Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army											Date: May 2017	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603728A *I Environmental Quality Technology Demonstrations*							
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	-	14.533	11.137	10.421	-	10.421	10.624	10.840	11.056	11.284	-	-
002: *Environmental Compliance Technology*	-	3.225	3.262	2.203	-	2.203	2.353	2.455	2.503	2.554	-	-
025: *Pollution Prevention Technology*	-	1.430	1.489	1.488	-	1.488	1.488	1.488	1.518	1.549	-	-
03E: *Environmental Restoration Technology*	-	5.878	6.386	6.730	-	6.730	6.783	6.897	7.035	7.181	-	-
03F: *Environmental Quality Tech Demonstrations (CA)*	-	4.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-

A. Mission Description and Budget Item Justification

This Program Element (PE) matures and demonstrates technologies that assist the Army in becoming environmentally compliant and limiting future liability without compromising readiness or training assets critical to the success of the future force. Project 002 demonstrates tools and methods for compliance with environmental laws relevant to conservation of natural and cultural resources while providing a flexible realistic training environment for mission activities. Project 025 demonstrates pollution prevention tools and methods to minimize the Army's use and generation of toxic chemicals and hazardous wastes. Project 03E focuses on maturation and demonstration of technologies for advanced life cycle analysis, advanced sensing, and advanced remediation of Army-unique toxic or hazardous materials. This program demonstrates technological feasibility and transitions mature technologies from the laboratory to the user. Technologies matured and demonstrated by this program element improve the ability of the Army to achieve environmental restoration and compliance at its installations, at active or inactive ranges and other training lands, and in modernization programs. Technologies demonstrated focus on reducing current and future environmental liability costs.

The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy and supports the Army Strategy for the Environment.

This PE is fully coordinated and complementary to PE 0602720A (Environmental Quality Technology).

Work in this PE is performed by the Army Engineer Research and Development Center, Vicksburg, MS, and the United States (U.S.) Army Research, Development, and Engineering Command, Aberdeen Proving Ground, MD.

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Army	Date: May 2017
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603728A *I Environmental Quality Technology Demonstrations*

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	14.727	11.137	10.382	-	10.382
Current President's Budget	14.533	11.137	10.421	-	10.421
Total Adjustments	-0.194	0.000	0.039	-	0.039
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.194	-			
• Civ Pay Adjustments	0.000	0.000	0.039	-	0.039

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2016	FY 2017
Project: 03F: *Environmental Quality Tech Demonstrations (CA)*		
Congressional Add: *Program Increase*	4.000	-
Congressional Add Subtotals for Project: 03F	4.000	-
Congressional Add Totals for all Projects	4.000	-

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603728A / *Environmental Quality Technology Demonstrations*	Project (Number/Name) 002 / *Environmental Compliance Technology*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
002: *Environmental Compliance Technology*	-	3.225	3.262	2.203	-	2.203	2.353	2.455	2.503	2.554	-	-

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies transitioned from Program Element (PE) 0602720A (Environmental Quality Technology), Projects 048 and 896, that assist Army installations and operations in achieving environmental compliance. Army facilities are subject to fines and facility shutdowns for violations of federal, state, and local environmental regulations. Efforts under this Project enable the Army to reduce environmental constraints at installations while complying with the myriad of federal, state, local, and host country environmental regulations and policy. Current and planned efforts enable the Army to efficiently characterize, assess, and sustain training and testing capacity; power and water management in contingency operations and on installations; and noise mitigation and management. Technologies demonstrated aim to reduce the cost of resolving compliance issues for the Army, avoid reductions in availability of training facilities, and sustain the viability of testing and training ranges as well as protect the critical resources, i.e., land, air, and waters of the Army.

Work in this Project supports the Army Science and Technology Innovation Enablers Portfolio.

The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy, and supports the Army Strategy for the Environment.

Work in this Project is performed by the Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Sustainable Ranges and Lands	0.859	0.909	1.099
Description: This effort provides ecosystem vulnerability assessment and ecosystem analysis, monitoring, modeling, and mitigation technologies to support sustainable, unconstrained, realistic access and use of the Army's ranges and lands. This effort demonstrates environmentally safe and cost effective technologies to manage and reduce the increase in noise and pollution concerns associated with training ranges.			
FY 2016 Accomplishments: Matured and validated the design for a robust, operationally-efficient gray water reuse system that can reduce water demand at Contingency Operating Bases (COBs) of 600-3000 Pax capacity that will result in United States (U.S.) Army Public Health Command and U.S. Army Test and Evaluation Command safety and performance approval for fully integrated grey water reuse system for contingency bases.			
FY 2017 Plans:			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 002 / *Environmental Compliance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Will exploit assessment methodologies that quantify the adaptive capacity of social-ecological systems to understand potential climate change drivers on the continental United Stated (CONUS) and outside of the continental United States (OCONUS) installation security, resilience, and sustainability. ***FY 2018 Plans:*** Will integrate and mature methodologies for high-resolution permafrost/ground-ice mapping for improved risk characterization. Will extend permafrost heat transfer models to account for near surface ground heterogeneity and provide a real-time feedback system for early warning of ground stability, including permafrost change development, for existing infrastructure.			
Title: Adaptive & Resilient Installations ***Description:*** This effort demonstrates sustainable, cost efficient, and effective facilities while providing technologies and techniques for achieving resilient and sustainable installation and base operations. Demonstrates the applicability of using automated adaptive construction techniques to impact manpower and materials necessary for contingency construction through the maturation of an additive construction system utilizing cementitious materials. ***FY 2016 Accomplishments:*** Integrated contingency base planning, design, operations, and management modeling tools that link with the Joint Construction Management System (JCMS) to provide a single system for all Services to plan and execute construction in support of the Joint Force. Assessed the cementitious material requirements and characteristics required for automated additive construction that will be assessed utilizing a rudimentary pre-development system. ***FY 2017 Plans:*** Will complete software validations and transition contingency base planning modeling tools to the Army Facilities Components System and to the Joint Construction Management System. Will demonstrate an automated construction capability to print a custom-designed 500 square foot expeditionary structure within 24 hours that will reduce operational logistics demands and improve energy efficiency. ***FY 2018 Plans:*** Will mature and validate representative hardware and software to assess the relative risk associated with autonomous construction activities, and the degree to which risk may be mitigated through the employment of innovative robotic construction methods.	2.366	2.353	1.104
Accomplishments/Planned Programs Subtotals	3.225	3.262	2.203

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 002 / *Environmental Compliance Technology*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603728A / *Environmental Quality Technology Demonstrations*	Project (Number/Name) 025 / *Pollution Prevention Technology*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
025: *Pollution Prevention Technology*	-	1.430	1.489	1.488	-	1.488	1.488	1.488	1.518	1.549	-	-

A. Mission Description and Budget Item Justification

This Project matures and demonstrates pollution prevention advanced technologies required for sustainable operation of Army weapon systems, to include compliance with regulations mandated by federal, state, and local environmental and health laws. Technology thrusts under this Project include demonstration of advanced technologies to enable sustainment of propellant, explosive and pyrotechnic production and maintenance facilities and training ranges through elimination or significant reduction of environmental impacts. These technologies will ensure that advanced energetic materials required for future force's high performance munitions are developed that meet weapons lethality and survivability goals and that are compliant with environmental and health laws. Technology thrusts also include demonstration of more sustainable technologies for surface finishing processes, paints and coatings, cleaning solvents, refrigerants and fire suppressants.

Work in this Project supports the Army Science and Technology Innovation Enablers (formerly Enduring Technologies) Portfolio.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy and supports the Army Strategy for the Environment.

The Project is fully coordinated and complementary to Program Element (PE) 0602720A, Project 895. This Project transitions technologies developed under that PE.

Work in this Project is performed by the Research, Development, and Engineering Command Army Research Laboratory, Aberdeen Proving Ground, MD, the Armaments Research, Development, and Engineering Center, Picatinny Arsenal, NJ, the Aviation and Missile Research, Development, and Engineering Center, Redstone Arsenal, AL, and the Tank Automotive Research, Development and Engineering Center, Warren, MI in conjunction with the Army Public Health Command, Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Pollution Prevention Technology	1.430	1.489	1.488
Description: This effort demonstrates pollution prevention advanced technologies required to sustain operation of Army weapons systems to comply with state, federal, and local environmental and health laws and regulations.			
FY 2016 Accomplishments:			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 025 / *Pollution Prevention Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Conventional Ammunition: Qualified lead-free primary explosive from full-scale production lot; Pyrotechnics: Conducted testing for chromate- and lead-free gasless delay formulations in a relevant end item; Toxic Metal Reduction: Conducted firing tests for large caliber gun barrel with hexavalent chromium-free liner. ***FY 2017 Plans:*** Will formulate environmentally sustainable high explosive compositions from kilogram-scale batches of novel energetic materials; will demonstrate non-chromate sealers for use in depot-level maintenance processes; will evaluate commercially available refrigerants with low global warming potential against military-unique flammability and toxicity requirements. ***FY 2018 Plans:*** Will mature and characterize nanoporous silicon-based energetic materials as potential alternatives to lead-based primary explosives; will demonstrate the use of Chemical Agent Resistant Coating formulations that replace hazardous isocyanate compounds with polysiloxane-based resins; will demonstrate alternative refrigerants with low global warming potential in military environmental control unit applications.			
Accomplishments/Planned Programs Subtotals	1.430	1.489	1.488

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army			Date: May 2017
Appropriation/Budget Activity 2040 / 3	R-1 Program Element (Number/Name) PE 0603728A / *Environmental Quality Technology Demonstrations*	Project (Number/Name) 03E / *Environmental Restoration Technology*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
03E: *Environmental Restoration Technology*	-	5.878	6.386	6.730	-	6.730	6.783	6.897	7.035	7.181	-	-

A. Mission Description and Budget Item Justification

This Project matures and demonstrates technologies transitioned from Program Element (PE) 0602720A (Environmental Quality Technology), Projects 835 and 896 by addressing the management and mitigation of materials and chemicals released to the natural environment and the residual environmental effects of military training and operations. The emphasis of this effort includes remediation of legacy materials, e.g., traditional explosives energetics, and unexploded ordinance; management of new materials, e.g., nanomaterials and emerging contaminants; and mitigation of residual impacts from implementation of sustainable technologies and processes. Technologies matured within this Project enable the Army to cost effectively address current and future environmental liabilities resulting from the use of militarily relevant materials and chemicals in the environment. Current and planned efforts enable the Army to efficiently characterize, assess, and remediate soil and water at installations, ranges, facilities, and during operations under changing weather and climatic conditions. Efforts also identify ways to economically comply with the myriad of federal, state, and host country regulations dealing with contaminated soil and water. A key aspect of this work is the enhancement of risk assessment and life cycle analysis techniques that can more accurately predict and identify the environmental liabilities associated with fielding new systems and technologies. This Project includes pilot scale field studies to demonstrate technological feasibility and optimize performance and productivity of the risk mitigation techniques.

Work in this Project supports the Army Science and Technology Innovation Enablers Portfolio.

The cited work is consistent with the Assistant Secretary of Defense, Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy and supports the Army Strategy for the Environment.

Work in this Project is performed by the Army Engineer Research and Development Center, Vicksburg, MS.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Title: Sustainable Ordnance Mitigation and Management	1.280	-	-
Description: This effort develops real time detection and discrimination methodologies for unique and emerging non-metallic unexploded ordinance (UXO). ***FY 2016 Accomplishments:*** Validated algorithms for the detection and discrimination of intermediate electrically conductive material (IECM) munitions; and conducted field evaluations of electromagnetic induction (EMI) sensor systems on test ranges with the capability to detect non-metallic IECM munitions.			
Title: Hazard Assessment for Military Materials	1.100	2.090	1.398

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 03E / *Environmental Restoration Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
Description: This effort demonstrates tools to assess hazard and risk of Army-unique chemicals and materials. The tools provide for rapid environmental baseline survey reporting and screening assessments of existing and future militarily relevant compounds and allow for improved predictive risk assessment and provide environmental life cycle assessment capability. ***FY 2016 Accomplishments:*** Matured sensor technologies (e.g. biological sensors, geochemical sensors, and petroleum kit additions) for rapid and reliable data collection, providing real time screening for contamination within an operational environment. ***FY 2017 Plans:*** Will mature environmental lifecycle tool for use in developing new materials. Will demonstrate sensor technologies that are field-rugged and long-lasting for accurate assessment of contaminant presence in complex operating environments. Will provide algorithms for sensor systems to auto-populate Environmental Baseline forms as required by the Engineer Field Manual. ***FY 2018 Plans:*** Will demonstrate a novel passive chemical sensor to detect multiple contaminants (copper, arsenic, and nitrate) in water to provide sensing devices that are rapid, robust, and cost-efficient for real time water quality monitoring.			
Title: Technologies for Sustainable and Green Operations and Acquisition	2.048	1.908	3.331
Description: This effort exploits and matures technologies to control contaminant transport in environmental media on Army lands and mission spaces as well as assesses and demonstrates novel detection, remediation, and mitigation capabilities for existing and emerging contaminants. ***FY 2016 Accomplishments:*** Validated computational tools to predict the physical and chemical properties and toxicity of insensitive munitions to assess hazard potentials and health effects of insensitive munitions. Matured predictive models and computational tools to assess surface water characterization and contamination potential in austere environments. ***FY 2017 Plans:*** Will validate novel treatment approaches with reactive membrane materials and mature an operational effluent treatment system that will minimize water demand and minimize decontaminated waste. ***FY 2018 Plans:*** Will demonstrate an operational field effluent treatment system that will minimize water demand, decontaminated waste, and reduce logistic demands. Will validate computationally developed environmentally relevant physical and chemical properties of emerging and traditional munitions compounds essential to predict their fate and transport in natural water. Will validate an			

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army		Date: May 2017
Appropriation/Budget Activity 2040 / 3	**R-1 Program Element (Number/Name)** PE 0603728A / *Environmental Quality Technology Demonstrations*	**Project (Number/Name)** 03E / *Environmental Restoration Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017	FY 2018
artificial intelligence model that will predict adverse outcomes based on chemical-biological interactions for assessment of military compounds.			
Title: Risk Prediction and Decision Technologies ***Description:*** This effort matures and provides integrated science and technology solutions to Army environmental challenges with a focus on predicting the environmental attributes of emerging chemicals and materials, predictions that inform acquisition lifecycle models in order to minimize impacts to the mission and to the Soldier. ***FY 2016 Accomplishments:*** Matured experimental protocols and characterization factors in new small arms formulations for environmental risk determination; matured and demonstrated software for interpreting life cycle impact assessment calculations using decision support tools. ***FY 2017 Plans:*** Will begin demonstration of fate and transport models of contaminant movement and persistence in the environment using a novel soils informatics approach. Will begin expansion of the environmental lifecycle assessment methodology beyond new materials to weapons system approaches. ***FY 2018 Plans:*** Will validate an environmental lifecycle forecasting tool designed to provide quantitative environmental impact assessment for emerging materials and technologies. Will mature qualitative and quantitative methods for assessing synthetic biology environmental impacts of military relevance.	1.450	2.388	2.001
Accomplishments/Planned Programs Subtotals	5.878	6.386	6.730

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: FY 2018 Army											Date: May 2017	
Appropriation/Budget Activity 2040 / 3					R-1 Program Element (Number/Name) PE 0603728A / *Environmental Quality Technology Demonstrations*				Project (Number/Name) 03F / *Environmental Quality Tech Demonstrations (CA)*			
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
03F: *Environmental Quality Tech Demonstrations (CA)*	-	4.000	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	-	-

A. Mission Description and Budget Item Justification

This is a Congressional Interest Item.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2016	FY 2017
Congressional Add: Program Increase	4.000	-
FY 2016 Accomplishments: Program increase. Developed unique partnerships between Army and Industry for determining approaches to mitigate risks associated with nanotechnology or advanced materials products. Conducted field evaluation and validation of a combined physical and soil leaching system for removal of depleted uranium (DU) contamination in soils.		
Congressional Adds Subtotals	4.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A