

**Report No. SFIM-AEC-PC-CR-2002028**

**PROPOSED PLAN**

**US Army UXO Environmental Remediation and Active Range  
Clearance Technology Strategic Plan**

**December 1999**

**Prepare for:**

**U.S. Army Environmental Center  
Aberdeen Proving Ground, Maryland 21010-5401**

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
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1. REPORT DATE (DD-MM-YYYY) December 1999		2. REPORT TYPE Proposed Plan		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE U.S. Army UXO Environmental Remediation and Active Range Clearance Technology Strategic Plan				5a. CONTRACT NUMBER DACA31-96-D-0082	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Julie Van Deuren, Wei-Han Liu, and Shobha Chhetry (Platinum International, Inc.) and Johnathan Sperka (Malcolm Pirnie)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Platinum International Inc. 5350 Shawnee Road, Suite 200 Alexandria, VA 22312				8. PERFORMING ORGANIZATION REPORT NUMBER PII-0216501-01	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army Environmental Center Attn: SFIM-AEC-PCAT (George Robitaille) Building E4460, Beal Road Aberdeen Proving Ground, MD 21010-5401				10. SPONSOR/MONITOR'S ACRONYM(S) AEC	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S) SFIM-AEC-PC-CR-2002028	
12. DISTRIBUTION/AVAILABILITY STATEMENT Unclassified. Unlimited Distribution.					
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14. ABSTRACT Under contract to the U.S. Army Environmental Center and Platinum International, Inc., this plan was developed to ensure that the Army's overall UXO Technology Development, Testing, and Evaluation (RDT&E) program is responsive to the short and long term requirements of the user community, is adequately funded, is properly executed, and promotes technology system usage in the field. Also, this plan will ensure the Army compliance with DoD Directive 4715.11, "Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges within the United States". The purpose of this plan is to provide an overarching UXO technology strategic plan within the Army which will establish integrated guiding principles, goals and objectives for addressing UXO technology requirements and deficiencies that will provide an overarching Army strategy within the DoD framework for developing UXO technologies.					
15. SUBJECT TERMS UXO, technology, strategic plan, environmental, restoration, range clearance					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			George Robitaille
U	U	U	UU	24 pages	19b. TELEPHONE NUMBER (Include area code) (410)436-6865

**US ARMY UXO ENVIRONMENTAL REMEDIATION AND  
ACTIVE RANGE CLEARANCE TECHNOLOGY STRATEGIC  
PLAN**

**December 1999**

**PROPOSED**

**US Army UXO Environmental Remediation and Active Range Clearance  
Technology Strategic Plan**

**Table of Contents**

	<b>Pages</b>
Executive Summary .....	1-2
UXO Technology Strategic Plan Flowchart.....	3
UXO Technology Strategic Plan.....	4-15
Key Acronyms.....	16
Draft Resource Cost Estimate UXO.....	18
Technology Strategic Plan Proposed Timelines.....	20-21

## Foreword

### Purpose

The purpose of this UXO Environmental Remediation and Active Range Clearance Technology Strategic Plan is to provide an overarching UXO technology strategic plan within the Army. This Plan has been developed to ensure that the Army's overall UXO Technology Development, Testing, and Evaluation (RDT&E) program is responsive to the short and long term requirements of the user community, is adequately funded, is properly executed, and promotes technology system usage in the field. The Plan will also ensure Army compliance with DoD Directive 4715.11, "Environmental and Explosives Safety Management on Department of Defense Active and Inactive Ranges within the United States". The plan establishes integrated guiding principles, goals and objectives for addressing UXO technology requirements and deficiencies that will provide an overarching Army strategy within the DoD framework for developing UXO technologies.

The Assistant Secretary of the Army for Research, Development, and Acquisition (ASA RDA) and the Assistant Secretary of the Army for Installations and the Environment (ASA IE) have established a formal Army environmental technology management and oversight process. In 1999, as part of this management and oversight process, a validation of environmental restoration pillar requirements identified the need for improved UXO technologies as having the highest priority for action. This is based on a 1999 review of DSERTS that indicated 91 Army installations reporting UXO contamination, as well as an additional 600 FUDS and 130 BRAC sites covering millions of acres throughout the U.S., which may contain UXO.

### Background

As part of the DoD UXO Environmental Remediation Mission, the Army has the responsibility to ensure that UXO impacted sites are fully characterized and remediated to a condition that is consistent with its intended future use. However, the full extent of the impact of UXO on Army sites is currently unknown due to the insufficiency of broadly based, multi-media and variable condition UXO characterization tools necessary to establish locations, positive identification, and existing conditions of UXO. In an independent study, the potential magnitude of the UXO problem was recognized by the Defense Science Board (DSB), which reported in 1998 that current UXO characterization technologies lack adequate capability to discriminate, buried UXO from non-hazardous exploded ordnance/scrap metal masses.

The need for an overarching Army-wide UXO technology strategic plan to address different Army user community requirements (which address and consider technology needs for Range Response, Range Rule, R3M, and Range XXI programs) stems from the presence and extent of UXO on Closed, Transferred, and Transferring (CTT) ranges, Active/Inactive (A/I) ranges, and other UXO areas. This UXO Technology Strategic Plan's mission is to conduct RDT&E to support the use of improved UXO detection, navigation, reacquisition, discrimination, identification, assessment, remediation, and safety, security, and risk management technologies as required by the Army. The plan serves as a baseline to address and support current Army UXO user requirements by providing a framework for execution of the plan within two DOD recognized mission areas having RDT&E responsibility for UXO technologies: Environmental Remediation and Active Range Clearance. Significant developmental

progress towards advancing the capabilities of UXO technologies has furthered the goals of other DOD mission areas, most notably Countermine technology activities conducted by the Unexploded Ordnance Center of Excellence (UXOCOE). The UXO strategic plan proposed herein places heavy reliance on ensuring the coordination and leveraging of Countermine technology efforts by UXOCOE, as well as upon efforts undertaken by the user community and other non-DOD UXO technology related programs and initiatives.

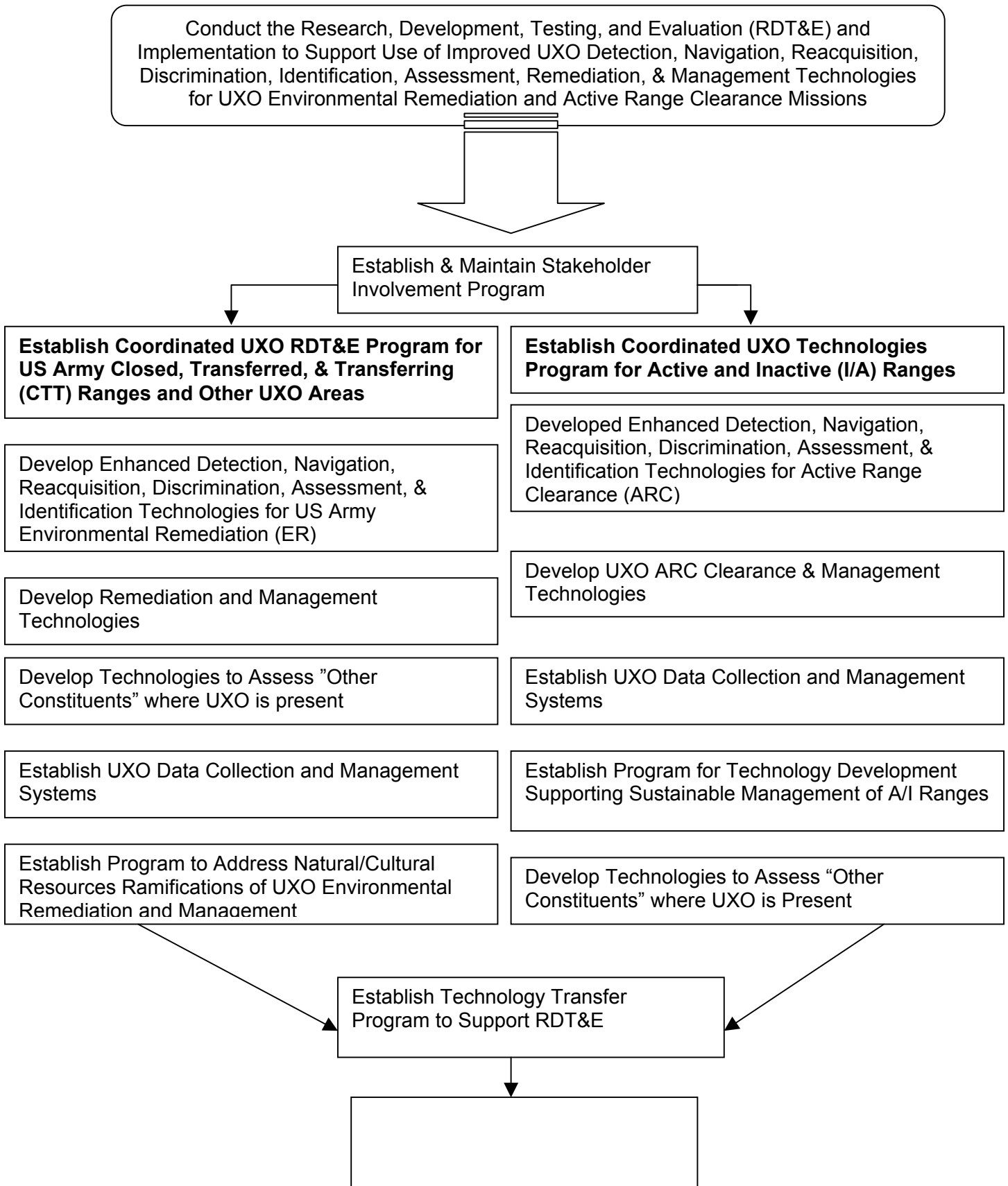
## **Strategic Plan Development**

Army representatives from ACSIM/ODEP, AEC, USACE (ERDC and Huntsville), JUXOCO, OEESCM, Range Rule/Munitions Rule Joint Working Groups, and the Army UXO Tiger Team for the Corrective Action Plan for the UXO (C) Material Weakness developed this UXO Technology Strategic Plan. These groups identified and quantified the proposed Army UXO technology goals and objectives, as well as pursued consensus of all aspects of the strategic plan. The plan's goals and objectives were derived and organized into an integrated framework that addresses Army UXO technology deficiencies by recommending RDT&E to support the use of improved UXO technologies. Because of efforts in other UXO program areas conducted by the Army, DOD, and other federal agencies, the plan's underlying guiding principle, to the extent practical, is to leverage, coordinate, integrate, and minimize duplication of efforts between this UXO technology strategic plan and other UXO-related plans and programs, as well as the coordination of activities with other stakeholders, in order to support the implementation and use of improved UXO technologies.

## **Summary**

In summary, it is the mission of this Plan to seek out support for its implementation in order to respond to very high priority Army EQT technology user requirements, as well as seek out solutions to the complex web of technical and financial challenges involved in its execution.

# U.S. ARMY UXO ENVIRONMENTAL REMEDIATION AND ACTIVE RANGE CLEARANCE TECHNOLOGY STRATEGIC PLAN



## **MISSION:**

**Conduct the Research, Development, Testing, Evaluation (RDT&E) to Support the Implementation and Use of Improved UXO Detection, Navigation, Reacquisition, Discrimination, Identification, Assessment, Remediation, and Safety, Security, and Risk Management Technologies as Required by the Army for UXO Environmental Remediation and Active Range Clearance.**

## **UXO Technology Strategic Goals**

- **Strategic Goal 1.0 – Establish a Coordinated Program to Execute the Mission.**
- **Strategic Goal 2.0 – Establish a Coordinated UXO Technologies Program for Closed, Transferred, and Transferring (CTT) Ranges and Other UXO Areas.**
- **Strategic Goal 3.0 – Establish a Coordinated UXO Technologies Program for Active/Inactive Ranges.**
- **Strategic Goal 4.0 – Establish a Coordinated Stakeholder Involvement Program.**



## **Guiding Principles**

- Support the Army mission for UXO Environmental Remediation.
- Protect human health and the environment.
- Comply with all applicable requirements, laws, and regulations.
- Provide an effective, strategic, and well-coordinated investment in UXO characterization and remediation technologies development.
- Leverage efforts in other services and DoD mission areas.
- Promote early stakeholder/user involvement.
- Be applicable to all military munitions, with the exception of mine detection technology development, but leverages countermine technology development efforts.

## **Strategic Goal 1.0 – Establish a Coordinated Program to Execute the Mission.**

### **1.1 Objective - Establish Authority and Management.**

- **1.1.1 Task:** Identify and define UXO RDT&E to support use of improved detection, navigation, reacquisition, discrimination, assessment, identification, remediation, and safety, security, and risk management program requirements for US Army UXO Environmental Remediation and Active Range Clearance missions.
- **1.1.2 Task:** Define and coordinate the roles, responsibilities, authority, and oversight.
  - Identify Army UXO Environmental Remediation and Active Range Clearance technology managers.
  - Develop plan for ETIPT oversight.
- **1.1.3 Task:** Establish "peer review" processes.

### **1.2 Objective – Establish a Funding Strategy.**

- **1.2.1 Task:** - Identify the appropriate funding resources.
- **1.2.2 Task:** Utilize the Planning, Programming, Budgeting, and Execution System (PPBES) to obtain required resources for the program.

### **1.3 Objective – Program Coordination and Leveraging.**

- **1.3.1 Task:** Identify UXO environmental remediation technology advances, successful application and performance metrics of UXO-related technologies, cost savings, and regulator/stakeholder acceptance of technology application for Army UXO Environmental Remediation and Active Range Clearance missions.
- **1.3.2 Task:** Coordinate with UXOCOE to leverage efforts with Combat Countermining, Humanitarian De-mining, Explosives Ordnance Disposal, Active Range Clearance, SERDP, ESTCP, underwater, and other component programs.

### **1.4 Objective - Establish Integration Mechanisms for Technology Initiatives between Active/Inactive Ranges (A/I); Closed, Transferred, and Transferring Ranges (CTT) and Other UXO Areas.**

- **1.4.1 Task:** Integrate technology transfer, RDT&E, use, and outreach efforts on A/I, CTT, and other UXO area programs in order to minimize duplication between technology initiatives.
- **1.4.2 Task:** Provide coordination for dissemination/sharing of information regarding UXO detection, discrimination, identification, remediation, and safety, security, and risk management technology capabilities.
  - Develop a methodology to communicate “lessons learned.”
  - Document capabilities and limitations of the technology.

**1.5 Objective - Define and Develop UXO Technology Requirements as Part of the Army Environmental Requirements and Technology Assessments (AERTA) Process.**

- **1.5.1 Task:** Develop quantified data as required to support UXO Environmental Remediation and Active Range Clearance requirements.
  - Quantify the extent of the UXO problem at US Army CTT, A/I, and other UXO areas.
  - Quantify all impacts of UXO issues (e.g., cost of living with the UXO problem, effects on natural and cultural resources, etc.).
  - Acquire data that contain appropriate metrics to prioritize UXO Environmental Remediation and Active Range Clearance technologies for development.
- **1.5.2 Task:** Identify and prioritize specific UXO technology requirements based on the extent of US Army UXO Environmental Remediation and Active Range Clearance problems.

**1.6 Objective – Coordinate with DoD, Other Component, and Other Agency UXO Technology Development Requirements while Addressing Army Requirements.**

- **1.6.1 Task:** Coordinate with the OEESCM Munitions Action Plan (MAP), the DoD Strategic Plan for Munitions and Range Management, and all other applicable DoD agencies for UXO technology development.
- **1.6.2 Task:** Coordinate with the UXOCOE to:
  - Coordinate with the applicable non-DoD government agencies conducting UXO related RDT&E and fielding activities.
  - Consider other Federal agencies in UXO technology development (e.g., NASA, FBI, CIA, ATF, FAA, and the State Department).

- Consider international UXO technology development (e.g., German, Canada, and Australia).
- **1.6.3 Task:** Leverage the efforts other UXO technology plans including the requirements of the Corrective Action Plan for the UXO (C) Material Weakness, Range Rule, R3M, Range XXI, the SASC Report, the DSB Report, the Munitions Rule, and UXOCOE UXO Detection and Clearance Technology Development Annual Reports.
- **1.6.4 Task:** Support the Army implementation of DoD Directive 4715.11, “Environmental and Explosives Safety Management on DoD Active and Inactive Ranges within the United States”.
  - Address technology requirements to ensure sustainable range management.
  - Address safety hazards of range clearance.
  - Address the quantities and types of UXO expended on US Army ranges.

## **Strategic Goal 2.0 - Establish a Coordinated UXO Technology Program for CTT Ranges and Other UXO Areas**

### **2.1 Objective – Develop Enhanced Detection, Navigation, Reacquisition, Discrimination, Assessment, and Identification Technologies for US Army Environmental Remediation Missions.**

- **2.1.1 Task:** Conduct research, development, testing, and evaluation (RDT&E) of enhanced detection, navigation, reacquisition, discrimination, assessment, and identification technologies for Army UXO Environmental Remediation missions.
  - Enhance UXO detection technology RDT&E program for Army UXO Environmental Remediation (ER) missions.
    - Develop a plan for rapid wide-area screening/footprint reduction and enhanced detection UXO-ER technologies.
    - Develop plan for enhanced UXO navigation and reacquisition technologies as applied to ER missions.
    - Develop plan for high confidence discrimination and identification between live and inert ordnance at CTT ranges and other areas.
    - Coordinate with the Hazardous, Toxic, and Radioactive Waste (HTRW) program for “other constituents.”
      - Develop plan for mitigating impacts from chemical fill, high explosives, and inert ordnance during detection and discrimination technology use.
    - Base RDT&E of UXO-ER technologies on user requirements, range inventory, and strategic needs.
  - Establish exit criteria/performance metrics that:
    - Includes metrics for percent detection/confidence, cost limitations, and false positive and false negative reduction rates.
    - Plan for a time-phased approach for achieving metrics rates.
  - Develop UX-ER demonstration/validation plan.
    - Execute and evaluate demonstration/validation program.
- **2.1.2 Task:** Develop technology transfer program for UXO–ER.
  - Develop technology implementation plan/strategy.
  - Assure effective and cost-efficient UXO-ER screening, enhanced detection, discrimination, and identification technology transfer program management.
  - Assure validity of technologies for user application to the field.
  - Assure regulator acceptance of technology transition to the field.

- Assure user and Army management acceptance of technology transition to the field.
  - Establish user involvement/training program for new UXO-ER technologies.
- **2.1.3 Task:** Establish program for use of developed technologies.
  - Develop Army/commercial partnering plan.
  - Develop technology commercialization plan.
  - Integrate into Army policy for QA/QC.
  - Promote commercial availability.

## **2.2 Objective – Develop Remediation and Management Technologies for Environmental Remediation missions.**

- **2.2.1 Task:** Conduct research, development, testing, and evaluation (RDT&E).
  - Enhance UXO remediation technology RDT&E program.
    - Develop plan for more effective and safer UXO-ER excavation equipment.
    - Develop plan for better in-situ and ex-situ UXO-ER destruction techniques.
    - Develop plan for better in-situ and ex-situ UXO-ER neutralization techniques.
    - Develop plan for better safety, security, and risk management technologies.
    - Develop plan for recycling range residue.
    - Develop plan for UXO-ER safety equipment including personal protective equipment.
    - Develop plan for UXO-ER vehicle access to ranges with varied terrain.
    - Develop plan for effective and appropriate vegetation removal.
    - Establish exit criteria/performance metrics.
    - Establish UXO-ER cleanup standards.
    - Develop and execute demonstration/validation plan.
- **2.2.2 Task:** Develop technology transfer program.
  - Develop technology implementation plan/strategy.
  - Assure effective and cost-efficient UXO remediation and management technology transfer program management.
  - Assure validity of technologies for user application to the field.
  - Assure regulator acceptance of technology transition to the field.
  - Assure user and Army management acceptance of technology transition to the field.
    - Establish user involvement/training program for new technologies.

- **2.2.3 Task:** Establish program for use of developed technologies.
  - Develop plan for Army/contractor partnerships.
  - Develop technology commercialization plan.
    - Document existing off-the-shelf technologies applicable to UXO-ER and management technologies.
    - Develop consistent performance-based contract language.
  - Integrate into Army policy for QA/QC.
  - Promote commercial availability.

### **2.3 Objective – Establish UXO Data Collection and Management Systems for US Army Sites.**

- **2.3.2 Task:** Develop plan to standardize UXO data collection and management systems for US Army sites.
  - Develop standards for all UXO-ER data collection and management systems.
  - Establish single location for UXO-ER data repository.
  - Assure that data collected allows for analysis for anomaly location and characteristics.
  - Assure that all Army organizations and contractors utilize standard data collection and management systems requirements.
- **2.3.1 Task:** Develop plan to enhance data acquisition capabilities.
  - Address data for navigation and reacquisition.
  - Address current global positioning system (GPS) capabilities.

### **2.4 Objective - Establish a Program which Addresses the Natural and Cultural Resources Ramifications of UXO Environmental Remediation missions.**

- **2.4.1 Task:** Address the protection and restoration of natural resources during UXO-ER.
  - Promote conservation, protection, and environmental stewardship.
  - Prevent/minimize/mitigate impacts during UX-ER cleanup operations.
  - Plan for UXO remediation while minimizing impacts to threatened and endangered species (TES).
- **2.4.2 Task:** Address the protection and preservation of cultural resources during UXO-ER.

- Promote conservation, protection, and environmental stewardship.
- Prevents/mitigates impacts during UXO-ER cleanup operations.
- Plan for historic and archaeological impacts from UXO remediation.

## **2.5 Objective - Develop Technologies to Assess “Other Constituents” in Areas where UXO is Present.**

- **2.5.1 Task:** Develop remote or non-invasive sampling and analysis technologies of “other constituents”.
- **2.5.2 Task:** Develop plan to address heavy metals, PEP, and chemical agents where UXO is present.

## **Strategic Goal 3.0 - Establish a Coordinated UXO Technologies Program for Active/Inactive Ranges**

### **3.1 Objective – Develop Enhanced Detection, Navigation, Reacquisition, Discrimination, Assessment, and Identification Technologies for Active Range Clearance (ARC) missions.**

**3.1.1 Task:** Conduct research, development, testing, and evaluation (RDT&E) of UXO detection, discrimination, assessment, and identification technologies for ARC missions.

- Enhance Active Range Clearance UXO detection technology RDT&E program.
  - Develop plan for rapid wide-area screening/footprint reduction and enhanced detection.
  - Develop plan for enhanced UXO-ARC navigation and reacquisition technologies.



- Develop plan for high confidence discrimination and identification between live and inert ordnance at active/inactive ranges.
- Coordinate with the Hazardous, Toxic, and Radioactive Waste (HTRW) program for evaluating the impacts from “other constituents”.
  - Develop plan for mitigating impacts from chemical fill, high explosives, and inert ordnance during detection and discrimination technology use.
- Focus RDT&E of UXO ARC technologies on user requirements, range inventory and strategic needs.
- Establish exit criteria/performance metrics for UXO technologies.
  - Includes metrics for percent detection/confidence, cost limitations, and false positive and false negative reduction rates.
  - Develop plan for a time-phased approach in achieving performance metrics rates.
- Develop UXO-ARC technology demonstration/validation plan.
  - Execute and evaluate demonstration/validation program.
- **3.1.2 Task:** Establish technology transfer program to assure the successful implementation of technologies in the field.
  - Develop technology implementation plan/strategy.
  - Assure effective and cost efficient UXO-ARC screening, enhanced detection, discrimination, and identification technology transfer program management.
  - Assure validity of technologies for user application to the field.
  - Assure user and Army management acceptance of technology transition to the field.
    - Establish user involvement/training program for new technologies.
- **3.1.3 Task:** Establish program for use of developed technology.
  - Develop technology commercialization plan.
  - Integrate into Army policy for QA/QC.
  - Promote commercial availability.

### **3.2 Objective – Develop UXO-ARC Clearance and Management Technologies.**

- **3.2.1 Task:** Conduct research, development, testing, and evaluation (RDT&E).

- Enhance UXO-ARC clearance technology RDT&E program.
  - Develop plan for more effective and safer UXO-ARC digging equipment.
  - Develop plan for better in-situ and ex-situ UXO-ARC destruction techniques.
  - Develop plan for better in-situ and ex-situ UXO-ARC neutralization techniques.
  - Develop plan for better safety, security, and risk management technologies.
  - Develop plan for recycling range residue.
  - Develop plan for UXO-ARC safety equipment including personal protective equipment.
  - Develop plan for UXO-ARC vehicle access to ranges with varied terrain.
  - Develop plan for effective and appropriate vegetation removal.
  - Establish exit criteria/performance metrics.
  - Modify UXO-ARC clearance standards, if necessary.
  - Develop and execute demonstration/validation plan.
  
- **3.2.2 Task:** Develop UXO-ARC technology transfer program.
  - Develop technology implementation plan/strategy.
  - Assure effective and cost efficient UXO-ARC clearance and management technology transfer program management.
  - Assure validity of technologies for user application to the field.
  - Assure user and Army management acceptance of technology transition to the field.
    - Establish user involvement/training program for new technologies.
    - Assure natural and cultural resources are considered for UXO-ARC clearance technologies transferred to the field.
  
- **3.2.3 Task:** Establish program for use of developed technologies.
  - Develop technology commercialization plan.
    - Document existing off-the-shelf technologies.
    - Develop consistent performance-based contract language.
    - Assure natural and cultural resources are considered for UXO-ARC clearance technologies used by commercial organizations.
  - Integrate into Army policy for QA/QC.
  - Promote commercial availability.

**3.3 Objective – Establish UXO Data Collection and Management Systems for UXO-ARC US Army Sites.**

- **3.3.2 Task:** Develop plan to standardize data collection and management systems for US Army Sites.
  - Develop standards for all UXO-ARC data collection and management systems.
  - Establish single location for UXO-ARC data repository.
  - Assure that data collected allows for analysis for anomaly location and characteristics.
  - Assure that all Army organizations and contractors utilize standard data collection and management systems requirements.
- **3.3.1 Task:** Develop plan to enhance data acquisition capabilities.
  - Address data for navigation and reacquisition.
  - Address current global positioning system (GPS) capabilities.

### **3.4 Objective - Establish Program for Technology Development to Support Sustainable Management of Active/Inactive Ranges.**

- **3.4.1 Task:** Develop UXO-ARC technologies capable of use while maintaining readiness and training.
  - Plan for mitigation of natural resource impacts.
  - Consider range impacts from UXO.
- **3.4.2 Task:** Develop UXO technologies that aid active/inactive range clearance processes.
- **3.4.3 Task:** Develop plan for in-situ management of UXO-ARC.
  - Develop modifications, which would support standard doctrinal range designs, which can reduce UXO liability, explosive safety hazards, minimize environmental risk, and facilitate active range clearance. Considerations should include range maintenance, available maneuver space, and access to targets.
  - Plan for balancing risk against anticipated range use.
- **3.4.4 Task:** Develop plan for management of impacts from exploding and exploded ordnance.
  - Address soil erosion.

**3.5 Objective - Develop Technologies to Assess "Other Constituents" in Areas where UXO is Present.**

- **3.5.1 Task:** Develop remote or non-invasive sampling and analysis technologies of "other constituents".
- **3.5.2 Task:** Develop plan to address heavy metals, PEP, and chemical agents where UXO is present.

## **Strategic Goal 4.0 - Establish a Coordinated Stakeholder Involvement Program**

### **4.1 Objective – Develop Requirements for Early Stakeholder/User Involvement in Technology Program.**

- **4.1.1 Task:** Establish stakeholder/user training program.
  - Define true stakeholder/user list.
  - Develop user-training program for UXO-ER and ARC technologies.
  - Develop other stakeholder-training program for UXO-ER and ARC technologies.
  - Develop general public training program for UXO-ER and ARC technologies.
  - Develop plan to focus stakeholder perception to improve understanding and acceptance of the process and UXO-ER and ARC technologies.
  - Develop plan to address congressional inquiry.
- **4.1.2 Task:** Establish stakeholder communication program.
  - Define true stakeholder listing.
  - Develop user communication program for UXO-ER and ARC technologies.
  - Develop other stakeholder communication program for UX-ER and ARC technologies.
  - Develop general public communication program for UXO-ER and ARC technologies.
  - Develop plan for proactive communication with Congress.

### **4.2 Objective - Identify and Interact with Stakeholders/Users.**

- **4.2.1 Task:** Define roles and responsibilities for stakeholder/user involvement.
  - Identify all US Army UXO-ER and ARC technology users.
    - Develop US Army UXO-ER and ARC technology education program.
  - Identify all regulators/regulatory agencies with involvement in UXO-ER and ARC technology program.
    - Address other Federal agencies/UXOCOE coordination.
    - Address state-by-state differences.
    - Address UXO-ER and ARC technical capabilities and cost considerations.
    - Address UXO-ER and ARC cleanup standards.
  - Identify extent of public involvement.
    - Identify and leverage efforts from the OEESCM MAP stakeholder involvement program.
- **4.2.2 Task:** Develop a time-phased plan for interaction with stakeholders/users.

- Develop a time-phased plan for user involvement.
  - Develop UXO-ER and ARC technology education program for Army users.
  - Develop UXO-ER and ARC technology education program for other component users.
  - Develop UXO-ER and ARC technology education program for other agency users.
- Develop a time-phased plan for regulator involvement.
  - Develop plan for regulator involvement in technology transfer.
  - Develop plan for regulator awareness of Army/contractor partnerships.
  - Develop plan for demonstration of technology to regulators.
- Develop a time-phased plan for public involvement.
  - Develop plan for involvement of RAB.
  - Develop plan for Army installation neighbor involvement.
  - Develop plan to address environmental group involvement.
  - Identify and leverage efforts from the Range Rule and OEESCM MAP stakeholder involvement program.
- Develop a Plan for UXOCOE coordination.

## Key Acronyms

**AERTA:** Army Environmental Requirements and Technology Assessments  
**A/I Ranges:** Active or Inactive Ranges  
**ATF:** Bureau of Alcohol, Tobacco, and Firearms  
**ATSC:** Army Training Support Center  
**ARC:** Active Range Clearance Mission  
**CIA:** Central Intelligence Agency  
**CWM:** Chemical Warfare Materiel  
**CTT Ranges:** Closed, Transferred, or Transferring Ranges  
**DSB:** Defense Science Board  
**ERDC:** US Army Engineer Research and Development Center  
**ER:** Environmental Remediation Mission  
**ESTCP:** Environmental Security Technology Certification Program  
**ETIPT:** Environmental Technology Integrated Process Team  
**FAA:** Federal Aviation Administration  
**FBI:** Federal Bureau of Investigation  
**GPS:** Global Positioning System  
**HTRW:** USACE CTX for Hazardous, Toxic, and Radioactive Waste  
**JUXOCO:** Joint Unexploded Ordnance Coordination Office  
**JWG:** Strategic Plan Joint Working Groups  
**MAP:** Munitions Action Plan  
**NASA:** National Aeronautics and Space Administration  
**OEESCM:** Operational Environmental Executive Steering Committee  
**PEP:** Propellants, Explosives, and Pyrotechnics  
**PPBES:** Planning, Programming, Budgeting, and Execution System  
**QA/QC:** Quality Assurance/Quality Control  
**RAB:** Restoration Advisory Board  
**R3M:** Range Rule Risk Methodology  
**RDT&E:** Research, Development, Testing, and Evaluation  
**SERDP:** Strategic Environmental Research and Development Program  
**TES:** Threatened and Endangered Species  
**USACE:** United States Army Corps of Engineers  
**UXO:** Unexploded Ordnance  
**UXOCOE:** Unexploded Ordnance Center of Excellence

**UXO Technology Strategic Plan Draft Resource Cost Estimate**



# US Army UXO Environmental Remediation and Active Range Clearance Technology Strategic Plan Draft Resource Estimate by Fiscal Year

DEC 99 PROPOSED

ID	Task Name	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12-16	FY17+
1	<b>Goal 1 - Establish a Coordinated Program to Execute the Mission</b>	10.62M	600K	500K	300K	500K	300K	250K	150K	250K	950K	1.1M	TBD
2	<b>1.1 Establish Authority and Management</b>												
3	Identify and define UXO RDT&E to support use of improved detection, navigation, reacquisition, discrimination, assessment, identification, remediation, safety, security, and risk management program requirements												
4	Define and coordinate the roles, responsibilities, authority, and oversight												
5	Establish peer review processes												
6	<b>1.2 Establish Funding Strategy</b>												
7	Establish a funding strategy to determine funding required to achieve mission goals.												
8	Utilize the PPBES to obtain required resources for the program.												
9	<b>1.3 Program Coordination and Leveraging</b>												
11	Identify UXO ER technology advances, successful application and performance metrics of UXO-related technologies, cost savings, and regulator/stakeholder acceptance of technology application												
10	Coordinate with UXOCOE to leverage efforts with combat countermeasures, humanitarian demining, explosives ordnance disposal, active range clearance, SERDP, ESTCP, underwater, and other programs												
12	<b>1.4 Establish Integration Mechanisms for Technology Initiatives between Active/Inactive (A/I), Closed, Transferred, and Transferring (CTT) Ranges, and Other UXO Areas</b>												
13	Integrate technology transfer, RDT&E, use, and outreach efforts between programs to minimize duplication of efforts between programs												
14	Provide coordination for dissemination/sharing of information regarding UXO detection, navigation, reacquisition, discrimination, identification, removal, and risk management technology capabilities												
15	<b>1.5 Define and Develop UXO Technology Requirements as Part of the AERTA Process</b>												
16	Develop quantified data as required to support UXO requirements												
17	Identify and prioritize specific UXO technology requirements based on extent of the UXO problem												
18	<b>1.6 Coordinate with DOD, Other Component, and Other Agency UXO Technology Development Requirements while Addressing Army Requirements</b>												
19	Coordinate with OEESCM Munitions Action Plan (MAP) and other applicable DOD agencies for UXO Technology Development												
20	Coordinate with UXOCOE and applicable non-DOD government agencies conducting UXO-related RDT&E and fielding activities												
21	Leverage other UXO technology plans including the Corrective Action Plan for UXO (C) Material Weakness, Range Rule (R3/M), SASC report, DSB report, Munitions Rule, and UXOCOE UXO Report to Congress.												
22	Support the Army implementation of DOD Directive 4715.11												
23	<b>Goal 2 - Establish a Coordinated UXO Technologies Program for Closed, Transferred, and Transferring (CTT) Ranges and Other UXO Areas</b>	7.8M	9.575M	21.1M	28.9M	29.4M	18.3M	15.3M	15.3M	15.3M	42M	22.7M	44.4M
24	<b>2.1 Develop Enhanced Detection, Navigation, Reacquisition, Discrimination, Assessment, and Identification Technologies for US Army ER and ARC</b>												
25	Conduct RDT&E of Enhanced Detection, Navigation, Requisition, Discrimination, Assessment, and Identification Technologies for ER and ARC missions												
26	Develop technology transfer program for UXO-ER												
27	Establish program for use of developed UXO detection technologies												
28	<b>2.2 Develop UXO Remediation and Management Technologies for ER Missions</b>												
29	Conduct UXO RDT&E for remediation and management technologies												
30	Develop UXO ER technology transfer program												
31	Establish program for use of developed UXO technologies												
32	<b>2.3 Establish UXO Data Management Systems for US Army Sites</b>												
33	Develop Plan to Enhance Data Acquisition Capabilities.												
34	Develop Plan to Standardize Data Management												
35	<b>2.4 Establish a Program which Addresses the Natural and Cultural Resources Ramifications of UXO Environmental Remediation Missions</b>												
36	Address the protection and restoration of natural resources during UXO -ER												
37	Address the protection and preservation of cultural resources during UXO -ER												
38	<b>2.5 Develop Technologies to Assess Other Constituents in Areas where UXO is Present</b>												
39	Conduct remote or non-invasive sampling and analysis of other constituents												
40	Develop plan to address heavy metals, PEP, and chemical agents where UXO is Present												
41	<b>Goal 3 - Establish a Coordinated UXO Technologies Program for Active/Inactive Ranges</b>	0	4.875M	16.8M	18.7M	21.3M	21.4M	21.3M	21.3M	12.3M	47.7M	22.2M	43.2M+
42	<b>3.1 Develop Enhanced Detection, Discrimination, Assessment, and Identification Technologies for ARC</b>												
43	Conduct RDT&E of Enhanced Detection, Discrimination, Assessment, and Identification Technologies												
44	Establish technology transfer program to assure the successful implementation of technologies in the field												
45	Establish program for use of developed UXO technologies												
46	<b>3.2 Develop UXO ARC Clearance and Management Technologies</b>												
47	RDT&E UXO ARC clearance and management technologies												
48	Develop UXO ARC clearance technology transfer program												
49	Establish program for use of developed UXO technologies												
50	<b>3.3 Establish UXO Lifecycle Data Management Systems for UXO ER and ARC</b>												
51	Develop Plan to Enhance Data Acquisition Capabilities.												
52	Develop Plan to Standardize Data Management.												
53	<b>3.4 Establish Program for Technology Development to Support Sustainable Mgmt of Active/Inactive Ranges</b>												
54	Develop UXO ER and ARC technologies capable of use while maintaining readiness and training												
55	Develop UXO technologies that aid active/inactive range clearance processes												
56	Develop plan for in-situ management of UXO for ER												
57	Develop plan for management of impacts from exploding and exploded ordnance												
58	<b>3.5 Develop Technologies to Assess "Other Constituents" in Areas where UXO is Present</b>												
59	Conduct remote or non-invasive sampling and analysis of other constituents												
60	Develop plan to address heavy metals, PEP, and chemical agents where UXO is Present												
61	<b>Goal 4 - Establish a Coordinated Stakeholder Involvement Program</b>	0	900K	400K	200K	200K	200K	200K	200K	200K	1.0M	1.0M	TBD
62	<b>4.1 Development Requirements for Early Stakeholder/User Involvement in Technology Program</b>												
63	Establish stakeholder/user training program												
64	Establish stakeholder communication program												
65	<b>4.2 Identify and Interact with Stakeholders/Users</b>												
66	Define roles and responsibilities for stakeholder /user involvement												
67	Develop time-phased plan for interaction with stakeholders/users												
<b>Totals</b>		18.4M	15.95M	38.8M	48.1M	51.4M	40.2M	37.5M	37.0M	28.1M	91.7M	47M	87.6M+

## **UXO Technology Strategic Plan Proposed Timelines**

# US Army UXO Environmental Remediation and Active Range Clearance Technology Strategic Plan

## Draft Timeline by Fiscal Quarter, Year, and 5-Year Periods Beginning FY2002

ID	Task Name	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
1	<b>Goal 1 - Establish a Coordinated Program to Execute the Mission</b>								
2	<b>1.1 Establish Authority and Program Coordination/Management</b>								
3	Identify and define UXO RDT&E to support use of improved detection, navigation, reacquisition, discrimination, assessment, identification, remediation, safety, security, and risk management program requirements								
4	Define and coordinate the roles, responsibilities, authority, and oversight								
5	Establish peer review processes								
6	<b>Establish a Funding Strategy</b>								
7	Establish a funding strategy to determine funding required to achieve mission goals.								
8	Utilize the PPBES to obtain required resources for the program.								
9	<b>1.3 Program Coordination and Leveraging</b>								
11	Identify UXO ER technology advances, successful application and performance metrics of UXO-related technologies, cost savings, and regulator/stakeholder acceptance of technology application								
10	Coordinate with UXOCOE to leverage efforts with combat countermeasures, humanitarian demining, explosives ordnance disposal, active range clearance, SERDP, ESTCP, underwater, and other programs								
12	<b>1.4 Establish Integration Mechanisms for Technology Initiatives between Active/Inactive (AI), Closed, Transferred, and Transferring (CTT) Ranges, and Other UXO Areas</b>								
13	Integrate technology transfer, RDT&E, use, and outreach efforts between programs to minimize duplication of efforts between programs								
14	Provide coordination for dissemination/sharing of information regarding UXO detection, navigation, reacquisition, discrimination, identification, removal, and risk management technology capabilities								
15	<b>1.5 Define and Develop UXO Technology Requirements as Part of the AERTA Process</b>								
16	Develop quantified data as required to support UXO requirements								
17	Identify and prioritize specific UXO technology requirements based on extent of the UXO problem								
18	<b>1.6 Coordinate with DOD, Other Component, and Other Agency UXO Technology Development Requirements while Addressing Army Requirements</b>								
19	Coordinate with OEESCM Munitions Action Plan (MAP) and other applicable DOD agencies for UXO Technology Development								
20	Coordinate with UXOCOE and applicable non-DOD government agencies conducting UXO-related RDT&E and fielding activities								
21	Leverage other UXO technology plans including the Corrective Action Plan for UXO (C) Material Weakness, Range Rule (R3/M), SASC report, DSB report, Munitions Rule, and UXOCOE UXO Report to Congress.								
22	Support the Army implementation of DOD Directive 4715.11								
23	<b>Goal 2 - Establish a Coordinated UXO Technologies Program for Closed, Transferred, and Transferring (CTT) Ranges and Other UXO Areas</b>								
24	<b>2.1 Develop Enhanced Detection, Navigation, Reacquisition, Discrimination, Assessment, and Identification Technologies for US Army ER and ARC</b>								
25	Conduct RDT&E of Enhanced Detection, Navigation, Reacquisition, Discrimination, Assessment, and Identification Technologies for ER and ARC missions								
26	Develop technology transfer program for UXO-ER								
27	Establish program for use of developed UXO detection technologies								
28	<b>2.2 Develop UXO Remediation and Management Technologies</b>								
29	Conduct UXO RDT&E for remediation and management technologies								
30	Develop UXO ER technology transfer program								
31	Establish program for use of developed UXO technologies								
32	<b>2.3 Establish UXO Data Collection and Management Systems for US Army Sites</b>								
33	Develop Plan to Standardize Data Collection and Management Systems.								
34	Develop Plan to Enhance Data Acquisition Capabilities.								
35	<b>2.4 Establish a Program which Addresses the Natural and Cultural Resources Ramifications of UXO Environmental Remediation and Management</b>								
36	Address the protection and restoration of natural resources during UXO -ER								
37	Address the protection and preservation of cultural resources during UXO -ER								
38	<b>2.5 Develop Technologies to Assess Other Constituents in Areas where UXO is Present</b>								
39	Develop remote or non-invasive sampling and analysis technologies of other constituents								
40	Develop a Plan to address heavy metals, PEP, and chemical agents where UXO is present.								
41	<b>Goal 3 - Establish a Coordinated UXO Technologies Program for Active/Inactive Ranges</b>								
42	<b>3.1 Develop Enhanced Detection, Discrimination, Assessment, and Identification Technologies for ARC</b>								
43	Conduct RDT&E of Enhanced Detection, Discrimination, Assessment, and Identification Technologies								
44	Establish technology transfer program to assure the successful implementation of technologies in the field								
45	Establish program for use of developed UXO technologies								
46	<b>3.2 Develop UXO ARC Clearance and Management Technologies</b>								
47	RDT&E UXO ARC clearance and management technologies								
48	Develop UXO ARC clearance technology transfer program								
49	Establish program for use of developed UXO technologies								
50	<b>3.3 Establish UXO Data Collection and Management Systems for UXO-ARC</b>								
51	Develop Plan to Standardize Data Collection and Management Systems.								
52	Develop Plan to Enhance Data Acquisition Capabilities.								
53	<b>3.4 Establish Program for Technology Development to Support Sustainable Mgmt of Active/Inactive Ranges</b>								
54	Develop UXO-ARC technologies capable of use while maintaining readiness and training								
55	Develop UXO technologies that aid active/inactive range clearance processes								
56	Develop plan for in-situ management of UXO for ARC								
57	Develop plan for management of impacts from exploding and exploded ordnance								
58	<b>3.5 Develop Technologies to Assess "Other Constituents" in Areas where UXO is Present</b>								
59	Develop remote or non-invasive sampling and analysis technologies of other constituents								
60	Develop plan to address heavy metals, PEP, and chemical agents where UXO is present.								
61	<b>Goal 4 - Establish a Coordinated Stakeholder Involvement Program</b>								
62	<b>4.1 Development Requirements for Early Stakeholder/User Involvement in Technology Program</b>								
63	Establish stakeholder/user training program								
64	Establish stakeholder communication program								
65	<b>4.2 Identify and Interact with Stakeholders/Users</b>								
66	Define roles and responsibilities for stakeholder /user involvement								
67	Develop time-phased plan for interaction with stakeholders/users								

