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Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	455.682	20.034	20.677	21.647	-	21.647	22.770	22.883	23.196	23.635	Continuing	Continuing
0401: <i>Shipboard Waste Mgmt</i>	356.010	9.297	9.352	10.051	-	10.051	10.353	10.409	10.623	10.832	Continuing	Continuing
0817: <i>Environmental Sustainability Development (NESDI)</i>	63.195	5.696	5.379	5.197	-	5.197	5.897	5.931	5.903	6.016	Continuing	Continuing
9204: <i>Marine Mammal Research</i>	36.477	5.041	5.946	6.399	-	6.399	6.520	6.543	6.670	6.787	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program develops and evaluates processes, hardware, systems, operational procedures, scientific methods, and environmental studies that will allow the Navy to operate in U.S., foreign, and international waters, air, space, and land areas while complying with environmental laws, regulations, Executive Orders, policies and international agreements.

Many environmental laws, regulations, and policies impose restrictions on Navy training and testing, vessels, aircraft, and facilities that interfere with operations and/or increase the cost of operations. The Navy must be able to conduct its national security mission in compliance with applicable environmental requirements in the U.S. and abroad without compromising performance, safety, or health, while simultaneously minimizing the cost of compliance. The projects for this Program Element (PE) support the Navy's compliance with the (a) Clean Water Act, (b) Act to Prevent Pollution from Ships, (c) International Convention for the Prevention of Pollution from Ships, (d) DoD Manual 4715.06, "Regulations on Vessels Owned or Operated by the Department of Defense," Vol 1-4, (f) Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, (g) National Invasive Species Act of 1996, (h) Ballast Water Management for Control of Nonindigenous Species in Waters of the United States, (i) Clean Air Act, (j) Federal Insecticide, Fungicide, and Rodenticide Act, (k) Marine Mammal Protection Act, and (l) Endangered Species Act, (m) Comprehensive Environmental Response, Compensation, and Liability Act, and (n) Resource Conservation and Recovery Act. References (a) through (n) establish Level I environmental protection requirements. Project 0401, Shipboard Waste Management, supports efforts that enable Navy ships and submarines to comply with laws, regulations, and policies in six major areas: (1) Technical Authority, (2) Liquid Wastes, (3) Hazardous Material Control and Management, (4) Ballast Water Management, (5) Solid Waste Management, and (6) Copper-Free and Low Copper Antifouling.

The Marine Mammal Research (MMR) program is responsible for applied research and works to address the Navy's key research needs and transition the results and technologies for use within the Navy's at-sea environmental compliance and permitting processes in compliance with the Marine Mammal Protection Act and the Endangered Species Act, with the goals of improving marine species impact analysis (including marine mammal take estimates), mitigation measures and monitoring capabilities. Key points of the MMR mission are: (1) Improve the best available science regarding the potential impacts to marine species from Navy activities, (2) Expand the technology and methods available to the U.S. Navy marine species monitoring program (3) Preserve core Navy readiness capabilities. This funding allows the Navy to avoid or reduce the chances of costly litigation for non-compliance.

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Appropriation/Budget Activity 1319: <i>Research, Development, Test & Evaluation, Navy / BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>
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B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	20.514	20.677	0.000	-	0.000
Current President's Budget	20.034	20.677	21.647	-	21.647
Total Adjustments	-0.480	0.000	21.647	-	21.647
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.480	0.000			
• Rate/Misc Adjustments	0.000	0.000	0.000	-	0.000
• Adjustments to Budget Year	-	-	21.647	-	21.647

Change Summary Explanation

The FY 2023 funding request was reduced by \$0.355 million to account for the availability of prior year execution balances.

FY 2023 increase of \$0.970 million is due to program adjustments for Shipboard Waste Management and Marine Mammal Research.

FY 2023 funding increase reflects the fact that the FY 2022 President's Budget request did not include out-year funding.

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy										Date: April 2022		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>				Project (Number/Name) 0401 / <i>Shipboard Waste Mgmt</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
0401: <i>Shipboard Waste Mgmt</i>	356.010	9.297	9.352	10.051	-	10.051	10.353	10.409	10.623	10.832	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

Navy ships and submarines must routinely operate in U.S., international, and foreign waters, and visit numerous U.S. and foreign ports. No body of water is without environmental restrictions that impact the movements and operations of Navy vessels. Environmental requirements tend to be most restrictive in port and in coastal waters, where the Navy's increasing littoral presence places ships and submarines in discharge-restricted waters for longer periods of time. Growing international cooperation in addressing global environmental concerns is resulting in expanding areas of ocean considered environmentally susceptible, where special prohibitions on ship discharges and operations are imposed. Navy vessels must comply with applicable environmental legal requirements while maintaining continued access to all waters for operations, exercises, training, and port access. The large crews and limited on-board space of Navy ships and submarines severely constrain their ability to hold wastes for return to port for shore side disposal.

Many environmental laws, regulations, and policies impose restrictions on Navy training and testing, vessels, aircraft, and facilities that interfere with operations and/or increase the cost of operations. The Navy must be able to conduct its national security mission in compliance with applicable environmental requirements in the U.S. and abroad without compromising performance, safety, or health, while simultaneously minimizing the cost of compliance. The projects for this Program Element (PE) support the Navy's compliance with the (a) Clean Water Act, (b) Act to Prevent Pollution from Ships, (c) International Convention for the Prevention of Pollution from Ships, (d) DoD Manual 4715.06, "Regulations on Vessels Owned or Operated by the Department of Defense," Vol 1-4, (f) Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, (g) National Invasive Species Act of 1996, (h) Ballast Water Management for Control of Nonindigenous Species in Waters of the United States, (i) Clean Air Act, (j) Federal Insecticide, Fungicide, and Rodenticide Act, (k) Marine Mammal Protection Act, and (l) Endangered Species Act, (m) Comprehensive Environmental Response, Compensation, and Liability Act, and (n) Resource Conservation and Recovery Act. References (a) through (n) establish Level I environmental protection requirements. Project 0401, Shipboard Waste Management, supports efforts that enable Navy ships and submarines to comply with laws, regulations, and policies in six major areas: (1) Technical Authority, (2) Liquid Wastes, (3) Hazardous Material Control and Management, (4) Ballast Water Management, (5) Solid Waste Management, and (6) Copper-Free and Low Copper Antifouling.

The Afloat Environmental Quality Program supports the designated Technical Warrant Holders for Environmental Systems & Materials Engineering, with responsibility and accountability for ensuring that ships and submarines are designed and upgraded, and can be operated, in compliance with existing and anticipated environmental requirements while minimizing total ownership cost and manning. This responsibility encompasses legacy platforms and new vessel designs, as well as Fleet operations exercises, and training.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Technical Authority	1.590	1.584	1.584	0.000	1.584
Articles:	-	-	-	-	-

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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0401 / <i>Shipboard Waste Mgmt</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Description: Funding in support of Technical Authority (TA) is utilized to develop waste stream design criteria and guidance. This includes system/technology selection, processing capacity, interfaces, shipboard integration, test and qualification protocols, processes and practices, and performance specifications; and development of ship requirement packages for various waste streams.</p> <p>FY 2022 Plans:</p> <ul style="list-style-type: none"> - Continue to update the Ship Oil Spill Database, analyze oil spill root causes and identify policy/training/hardware deficiencies to reduce oil discharges/violations. - Continue to implement class specific training tools and guidance to reduce ship oil spill discharge violations. - Initiate evaluation of most promising commercial hull cleaning technologies to determine future system feasibility to meet UNDS requirements. - Continue to work with Fleet, acquisition programs, and technical authorities to review and provide comments on issues, risks, and opportunities so as minimize the cost and risk to the Navy. - Meet with NATO and foreign Navy data exchange partners to leverage lessons learned on afloat environmental compliance. - Continue development of environmental equipment/system requirements documentation, design criteria/guidance, standards, and certification protocols based on evolving regulations and policy. - Perform annual assessments of emergent air and water emission processes and technologies to enable effective compliance at minimal life cycle cost and risk to operations. <p>FY 2023 Base Plans:</p> <ul style="list-style-type: none"> - Continue to update the Ship Oil Spill Database, analyze oil spill root causes and identify policy/training/hardware deficiencies to reduce oil discharges/violations. - Continue to implement class specific training tools and guidance to reduce ship oil spill discharge violations. - Continue evaluation of most promising commercial hull cleaning technologies to determine future system feasibility to meet UNDS requirements. - Continue to work with Fleet, acquisition programs, and technical authorities to review and provide comments on issues, risks, and opportunities so as minimize the cost and risk to the Navy. - Continue meetings with NATO and foreign Navy data exchange partners to leverage lessons learned on afloat environmental compliance. - Continue development of environmental equipment/system requirements documentation, design criteria/guidance, standards, and certification protocols based on evolving regulations and policy. 					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
- Perform annual assessments of emergent air and water emission processes and technologies to enable effective compliance at minimal life cycle cost and risk to operations. FY 2023 OCO Plans: N/A					
Title: Liquid Wastes	2.690	2.781	2.781	0.000	2.781
Articles:	-	-	-	-	-
Description: This effort addresses liquid wastes in two (2) major areas: Oil Pollution Abatement and Non-Oily Waste. Funding will be utilized to assess new commercial off-the-shelf (COTS), modified COTS, and developmental products and technologies for application to Navy ships and submarines. The funding will also be utilized to develop and demonstrate detailed system and performance specifications and design guidance for the acquisition of cost effective shipboard liquid waste management solutions that meet existing and anticipated environmental requirements within the constraints of shipboard performance, reliability, and warship-unique requirements. In addition, the effort will seek common solutions across platforms, and where possible, across the Fleet to provide lifecycle cost savings, logistical efficiency, and improved Fleet familiarity.					
FY 2022 Plans: - Continue assessments of emergent commercial off-the-shelf (COTS) Marine Pollution Control processes and technologies that would enable effective compliance at minimal life cycle cost and risk to operations. Identify systems for detailed acquisition and evaluation Oil Pollution Abatement: - Continue shipboard evaluation of a commercial centrifugal oil/water separator (OWS). - Develop implementation plans for militarized centrifugal OWS. - Conduct environmental tests (i.e., shock, vibration, electromagnetic interference (EMI) tests) of a militarized Oil Content Monitor (OCM) that utilizes microscopy technology . - Issue Request for Information (RFI) for submersible transfer pumps. Non-Oily Waste (NOW): - Complete long-term monitoring and assessment of sewage and graywater piping scale prevention and pipe degradation. - Initiate laboratory evaluation of alternative vacuum pumps.					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
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- Investigate previous testing of pressed fittings and applicability to Vacuum, Collection, Holding, and Transfer (VCHT) systems.

FY 2023 Base Plans:

- Oil Pollution Abatement:
- Continue shipboard evaluation of a commercial centrifugal OWS.
 - Demonstrate membrane regeneration software and evaluate alternate membrane cleaners.
 - Develop and issue bilge cleaner RFI.
 - Develop testing protocol for oily waste transfer pumps.

Non-Oily Waste (NOW):

- Continue laboratory evaluation of alternative vacuum pumps.
- Develop test plan for laboratory evaluation of pressed fittings.
- Prepare for laboratory evaluation of pressed fittings.
- Conduct environmental tests (i.e., shock, vibration, and EMI tests) of hydrogen sulfide (H2S) detectors.

FY 2023 OCO Plans:

N/A

Title: Hazardous Material Control and Management	0.882	0.900	0.900	0.000	0.900
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Articles:	-	-	-	-	-
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Description: A wide variety of Hazardous Materials (HM) are used to construct, operate and maintain Navy ships and submarines. These HMs include cleaning compounds, solvents, adhesives, sealants, corrosion preventive compounds, acids, alkalis, oxidizers, lubricants, functional fluids, and many other products. Hazardous Material Control and Management (HMC&M) addresses environmental, safety, and health risks to ship construction workers, Ship's Force (S/F), and shipyard workers.

FY 2022 Plans:

- Continue assessments of emergent COTS HM management processes and pollution prevention technologies that would enable effective compliance at minimal life cycle cost and risk to operations.
- Identify HM control and pollution prevention systems for detailed acquisition and evaluation.
- Assess less hazardous or non-hazardous substitutes for high-risk HM regulated under the Toxic Substance Control Act (TSCA).

FY 2023 Base Plans:

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<ul style="list-style-type: none"> - Continue assessments of emergent COTS HM management processes and pollution prevention technologies that would enable effective compliance at minimal life cycle cost and risk to operations. - Continue to identify HM control and pollution prevention systems for detailed acquisition and evaluation. - Continue to assess less hazardous or non-hazardous substitutes for high-risk HM regulated under TSCA. <p>FY 2023 OCO Plans: N/A</p>					
<p>Title: Ballast Water Management</p> <p align="right">Articles:</p> <p>Description: The National Invasive Species Act of 1996 (NISA) requires the Secretary of Defense to implement a Ballast Water Management (BWM) program to minimize the risk of introduction of non-indigenous species (NIS) and pathogens from releases of ballast water from seagoing vessels of the DoD.</p> <p>FY 2022 Plans:</p> <ul style="list-style-type: none"> - Continue assessments of emergent COTS electro-chlorination and ultraviolet (UV) based ballast water treatment systems (BWTSs) that would enable effective compliance at minimal life cycle cost and risk to operations. - Based on the detailed designs developed, begin fabrication, test site preparations, and test plan(s) of a modified compact-sized commercial UV BWTS. - Complete detailed design of a modified standard-sized commercial UV BWTS. <p>FY 2023 Base Plans:</p> <ul style="list-style-type: none"> - Continue assessments of emergent COTS electro-chlorination and UV based BWTSs that would enable effective compliance at minimal life cycle cost and risk to operations. - Continue fabrication and evaluation of a modified compact-sized commercial UV BWTS. - Begin laboratory and shipboard testing of a modified compact-sized commercial UV BWTS. - Begin fabrication and evaluation of a modified standard-sized commercial UV BWTS. <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY23 \$0.508M increase provided to accomplish laboratory and shipboard testing of the compact-sized commercial BWTS and fabrication of standard-sized commercial BWTS.</p>	2.832	2.737	3.245	0.000	3.245
	-	-	-	-	-
<p>Title: Solid Waste Management</p>	1.132	1.100	1.291	0.000	1.291

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Articles:	-	-	-	-	-
<p>Description: Solid Waste Management (SWM) supports the Act to Prevent Pollution from Ships (APPS), which regulates all garbage discharges from ships at sea.</p> <p>FY 2022 Plans:</p> <ul style="list-style-type: none"> - Continue assessments of SWM processes and technologies with emphasis on small ships that would enable effective compliance at minimal life cycle cost and risk to operations. - Continue to evaluate solid waste systems for surface ships and submarines. - Conduct shipboard evaluation and Navy ship environmental testing of innovative solid waste equipment. - Perform shipboard evaluation of Medical waste processing equipment for special solid waste (e.g., Feminine Hygiene Products, Pilot Urine bags, etc.). <p>FY 2023 Base Plans:</p> <ul style="list-style-type: none"> - Evaluate solid waste systems for surface ships and submarines. - Continue to conduct shipboard evaluation and Navy ship environmental testing of innovative solid waste equipment. - Continue to perform shipboard evaluation of Medical waste processing equipment for special solid waste (e.g., Feminine Hygiene Products, Pilot Urine bags, etc.). - Continue assessments of SWM processes and technologies with emphasis on small ships that would enable effective compliance at minimal life cycle cost and risk to operations. <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY23 \$0.191M increase supports shipboard evaluation and Navy ship environmental testing of innovative solid waste equipment.</p>					
Title: Copper-Free and Low Copper Antifouling	0.171	0.250	0.250	0.000	0.250
Articles:	-	-	-	-	-
<p>Description: The copper discharges from underwater hull coatings remain a regulatory concern. The effort focuses on characterizing advanced coating systems (copper-containing, copper-free, and low copper) and their suitability for Navy-unique operational factors such as speed time profiles, drydocking intervals, and maintenance practices. The biofouling pressure at Navy homeports is also being characterized in order to inform hull and, especially, propeller cleaning scheduling.</p>					

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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p><i>FY 2022 Plans:</i></p> <ul style="list-style-type: none"> - Install a promising new antifouling coating system on a DDG as a test band. - Continue evaluation of performance of advanced coating systems. - Continue assessing emergent commercial antifouling coatings. - Continue biofouling pressure surveys of Naval Station Norfolk and Joint Expeditionary Base Little Creek. <p><i>FY 2023 Base Plans:</i></p> <ul style="list-style-type: none"> - Monitor DDG test band coating system performance. - Continue evaluation of performance of advanced coating systems. - Continue assessing emergent commercial antifouling coatings. - Continue biofouling pressure surveys of Naval Station Norfolk and Joint Expeditionary Base Little Creek. - Expand biofouling pressure surveys to Naval Station San Diego and Mayport. <p><i>FY 2023 OCO Plans:</i> N/A</p>					
Accomplishments/Planned Programs Subtotals	9.297	9.352	10.051	0.000	10.051

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

RDT&E Contracts are Competitive Procurements.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy **Date:** April 2022

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Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Ancillary Hardware Development	Various	Misc. Contracts : Not Specified	19.149	0.000		0.000		0.000		-		0.000	0.000	19.149	Continuing
Primary Hardware Development	C/CPFF	Oceaneering : Not Specified	1.000	0.000		0.000		0.000		-		0.000	0.000	1.000	Continuing
Systems Engineering	C/CPFF	John J. McMullen & Son : Not Specified	4.487	0.000		0.000		0.000		-		0.000	0.000	4.487	Continuing
Subtotal			24.636	0.000		0.000		0.000		-		0.000	0.000	24.636	N/A

Support (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Software Development	WR	SPAWAR : Charleston, SC	10.838	0.000		0.000		0.000		-		0.000	0.000	10.838	Continuing
Subtotal			10.838	0.000		0.000		0.000		-		0.000	0.000	10.838	N/A

Test and Evaluation (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Developmental Test & Evaluation	WR	NSWCCD, Bethesda, MD : Bethesda, MD	234.606	7.778	Nov 2020	8.542	Oct 2021	9.291	Oct 2022	-		9.291	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NRL, Wash, DC : Wash, DC	34.074	0.050	Nov 2020	0.050	Oct 2021	0.050	Oct 2022	-		0.050	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	NSWCPD, Philadelphia, PA : Philadelphia, PA	1.493	0.479	Nov 2020	0.000		0.500	Oct 2022	-		0.500	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	SPAWARSYSCEN : SD, CA	12.308	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing
Developmental Test & Evaluation	WR	Misc. Govt Labs : TBD	23.700	0.080	May 2021	0.050	Mar 2022	0.000		-		0.000	0.000	23.830	-

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy **Date:** April 2022

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Test and Evaluation (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Developmental Test & Evaluation	C/CPFF	Misc. Contracts : TBD	13.753	0.700	May 2021	0.500	Mar 2022	0.000		-		0.000	0.000	14.953	-
Subtotal			319.934	9.087		9.142		9.841		-		9.841	Continuing	Continuing	N/A

Remarks
Increased funding to NSWCCD for Ballast Water Management (BWM) tasking related to testing of both commercial and modified commercial BWTs; for identification and testing of Capture and Clean Hull Cleaning Technology; and to investigate and spearhead design, integration and testing of innovative solid waste equipment. FY20 and 21 Miscellaneous Contract funding for BWM and Hull Cleaning Technology to be identified in FY20.

Management Services (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Travel	Allot	NAVSEA HQ : Washington, DC	0.375	0.010	Nov 2020	0.010	Oct 2021	0.010	Oct 2022	-		0.010	Continuing	Continuing	Continuing
SBIR Assessment	TBD	Not Specified : Not Specified	0.227	0.200	Nov 2020	0.200	Oct 2021	0.200	Oct 2022	-		0.200	0.000	0.827	Continuing
Subtotal			0.602	0.210		0.210		0.210		-		0.210	Continuing	Continuing	N/A

	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract	
Project Cost Totals		356.010	9.297	9.352	10.051	-	10.051	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Navy **Date:** April 2022

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	FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

SHIPBOARD WASTE MANAGEMENT																												
Technical Authority																												
Liquid Wastes																												
Hazardous Material Control and Management																												
Ballast Water Management																												
Solid Waste Management																												
Non-Copper Antifouling																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0401 / <i>Shipboard Waste Mgmt</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
SHIPBOARD WASTE MANAGEMENT				
Technical Authority	1	2022	4	2026
Liquid Wastes	1	2022	4	2026
Hazardous Material Control and Management	1	2022	4	2026
Ballast Water Management	1	2022	4	2026
Solid Waste Management	1	2022	4	2026
Non-Copper Antifouling	1	2022	4	2026

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy										Date: April 2022		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>				Project (Number/Name) 0817 / <i>Environmental Sustainability Development (NESDI)</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
0817: <i>Environmental Sustainability Development (NESDI)</i>	63.195	5.696	5.379	5.197	-	5.197	5.897	5.931	5.903	6.016	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The vision outlined in "A Design for Maintaining Maritime Superiority, Version 2.0" (December 2017) and "2018 National Defense Strategy of the United States of America" is for our Navy to become more lethal, resilient and a rapidly innovating joint force. We must maintain a fleet that is trained ready to operate and fight decisively. Today's reality requires training and operating within environmental constraints (national and international laws and agreements) and searching for alternatives to comply with and alleviate those constraints. Moreover, as we develop new systems and technologies in support of the National Defense Strategy, the Navy must anticipate and address potential environmental constraints which could in the future adversely impact our ability to protect and sustain our forces at home and abroad.

This program identifies pervasive Navy shore side environmental requirements and develops and validates information, new processes, and technologies that address requirements that pose significant impact on Naval shore activities in complying with environmental laws, regulations, orders, and policies. The goal of the program is to maximize opportunities for significant cost savings while minimizing personnel liabilities, operational costs, and regulatory oversight and preserving or enhancing the ability of Naval shore activities to accomplish their required missions and functions in support of the Navy's transformational strategy.

Environmental Enabling Capabilities -2 (EEC-2) MAXIMIZE TRAINING AND TESTING RANGE REQUIREMENTS WITHIN ENVIRONMENTAL CONSTRAINTS: This capability addresses environmental impacts and restrictions at Navy land and sea ranges, including munitions testing and manufacturing, to ensure Navy ranges are available to conduct required training and testing operations for the Fleet. Investments in EEC-2 provide validated knowledge, models, and processes to mitigate environmental impacts, restrictions, and costs at Navy training and test ranges to maximize the availability and utilization of the ranges. The results support operational readiness by providing the tools and technologies necessary for sustaining and managing Navy land and sea ranges related to unexploded ordnance (UXO) and munitions, encroachment, air quality, airborne noise, water quality, and wetlands. Capabilities gained include the ability to assess and determine the risks from underwater UXO, the evaluation and prioritization of ordnance contaminated sites for evaluation in environmental programs and the implementation of range specific best management practices by evaluating and modeling available process, procedures, and technologies.

Environmental Enabling Capabilities-3 (EEC-3) PLATFORM MAINTENANCE AND REPAIR WITH MINIMAL ENVIRONMENTAL FOOTPRINT: This capability focuses on minimizing or eliminating environmental impact related to Navy and Marine Corps weapon system repair and maintenance operations. Investments in EEC-3 provide valid knowledge, models, processes, and technologies to minimize regulated emissions, discharges and hazardous material usage during the repair and maintenance of ships, submarines, and surface/sub-surface vehicles and aircraft and air vehicles. The program supports Fleet operational readiness and Navy acquisition communities by investing in information to understand emerging environmental requirements and to develop innovative processes and technologies that result in savings while reducing the fleet environmental constraints related to platform maintenance. Capabilities and benefits gained include, but are not limited to, the reduction in the usage of heavy metals used in metal finishing (chromium and cadmium), reduced hazardous air pollutant (HAP) emissions, the development of best management practices

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0817 / <i>Environmental Sustainability Development (NESDI)</i>
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and tools to minimize the use of hazardous materials, and the generation of hazardous wastes associated with maintaining and repairing ships, submarines, aircraft, and unmanned vehicles. Results of program investments will be leveraged across weapon system and platform acquisition to ensure continued reduction in lifecycle costs and long-term environmental compliance burdens to the Fleet.

Environmental Enabling Capabilities-4 (EEC-4). SUPPORT SHORE READINESS WITHIN ENVIRONMENTAL CONSTRAINTS: Naval shore establishment requires the capability to operate and maintain facilities and provide waterfront and airfield services to the fleet while complying with applicable environmental regulations and minimizing environmental impacts and costs. The program invests in knowledge and innovative processes and technologies that minimize infrastructure and operational costs, regulated emissions, while minimizing discharges and hazardous material usage from ship (waterfront) and aviation operations. Capabilities and benefits gained under EEC-4 include, reduced costs associated with wastewater treatment, elimination/reduction in the use of HAPs, ozone depleting substances (ODSs), volatile organic compounds (VOCs) and the associated reporting requirements, reduced hazardous waste and disposal costs, and improved storm water management.

Environmental Enabling Capabilities-5 (EEC-5). COST-EFFECTIVE MANAGEMENT OF ENVIRONMENTAL REGULATORY REQUIREMENTS: The environmental compliance regulations require base managers to permit, monitor and report on many processes associated with weapon system and platform operations. Naval shore environmental managers require the capability to efficiently and cost effectively manage these compliance requirements. Under EEC-5, the program invests in improved data collection, methods, and models to assess environmental impacts and ecological risk assessments of Naval Operations on harbors, U.S. waterways, and surrounding communities. Benefits include gaining standardized technical environmental management improvements/techniques related to source control, assessment, and monitoring. EEC-5 also provides validated knowledge, models, processes and technologies to improve environmental monitoring and reporting, and to reduce the cost of compliance with regulations applicable to coastal contamination and contaminated sediments.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: EEC-2, Maximize Training & Testing Requirements Within Environmental Constraints	0.583	0.665	0.357	0.000	0.357
Articles:	-	-	-	-	-
FY 2022 Plans:					
-Continue providing validated knowledge, models, and processes to mitigate environmental impacts, restrictions, and costs of Navy training and test ranges to maximize the availability and utilization of the ranges.					
-Continue demonstration of the Robust Caisson Structure to Reduce Blast Effects from Underwater Blow-In-Place, Integrated Analytical Approach to Transition from Active to Passive Treatments at Munitions Sites.					
FY 2023 Base Plans:					
-Continue providing validated knowledge, models, and processes to mitigate environmental impacts, restrictions, and costs of Navy training and test ranges to maximize the availability and utilization of the ranges.					
-Continue demonstration of the Robust Caisson Structure to Reduce Blast Effects from Underwater Blow-In-Place, Integrated Analytical Approach to Transition from Active to Passive Treatments at Munitions Sites.					
FY 2023 OCO Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0817 / <i>Environmental Sustainability Development (NESDI)</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A					
<i>FY 2022 to FY 2023 Increase/Decrease Statement:</i> FY23 \$0.308M decrease due to completion of tasks by Naval Information Warfare Center (NIWC) for continuing projects.					
<i>Title:</i> EEC-3, Platform Maintenance and Repair With Minimal Environmental Footprint	1.405	1.395	1.490	0.000	1.490
<i>Articles:</i>	-	-	-	-	-
<i>FY 2022 Plans:</i> -Continue evaluations and demonstrations of innovative solutions for difficult and persistent aviation and shipyard platform sustainment issues related to hexavalent chrome, cadmium, volatile organic compounds (VOC) hazardous air pollutants (HAP) and other hazardous compounds at Naval Aviation Systems Command Fleet Readiness Centers and the Navy's shipyards -Continue Assessment of Cadmium Alternatives for Connector Applications, Dry Ice Paint Removal and Cleaning, Chrome-free, Low-VOC and Fast-drying Single- and Two-component Primers, Development and Implementation of Methods to Reduce Sealant Waste in Fleet/Depot Level Operations, Minimizing Hazardous Waste from Expired Paints and Associated Solvents from Ships Supply, Advanced Anodize Repair, Electromagnetic Interference Shielding Tape (EMIST) -Complete Replacement of Elimination of Hexavalent Chromium from Magnesium Conversion Coating Processes at Fleet Readiness Centers, Low VOC Primers for Ground Support Equipment Application, Enhanced Trivalent Chromium Pretreatment for Improved Coloration and Corrosion Performance of Aluminum Substrates					
<i>FY 2023 Base Plans:</i> -Continue evaluations and demonstrations of innovative solutions for difficult and persistent aviation and shipyard platform sustainment issues related to hexavalent chrome, cadmium, volatile organic compounds (VOC) hazardous air pollutants (HAP) and other hazardous compounds at Naval Aviation Systems Command Fleet Readiness Centers and the Navy's shipyards - Continue Dry Ice Paint Removal and Cleaning, Chrome-free, Low-VOC and Fast-drying Single- and Two-component Primers, Development and Implementation of Methods to Reduce Sealant Waste in Fleet/Depot Level Operations, Minimizing Hazardous Waste from Expired Paints and Associated Solvents from Ships Supply, Advanced Anodize Repair, Electromagnetic Interference Shielding Tape (EMIST) - Complete Cadmium Alternatives for Connector Applications					
<i>FY 2023 OCO Plans:</i>					

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0817 / <i>Environmental Sustainability Development (NESDI)</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p><i>FY 2022 Plans:</i></p> <ul style="list-style-type: none"> -Continue providing validated knowledge, models, processes and systems to improve environmental monitoring and reporting, and reduce the cost of compliance with regulations and management of coastal contamination and contaminated sediments -Continue Mesocosm Field Testing of In situ PFAs Treatment Trains, Demonstrating the Use of a Novel, Hybrid Polyelectrolyte/Hydrophilic Polymer for In situ PFAS Treatment Applications, Low-profile Integrated Porous Pretreatment Swale (LIPPS) for Metals Treatment in Industrial Areas, Real-Time Multi-Contaminant Detection System (RMDS), Locating and Quantifying Groundwater Surface Water Connections using Distributed Temperature Sensing, Evaluating potential effects to marine biota from small-scale, legacy radioactive objects, Demonstration and Application of Amendments Targeting Comingled Organics and Metals in Sediments, Rapid Pathogen Detection in Drinking and Surface Waters, Chronic toxicity and bioaccumulation evaluation of multiple PFAS for benthic and pelagic species relevant to marine ecological risk assessment, Initiation Decision Report (IDR) for Addressing Opportunistic Premise Plumbing Pathogens at Navy Installations Characterization of Antifouling Paint and Environmental Loading with Navy Dome System, Closed Loop, In Situ Soil Flushing at PFAS-Impacted Source Zones -Complete the following initiatives: Development and Demonstration of a Portable, Temporary Barrier to Aid in Cargo and Equipment Inspections to Prevent Brown Treesnake Dispersal, Evaluate the feasibility of In-situ Biodegradation of 1,4-Dioxane and Chlorinated Solvent Mixtures in Dilute Plumes, In-well headspace samplers for long-term groundwater chlorinated hydrocarbon monitoring, Field Demonstration of Colloidal Activated Carbon for In Situ Sequestration of Per- and Polyfluoroalkyl Substances, High efficiency media for metals removal in NPDES discharges, Air Filtration for Indoor Air Quality, Improving Site Closure Decision-Making with Time- Integrated Groundwater Samples, Sensor interface and infrastructure for monitoring (SIIM), Contaminant Monitoring and Mapping for Informing Stormwater Best Management Practices, Innovative Activated Carbon Filters to Address Vapor Intrusion within Commercial/Industrial Buildings <p><i>FY 2023 Base Plans:</i></p> <ul style="list-style-type: none"> -Continue providing validated knowledge, models, processes and systems to improve environmental monitoring and reporting, and reduce the cost of compliance with regulations and management of coastal contamination and contaminated sediments -Continue Low-profile Integrated Porous Pretreatment Swale (LIPPS) for Metals Treatment in Industrial Areas, Real-Time Multi-Contaminant Detection System (RMDS), Locating and Quantifying Groundwater Surface Water Connections using Distributed Temperature Sensing, Evaluating potential effects to marine biota from small- 					

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0817 / <i>Environmental Sustainability Development (NESDI)</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>scale, legacy radioactive objects, Demonstration and Application of Amendments Targeting Comingled Organics and Metals in Sediments, Rapid Pathogen Detection in Drinking and Surface Waters, Chronic toxicity and bioaccumulation evaluation of multiple PFAS for benthic and pelagic species relevant to marine ecological risk assessment, Initiation Decision Report (IDR) for Addressing Opportunistic Premise Plumbing Pathogens at Navy Installations, Characterization of Antifouling Paint and Environmental Loading with Navy Dome System, Closed Loop, In Situ Soil Flushing at PFAS-Impacted Source Zones</p> <p>-Complete Mesocosm Field Testing of In situ PFAs Treatment Trains, Demonstrating the Use of a Novel, Hybrid Polyelectrolyte/Hydrophilic Polymer for In situ PFAS Treatment Applications</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY23 \$0.052M increase due to increase in material costs and allocated labor hours.</p>					
Accomplishments/Planned Programs Subtotals	5.696	5.379	5.197	0.000	5.197

C. Other Program Funding Summary (\$ in Millions)
N/A

Remarks

D. Acquisition Strategy
This project is categorized as Non-ACAT (Non Acquisition). The project delivers a broad spectrum of products that require a variety of acquisition processes to implement. Equipment products for naval stations and other mission funded activities are often procured directly through the base operating budget. Equipment products for Shipyards and other Navy Working Capital Fund (NWCF) activities costing over \$250K are procured through their Capital Investment Program (CIP). For both types of activities, equipment products costing less than \$250K, and process changes not requiring the purchase of new equipment such as consumable material or product substitutions, are funded through the activity's operating budgets. Occasionally there is a technology that must be implemented as a specialized facility. These are acquired through the Military Construction (MILCON) Program. All these acquisition processes are pursued using a common strategy that satisfies the needs of all the critical stakeholders: 1) fleet end user; 2) funding sponsor for the Navy end user; 3) other stakeholders with cognizance over the Navy process or operation being changed, 4) cognizant environmental federal, state, and local regulators; and 5) the private or government organization that will produce the product.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy												Date: April 2022			
Appropriation/Budget Activity 1319 / 4				R-1 Program Element (Number/Name) PE 0603721N / Environmental Protection				Project (Number/Name) 0817 / Environmental Sustainability Development (NESDI)							
Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total			
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Cost To Complete	Total Cost	Target Value of Contract
EEC 2	Various	EXWC : PT HUENEME, CA	7.635	0.283	Oct 2020	0.350	Oct 2021	0.357	Oct 2022	-		0.357	Continuing	Continuing	Continuing
EEC 2	Various	SSC : SAN DIEGO, CA	6.884	0.300	Dec 2020	0.315	Dec 2021	0.000		-		0.000	Continuing	Continuing	Continuing
EEC 3	WR	NAWC : PATUXENT RIVER, MD	2.548	0.150	Mar 2021	0.130	Mar 2022	0.130	Mar 2023	-		0.130	Continuing	Continuing	Continuing
EEC 3	Various	NSWC : BETHESDA, MD	4.414	0.200	Feb 2021	0.175	Feb 2022	0.000		-		0.000	Continuing	Continuing	Continuing
EEC 3b	Various	EXWC : PT HUENEME, CA	1.608	0.160	Mar 2021	0.160	Mar 2022	0.160	Mar 2023	-		0.160	Continuing	Continuing	Continuing
EEC 4	Various	EXWC : PT HUENEME, CA	9.714	0.606	Mar 2021	0.701	Mar 2022	0.670	Mar 2023	-		0.670	Continuing	Continuing	Continuing
EEC 4	Various	NSWC : BETHESDA, MD	5.210	0.216	Nov 2020	0.065	Nov 2021	0.065	Nov 2022	-		0.065	Continuing	Continuing	Continuing
EEC 4a	Various	SSC : SAN DIEGO, CA	4.703	0.580	Apr 2021	0.765	Apr 2022	0.775	Feb 2023	-		0.775	Continuing	Continuing	Continuing
EEC 5	Various	EXWC : PT HUENEME, CA	4.959	0.870	Nov 2020	0.535	Oct 2021	0.600	Oct 2022	-		0.600	Continuing	Continuing	Continuing
EEC 5	Various	SSC : SAN DIEGO, CA	2.878	0.791	Feb 2021	0.663	Oct 2021	0.730	Oct 2022	-		0.730	Continuing	Continuing	Continuing
EEC 5	Various	NAWC : PATUXENT RIVER, MD	1.572	0.130	Jun 2021	0.115	Jun 2022	0.115	Jun 2023	-		0.115	Continuing	Continuing	Continuing
EEC 5	Various	NSWC : BETHESDA, MD	3.566	0.165	Jan 2021	0.165	Jan 2022	0.060	Jan 2023	-		0.060	Continuing	Continuing	Continuing
EEC 5	WR	NAWCWD : CHINA LAKE, CA	1.772	0.210	Dec 2020	0.185	Dec 2021	0.185	Dec 2022	-		0.185	Continuing	Continuing	Continuing
EEC 5	WR	NAWC : LAKE HURST, NJ	1.081	0.140	Nov 2020	0.125	Nov 2021	0.150	Nov 2022	-		0.150	Continuing	Continuing	Continuing
EEC 3	WR	FRC - SE : JACKSONVILLE, FL	2.750	0.600	May 2021	0.635	May 2022	0.635	May 2023	-		0.635	Continuing	Continuing	Continuing
EEC 3	Various	NSWC : San Diego, CA	0.060	0.000		0.000		0.000		-		0.000	Continuing	Continuing	Continuing

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0817 / <i>Environmental Sustainability Development (NESDI)</i>
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Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
EEC 3	WR	FRC - CE : Cherry Point, NC	0.615	0.100	Jan 2021	0.100	Jun 2022	0.100	Jun 2023	-		0.100	Continuing	Continuing	Continuing
EEC 3	Various	FRC-SW : San Diego, CA	1.226	0.195	Mar 2021	0.195	Mar 2022	0.195	Mar 2023	-		0.195	Continuing	Continuing	Continuing
EEC 3	WR	NRL : Washington DC	0.000	0.000		0.000		0.270	Feb 2023	-		0.270	Continuing	Continuing	Continuing
Subtotal			63.195	5.696		5.379		5.197		-		5.197	Continuing	Continuing	N/A

Remarks
 Remarks
 Performing Activities: Naval Surface Warfare Center, Carderock Division (NSWC/CD); Engineering and Expeditionary Warfare Center (EXWC), Port Hueneme, CA; Naval Surface Warfare Center, Indian Head Division (NSWC/IH); Space and Warfare Systems Center, San Diego (SSC/SD); Naval Air Warfare Center Aircraft Division Patuxent River (NAWCAD/PAX); Naval Air Warfare Center (NAWCWD/China Lake); Naval Air Warfare Center Aircraft Division Lakehurst (NAWCAD/Lakehurst); Fleet Readiness Center Southeast, Jacksonville FL (FRC-SE); Fleet Readiness Center Southwest, San Diego (FRC-SW), Fleet Readiness Center East, Cherry Point (FRC-CE). Total Prior Years Cost: Subtotal does not include performing activities from prior years that are no longer performing activities. Award Dates: About 55% of the project is executed via contracts awarded by the performing activities. More rigorous contracting, funding and performer work induction processes are slightly increasing project management costs. Contracting and financial management offices across the performing organizations may be understaffed. Projects are derived from field level needs and awarded competitively to performing organizations, the portfolio mix of cost category/performing organization naturally changes from fiscal year to fiscal year. Due to this, individual line items in the R-3 will increase at greater than a 2% escalation factor.

Explanation of increases/decreases greater than 2% between FY2022 and FY2023:
 -EEC2 SSC San Diego CA decreased from 0.315 to 0.000 due to completion of continuing projects for which they are contributors.
 -EEC3 NSWC Bethesda MD decreased from 0.175 to 0.000 due to completion of projects for which they are contributors.
 -EEC4 EXWC PT Hueneme CA decreased from 0.701 to 0.670 due to completion of equipment procurements for continuing projects.
 -EEC5 EXWC PT Hueneme CA increased from 0.535 to 0.600 due to increase in field work for continuing projects
 -EEC5 SSC San Diego CA increased from 0.663 to 0.730 due to field work for Mesocosm Field Testing of In situ PFAs Treatment Trains.
 -EEC5 NSWC Bethesda MD decreased from 0.165 to 0.060 due to completion of projects for which they are contributors.
 -EEC5 NAWC Lakehurst NJ decreased from 0.125 to 0.150 due to increase in program web page modifications.
 -EEC5 NRL Washington DC increased from 0.000 to 0.270 due to continuing projects.

	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	63.195	5.696	5.379	5.197	-	5.197	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0817 / <i>Environmental Sustainability Development (NESDI)</i>

FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

Proj 0817	
EEC 2	
EEC 3	
EEC 4	
EEC 5	

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 0817 / <i>Environmental Sustainability Development (NESDI)</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>Proj 0817</i>				
EEC 2	1	2021	4	2027
EEC 3	1	2021	4	2027
EEC 4	1	2021	4	2027
EEC 5	1	2021	4	2027

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy										Date: April 2022		
Appropriation/Budget Activity 1319 / 4					R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>				Project (Number/Name) 9204 / <i>Marine Mammal Research</i>			
COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
9204: <i>Marine Mammal Research</i>	36.477	5.041	5.946	6.399	-	6.399	6.520	6.543	6.670	6.787	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Navy has been and will continue to be subject to litigation with regard to the potential injuring, killing or biologically significant disturbance of marine animals by the use of intense underwater sound. Since Fleet operation and training areas coincide with known or probable habitats, migration routes, or breeding areas of marine mammals and other protected marine species, the possibility exists that such incidents are likely to continue in the future. The increasing public interest and pressure has resulted in escalating Fleet costs. For example, Fleet and SYSCOM development activities have been interrupted; modified, or altogether cancelled and environmental regulations have, among other things, required new ship construction shock trials to obtain Federal permits and conduct extensive environmental planning that can take several years to complete. The incorporation of mitigation measures in Fleet training operations to minimize the potential adverse effects on protected marine animals can significantly reduce the realism of these operations. In addition, the testing, evaluation, and deployment of new sonar detection and monitoring systems that use active acoustics are under intense public scrutiny for their potential adverse effects on whales and other marine mammals. Navy needs scientific evidence to substantiate its claims of limited or inconsequential adverse effects to marine life from operations.

This project primarily focuses on the development of planning, monitoring, and mitigating tools to aid the Fleet in minimizing contact with and the potential harassment of protected marine animals during operations, exercises, training, and undersea surveillance and weapons testing. These new capabilities will encompass historical and newly acquired data and analytical models that together can predict marine animal habitats (where they are likely to be), and their natural and expected behavior (diving patterns, prey localization, calling activity, etc.). This project consists of three major areas that will help ensure Navy compliance with the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA).

These areas are (1) Marine Ecology and Population Dynamics - determine the likelihood of the presence of marine mammals or other protected species by developing habitat and ecological models. Refine marine animal survey techniques to optimize the accuracy of abundance estimates in small ocean regions of Navy interest. (2) Criteria, Thresholds, and Mitigation - Establish criteria and thresholds from which to measure potential impact on marine mammals and other marine species from Navy training operations. Determine the effectiveness and usefulness of various mitigation measures in relation to the potential impact of Navy operations on marine mammals; and (3) Mitigation Methodologies - Determine the observation, detection and classification measures required to develop effective monitoring and mitigation procedures for Fleet and SYSCOM use. Focus on improving marine animal monitoring capabilities over current methods by developing new technologies or improving existing technologies that improve monitoring and mitigation effectiveness, reduce cost and minimize impacts on readiness activities.

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Marine Ecology and Population Dynamics	1.019	1.134	1.134	0.000	1.134
Articles:	-	-	-	-	-
FY 2022 Plans:					

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy	Date: April 2022
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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 9204 / <i>Marine Mammal Research</i>
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)

	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Within the area of 'Marine Ecology and Population Dynamics', ongoing work covers topics such as density estimation from passive acoustic data, standards/metrics development and development of an automated sonar detector to standardize analysis of acoustic data.</p> <p>Ongoing studies that are expected to be completed by the end of FY 2022:</p> <ul style="list-style-type: none"> -Standardizing Methods and Nomenclature for Automated Detection of Navy Sonar -Analytical methods to support the development of noise exposure criteria for behavioral response <p>Ongoing studies that will continue into FY 2023:</p> <ul style="list-style-type: none"> -ACCURATE: ACoustic CUe RATEs for passive acoustic density estimation -MSM4PCoD: Marine Species Monitoring for the Population Consequences of Disturbance -Demonstration and validation of passive acoustic density estimation for right whales -Capability enhancements for Tethys, a passive acoustic metadata workbench <p>In addition, studies are expected to be initiated in FY 2022 in response to needs collected from Navy personnel in FY 2021.</p> <p>FY 2023 Base Plans:</p> <p>Within the area of 'Marine Ecology and Population Dynamics', ongoing work covers topics such as density estimation from passive acoustic data, standards/metrics development and development of an automated sonar detector to standardize analysis of acoustic data.</p> <p>Ongoing studies that are expected to be completed by the end of FY 2023:</p> <ul style="list-style-type: none"> -MSM4PCoD: Marine Species Monitoring for the Population Consequences of Disturbance -Capability enhancements for Tethys, a passive acoustic metadata workbench <p>Ongoing studies that will continue into FY 2024:</p> <ul style="list-style-type: none"> -ACCURATE: ACoustic CUe RATEs for passive acoustic density estimation -Demonstration and validation of passive acoustic density estimation for right whales -Combining global OBS and CTBTO recordings to estimate abundance and density of fin and blue whales <p>In addition, studies are expected to be initiated in FY2023 in response to needs collected from Navy personnel in FY 2022.</p> <p>FY 2023 OCO Plans:</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 9204 / <i>Marine Mammal Research</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
N/A					
<p>Title: Criteria and Thresholds, Physiology and Behavior, and Effects of Sound</p> <p align="right">Articles:</p> <p>FY 2022 Plans: Within the area of 'Criteria and Thresholds, Physiology and Behavior, and Effects of Sound', ongoing work covers topics such as hearing, temporary threshold shift, behavioral response studies, and effects from underwater explosions.</p> <p>Ongoing studies that are expected to be completed by the end of FY 2022: -Multi-spaced measurement of underwater sound fields from explosive sources (this project was extended due to COVID-19) -Hearing and estimated noise impacts in three species of Auk: Implications for the marbled murrelet (this project was extended due to COVID-19) -Use of "Chirp" Stimuli for non-invasive, low-frequency measurement of marine mammal auditory evoked potentials</p> <p>Ongoing studies that will continue into FY 2023: -Collection of auditory evoked potential hearing thresholds in minke whales (<i>Balaenoptera acutorostrata</i>) data on sea turtle hearing/TTS -Towards a mysticete audiogram using humpback whales' behavioral response thresholds data on mysticete hearing -Temporary threshold shifts in underwater hearing sensitivity in aquatic turtles -Frequency-dependent, underwater, temporary threshold shift in California sea lions -Standardizing auditory evoked potential hearing thresholds with behavioral hearing thresholds</p> <p>In addition, studies are expected to be initiated in FY 2022 in response to needs collected from Navy personnel in FY 2021.</p> <p>FY 2023 Base Plans: Within the area of 'Criteria and Thresholds, Physiology and Behavior, and Effects of Sound', ongoing work covers topics such as hearing, temporary threshold shift, behavioral response studies, and effects from underwater explosions.</p>	2.807	3.597	4.050	0.000	4.050
	-	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy	Date: April 2022
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Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 9204 / <i>Marine Mammal Research</i>
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B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Ongoing studies that are expected to be completed by the end of FY 2023:</p> <ul style="list-style-type: none"> -Multi-spaced measurement of underwater sound fields from explosive sources (this project was extended due to COVID-19) -Temporary threshold shifts in underwater hearing sensitivity in aquatic turtles -Frequency-dependent, underwater, temporary threshold shift in California sea lions -Collection of In situ acoustic data for validation of US Navy propagation models of ship shock trial sound sources <p>Ongoing studies that will continue into FY 2024:</p> <ul style="list-style-type: none"> -Collection of auditory evoked potential hearing thresholds in minke whales (<i>Balaenoptera acutorostrata</i>) data on sea turtle hearing/TTS -Towards a mysticete audiogram using humpback whales' behavioral response thresholds data on mysticete hearing -Standardizing auditory evoked potential hearing thresholds with behavioral hearing thresholds -Loudness perception in killer whales (<i>Orcinus orca</i>); effects of temporal and frequency summation -Minimum sound pressure levels required for TTS during simulated continuously active sonar -3S4: Effects of continuous active sonar and longer duration sonar exposures -Behavioral response to SURTASS LFA sonar <p>In addition, studies are expected to be initiated in FY2023 in response to needs collected from Navy personnel in FY 2022.</p> <p>FY 2023 OCO Plans: N/A</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY23 \$0.453M increase supports a number of ongoing projects hitting the height of data collection and data analysis along with new projects that are expected to begin.</p>					
<p>Title: Mitigation Methodologies: Monitoring, New Technology, and Risk Assess</p> <p align="right">Articles:</p> <p>FY 2022 Plans: Within the area of 'Mitigation Methodologies', ongoing work covers demonstration and validation of new technologies for monitoring and mitigation.</p>	1.215	1.215	1.215	0.000	1.215
	-	-	-	-	-

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Exhibit R-2A, RDT&E Project Justification: PB 2023 Navy		Date: April 2022
Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 9204 / <i>Marine Mammal Research</i>

B. Accomplishments/Planned Programs (\$ in Millions, Article Quantities in Each)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
<p>Ongoing studies that will continue into FY 2023: -M3R (Marine Mammal Monitoring on Navy Ranges) -Improved Tag Attachment System for Remotely-Deployed Medium-Term Cetacean Tags</p> <p>No studies are scheduled to be completed by the end of FY 2022. Studies are expected to be initiated in FY 2022 in response to needs collected from Navy personnel in FY 2021.</p> <p>FY 2023 Base Plans: Within the area of 'Mitigation Methodologies', ongoing work covers demonstration and validation of new technologies for monitoring and mitigation.</p> <p>Ongoing studies that will continue into FY 2024: -M3R (Marine Mammal Monitoring on Navy Ranges) -Improved Tag Attachment System for Remotely-Deployed Medium-Term Cetacean Tags</p> <p>No studies are scheduled to be completed by the end of FY2023. Studies are expected to be initiated in FY 2023 in response to needs collected from Navy personnel in FY 2022.</p> <p>FY 2023 OCO Plans: N/A</p>					
Accomplishments/Planned Programs Subtotals	5.041	5.946	6.399	0.000	6.399

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

RDTEN Contracts are Competitive Procurements.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 9204 / <i>Marine Mammal Research</i>
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Test and Evaluation (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
Mar Ecol & Pop Dynamics	Various	EXWC : Port Hueneme, CA	4.467	0.871	Oct 2020	0.986	Oct 2021	1.005	Oct 2022	-		1.005	Continuing	Continuing	Continuing
Mitigation Methods	WR	SPAWAR : San Diego, CA	1.373	0.200	Oct 2020	0.200	Oct 2021	0.204	Oct 2022	-		0.204	Continuing	Continuing	Continuing
Criteria & Thresholds	SS/CPFF	MARECOTEL : Seabeck, WA	1.760	0.600	Oct 2020	0.600	Oct 2021	0.400	Oct 2022	-		0.400	0.000	3.360	-
Criteria & Thresholds	Various	EXWC : Port Hueneme, CA	2.783	1.600	Jan 2021	2.391	Jan 2022	3.039	Jan 2023	-		3.039	Continuing	Continuing	Continuing
Mar Ecol & Pop Dynamics	WR	NAVAIR : Lakehurst, NJ	0.657	0.075	Oct 2020	0.075	Oct 2021	0.075	Oct 2022	-		0.075	Continuing	Continuing	Continuing
Mitigation Methods	Various	EXWC : Port Hueneme, CA	1.413	0.715	Oct 2020	0.714	Oct 2021	0.728	Oct 2022	-		0.728	Continuing	Continuing	Continuing
Mitigation Methods	WR	NUWC : Newport, RI	11.551	0.300	Oct 2020	0.300	Oct 2021	0.306	Oct 2022	-		0.306	Continuing	Continuing	Continuing
Mar Ecol & Pop Dynamics	WR	NPGS : Monterey, CA	3.669	0.030	Oct 2020	0.030	Oct 2021	0.030	Oct 2022	-		0.030	Continuing	Continuing	Continuing
Mar Ecol & Pop Dynamics	MIPR	NOAA: Various : La Jolla, CA	3.611	0.050	Oct 2020	0.050	Oct 2021	0.000		-		0.000	Continuing	Continuing	Continuing
Criteria & Thresholds	WR	NUWC : Newport, RI	0.400	0.300	Oct 2020	0.300	Oct 2021	0.306	Oct 2022	-		0.306	Continuing	Continuing	Continuing
Criteria & Thresholds	SS/CPFF	SPAWAR : San Diego, CA	4.793	0.300	Oct 2020	0.300	Oct 2021	0.306	Oct 2022	-		0.306	Continuing	Continuing	Continuing
Subtotal			36.477	5.041		5.946		6.399		-		6.399	Continuing	Continuing	N/A

Remarks
 Individual projects are derived from field level needs and awarded competitively to performing organizations, the portfolio mix of cost category/performing organization naturally changes from fiscal year to fiscal year.

The following increases are above 2% from FY 2022 to FY 2023:
 - Criteria & Thresholds: EXWC: Port Hueneme, CA; Increase from \$2.391M to \$3.039M. Increase due to planned FY2022/2023 projects that will be awarded competitively by EXWC to performing organizations based on subject matter expertise required by Navy need. Specific needs that are attributed to increase include studying behavioral response from SURTASS LFA and continuously active sonar (CAS).

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 9204 / <i>Marine Mammal Research</i>
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FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4

<i>MARINE MAMMAL RESEARCH</i>	
Marine Mammal Ecology and Population Dynamics	
Criteria and Thresholds, Physiology and Behavior, and Effects of Sound	
Mitigation Methodologies: Monitoring, New Technology, and Risk Assessment	

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Navy **Date:** April 2022

Appropriation/Budget Activity 1319 / 4	R-1 Program Element (Number/Name) PE 0603721N / <i>Environmental Protection</i>	Project (Number/Name) 9204 / <i>Marine Mammal Research</i>
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
<i>MARINE MAMMAL RESEARCH</i>				
Marine Mammal Ecology and Population Dynamics	1	2021	4	2027
Criteria and Thresholds, Physiology and Behavior, and Effects of Sound	1	2021	4	2027
Mitigation Methodologies: Monitoring, New Technology, and Risk Assessment	1	2021	4	2027