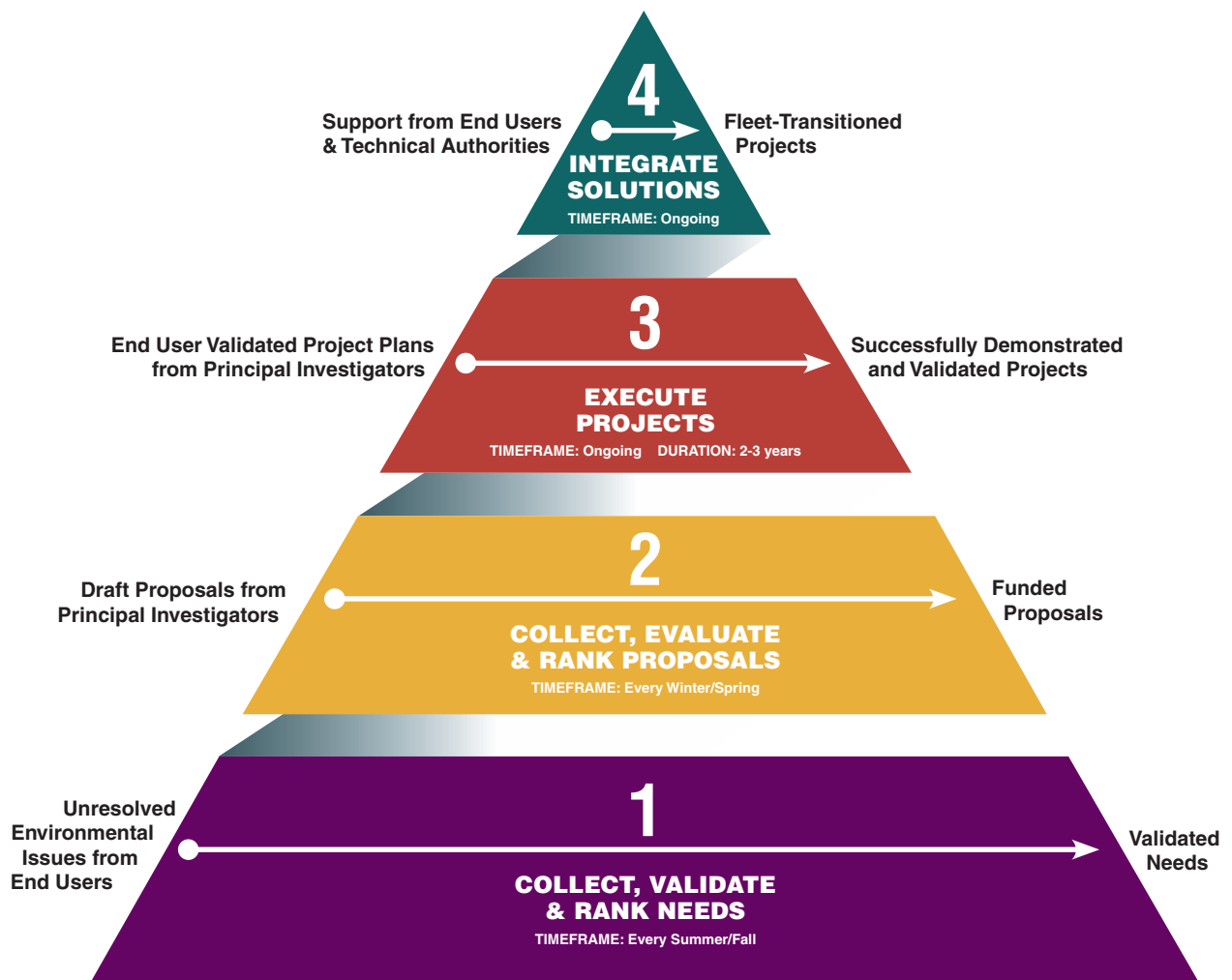
Throughout this process, the program's targeted customers—including need submitters, end users, technical authorities and other stakeholders—provide valuable input to develop meaningful needs, support the ongoing execution of individual projects, and help to ensure the successful integration of products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

The inputs, outputs and timeframes associated with each of the above stages are highlighted in the following diagram.





## THE NESDI PROGRAM PROCESS





## FY18 NEEDS SOLICITATION RESULTS

### RESULTS OF OUR FY18 NEEDS SOLICITATION

The NESDI program collected a total of 59 needs via our FY18 solicitation. After a thorough review by program personnel including the TDWG and the program's resource sponsor (OPNAV N45), the following seven needs were determined to be worthy of further attention by the program:

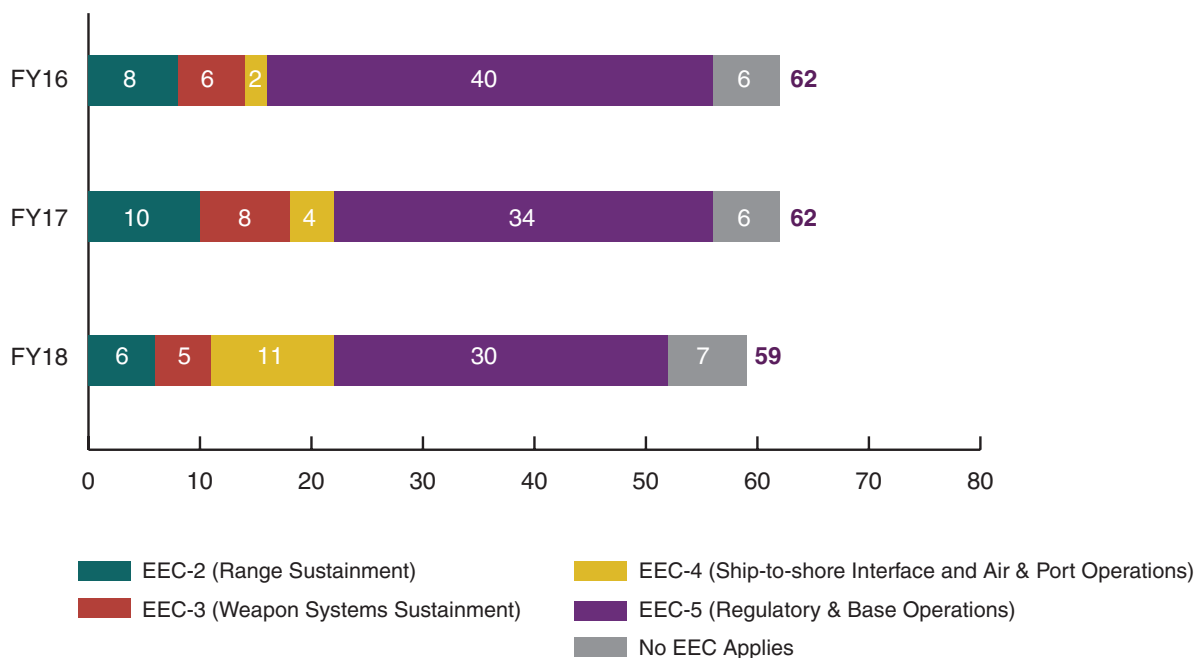
1. Cost Effective Main Charge Remediation of Insensitive Munitions for Range Clearance (need no. N-1179-18)
2. Demonstration/Validation of Air Filtration for Indoor Air Quality (need no. N-1187-18)
3. Improving Site Closure Decision Making with Time Integrated Groundwater Samples (need no. N-1188-18)
4. Stormwater Piping Based Pollutant Best Management Practice (need no. N-1194-18)
5. Under Pier Sediment Pile Assessment Tools (need no. N-1196-18)

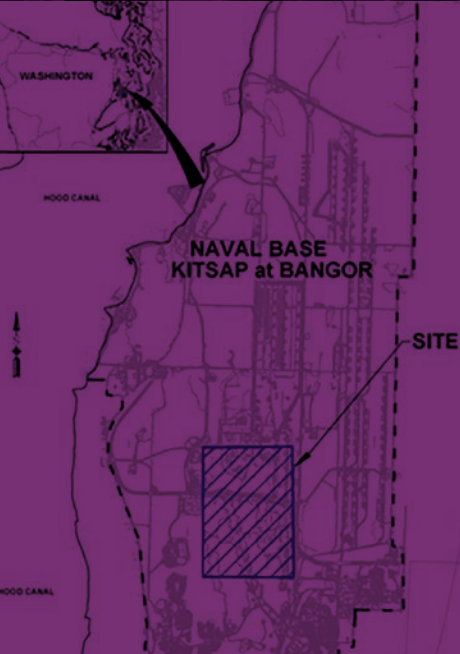
6. Electromagnetic Interference Shielding Tape (need no. N-1220-18)
7. Replacement of Cadmium in GSE Avionics Applications (need no. N-1234-18)

Due to budget limitations, the program was not able to solicit proposals to address these priority needs in FY18. As a result, these needs were carried over into the next fiscal year and considered along with the needs collected and selected over the course of the program's FY19 needs solicitation and ranking processes.

A summary of the number of needs collected by EEC from FY16 through FY18 is provided in the chart below.

NEEDS COLLECTED (FY16 – FY18)





## OUR FY18 PROJECT ACCOMPLISHMENTS





### OUR FY18 PROJECT ACCOMPLISHMENTS

In this year's annual report, we provide a summary of the accomplishments of our projects that had significant activity in fiscal year 2018—51 projects in all and all represented in this consolidated chapter. To execute these projects, the NESDI program relied on 40 different Principal Investigators from the following organizations:

1. The Naval Air Systems Command (NAVAIR)
2. The Navy Information Warfare Center (NIWC) Pacific (formerly the Space and Naval Warfare Systems Center Pacific)
3. The Naval Facilities Engineering and Expeditionary Warfare Center (NAVFAC EXWC)
4. The Naval Sea Systems Command (NAVSEA)
5. The Naval Supply Systems Command (NAVSUP)
6. The Naval Research Laboratory (NRL)

For our ten NAVAIR-run projects, we tapped engineers and scientists from the Fleet Readiness Center Southeast in Jacksonville, FL as well as the materials engineering laboratory at the Naval Air Warfare Center in Patuxent River, MD. Our NAVAIR projects often explore environmentally-friendly corrosion-resistance coatings and solvents for use on a variety of Navy weapons systems. NAVAIR-led NESDI projects include an effort to validate a zero-volatile organic hazardous air pollutant and low-volatile organic compound solvent that can serve as a general use solvent as well as an effort to combine a commercially-available color additive with an enhanced trivalent chromium pretreatment solution to produce a visible color change to the aluminum substrate, indicating that the trivalent conversion coating process has been successfully performed.

Eleven different investigators from NIWC in San Diego, CA managed 14 NESDI projects over the course of the past fiscal year.

These projects include the development and testing of an unmanned underwater vehicle that monitors coral reef and benthic communities on vertical structures residing at Navy at-sea ranges, vessel homeports and weapons test and evaluation centers and a second effort to validate the use of a Forward Looking Infrared (FLIR) camera to provide a fast and accurate means of characterizing pier-side discharges.

Fourteen investigators managed 17 NAVFAC NESDI projects over the course of fiscal year 2018. These investigators oversaw efforts including a project to determine whether there are adverse impacts from low flow devices in Navy-operated wastewater collection and treatment systems and a second effort which intends to provide environmental restoration managers and Remedial Project Managers (RPM) with better tools for building accurate conceptual site models and improving the management of sites impacted by perfluorinated and polyfluorinated substances.

Engineers and scientists from the Naval Surface Warfare Center, Carderock Division (in West Bethesda, MD) executed eight different NESDI projects in FY18. One of these projects investigated the volatilization rate of paint containing polychlorinated biphenyls to generate a defensible, environmentally and fiscally responsible work process for the removal of paints containing these compounds during ship dismantling. Another NAVSEA-led effort sought to better understand shoreside and shipboard regulated garbage management processes with the aim of creating enhanced methods that ensure compliance with regulated garbage regulatory requirements.

Rounding out the cadre of NESDI talent is an investigator from NRL whose project seeks to provide RPMs with a more accurate way of measuring munitions degradation rates to support knowledge-based remediation



strategies including the use of monitored natural attenuation. Our single NAVSUP investigator is working to standardize the procurement of consumable general use hazardous materials and create tools to help end users of hazardous materials procure less hazardous products.

All of these projects are summarized in the pages that follow.

1. **Project no. 433:**  
**User Friendly Oxygen Cleaning Alternatives to Naval Oxygen Cleaner \***  
PRINCIPAL INVESTIGATOR:  
Kami Downey
2. **Project no. 474:**  
**Toxicity Associated with PAHs Used in Clay Targets †**  
PRINCIPAL INVESTIGATOR:  
Kara Sorensen
3. **Project no. 499:**  
**Aerobic Bioaugmentation for Remediation of RDX-Contaminated Groundwater †**  
PRINCIPAL INVESTIGATOR:  
Steve Hammett
4. **Project no. 500:**  
**Demonstration of Non-Chromated Adhesive Bond Primer for Metal Repair Bonding \***  
PRINCIPAL INVESTIGATOR:  
Justin Massey
5. **Project no. 503:**  
**Dry Dock Sediment Management \***  
PRINCIPAL INVESTIGATOR:  
Pat Morrow
6. **Project no. 504:**  
**Low-VOC and Low-HAP Wipe Solvent and Paint Thinner Demonstration/Validation †**  
PRINCIPAL INVESTIGATOR:  
Ed Lipnickas
7. **Project no. 506:**  
**Evaluation and Implementation of Compliance Options for NPDES Cooling Water Intake Structures at Existing Facilities †**  
PRINCIPAL INVESTIGATOR:  
Pei-fang Wang

8. **Project no. 511:**  
**Demonstration of an Improved Method for Quantifying Algal Biomass to Meet Nutrient Numeric Endpoint Compliance \***  
PRINCIPAL INVESTIGATOR:  
Kara Sorensen
9. **Project no. 514:**  
**Enhanced Trivalent Chromium Pretreatment for Improved Coloration and Corrosion Performance of Aluminum Substrates \***  
PRINCIPAL INVESTIGATOR:  
Peter Sheridan
10. **Project no. 516:**  
**Automated Monitor to Determine the Opacity of Fugitive Emissions \***  
PRINCIPAL INVESTIGATOR:  
Pat Morrow
11. **Project no. 518:**  
**Understanding the Impact of Low Water Flows on Sewer Systems and Wastewater Treatment Plants †**  
PRINCIPAL INVESTIGATOR:  
Tami Relph
12. **Project no. 519:**  
**Analysis of the Long-Term Fate of Munitions Constituents on Terrestrial Sites †**  
PRINCIPAL INVESTIGATOR:  
Anthony Danko
13. **Project no. 520:**  
**Quantification of Polychlorinated Biphenyls Paint Volatilization \***  
PRINCIPAL INVESTIGATOR:  
Pat Morrow
14. **Project no. 521:**  
**Autonomous Benthic Ecology System \***  
PRINCIPAL INVESTIGATOR:  
Cheryl Ann Cooke
15. **Project no. 522:**  
**Demonstration of New Strategies for Enhanced Monitored Natural Recovery at Navy Sediment Sites \***  
PRINCIPAL INVESTIGATORS:  
Ignacio Rivera, Gunther Rosen

\*Ongoing Projects    †Completed Projects



## FY18 PROJECT ACCOMPLISHMENTS

16. **Project no. 523:**  
**Integrated Diagnostic Stormwater Monitoring with Passive Sampling\***  
PRINCIPAL INVESTIGATOR:  
Gunther Rosen
17. **Project no. 525:**  
**Non-Isocyanate Polyurethane-Free Formulation Coatings for Aircraft and Support Equipment\***  
PRINCIPAL INVESTIGATOR:  
Jessica Rex
18. **Project no. 527:**  
**Structure-function Relationship and Environmental Behavior of Per- and Polyfluorochemicals from Aqueous Film Forming Foams\***  
PRINCIPAL INVESTIGATOR:  
John Kornuc
19. **Project no. 528:**  
**Impacts of Water Conservation Measures on Potential Safe Drinking Water Act Violations in Navy Water Supply Systems†**  
PRINCIPAL INVESTIGATOR:  
Tami Relph
20. **Project no. 529:**  
**Diver-less Deployment System for In-Situ Sediment Samplers†**  
PRINCIPAL INVESTIGATOR:  
Jessica Carilli
21. **Project no. 531:**  
**Management Tools for Radiological Compounds in Environmental Media†**  
PRINCIPAL INVESTIGATOR:  
Joey Trotsky
22. **Project no. 532:**  
**Multi-Functional Surface Preparation Technology for Maintenance Painting†**  
PRINCIPAL INVESTIGATOR:  
Pat Morrow
23. **Project no. 533:**  
**Analysis of Regulated Garbage Management Processes to Ensure Compliance with Animal and Plant Health Inspection Service Regulations\***  
PRINCIPAL INVESTIGATOR:  
Tracy Carole
24. **Project no. 534:**  
**Technology Evaluation and Sampling for Treatment of Perfluorochemicals\***  
PRINCIPAL INVESTIGATOR:  
John Kornuc
25. **Project no. 535:**  
**Evaluation of Alternative Groundwater Supply Sources from a Safe Drinking Water Act Viewpoint\***  
PRINCIPAL INVESTIGATOR:  
Michael Esteban
26. **Project no. 537:**  
**Stable Carbon Isotopes for Tracing In-Situ RDX Remediation\***  
PRINCIPAL INVESTIGATOR:  
Thomas Boyd
27. **Project no. 538:**  
**Advanced Primer Superhydrophobic Topcoat for Corrosion Prevention and Leachate Impedance\***  
PRINCIPAL INVESTIGATORS:  
Brandon Swope, Jeremy Mattison
28. **Project no. 539:**  
**Using a Forward-Looking Infrared Camera for Advanced Discharge Characterization\***  
PRINCIPAL INVESTIGATOR:  
Brandon Swope
29. **Project no. 540:**  
**Smart Electronic Tools for Navy Environmental Compliance Monitoring and Reporting\***  
PRINCIPAL INVESTIGATOR:  
Itzel Godinez
30. **Project no. 541:**  
**Utility Vault Water Treatment\***  
PRINCIPAL INVESTIGATOR:  
Pat Morrow
31. **Project no. 542:**  
**Naval Air Systems Command Solutions for Engine Washing\***  
PRINCIPAL INVESTIGATOR:  
Keiko Sapp
32. **Project no. 543:**  
**Preventative Management of Contaminated Silt\***  
PRINCIPAL INVESTIGATOR:  
Pat Morrow
33. **Project no. 544:**  
**Using Stable-Isotope Labeled Tracers to Validate Natural Attenuation of RDX in Groundwater\***  
PRINCIPAL INVESTIGATOR:  
Jovan Popovic
34. **Project no. 545:**  
**In-situ Treatment of 1,4-Dioxane Using Enhanced Biodegradation\***  
PRINCIPAL INVESTIGATOR:  
Anthony Danko

\*Ongoing Projects    †Completed Projects





- |   |   |
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| <p><b>35. Project no. 546:</b><br/> <b>NPDES Copper Effluent Control System *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Iryna Dzieciuch</p> <p><b>36. Project no. 547:</b><br/> <b>Demonstration of Improved Toxicity<br/>         Methodology to Link Stormwater<br/>         Discharges to Receiving Water Impacts *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Marianne (Molly) Colvin</p> <p><b>37. Project no. 548:</b><br/> <b>Sewer Gas Elimination Technology *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Steven Fann</p> <p><b>38. Project no. 549:</b><br/> <b>Demonstration of Optimized non-NMP<br/>         (n-Methyl-2-pyrrolidone) Solvents<br/>         for Immersion Chemical Depainting *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Joseph Santa Maria</p> <p><b>39. Project no. 550:</b><br/> <b>A Comprehensive Analysis<br/>         and Strategy for Contaminated<br/>         Sediment Management †</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Joey Trotsky</p> <p><b>40. Project no. 551:</b><br/> <b>Impact of Sediment Resuspension<br/>         by Propeller Wash and Shore Sediment<br/>         Dynamics on Remediation Options *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Pei-fang Wang</p> <p><b>41. Project no. 553:</b><br/> <b>Study of Waste Management and<br/>         Minimization for AFFF Wastewater *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Daniel Edwards</p> <p><b>42. Project no. 555:</b><br/> <b>Demonstrating the Effectiveness<br/>         of Novel Treatment Technologies<br/>         for the Removal of Poly- and<br/>         Perfluoroalkyl Substances<br/>         from Groundwater *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Jovan Popovic</p> <p><b>43. Project no. 556:</b><br/> <b>Enterprise-wide Hazardous<br/>         Material Standardization<br/>         and Minimization of<br/>         General Use Consumables *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Renata Laing</p> | <p><b>44. Project no. 557:</b><br/> <b>Initiation Decision Report<br/>         of Laser Coating Removal<br/>         on Naval Aircraft Components *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Stephen Starnes</p> <p><b>45. Project no. 558:</b><br/> <b>In-situ Automatic<br/>         Stormwater Sampling Device<br/>         for Use at Tidally Impacted<br/>         Sampling Locations *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Ernie Arias</p> <p><b>46. Project no. 560:</b><br/> <b>Biochar Adsorption<br/>         for Dry Dock Effluent *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Lewis Hsu</p> <p><b>47. Project no. 561:</b><br/> <b>Development and Demonstration<br/>         of a Portable, Temporary Barrier<br/>         to Aid in Cargo and Equipment<br/>         Inspections to Prevent Brown<br/>         Treesnake Dispersal *</b><br/>         PRINCIPAL INVESTIGATORS:<br/>         Jean Pan, Itzel Godinez</p> <p><b>48. Project no. 562:</b><br/> <b>Elimination of Hexavalent<br/>         Chromium from Magnesium<br/>         Conversion Coating Processes<br/>         at Fleet Readiness Centers *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Alan Grieve</p> <p><b>49. Project no. 563:</b><br/> <b>Low-VOC Primers for Ground<br/>         Support Equipment Application *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Michael Brindza</p> <p><b>50. Project no. 566:</b><br/> <b>Source Metal Particle Removal<br/>         for Stormwater Compliance *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Jim Howell</p> <p><b>51. Project no. 567:</b><br/> <b>Business Processes and<br/>         Requirements Enabling<br/>         Technology Integration *</b><br/>         PRINCIPAL INVESTIGATOR:<br/>         Martin McMorrow</p> |
|---|---|

\*Ongoing Projects

†Completed Projects



## PROJECT ACCOMPLISHMENTS

PROJECT NO. 433:

### **User Friendly Oxygen Cleaning Alternatives to Naval Oxygen Cleaner\***

PRINCIPAL INVESTIGATOR:  
KAMI DOWNEY

The objective of this project is to eliminate the use of Freon (CFC-113) for oxygen cleaning at the Fleet Readiness Center (FRC) Southeast and Naval Sea Systems Command facilities. In FY17, the T-45 trainer was temporarily grounded because of physiological episodes that may have been attributed to the On Board Oxygen Generator (OBOG) system. This resulted in a heightened awareness for potential contaminants in the OBOG systems.

In 2018, there were at least two other T-45's grounded due to contamination in the oxygen lines. The contaminant in the lines was a white substance that Fleet maintainers were unable to sufficiently clean using the currently-authorized Naval Oxygen Cleaner. The lines were sent to FRC Southeast to be cleaned although the use of approved methods did not sufficiently clean the targeted components so a new cleaning method needed to be found and validated.

FY18 efforts continued with compatibility testing, off-gas testing and toxicology approval. The Principal Investigator for this project launched her FY18 efforts by sending solvent samples to her collaborators at the National Aeronautics and Space Administration (NASA). Testing has been completed and results are being reviewed by stakeholders at NASA, NAVSEA and NAVAIR. Testing and other results have been sent to independent toxicology laboratories for additional analysis.



**The T-45 trainer was temporarily grounded because of physiological episodes that may have been attributed to the OBOG system.**

Photo Credit: MCS 2nd Class Joseph E. Montemarano



**Fleet maintainers were unable to clean a contaminant (white substance) in aircraft oxygen lines with the currently-authorized Naval Oxygen Cleaner.** Photo Credit: Kami Downey

\*Ongoing Projects    †Completed Projects



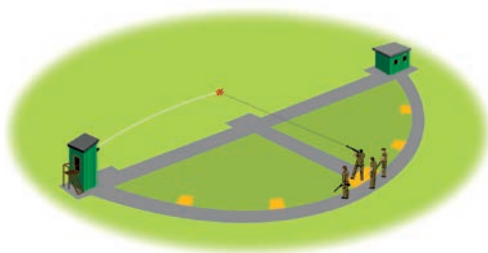
## PROJECT NO. 474:

### Toxicity Associated with PAHs Used in Clay Targets†

PRINCIPAL INVESTIGATOR:  
KARA SORENSEN

This NESDI project sought to determine the polycyclic aromatic hydrocarbon (PAH) composition of clay targets used at skeet ranges and the relative bioavailability of PAH in the soil at these ranges. FY18 project accomplishments include the following:

- Presented two talks at the Society of Environmental Toxicology and Chemistry (SETAC) conference and a third invited talk at the 2018 Southern California SETAC conference.
- Continuing dialogue with State and Federal regulators for the applicability of the in vitro model as an appropriate surrogate for an in vivo feeding trial.
- Submitted a proposal to the Environmental Security and Technology Certification Program (ESTCP) for their consideration.



The configuration of a typical Navy skeet shooting range. Diagram Credit: John Lambert



A pile of broken clay targets found on a skeet range. Photo Credit: Kara Sorensen

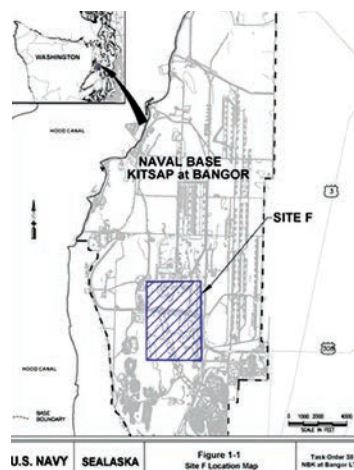
## PROJECT NO. 499:

### Aerobic Bioaugmentation for Remediation of RDX-Contaminated Groundwater†

PRINCIPAL INVESTIGATOR:  
STEVE HAMMETT

This NESDI project demonstrated an innovative application of bioaugmentation to cleanup of RDX-contaminated groundwater under aerobic and low-oxygen conditions. Bioaugmentation has the potential to be less costly and more easily implemented for large, aerobic plumes compared to anaerobic biostimulation and should avoid groundwater quality degradation caused by anaerobic processes. Project accomplishments include the following:

- Selected Site F at Naval Base Kitsap in Bangor, WA as the field demonstration site.
- Evaluated several strains of RDX-degrading bacteria in microcosm studies to assess degradation rates on various substrates as well as their growth, viability and transportability under simulated field conditions.
- Provided site-specific treatability testing proof-of-concept results for using a bioaugmentation culture composed of both aerobic and facultative anaerobic RDX degrading strains for remediation of the RDX plume at field demonstration site.



Location of Site F at Naval Base Kitsap.

Photo Credit: Steve Hammett

\*Ongoing Projects    †Completed Projects





## PROJECT ACCOMPLISHMENTS

### PROJECT NO. 500:

#### **Demonstration of Non-Chromated Adhesive Bond Primer for Metal Repair Bonding\***

PRINCIPAL INVESTIGATOR:  
JUSTIN MASSEY

The objective of this project is to verify the performance of a hexavalent chromium-free adhesive bond primer against a standard chromium product in the laboratory and in the field. FY18 project accomplishments include the following:

- Positioned P-3 Orion and F/A-18 Hornet components at Kennedy Space Center, the Naval Air Warfare Center - Aircraft Division Patuxent River and the Marine Corps Air Station (MCAS) Miramar for the purposes of a demonstration/validation (dem/val).
- Coordinated with the F/A-18 Fleet Support Team, MCAS Miramar production, Fleet Readiness Southeast production and VMFAT-101 personnel about manufacturing or procuring replacement doors for the two F/A-18 on-aircraft dem/val components.



**P-3 Orion components are being used in this NESDI project to assess the performance of hexavalent chromium-free adhesive bond primer.**

Photo Credit: MCS Seaman Zachary Dalton

### PROJECT NO. 503:

#### **Dry Dock Sediment Management\***

PRINCIPAL INVESTIGATOR:  
PAT MORROW

The objective of this project is to demonstrate tools and methods to reduce the risk of National Pollutant Discharge Elimination System (NPDES) permit violations through the collection and removal of contaminated sediment. The resultant technology will allow advanced cleaning methods to be employed by shipyard personnel to meet standards set forth in the Interface Engineering Instruction which provides a means for increasing ship turnover rate. FY18 project accomplishments include the following:

- Requested and received quotes for the purchase and delivery of two Municipal Cleaning Vehicles units and accompanying training for use at Puget Sound Naval Shipyard and Intermediate Maintenance Facility.
- Monitoring the acquisition process which is expected to advance as an unfunded requirement to replace current aging and less effective surface cleaning equipment.



**The Municipal Cleaning Vehicle.**

Photo Credit: Pat Morrow



## PROJECT NO. 504:

### Low-VOC and Low-HAP Wipe Solvent and Paint Thinner Demonstration/Validation†

PRINCIPAL INVESTIGATOR:  
ED LIPNICKAS

The objective of this project is to demonstrate and validate that a zero-volatile organic hazardous air pollutant (VOHAP) and low-volatile organic compound (VOC) solvent can serve as a general use solvent substitution. FY18 project accomplishments include the following:

- Determined that new solvent blend performs comparably with the currently-used product (MIL-T-81772 “Thinner, Aircraft Coating”).
- Revising NAVAIR military specification (MIL-T-81772) to include a new type for low-VOCs, zero-VOHAPs and low vapor pressure.
- Incorporating instructions for use of this material into the next revision of the “Cleaning and Corrosion Control” manual (NAVAIR 01-1A-509).
- Assigned National Stock Numbers (NSN) and in the process of generating an authorization letter for the material substitution.



A Fleet maintainer applying a wipe solvent to an E-2 Hawkeye airborne early warning aircraft before the application of a primer. Photo Credit: Ed Lipnickas

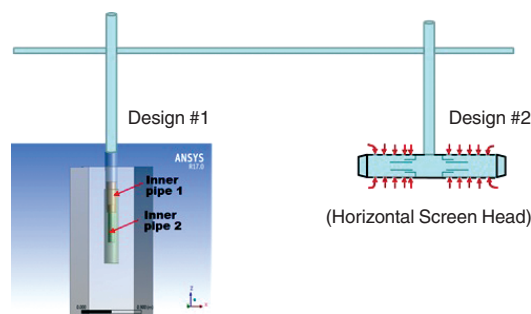
## PROJECT NO. 506:

### Evaluation and Implementation of Compliance Options for NPDES Cooling Water Intake Structures at Existing Facilities†

PRINCIPAL INVESTIGATOR:  
PEI-FANG WANG

This project helped Navy facilities achieve compliance with a new EPA rule regarding cooling intake structures. The ruling requires facilities to implement one of seven mitigation schemes to minimize fish kills by impingement on intake screens of a specified mesh size or during entrainment in the cooling systems. FY18 project accomplishments include the following:

- Conducted study to evaluate and identify the most feasible mitigation scheme which is to redesign the screen heads of the cooling water discharge systems.
- Finalized modeling of intake screen options and study results to help Navy shipyard cooling water intake systems remain in compliance with the new EPA rule. Those shipyards can now operate without regulatory violation notice or interruptions in their mission activities.



The project team developed two new designs for the screen heads—a vertical screen head (Design #1) and a horizontal screen head (Design #2). The second design resulted in the best intake velocities that were in full compliance with the new EPA rule. Diagram Credit: Pei-fang Wang

\*Ongoing Projects

†Completed Projects



## PROJECT ACCOMPLISHMENTS

### PROJECT NO. 511:

#### **Demonstration of an Improved Method for Quantifying Algal Biomass to Meet Nutrient Numeric Endpoint Compliance\***

PRINCIPAL INVESTIGATOR:  
KARA SORENSEN

Regulatory total maximum daily load (TMDL) requirements are shifting toward at minimum including if not completely requiring biological, nutrient-based endpoints as markers of system health. Algal biomass has been identified as a key variable to be included in waterbody evaluation. This project intended to demonstrate and validate a cost effective and accurate method for measuring subtidal benthic algal biomass. FY18 project accomplishments include the following:

- Conducted a side-by-side comparison of use of the multi-substrate subtidal (SUBS) sampler versus the state-sponsored subtidal sampling approach.
- Revising the statewide macroalgal sampling protocol to include the use of the Navy SUBS sampler as a methodology option for subtidal sampling.
- Briefed progress on the SUBS sampler to California watershed working groups which included city and state regulators.
- Relocated sampler to a second demonstration site (in Norfolk, VA) for evaluation.



Left picture illustrates SUBS components. Middle picture shows the SUBS Sampler on a kayak in the open position. Right picture is the SUBS Sampler in the closed position.

Photo Credits: Left drawing: Justin Chow, Joshua Yun  
Center and right pics: Kara Sorensen

### PROJECT NO. 514:

#### **Enhanced Trivalent Chromium Pretreatment for Improved Coloration and Corrosion Performance of Aluminum Substrates\***

PRINCIPAL INVESTIGATOR:  
PETER SHERIDAN

The goal of this project is to combine a commercially available color additive with an enhanced trivalent chromium pretreatment (eTCP) solution to produce a visible color change to the aluminum substrate, indicating that the trivalent conversion coat process has been performed.

Conversion coating is a process by which an aluminum surface coated with a protective coating serves as a barrier to corrosion and as an “anchor” for subsequently applied coatings (primers/paints). Historically, conversion coatings applied at FRCs utilized hexavalent chromium, a known carcinogen that may present a hazard to the workforce and environment. Implementation of dyed trivalent chromium conversion coatings will result in a 22 percent (21,000 gallons/year) reduction in hexavalent chromium usage across all FRCs — a key effort in improving worker safety and environmental stewardship. FY18 project accomplishments include the following:

- Received material from the chemical manufacturer’s first production run. Verification testing is ongoing at FRC Southeast.
- Presented a poster with CRADA partner at the 2018 Advanced Surface Engineering Technologies Defense Workshop which prompted interest from a number of Original Equipment Manufacturers (OEM) and Department of Defense (DoD) agencies.
- Completing the industrial scale-up and testing at FRC Southeast.

\*Ongoing Projects    †Completed Projects





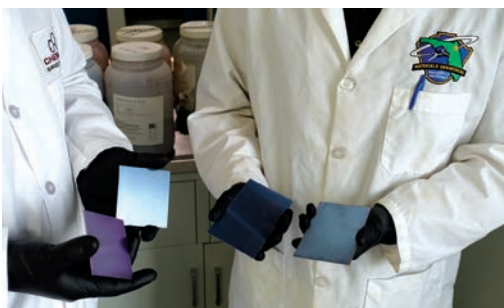
## PROJECT NO. 516:

### Automated Monitor to Determine the Opacity of Fugitive Emissions\*

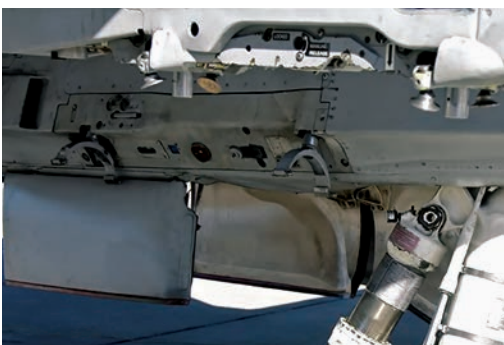
PRINCIPAL INVESTIGATOR:  
PAT MORROW

The objective of this project is to secure and demonstrate a technology that can provide timely measurement of visible airborne emissions generated during ship dismantling operations. The operation of this technology will also allow for diagnostic testing under controlled conditions to identify best practices to be used during live ship recycling activities. FY18 project accomplishments include the following:

- Generated an updated specifications sheet and further clarified features of interest to the end user community including aspects associated with the eye-safe laser and the ability to operate the system in environments ranging from high to low humidity and during day or nighttime conditions.
- Visited the Micro-Pulse LIDAR (MPL) manufacturer's facility to review and demonstrate monitoring system software updates identified during the final equipment testing.
- Performed a demonstration of the opacity monitor during a shipboard incinerator evaluation at the Carderock laboratory.
- Published new software and made it available to MPL users in addition to an introductory video and descriptive system literature to promote additional use and evolution of MPL technology.



All four panels are dyed TCP on aluminum 2024-T3. From left to right, eTCP-Violet, eTCP-Blue, eTCP-Violet and eTCP-Blue. The color change is most apparent on the two left panels. Photo Credit: Ted Ventresca



Investigators on this NESDI project are using a scrap Aircraft Armament Equipment part (a LAU-116 assembly structure and fairings) to demonstrate and validate an eTCP Violet spray application. Photo Credit: Joseph Santa Maria



This opacity monitor is being demonstrated during this NESDI project. Photo Credit: Pat Morrow

\*Ongoing Projects

†Completed Projects



## PROJECT ACCOMPLISHMENTS

PROJECT NO. 518:

### **Understanding the Impact of Low Water Flows on Sewer Systems and Wastewater Treatment Plants†**

PRINCIPAL INVESTIGATOR:  
TAMI RELPH

This project determined whether there are adverse impacts from low flow devices in Navy-operated wastewater collection and treatment systems, summarized key issues and identified potential solutions and Best Management Practices (BMP). FY18 project accomplishments include the following:

- Determined that Navy installations that experienced significant reductions in water consumption were no more likely to have Clean Water Act (CWA) Notices of Violation (NOV) than those installations that experienced no reductions in water consumption. The water consumption and compliance data obtained does not show any widespread trends that suggest reductions in water consumption is currently causing increases in exceedance related CWA NOVs at the regional level.
- Analyzed wastewater quality and flow data, performed site visits, interviewed local and regional personnel and examined wastewater treatment and conveyance systems.
- Completed analysis of wastewater quality and flow data which showed no specific trends in concentrations either in the influent or effluent that definitively related to low flow conditions.
- Determined that changes in wastewater quality during periods of flow reduction did not generally result in treatment changes or plant violations of discharge requirements.

- Discovered that issues impacting wastewater infrastructure are mainly linked to aging systems or poorly designed and/or managed systems.
- Determined that overarching wastewater infrastructure degradation is a combination of factors including poor system design, lack of maintenance and timely upgrades, personnel and staffing issues and dated and aging infrastructure. Each of these factors contribute significantly more to degradation of wastewater quality than low flow as a result of conservation.
- Discovered that the most impact factor for a compliant wastewater system was having a sufficient number of staff members with enough long-term personnel familiar with the system to foresee and prevent potential issues from occurring.



During a time of low flow into a wastewater treatment plant, the incoming sewage flows through two bar screens and finally into a Parshall flume where the flowmeter records the flowrate of the influent wastewater.

Photo Credit: Tami Relph



Outfall for the same wastewater treatment plant. The treated wastewater effluent discharges into a combined sewer line after chlorination.

Photo Credit: Tami Relph

\*Ongoing Projects    †Completed Projects



## PROJECT NO. 519:

### Analysis of the Long-Term Fate of Munitions Constituents on Terrestrial Sites†

PRINCIPAL INVESTIGATOR:  
ANTHONY DANKO

This NESDI effort identified, researched and summarized the current knowledge about the fate, transport and toxicity characteristics of munition constituents (MC) and associated degradation products found at Navy terrestrial munition response sites. FY18 project accomplishments include the following:

- Compiled information on physical and chemical properties that directly affect fate and transport of energetic compounds in the environment. Information on sources of aquatic and human toxicity data is also captured. Data gaps that list research, demonstration and technology transfer needs are summarized to help define future needs.
- Designed the report to serve as a useful reference tool for RPMs, range managers and engineers/scientists in supporting site characterization and remedy selection efforts at DoD sites contaminated by MC. Information will be useful for researchers looking to better understand MC contamination issues and key research gaps.



This NESDI effort identified, researched and summarized the current knowledge about the fate, transport and toxicity characteristics of munition constituents. Photo Credit: Tony Danko

## PROJECT NO. 520:

### Quantification of Polychlorinated Biphenyls Paint Volatilization\*

PRINCIPAL INVESTIGATOR:  
PAT MORROW

This project investigated the volatilization rate of paint containing polychlorinated biphenyls (PCB) to generate a defensible, environmentally and fiscally responsible work process for the removal of paints containing these compounds. FY18 project accomplishments include the following:

- Received a second round of volatilization data which describes the vaporization of PCBs at higher temperatures. Nearly complete vaporization was observed at these temperatures after the heating duration of two hours.
- Conducted further analysis of the existing data which showed that there are differences among the paint samples being analyzed with respect to the chlorination level in the PCB congeners and the temperature at which maximum volatilization was observed.
- Held discussions with welders and weld engineers from the Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS&IMF) to determine an appropriate and representative minimum heating time for the final round of testing and further compare values to the maximum heating time that has already been tested.



This NESDI project investigated the volatilization rate of PCB-containing legacy paints on Navy ships.

Photo Credit: MCS Seaman Apprentice Robert Robbins

\*Ongoing Projects    †Completed Projects





## PROJECT ACCOMPLISHMENTS

PROJECT NO. 521:

### Autonomous Benthic Ecology System\*

PRINCIPAL INVESTIGATOR:  
CHERYL ANN COOKE

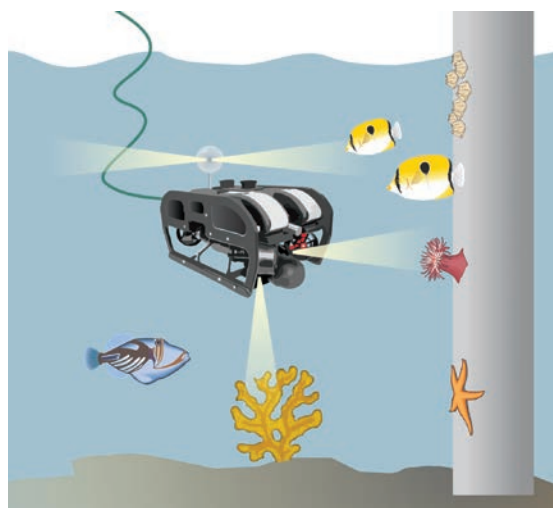
This NESDI project developed and tested an Automated Benthic Ecology System (ABES) for the purpose of monitoring coral reef and benthic communities on vertical structures residing at Navy at-sea ranges, vessel homeports and weapons test and evaluation centers. The ABES provides the Navy with a cost-effective and efficient way to collect marine biological and water quality data required for National Environmental Policy Act compliance in areas that are unsafe for human divers to ensure that the maintenance, training and readiness of Navy forces continues. FY18 project accomplishments include the following:

- Designed an all-in-one system capable of conducting the equivalent of four different human diver-swum surveys in one survey.
- Devised protocols that generated biological data comparable with other methods, such as video transects protocols, that are commonly used to assess underwater structures.
- Composed, tested and verified new MATLAB algorithms that permit blurry, dark and hazy imagery to be used to create photomosaics.
- Reduced the data acquisition swim speed and swim pattern (human divers versus Remotely Operated Vehicle performance).
- Devised cost-effective and efficient way to obtain fish identification, fish count and fish length measurements.
- Advanced an ABES patent submittal to the Undersecretary for Technology at the U.S. Department of Commerce and transitioned system to ESTCP.

- Provided SOWs and cost estimates for ABES use in support of the Army in Hawaii for coral mitigation surveys and the Navy's Explosive Ordnance Disposal team in Bahrain for fish assessments.
- Promoting additional integration with the Air Force (at-sea runway warning light structures), Coast Guard (navigational buoys and chains) and National Oceanic and Atmospheric Administration (fluorometry integration).

#### Benefits

- Easy access to both vertical and horizontal areas not previously able to be assessed due to high costs or safety hazards
- Accurate spatial measurements
- Ability to monitor individual colonies without tagging
- Superior data archival potential
- Increased ability to assess and monitor the condition of benthic resources using multiple desktop analytical methods
- High-quality visual means of conveying benthic condition to a stakeholder and/or regulator



**Mission applications for the Automated Benthic Ecology System.** Schematic Credit: Cheryl Ann Cooke





## PROJECT NO. 522:

### Demonstration of New Strategies for Enhanced Monitored Natural Recovery at Navy Sediment Sites\*

PRINCIPAL INVESTIGATORS:  
IGNACIO RIVERA, GUNTHER ROSEN

This project is investigating the use of clean dredged material as a cost effective and improved substrate relative to clean sand for thin-layer capping for remediation of moderately contaminated sediments at Navy sites. The growing use of thin-layer caps as a component of Enhanced Monitored Natural Recovery (EMNR) typically involves importing clean sand at considerable cost, while clean dredged material from nearby maintenance dredging is a potential beneficial reuse opportunity with the added benefit of natural organic carbon that could improve long-term performance of the remedy. FY18 project accomplishments include the following:

- Developed a protocol to guide the selection of appropriate dredged material for reuse and delineate risk factors relative to clean sand.
- Collected and characterized multiple dredged material samples from the confined disposal facility located on Waipio Peninsula in Pearl Harbor, HI two of which were selected for the demonstration based on low contaminant concentrations and other criteria provided in the selection protocol.
- Conducting a field demonstration at a Pearl Harbor sediment site currently planned for EMNR due to elevated PCBs and metals at a mesocosm scale using Remedy and Recontamination Assessment (RARA) arrays, recently developed under SERDP project no. 2537. The RARA arrays allow for multiple lines of evidence to be collected in-situ to assess realistic performance of multiple different treatment options over relatively long-time scales when compared with laboratory treatability studies.

- Placed three RARA arrays containing a total of 15 18-gallon treatment cells at the field site, representing the initiation of a 10-month assessment incorporating five different treatments in triplicate (two dredged material, one activated carbon, one clean sand and one control (contaminated sediment only)). The treatments were generally applied as a 4-inch layer over top of 6-inch of moderately contaminated sediment from Pearl Harbor.
- Deployed and recovered three different types of passive samplers from the arrays for comparison of bioavailable PCBs and metals in the surface layers. The passive samplers revealed very encouraging results, specifically showing that dredged material performed nearly as well as activated carbon (very effective, yet relatively costly), and also considerably better than clean sand, in reducing bioavailable PCBs in the sediment surface layer.



**Sampling a dredged material stockpile for the demonstration of natural sediment EMNR at Pearl Harbor, HI.** Photo Credit: Gunther Rosen



**Top-down view of a RARA array containing different thin-layer cap treatments over site sediments elevated in PCBs and metals.** Photo Credit: Steve Smith

\*Ongoing Projects

†Completed Projects



## PROJECT ACCOMPLISHMENTS

PROJECT NO. 523:

### **Integrated Diagnostic Stormwater Monitoring with Passive Sampling\***

PRINCIPAL INVESTIGATOR:  
GUNTHER ROSEN

This NESDI project evaluated the effectiveness of using passive sampling devices to assess the impacts of stormwater runoff and improve stormwater management at Navy facilities. FY18 project accomplishments include the following:

- Completed confirmatory wet and dry season receiving water sampling efforts using two types of commercially available passive sampling devices, the Polar Organic Chemical Integrative Sampler (POCIS) for detection of illicit discharges (e.g. pharmaceuticals, fragrances, insect repellent) as indicators of wastewater and Diffusive Gradients in Thin Film (DGT) for detection of available metals concentrations in waters adjacent to the Puget Sound Naval Shipyard and Naval Base San Diego.
- Puget Sound shipyard personnel provided leveraged funding to enhance the level of monitoring and end users actively participated in the field work.
- Demonstrated DGTs end-of-pipe applications, providing a promising alternative to costly stormwater monitoring involving autocomposite sampling.
- Presented results at multiple conferences and stakeholder meetings and recently submitted one manuscript to a peer reviewed journal (*Environmental Toxicology and Chemistry*) with two others in preparation.
- Incorporation of passive samplers into stormwater monitoring programs can help reduce the risk of illicit discharges and reduce costs associated with compliance monitoring at Navy facilities.



**Prototype configuration of commercially available DGTs (round plastic sensors) for monitoring stormwater in end-of-pipe applications.** Photo Credit: Gunther Rosen

\*Ongoing Projects    †Completed Projects



## PROJECT NO. 525:

### Non-Isocyanate Polyurethane-Free Formulation Coatings for Aircraft and Support Equipment\*

PRINCIPAL INVESTIGATOR:  
JESSICA REX

The objective of this project is to validate, approve and transition of non-isocyanate polyurethane free formulation (NI-PUFF) topcoats as replacements for existing polyurethane materials. FY18 project accomplishments include the following:

- Multiple tests this year resulted in technical issues (marring and color matching) that were relieved by a new batch of material being sent from the manufacturer and optimization of paint spray times.
- Successful sprayouts were performed of the coating on various geometries and sizes of panels and aircraft parts as well as the optimization of spray parameters.
- Monitoring of the ground support equipment is ongoing and dem/val of touch-up kits is expected to start in early FY19.



Worker applying polyurethane coating to an F/A-18 aircraft. Photo Credit: Jennifer Nunez

## PROJECT NO. 527:

### Structure-function Relationship and Environmental Behavior of Per- and Polyfluorochemicals from Aqueous Film Forming Foams\*

PRINCIPAL INVESTIGATOR:  
JOHN KORNUC

This project will provide environmental restoration managers and RPMs with better tools for building accurate conceptual site models (CSM). Additionally, the project will support improvements to the management of sites impacted by perfluorinated and polyfluorinated substances (PFAS). FY18 project accomplishments include the following:

- Sampled media from several aqueous film forming foams (AFFF) -impacted Navy sites, including a recent crash site at Naval Base Point Mugu (Triton Unmanned Aerial Vehicle). The use of AFFF at Mugu provided the opportunity to track the transformation of freshly-applied fluorotelomer-based AFFF in soil.
- Characterized PFAS from a Navy installation using an expanded chemical list.



A Sailor carries a tank of AFFF down a ladder during a fire drill. Photo Credit: MCS 2nd Class Nathan K. Serpico

\*Ongoing Projects

†Completed Projects





## PROJECT ACCOMPLISHMENTS

PROJECT NO. 528:

### **Impacts of Water Conservation Measures on Potential Safe Drinking Water Act Violations in Navy Water Supply Systems<sup>†</sup>**

PRINCIPAL INVESTIGATOR:  
TAMI RELPH

This project studied the impact of water conservation efforts on Navy drinking water supply systems including how those systems are negatively impacted by dramatic reductions in water consumption. FY18 project accomplishments include the following:

- Assessed a representative sample of water systems, NOV's and water quality data to gain a better understanding of the impact of declining water consumption in drinking water distribution system compliance with Safe Drinking Water Act (SDWA) regulations.
- Analyzed available data on drinking water consumption and SDWA NOV's at the regional and installation level to elucidate long term trends and water system vulnerability.
- Completed a case study utilizing portable water quality field testing equipment to perform high-frequency precision monitoring of a Navy water distribution system experiencing high water residence times and water quality deterioration.
- Completed site visits to specific Navy installations to assess how water utility system managers are dealing with the impacts of low water flow on drinking water systems.
- Established that installations that experienced significant reductions were no more likely to have a water quality-related NOV than those that experienced no reductions in water consumption.

- Concluded that other overarching factors that contributed to maintaining compliance were a well-looped system, a good quality source water and a robust operations and maintenance plan. These three factors are capable of being addressed over time but a long-term strategy needs to be in place to ensure success.
- Determined that nearly all of the common factors for good or bad drinking water systems were non-technical. The most important factor was having a sufficient number of staff members with enough long-term personnel familiar with the system to foresee and prevent potential issues from occurring. The ability to execute proactive strategies to prevent future problems, rather than operating in reactionary mode, has a major impact on keeping a system in compliance.



**This NESDI project studied the impact of declining consumption on drinking water systems.**

Photo Credit: Photographer's Mate 1st Class Bart A. Bauer

\*Ongoing Projects    †Completed Projects





## PROJECT NO. 529:

### Diver-less Deployment System for In-Situ Sediment Samplers†

PRINCIPAL INVESTIGATOR:  
JESSICA CARILLI

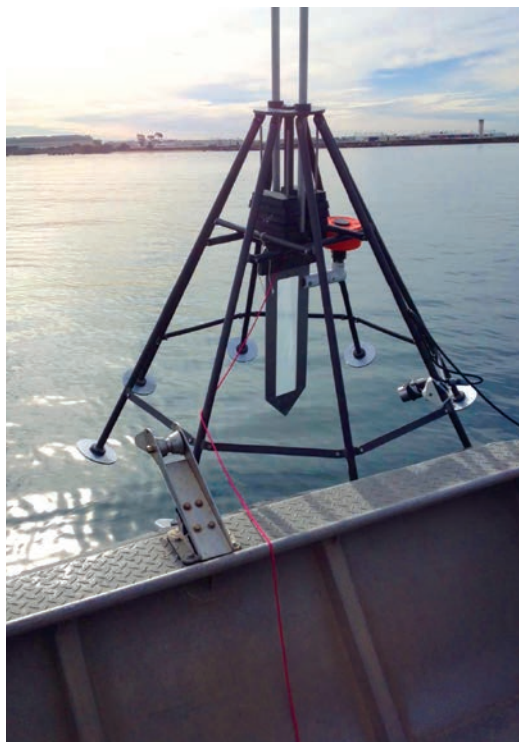
This project adapted available technologies and demonstrated a rapid, cost-effective system and methodology for cost effective deployment and retrieval of in-situ passive sediment samplers at contaminated sediment sites without putting divers in the water.

The “Passive Push” system was refined and tested in San Diego Bay and Pearl Harbor. During these tests and demonstrations the system was able to:

1. Accommodate multiple types of passive sampling materials.
2. Install and recover samplers from approximately 20 stations per day (versus approximately five stations with divers).
3. Retrieve most (90 percent) passive samplers (versus approximately 50 percent with divers).
4. Deploy and recover samplers in a range of water depths, currents and bottom types.
5. Be used easily by a small field team.

The increased rate of sampler deployment and recovery and increased number of recovered samples both made this system much more cost effective than traditional diver-deployed methods. The technology is expected to be applicable across the full spectrum of Navy sediment sites because it is useful in both the risk assessment stage and the remediation and monitoring stages of the contaminated sediment cleanup process.

The project team produced standard operating procedures (SOP) and disseminated information about the technology to potential users through platform presentations at the 2018 Ocean Sciences conference and sediment working group meeting and professional networks. The technology is already being transitioned to industry and other Navy users. For example, Geosyntec purchased a system and has used it for at least two field studies. Coastal Monitoring Associates, the point of contact for commercializing the technology, has been contacted by other interested consulting groups as well and Navy Region Southwest has provided funding for additional work in San Diego Bay.



**The “Passive Push” drive frame ready to deploy a polyethylene passive sampler to assess PCB contamination in San Diego Bay.**

Photo Credit: Jessica Carilli



PROJECT NO. 531:

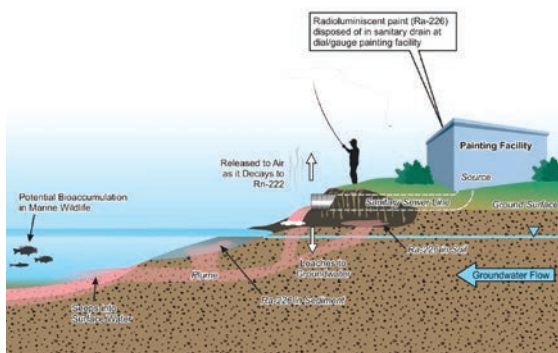
## Management Tools for Radiological Compounds in Environmental Media†

PRINCIPAL INVESTIGATOR:  
JOEY TROTSKY

The objective of this NESDI project is to prepare an Initiation Decision Report (IDR) that captures an informed strategy to guide future investments in the area of radiological contamination at Navy Installation/Restoration (IR) sites.

During this reporting period, the project team initiated their work on the development of an annotated outline for the IDR and solicited feedback from members of the Navy's radiological workgroup as well as key partners from the Radiological Affairs Support Office (RASO).

This IDR will analyze the problem the Navy is facing with radiological contamination at its IR sites. New or emerging technologies that are either available or need to be developed will be assessed along with their ability to meet the Navy's requirements and limitations. Recommendations will be made regarding potential technology areas for the Navy to consider investing in to improve the overall effectiveness of its radiological program.



**A source of radiological contamination in sediment.**

Diagram Credit: Joey Trotsky

## Management Tools for Radiological Compounds in Environmental Media: Draft Initiation Decision Report Annotated Outline

1. Executive Summary
2. Introduction
3. Problem Definition
  - a. What is the specific Navy problem?
4. Current Technologies
  - a. State of the Science/Current Practices
  - b. Assessment of Current Technologies
5. Emerging Technologies
6. Technology Gaps
  - a. What types of technology gaps exist?
    1. Policy
    2. Informational
    3. Process
    4. Materiel
  - b. What is needed to close the gaps?
    1. Research
    2. Demonstration and validations
    3. The right people involved
    4. Communication
7. Other Insights
8. Conclusions & Recommendations
9. References
10. Appendices
  - a. Table: Navy Radiological Site Needs (Technologies)
  - b. Table: Emerging Technologies for Radiological Compounds in Environmental Media



## PROJECT NO. 532:

### Multi-Functional Surface Preparation Technology for Maintenance Painting†

PRINCIPAL INVESTIGATOR:  
PAT MORROW

The objective of this project is to advance and evaluate the effectiveness of modified surface cleaning and decontamination gel materials for removing paint and providing sufficiently clean surfaces for coating. FY18 project accomplishments include the following:

- Conducted DeconGel™ formula refinement and initial paint removal tests on four different combinations of shipyard-provided steel samples.
- Formulated hydrogel coating as a carrier for the various paint strippers.
- Met with stakeholders at the Pearl Harbor Naval Shipyard & Intermediate Maintenance Facility (PHNSY&IMF) to refine the targeted application sites onboard ships and confirm the project's performance goals and requirements.
- Initial testing consisted of applying two commercially available paint strippers. Paint strippers softened the paint initially, but upon evaporation the paint returned to a set condition that remained difficult to remove.
- Paired the most promising paint stripper with the specially-formulated hydrogel. Once dry, the cured hydrogel was peeled away to observe paint removal effects. Again, some paint was removed and that which remained behind was softened, though not to the satisfaction of the investigators.

- Seeking to extend the cure time and potentially remove more paint during the drying process, a new (fourth) formula was used in conjunction with a hydrogel for the final testing. This fourth formulation did show some improvement in that more of the paint remained soft after removal of the hydrogel. Ultimately, it was not soft enough to remove the paint easily by scraping.
- The current state of the technology does not provide sufficiently effective removal of the robust paint systems targeted during this evaluation. A project "no-go" decision was reached for this application following discussion with stakeholders.



**NESDI investigators met with stakeholders at PHNSY&IMF to refine the targeted applications for DeconGel onboard ships and confirm the project's performance goals and requirements.**

Photo Credit: MCS 1st Class Jason Swink



PROJECT NO. 533:

### **Analysis of Regulated Garbage Management Processes to Ensure Compliance with Animal and Plant Health Inspection Service Regulations\***

PRINCIPAL INVESTIGATOR:  
TRACY CAROLE

The objective of this project is to better understand shoreside and shipboard regulated garbage (RG) management processes with the aim of creating SOPs and/or BMPs to ensure efficient RG compliance. FY18 project accomplishments include the following:

- Completed the RG management process baseline, a best practices document, pre-deployment training slides and an “All Hands” message template.
- Held multiple teleconferences with the fleet to refine the best practices document, address requests for additional training and determine how to disseminate information.
- Worked with fleet and NAVSUP representatives to identify NSNs for clear bags that meet the thickness requirement.
- Developed a label for the RG bags and obtained an NSN so that the fleet can order the label through the standard Navy supply system. Incorporated NSNs into best practices document and training slides.
- Provided the NAVSUP Food Management Team (FMT) with the best practices document and training slides for use in the FMT training provided to Navy vessels every two years.
- Identified the Afloat Environmental Compliance Toolbox site managed by U.S. Fleet Forces (USFF) Command as a temporary home for the best practices document and training slides.
- Collaborated with USFF personnel to get best practices document and training slides uploaded while discussions continue among fleet representatives.



**A regulated garbage container.**

Photo Credit: Tracy Carole

- Provided revisions of the Afloat Environmental Protection Coordinator course content to the Naval Safety and Environmental Training Center.
- Provided the best practices document and training slides to shoreside points of contact (including NAVFAC and port operations personnel) for distribution to returning vessels.
- Standardized related items (including the use of clear, 3-mil thick bags, the method of bag closure and RG bag labeling) and then highlighted those same items in a distribution email message.

**DEFINITION:** Regulated garbage is defined as all waste material and foreign food stores that are derived in whole or in part from fruits, vegetables, meats or other plant or animal (including poultry) material and other materials (packaging, Navy plastic pucks (ships) and plastic logs/slugs (submarines)) that have been associated (commingled) with any such material or has been in any port in Hawaii or any U.S. territory or possession within the last one-year period.

\*Ongoing Projects    †Completed Projects





## PROJECT NO. 534:

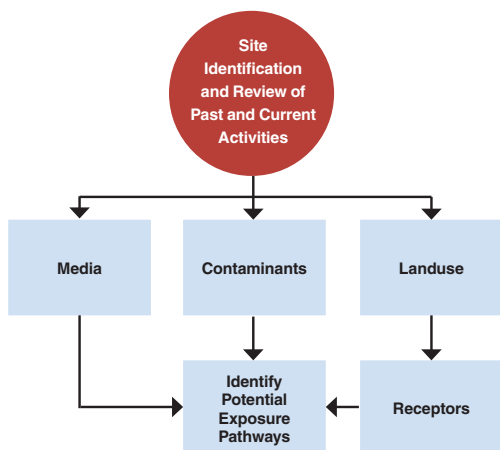
### Technology Evaluation and Sampling for Treatment of Perfluorochemicals\*

PRINCIPAL INVESTIGATOR:  
JOHN KORNUC

This NESDI project explores the effects of prior treatment of co-contaminants on PFAS distribution, transformation and the fate and transport to develop decision tools so that RPMs can develop better conceptual site models (CSM) for the investigation and cleanup of PFAS at Navy sites. FY18 project accomplishments include the following:

- Collected media from NAWC Warminster which has been undergoing remediation for co-contaminants using in-situ reductive methods. The media was then placed into anaerobic soil columns for studies and treated using lactate.
- Documented results that indicated that PFAS eluted from the soil during the initial application of lactate, but stabilize to a much lower, though still detectable, rate of PFAS leaching. Initial analyses suggest that the lactate/reductive treatment does not increase the rate of PFAS leaching

#### Notional Conceptual Site Model



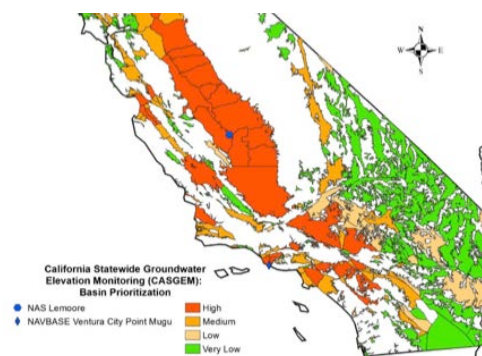
## PROJECT NO. 535:

### Evaluation of Alternative Groundwater Supply Sources from a Safe Drinking Water Act Viewpoint\*

PRINCIPAL INVESTIGATOR:  
MICHAEL ESTEBAN

The purpose of this project is to research, consolidate and summarize the state-of-knowledge on water security at Navy installations with a focus on groundwater supply sources in Navy Region Southwest. Water security and water resource vulnerabilities are a growing concern for southwest installations as encroaching populations and an increasingly variable climate negatively impact the quantity and quality of available water resources. FY18 project accomplishments include the following:

- Collecting data for a groundwater resources vulnerability assessment which will be a tool to support installation water resources decision-making.
- Evaluating and critiquing the Fox Canyon Groundwater Management Agency's Groundwater Sustainability Plan which has long-term impacts on Naval Base Ventura County's (NBVC) access to water resources.



The California Department of Water Resources' basin prioritization data classifies basins for implementation of the new groundwater sustainability plans. These classifications show both NBVC and NAS Lemoore as being in high priority basins.

Photo Credit: California Department of Water Resources

\*Ongoing Projects

†Completed Projects



PROJECT NO. 537:

### Stable Carbon Isotopes for Tracing In-Situ RDX Remediation\*

PRINCIPAL INVESTIGATOR:  
THOMAS BOYD

This project is providing Remedial Project Managers (RPM) with a more accurate way of measuring munitions degradation rates to support knowledge-based remediation strategies including the use of monitored natural attenuation. FY18 project accomplishments include the following:

- Conducted site visit and assessment, interfaced with personnel from the U.S. Army Corps of Engineers to collaborate with push-pull tests and received initial feedback on workplans from EPA and State regulators.
- Generated and submitted final workplans that reflected comments from the regulators and a Tier II sampling and analysis plan (SAP) for Site F (regulatory compliance document) was submitted and approved.
- Dual ( $^{13}\text{C}$  and  $^{15}\text{N}$ ) RDX synthesis was completed and delivered to the site while carbon dioxide traps were deployed before push-pull tests to establish an isotopic baseline for Site F and Site A at the Naval Base Kitsap in Washington state.



Post-push sampling for bacterial mineralization products.

- Initiated push-pull tests (injecting water, conservative tracer and  $^{13}\text{C}$ -,  $^{15}\text{N}$ -labeled RDX) at six wells and long-term traps were deployed in spring of 2018 at Site F (year one site).
- Finalizing fate and transport models to account for RDX degraded at each well.
- Completing final analyses and modeling to submit a peer-reviewed manuscript before 2019. A similar demonstration at Site A will commence in the spring of 2019.
- Results from this demonstration will allow site and other RPMs to accurately assess on-site remediation with concrete evidence (isotopes), under various remediation schemes.



Push-pull test preparation with reservoir, in-well pump installed, coolers ready to ship samples.



Preparing push with  $^{13}\text{C}$ -,  $^{15}\text{N}$ -RDX, conservative tracer and, in some wells, fructose.

All photos by Tom Boyd.

\*Ongoing Projects    †Completed Projects



## PROJECT NO. 538:

### Advanced Primer Superhydrophobic Topcoat for Corrosion Prevention and Leachate Impedance\*

PRINCIPAL INVESTIGATORS:  
BRANDON SWOPE, JEREMY MATTISON

This effort is developing and demonstrating coatings that provide corrosion protection and impede metal leachate via two research and development mechanisms — superhydrophobic coatings and inorganic zinc-free primers. FY18 project accomplishments include the following:

- Completed initial salt-fog chamber testing of two coating systems on galvanized test panels. Different combinations of Superhydrophobic Diatomaceous Earth (SHDE) and solvent types were used to perform an initial round of panel testing.
- Used two mil-spec paint systems to coat test panels (a gray PSX-700 two-part epoxy and a white Sherwin-Williams two-part urethane (SWPU)). In general, PSX-700 and SWPU performed well with two of the three solvent types; Fluorinert and Isopar-C worked well, while the panels using Naptha as a solvent showed a high degree of undercutting (corrosion).
- Results of initial testing guided the final formulations for full scale panel testing of SHDE topcoats. Completed a large-scale panel coating process and series of test panels that have been successfully painted with integrated SHDE topcoat.
- Will evaluate all panels in laboratory-based tests such as the salt fog testing done previously. Panels will also be deployed outside for exposure testing and leachate evaluation, and will include long term exposure at various locations known for high corrosion rates.



Corrosion on underside of galvanized tower related to exposure to salt spray.



Close-up of corrosion on coated, galvanized structure.



Heavy corrosion and coatings failure on galvanized tower.

All photos by Felicia Johnson.





## PROJECT ACCOMPLISHMENTS

### PROJECT NO. 539:

#### **Using a Forward-Looking Infrared Camera for Advanced Discharge Characterization\***

PRINCIPAL INVESTIGATOR:  
BRANDON SWOPE

Using a Forward Looking Infrared (FLIR) camera, this NESDI project will provide a fast and accurate means of characterizing pier-side discharges and incorporate results into existing hydrodynamic models. FY18 project accomplishments include the following:

- Performed San Diego Bay pier-side testing with a field camera tri-pod system.
- Initiated model development and model results are in agreement with the observed plume discharge. Model was refined for a planned site visit to Pearl Harbor to assess the effectiveness of the camera to characterize a full-scale outfall.
- Captured background ambient conditions at Pearl Harbor (Dry Dock 4) before any discharge occurred and then collected approximately 10 videos once discharge had reached equilibrium. Model results closely match empirical field data. Camera was able to successfully capture the discharge plume with only minor variations in temperature from ambient and post processing allowed for establishment of a mixing zone area.
- Initiated the drafting of a manual to guide the field use of the camera.



Using a FLIR camera, this NESDI project will provide a fast and accurate means of characterizing pier-side discharges. Photo Credit: Brandon Swope

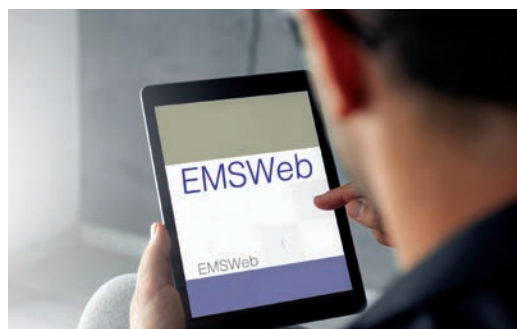
### PROJECT NO. 540:

#### **Smart Electronic Tools for Navy Environmental Compliance Monitoring and Reporting\***

PRINCIPAL INVESTIGATOR:  
ITZEL GODINEZ

The purpose of this NESDI project is to evaluate the performance of smart mobile devices such as tablets and web-based environmental management systems (EMS) in facilitating data collection, manipulation and dissemination while performing audits and inspections at Naval facilities. Their implementation may also reduce, in significant numbers, the current amount of labor hours invested in the field. FY18 project accomplishments include the following:

- Provided tablets to the NAVFAC Information Technology Center (NITC) wireless manager to process the inventory, buildout necessary changes for the tablets and complete the necessary hardware testing and approval.
- Secured the use of a tablet to conduct a proof-of-concept on the performance of the tablet in connection with EMSWeb which incorporated testing for mobility functionality, basic EMSWeb functionality and enhanced user capabilities. These proof-of-concept tests were successful.
- NMCI personnel completed the tablet's hardware approval process, issued their certification and ordered NITC to release them to the user.



This NESDI project is evaluating the performance of tablets and other mobile devices for use in the field during audits and inspections.

\*Ongoing Projects    †Completed Projects





## PROJECT NO. 541:

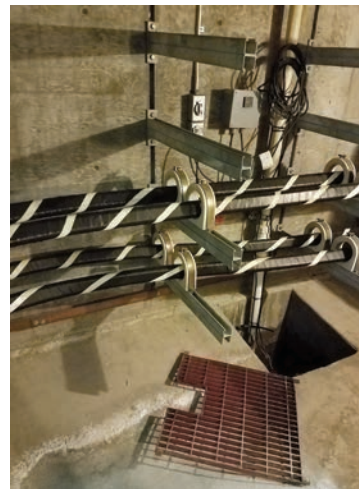
**Utility Vault Water Treatment\***

PRINCIPAL INVESTIGATOR:  
PAT MORROW

The purpose of this NESDI project is to demonstrate a technology that will allow users to decontaminate water accumulated in utility vaults and discharge it to storm drains—avoiding permit violations. FY18 project accomplishments include the following:

- Discussed acceptance criteria for the performance of the targeted filters and identify test locations with Naval Base Coronado (NBC) personnel.
- Examined utility vaults and underground sumps at stations onboard NBC along with personnel from NAVFAC Southwest. These stations were incorporated into a test plan in addition to an open, above-ground containment berm near NBC Pier K. Integration strategies were discussed, and following validation, the Hydrocarbon and Contaminants Removal (HCOR) device will be included in the next revision of NBC's Stormwater Pollution Prevention Plan as a narrative BMP.
- Developed configurations for the HCOR device testing working with NAVFAC's sampling experts. The targeted sumps currently operate on automatic discharge pumps. Additional pumps will be needed to manually pump, treat and sample for during testing.
- Refined sampling plan and strategy after conversation with personnel from NAVFAC Southwest and one of the project's support contractors (Red Lion Chem Tech). Due to a lack of accumulated stormwater and groundwater intrusion in utility vaults, sampling has not yet been conducted.
- Drafting an alternate sampling plan in the event that a utility vault wash-down/cleanout is used as a treatment evolution rather than accumulated stormwater.

- Considering options for flushing water into a vault or performing a wash-down procedure in addition to conducting stormwater sampling during the next rainy season. Working with San Diego-based team members to execute this and other options to validate the technology.



**This NESDI project intends to demonstrate a method to decontaminate the accumulated water in utility vaults on board Naval Base Coronado and elsewhere.** Photo Credit: Pat Morrow

\*Ongoing Projects

†Completed Projects



## PROJECT ACCOMPLISHMENTS

### PROJECT NO. 542:

#### **Naval Air Systems Command Solutions for Engine Washing\***

PRINCIPAL INVESTIGATOR:  
KEIKO SAPP

This project evaluates an engine wash process (the EcoPower™ system) for use in Navy aircraft maintenance facilities to reduce environmental impacts while also improving cleaning efficiency, engine performance and time-on-wing for enhanced mission readiness. FY18 project accomplishments include the following:

- Completed a number of demonstration trials including a 30-day and 90-day trial of the P-8 Poseidon transport in Jacksonville, FL, where 25 P-8 engines were washed. A T-34 Mentor demonstration wash was also conducted. Technical reports summarizing the success of each of these trials are on the NESDI website. Other work included corrosion testing of a T-64 (turboshaft engine) torque shaft and an engine wash of a H-53 Super Stallion helicopter.
- Obtained the EcoPower engine wash performance data, analyzed fuel cost savings and provided these data to the V-22 Osprey and H-60 Black Hawk Fleet Support Teams (FST). The V-22 FST has since requested a 30-day trial of the engine wash system and the H-53 program office is also interested in a trial.



**The EcoWash engine wash system nozzles in place during a test on one of FRC Southeast's flight lines.** Photo Credit: Kami Downey

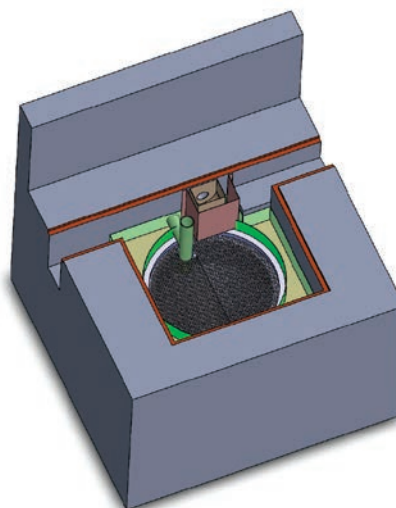
### PROJECT NO. 543:

#### **Preventative Management of Contaminated Silt\***

PRINCIPAL INVESTIGATOR:  
PAT MORROW

This NESDI project is evaluating the use of drop-in passive and active silt collection, dewatering and removal devices to simplify sediment cleanup following docking and undocking evolutions and incrementally reduce the contaminants surrounding dry dock facilities. FY18 project accomplishments including the following:

- Drafted Computer Aided Design drawings of clarifier inserts to support submission of a fabrication technical instruction package.
- Held follow-on discussions with fabricator to further advance a specific design for sand trap inserts.
- Draft a requirements document and shared it with PSNS&IMF personnel for further input regarding installation-based requirements.



**A CAD drawing of a clarifier insert configuration.**

Credit: Pat Morrow



## PROJECT NO. 544:

### Using Stable-Isotope Labeled Tracers to Validate Natural Attenuation of RDX in Groundwater\*

PRINCIPAL INVESTIGATOR:  
JOVAN POPOVIC

This project is demonstrating a stable isotope tracer approach for determining the mechanisms and in-situ rates of cyclotrimethylene-trinitramine (RDX) attenuation in groundwater at Navy sites that are impacted by munitions explosives contamination. FY18 project accomplishments include the following:

- The Nitrogen-15 labeled RDX tracer was synthesized by Dr. Steve Fallis at NAWCWD China Lake. The  $^{15}\text{N}$  labeled RDX injection took place in the summer of 2018 with sampling efforts continuing into September. Samples were collected and shipped to Dr. Craig Tobias's Isotope Facility at the University of Connecticut for analysis. All wells in the study were pumped back to baseline conditions following completion of the field portion of the study at Naval Base Kitsap.
- Preliminary data indicate that under anaerobic conditions, such as those observed in one of the monitoring wells,  $^{15}\text{N}_2$  gas evolution is occurring as a result of  $^{15}\text{N}$  RDX mineralization. RDX/contaminant mass reduction is of primary interest and out of the many end products that can form as a result of RDX degradation, production of inert  $\text{N}_2$  gas is the most desirable outcome.



RDX partially labeled with  $^{15}\text{N}$  was synthesized at NAWCWD China Lake. This material was injected into a groundwater well at Naval Base Kitsap to study mechanisms and in-situ rates of RDX attenuation. Diagram Credit: Ross Shingledecker

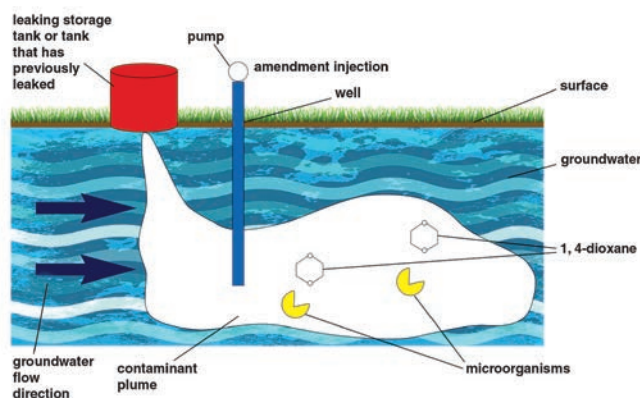
## PROJECT NO. 545:

### In-situ Treatment of 1,4-Dioxane Using Enhanced Biodegradation\*

PRINCIPAL INVESTIGATOR:  
ANTHONY DANKO

The objective of this NESDI project is to demonstrate a cost-effective treatment method for reducing or removing concentrations of 1,4-dioxane from groundwater at impacted Navy sites. FY18 project accomplishments include the following:

- Held an initial site visit and meeting with the demonstration site's RPM and started working on the project's Health and Safety Plan (HASP) and PMP.
- Identified a tentative location (Naval Air Station North Island) and a Rhodococcus strain.
- Working on scaling up the culture with continual testing of different media types and their impact on microbial degradation activity.
- Completing a final HASP and logistical considerations now that a demonstration site and culture have been determined.



An idealized representation of the treatment of a groundwater plume containing 1,4-dioxane via amendment (in this case microorganisms) injection to facilitate remediation.

Diagram Credit: Amy Jungers

\*Ongoing Projects    †Completed Projects



## PROJECT ACCOMPLISHMENTS

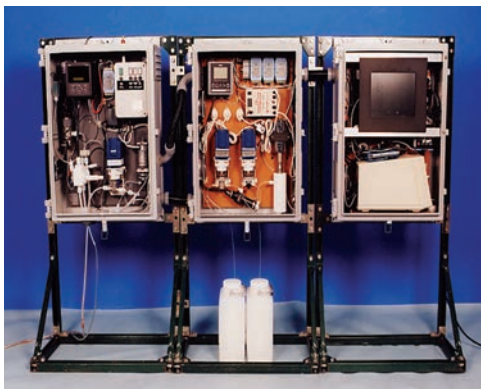
### PROJECT NO. 546:

#### **NPDES Copper Effluent Control System\***

PRINCIPAL INVESTIGATOR:  
IRYNA DZIECIUCH

This project is demonstrating the ability of the Navy Copper Analyzer (NCA) to continuously measure in real-time the total copper (dissolved and particulate) concentrations in dry dock effluents. FY18 project accomplishments include the following:

- Continued to maintain and upgrade the NCA system including refurbishing the salinity sensor system, replacing pH probes, reference electrodes and Cu-IES electrodes as well as re-calibrating the instrument using new sensors.
- Met with CRADA partners (ThermoFisher and Jensen instruments).
- Shipped refurbished instrument to Pearl Harbor where a security permit was issued and installation of the system was pending prior to the system demonstration that was initiated in August 2018.



**This NESDI project is demonstrating the ability of the NCA to measure in real-time total copper concentrations in dry dock effluents.** Photo Credit: Mike Putnam

### PROJECT NO. 547:

#### **Demonstration of Improved Toxicity Methodology to Link Stormwater Discharges to Receiving Water Impacts\***

PRINCIPAL INVESTIGATOR:  
MARIENNE (MOLLY) COLVIN

This effort will derive, demonstrate and validate a more accurate exposure design for laboratory toxicity testing to improve stormwater discharge monitoring. FY18 project accomplishments include the following:

- Presented poster at the national SETAC meeting in November 2017, published a feature article in the fall 2017 newsletter published by the Southern California SETAC, delivered a project briefing to NAVFAC Southwest end users and presented a webinar to the members of California Stormwater Quality Association (CASQA).
- Launched and completed a literature review which resulted in a summary report ("Approaches to Evaluating Episodic Discharged") and a technical document ("Historical Rainfall Assessment").
- Presented a briefing to personnel from EPA's Office of Wastewater Management/ Water Permits Division who showed interest and willingness to help with the method development and acceptance.
- Conducted laboratory testing using copper-spiked seawater samples as well as stormwater samples collected from Naval Base San Diego (NBSD) and the University of California San Diego/ Scripps Institution of Oceanography (UCSD/SIO) to determine the median lethal and median effective concentrations.
- Deployed in-situ organisms during end-of-pipe sampling/toxicity testing at UCSD/SIO to provide linkage between end-of-pipe and conditions observed in receiving environment.

\*Ongoing Projects    †Completed Projects





- Tested dry dock discharge samples that are routinely sampled as part of a NPDES monitoring program at the PSNS&IMF under the pulsed exposure methodology.
- Conducted site visits to NBSD, NB Point Loma and NBC/Naval Amphibious Base Coronado and identified several outfalls for sample collection and equipment deployments.
- Conducted visits with RPMs who have indicated strong support of this project.
- Tested PSNS&IMF dry dock discharge samples under the pulsed exposure methodology for a second round of testing. A third and final iteration of pulsed exposures on dry dock effluent samples from PSNS&IMF occurred in late August 2018.



Traditional end-of-pipe collection and testing methods along with in-situ validation of the pulsed exposure methods will be performed in the receiving environment to validate the representativeness and protectiveness of the pulsed exposure method using the SEA Ring. Photo Credits: Outfall (top left) and two submerged SEA Rings (bottom right): Chris Stransky

#### PROJECT NO. 548:

### Sewer Gas Elimination Technology\*

PRINCIPAL INVESTIGATOR:  
STEVEN FANN

The objective of this NESDI project is to demonstrate a dissolved air technology as a cost-effective way to mitigate the generation and release of noxious and toxic gases in sanitary sewers and to comply with sulfide discharge standards. Replacing chemical injection with dissolved air system can result in significant cost savings. FY18 project accomplishments include the following:

- Selected Pump Station A (PS-A) at NAB Coronado as a demonstration site, completed a baseline study and awarded a contract for the fabrication and installation of a dissolved air system at PS-A for demonstration.
- Coordinated with NAVFAC Southwest personnel to inject chemicals (a ferrous chloride solution) into PS-A and its upstream PS-B to mitigate sulfide problems. Baseline sampling showed that PS-A had hydrogen sulfide levels exceeding the health and safety standards if left untreated and that treating PS-A and PS-B with chemical injection can reduce dissolved sulfide concentrations to levels that meet compliance standards.

End users anticipate integrating this technology to other pump stations at NAB Coronado, NAS North Island and NBVC Point Mugu if it is proven successful.



**This dissolved air technology is being demonstrated to mitigate toxic gases from sanitary sewers onboard NAB Coronado.** Photo Credit: Steve Fann

\*Ongoing Projects

†Completed Projects



## PROJECT ACCOMPLISHMENTS

PROJECT NO. 549:

### **Demonstration of Optimized non-NMP (n-Methyl-2-pyrrolidone) Solvents for Immersion Chemical Depainting\***

PRINCIPAL INVESTIGATOR:  
JOSEPH SANTA MARIA

The purpose of this effort is to demonstrate and validate an optimized non-NMP (N-Methyl-2-Pyrrolidone) solvent for immersion chemical depainting as a drop-in replacement for NMP and methylene chloride products. FY18 project accomplishments include the following:

- Received all immersion depainting products and readied test panels for performance testing.
- Leveraged the results of the studies sponsored by the Aircraft Equipment Reliability and Maintainability Improvement Program (AERMIP). The AERMIP study found that a significant evaporative loss of D-Zolve 15-33 IM was demonstrated in a laboratory environment.
- Optimized two oil seals in a laboratory environment to reduce the evaporation of D-Zolve 15-33 IM. One of the oil seals (Crystal Plus 70 FG) was performance tested for strippability and was found to not affect the strippability of D-Zolve 15-33 IM.
- Initiated work on a replenishment solution/procedure for the optimized D-Zolve 15-33 IM since the evaporation has not completely ceased with the incorporation of an oil seal.
- Evaluated various different replenishment formulations for strippability in a laboratory since it was found that strippability is negatively affected by evaporation.



Photo Credit: MCS 3rd Class Anderson W. Branch

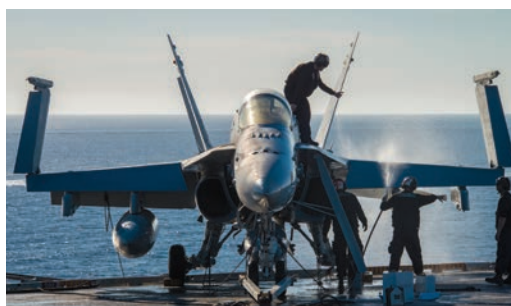


Photo Credit: Petty Officer 3rd Class Sean M. Castellano



Photo Credit: MCS 3rd Class Cole C. Pielop



**NESDI investigators are demonstrating and validating an optimized non-NMP solvent for immersion chemical depainting as a drop-in replacement for NMP and methylene chloride use on the F/A-18F Super Hornet and other Navy platforms.** Photo Credit:

MCS Seaman Apprentice Jarrod A. Schad

\*Ongoing Projects    †Completed Projects



## PROJECT NO. 550:

### A Comprehensive Analysis and Strategy for Contaminated Sediment Management†

PRINCIPAL INVESTIGATOR:  
JOEY TROTSKY

The goal of this project is to prepare an IDR to better frame the Navy's approach and investments toward effective contaminated sediment management—a challenge that is broadly estimated to be a one-billion-dollar problem for the Navy. If the sediment remediation costs proposed recently at Navy sites in the Feasibility Study and Record of Decision stage are a guide, the actual cost of managing these sites could be even higher than this estimate.

At many sediment sites, the understanding and tools for determining the nature and extent of the contamination, the limitations of existing characterization tools, the shortcomings of current remediation and performance monitoring technologies and regulatory/stakeholder expectations are still evolving. Therefore, decision making can occur at each stage without the necessary and complete information.

This project's draft IDR provides technical insights into the sediment marketplace, identifies information gaps and limiting factors such as Navy operational or regulatory policies, and highlights the challenges associated with implementing effective contaminated sediment remediation.



A barge distributes tons of armored rock on top of a confined aquatic disposal cell. This IDR will provide a comprehensive strategy to guide the NESDI program's investments in the Navy's contaminated sediment management area. Photo Credit: Vance Vasquez

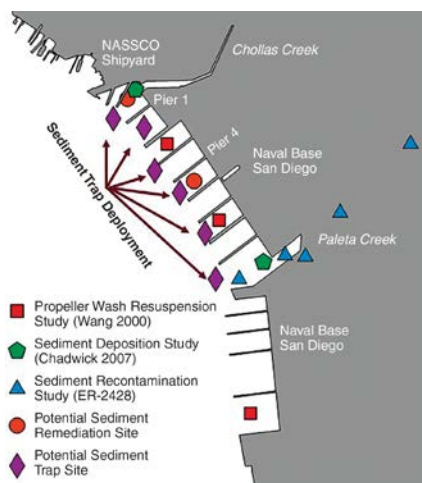
## PROJECT NO. 551:

### Impact of Sediment Resuspension by Propeller Wash and Shore Sediment Dynamics on Remediation Options\*

PRINCIPAL INVESTIGATOR:  
PEI-FANG WANG

The purpose of this project is to provide RPMs with more information regarding the effectiveness of various sediment remediation methodologies under real-world stressors such as propeller wash and wave activity. FY18 project accomplishments include the following:

- Completed the sediment and metal analysis for the two deployments, including the wet and dry seasons. These data are being used to evaluate and identify deposition patterns of the sediment loads during the dry (including primarily propeller wash) and wet (with additional river input) seasons.
- Developed propeller speed contour maps which aim to provide speed limits for the propellers near the remediation sites in order to protect the integrity of the remediated contaminated sediment sites.
- Launched near- and long-term modeling efforts on the effects of propeller wash.



Sediment traps were deployed in San Diego Bay to assess the effectiveness of various sediment remediation methodologies under real-world stressors such as propeller wash and wave activity. Diagram Credit: Pei-fang Wang

\*Ongoing Projects †Completed Projects





## PROJECT ACCOMPLISHMENTS

### PROJECT NO. 553:

#### **Study of Waste Management and Minimization for AFFF Wastewater\***

PRINCIPAL INVESTIGATOR:  
DANIEL EDWARDS

The objective of the project is to develop economic costing factors, cleanout methods, treatment and disposal options in support of aqueous film forming foam (AFFF) system cleanout. The project will help transition away from concentrates with environmentally deleterious materials. FY18 project accomplishments include the following:

- Identified a potential site for the pilot study to determine residual contaminant concentrations within AFFF systems after conducting a triple rinse to ensure compliance with the military specification when systems were recharged with new formulations of AFFF.
- Completed the pilot scale test and shared the results with the Department of the Navy (DON) AFFF working group. The results indicate that a triple rinse with either water or a butyl carbitol/water mix significantly reduces the amount of PFAS in the mobile system tanks (a reduction of 99.97 percent was observed).



**Pilot scale cleanout of a mobile Aircraft Rescue and Fire Fighting vehicle at NAS Meridian.**

Photo Credit: Andy Vasquez

### PROJECT NO. 555:

#### **Demonstrating the Effectiveness of Novel Treatment Technologies for the Removal of Poly- and Perfluoroalkyl Substances from Groundwater\***

PRINCIPAL INVESTIGATOR:  
JOVAN POPOVIC

The objective of this project is to obtain data from laboratory studies and field demonstrations to determine the best available technologies for the treatment of groundwater impacted by PFAS at Navy sites. Project accomplishments in FY18 include the following:

- Initiated batch tests using various adsorbents to treat PFAS from AFFF. Varying amounts of two types of granular activated carbon (GAC), a single-use ion exchange resin and a cross-linked cyclodextrin were placed in synthetic groundwater solutions containing AFFF and PFAS concentrations in the supernatant compared to pre-sorbent levels. The cross-linked cyclodextrin removed PFAS most efficiently followed by the ion exchange resin and GACs.
- Prepared column studies using the sorbents based on the results from the batch tests. While the developmental cross-linked cyclodextrin removed the greatest mass of PFAS, this material is also expected to be costlier than GAC or ion-exchange resins, both of which are currently commercially available, whereas the cyclodextrin material is still in development.



**PFAS column treatability study construction at NAVFAC EXWC's environmental laboratory (left) and commercially available sorbents for batch and flow-through column studies (right).**

Photo Credit: Jovan Popovic

\*Ongoing Projects    †Completed Projects





## PROJECT NO. 556:

### Enterprise-wide Hazardous Material Standardization and Minimization of General Use Consumables\*

PRINCIPAL INVESTIGATOR:  
RENATA LAING

This NESDI project will result in a process to standardize the procurement of consumable general use hazardous materials and create tools to guide end users of hazardous materials to procure less hazardous products. The project team accomplished the following tasks in FY18:

- Interviewed stakeholders at Naval Base Ventura County and Naval Air Station (NAS) Oceana to understand the current process of ordering hazardous materials and adding items to the Authorized Use List (AUL).
- Examined an existing database used at NAS Oceana for ordering hazardous materials and streamlining the AUL process.
- Researched regulations and proposed a process to remove items that are either exempted from the AUL process or must follow another process. New safety and industrial hygiene stakeholders were added to the project team to obtain early buy-in.
- Selected three existing green rating systems that effect 44 percent of Local Stock Number items ordered.



This NESDI project intends to standardize the procurement of consumable general use hazardous materials. Photo Credit: Renata Laing

## PROJECT NO. 557:

### Initiation Decision Report of Laser Coating Removal on Naval Aircraft Components\*

PRINCIPAL INVESTIGATOR:  
STEPHEN STARNES

This project will study the applicability of current laser depainting systems to Navy aircraft components, specifically composite nose radomes. FY18 project accomplishments include the following:

- Visited Hill Air Force Base (AFB) and participated in a tour and demonstration of the base's Laser Automated De-coating System (LADS) and toured Marine Corps Air Station Cherry Point's Automated Rotor Blade Stripping System (ARBSS) blade depainting system.
- Visited Southwest Research Institute and Adapt Lasers whose personnel are developing aircraft laser depainting systems
- Met with the F-18 Fleet Support Team (FST) to discuss their requirements for using laser depainting system on the nose radome.
- Generated a first draft of the report that contains the results of the laser depainting technology survey.



This NESDI project is studying the applicability of current laser depainting systems on composite nose radomes and other Navy aircraft components. Photo Credit: Steve Starnes

\*Ongoing Projects

†Completed Projects



## PROJECT ACCOMPLISHMENTS

### PROJECT NO. 558:

#### **In-situ Automatic Stormwater Sampling Device for Use at Tidally Impacted Sampling Locations\***

PRINCIPAL INVESTIGATOR:  
ERNIE ARIAS

This project was established to design and test a simple, cost-effective device for accurately sampling stormwater in tidally impacted areas. FY18 project accomplishments include the following:

- Attended to the testing site requirements and selection, the extent of modifications to the Programmable Automatic Water Sampler (PAWS) system, performance measurement, transition and a schedule of milestones.
- Initiated modifications to the PAWS system for use as an in-situ stormwater sampler including pressure and conductivity sensors for triggering the sample pump.
- Initiated work on the design of an anchoring mechanism for secure placement of the unit at stormwater sampling sites.
- Validated a benchtop system that includes the sensor array, control board, pump system and sample container and integrated sub-routine algorithms for system-wide operation. The system performed as designed during benchtop testing; sensor response was captured and pump operation was correctly triggered.
- Determined that a sampling device will be appropriate where a single stormwater grab sample is needed, equivalent to manual collection of a grab sample with the advantage of automatic, unattended operation and the capability of distinguishing tidal water.



**The PAWS system electronics and pump.**

Photo Credit: Ernie Arias

### PROJECT NO. 560:

#### **Biochar Adsorption for Dry Dock Effluent\***

PRINCIPAL INVESTIGATOR:  
LEWIS HSU

This project will establish the efficacy of the use of biochar to remove regulated contaminants from shipyard dry dock discharges. FY18 project accomplishments include the following:

- Performed preliminary laboratory studies assessing biochar adsorption capacity and rate of adsorption which show a reduction of copper levels to baseline levels in distilled water.
- Generated preliminary engineering drawings for drop-in filters for dry dock implementation.
- Successful implementation of biochar media for pollutant control supports a cost-effective means for achieving regulatory compliance that ensures the shipyards can complete their mission.



**A submarine awaits repair in dry dock.**

Photo Credit: MCS 1st Class Amanda R. Gray



## PROJECT NO. 561:

### Development and Demonstration of a Portable, Temporary Barrier to Aid in Cargo and Equipment Inspections to Prevent Brown Treesnake Dispersal\*

PRINCIPAL INVESTIGATORS:  
JEAN PAN, ITZEL GODINEZ

The objective of this effort is to design and demonstrate a portable, temporary barrier that will help prevent the spread of brown treesnakes (BTS) from Guam through Department of Defense (DoD) cargo shipments. Portable, temporary barriers that prevent BTS movement will reduce transportation delays and allow for realistic training flows to support warfighter readiness. FY18 project accomplishments including the following:

- Completed and received approval of a project demonstration plan, corresponded with U.S. Geological Survey (USGS) partner to review that plan, established a support agreement and drafted an overall project schedule.
- Leveraged funding from other projects to meet with project partners on Guam to discuss the barrier requirements, the current BTS inspection process and a demonstration location on Guam for the second phase of this effort (i.e., demonstration of a large-scale prototype in a representative military environment).
- Corresponded with and received leveraged resources from the U.S. Air Force Civil Engineer Center to incorporate barrier requirements that may be useful for construction purposes.
- Reviewed, discussed and refined preliminary ideas on barrier design to provide the DoD and Navy with a tool that will increase efficiency and efficacy of current BTS inspections and will also provide for flexibility in military training activities and missions.



John Lizama, a dog handler with the U.S. Department of Agriculture, guides a working dog around a Humvee to check for brown treesnakes before the vehicle is loaded onto an Air Force C-130 Hercules aircraft at Andersen Air Force Base, Guam.

Photo Credit: Senior Airman Marianique Santos



The brown treesnake.

Photo Credit: Shane R. Siers

\*Ongoing Projects

†Completed Projects





PROJECT NO. 562:

### **Elimination of Hexavalent Chromium from Magnesium Conversion Coating Processes at Fleet Readiness Centers \***

PRINCIPAL INVESTIGATOR:  
ALAN GRIEVE

This project is evaluating the use of hexavalent chromium-free conversion coatings on magnesium alloys and demonstrate their effectiveness as a drop-in replacement. The immediate benefit for the Navy from this program is the further reduction of chemical immersion processes based on hexavalent chromium. The costs associated with the rework of magnesium alloys should significantly diminish with time as environmental, safety and occupational health (ESOH) -related costs are expected to decrease. FY18 project accomplishments include the following:

- Initiated tests with both trivalent chromium and non-chromium conversion coatings containing various color additives on various magnesium alloy types (cast and wrought). They determined the appropriate concentration range of additive needed to provide adequate coloration for visual inspection.
- Used electrochemical methods (electrochemical impedance spectroscopy (EIS) and potentiodynamic polarization) to quickly assess corrosion resistance properties. Magnesium panels can then be stripped and re-used in similar tests. When satisfactory performance is demonstrated with several conversion coating types, a more complete test matrix will commence.



Photo Credit: MCS 3rd Class Chris Roys



Photo Credit: Lance Cpl. Jason Monty



**NESDI investigators are demonstrating the effectiveness of hexavalent chromium-free conversion coatings on magnesium alloys for future use on H-53 helicopters and other Navy weapons platforms.**

Photo Credit: MCS 3rd Class Chris Roys





## PROJECT NO. 563:

### Low-VOC Primers for Ground Support Equipment Application\*

PRINCIPAL INVESTIGATOR:  
MICHAEL BRINDZA

The objective of this effort is to laboratory test, demonstrate, validate and qualify low volatile organic compound (VOC) primers for use on ground support equipment (GSE). Failure to identify primer alternatives can jeopardize Navy GSE coatings operations and increase compliance cost to current and future local and EPA environmental regulations. FY18 project accomplishments include the following:

- Applied candidate and control primers to test specimens and initiated the testing of their performance properties.
- Participated in a dem/val at the Letterkenny Army Depot of a non-chromate lower VOC formulation of the MIL-DTL-53022 primer.



This truck is among the targeted GSE for the low-VOC primers being demonstrated under the NESDI program. Photo Credit: Michael Brindza

### NESDI By the Numbers

#### PROGRAM

578: Program participants  
34: Commands supporting the program  
67: Activities supporting the program

#### NEEDS

772: Needs submitted  
233: Needs approved  
30: Percentage of needs approved  
10: Commands submitting needs

#### PROPOSALS

350: Pre-proposals submitted  
218: Pre-proposals approved  
62: Percentage of pre-proposals advanced to full proposal stage  
8: Commands submitting pre-proposals  
219: Full proposals submitted  
145: Full proposals approved  
66: Percentage of full proposals approved  
6: Commands submitting full proposals

#### PROJECTS

145: Projects launched  
80: Participating Principal Investigators  
6: Commands participating in projects  
11: Activities participating in projects

#### OTHER

3: Program Managers  
(Scott Mauro, Leslie Karr, Ken Kaempffe)  
205: Current active users  
388: Users since 2007

**Note:** These numbers were compiled from data available on the NESDI website since 2007.



## PROJECT ACCOMPLISHMENTS

PROJECT NO. 566:

### **Source Metal Particle Removal for Stormwater Compliance\***

PRINCIPAL INVESTIGATOR:  
JIM HOWELL

This project is demonstrating an advanced, vehicle-based, water-jet surface cleaning and recovery system for removing metal particulate and other contaminants from surfaces, including facility operational areas, that contribute to stormwater discharges. The commercial system selected and further advanced for validation is the Municipal Cleaning Vehicle (MCV). FY18 project accomplishments include the following:

- Completed full operational checks and repair of the MCV operational joystick that was damaged during shipment following system evaluation at PSNS&IMF.
- Finalizing surface cleaning and samplings details with NAVFAC Southwest personnel and the Naval Amphibious Base (NAB) Coronado sampling contractor that are needed to complete the project's test and sampling plan.
- Preparing to ship the vehicle to NAB Coronado after which Carderock personnel will train on-site personnel to operate the system in support of the planned surface cleaning evolution that is arranged to occur during San Diego's rainy season.



**These industrial areas onboard NAB Coronado are the priority targets to be cleaned by the MCV over the course of this NESDI project.**

Photo Credit: Jim Howell



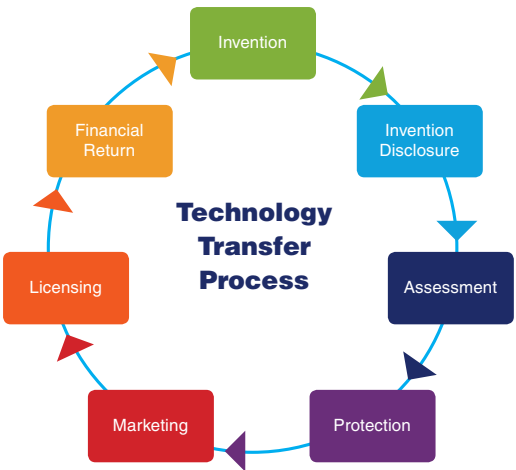
PROJECT NO. 567:

**Business Processes and Requirements Enabling Technology Integration\***

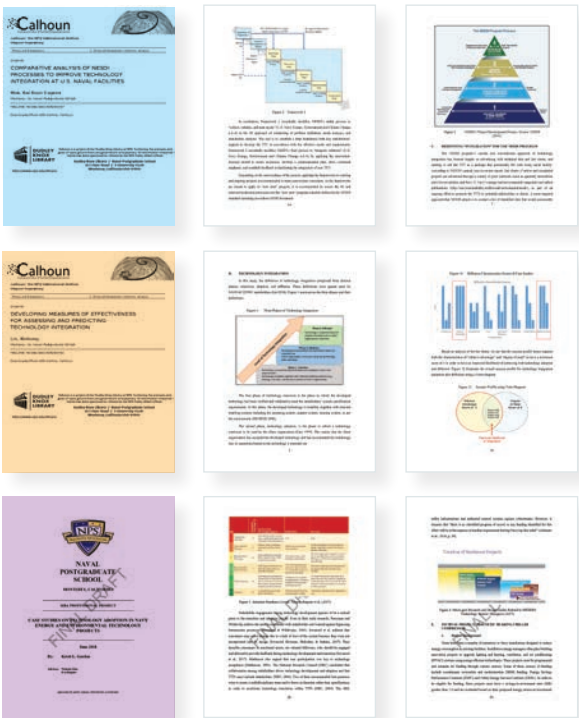
PRINCIPAL INVESTIGATOR:  
MARTIN MCMORROW

The objective of this project is to provide a clear, practical approach and manual/tool to enable efficient and effective integration of technology, techniques, tools (TTT) with an emphasis on environmental compliance type projects at facilities. FY18 project accomplishments include the following:

- Published three Naval Postgraduate School theses—“Case studies on Technology Adoption in Navy and Environmental Technology Projects,” “Developing Measures of Effectiveness for Assessing and Predicting Technology Integration” and “Comparative Analysis of NESDI Process to Improve Technology Integration at U.S. Naval Facilities.”
- Determined the appropriate related research and development efforts to look for lessons learned that can be applied to the NESDI process.
- Established a framework to objectively rank past NESDI projects based on technical performance and integration potential.
- Evaluated various databases/tracking tools to determine their potential for producing leads or other stakeholders that may be interested in a NESDI developed or developing technology.



This NESDI project intends to provide a clear, practical approach and manual/tool to enable efficient and effective integration of technology, techniques and tools.



Naval Postgraduate School theses were published as part of this project’s efforts in FY18.

\*Ongoing Projects    †Completed Projects



## OUR FY19 SCHEDULE

Check out the NESDI website (<https://epl.navfac.navy.mil/nesdi>) for the latest version of our program schedule.

What	When
Conduct OPNAV N45 Programmatic Review	13 January 2019
Request Full Proposals	17 January 2019
Full Proposals DUE	14 March 2019
Screen Full Proposals	5 April 2019
Conduct First FY19 In-Progress Review	29 April – 3 May 2019 (Washington Navy Yard, DC)
FWG & TDWG Comments on Full Proposals DUE	24 May 2019
Principal Investigator Answers to Full Proposal Screening Questions DUE	24 May 2019
Announce FY20 Needs Solicitation	3 June 2019
Complete Evaluation of Full Proposals	4 June 2019
Obtain Sponsor Review & Approval of Full Proposals	6-28 June 2019
Conduct Second FY19 In-Progress Review	10-14 June 2019 (San Diego, CA)
Announce FY20 New Starts	26 July 2019
Close FY20 Needs Solicitation	3 August 2019
Screen FY20 Needs	12-15 August 2019
Evaluate & Rank Needs	9 -13 September 2019
Obtain Sponsor Review & Approval of Needs	16 September – 11 October 2019
Request Pre-proposals	14 October 2019
Pre-proposals DUE	20 November 2019
Make Pre-proposals Assignments to FWGs	11 December 2019
TDWG & FWG Comments on Pre-proposals DUE	6 January 2020
Evaluate Pre-proposals	6-10 January 2020
Quarterly Status Reports Due	4 January 2019 1 April 2019 1 July 2019 7 October 2019





## PROMOTING OUR SUCCESSES

Successful NESDI projects were promoted throughout FY18 in a variety of print and online publications. In addition to this Year in Review report, an annual programmatic review and the program website, the NESDI program also sponsors an electronic newsletter and generates project fact sheets all available via the NESDI website at <https://epl.navfac.navy.mil/nesdi> (Common Access Card required).

### Website

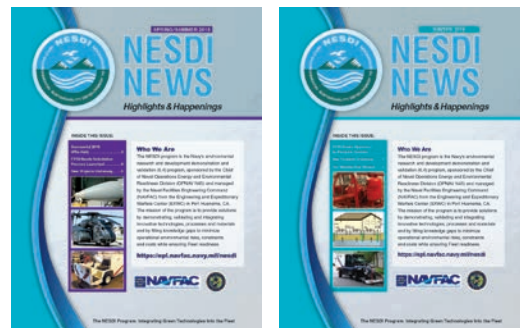
For two years now, the program's on-line presence has been located on the NAVFAC website at <https://epl.navfac.navy.mil/nesdi> (Common Access Card required).

The website is regularly updated with “new start” project fact sheets, our quarterly newsletters as well as Year in Review reports.



### Electronic Newsletters

*NESDI News: Highlights and Happenings*—the program's regular electronic publication—brings recent technical achievements and regulatory concerns to the forefront, along with highlights on significant program events over the course of the year. A history of program newsletters is available on-line at <https://epl.navfac.navy.mil/nesdi>.



### Fact Sheets

In an ongoing effort to promote the program's investments, we develop on-line fact sheets that highlight “new start,” ongoing and completed NESDI projects. These fact sheets are also available at <https://epl.navfac.navy.mil/nesdi>.





FOR MORE INFORMATION

## FOR MORE INFORMATION

For more information about the operation of the NESDI program, contact Ken Kaempffe, the NESDI program manager, or members of the TDWG.

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Available for download at:  
<https://epl.navfac.navy.mil/nesdi>

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# 2018

## YEAR IN REVIEW REPORT

Accomplishments of the  
**NAVY ENVIRONMENTAL  
SUSTAINABILITY DEVELOPMENT  
TO INTEGRATION PROGRAM**



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