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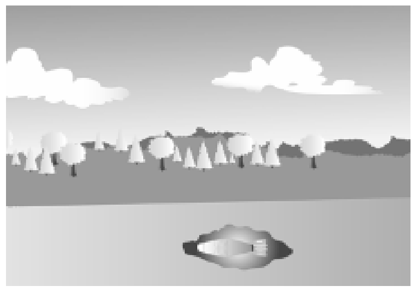
Welcome – Thanks for joining us.
ITRC's Internet-based Training Program

Site Investigation and Remediation for Munitions Response Projects



This training is co-sponsored by the EPA Office of Superfund Remediation and Technology Innovation

The Department of Defense (DoD) is currently working on an inventory of former ranges with potential for munitions contamination. There are an estimated 2,000 munitions-contaminated sites located in all 50 states and territories that may affect more than 10 million acres. State and tribal regulatory officials and community stakeholders are routinely required to evaluate DoD cleanup strategies with little, if any, environmentally oriented munitions response experience or guidance. State regulators are increasingly being charged with oversight responsibility for munitions response cleanup projects on other than operational ranges, such as formerly used defense sites (FUDS) and base realignment and closure (BRAC) sites. In addition, DoD project managers and industry will benefit from a greater understanding of state regulator expectations.

ITRC's Unexploded Ordnance Team has developed this Internet-based training on the site investigation and site remediation process for munitions response sites on other than operational ranges. This training provides an introduction and overview of the processes, tools, and techniques used in investigation and remediation. These concepts are illustrated using an example munitions response site. During the course of the training, major steps in each process are identified and key regulatory considerations discussed. This training also identifies additional sources for more detailed information on key aspects of investigation and remediation. State regulators and others who need to understand the general processes involved in these critical aspects of the munitions response process will benefit from this training.

Related ITRC trainings include Munitions Response Historical Records Review and Geophysical Prove-Outs for Munitions Response Projects.

ITRC (Interstate Technology and Regulatory Council) www.itrcweb.org

Training Co-Sponsored by: EPA Office of Superfund Remediation and Technology Innovation (www.clu-in.org)

ITRC Course Moderator: Mary Yelken (myelken@earthlink.net)

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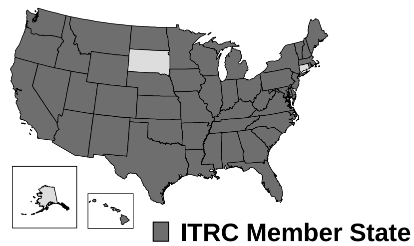
ITRC (www.itrcweb.org) – Shaping the Future of Regulatory Acceptance

- Network
  - State regulators
  - Federal government
  - Industry
  - Consultants
  - Academia
  - Community stakeholders
- Documents
  - Technical and regulatory guidance documents
  - Technology overviews
  - Case studies
- Training
  - Internet-based
  - Classroom

Host Organization ECOS

ITRC State Members



Federal Partners: DOE DOD EPA

The Interstate Technology and Regulatory Council (ITRC) is a state-led coalition of regulators, industry experts, citizen stakeholders, academia and federal partners that work to achieve regulatory acceptance of environmental technologies and innovative approaches. ITRC consists of over 45 states (and the District of Columbia) that work to break down barriers and reduce compliance costs, making it easier to use new technologies and helping states maximize resources. ITRC brings together a diverse mix of environmental experts and stakeholders from both the public and private sectors to broaden and deepen technical knowledge and advance the regulatory acceptance of environmental technologies. Together, we're building the environmental community's ability to expedite quality decision making while protecting human health and the environment. With our network approaching 7,500 people from all aspects of the environmental community, ITRC is a unique catalyst for dialogue between regulators and the regulated community.

For a state to be a member of ITRC their environmental agency must designate a State Point of Contact. To find out who your State POC is check out the "contacts" section at www.itrcweb.org. Also, click on "membership" to learn how you can become a member of an ITRC Technical Team.

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•Although we discuss various technologies, processes, and vendor's products, we are not endorsing any of them.

•Finally, if you want to use ITRC information, you should ask our permission.

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ITRC Course Topics Planned for 2007

Popular courses from 2006

- Characterization, Design, Construction, and Monitoring of Bioreactor Landfills
- Direct Push Well Technology for Long-term Monitoring
- Evaluate, Optimize, or End Post-Closure Care at MSW Landfills
- Perchlorate: Overview of Issues, Status and Remedial Options
- Planning & Promoting Ecological Re-use of Remediated Sites
- Real-Time Measurement of Radionuclides in Soil
- Remediation Process Optimization Advanced Training
- Risk Assessment and Risk Management
- Site Investigation and Remediation for Munitions Response Projects

New in 2007

- Decontamination and Decommissioning of Rads Sites
- Perchlorate Remediation Technologies
- Performance-based Environmental Management
- Protocol for Use of Five Passive Samplers
- Quality Oversight for Munitions Response Projects
- Survey of Munitions Response Technologies
- Vapor Intrusion Pathway: A Practical Guide
- More in development…

Training dates/details at **www.itrcweb.org**
Training archives at **http://cluin.org/live/archive.cfm**

More details and schedules are available from www.itrcweb.org under “Internet-based Training.”

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Site Investigation and Remediation for Munitions Response Projects

Logistical Reminders

- Phone line audience
  - ✓ Keep phone on mute
  - ✓ "*6" to mute, "*7" to un-mute to ask question during designated periods
  - ✓ Do NOT put call on hold
- Simulcast audience
  - ✓ Use ? at the top of each slide to submit questions
- Course time = 2¼ hours

Presentation Overview

- Site investigation
- Questions and answers
- Feasibility study overview
- Site remediation
- Links to additional resources
- Your feedback
- Questions and answers

No associated notes.

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Meet the ITRC Instructors

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Ken Vogler has been with the Hazardous Materials and Waste Management Division since 2002. Prior to that he worked in hydrology and environmental consulting for 20 years both in the United States and overseas. He currently provides regulatory oversight on a munitions response site at the former Rocky Mountain Arsenal in Colorado. Mr. Vogler has a B.S. degree from Colorado State University and an M.S. degree from the University of Arizona. He is a registered Professional Engineer in Colorado and Oklahoma.

Andrew Schwartz is a senior geophysicist with the U.S. Army Corps of Engineers and a member of the Ordnance and Explosives Team at the U.S. Army Engineering & Support Center, Huntsville. He develops guidance documents and training materials on the topics of applied geophysics and quality control/quality assurance for geophysics operations. He teaches geophysics to geotechnical personnel within the Corps, and provides technical reviews and oversight of munitions response contracts. He also supports the MEC research and development community, working with researchers and software developers to design, test and evaluate geophysical detectors, data processing systems and anomaly discrimination algorithms. Before joining the Huntsville Center in 2002, Mr. Schwartz was a principle geophysicist with Parsons Infrastructure and Technology, where he managed their corporate geophysics program and oversaw field operations for munitions response actions and HTRW remedial investigations. Mr Schwartz has 17 years experience in exploration, environmental and engineering geophysics, and holds a degree in Physics from Dalhousie University.

Doug Maddox is the EPA Headquarters Program Manager for munitions cleanup and has worked for EPA for 7 years, and a total of 15 years with the Federal government at EPA, the U.S. Army Corps of Engineers, and the Department of Energy. Mr. Maddox has a B.S. in Mechanical Engineering and an M.S. in Environmental Engineering; he is a registered Professional Engineer.

Jim Pastorick is President of UXO Pro, Inc., in Alexandria, Virginia. UXO Pro provides technical support to state regulators and other non-Department of Defense organizations on munitions and explosives of concern/unexploded ordnance (MEC/UXO) project planning, management, and quality assurance. He is a former Navy Explosive Ordnance Disposal (EOD) officer who graduated from the U.S. Naval School of EOD in 1986. Since leaving the Navy he has worked as the Senior UXO Project Manager for UXB International, Inc. and IT Corporation prior to starting his company in 1999. Mr. Pastorick has served on committees of the National Research Council Board on Army Science and Technology and is a member of the ITRC UXO Work Team. He has a BA degree in Journalism from the University of South Carolina and worked as a photographer for The Columbia Record prior to reentering the Navy as a diver and EOD officer. Before attending college he served as a Navy enlisted man in the SEABEES.

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ITRC UXO Team

- Formed in 1999
- Develops guidance documents
  - Help states and others gain technical knowledge
  - Promote consistent regulatory approaches for review and approval of munitions response cleanup approaches
  - Two published guidance documents
  - Two guidance documents currently under development
- Provides training to the munitions response community
  - UXO Basic Training (two-day classroom training course)
  - Internet-based training (three different course topics)

The ITRC UXO team was formed in 1999. It consists of representatives from state and local regulatory agencies, federal partners including DoD personnel, and local stakeholders. The team has conducted six two-day classroom trainings ("UXO Basic Training") to introduce participants to the topics associated with munitions response, including UXO site investigation and remediation.

The team has published guidance documents on munitions response historical records review (MR HRR) and geophysical prove-outs (GPO) for munitions response projects. Accompanying the publication of these documents, the Team also developed and has offered Internet-based trainings on these topics. The training classes are available as archives. Please see the ITRC web site (www.itrcweb.org) for more information on these trainings.

The Team is currently developing a quality assurance/quality control guidance document for munitions response (to be published in 2007) and is working collaboratively with the Strategic Environmental Research and Development Program (SERDP) on a UXO technologies document (to be published in 2006).

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Munitions Response in the US

- Scope: Approximately 10 million acres potentially affected
- State regulators may
  - Be involved
  - Have oversight responsibilities
- Other than operational ranges are the focus of this training
  - Formerly used defense site (FUDS)
  - Base realignment and closure (BRAC) sites

Lowry Bombing Range, Colorado

The ITRC UXO Team conducted an introductory training course called UXO Basic Training in 2002 and 2003. This training on site investigation and remediation is an offshoot of that training. The UXO Team has also produced additional guidance documents and Internet-based trainings that are currently available. This training will mention these and will explain how they are relevant to investigation and remediation.

The ITRC UXO Team was formed to address the needs of regulators and stakeholders involved in munitions response work. Munitions response work is very different from the typical environmental work that regulators and stakeholders are familiar. The team consists of representatives from the DoD, state regulatory agencies, consultants, and private stakeholders.

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What You Will Learn…

- Important considerations for planning an investigation of a munitions response site
- How the conceptual site model guides the investigation
- How the results of the investigation are used to develop the feasibility study and remedial design
- How a remedy is selected and implemented
- Where to go for more information

For the remainder of the first half of this course, we are going to walk through the investigation process as it was applied to a relatively simple hypothetical site. The second half of the class covers the site remediation process. It begins with an overview of the site remediation process and shows how the remedy decision for our simple hypothetical site was determined. It concludes with a discussion of implementation of the site remediation decision.

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Acronyms

- Base realignment and closure (BRAC)
- Formerly used defense site (FUDS)
- Munitions response (MR)
- Munitions response site (MRS)
- Munitions constituents (MC)
- Munitions and explosives of concern (MEC)
- Unexploded ordnance (UXO)
- Material potentially presenting an explosive hazard (MPPEH)
- Conceptual site model (CSM)
- Data quality objectives (DQOs)
- Digital geophysical mapping (DGM)
- Time critical removal action (TCRA)

Munitions response (MR)—response actions, including investigation, removal, and remedial actions to address the explosives safety, human health, or environmental risks presented by unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC).

Munitions response area (MRA)—any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. An MRA comprises one or more munitions response sites.

Munitions response site (MRS)—a discrete location within a MRA that is known to require a munitions response.

Munitions constituents (MC)—any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 U.S.C. 2710 [e][4]).

Munitions and explosives of concern (MEC)—this term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means (A) UXO, as defined in 10 U.S.C. 2710 (e)(9); (B) discarded military munitions (DMM), as defined in 10 U.S.C. 2710 (e)(2); or (C) explosive munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.

Unexploded ordnance (UXO) - Military munitions that (a) have been primed, fused, armed, or otherwise prepared for action; (b) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (c) remained unexploded whether by malfunction, design, or any other cause

Discarded Military Munitions (DMM): Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations.

Material potentially presenting an explosive hazard (MPPEH) - Material potentially containing explosives or munitions, or potentially contaminated with a high enough concentration of explosives such that the material presents an explosive hazard.

Conceptual Site Model (CSM) - a method of organizing, displaying, and using site data that facilitates developing hypotheses drawing logical conclusions about a site.

Data Quality Objectives (DQOs) – quantitative and qualitative statements that specify the type and quality of the data needed to support an investigative activity.

Digital Geophysical Mapping (DGM) – mapping of geophysical responses by correlating sensor readings with GPS coordinates.

Time Critical Removal Action (TCRA) - an expedited regulatory approach used when quick actions are needed to clean up hazardous materials.

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Training Overview

- Hypothetical munitions response site we have named "Camp Sample" illustrates
  - A representative process
  - Overall view of a munitions response project
- General considerations for site remediation
  - Explosives management
  - Scrap management
  - Quality assurance and quality control (QA/QC)

The investigation process is explained using a hypothetical munitions response site for illustration. Next, the feasibility study and remediation process is explained, also using our example site for illustration. General considerations for site remediation, such as explosives and scrap management, QA/QC, etc. are described.

Real-world munitions response sites will typically require a more complicated investigation process; however, the general processes outlined in this training can be applied to more complex sites.

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What This Training Will Not Do

- Provide information on cost
  - Costs are entirely site-specific and depends upon characterization factors, such as:
    - Anomaly density
    - Vegetation removal
    - Proposed technologies
- Discuss munitions constituents investigation
- Cover specific applications for specific site considerations

This training will not show a real-life example. Our Camp Sample site is not real. It is an example only.

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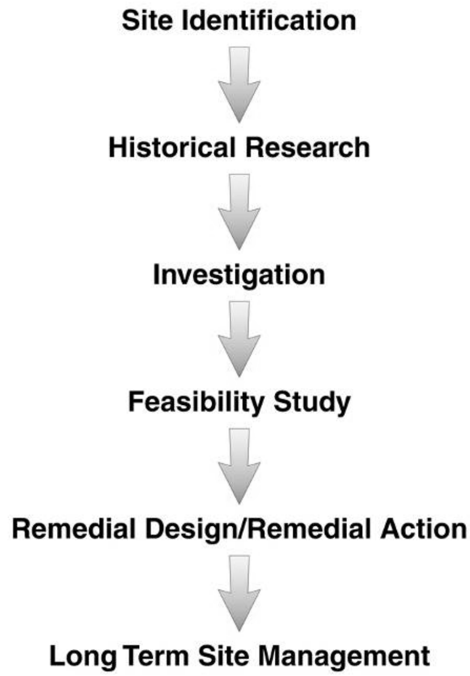
Flow Chart

Generalized process from identification to completion of munitions response actions



The munitions response process consists of sequential steps. The first two steps are intended to develop a preliminary conceptual site model (CSM). The preliminary CSM is used to identify data gaps and design the site investigation. The site investigation is used to developed a complete CSM. The site investigation may be done in an iterative manner to build the CSM. The completed CSM is the basis for the feasibility study. If additional information is learned, the CSM may be updated during any step in the process and subsequent steps may be modified as needed.

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Regulatory Overview

- Regulatory framework of the investigation and remediation of a munitions response site
  - CERCLA or
  - RCRA
- Investigation and remediation processes are the same, regardless of the regulatory framework

There are exceptions to the CERCLA or RCRA regulatory framework for site investigation and site remediation, however they have been very infrequent. Examples include the Massachusetts Military Reservation (Safe Water Drinking Act.) and Kahoolawe in Hawaii (Act of Congress).

US Army Corps of Engineers Huntsville Engineering and Support Center recently changed to a CERCLA process. See ER 200-3-1, May 2004: Section 102.1.2. Non NPL Properties: For FUDS properties not included on the National Priorities List (NPL), the DERP statute [10 USC 2701 (a)(2)] requires that response actions addressing DoD hazardous substances, pollutants, and contaminants be conducted in accordance with CERCLA (42 USC 9620). States or tribes are generally the lead regulator for environmental investigations and responses at non-NPL FUDS.

RCRA and CERCLA processes produce equivalent remedies and the programs parallel each other.

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Who Is Involved?

- Regulatory agencies
  - EPA
  - State and local agencies
  - Tribal agencies
- Department of Defense representatives and contractors
  - Army Corps of Engineers, Navy, Air Force
  - Consultants
- Local stakeholders
  - Restoration advisory board (RAB)
  - Citizen groups
- Regardless of who is involved, the general process will be the same

The role of each organization, including tribal governments, needs to be determined as part of building the Project Team. See Chapter 2 of ITRC's *Munitions Response Historical Records Review* document for more information on the project team formation and roles and responsibilities. ITRC's *Munitions Response Historical Records Review* (UXO-2, November 2003) is available at the ITRC web site (www.itrcweb.org) under "Guidance Documents" and "Unexploded Ordnance." A hard copy can be requested from the same Web page. An archive of ITRC Internet-based training on "Munitions Response Historical Records Review" is available at http://www.clu-in.org/conf/itrc/mrhrr_062204/.

Tribal agencies - Native American tribal governments have different levels of autonomy and this is a complex issue that is beyond the scope of our training. For example, in Alaska some recognized tribes are organized as commercial corporations and can have a very important regulatory role should they decide to exercise it. Other tribal agencies will have an environmental regulatory agency and exercise regulatory authority for a munitions response project. Others do not.

Local stakeholders can include Restoration Advisory Board (RAB) members and other local groups.

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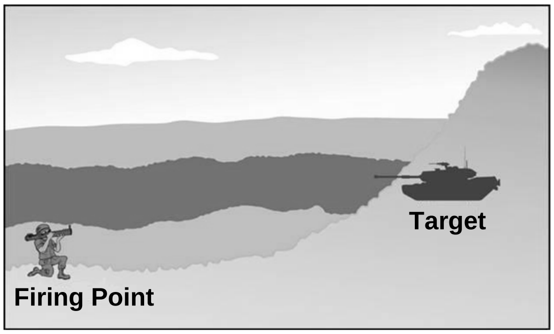
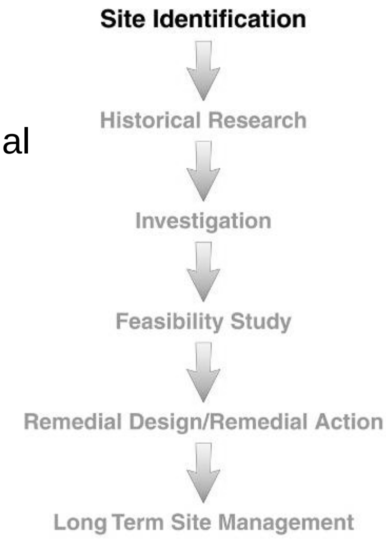
Site Identification

Any organization with credible evidence that military munitions were used can identify a potential munitions response site





Site identification is the first step in developing the preliminary CSM.

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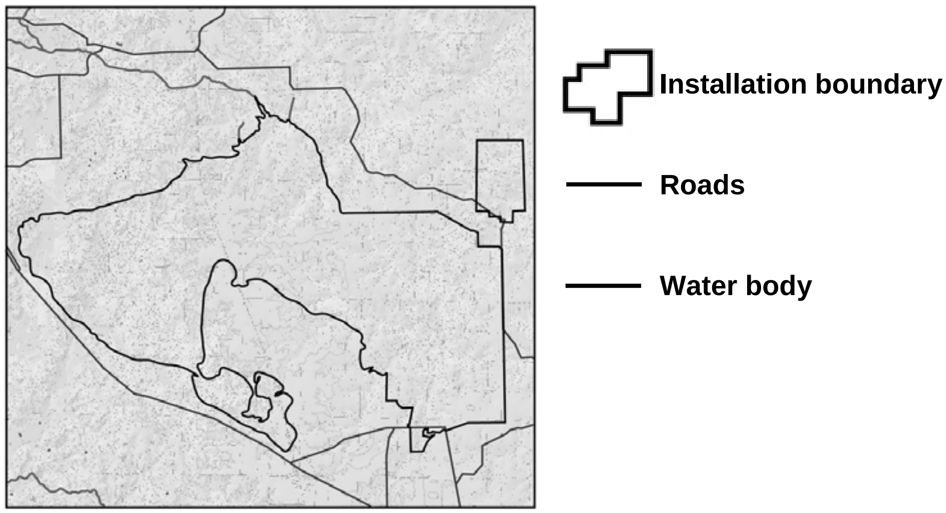
Our Example Site – Former "Camp Sample"



Former "Camp Sample" real estate boundaries

This training will use a simple hypothetical site to illustrate the steps in a munitions response action. Our hypothetical site is called "Camp Sample". A base map of our hypothetical "Camp Sample" is illustrated in this slide.

The site boundaries is among the first information that will be available for a site.

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Former “Camp Sample” Site Features

- Undeveloped inside the boundaries
- Nature trail cuts through portion of property
- Existing residential area nearby
- Elementary school planned nearby

General area of “Camp Sample”

Some of the features of “Camp Sample” may be apparent from the base map, aerial photographs, site visits, and local sources. The features identified during the site identification are used to help set the parameters for what we know and what we need to know.

For “Camp Sample” example, we are assuming that the site is undeveloped within the boundaries. There is a nature trail that crosses the site, and an elementary school is being planned nearby (but not within the boundaries).

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Site Characteristics and Features of "Camp Sample"

- Important site characteristics identified
  - Property boundaries
  - Topography
  - Vegetation
  - Soil
  - Listed species
  - Infrastructure
  - Current land owners

Terrain, topography, and vegetation are all important site characteristics

Important features are listed in this slide. Ownership of the site and adjacent lands, access permission and easements, utilities and buildings are important features to consider.

Topography is important. For example, is the site steep?

Are the soils sandy or clay?

Also, because some munitions response techniques may involve vegetation removal, another important issue concerns whether vegetation can be removed and, if so, how it will be replaced.

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Historical Research

- Historical record
  - Collect
  - Analyze
  - Document
- Use of military munitions

Historical research entails the collection, analysis, and documentation of historical records and information related to the use of military munitions. This step builds upon the site identification information to develop the preliminary CSM.

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Historical Research (continued)

- Military use area boundaries identified using
  - Historical aerial photo analysis
  - Wide area assessment
    - May use imagery analysis, airborne geophysics
  - Site visit

1951 aerial photo

See also ITRC's *Munitions Response Historical Records Review* (UXO-2, November 2003) document and archived Internet-based training

ITRC's *Munitions Response Historical Records Review* (UXO-2, November 2003) is available at the ITRC web site (www.itrcweb.org) under “Guidance Documents” and “Unexploded Ordnance.” A hard copy can be requested from the same Web page. An archive of ITRC Internet-based training on “Munitions Response Historical Records Review” is available at http://www.clu-in.org/conf/itrc/mrhrr_062204/.

Wide area assessment (WAA) technologies involve the composite application of several airborne remote sensing technologies, data processing and fusion algorithms, and geospatial information technologies. At the most fundamental level, this WAA methodology is based on detection and mapping of ordnance-related features (ORF). ORFs include features such as metallic fragments and munitions parts, topographic features such as craters and artillery emplacements, and man-made features such as range and target infrastructure remnants. The basic data sets for ORF detection are collected using synthetic aperture radar (SAR), hyperspectral imaging spectrometers (HSI), high resolution orthophotography, and light detection and ranging (LiDAR). These data sets are spatially co-registered in a Geographic Information System (GIS) geospatial database and fused based on ground reference and calibration sample data to reduce false-positive ORF detections. In the GIS, ORFs are classified, analyzed for pattern and spatial distribution, and related to historical land use and other relevant data. This process results in the classification of the site into the following three categories: (1) Presumptively Clean, (2) Area of Interest, and (3) Not Analyzed. The development of a site GIS provides a critically important resource for the efficient and cost-effective management of subsequent remediation activities.

Wide area assessment technologies may be a topic for a future ITRC UXO Team document; also, the Munitions Response Committee (MRC) is addressing the technology in a paper it is developing.

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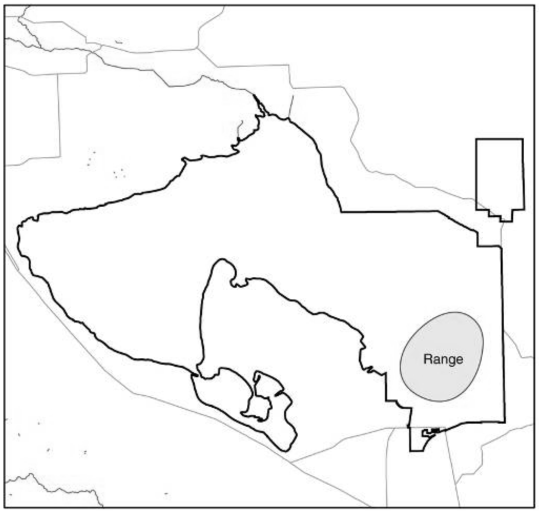
Historical Research at “Camp Sample” - Practice Range Identified



Installation boundary

Roads

Water body

Range

Be aware that there could be more than one range at a site. For our example, we have found only one historic range.

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Historical Research at "Camp Sample" - Munitions Used and Time Frame

- 2.36" rockets used for training
- "Camp Sample" used during and after WWII; closed in the 1950's

Rocket launcher

2.36-inch rocket

Regulators who conduct site visits should be accompanied by UXO technicians. Munitions and munitions debris may be located on the ground surface. Sometimes a munitions does not look obvious. If you go onto a suspected site remember, "IF YOU DIDN'T DROP IT, DON'T PICK IT UP!"

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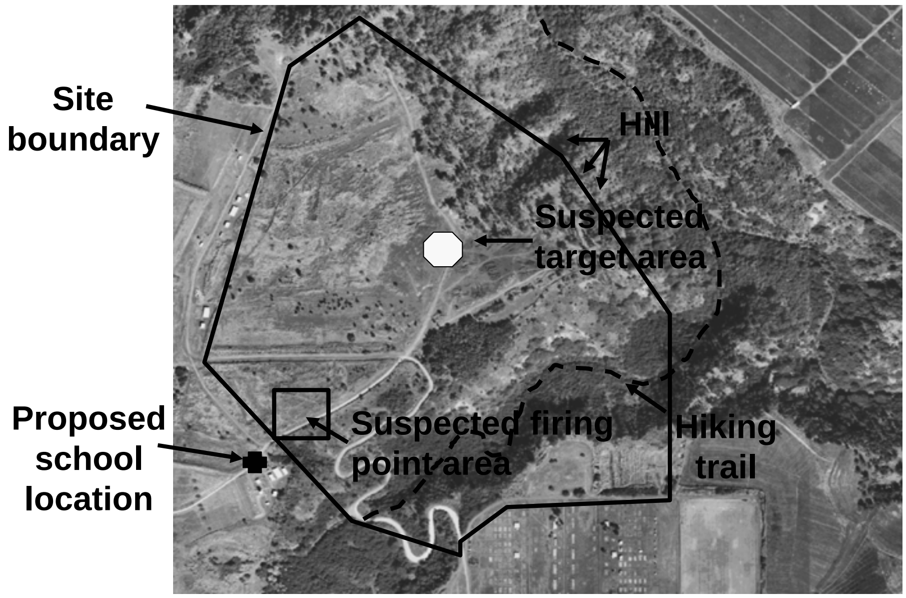
Historical Research – Approximate Boundaries Identified on Former Range



The historical records review for our hypothetical "Camp Sample" provides information about the firing point for the 2.36-inch rockets and the likely target area. This information provides a good preliminary CSM and indicates where the site investigation may be focused.

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Investigating "Camp Sample"

Site Identification

↓

Historical Research

↓

Investigation

↓

Feasibility Study

↓

Remedial Design/Remedial Action

↓

Long Term Site Management

The next step is to use the preliminary CSM to design the site investigation.

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Developing Investigation Objectives

1. What do we need to know?
2. How are we going to find the answers?
3. What resources are available and what is the time frame?

The site investigation is guided by answering three questions.

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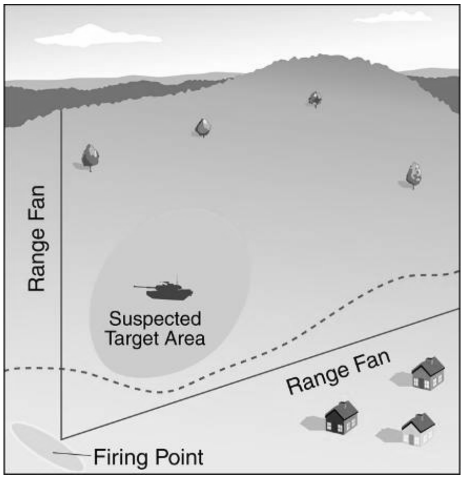
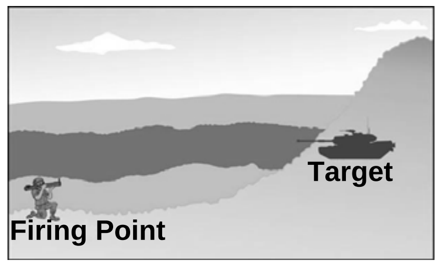
What Do We Know Already? Preliminary Conceptual Site Model



- Suspected locations of
  - Firing point
  - Range fan



For our hypothetical “Camp Sample” we will assume that the firing point and the range fans for this site are known from the Archive Search Report (ASR) conducted previously by the Army Corps of Engineers as part of the historical records review process.

The tank is a stationary target, fired on from the firing point, as shown on the preliminary conceptual site model. The range fan includes the target area as well as buffer and safety zones.

We have a lot of knowledge about what the range fan looks like. A 2.36” rocket range fan has an expected effective range fan of approximately 600 yards. The distance to target is approximately 100 to 250 yards. While we do not know exactly where the target was located, the MEC contamination in the range fan is expected to be a relatively small area.

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What Do We Need To Know?

- What are the boundaries of UXO contamination in the target area?
- What are UXO density distributions?
- Are buried or discarded military munitions a concern?
- Are the munitions detectable?
- What are the effects of site characteristics on detection tools?
- Is a Time Critical Removal Action (TCRA) needed?
- What kind of resources ($$) are needed and available?

View of range with hill "backstop"

Now we want to answer more detailed questions about the exact location and density of munitions. An important consideration in the firing point area is whether unused munitions may have been buried. Another important consideration is whether the munitions in the target area (and buried items in the firing point) can be detected.

As you will see, there are two basic instrument techniques for detecting munitions. Other considerations concern whether an emergency action is needed. All of these also need to be assessed in the context of the available resources.

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How Are We Going To Find the Answers?

- Use preliminary Conceptual Site Model (CSM) to determine sampling protocol
- Use geophysical transects and anomaly digging to find target location
- Use small grids to identify anomaly density and distribution
- Data collection supported by Data Quality Objectives (DQOs)
- CSM is updated and reviewed to determine if characterization is complete

The preliminary CSM at our hypothetical “Camp Sample” is used to design the site investigation. The data quality objectives (DQOs) are developed to answer the question “where are the munitions located?” The design team decides to use transects to identify the target location in the target area and then use grids to assess the density and distribution of munitions at the target location.

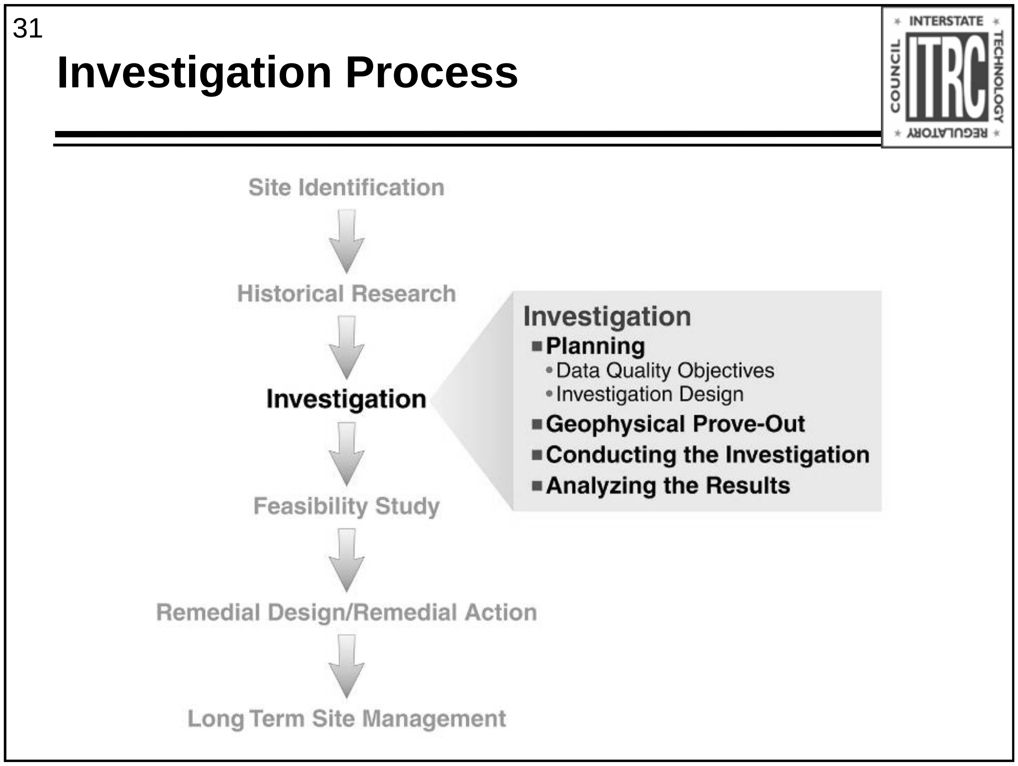
Note: Munitions constituents may be a concern, but will be investigated during the environmental sampling conducted separately from the munitions response investigations.

30

What Resources Are Available and What Is the Time Frame?

- FUDS funding has been programmed for the investigation and cleanup
- Contracting mechanisms are in place
- Our goal is to complete the investigation and feasibility study in approximately one year
- Time Critical Removal Action (TCRA) will be conducted, if needed

At our hypothetical “Camp Sample” we have assumed that it is a formerly used defense site (FUDS) property that is no longer owned by the DoD. FUDS funding is available through the DoD.



The investigation plan is documented and includes:

•Field sampling plan

•Quality assurance project plan (QAPP)

•Geophysical investigation plan

•Hazard analysis

•An Explosives Safety Submission (ESS), if required by the appropriate Service, may need to be conducted for the investigation process. All services require an ESS the remediation phase; there is further information on this later in the training.

Reference: Army Corps of Engineers, ER-200-3-1 (FUDS ER). This regulation provides specific policy and guidance for management and execution of the Formerly Used Defense Sites (FUDS) program.

US Army Corps of Engineers technical requirements include

Geophysics

Geophysical prove-outs

Munitions and explosives of concern (MEC) work plan requirements

Much more

See the Army Corps' Data Item Descriptions (DIDs) for more information

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Data Quality Objectives (DQOs)

- Specify the type and quality of the data needed to support an investigative activity
- Statements that
  - Clarify objectives of the data collection effort
  - Specify how data will be used to support hazard assessment
  - Define most appropriate type, quantity, and quality of data to collect
  - Specify acceptable levels of decision errors

See: U.S. Environmental Protection Agency. 2000. Data Quality Objectives Process for Hazardous Waste Site Investigations. EPA QA/G-4HW http://www.epa.gov/quality/qs-docs/g4hw-final.pdf for more information.

Data quality objectives are developed before data are collected as part of sampling program design

Data quality objectives developed using EPA's 7-step process:

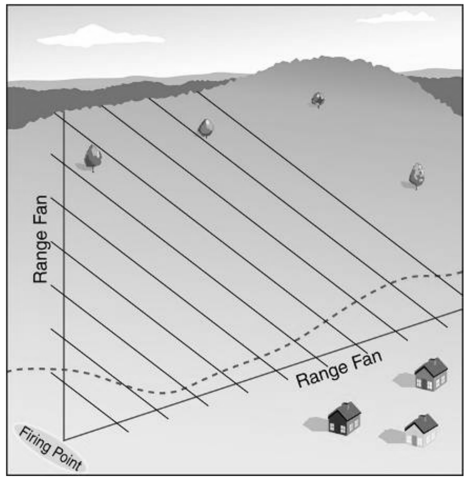
1. State the problem
2. Identify decisions
3. Identify inputs
4. Define study boundaries
5. Develop decision rules
6. Specify tolerance limits
7. Optimize sampling design

Output of each development step above is a data quality objective.

33

Identify Data Needs for Investigation Design

- Data Need 1: What are the boundaries of UXO contamination in the target area?
  - Use appropriately spaced geophysical transects to collect information
  - Preliminary DQO: Use transects of 100 feet over the entire range fan to delineate target area



Original investigation transects spaced at 100 feet in range fan

The Project Team makes the decisions on appropriate sampling size and coverage.

In this example, a sampling pattern of 100-foot transects has been chosen, based on the assumption that the target area, whose location and size are not known, could be small, on the order of 200 feet to 300 feet in diameter if it was only used periodically for training purposes.

There are many different sampling patterns that can be used, but the important aspect of the sampling to remember is that the project team must agree up-front, before field work is performed, that the sampling design will meet all team member’s needs. Most of the time, team members want to see a relatively even distribution of sampling over a suspected munitions response site (MRS), and the size of the sampled areas, such as if grids are used to collect the sampling data, need not be large in order to find indications of a target area. Care should be exercised in not over sampling easy-access areas at the expense of other locations based solely on the difficulty of area access.

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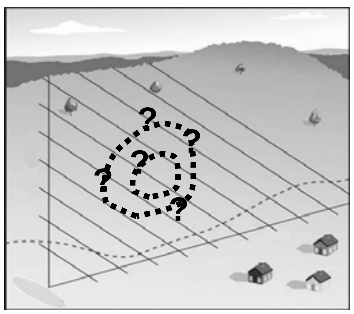
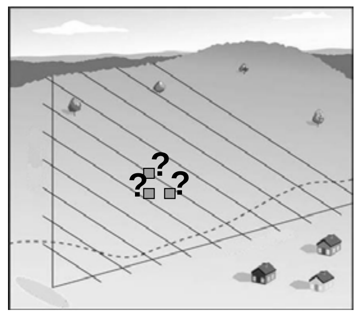
Identify Data Needs for Investigation Design (continued)

- Data Need 2: Where is the most likely boundary of the problem area?
  - Increase transect density over suspected target area
  - Preliminary DQO: Use 25 foot transects in suspected target area



- Data Need 3: What are UXO density distributions?
  - Perform 100% characterization of mini-grids to better define the whole UXO problem, better estimate UXO densities and to estimate the vertical extent of contamination

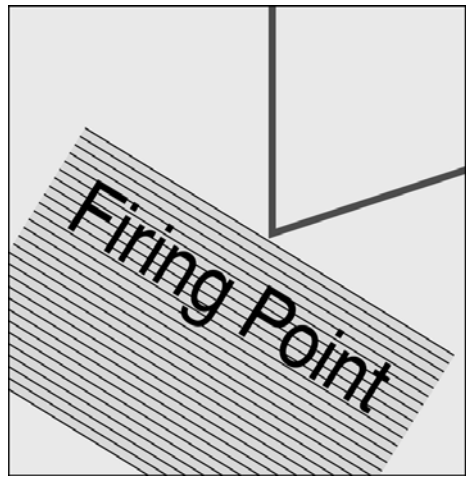


No associated notes.

35

Identify Data Needs for Investigation Design (continued)

- Data Need 4: Are buried or discarded military munitions a concern?
  - Find any large subsurface geophysical anomaly
  - Preliminary data quality objective: 100% digital geophysical mapping of firing point



100% investigation of firing point

To characterize the firing point, we will use the same techniques and methodology as presented to investigate the range point, but instead of transects placed at 100 feet apart, we will place the transects 2.5 to 3 feet apart. This will give us 100% coverage of the firing point. We need 100% coverage of this area because there is no statistical model to help us predict where buried munitions might exist.

36

What Are My Detection Technology Options?

Mag and dig

- Avoids having to remove vegetation
- Easier and cheaper than using digital geophysical methods

Mag and dig survey at Fort Ord, California

Digital geophysical mapping (DGM)

- Sensors generally have a greater ability to locate anomalies and to a greater depth than mag and dig
- Easier to QC than mag and dig because a record is produced

Towed array

For more information on geophysical investigation methods, see chapter 2 of ITRC's *Geophysical Prove-Outs for Munitions Response Projects* (UXO-3, November 2004), available at the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Unexploded Ordnance." If available, a CD-ROM or hard copy of the document can be requested from the same Web page. An archive of ITRC Internet-based training on "Geophysical Prove-Outs" is available at http://www.clu-in.org/conf/itrc/gpo_012505/.

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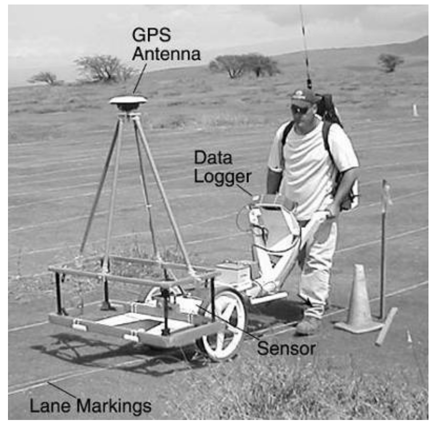
Proposed Detection Technologies for Investigating "Camp Sample"

- Digital geophysical mapping (DGM)
  - Map transects in the range fan
  - Conduct 100% mapping of the firing point area where we need complete information
- Mag and dig
  - Detailed density and depth sampling areas ("postage stamps") in the target area



Digital geophysical mapping

Expected level of metal inside a target area is very high; the digital tools are not typically feasible to detect individual unexploded ordnance. The mag and dig can detect small pieces of fragments.

Postage stamp sampling areas – used to determine depth information and costing purposes

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How Do I Know the Selected Technologies Will Work?

- Geophysical prove-out (GPO) will be conducted at "Camp Sample"
  - Test, evaluate and demonstrate the site-specific capability of our proposed detection technologies
  - Demonstrate that our data quality objectives can be met
- See ITRC's Geophysical Prove-Outs for Munitions Response Projects (UXO-3, November 2004)
  - More information on GPOs
  - General information on geophysical equipment, methodologies, etc.
  - ITRC Internet training archive at http://www.clu-in.org/conf/itrc/gpo_012505/


Technical/Regulatory Guideline

Geophysical Prove-Outs for Munitions Response Projects

November 2004

Prepared by
The Interstate Technology & Regulatory Council
Unexploded Ordnance Team

ITRC's *Geophysical Prove-Outs for Munitions Response Projects* (UXO-3, November 2004) is available at the ITRC Web site (www.itrcweb.org) under "Guidance Documents" and "Unexploded Ordnance." If available, a CD-ROM or hard copy of the document can be requested from the same Web page. An archive of ITRC Internet-based training on "Geophysical Prove-Outs" is available at http://www.clu-in.org/conf/itrc/gpo_012505/.

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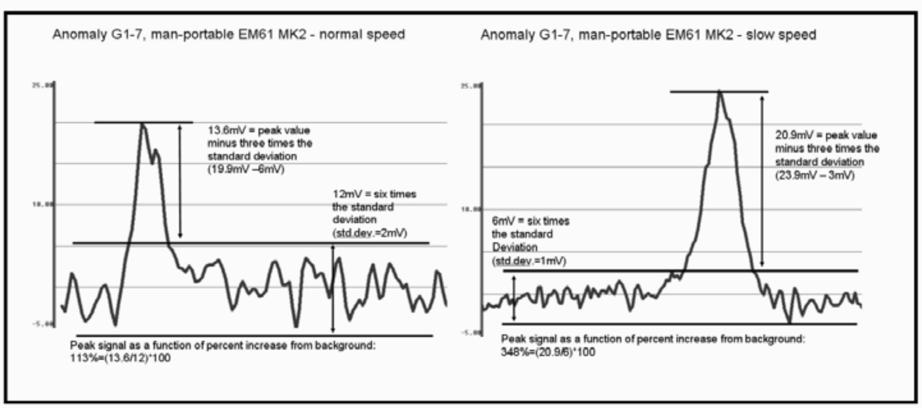
Camp Sample GPO Summary – Some Key Points

DQO for Geophysical Operations	Example GPO Results
How deep are 2.36” rockets consistently detected?	2.4 feet horizontal orientation 4 feet vertical orientation
What measurement densities are needed?	Need data every 0.3m along each transect
How accurate do we need to be?	Overall, anomalies sources could be within one meter along-track and within two meters across-track of their interpreted location
How will we demonstrate process compliance?	• Instrument function checks • Data coverage checks • Multi-level process checks

The example below shows how survey speed influences anomaly characteristics. The faster you travel, the lower the signal to noise ratio. This example is for an 81mm buried at approximately 2.5 feet (76cm)

Figure 4-4: Example Calculation of Percentage Increase Above Background



The list below is an example of process-level quality control checks. These were developed after testing and evaluating the contractor’s standard operating procedures (SOPs) for resolving anomalies on the GPO.

Example of Anomaly Resolution Process Compliance

Test 1- All reacquisition locations must be within 1m along track and 2m across track of interpreted location

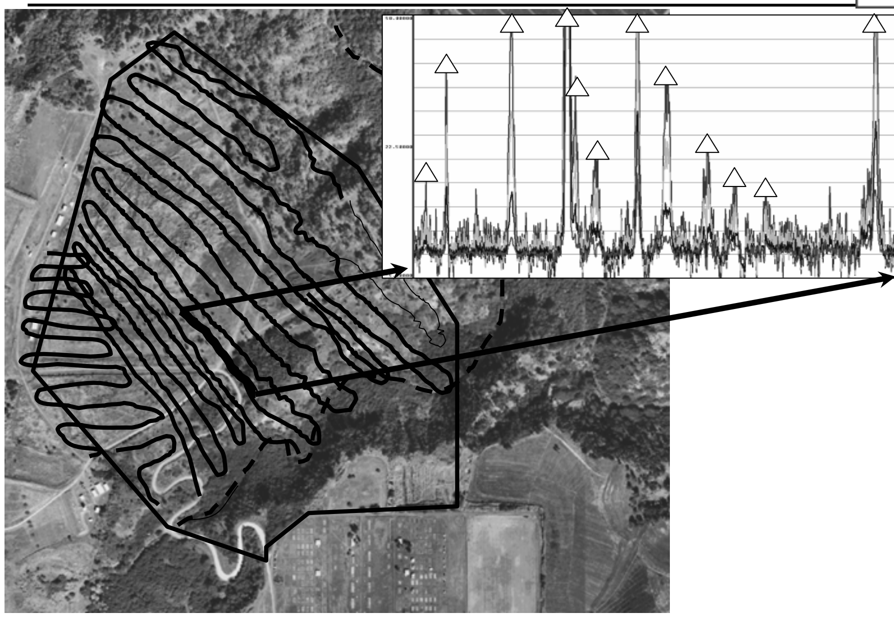
Test 2 - All peaks responses within search area must be flagged and excavated

Test 3- -Excavated material dimensions and weights must be consistent with anomaly size and SNR characteristics (e.g. “small” (less than 0.5lbs) = less than 1.2m and SNR<15). All outliers revisited with original instrument used for DGM

Test 4 - All False positives and no-contacts must be for anomalies smaller than 1.2m along track and SNR<5. All must be accepted by QC geophysicist. Random verification on 15% using original instrument used for DGM.

40

What Was Found?



This is an example of what anomalies look like and what their interpreted locations are on the actual transect. The black lines represent exactly where the field crew collected information along the transects. The geophysicist has interpreted the data from the geophysical sensors. The geophysicist has selected anomalies in the data for further investigation.

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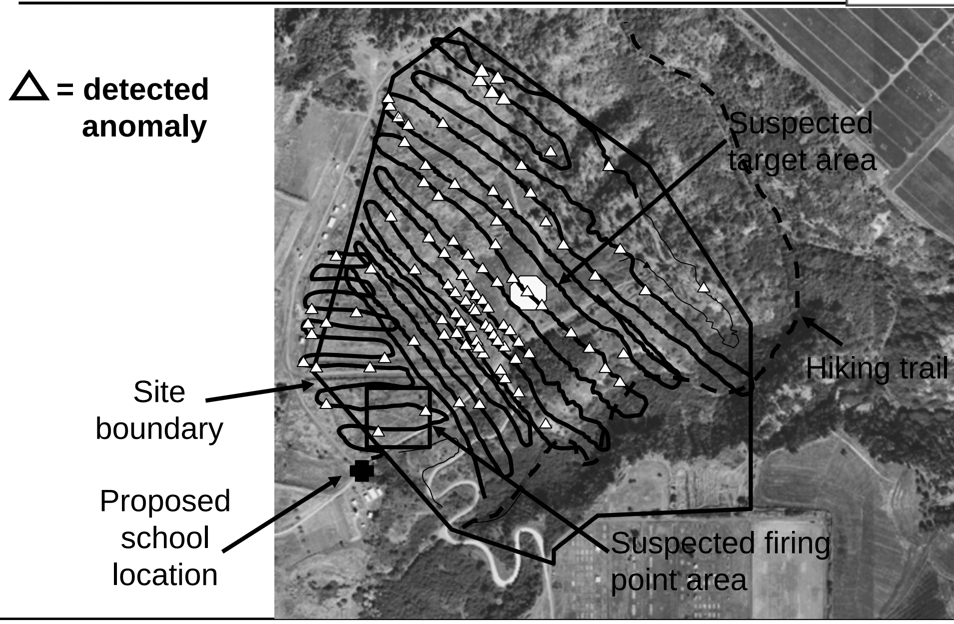
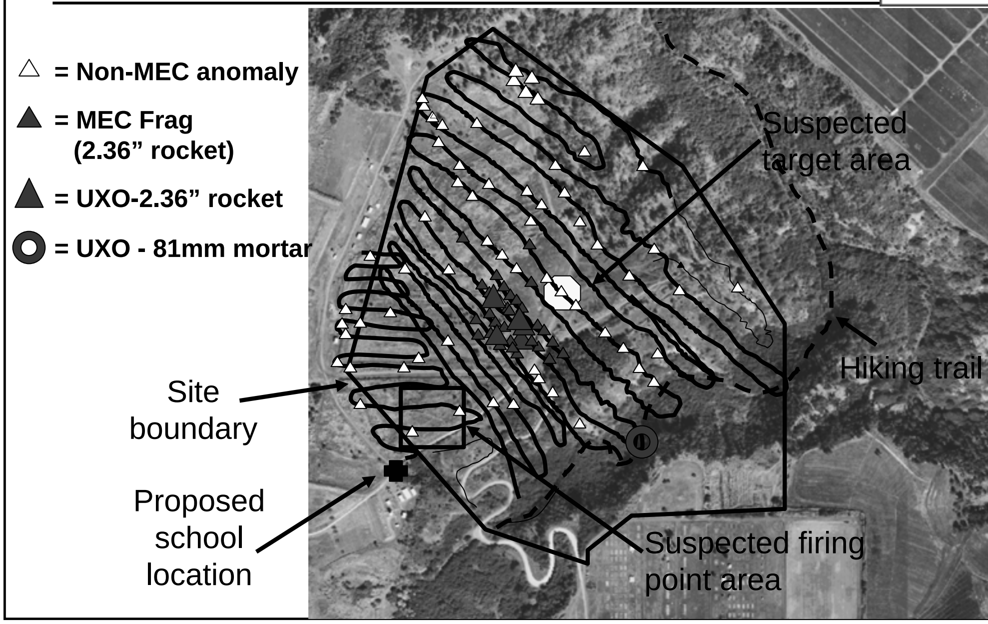
Detected Anomalies



This is an example of what anomalies look like and what their interpreted locations are on the actual transect.

42

Anomalies Identified



This is an example of what anomalies look like and what their interpreted locations are on the actual transect. We found non-range related debris, some UXO frag, unexploded 2.36" rockets and an 81 mm mortar along the hiking trail. From the information collected, the project team has identified the suspected target area.

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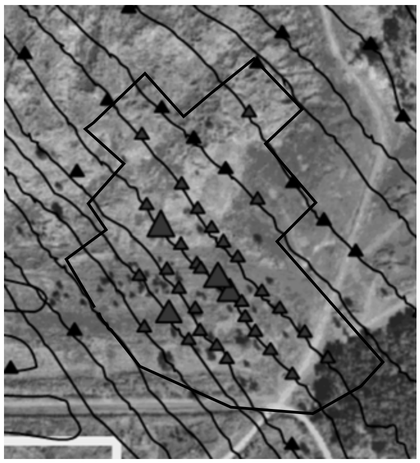
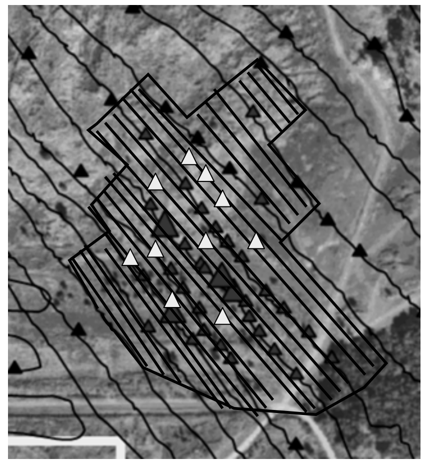
Employing the Decision Rule





Apply decision rule to this area

Results of adding 25 foot transects added to investigation plan

Based upon decision rule we discussed earlier, which stated that anywhere we found unexploded ordnance, we would increase the number of transects to 25 foot spacing.

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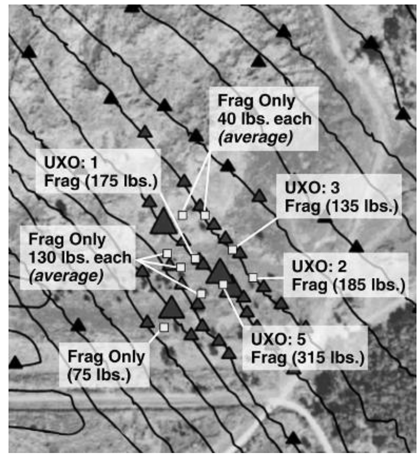
Detailed Sampling Results

- Items detected: 2.36” rockets (HE) and 2.36” rocket frag
- Depth ranges: Surface to one-foot
- UXO density: estimated 4/acre
- Scrap density: estimated 480 anomalies/acre



Closer to the suspected firing point, only frag was found. The information from these findings indicate that we have done a good job of bounding the target area. We did not find any indications of 81 mm mortars anywhere in the target area. This supports our assertion that the 81 mm mortar found on the hiking trail came from somewhere else off-range, probably carried by a hiker.

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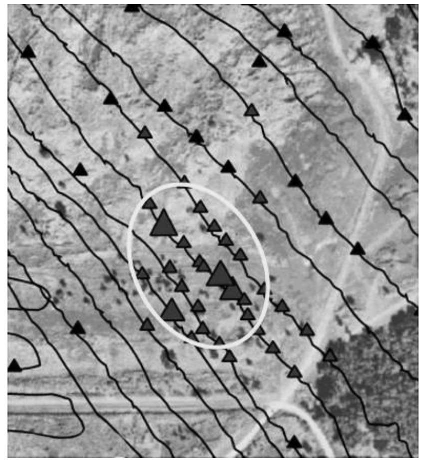
Target Area Delineated – Extent of Contamination

- Estimated target area
  - 17 acres
- Estimated clean-up costs
  - $195,000
  - = $11,500/acre



Using the information presented in the previous slide, we can come up with rough estimates of cost. Based on the information found in the grid, we would expect to find frag kicked out from the target area (frag distance for 2.36" rockets could be 800 to 900 feet); therefore, we can expect to find frag outside of the target area boundary.

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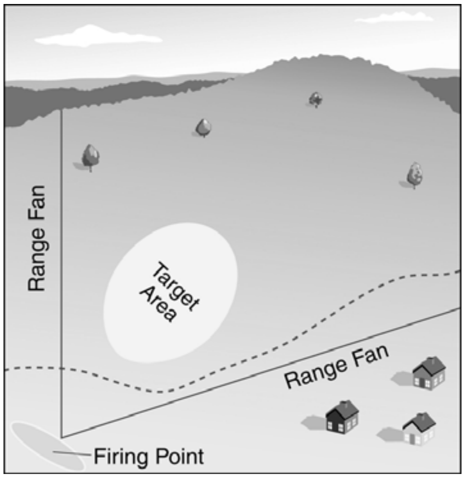
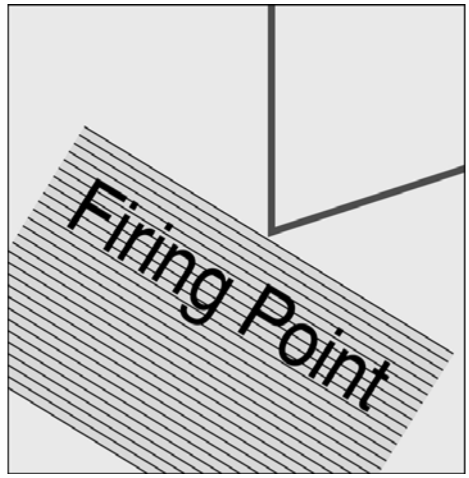
Continuing the Investigation – Firing Point Investigation



Investigation of range fan complete



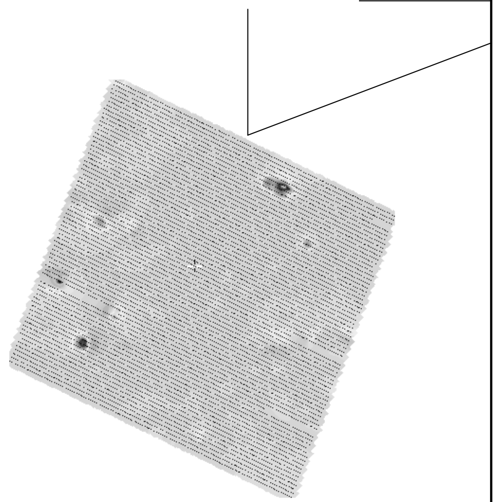
100% investigation of firing point to be conducted

Now we are going to talk about what was done and found in the firing point.

47

Results of the Investigation of the Firing Point

- Anomalies identified during mapping are cultural features (buried tin rations and metal fence)
- No evidence of buried discarded military munitions found



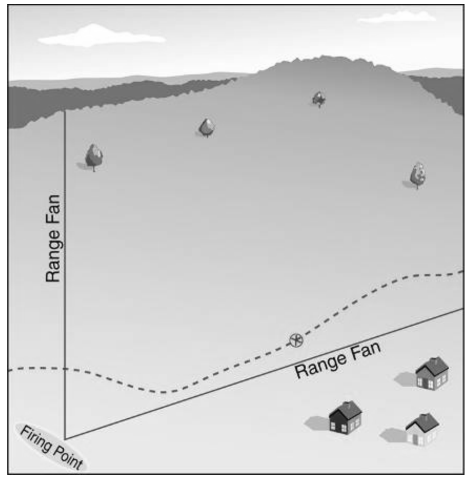
Digital geophysical map of firing point

The picture shown here shows the geophysical data from the geophysical sensor. There are a couple of data gaps where parts of transects were missing (probably obstructions in the way of the sensor). There are a couple of locations where there are anomalies (red and blue areas). The dig team went out to characterize what was found in these areas. These were found to be buried metal ration cans, metal fence posts, etc. No evidence of discarded military munitions were found. Therefore, we can predict that we will find a no further action finding for this area.

48

Additional Investigation Results

- One 81 mm mortar found on the surface near the hiking trail
- Project Team will address this issue



The presence of the 81 mm mortar will need to be addressed by the team to verify that there are no additional mortars on the site.

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Investigation Complete

- Ready to begin feasibility study and site remediation process
- Our example is a simplified example of an investigation of a munitions response site
- Real world sites will typically be more complex
  - More ordnance types
  - Varied terrain
  - Multiple target areas

Please remember, that "Camp Sample" is a simplified site; most ordnance sites will usually be much more complex. For example, more than one ordnance type, more than one target area, more varied terrain, etc. are typical of other sites.

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Questions and Answers

No associated notes.

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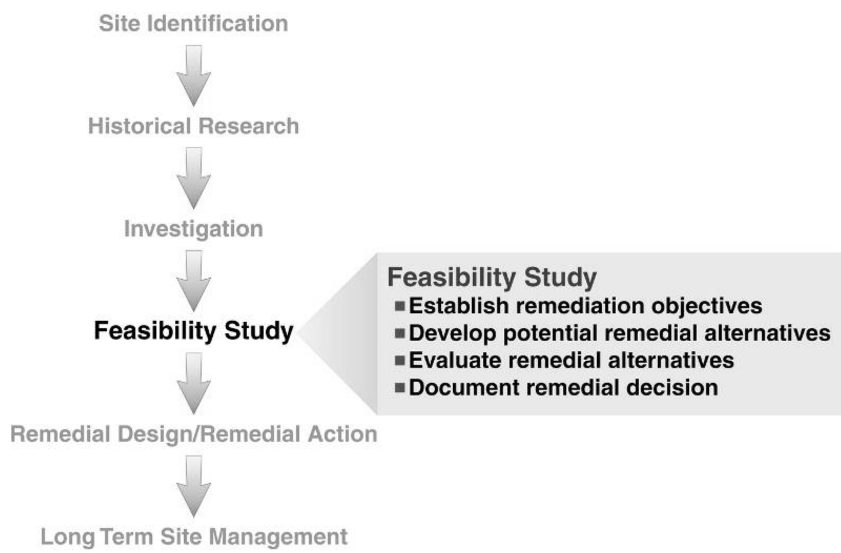
Ready to Begin Feasibility Study



No associated notes.

52

Time Critical Removal Action

- Range 1 is not an 81 mm mortar range, but an 81 mm mortar found near hiking trail
- Mortar thought to have been carried on to range from a different area
- Therefore, Project Team recommends a Time Critical Removal Action (TCRA)
  - Look for additional mortars that may have been carried and disposed of by hikers
  - Detector-aided surface clearance out to 25 feet on either side of hiking trail

The three key items in a Time Critical Removal Action are the following:

•the lead regulator is provided notice and opportunity for comment on proposed actions

•the Action Memorandum

•the availability of the Administrative Record file.

Time critical removal actions can take up to six months to plan.

Non-time critical removal actions take six months or longer to plan

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Establishing Remediation Objectives

Developed based on:

- Agreement on land end use
  - Unrestricted
  - Public access, farming
  - Limited public access, recreation, parking
  - Use not yet determined
- Clearance depth considerations
  - Hazard based depth determination
  - Land end use
  - Available technology
  - Cost
- Target type and size
- Considers the physical characteristics of site

No associated notes.

54

Establishing Remediation Objectives for "Camp Sample"

- Will establish remediation objectives for
  - Target area
  - Remainder of range fan
  - Firing point

•May be known as Preliminary Remediation Goals.

•Used for planning purposes.

•Should identify the area that is the subject of the cleanup and the required depth of clearance.

55

Remediation Objective for "Camp Sample" Target Area

- Target area objective: remove detectable UXO
  - To maximum depth of penetration as determined in investigation
  - Use best available technology
  - To support future land use
- We will use the target area to show how remedial alternatives are developed and evaluated; we will also have to go through same process for the remainder of the range fan and the firing point

•May be known as Preliminary Remediation Goals.

•Used for planning purposes.

•Should identify the area that is the subject of the cleanup and the required depth of clearance.

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Remedial Options to Achieve Remediation Objective

- Potential remedial options, in general
  - Visual surface clearance
  - Detector aided surface clearance
  - Clearance to specified depth
  - Clearance to depth of detection
  - Land use/institutional controls
  - No further action
- Can combine multiple options for a specific remedy

No associated notes.

57

Applying Remedial Options to Target Area at "Camp Sample"

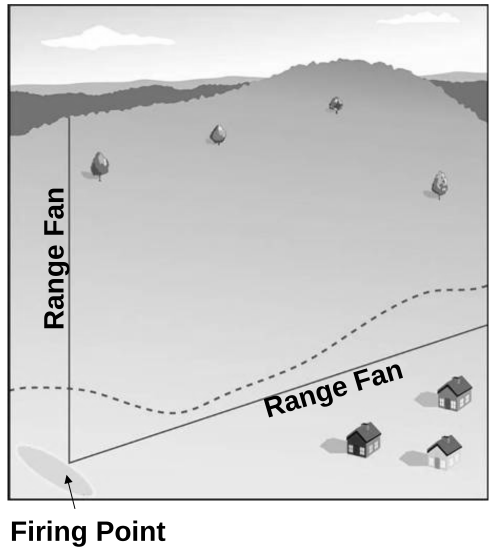
Remedial Options	Example Methodology
Visual surface clearance	• Visual observation
Detector aided surface clearance	• Hand held geophysical sensors
Clearance to specified depth	• Mag and dig • Digital geophysical mapping • Bulk removal
Clearance to depth of detection	• Mag and dig • Digital geophysical mapping • Bulk removal
Land use/institutional controls	• Signs, fences, land use restrictions
No further action	• None needed

These are the options that can be used and combined to build the remedial options for our target area.

58

Using the Remedial Options to Begin Developing Remediation Alternatives

- Consider remediation objectives and land use
- Consider site-specific conditions
  - Proximity to populations
  - Terrain, site geology, vegetation
  - Nature and extent of contamination
  - Cultural and ecological resources



Analyze the remediation objectives in light of the current and future land use and site specific conditions to determine the potential ways to meet all of those requirements.

Remediation alternatives are usually: No DoD Action Indicated (NDAI), surface clearance, clearance to a specified depth, Land Use Controls (LUCs).

59

Developing Specific Remedial Alternatives

- Technology options combined to develop remedial alternatives for each area on the range
- Alternatives are evaluated using CERCLA nine criteria
- Preferred alternatives are identified

CERCLA nine criteria are as follows:

1. Overall protection of human health and the environment
2. Compliance with applicable or relevant and appropriate substantive requirements (ARARs)
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

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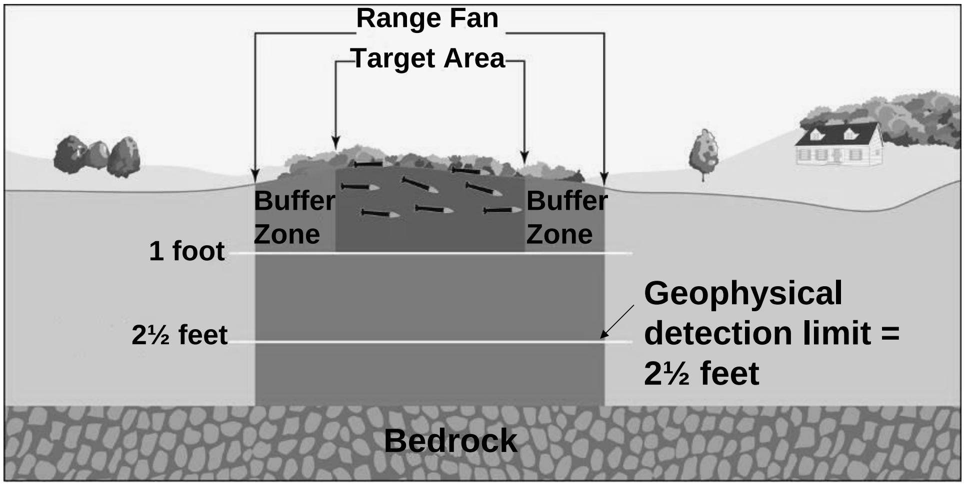
Example Alternative: Clearance to Depth of Detection for Target Area



Geophysical sensor can detect 2 ½ feet

Bedrock is at 3-3 ½ feet

Munitions found in the top 1 foot

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Evaluating the Remediation Alternatives

Apply CERCLA nine criteria to remedial alternatives:

- Threshold criteria
  - Protectiveness of human health and the environment.
  - Compliance with applicable or relevant and appropriate substantive requirements (ARARs)
- Balancing criteria
  - Long-term effectiveness and permanence
  - Reduction of toxicity, mobility or volume through treatment
  - Short-term effectiveness
  - Implementability
  - Cost
- Modifying criteria
  - State acceptance
  - Community acceptance

This process should be open to observation and participation by the stakeholders. Select a remedy that can be performed and supports the end land use.

CERCLA nine criteria are as follows:

1. Overall protection of human health and the environment
2. Compliance with applicable or relevant and appropriate substantive requirements (ARARs)
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

ARARs – CERCLA cleanups must achieve applicable or relevant and appropriate substantive requirements (ARARs) when hazardous substances, or pollutants or contaminants are left on site.

Risk Assessment for UXO

- Chemical risk – usually chronic, long term
  - Risk assessment methods for chemical risk well documented
- Risk/hazard from UXO – acute, immediate
  - Some project teams have developed site specific methodology
  - No standardized method yet……

No associated notes.

63

Remedial Decision Process

- Preferred alternatives selected
- Public comment period conducted
- Remedial decisions documented

No associated notes.

64

Remedial Decisions at "Camp Sample"

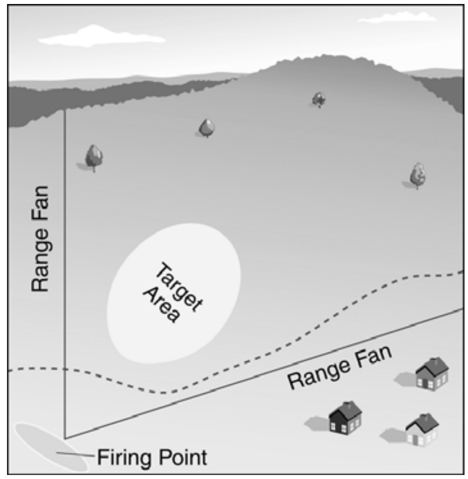
- Alternatives were developed and evaluated for each area
  - Target area
  - Remainder of range fan
  - Firing point

No associated notes.

65

Remedial Decisions at "Camp Sample" – Target Area

- Target Area
  - Removal to depth of detection



No associated notes.

66

Remedial Decisions at “Camp Sample” – Remainder of Range Fan

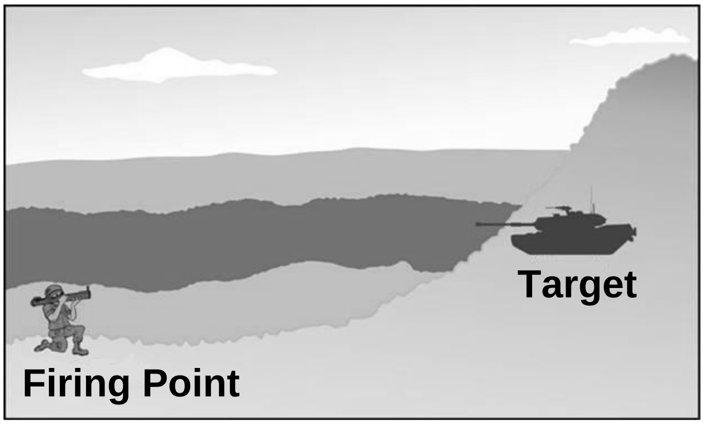
- Detector aided surface clearance
- Implement institutional controls
- Proceed with environmental investigation

No associated notes.

67

Remedial Decisions at "Camp Sample" – Firing Point

- Munitions response complete
- Proceed with environmental investigation



No associated notes.

68

Ready to Begin Remedial Design / Remedial Action

Site Identification

↓

Historical Research

↓

Investigation

↓

Feasibility Study

↓

Remedial Design/Remedial Action

↓

Long Term Site Management

The site is now adequately investigated, the project team has gone through the decision process concerning future actions at the site, and we are ready to begin the remedial portion of the project which consists of designing and implementing the remedial action

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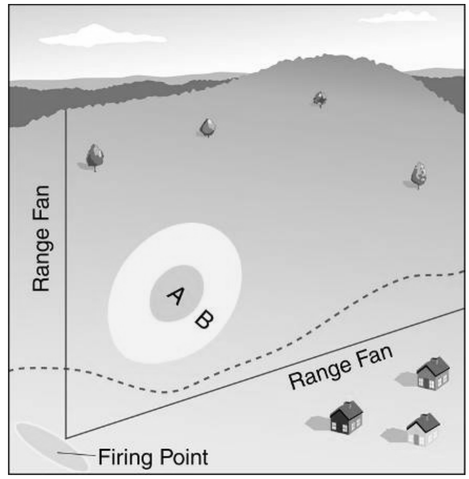
Target Area Remedial Design

- High density area (A)
  - Mag and dig
  - Digital geophysical mapping (DGM) to verify and dig as necessary
- Low density area (B)
  - Digital geophysical mapping (DGM)
  - Remove all detected anomalies



Represented here are the remedial decisions that were made by the Project Delivery Team. Area “A” will receive 100% mag and dig removal of all anomalies. After that, Area “B” (including Area “A” also) will receive 100% digital geophysical mapping and removal of all anomalies. Area “A” is heavily contaminated with metal debris from the targets and rocket fragments and this heavy contamination will result in unusable digital geophysical mapping data unless it is removed. Under this plan, the metal contamination will be removed from the most heavily contaminated portion of the site and then a larger area will receive complete digital geophysical mapping to locate any remaining MEC and provide a permanent record of the site geophysics.

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Remedial Action Work Plan

- Work plan is designed and documented
- Important elements of a work plan include
  - Detection of UXO
  - Geophysical prove-out
  - Removal and disposal of UXO
  - Explosive management
  - Scrap management
  - Quality assurance/quality control
  - Site specific health and safety plan
  - Site security
- Design is documented in the work plan and Explosives Safety Submission (ESS)

View of range with hill "backstop"

The remedial action is designed by the DoD contractor and presented to the Project Delivery Team in the work plan. DoD has guidance on what needs to be included in the work plan. Some of the information contained in a work plan that is most important to state regulators are shown here.

The ESS is also developed by the contractor. This is an internal DoD document developed for the DoD Explosive Safety Board to demonstrate to them that the selected remedy is protective, is properly planned, and can be safely implemented.

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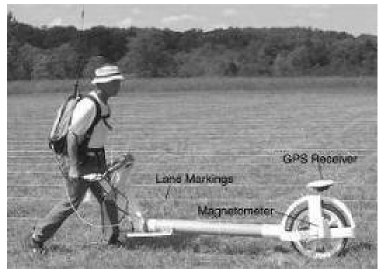
Detection Technologies

- Mag and dig
- Digital geophysical mapping

NOTE: Another geophysical prove-outs (GPO) may be needed specifically for the remedial action if the geophysical processes are different from what was tested in the investigation



The contractor has recommended in the work plan that these two geophysical methods ("mag and dig" and digital geophysical mapping) be used for the reasons previously explained.

Also note that the geophysical prove-out (GPO) that was done for the investigation may not be adequate for the remedial action and may need to be redesigned and redone. This will be necessary if the geophysical sensors or processes have changed and also if the detection data quality objectives (DQOs) have changed (for example, there is a new detection depth requirement).

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Disposal Technologies

- At "Camp Sample," we are using blow in place (BIP) to dispose of the 2.36 inch rockets
- Other on-site disposal options
  - Consolidate munitions
  - Blast chamber
- Off-site disposal options
  - Approved and permitted treatment facility

Blow in place

Blow in place, known as "BIP", is the preferred method of disposal because it is the safest method. This is because the MEC is not moved or disturbed and this is especially important when disposing of UXO. BIP is accomplished by placing a "donor" explosive charge on or next to the UXO. Upon detonation, the "donor" explosive charge creates a "sympathetic detonation" in the main charge of the UXO, thereby completing its disposal.

Other methods requiring movement of the MEC may be possible and may have some advantages if movement of the MEC is possible. An example of this situation is when a land burial of MEC is found. These MEC were not fired and may be determined to not be shock sensitive. In this case it may be possible to move them into a blast chamber for disposal which will contain the blast, fragments, and contaminants associated with detonations.

See ITRC UXO Team and SERDP's document on UXO technologies (to be published 2005 and will be available on www.itrcweb.org under "Guidance Documents") for more information on removal and disposal technologies.

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Safety

- Explosives management
  - Cite and follow regulations
    - DoD
    - Federal
    - State
    - Local
- Site security
  - Ensure the public is protected from the hazards of the project

A former 3.5-in. rocket range

Explosives management: Work plan includes explosives storage, security, and transportation procedures. Must meet DoD service component regulations as well as all state and local laws. Transportation of explosives must meet Department of Transportation (DOT) regulations

Site Security: Ensure the security of the site during remediation. Public, especially children, are attracted to munitions response projects. Consider fencing and guards. Plan for what you do with munitions and explosives of concern (MEC) when you find it.

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Scrap Management

- DoD 4160.21-M-1, Defense Demilitarization Manual (1991)
- Range-related scrap is segregated from non range-related scrap
- Inspect, certify, and verify scrap

Inspection and segregation of material potentially presenting an explosive hazard (MPPEH)

Material potentially presenting an explosive hazard (MPPEH) handling and disposal is important to state regulators because the inspected and certified MPPEH is likely to end up in a local scrap yard. There have been recent cases of accidents resulting from improper demilitarization and inspection of MPPEH.

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Scrap Management (continued)

- DoD Instruction 4140.62, Management and Disposition of Material Potentially Presenting an Explosive Hazard (MPPEH), December 2004
- Apply physical controls to maintain the certification
- Requires 100% inspection and 100% reinspection
- Scrap dealer must be qualified to receive ordnance scrap

Inspection and segregation of material potentially presenting an explosive hazard (MPPEH)

The DoD instruction referenced here is new (December 2004) and includes some new procedural requirements (100% inspection and 100% reinspection of all MPPEH, qualification requirements for scrap dealers to receive former MPPEH) that should be addressed in the work plan.

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Quality Assurance/Quality Control

- Contractor performs quality control (QC)
- Government (DoD) performs quality assurance (QA)
- State/EPA can also perform QA
  - Concentrate on implementation of the approved plan
  - Observe procedures
  - Ensure compliance with data quality objectives
- Guidance on tools and techniques for quality verification under development by ITRC

QC is performed by the DoD contractor. It usually involves several levels of inspections of the work in progress and frequently culminates with a final QC inspection to ensure that the contractual requirements of the work have been met. Regulators should review and understand how the contractor is going to ensure the quality of his work.

QA is performed by regulators and DoD to ensure that the agreed-upon work plan is completely implemented and also may include a final QA acceptance inspection to ensure that the project goals, as defined by specific inspection criteria, have been achieved on the project.

ITRC is developing a document covering quality aspects of munitions response projects which will provide much more information on QC and QA.

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Post Remediation Verification

- Verify QA/QC
- Verification and/or acceptance sampling surveys, as agreed upon
- Close out reporting requirements
- Ensure that institutional controls have been implemented
- Long-term monitoring plan in place, costs, and responsibilities identified

It may be beneficial to have a final QC acceptance meeting at the end of the project. Such a meeting can include the quality managers from the Project Delivery Team (DoD, contractor, regulators, stakeholders) reviewing all of the QC documentation from the project. At the end of the meeting they can approve the work as having been done in accordance with the work plan and meeting the remedial goals and specific data quality objectives, or they may identify some discrepancies that require correction prior to completion of the project.

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Remedy Summary

- Review the draft work plan for technical adequacy
- Ensure the approved work plan is followed
- Perform quality assurance
- Document field changes
- Correct deficiencies
- Update conceptual site model (CSM) as required
- Perform final QA review of project QC and approve or note deficiencies

In summary, the items shown here are usually where regulators apply their oversight efforts to ensure that the remedial project goals and objectives have been met.

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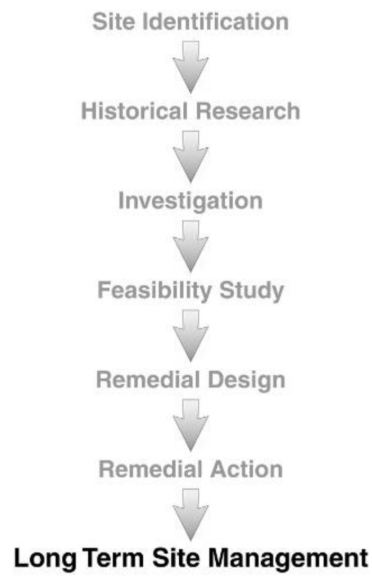
Other General Removal Considerations

- Long-term site management
- Land use/institutional controls
- Site management plan



Long Term Site Management: Regulators ensure an appropriate plan is in place. Stakeholders notify regulators of changes in land end use. DoD implements site management plan.

Land use/institutional controls: Property controls (deed notices, applicable to BRAC and FUDS sites where property transactions are subject to state regulations requiring deed notices). Governmental controls (enforceable by states and local governments under a declaration that munitions and explosives of concern (MEC) are regulated; BRAC – enforceable by state under deed notice (not required in every state); FUDS – enforceable by state as regulator charged with ensuring the protection of personnel and property; active DoD Facilities – Enforced by DoD)

Site management plan: Selects land use/institutional controls (real estate controls (deed notices); control of site access; restrictions on use; education plans; requires recurring reviews). Changes to planned land use (proposed change must be evaluated by DoD, state regulators, and stakeholders; additional clearance may be necessary)

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Summary

- Institutional controls will be put into place and a long-term management plan followed
- Munitions response is complete for our fictitious site
- Environmental investigation and remediation process for other potential contaminants will proceed as appropriate

No associated notes.

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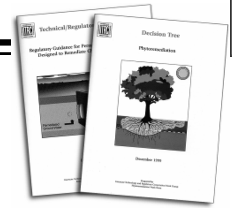
Thank You for Participating



- **Links to additional resources**
  - **http://www.clu-in.org/conf/itrc/uxosisr/resource.cfm**

- **2nd question and answer session**

Links to additional resources:

http://www.clu-in.org/conf/itrc/uxosisr/resource.cfm

Your feedback is important – please fill out the form at:

http://www.clu-in.org/conf/itrc/uxosisr/

The benefits that ITRC offers to state regulators and technology developers, vendors, and consultants include:

✓Helping regulators build their knowledge base and raise their confidence about new environmental technologies

✓Helping regulators save time and money when evaluating environmental technologies

✓Guiding technology developers in the collection of performance data to satisfy the requirements of multiple states

✓Helping technology vendors avoid the time and expense of conducting duplicative and costly demonstrations

✓Providing a reliable network among members of the environmental community to focus on innovative environmental technologies

How you can get involved with ITRC:

✓Join an ITRC Team – with just 10% of your time you can have a positive impact on the regulatory process and acceptance of innovative technologies and approaches

✓Sponsor ITRC's technical team and other activities

✓Be an official state member by appointing a POC (State Point of Contact) to the State Engagement Team

✓Use ITRC products and attend training courses

✓Submit proposals for new technical teams and projects