ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2 Exhibit)

June 2001

BUDGET ACTIVITY
2 - APPLIED RESEARCH

PE NUMBER AND TITLE
0602720A - Environmental Quality Technology

	COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	76907	60434	16150	0	0	0	0	0	0	0
048	IND OPER POLL CTRL TEC	2153	2361	2539	0	0	0	0	0	0	0
829	NDCEE TECHNOLOGY	1909	0	0	0	0	0	0	0	0	0
835	MIL MED ENVIRON CRIT	2223	2822	2921	0	0	0	0	0	0	0
876	PLASMA ENERGY PYROLYSIS SYS	7638	0	0	0	0	0	0	0	0	0
896	BASE FAC ENVIRON QUAL	4908	5143	5136	0	0	0	0	0	0	0
908	COMMERCIAL TECHNOLOGY TO REDUCE COSTS	6684	0	0	0	0	0	0	0	0	0
917	COMPUTER BASED LAND MANAGEMENT	1909	0	0	0	0	0	0	0	0	0
91G	TECHNOLOGIES TO REDUCE NON-HAZARDOUS WASTE	0	4954	0	0	0	0	0	0	0	0
946	ELECTRONIC EQUIPMENT DEMANUFACTURE	15275	12386	0	0	0	0	0	0	0	0
947	SUSTAINABLE GREEN MANUFACTURING	5251	5449	0	0	0	0	0	0	0	0
959	CORROSION MEASUREMENT & CONTROL PROJ	8593	0	0	0	0	0	0	0	0	0
960	WATERVLIET ARSENAL POLLUTION PROJECTS	3818	0	0	0	0	0	0	0	0	0
961	VESSEL PLATING TECHNOLOGY	955	0	0	0	0	0	0	0	0	0
F25	MIL ENV RESTOR TECH	3180	3540	5554	0	0	0	0	0	0	0
F28	RANGE SAFETY TECH DEMO	9547	4954	0	0	0	0	0	0	0	0
F29	PHYT0-REMEDIATION IN ARID LANDS	2864	0	0	0	0	0	0	0	0	0
F31	ENVIRONMENTAL CLEANUP AT PORTA BELLA	0	2972	0	0	0	0	0	0	0	0
F35	ENVIRONMENTAL QUALITY TECHNOLOGY	0	5945	0	0	0	0	0	0	0	0
F36	ARMY HEAVY METALS OFFICE	0	5945	0	0	0	0	0	0	0	0
F37	PROTON EXCHANGE MEMBRANE (PEM) FUEL CELL	0	3963	0	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification:

PLEASE NOTE: This administration has not addressed FY2003-2007 requirements. All FY 2003-2007 budget estimates included in this book are notional only and subject to change.

The objective of this program element (PE) is to provide technologies that will improve the Army's ability to comply with regulations mandated by all Federal, state and local environmental/health laws and to reduce the cost of this compliance. Examples of key laws include the Superfund Amendments and Reauthorization Act of 1986 and the Defense Environmental Restoration Act (the Department of Defense equivalent of this law), in addition to the Resource Conservation and Recovery Act of 1984, as amended. This PE provides the Army with a capability to decontaminate or neutralize Army-unique hazardous and toxic wastes at sites containing waste ammunition, explosives, heavy metals, propellants, smokes, chemical munitions, and other organic contaminants. This PE also provides technology to avoid the potential for future hazardous waste problems, by reducing hazardous waste generation through process modification and control, materials recycling and substitution. This PE develops pollution control technology, which assists installations in complying with environmental regulations at less cost. The PE also provides technology to mitigate noise impacts and maneuver area damage resulting from Army training activities. The work in this PE is aligned with the Army's vision for the Objective Force and adheres to Defense Reliance Agreements on civil engineering and environmental quality with oversight provided by the Joint Engineers and Armed Services Biomedical Research Evaluation and Management. The cited work is also consistent with the Army Science and Technology Master Plan (ASTMP) and the Army Modernization Plan. Work is performed by the U.S. Army Engineer Research and Development Center (ERDC) and the U.S. Army Armament Research, Development and Engineering Center (ARDEC).

B. Program Change Summary	FY 2000	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2001 PB)	78905	13994	14238	0
Appropriated Value	80258	60994	0	
Adjustments to Appropriated Value	0	0	0	
a. Congressional General Reductions	0	0	0	
b. SBIR / STTR	-2011	0	0	
c. Omnibus or Other Above Threshold Reductions	-311	0	0	
d. Below Threshold Reprogramming	13	0	0	
e. Rescissions	-1042	-560	0	
Adjustments to Budget Years Since FY2001 PB	0	0	1912	
Current Budget Submit (FY 2002/2003 PB)	76907	60434	16150	0

FY02 and FY03 funding was increased to address high priority Army requirements for remediation of unexploded ordnance.

In FY01, Congressional adds were received for (947) Sustainable Green Manufacturing ($5500), (F28) Range Safe Demonstration Program (TACOM-ARDEC) ($5000), (F36) Army's Heavy Metals Office Initiative ($6000), (F37) Proton Exchange Membrane (PEM) Fuel Cell Demonstration ($4000), (91G) Technologies to Reduce Non-Hazardous Waste ($5000), (946) Demanufacturing of Electronic Equipment for Reuse and Recycling (DEER2) ($12500), (F35) Environmental Quality Technology ($6000), and (F31) Environmental Clean-Up Demonstration at Porta Bella ($3000). No additional funds are required to complete these projects.

- ($5500) Sustainable Green Manufacturing continues research supported by previous Congressional adds to introduce clean technologies and techniques into weapon system and related production lines.
- ($5000) Range Safe Demonstration Program continues research supported by previous Congressional adds to investigate technologies for remediation of military firing ranges containing lead and low level radioactive materials.
- ($6000) Heavy Metals Office Initiative to investigate remediation of heavy metals at military firing ranges.
- ($4000) PEM Fuel Cell Demonstration to investigate use of residential PEM fuel cell technology in military facilities.
- ($5000) Technologies to Reduce Non-Hazardous Waste for investigating technologies and processes applied to the reuse, recycle, or disposal of non-hazardous waste.
- ($12500) Demanufacturing of Electronic Equipment for Reuse and Recycling continues research supported by previous Congressional adds to develop and demonstrate technologies and processes for the reuse, recycle, or disposal of manufactured electronic equipment.
- ($6000) Environmental Quality Technology to transfer environmental pollution prevention/compliance technologies to Army industrial operations.
- ($3000) Environmental Clean-Up Demonstration to investigate remediation technologies for environmental clean-up at Porta Bella.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602720A - Environmental Quality Technology**	**048**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
048 IND OPER POLL CTRL TEC	2153	2361	2539	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The objective of this project is to provide technologies to support the readiness condition of the Army's military installations and munitions manufacture, to accommodate force transformation, and provide support to the Objective Force. Specifically, this project emphasizes the reduction or elimination of the impacts of legal and regulatory restrictions that subject the Army to fines and liabilities, as well as avoiding facility shutdowns for violations of these restrictions. These new technologies are essential for the effective control and reduction of hazardous and non-hazardous wastes. Efforts will include a focus on new materials that will enter the Army inventory within the next decade supporting the Objective Force. The work is managed by the U.S. Army Engineer Research and Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

• 2153 - Identified weather-based propagation cases for assessment of long-term average noise exposure for small arms range noise model.

- Developed designs to minimize weather-based propagation cases for assessment of long-term average noise exposure for small arms range noise model.

- Developed designs to minimize reactor headloss during electrochemical reduction of energetic compounds in water.

Total 2153

FY 2001 Planned Program

• 2320 - Develop measures and criteria to predict and avoid negative community response to noise.

- Investigate modified absorbent/biosorbent technology for treating Army waste streams containing heavy and toxic metals and explosives.

- Establish guidelines for fluidized-bed granular activated carbon bioreactor to replace carbon absorption for water contaminated with explosives.

• 41 - Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.

Total 2361

FY 2002 Planned Program

•	2539	- Investigate reductive electrochemical treatment for destruction of nitro-aromatics, nitramine or nitrate esters.
		- Determine physical and chemical interactions between energetic materials and building materials under long term exposure situations.
Total	2539	

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602720A - Environmental Quality Technology**	**835**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
835 MIL MED ENVIRON CRIT	2223	2822	2921	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: This project will provide quantitative means to determine the environmental and human health effects resulting from exposure to explosives, propellants, and smokes produced in Army industrial and field operations or disposed of through past activities. The end results of this research are determinations of acceptable residual concentration levels that will protect the environment and human health from adverse effects. The main product of this research is the Army Risk Assessment and Modeling System (ARAMS). This PC-based platform links models of fate and transport to the exposure and the effects models and databases of explosives and their degradation by-products on endpoint organisms in both aquatic and terrestrial ecosystems. This will reduce the uncertainty associated with both the probability of exposure and the ultimate effect if exposed. Interim products are U.S. Environmental Protection Agency approved health advisories and criteria documents to be used in risk assessment procedures. These criteria are used by the Army during negotiations with regulatory officials to set scientifically and economically rational safe cleanup and discharge levels at Army installations. The primary developing laboratories are the Center for Health Promotion and Preventive Medicine (CHPPM), Edgewood, MD, and the U.S. Army Engineer Research and Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 255 - Constructed a screening level model of Earth-borne chemical signatures from Unexploded Ordinance (UXO).
- 1968 - Identified toxicity values for use in the ARAMS.
  - Identified biomarkers to assess various toxic endpoints as well as bioaccumulation.
  - Constructed a comprehensive exposure model platform and integrated this module into ARAMS.
  - Identified physical/biological/chemical means by which explosives enter and accumulate in plants and animals (bioaccumulation) in order to develop screening tools and contaminant risk assessment methods.

Total 2223

FY 2001 Planned Program

•	376	- Determine effects of relevant environmental parameters of Earth media on UXO chemical signatures.
		- Design predictive tools for UXO multi-contaminant transport processes in various Earth media.
•	2362	- Construct comprehensive risk assessment model and database modules for explosives and their byproducts to be linked with the ARAMS.
		- Establish effects information to input into comprehensive ARAMS.
		- Construct population model for assessment of environmental effects and link to ARAMS.
		- Link contaminant fate and transport with effects databases for multiple endpoints.
		- Complete design of a comprehensive link between contaminant fate and transport with effects databases for multiple environmental endpoints for incorporation into ARAMS.
		- Enhance the overall performance and real-world simulation of the ARAMS by development of risk assessment prediction methods for whole populations of plants and animals.
•	84	- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	2822	

FY 2002 Planned Program

•	400	- Design a comprehensive model for how the various UXO constituents move and chemically transform through the ground (fate and transport) and prepare this quantitative model for inclusion into the ARAMS.
•	2521	- Complete the determination of how explosives accumulate and enter land-based populations of plants and animals (bioaccumulation) and the reference amounts and rates by which explosives become toxic (toxicity) to marine-based organisms. The specific explosives include: TNT, Royal Demolition explosive (RDX), and High Melting explosive (HMX).
		- Describe the ways and means by which the toxic effects of contaminants are transferred into the human body through the skin (dermal uptake) for ultimate use in the ARAMS.
		- Determine the dynamic mechanisms (kinetics) by which explosives accumulate and enter land-based populations of plants and animals (bioaccumulation) with those factors that determine how toxic the chemicals are to the specified organisms (toxicity).
		- Design a comprehensive predictive model of bioaccumulation and toxicity for site scenarios multiple species of organisms and multiple pathways by which the contaminants can reach the organisms.

FY 2002 Planned Program (Continued)

- Develop hazard/risk assessment procedures for both land-based and aquatic ecosystems which link exposure, accumulation and the toxic effects of explosives and their byproducts to the organisms.

- Improve the user interface with the ARAMS by the design of a multi-media version.

Total 2921

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602720A - Environmental Quality Technology**	**896**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
896 BASE FAC ENVIRON QUAL	4908	5143	5136	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The objective of this project is to provide technologies to support sustainable use of the Army's training, facilities, lands, and firing ranges. Specific focus is on technologies to reduce or eliminate environmental restrictions on military use of installation facilities, lands, and airspace. Efforts will provide the Army with the technical capability to protect and improve the biophysical characteristics of training and testing areas needed for sustainable ranges and training lands, to accommodate force transformation, and provide support to the Objective Force. Technology developed within this project will enable training and testing facility and land users to match mission events and schedules of training forces employing Future Combat Systems (FCS) to the capabilities of specific land areas, and will also provide advanced methods to restore lands damaged during activities. Technologies will allow operation and maintenance of installation facilities and training range resources in compliance with the myriad of environmental requirements while minimizing threat from stringent environmental laws. Efforts target the development of assessment, monitoring, and modeling capabilities to support risk-based analysis of changes in training doctrine, testing activities and provide for environmentally sustainable land and facilities. The work is managed by the U.S. Army Engineer Research and Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 4283 - Compared Army-relevant threatened and endangered species (TES) with potentially conflicting mission activities to determine relative risks to species and mission.

  - Developed process-based soil erosion and deposition models that will assist in selecting sites and methods to more effectively reduce the effects of erosion and sedimentation from military activities on training lands.

  - Integrated training distribution, plant species composition, and sedimentation factors that affect land carrying capacity into the Army Training and Testing Area Carrying Capacity (ATTACC) model.

  - Developed a construction demolition debris decision tree for determining recyclability/reusability of structures slated for demolition.

- 625 - Developed activated carbon fiber cloth absorption technologies to control Hazardous Air Pollutants (HAPs) from organic solvents used in Army painting, cleaning, and degreasing operations.

Total 4908

FY 2001 Planned Program

•	4349	- Validate the use of remote monitoring instrumentation and methods to evaluate changes in animal activity that may be caused by military activities.
		- Incorporate information on the potential of land (soils and vegetation) to be effectively rehabilitated to reduce erosion and sustain land resources into decision support processes for land rehabilitation and maintenance.
		- Develop management and recovery protocols for endangered species that are consistent with an adaptive ecosystem management approach.
		- Develop techniques to spatially link resources and military activity distribution parameters for impact assessment.
		- Identify the proximate effects and protocols to determine effects of smokes and obscurants on endangered species.
		- Investigate impact of contaminated lumber on the recyclability/reusability of deconstructed material.
•	720	- Develop HAP control technologies for toxic combustion sources.
•	74	- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	5143	

FY 2002 Planned Program

•	4701	- Establish methodological and statistical protocols for determination of endangered species population viability.
		- Develop protocols for installation-level use of fundamental spatial assessment, cost estimation, and prediction capabilities for ATTACC.
		- Identify adaptive mitigation techniques to reduce constraints on mission activities as a result of endangered species.
•	435	- Develop new technologies for controlling and/or recycling inorganic HAP emissions.
Total	5136	

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June 2001

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - APPLIED RESEARCH	**0602720A - Environmental Quality Technology**	**F25**

COST (In Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
F25 MIL ENV RESTOR TECH	3180	3540	5554	0	0	0	0	0	0	0

A. Mission Description and Budget Item Justification: The objective of this project is to provide cost effective technologies required to clean up Department of Defense (DoD) hazardous waste sites, including active installations under the Installation Restoration Program, those indicated for closure under the DoD Base Realignment and Closure Program and the Formerly Used Defense Sites Program. Technologies focus on cost-effective and efficient remediation of active training ranges that support enhanced readiness for the Objective Force. The thrust of this effort is to expedite site cleanup, reduce the cost of cleanup of contaminated soil, groundwater, and structures, and ensure that human health and the environment are protected. Research is conducted in several major areas: innovative and cost-effective site identification, characterization, and monitoring technologies, groundwater systems; and treatment technologies to remediate soil and groundwater contaminated with military-unique contaminants such as explosives/energetics, chemical agents, heavy metals, and other organics. Emphasis is placed on the development of in-situ remediation technologies and real or near real-time sensing technologies for Unexploded Ordnance (UXO). Development of existing technologies provides near-term solutions while adding to the knowledge base applicable to successful development of more complex in-situ technologies. The primary developing agency is the U.S. Army Engineer Research And Development Center (ERDC). This project supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2000 Accomplishments

- 3180 - Completed multi-sensor UXO data collection and demonstrated 50% reduction of false alarms at well-characterized UXO test sites.

  - Developed engineering approach for delivery of microbiologically nutritional or physical/chemical amendments into the ground for in-situ treatment or for hydrological modifications to groundwater systems to enhance biodegradation and completed bench scale parameter optimization for reactive barrier enhancement.

  - Completed vapor-phase biological activity enhancing amendment delivery (proof-of-concept) in soil columns, developed engineering approach for delivery of amendments to the vadose zone, and correlated saturated soil/sediment characteristics with contaminant bioavailability.

  - Completed first generation electro-kinetic treatment evaluation for lead and developed prototype instrumentation for on line detection of metal contaminated soils.

Total 3180

FY 2001 Planned Program

•	3435	- Develop predictive models for advanced UXO detection sensors (multi-frequency/multi-channel time domain electromagnetic, Ground Penetrating Radar (GPR), vector magnetic, and seismic/acoustic) and conduct advanced UXO sensor data collection effort at a well-documented site.
		- Conduct first-phase of pilot-scale evaluation of in-situ biodegradation for TNT and in-situ reactive barriers and/or reactive barriers coupled with biodegradation for explosives in groundwater.
		- Conduct evaluation of advanced electro-kinetic treatment technologies for lead and evaluate prototype instrumentation for on line detection of metal contaminated unsaturated soils and groundwater.
		- Investigate aggressive chemical metal treatment alternatives for unsaturated soils and groundwater at small arms training ranges.
		- Evaluate processes for the recycling of metal from contaminated unsaturated soils and groundwater treatment systems with emphasis on electro-kinetic treatment extracts.
•	105	- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Programs.
Total	3540	

FY 2002 Planned Program

•	656	- Construct predictive tools for UXO multi-contaminant transport processes in various earth media.
		- Design a predictive model to determine explosives toxicity for avian and marine species.
•	2180	- Complete advanced UXO sensor data collection effort at a well documented site.
		- Construct advanced UXO sensor fusion analysis algorithms to be applied to developing UXO detection/discrimination sensing capabilities.
		- Prepare an integrated suite of UXO detection/discrimination multi-sensing and processing modes to be optimized for site-specific environmental characteristics.
•	2718	- Complete first phase of pilot-scale evaluation of in-situ biodegradation for TNT and in-situ reactive barriers and/or reactive barriers coupled with biodegradation for explosives in groundwater.
		- Conduct pilot-scale demonstration of advanced electro-kinetic treatment technologies for lead and of prototype instrumentation for on line detection of metal contaminated soils.
		- Down-select aggressive chemical metal treatment alternatives for small arms training ranges.

FY 2002 Planned Program (Continued)

- Evaluate processes for the recycle of metal contaminated extracts for soils treatment systems.

Total 5554