

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2007

BUDGET ACTIVITY		PE NUMBER AND TITLE						
3 - Advanced technology development		0603728A - Environmental Quality Technology Demonstrations						
COST (In Thousands)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate
Total Program Element (PE) Cost	15306	17098	14982	16449	16666	16838	17208	17587
002 ENVIRONMENTAL COMPLIANCE TECHNOLOGY	1272	1967	2026	2068	2091	2106	2152	2200
025 POLLUTION PREVENTION TECHNOLOGY	2979	3433	3532	3645	3725	3799	3883	3968
03E ENVIRONMENTAL RESTORATION TECHNOLOGY	7797	8533	9424	10736	10850	10933	11173	11419
03F Environmental Quality Tech Demonstrations (CA)	3258	3165						

A. Mission Description and Budget Item Justification: The objective of this advanced technology development program element is to mature and demonstrate technologies that assist Army installations in becoming environmentally compatible without compromising the readiness or training critical to the success of the Future Force. Technologies demonstrated within this program element are transitioned from PE 0602720A (Environmental Quality Technology). This program includes technology demonstrations for: restoration of sites contaminated with toxic and/or hazardous materials (such as unexploded ordnance [UXO]) resulting from Army operations; pollution prevention to minimize the Army's use and generation of toxic chemicals and hazardous wastes; compliance with environmental laws by control, treatment, and disposal of hazardous waste products; and conservation of natural and cultural resources while providing a realistic environment for mission activities. This program demonstrates technological feasibility, assesses the technology and its producibility, and transitions mature technologies from the laboratory to installations. Technologies developed by this program element improve the Army's ability to achieve environmental restoration and compliance at its installations, at active and inactive ranges and other training lands, and at its rework and production facilities. Technologies demonstrated focus on reducing the cost of treating hazardous effluents and remediating Army sites contaminated by hazardous/toxic materiel. The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). The US Army Engineer Research and Development Center, headquartered at Vicksburg, MI, and the US Army Research, Development, and Engineering Command, headquartered at Fort Belvoir, VA, execute the project work.

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<u>B. Program Change Summary</u>	FY 2006	FY 2007	FY 2008	FY 2009
Previous President's Budget (FY 2007)	15777	14089	15098	16479
Current BES/President's Budget (FY 2008/2009)	15306	17098	14982	16449
Total Adjustments	-471	3009	-116	-30
Congressional Program Reductions		-65		
Congressional Rescissions				
Congressional Increases		3200		
Reprogrammings	-471	-126		
SBIR/STTR Transfer				
Adjustments to Budget Years			-116	-30

One FY07 congressional adds totaling \$3066 after adjustment for Congressional undistributed reductions was added to this PE.

(\$3066) Alternate Power Fuel Cell Demo at FT. Irwin

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BUDGET ACTIVITY 3 - Advanced technology development	PE NUMBER AND TITLE 0603728A - Environmental Quality Technology Demonstrations						PROJECT 002		
COST (In Thousands)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
002 ENVIRONMENTAL COMPLIANCE TECHNOLOGY	1272	1967	2026	2068	2091	2106	2152	2200	

A. Mission Description and Budget Item Justification: The objective of this advanced technology development project is to mature and demonstrate technologies transitioned from program element (PE) 0602720A (Environmental Quality Technology), projects 048 and 896 that assist Army installations in achieving environmental compliance. These technologies reduce the cost of treating hazardous effluents from Army installations, including ammunition plants, depots and arsenals, to satisfy increasingly stringent wastewater and air pollutant discharge standards. Army facilities are now subject to fines and facility shutdowns for violation of federal, state, and local air and wastewater discharge regulations. This technology is essential to control and reduce the generation of waste to satisfy hazardous waste reduction goals, and to avoid future hazardous waste disposal costs and liabilities to the Army. Efforts under this project enable the Army to reduce pollution at installations while complying with the myriad of federal, state, and host country regulations dealing with hazardous wastewater, air emissions, and solid wastes. Technologies demonstrated also reduce the cost of resolving training noise compliance issues for the Army, avoid reductions in availability of training facilities, and sustain the viability of testing and training ranges. The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). The US Army Engineer Research and Development Center, headquartered at Vicksburg, MI, executes the project work.

<u>Accomplishments/Planned Program:</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Installation Operations: Demonstrate environmentally safe and cost-effective technologies for removing lead-based paint and reducing Hazardous Air Pollutants (HAP) emissions from Army sources to meet National Emission Standards for HAP that will continue under project 025 and to manage and reduce the increase in noise concerns associated with training ranges. In FY06, matured acoustic emission data acquisition techniques and models for various weapon systems. In FY07, integrate noise prediction and management tools into Army range design protocols. In FY08, will complete initial blast noise complaint risk study criteria and develop impulse noise prediction models. In FY09, will complete complaint risk guidelines and a new noise modeling calculation engine for peak noise event based on statistical data and numerical analysis propagation algorithms.	1272	1932	2026	2068
Small Business Innovative Research/Small Business Technology Transfer Programs		35		
Total	1272	1967	2026	2068

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BUDGET ACTIVITY 3 - Advanced technology development	PE NUMBER AND TITLE 0603728A - Environmental Quality Technology Demonstrations						PROJECT 025		
COST (In Thousands)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
025 POLLUTION PREVENTION TECHNOLOGY	2979	3433	3532	3645	3725	3799	3883	3968	

A. Mission Description and Budget Item Justification: The objective of this project is to mature and demonstrate pollution prevention advanced technologies required to comply with regulations mandated by federal, state, and local environmental and health laws. Technology thrusts under this project include: (1) demonstration of new coating materials, systems, and processes to comply with existing and new national laws and local regulations; (2) demonstration of advanced nanocomposite packaging systems and advanced technologies for the reuse/recycling of solid waste resulting from packaging during deployed operations required to meet the operational needs of the Future Force; (3) demonstration of advanced technologies to enable sustainment of rocket and missile propellant production and maintenance facilities and training ranges through elimination or significant reduction of environmental impacts. These technologies are transitioned from PE 0602720A, project 895, and will ensure that advanced energetic materials required for Future Combat Systems (FCS) high performance munitions are developed that are compliant with environmental and health laws and meet weapons lethality and survivability goals. The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP), and supports the Army Strategy for the Environment. Work in this project is performed by the Research, Development, and Engineering Command's (RDECOM) Army Research Laboratory (ARL) located at Aberdeen, MD, the US Army Natick Soldier Center (NSC) located at Natick, MA, the Armaments Research, Development, and Engineering Center (ARDEC) located at Picatinny Arsenal, NJ, the Aviation and Missile Research, Development, and Engineering Center (AMRDEC) located at Huntsville, AL, and the Tank-Automotive Research, Development, and Engineering Center (TARDEC) located at Warren, MI.

<u>Accomplishments/Planned Program:</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Sustainable Painting Operations: In FY06, matured hazardous air pollutant (HAP)-free solvents, cleaners, and thinners used in coating operations and processes. In FY07, reformulate HAP-free sealants and adhesives used in weapon system maintenance, production, and industrial processes. In FY08, will design and evaluate touch-up kits containing HAP-free paints for on-system field maintenance. In FY09, will investigate HAP-free coatings for production of medium and large caliber ammunition. Solid Waste Diversion: In FY06, demonstrated solid waste minimization techniques for base camp operations. In FY07, mature and evaluate advanced nanocomposite packaging technologies to reduce the amount of packaging debris generated during deployed operations. In FY08, will optimize nanocomposite packaging structures and evaluate prototype packages in an operational environment. Compliant Ordnance Lifecycle: In FY06, selected and demonstrated most promising benign propellant alternative that eliminates or significantly reduces environmental impacts. In FY07, demonstrate alternatives to perchlorate and hydrazine propellants and non-toxic pyrotechnic compositions. In FY08, will evaluate environmental health of new propellants, pyrotechnics and explosives, and will demonstrate and refine alternative rocket propellants/motor combinations. In FY09, will scale-up synthesis of environmentally benign RDX replacement candidates for demonstration in munitions.	2979	3337	3532	3645
Small Business Innovative Research/Small Business Technology Transfer Programs		96		
Total	2979	3433	3532	3645

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BUDGET ACTIVITY 3 - Advanced technology development		PE NUMBER AND TITLE 0603728A - Environmental Quality Technology Demonstrations					PROJECT 03E		
COST (In Thousands)	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	
03E ENVIRONMENTAL RESTORATION TECHNOLOGY	7797	8533	9424	10736	10850	10933	11173	11419	

A. Mission Description and Budget Item Justification: The objective of this advanced technology development project is to mature and demonstrate technologies transitioned from program element (PE) 0602720A (Environmental Quality Technology), project 835 that improve the Army's ability to achieve cost-effective environmental restoration of contaminated (unexploded ordnance, military unique compounds, and energetics) sites at its installations, active, and inactive ranges, its rework and production facilities, and the battlefield. Technologies matured within this project enable the Army to cost effectively address current environmental liabilities resulting from soil and groundwater contamination. Current and planned efforts enable the Army to efficiently characterize, evaluate, assess, and remediate soil and groundwater at installations, ranges, facilities, and during battlefield operations. Efforts also identify ways to economically comply with the myriad of federal, state, and host country regulations dealing with contaminated soil and groundwater. A key aspect of this work is the enhancement of risk assessment techniques that can more accurately display the environmental risks associated with munitions residues. This program includes pilot scale field studies to establish technological feasibility and assess performance and productivity of the risk assessment techniques, and includes technology transition from the laboratory to demonstration/validation funded under PE 0603779A (Environmental Quality Technology - Dem/Val), project 04E. The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). The US Army Engineer Research and Development Center, headquartered at Vicksburg, MI, executes the project work.

<u>Accomplishments/Planned Program:</u>	<u>FY 2006</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
Unexploded Ordnance (UXO): In FY06, developed UXO discrimination models for wide-area transmitter sensor systems and for multi-axis sensor systems. In FY07, develop and evaluate a model for active range real-time UXO discrimination, and the Management Aid for UXO Detection Efforts (MAUDE) software application which assesses key geophysical and environmental site parameters and assists the site remediation manager with sensor/method/system site-specific selection guidelines for active range remediation. In FY08, will complete development of rapid computational modeling for active range scenarios. Will conduct field evaluations of rapid route survey and evaluation systems, of target/berm/bunker survey and assessment systems, and of a multi-sensor projectile impact assessment, positioning, and characterization system for range operations. In FY09, will conduct field evaluations of specialized instrumentation for targets, berms, and bunkers for monitoring impacts and condition assessment. Will investigate innovative technologies for range UXO maintenance and for mitigation of unique and emerging UXO.	1481	2162	2304	1761
Hazard/Risk Assessment Tools for Toxicity of Munitions Constituents (MCs) and Munitions and Explosives of Concern (MECs): In FY06, assessed non-intrusive methods for identification and risk assessment of toxic industrial chemicals and materials and developed conceptual techniques and procedures for incorporation into Intelligence Preparation of the Battlefield (IPB) practices and conducted gap analyses. In FY07, complete migration of Adaptive Risk Assessment Modeling System (ARAMS) to the higher order modeling technique, initiate adapting ARAMS to live fire range assessment, and continue preparation of geospatial environmental risk visualization techniques for incorporation into the IPB process. In FY08, will initiate advanced toxicogenomics of molecular tools to quantitatively assess MEC exposure, mathematical models of toxicity and effects due to existing, well characterized MEC, predicting multiple stressor impacts on toxicity, MEC toxicity mechanisms in ecological species, and species developmental pathways affected by MECs. In FY09,	936	1542	2466	5311

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will conduct cross-species validation of MEC effects. Will initiate advanced protocols for rapid screening and monitoring of ecological impact of MECs. Will initiate advanced computational chemistry predictions of chemical structures and physical properties of adsorbed explosives and organophosphorus compounds in soils. Will conduct technology demonstration of exposure quantification metrics for select representative nanomaterials.				
In Situ Remediation Technologies for Contaminated Groundwater and Soils: In FY06, matured in situ physical and biological cleanup processes for explosives in groundwater, and advanced in situ chemical and plant uptake treatment methods to immobilize inorganics at small arms training ranges. In FY07, finalize in situ physical and biological cleanup processes for explosives in groundwater with process guidance, specifications, and protocols and continue to mature in situ chemical and plant uptake treatment methods to immobilize inorganics on berms at small arms training ranges. In FY08, will mature near-surface biostabilization and phytostabilization technologies for inorganics on small arms firing ranges (SAFRs). Will construct integrated assessment models for inorganics on SAFRs. In FY09, will finalize and validate remediation/management of inorganic residues on SAFRs with process guidance, specifications, and protocols.	1782	1551	897	177
Characterization, Evaluation and Remediation of Distributed Source Contamination on Army Ranges: In FY06, matured and initiated early stage demonstration of a real-time detection capability and topical treatment methods for high concentration source zones of explosives and propellants. In FY07, complete a real-time detection capability for high concentration source zones for explosives and propellants and evolve geo-statistical methods to predict contaminant distribution patterns; mature in situ explosive treatment processes for distributed contamination on active ranges. In FY08, will complete field evaluation of statistically valid range characterization/sampling protocols for MC sources on active range soils and surface waters. Will continue maturing on-site, topical alkaline hydrolysis of impact area explosives and quantifying the effects of wildfire control practices on active ranges. In FY09, will conduct field evaluations of advanced spatial components for range risk assessment in Adaptive Risk Assessment Modeling System (ARAMS). Will quantify the effects of wildfire control practices on active ranges. Will perform field evaluation of on-site, topical alkaline hydrolysis of impact area explosives.	2408	1939	2350	2319
Long Term Monitoring Applications: In FY06, matured adaptations of commercially available direct-push wells for long term monitoring applications, and evaluated field portable sensors, sampling, and analysis methods. In FY07, integrate direct-push wells coupled to in situ real time sensing and analysis technologies, and evaluate integrated long term monitoring system designs for near real-time sampling, measurement, analysis, and information transmission. In FY08, will complete advance development of prototype gene signature array microchip sensor for MCs. Will evaluate field detection of MCs and emerging contaminants with negative ion miniature mass spectrometry achieved. Will conduct field evaluation of catalytic DNA and Surface Plasmon Resonance (SPR) affinity array sensors. In FY09, will complete advanced development of in situ biosensor technologies implemented in direct push wells. Will conduct final field evaluation of gene signature array sensor and of negative ion miniature mass spectrometer for multiple targets and multiple matrices.	1190	1144	1407	1168
Small Business Innovative Research/Small Business Technology Transfer Programs		195		
Total	7797	8533	9424	10736