Welcome to the CLU-IN Internet Seminar

Military Munitions Support Services – Guidance

Sponsored by: U.S. Army Corps of Engineers

Delivered: March 28, 2013, 1:00 PM - 4:45 PM, EDT (17:00-20:45 GMT)

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Moderators:

- *John Sikes, CEHNC (John.a.sikes@usace.army.mil or (256) 895-1334)*
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- *Jean Balent, U.S. EPA Technology Innovation and Field Services Division (balent.jean@epa.gov or (703) 603-9924)*

Visit the Clean Up Information Network online at www.cluin.org

Seminar Homepage

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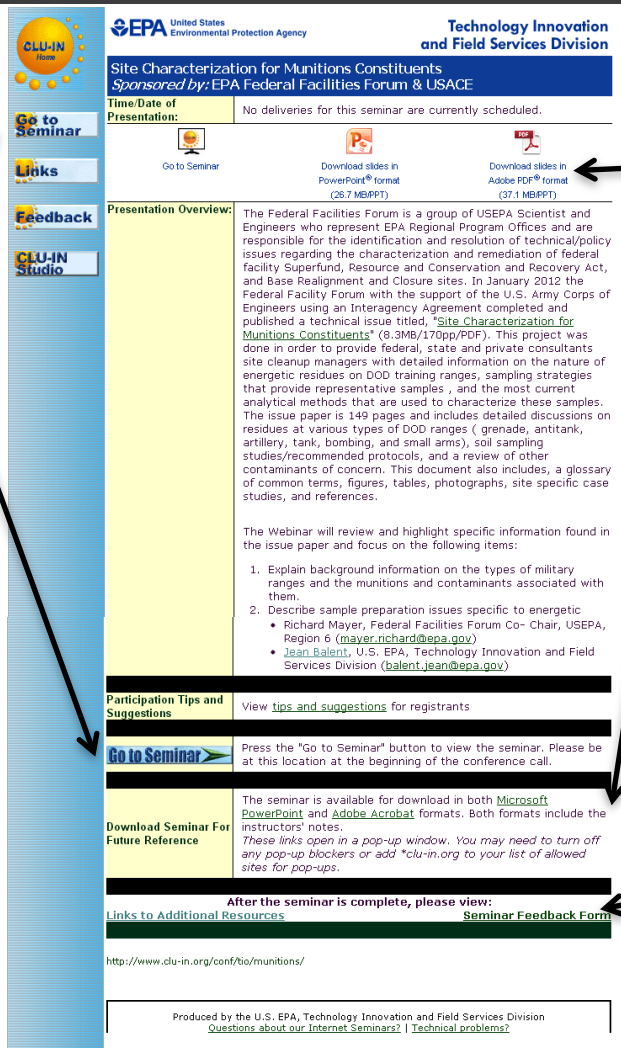

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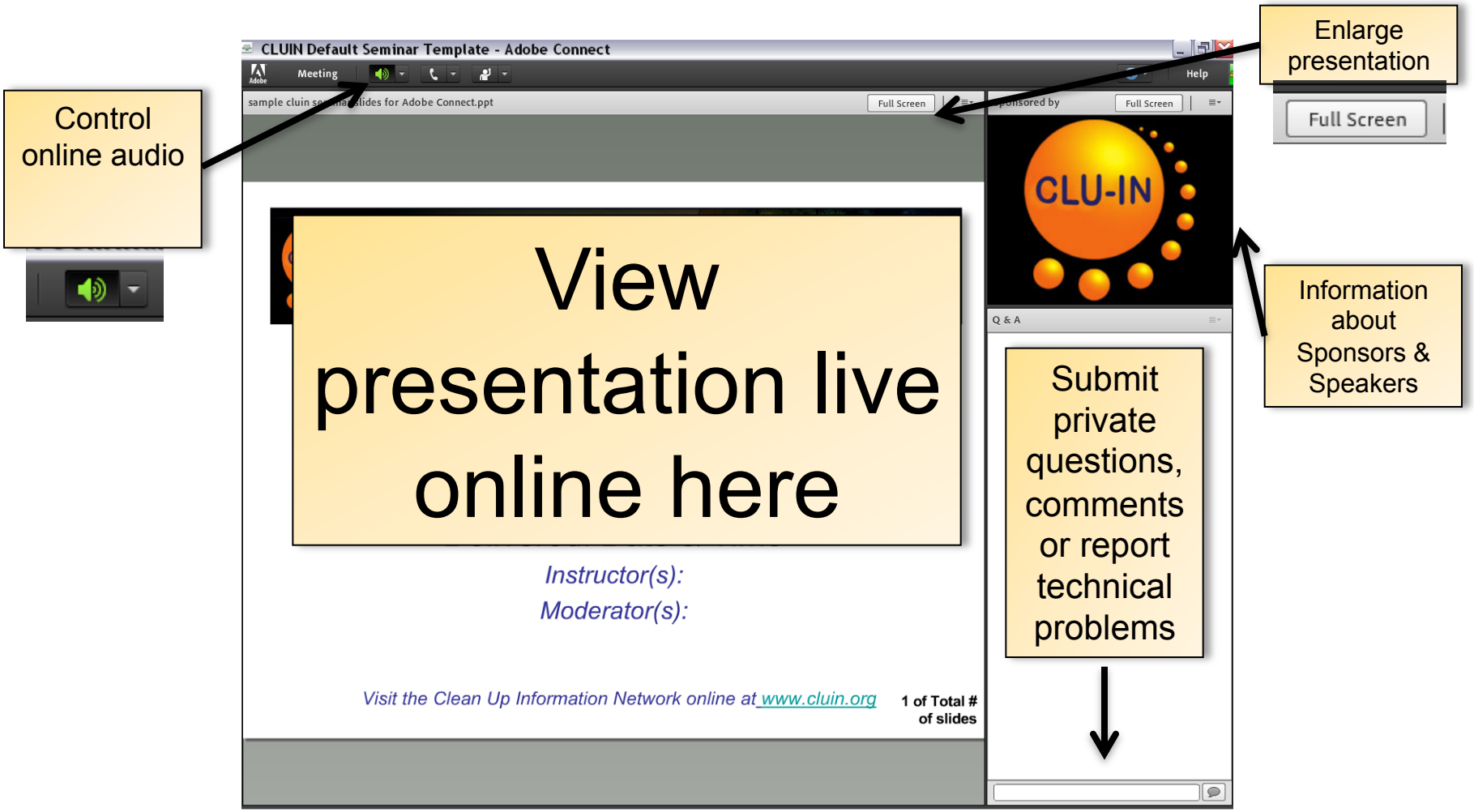
- Archives accessed for free **http://cluin.org/live/archive/**

New online broadcast screenshot



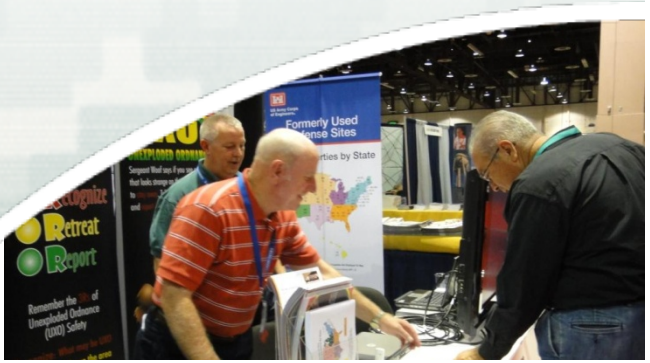
2013 Military Munitions Support Services (M2S2) Webinar Series

Welcome!

Updating a manual is like changing tires on a moving car.

Edmond Weiss

US Army Corps of Engineers
BUILDING STRONG®



On Today's Episode…

- ***Speakers –***

  Dr. Christine Altendorf, Chief, Environmental Division, Directorate of Military Programs, USACE

  Carol Dona, EM CX

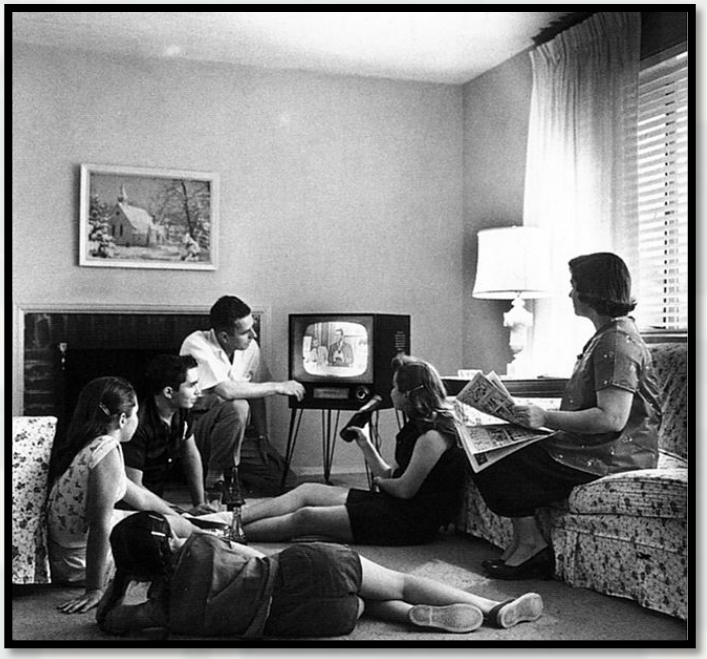
  Nick Stolte, EM CX

  Blanca Roberts, HQUSACE Safety Office

  Steve Stacy, ARCADIS U.S., Inc.

  Deb Walker, EM CX

- ***Moderator –*** John Sikes, EM CX
- ***Facilitator –*** Dwayne Ford, EM CX



On Today's Episode…

Date	*Theme / Moderator*	*Time (EDT)*	*Topic*	*Presenter*
28 March 2013	**Guidance** **John Sikes**	1300 - 1310	Welcome & Introduction	Dwayne Ford, EM CX; Jean Balent, EPA
		1310 - 1330	Keynote Speaker	Dr. Christine Altendorf, Chief, Environmental Division, Directorate of Military Programs, USACE
		1330 - 1400	Evaluation of Green and Sustainable Practices for Military Munitions Response Program Characterization and Cleanup	Carol Dona, EM CX and Nick Stolte, EM CX
		1400 - 1430	USACE Explosives Safety Training (EST) & Guidance Updates	Blanca Roberts, CESO
		1430 - 1445	*Intermission*	
		1445 - 1615	Revised Technical Guidance for Military Munitions Response Actions: EM 200-1-15 "Technical Guidance for Military Munitions Response Actions" (The Guidance Previously Known As EM 1110-1-4009)	Steve Stacy, ARCADIS U.S., Inc. and Deb Walker, EM CX
		1615 - 1645	Questions and Open Discussion	John Sikes, EM CX

Before We Begin…

- Technical assistance
- Q & A
  - ► During presentation
  - ► Open discussion period
- Presentation materials for download
- Registration for future sessions
- Be our ambassadors

On the Next Exciting Episode…

- *"Technology "* – 22 April
- *"Non-CERCLA Regulatory Framework"* – 30 May
- *"Characterization"* – 25 July
- *"Case Studies & Lessons Learned"* – 29 August

- **Register now at**

  www.clu-in.org

If You Missed an Episode…

- Re-runs of the M2S2 webinars can be viewed at

  www.clu-in.org/live/archive/

Speakers Wanted!

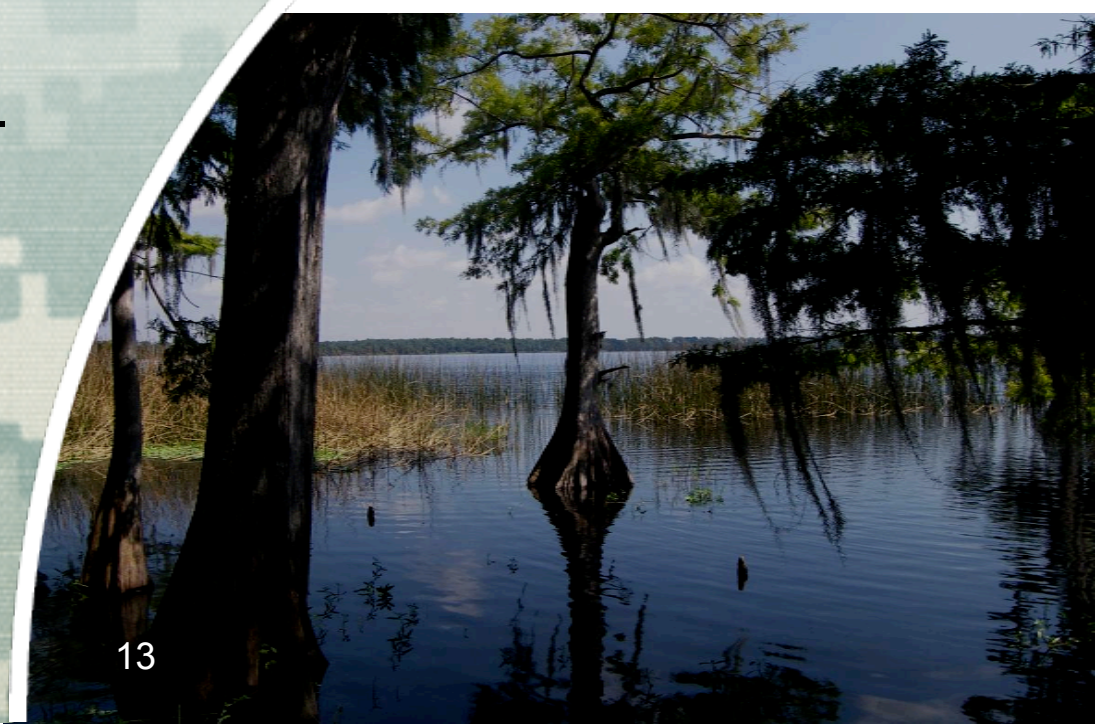
- *Share your knowledge and improve our industry!*
- Submit ideas for topics and speakers to:
  Dwayne.C.Ford@usace.army.mil

Army UXO Safety Program

US Army Corps of Engineers

The Nation's Environmental Engineer

Military Munitions Support Services Webinar
28 March 2013



Christine T. Altendorf, Ph.D., P.E.
Chief, Environmental Division

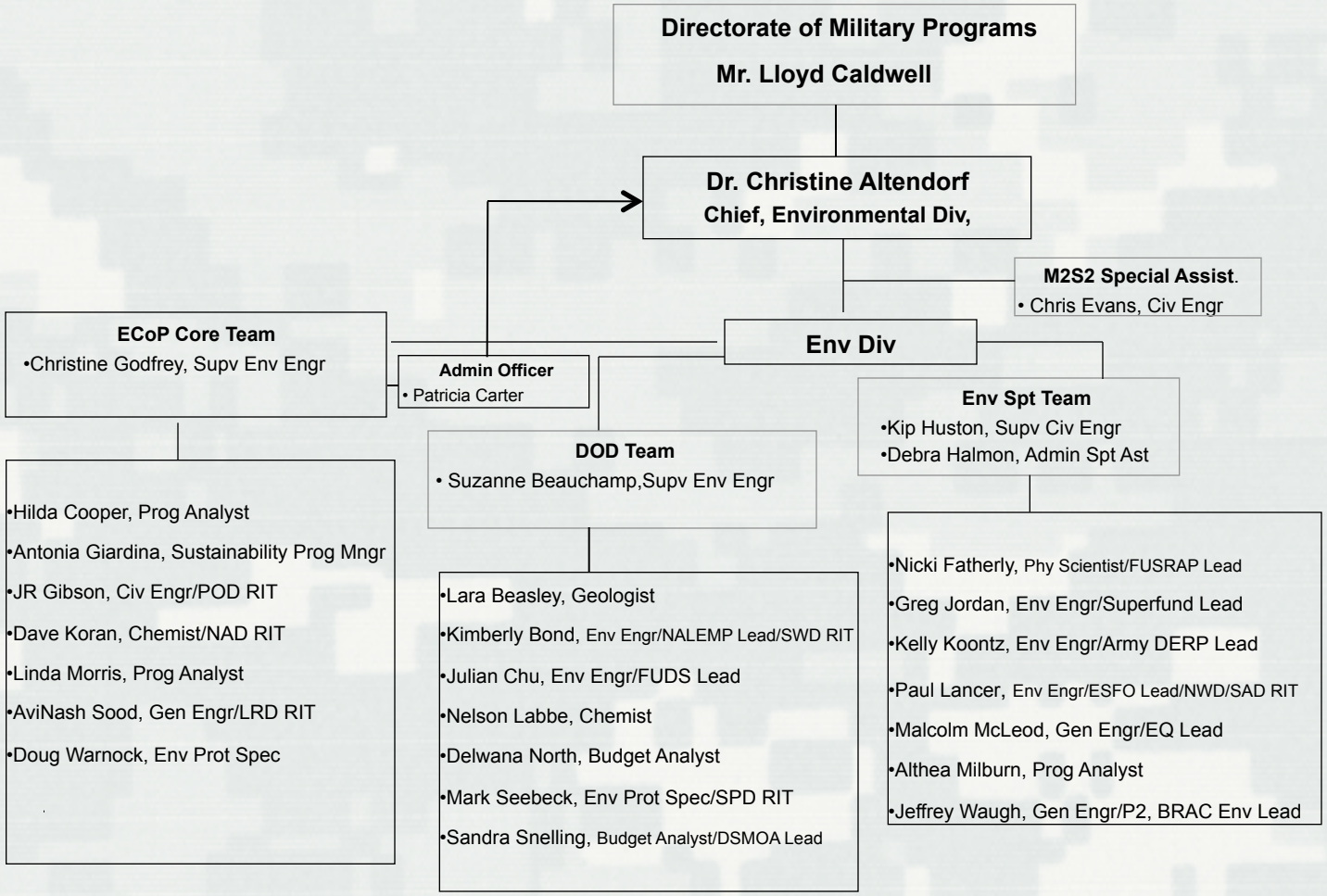
Directorate of Military Programs

US Army Corps of Engineers
BUILDING STRONG®

Six Key Messages

- The Corps of Engineers creates engineering solutions for the Nation's environmental challenges, taking steps to preserve, sustain and protect the environment in everything we do.
- The Corps is the steward of almost 12 million acres of public lands and waters in 43 states.
- The Corps carefully balances regulatory decisions to protect the nation’s aquatic resources.
- The Corps restores properties and ecosystems, making both available to the public for beneficial use.
- Corps environmental projects improve quality of life by promoting sustainable economic development.
- The Corps develops and implements sustainable solutions by applying its Environmental Operating Principles.

Environmental Division



Environmental Community of Practice (ECoP) Initiatives

- Environmental Services Transformation
- Installation Management Reform Task Force
- FUDS 2.0 Transformation
- Environmental Operating Principles (EOP) refresh and implementation
- Environmental Advisory Board (EAB) member adjustment
- CP18 Refresh
- ECoP Steering Committee Refocus
- ECoP Outreach to Total Army Environmental Community
- Strategic Engagement Plan
- Sustainability PDT
- Webinars
- Division-Focused ECoP Workshops
- National Environmental Conference Summer 2014

USACE Environmental Operating Principles

Refreshed Aug 2012

1. Foster Sustainability as a way of life throughout the organization.
3. Proactively consider environmental consequences of all Corps activities and act accordingly.
4. Create mutually supporting economic and environmentally sustainable solutions.
5. Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps which may impact human and natural environments.
6. Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs.
7. Leverage scientific, economic, and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner.
8. Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

Civil Works - Environmental

- Navigation
- Hydropower
- Flood Risk Management
- Ecosystem Restoration
- Environmental Stewardship
- Water Supply
- Regulatory (Wetlands)
- Recreation

Military Programs - Environmental

•Executed $1.6 billion in environmental program and project management in FY12

- Installation Restoration Program (IRP) [Army and Air Force]
- Base Realignment & Closure Act (BRAC)
- Environmental Quality Support (EQ)
- Formerly Used Defense Sites (FUDS)
- Military Munitions Support Services (M2S2)
- EPA Superfund, Brownfields, Urban Waters
- Formerly Utilized Sites Remedial Action Program (FUSRAP)
- Defense State Memorandum of Agreement (DSMOA)
- Support for Other Federal Agencies

Sustainability

Mississippi River Gulf Outlet

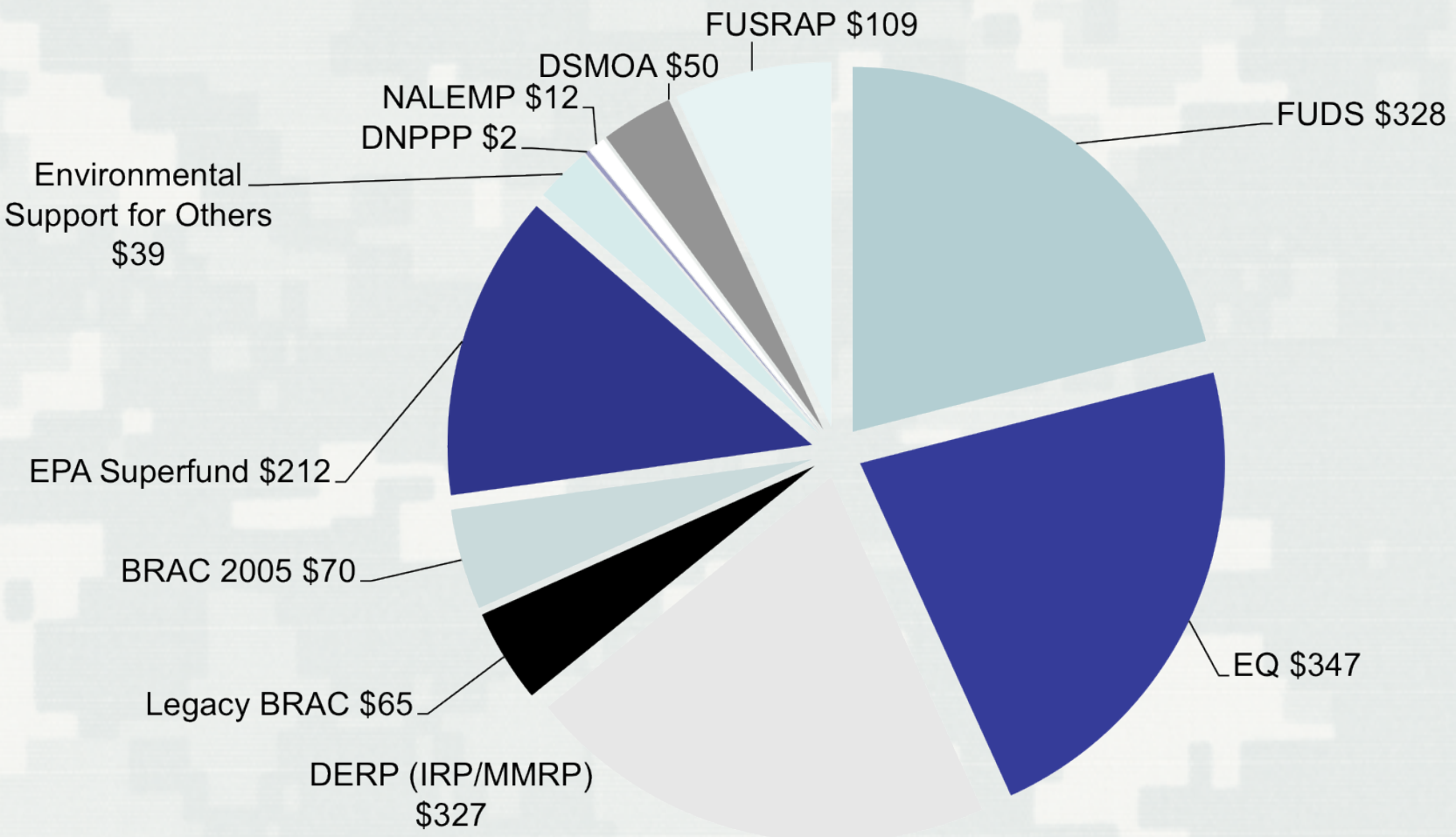
Create projects that meet today's needs without compromising ability of future generations to meet their needs

USACE has developed own Strategic Sustainability Performance Plan

Environmental Community has lead, but meeting goals is a command responsibility – USACE-wide effort

FY12 Environmental Workload $1.6B

Obligations (M)



Cost to Complete

Program	Cost to Complete	End Year
Army Cleanup	$4.0 B	2021
Air Force Cleanup	$4.0 B	2024
BRAC	$1.2B	2017
FUDS	$13.2 B	>2085
FUSRAP	$1.4 B	2023

Military Munitions Support Services

Supports all USACE work involving unexploded ordnance, discarded military munitions, munitions constituents, and chemical warfare material:

M2S2 Advisory Board – oversight/recommendations
Environmental & Munitions Center of Expertise
5 Military Munitions Design Centers

❖ **Environmental Restoration**
- Formerly Used Defense Sites (FUDS)
- BRAC-ER MMRP
- Army MMRP
- Air Force MMRP
- Army National Guard NDNODS
- Compliance Cleanup (Env. Quality)

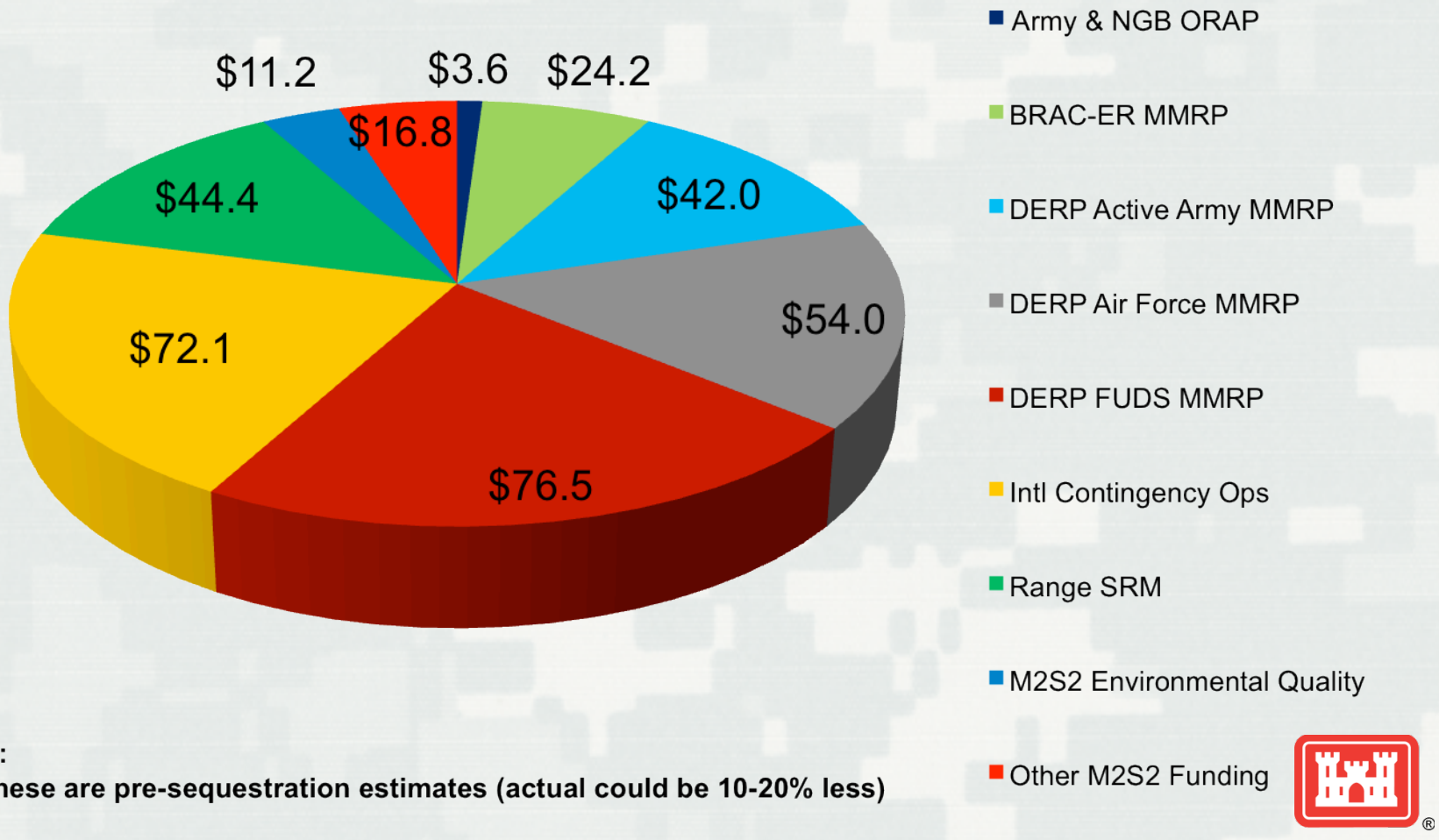
❖ **COCOM Missions**
- Afghanistan UXO/Mine Clearance
- International Contingency Operations
- Depleted Uranium Cleanup

❖ **Construction Support**
- Range Modernization (RTLP)
- MILCON & BRAC Construction
- Civil Works Dredging

❖ **Operational Range Sustainment**
- Operational Range Assessment Program
- Range Maintenance
- ERDC Research & Development

❖ **Annual USACE M2S2 Workload:**
FY12 - $355M
FY13 - $345M (Est.)

USACE FY13 M2S2 Estimates - $345M



Note:
These are pre-sequestration estimates (actual could be 10-20% less)

USACE M2S2 Workload ($M)

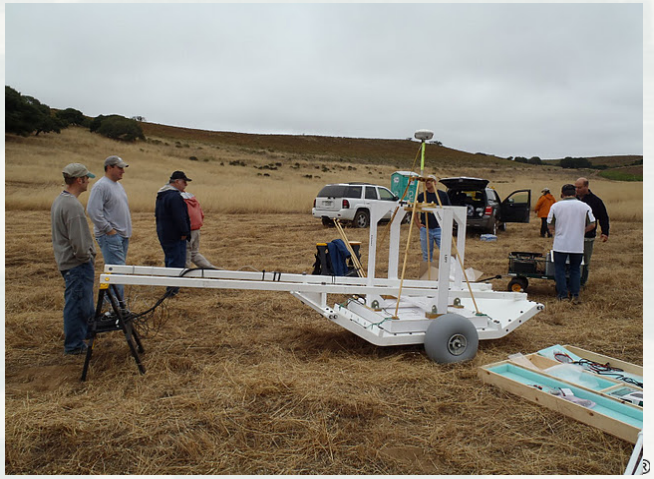
Program	FY12 Actual	FY13 Est.	FY14 Proj.
Army & NGB ORAP	$ 7.2	$ 3.6	$ 0.7
BRAC-ER MMRP	$ 38.5	$ 24.2	$ 24.3
Active Army MMRP	$ 55.0	$ 42.0	$ 40.0
Air Force MMRP	$ 24.5	$ 54.0	$ 15.3
FUDS MMRP	$ 101.8	$ 76.5	$ 74.6
Intl Contingency Ops	$ 78.0	$ 72.1	$ 55.0
Range SRM	$ 26.2	$ 44.4	$ 44.0
Environmental Quality	$ 13.5	$ 11.2	$ 12.3
Other M2S2	$ 10.3	$ 16.9	$ 15.7
Totals:	$ 355.0	$ 344.9	$ 281.9

Note: Peak USACE M2S2 funding was $505M in FY11.

Munitions Classification

- USACE Commitment to Technology Transfer (14 Projects):
  - ESTCP Post Survey Data Analysis: Fort Sill & Camp Spencer
  - ESTCP Ongoing Demos: Camp Ellis & Southwest Proving Ground
  - ESTCP Upcoming Demos: Camp Elliot, Waikoloa, Fort Rucker, & Fort Bliss
  - USACE Ongoing Projects: Camp Beale & Bellow AFS
  - USACE Upcoming Projects: Kirtland West Mesa, Camp Sibert, MMR, & Fort Ord
  - USACE participation on ESTCP Advisory Group, ITRC Team, and DDESB Working Group

- Issues on the Table:
  - Part of Feasibility Study Alternatives
  - Regulator Buy In of Remedial Action Objectives
  - DoD Explosives Safety Policy revisions
  - Development of Workforce/Practitioner Qualifications
  - Advanced Sensor Equipment Availability
  - Contracting Language/RFP Requirements
  - Quality Assurance/Quality Control Processes



Environmental and Munitions Center of Expertise (EM CX)

The EMCX supports the Army for environmental and munitions response missions across the world protecting public health and the environment.

- **Mission Activities**
  - •Project document reviews and Independent technical reviews
  - • Project specific technical assistance
    - -Project site visits
    - -Project planning facilitation & technical support
  - • Participation on panels and advisory committees
  - • Technology transfer/ Lessons learned (e.g. Metal Mapper)
  - • Guidance document development
  - • Training development and instruction
  - •Studies
  - •Cost estimating

USACE Engineer Research & Development Center

- 2,500 Employees (1,800 Full Time Federal)
- 991 Scientists & Engineers
- $1.2 B in Unique Research Facilities & Equipment
- $1.5 B Annual Program
- 77 Active Patents

Cold Regions Research and Engineering Laboratory

Hanover, NH

Construction Engineering Research Laboratory

Champaign, IL

ERDC Topographic Engineering Center

Alexandria, VA

ERDC Headquarters
Coastal and Hydraulics Laboratory
Environmental Laboratory
Geotechnical and Structures Laboratory
Information Technology Laboratory

Vicksburg, MS

OCONUS Environmental Support to CENTCOM AOR

- In support of U.S. Forces – Afghanistan
  - Provide environmental staff on a rotational basis.
  - Perform environmental baseline surveys
  - Provide technical support for hazardous/solid material/ waste management and disposal
  - Provide technical support for water/waste water issues
  - Support critical water mission
- In support of ARCENT and CENTCOM
  - Provide SME support to develop workable solutions on environmental issues that have a significant impact on the CENTCOM AOR

Tools to Help Promote a Knowledge Sharing Environment

- **ECoP Public Website** www.usace.army.mil/Missions/Environmental

- **ECoP Steering Committee**
- ***"The Corps Environment"* newsletter**
- **ENV Webinars & Conferences & Workshops**
- **Sustainability Awards**
- **Quality Management & Enterprise Lessons Learned Systems**

Points of Contact

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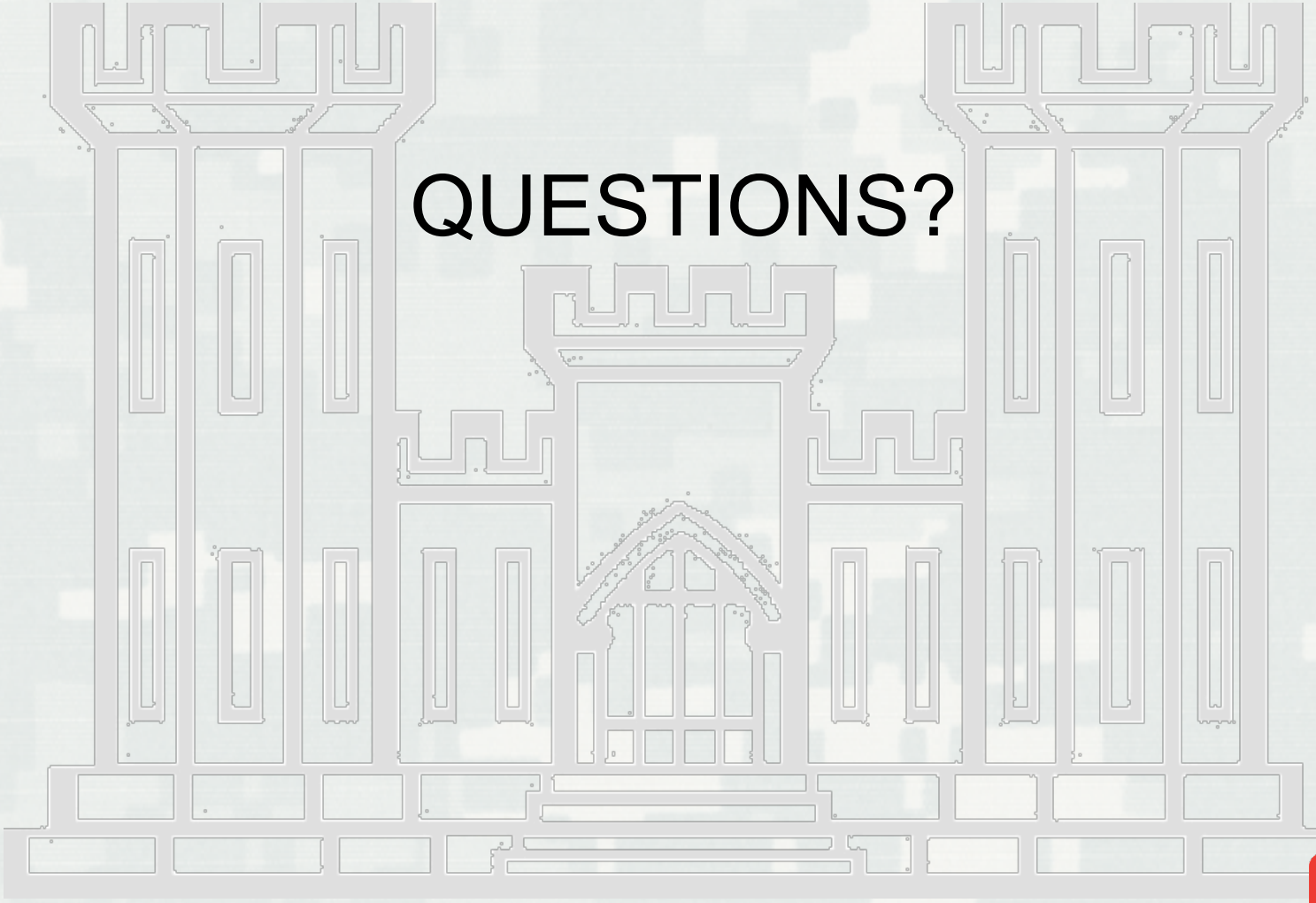
QUESTIONS?



Green and Sustainable Remediation (GSR) Applications to Military Munitions Response Program (MMRP) Projects

Carol Lee Dona, P.E., Ph.D.

Environmental and Munitions Center of Expertise, Omaha, NE

Nick Stolte, P.E.

Environmental and Munitions Center of Expertise, Huntsville, AL

28 March 2013

US Army Corps of Engineers
BUILDING STRONG®

Outline

- Green and Sustainable Remediation (GSR) Definition and Drivers
- MMRP GSR
  - ►Army Study
  - ►Examples
  - ►Summary
- Path Forward

Green & Sustainable Remediation

DEFINITION AND DRIVERS

What is Sustainable (Army)

Figure 1-1. Pillars of Army Sustainability (Triple Bottom Line Plus), Army Posture Statement, Feb 2007

What is GSR (DoD)

- March 2012 DERP Manual
- DoD GSR Definition:
  - ► Employ strategies for environmental cleanups that:
    - Use natural resources and energy efficiently
    - Reduce negative impacts on the environment
    - Minimize or eliminate pollution at its source
    - Reduce waste to the greatest extent possible
  - ► Consider all environmental effects of remedy implementation and operation
  - ► Incorporate options to maximize the overall environmental benefit of environmental response actions

Green & Sustainable Remediation

GSR POLICY AND GUIDANCE DRIVERS

Policy and Guidance Drivers
Executive Order 13423

Federal Register
Vol. 72, No. 17
Friday, January 26, 2007

Presidential Documents

Title 3—

The President

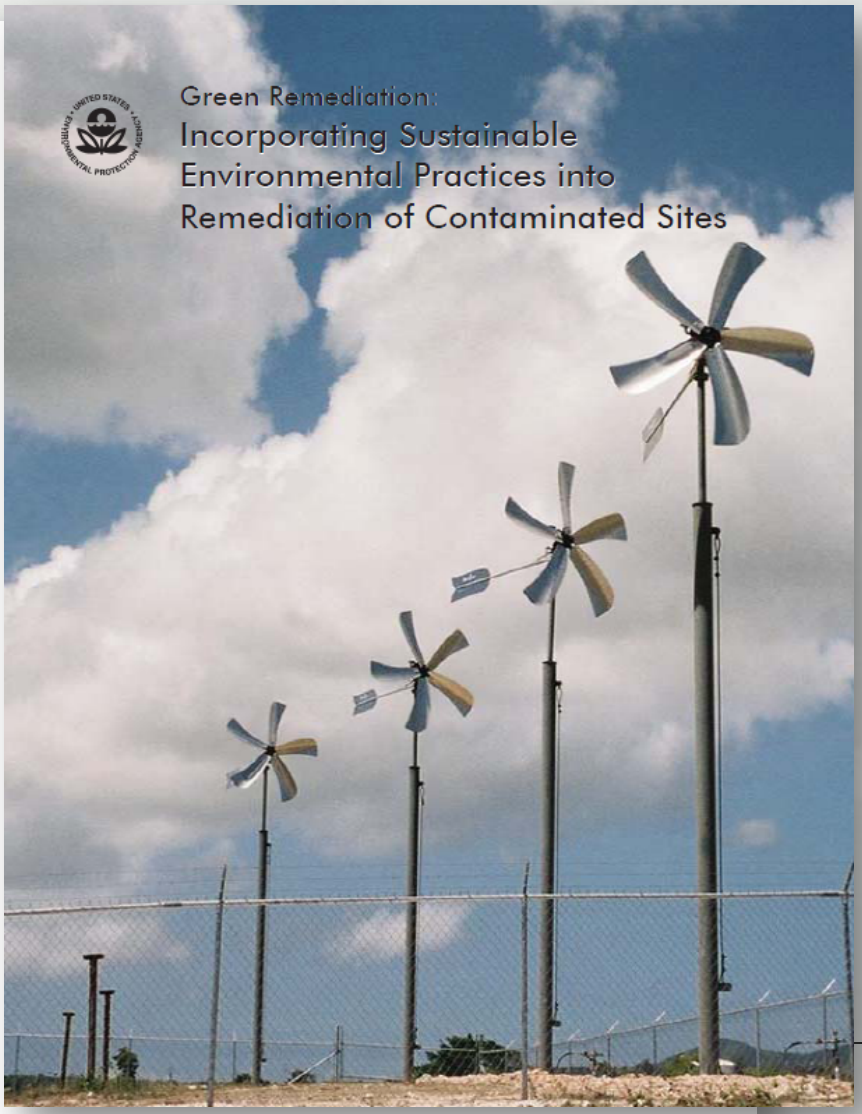
Executive Order 13423 of January 24, 2007

Strengthening Federal Environmental, Energy, and Transportation Management

By the authority vested in me as President by the Constitution and the laws of the United States of America, and to strengthen the environmental, energy, and transportation management of Federal agencies, it is hereby ordered as follows:

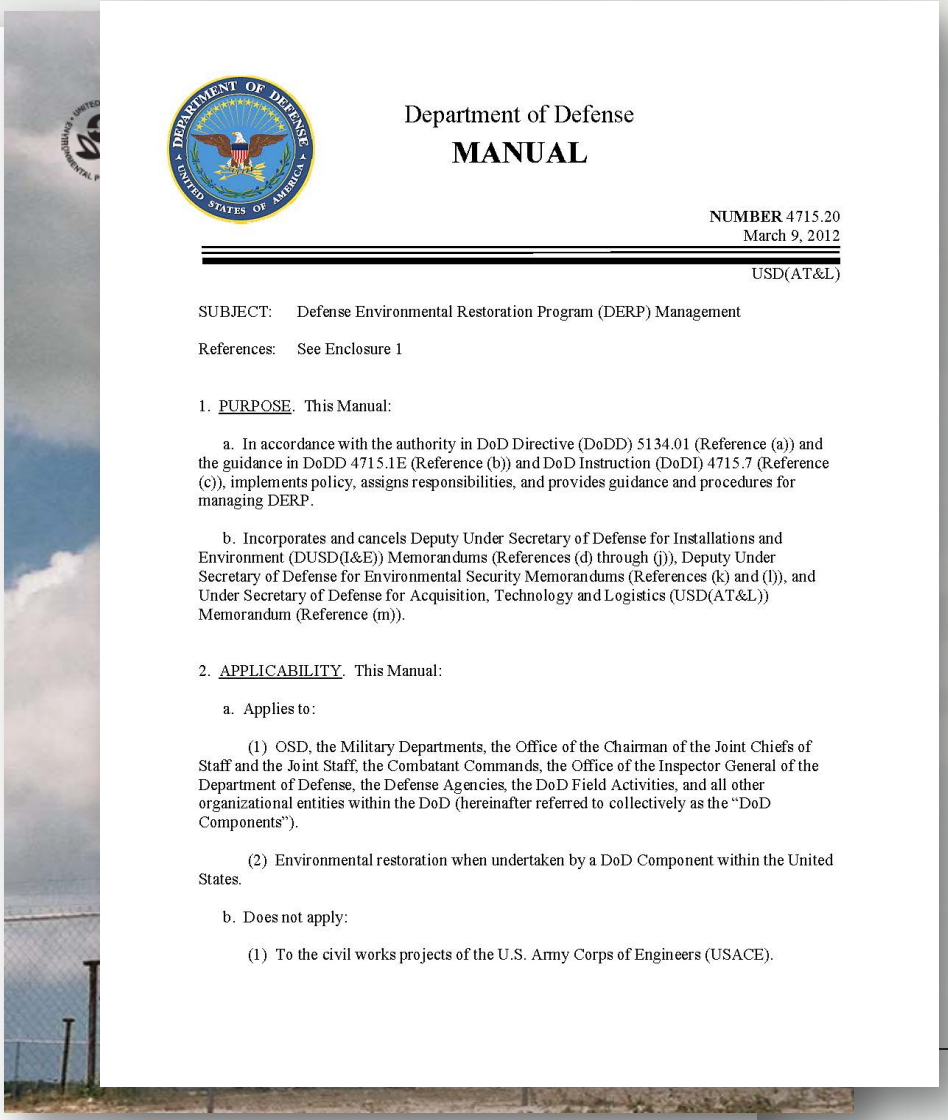
Section 1. *Policy.* It is the policy of the United States that Federal agencies conduct their environmental, transportation, and energy-related activities under the law in support of their respective missions in an environmentally, economically and fiscally sound, integrated, continuously improving, efficient, and sustainable manner.

Policy and Guidance Drivers



Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites (EPA, April 2008)

Policy and Guidance Drivers



Department of Defense

MANUAL

NUMBER 4715.20
March 9, 2012

USD(AT&L)

SUBJECT: Defense Environmental Restoration Program (DERP) Management

References: See Enclosure 1

1. PURPOSE. This Manual:

a. In accordance with the authority in DoD Directive (DoDD) 5134.01 (Reference (a)) and the guidance in DoDD 4715.1E (Reference (b)) and DoD Instruction (DoDI) 4715.7 (Reference (c)), implements policy, assigns responsibilities, and provides guidance and procedures for managing DERP.

b. Incorporates and cancels Deputy Under Secretary of Defense for Installations and Environment (DUSD(I&E)) Memorandums (References (d) through (j)), Deputy Under Secretary of Defense for Environmental Security Memorandums (References (k) and (l)), and Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) Memorandum (Reference (m)).

2. APPLICABILITY. This Manual:

a. Applies to:

(1) OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (hereinafter referred to collectively as the "DoD Components").

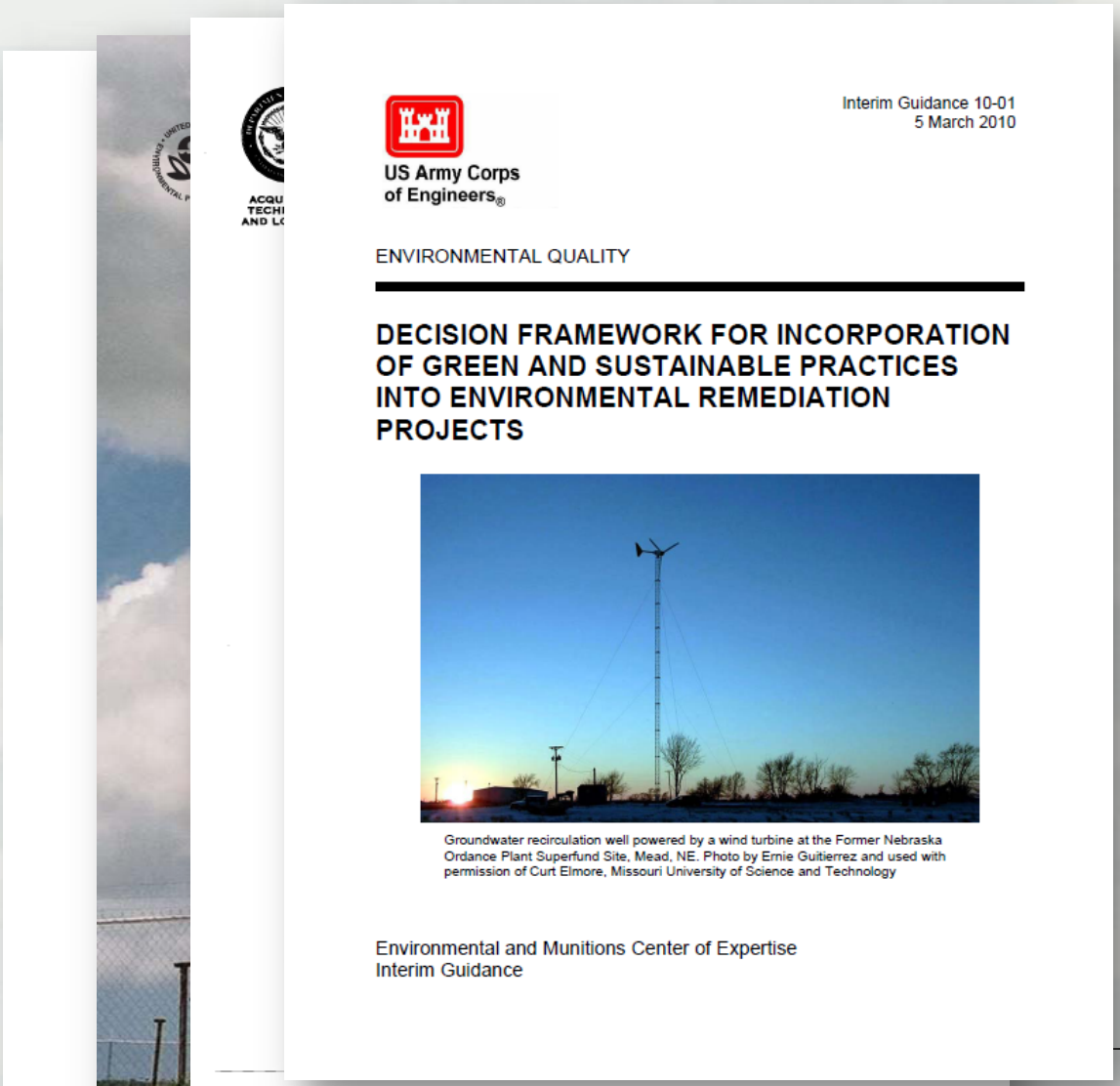
(2) Environmental restoration when undertaken by a DoD Component within the United States.

b. Does not apply:

(1) To the civil works projects of the U.S. Army Corps of Engineers (USACE).

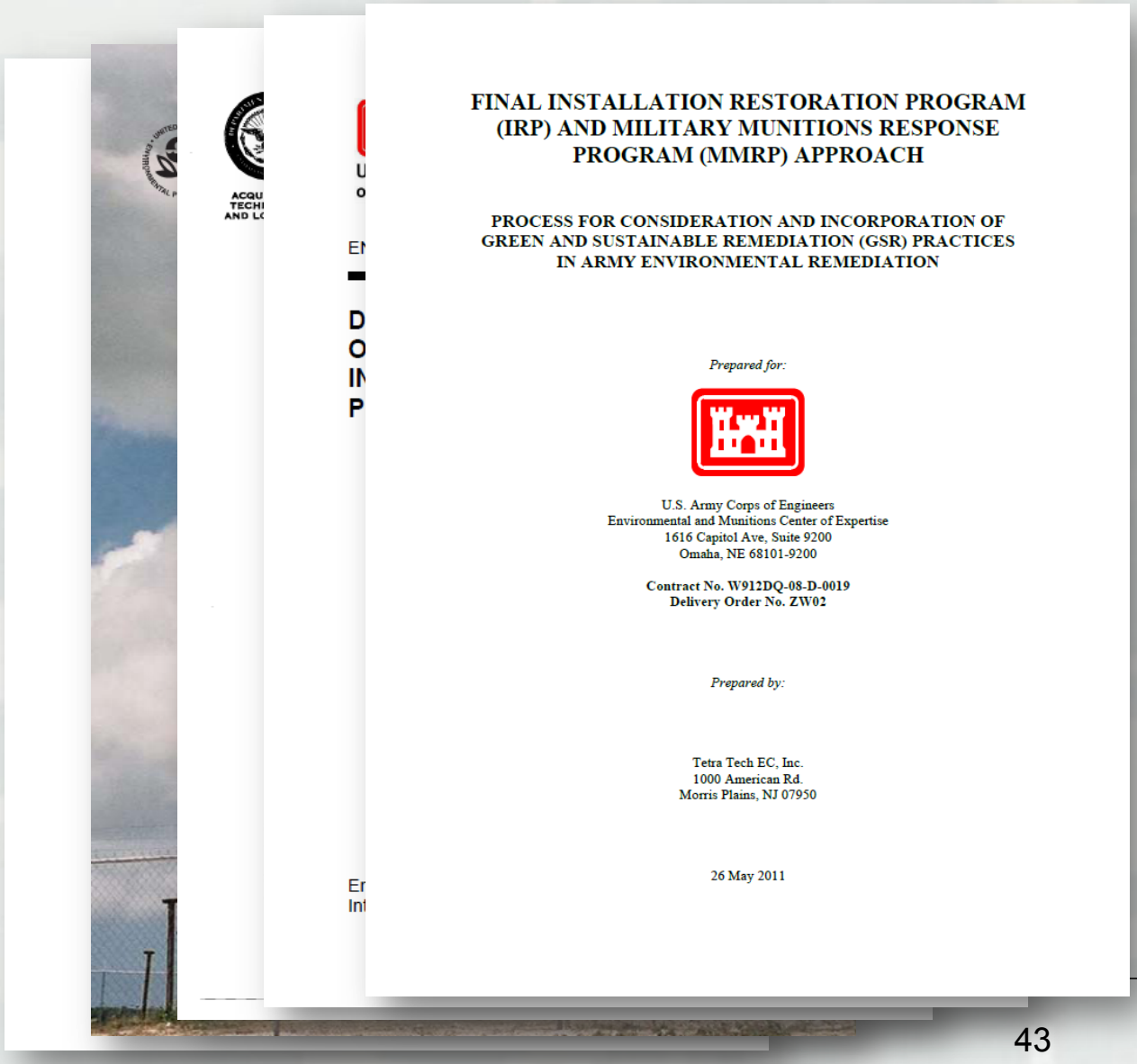
DoD Manual 4715.20, "Defense Environmental Restoration Program (DERP) Management," March 9, 2012

Policy and Guidance Drivers



Interim Guidance Document (IGD) 10-01: *Decision Framework for Incorporation of Green and Sustainable Practices Into Environmental Remediation Projects* (USACE, 5 March 2010)

Policy and Guidance Drivers



FINAL INSTALLATION RESTORATION PROGRAM (IRP) AND MILITARY MUNITIONS RESPONSE PROGRAM (MMRP) APPROACH

PROCESS FOR CONSIDERATION AND INCORPORATION OF GREEN AND SUSTAINABLE REMEDIATION (GSR) PRACTICES IN ARMY ENVIRONMENTAL REMEDIATION

Prepared for:

U.S. Army Corps of Engineers
Environmental and Munitions Center of Expertise
1616 Capitol Ave, Suite 9200
Omaha, NE 68101-9200

Contract No. W912DQ-08-D-0019
Delivery Order No. ZW02

Prepared by:

Tetra Tech EC, Inc.
1000 American Rd.
Morris Plains, NJ 07950

26 May 2011

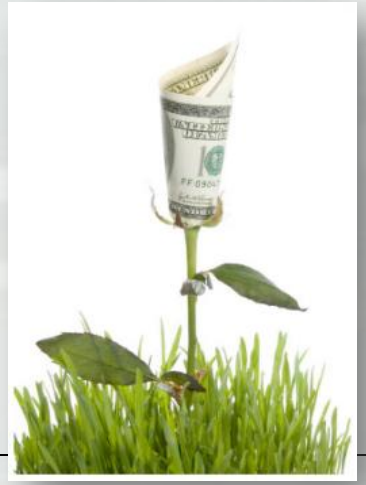
Process for Consideration and Incorporation of Green and Sustainable Remediation (GSR) Practices in Army Environmental Remediation (USACE, 26 May 2011)

Policy and Guidance Drivers

- Supports USACE Environmental Operating Principles
  - Foster sustainability as a way of life throughout the organization
  - Proactively consider environmental consequences of all Corps activities and act accordingly
  - Create mutually supporting economic and environmentally sustainable solutions
  - Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments
  - Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs
  - Leverage scientific, economic and social knowledge to understand the environmental context and effects of Corps actions in a collaborative manner
  - Employ an open, transparent process that respects views of individuals and groups interested in Corps activities

Other Drivers

- Showcase GSR examples to DoD, Army, USACE
- GSR usually makes sense (energy and water conservation, and waste minimization typically result in cost savings) – the GSR evaluation process can be used to optimize a remedial process
- Remedy efficiency and cost-effectiveness important when FUDS dollars are limited and aggressive FUDS remedy complete goals set
- GSR one of the FUDS current Plus-Up Funds criteria
- FY12 FUDS Program Management Plan, Target 8.4, calls for GSR evaluation when preparing FS/CMS or when reviewing ongoing RA-O/ LTM requirements



2012 DERP Manual Policy
GSR Consideration/Incorporation

- Consideration and/or implementation of GSR opportunities when "feasible" across all remedial phases and where "practicable based on economic and social benefits and costs"
- GSR evaluation/consideration directed in Feasibility Study and Remedial Action (Design) phases; inclusion in optimizations in Remedial Operation phase
- Generally, decision documents and previous agreements will not be reopened solely for GSR consideration
- Under Army consideration, similar GSR policy

Green & Sustainable Remediation

MMRP GSR

GSR Study

- Performed by USACE EM CX for OACSIM
- Results used to develop recommendations for Army-wide GSR policy and guidance
- Reviewed key documents to identify Best Management Practices (BMPs) for GSR for MMRP
- Evaluated 3 MMRP pilots in post-SI phases
- Study Report publicly available at http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p266001coll1/id/2298

GSR Study Results

- GSR Study found that consideration of BMPs was valuable on all projects
- The Study recommended a resource threshold (energy use) to help PDTs decide when a quantitative “footprint analysis” could be useful
- Results of the study supported a quantitative footprint analysis for remedial actions where the energy use was expected to exceed 10,000 MMBtus

GSR Study Results

- The GSR study concluded that MMRP projects usually do not exceed the 10,000 MMBtu threshold

- Evaluation of Best Management Practices sufficient for most MMRP projects

GSR Approach for MMRP

- Planning
- Characterization
- Energy/Emissions – Transportation
- Energy/Emissions – Equipment Use
- Materials and Off-Site Services
- Water Resource Use
- Waste Generation, Disposal, and Recycling
- Land Use, Ecosystems, and Cultural Resources
- Safety and Community

Example of BMP Application: MMRP Pilots

BMP	Example actions
Use systematic planning process to plan activities through end use of site, involve stakeholders early in process	Series of technical project planning sessions (internal to team, then outside stakeholders, and then final project planning resulted in decisions all parties were in agreement with)
Reduce the number of trips	Carpooling to and from site in 8-14 passenger vans in work plan; consolidating lab shipments since munitions constituents have long holding time
Establish project-specific decision points to limit extent of remediation	Not digging every geophysical anomaly; rather, using a decision framework to decide where to dig
Recycle or re-use materials rather than disposing of them	Munitions debris is sent to a scrap metal recycling center rather than landfill disposal
Conduct thorough review of project documents and historical records to minimize required scope of investigation	Historical record search substantially reduced acreage to be investigated; public outreach resulted in information that further restricted the study area

Green & Sustainable Remediation

MMRP GSR OPPORTUNITIES TO CONSIDER

MMRP Alternative Comparisons

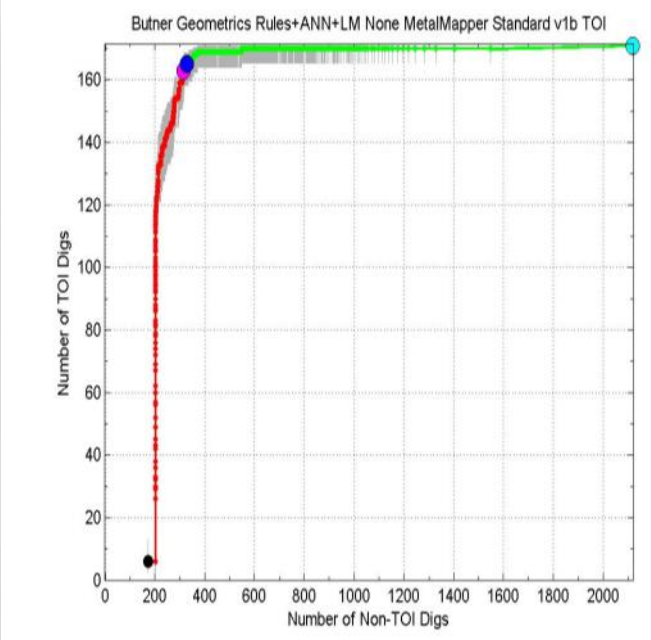
- Investigation techniques
  - Man-portable vs. vehicle-towed

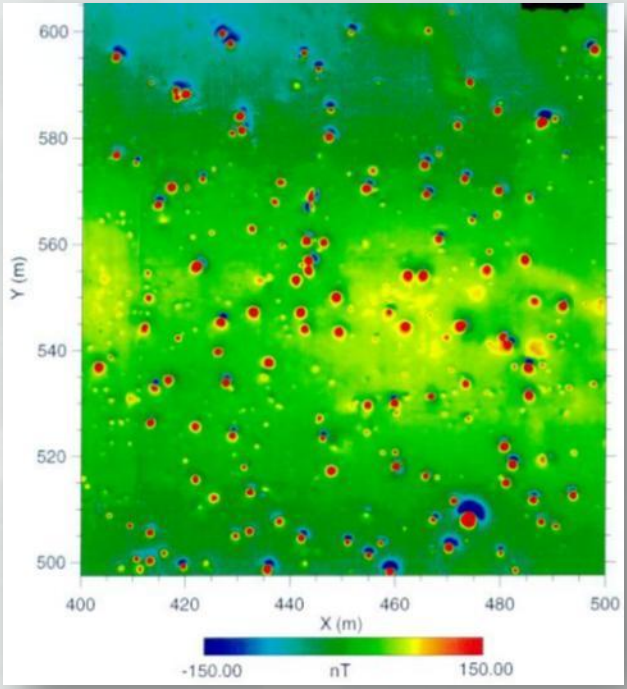
MMRP Alternative Comparisons

- Anomaly detection
  - Analog (mag & flag) vs. Digital Geophysical Mapping (DGM)

MMRP Alternative Comparisons

- Anomaly “dig/don’t dig” decision parameters
  - Using geophysics-based designs and selection criteria vs. digging everything





MMRP Alternative Comparisons

- Removal of subsurface anomalies
  - Mass removal vs. removal to depth with Land Use Controls (LUCs)

MMRP Alternative Comparisons

- MEC disposal
  - Detonation chamber vs. consolidated shot

MMRP Alternative Comparisons

- Remediation of small arms ammunition
  - Dig and haul vs. dig and sift

MMRP Alternative Comparisons

- Soil sampling
  - Incremental sampling vs. discrete sampling
- Handling Chemical Agent (CA) contaminated media
  - Dig and haul vs. on-site treatment
- Vegetation removal
  - Manual vs. mechanical

Green & Sustainable Remediation

MMRP GSR SUMMARY

Key Points

- GSR considers environmental, economic, and societal/community impacts of remedial actions.
- The DERP Manual requires consideration of GSR
- For most MMRP projects, a qualitative BMP analysis is sufficient. For large-scale projects, use the Study Screening method to determine if quantitative footprint analysis could be useful
- A lot of common practices are Green and Sustainable…take credit for it!
- Safety first!

Green & Sustainable Remediation

PATH FORWARD

Path Forward

- Update of USACE GSR Interim Guidance with Study Approach – contains specific MMRP GSR inclusion
- Upcoming Army DERP Manual includes GSR, Army-wide GSR policy being developed
- FUDS GSR web-based training Fall 2013
- Planned or ongoing research to assist in more efficient and effective characterization and remediation of munitions response sites

Questions?

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Resources

- USEPA 2008, EPA 542-R-08-002, *Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites* www.cluin.org/download/remed/Green-Remediation-Primer.pdf
- EPA general guidance link (http://www.clu-in.org/greenremediation/subtab_b3.cfm
- EPA GSR footprint spreadsheets (http://www.clu-in.org/greenremediation/methodology/index.cfm#gr-toolkit-name)
- Defense Environmental Restoration Program Manual, March 2012 http://www.dtic.mil/whs/directives/corres/pdf/471520m.pdf
- Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management http://edocket.access.gpo.gov/2007/pdf/07-374.pdf
- 2010-11 Army Environmental Cleanup Strategic Plan http://www.aec.army.mil/usaec/cleanup/10stratplan.pdf

Resources

- USACE GSR Decision Framework
  http://www.environmental.usace.army.mil/interim_guidance.htm
- USACE Environmental Operating Principles
  http://www.mvn.usace.army.mil/environmental/operatingprinciples.asp.
- US Army Offfice of the Assistant Chief of Staff for Installation Management (OACSIM) GSR Study Report
  http://cdm16021.contentdm.oclc.org/cdm/ref/collection/p266001coll1/id/2298.
- SURF White Paper 2009
  http://www.sustainableremediation.org/library/issue-papers/
- SiteWise™ GSR Tool
  www.ert2.org/t2gsrportal/tools.aspx
- SiteWise™ self-training available at
  www.ert2.org/t2gsrportal/tutorials/SitewiseTraining2/default.html
- Sustainable Remediation Tool (SRT)
  http://www.afcee.af.mil/resources/technologytransfer/programsandinitiatives/sustainableremediation/srt/index.asp

USACE EXPLOSIVES SAFETY PROGRAM

M2S2 Webinar

Guidance

28 Mar 2013

BUILDING STRONG…
SAFELY

By
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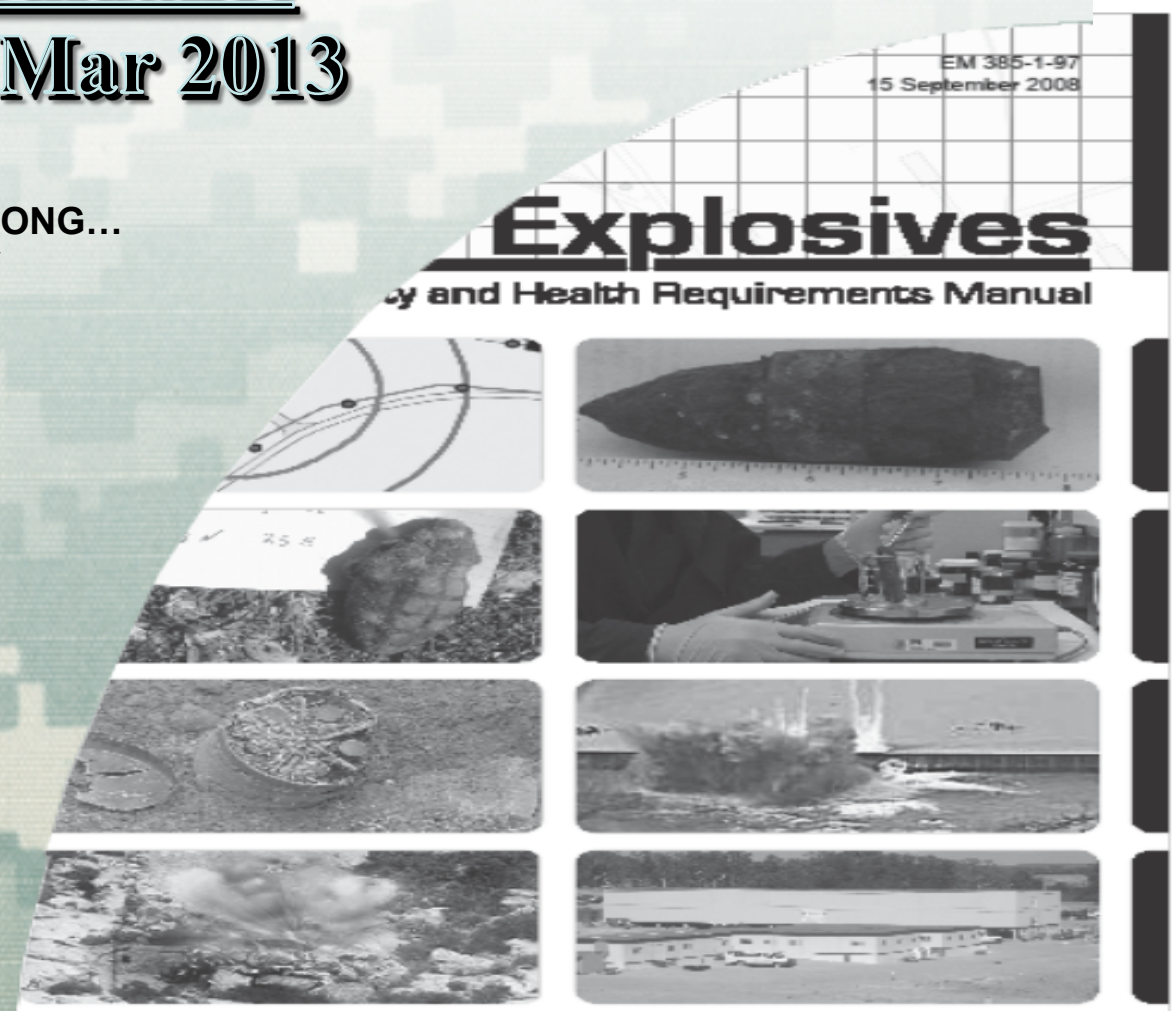


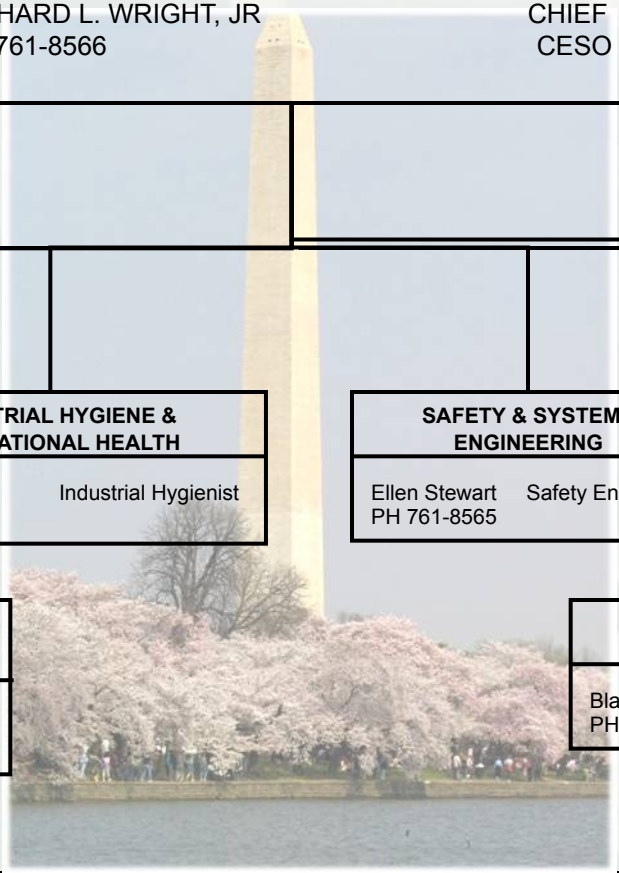
US Army Corps of Engineers
BUILDING STRONG®

USACE Explosives Safety Program
M2S2 Webinar – Guidance – 28 Mar 2013

Agenda

- HQ USACE Safety Office Organization
  - Explosives Safety Roles and Responsibilities
  - Environmental and Munitions Center of Expertise (EM CX) Services
- Explosives Safety Training Requirements
  - References
  - USACE Ordnance and Explosives Safety Specialist (OESS)
  - Unexploded Ordnance (UXO) Technicians
- USACE Explosives Safety Requirements
  - Engineer Regulation (ER) 385-1-95
  - Engineer Manual (EM) 385-1-97

HQ USACE
SOH Community of Practice
Org Chart / Staffing



SAFETY & OCCUPATIONAL HEALTH OFFICE
3/13

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PH 761-8566 — CESO

DEPLOYMENT HEALTH NURSE

CDR Thomas Janisko Physician Asst
PH 761-0348
Contract - PHC

EMERGENCY RESPONSE SAFETY

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PH 904-614-4485

POLICY & PROGRAMS

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PH 761-1989

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LOSS CONTROL

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CONSTRUCTION, OPERATIONS, AND TRAINING

Sam Crispin Safety & Health Spec
PH 761-8567

EXPLOSIVES SAFETY

Blanca Roberts Safety Engineer
PH 761-8668

HQ USACE
Explosives Safety PM

- HQ POC for all USACE Explosives Safety Issues
- HQ SOH Office Liaison to Environmental and Huntsville Engineering Center
- Explosives Safety Policy, Procedures and Technical Guidance-Proponent for ER 385-1-95, Safety and Health Req Manual for MEC Operation; and EM 385-1-97, Explosives SOH Requirements Manual
- Explosives Safety Support to DA, DoD and Others
- Hazardous, Toxic and Radioactive Waste (HTRW) Saf POC
- DA Explosives Safety, CA, Bio and Weapons SS Council Member
- Career Program Manager for OESSs
- HQ POC-CP12 Explosives Safety Cert-Level I

Explosives Safety Hierarchy

DoD (DDESB)	• Final Approval
Services (Army – USATCES)	• Army • Navy/Marine Corps • Air Force
MACOM (EM CX)	• USACE • BRAC • Active Army

USACE Authorized MM Program

…EM CX, Engineering and Support Center, Huntsville…

5-Design Centers
- South Pacific Division
- Omaha District
- Baltimore District
- Huntsville Center
- Huntsville Center RCWM

9-Remedial Action Districts
- Sacramento District
- Los Angeles District
- Honolulu District
- Baltimore District
- Savannah District
- Omaha District
- Fort Worth District
- Louisville District
- Huntsville Center

…South Pacific Division Partnered w/Southwestern Division
…77 OE Safety Specialists
…Subject Matter Experts
…HQ Military Munitions Support Services (M2S2)
…HQ SOH Explosives Safety PM

USACE Explosives Safety Program

USACE OESS CAPACITY

- 77 Total OESS and 69 Exec OESS Functions
  - 58-Conventional and 11-RCWM
    - EM CX, Environmental and Munitions Center of Expertise (2)
    - TL (2)
    - Supv (2)
  - Career Move (8)
    - PM, Project Manager (3)
    - SOH, Safety and Occupational Health Chief (Dist) (1)
    - SOHO, Safety and Occupational Health Officer (3)
    - RA, Rehired Annuitant (1)

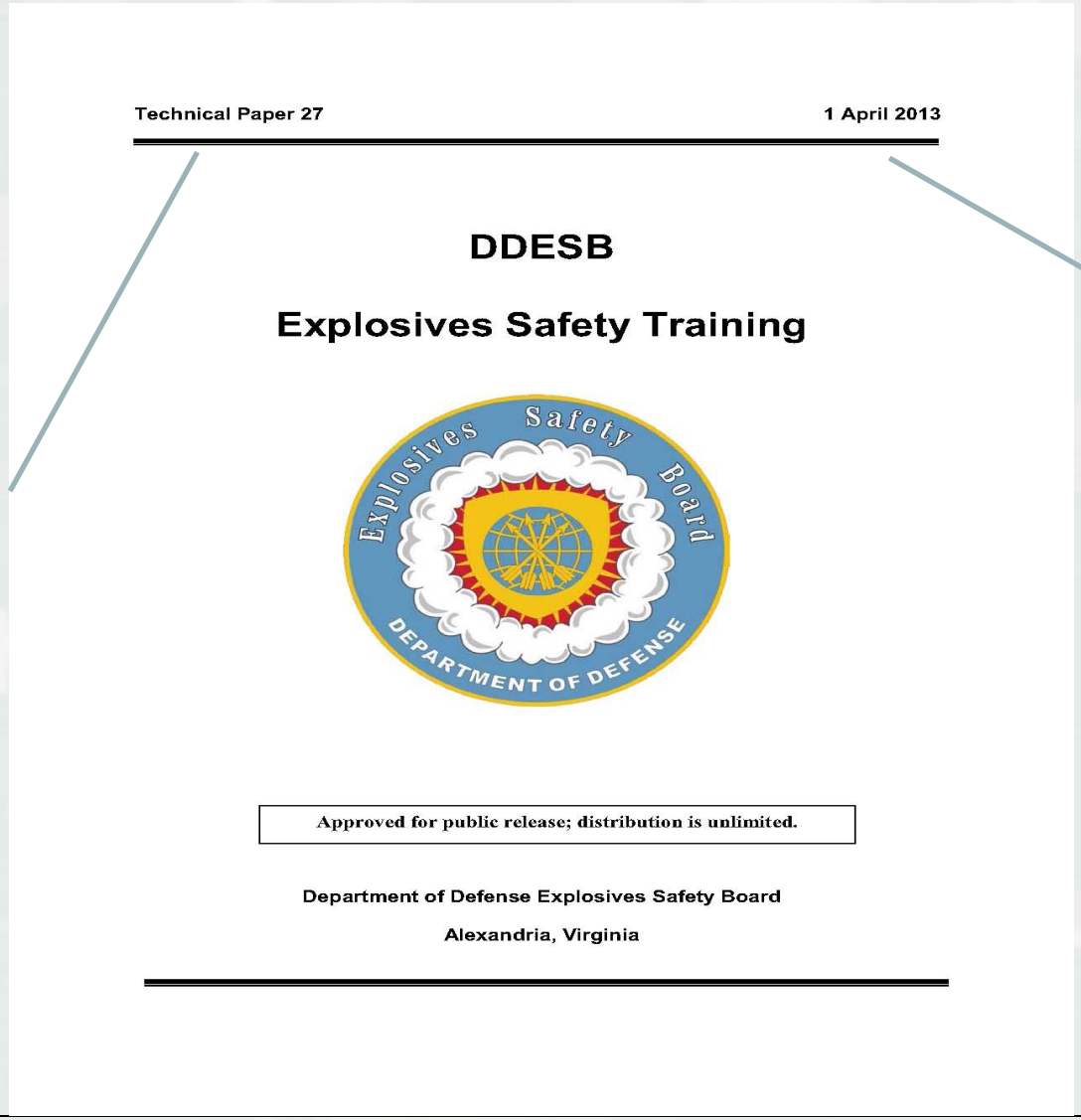
EM CX Explosives Safety Services

- Review and Approval of RESSs
- Develop Explosives Safety Policy and Guidance as Directed by HQ CESO
- Review Project Documents for Appropriate Application of DoD, DA and USACE Explosives Safety Requirements
- Conduct Safety and Process Quality Review of Project Sites
- Work with Federal and State Working Groups to Develop Regulatory Guidance Documents and Training for MMRP
- Work Closely with Other Services to Resolve Explosives Safety Issues and Concerns
- Participate on Project Delivery Teams

Explosives Safety Training Requirements

- References
  - ▶DDESB Technical Paper 27
  - ▶Army Saf CP 12 Exp Saf Handbook
  - ▶DDESB Technical Paper 18

DDESB Technical Paper (TP) 27
hppt://www.ddesb.pentagon.mil



Technical Paper 27 1 April 2013

DDESB

Explosives Safety Training

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Department of Defense Explosives Safety Board

Alexandria, Virginia

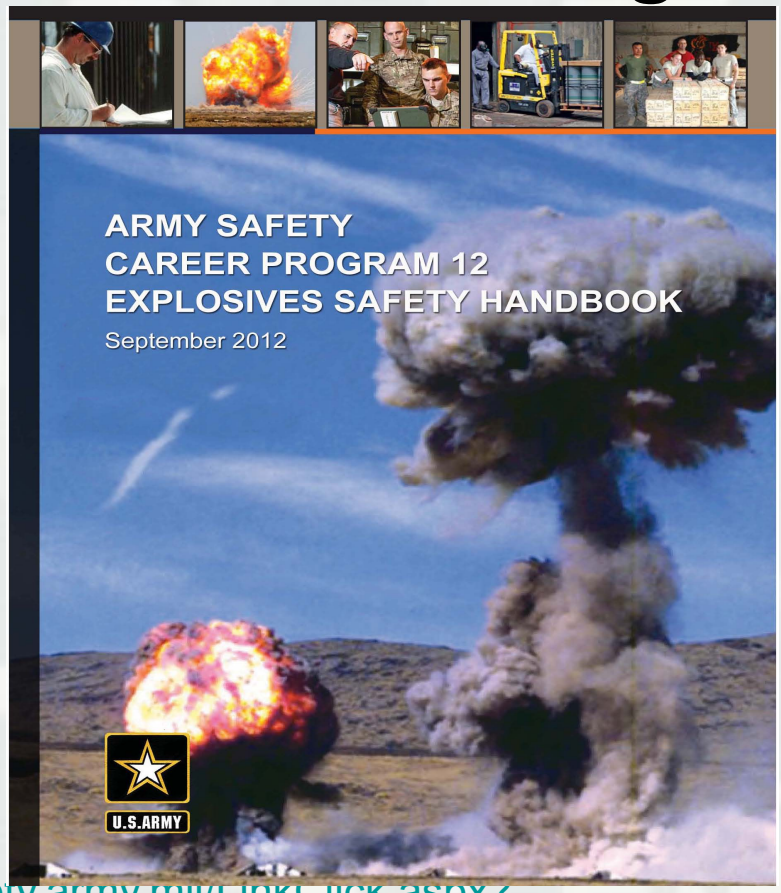
Technical Paper 27

1 April 2013

DDESB TP 27 Highlights

- Pre-Requisite: EOD Technician
- Training: “Explosives Safety for OE Safety Specialists”
  - ►To be scheduled within 6 months of initial hire or placement
  - ►Details to be incorporated into EM 385-1-97

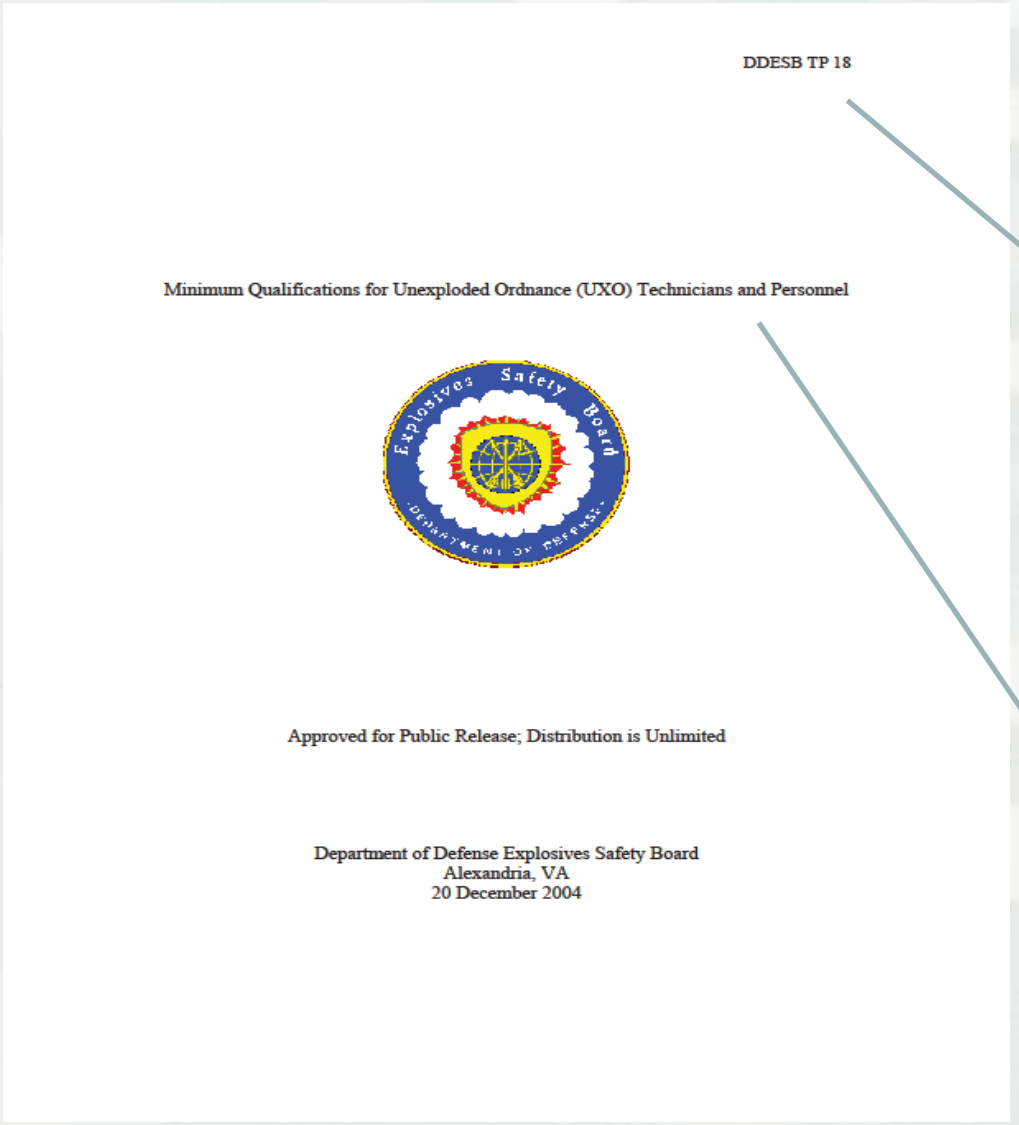
USACE Explosives Safety Program
CP 12 Training



Handbook: https://safety.army.mil/LinkClick.aspx?fileticket=Xja4wMm9ncQ=&tabid=2235

ANSI Certificate Application: https://safety.army.mil/cp12/QuickLinks/CP12CertificateProgram/tabid/2253/Default.aspx

DDESB TP 18



DDESB TP 18

Minimum Qualifications for Unexploded Ordnance (UXO) Technicians and Personnel

Approved for Public Release; Distribution is Unlimited

Department of Defense Explosives Safety Board
Alexandria, VA
20 December 2004

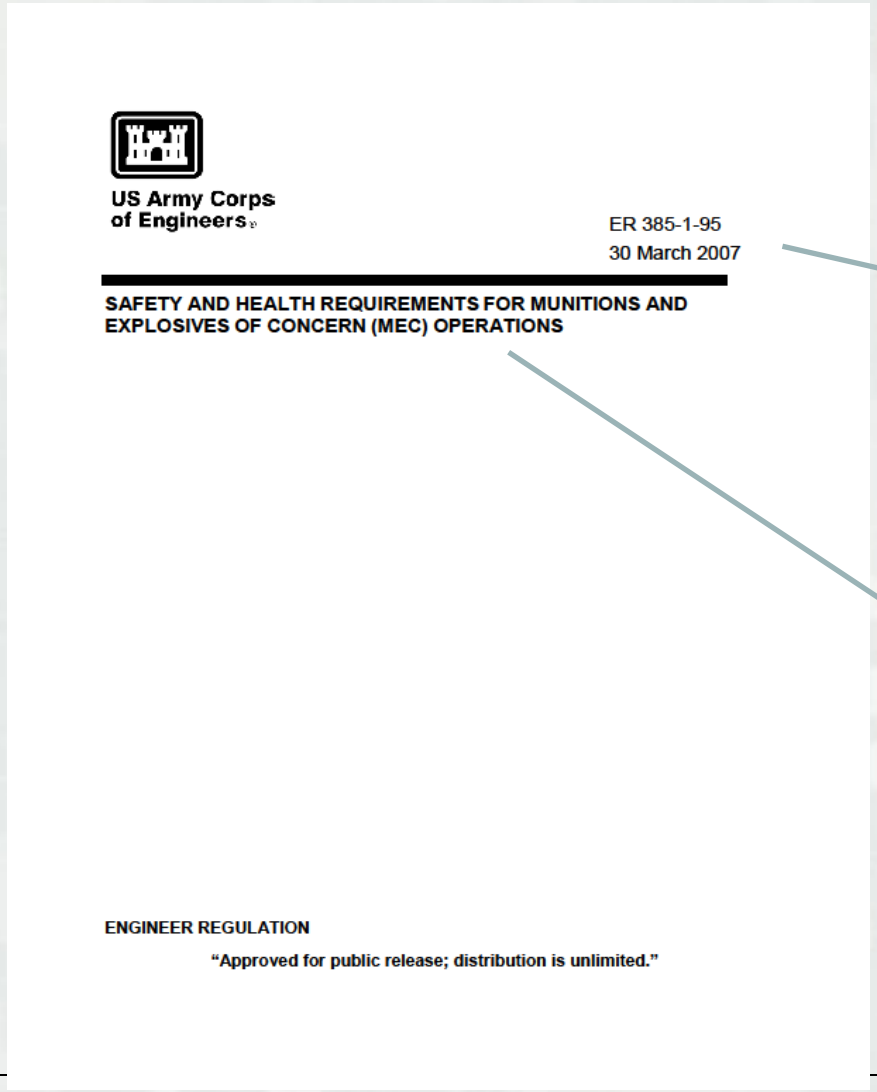
DDESB TP-18

Minimum Qualifications for UXO Technicians and Personnel

DDESB TP 18

- Primary Duties/Roles of UXO Technicians
- Minimum Training and Qualification standards
  - ▶UXOSP
  - ▶UXO Tech I, II, III
  - ▶UXOQCS
  - ▶UXOSO
  - ▶SUXOS

ER 385-1-95



US Army Corps of Engineers

ER 385-1-95
30 March 2007

SAFETY AND HEALTH REQUIREMENTS FOR MUNITIONS AND EXPLOSIVES OF CONCERN (MEC) OPERATIONS

ENGINEER REGULATION

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ER 385-1-95
30 March 2007

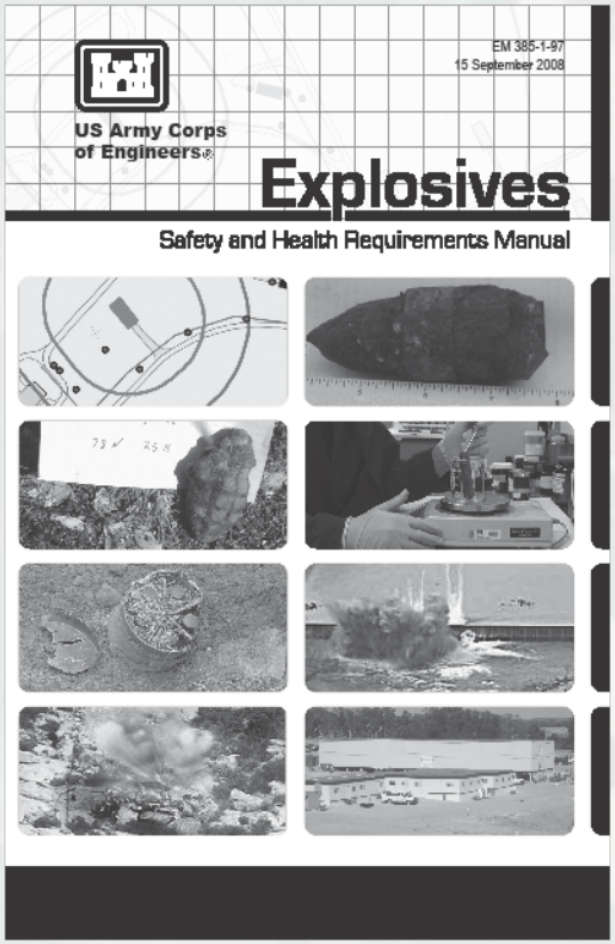
Safety and Health Requirements for MEC Operations

USACE MMRP Safety References

Engineer Regulation (ER) 385-1-95, Safety and Health Requirements for MEC Operations

- http://140.194.76.129/publications/eng-regs/
- General Safety Policy, Organizational Responsibilities.
- Authority for EM CX to Provide Direct Reporting Unit (DRU) Approval for Required Explosives Safety Submissions (ESS, ESP, CSS, CSP).
  - NOTE: New Terms “RESS”, “MRESS”, “MRESP”, “MRCSS”, “MRCSP”
- Authority for EM CX to Approve waivers.
  - NOTE: DA Changes - Waivers to CoRA to DARAD
- Establishes Requirements for Government Safety Oversight During Project Activities – *Appendix C*
- *Currently Under Revision for Publication in FY14*

EM 385-1-97
Explosives Safety and Health Requirements Manual



USACE Explosives Safety Program

EM 385-1-97

Explosives Safety and Health Requirements Manual

Chapters

I. ***MEC Activities***

II. Explosives Safety for Construction/Demolition Activities

III. ***MEC Encountered During USACE Activities***

IV. Explosives Safety Site Plans (ESSP) Requirements**

V. Explosives Safety for R&D Operations

**ESSPs are used for design and construction of Ammunition and Explosives (AE) facilities. They are NOT the same thing as a required explosives safety submission, i.e., RESS, MRESS, MRESP, etc. used during munitions response activities.

USACE MMRP Safety References

- ***Engineer Manual (EM) 385-1-97 –Explosives, Safety and Health Requirements Manual***
  - http://140.194.76.129/publications/eng-manuals/
  - 5 Errata Sheets.(Biggies are 2, 3 and 5).
  - Errata Sheet 2 – Clarifies UXO Team Composition During Construction Support and ESP Requirements During Investigation Activities.
  - Errata Sheet 3 – ESS/CSS/ESP/CSP Formats and Contents.
  - Errata Sheet 5 – Who Is Authorized on a Site to Determine if Items Are Acceptable to Move.
  - Contains all Explosives Safety Requirements, Authorized Visitors, Exclusion Zones, and Much More.
  - *Supersedes EP 385-1-95a and 95b!!!!*
  - *Currently Under Revision for Publication in FY14.*

USACE References
Proposed Revisions for FY 14
EM 385-1-97, Chapter I

- Reduce Redundancy - Streamline
- Update Terminology
- Incorporate Errata Sheets
- Develop a Single USACE Engineer Form 6048, Munitions Response Quality Assurance Report (QAR) Form (Not yet Published-Fill in PDF w/Electronic Signatures)
- Update Anomaly Avoidance and Construction Support Discussion
- Update Safety Submission Formats

USACE References
Proposed Revisions for FY 14
EM 385-1-97, Chapter I (Cont.)

- -Introduces the “DARAD” (Deviation Approval and Risk Acceptance Document)
- Updates Authorized Visitor Process
  - Only Requires Written Approval from Immediate Supervisor. (Memo Will Detail Purpose/Frequency and Duration of Activities to Be Conducted.)
  - All Visits Must Be Coordinated with the District PM.
  - Be Escorted, Receive Safety Brief, and Comply with Approved Project Safety Plans, etc.

USACE References
Proposed Revisions for FY 13

EM 385-1-97, Chapter III

Chapter III at ACE-IT for Publication

- Change Awaiting Publications
- Additional Revision Required for Final EM

USACE References
Revisions for FY 13 (Cont'd)

EM 385-1-97, Change 1 to Chapter III

- Incorporates EP 75-1-2, MEC Support During HTRW and Construction Activities
  - Anomaly Avoidance
  - Construction Support
  - Will Rescind EP 75-1-2
- Updates Design Center/Remedial Action District Contact Information
- Updates Emergency Contact Information in Appendix H

USACE References
Revisions for FY 13 (Cont'd)

EM 385-1-97, Change 1 to Chapter III

- Expands and Clarifies Discussion of Probability Assessments
- Introduces New Appendix Z:
  - Standard Format for Documenting a MEC Probability Assessment
  - Requires Safety Representative Concurrence and Signature (This Is the Installation Person with Designated or Assigned Safety Functions, for USACE Projects this Is an OESS)
  - Requires USACE/Installation Commander Concurrence and Signature

USACE Explosives Safety Program

DRU Review Plan Authority

EM 385-1-97

Responsibilities

- Chapters I and III – EM CX
- Blasting/Demolition, Chapter II – Div/Dist SOHO
- Blasting/Demolition, Chapter II - CEHNC-ED-CS-S
  - Requiring DDESB Approval
- ESSP, Chapter IV – CEHNC-ED-CS-S
- Medical/Labs, Chapter V – CEHNC-MX/CEHNC-SO (Facility Systems Safety)

USACE References

EM 385-1-97

Explosives Safety and Health Requirements Manual

Potential New Chapters

VI. Biological Safety
VII. Range Design/Construction
VIII. Transportation and Packing
IX. Protective Design
X. ES OCONUS Requirements
XI. Training

USACE Explosives Safety Program

On the Next Exciting Episode…

- *"Technology "* – 22 April
- *"Non-CERCLA Regulatory Framework"* – 30 May
- *"Characterization"* – 25 July
- *"Case Studies & Lessons Learned"* – 29 August

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  Dwayne.C.Ford@usace.army.mil

M2S2 Policy Workshop

Revised Technical Guidance for Military Munitions Response Actions

Key Enhancements and Additions

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Project Manager, Senior Geophysicist

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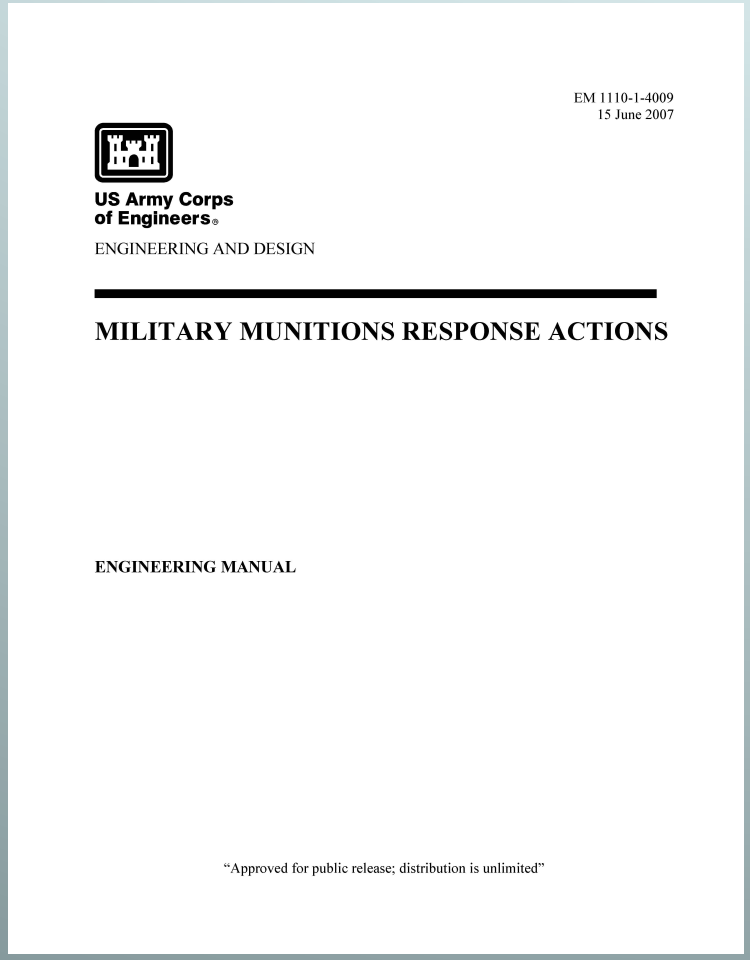
PIKA ARCADIS

Agenda

- General Overview
- Chapter Specific Enhancements and Additions

Prior Guidance – Reason for Update



EM 1110-1-4009
15 June 2007

US Army Corps of Engineers®

ENGINEERING AND DESIGN

MILITARY MUNITIONS RESPONSE ACTIONS

ENGINEERING MANUAL

"Approved for public release; distribution is unlimited"

- Reflect changes to DoD and USACE policies
- Reflect current trends/ advances/changes to MR technology/techniques
- Eliminate redundancies with other guidance
- Improve consistency with other guidance
- Update terminology and guidance references
- Reflect USACE organizational changes

Update Process

EM 1110-1-4009 (2007) *Military Munitions Response Actions*

EM 200-1-15 (2013) *Technical Guidance for Military Munitions Response Actions*

User Questionnaire

SME Interviews/ Review Available Guidance

Draft → SME Review

Draft Final →SME/ NAOC Review

Final/Editorial Review

Publication 2013

TOC Comparison (>100 pages of new content)

Key Enhancements and Additions

EM 1110-1-4009 TOC

- 1. Project Planning and Execution
- ~~2. Project Contracting Requirements~~
- 3. Site Visit
- 4. Work Plans
- 5. Geospatial Data Systems
- 6. Geophysical Planning Strategies for Response Actions
- 7. Site Characterization
- 8. Geophysical Investigation
- 9. Quality Control of Geophysical Systems and Related Operations
- 10. MC Sampling
- ~~11. Blast and Fragment Protection~~
- 12. Risk Characterization
- ~~13. Quality Assurance Surveillance Plan (QASP)~~
- ~~14. COE MPPEH Inspection, Certification, and Final Disposition Procedures~~

EM 200-1-15 TOC

- **1. Introduction**
- 2. Project Planning and Execution
- 3. Site Visits
- 4. Project Planning Documents
- 5. Geospatial Data and Systems
- 6. Geophysical Investigation Methodologies
- 7. MC Characteristics and Analytical Methodologies
- 8. Site Characterization Strategies
- 9. Planning Strategies for Remedial or Removal Actions
- **10. MC Planning Considerations for Remedial or Removal Actions**
- 11. Quality Control
- 12. Hazard and Risk Assessment
- **13. Project Reporting Requirements**

Project Flow

PIKA ARCADIS

Agenda

- General Overview
- **Chapter Specific Enhancements and Additions**

Chapter 1 - Introduction

Major Subsections	Enhancements	Additions
• Purpose • Applicability • Overview	• More clear applicability statement • TPP discussion moved to Project Planning and Execution (Ch. 2)	• Uses updated document numbers for EPs, EMs, etc. • Crosswalk table showing applicable sections by topic area

PIKA ARCADIS

Updated Guidance Document References

Prior Document No.	New Document No.	Document Title
EP 75-1-4	EP 200-1-18	Environmental Quality: Five-year Reviews of Military Munitions Response Projects
EP 1110-1-24	EP 200-1-20	Land Use Controls
EP 1110-3-8	EP 200-3-1	Environmental Quality: Public Participation Requirements for Defense Environmental Restoration Program
EM 1110-1-4007	EM 200-1-23	Safety and Health Aspects of Hazardous, Toxic, and Radioactive Waste Remediation Technologies
EM 1110-1-4009	EM 200-1-15	Military Munitions Response Actions
EM 1110-1-1200	EM 200-1-12	Conceptual Site Models for Environmental and Munitions Projects
EM 1110-1-4000	EM 200-1-17	Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites
EM 1110-1-4014	EM 200-1-16	Environmental Quality: Environmental Statistics
ER 1110-1-263	ER 200-1-7	Chemical Data Quality Management for Environmental Cleanup

PIKA ARCADIS

Content Crosswalk Table

Table 1-2: Information Locations by Topic Area

General Topic Area	Specific Topic	Relevant Section(s)
Geophysical investigation	Advanced EMI Sensors	6.3.7.3; Table 6-1
	Advanced EMI Tools and Surveys	6.3.5
	Analog Tools and Surveys	6.3.3
	Anomaly Classification	6.6.1
	Anomaly Classification – Anomaly Parameters	6.6.5
	Anomaly Classification – Anomaly Resolution	6.6.9; Table 6-6
	Anomaly Classification – Classifier Rules	6.6.7
	Anomaly Classification – Cued Data	6.6.4
	Anomaly Classification – Dig List	6.6.8
	Anomaly Classification – Selection	6.6.2; Figure 6-31; Figure 6-32
	Anomaly Classification – Training Data	6.6.6
	Data Analysis – Classification	6.6
	Data Analysis – Overview	6.6.1
	Deployment Platforms / Airborne	6.5.3; Figure 6-28
	Deployment Platforms / Man Portable	6.5.1; Figure 6-26
	Deployment Platforms / Multiple Instrument Arrays	6.5.2; Figure 6-27
	Deployment Platforms / Underwater Systems	6.5.4; Figure 6-29

Chapter 2 – Project Planning and Execution

Major Subsections	Enhancements	Additions
• PDT • TPP Process • Safety • Sustainability (new)	• Clearer discussion of PDT responsibilities • TPP discussion updated, more detailed, and follows revised EM 200-1-2	• Sustainability section with links to applicable EOs and other guidance

Chapter 3 – Site Visits

Major Subsections	Enhancements	Additions
• Pre-RFP Gov't. site visits • Pre-bid contractor site visits • Post-award site visits	• Reorganized • H&S requirements clarified	• More detailed suggestions for data collection

PIKA ARCADIS

Chapter 4 – Project Planning Documents

Major Subsections	Enhancements	Additions
• PMP • QASP • UFP-QAPP • APP • Property Management Plan • EPP • Interim Holding Facility/ Physical Security Plans • WMP • EMP • MR Safety Submission and Site Plans • CRP • Risk/Hazard Assessment Planning	• Significantly more guidance provided for plan objectives and content • Updated PMP/QASP	• UFP-QAPP section with crosswalk table to CIO 2106-G-05 and applicable EM sections • UFP-QAPP for MC **AND** MEC • Other plans to be appendices to UFP-QAPP

UFP-QAPP/EM Crosswalk

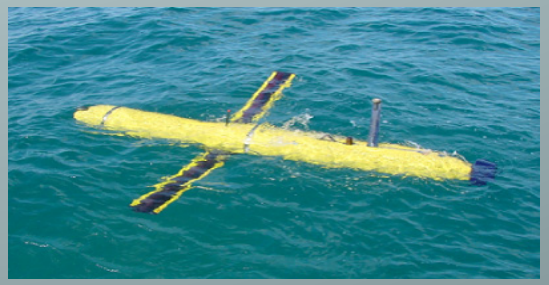
Worksheet Number(s)	Worksheet Title	CIO 2106-G-05 QAPP Guidance Section[a]		Potential Applicability		EM 200-1-15 Section
		Section	Title	MEC	MC	
1, 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off	•	•	NA
3, 5	Project Organization and QAPP Distribution	2.2.3	Distribution List	•	•	2.1; 2.2
		2.2.4	Project Organization and Schedule			
4, 7, 8	Personnel Qualifications and Sign-off Sheet	2.2.1	Title, Version, and Approval/Sign-Off	•	•	2.1.4; 6.2.1, 8.2.5.1
		2.2.7	Special Training Requirements and Certification			
6	Communication Pathways	2.2.4	Project Organization and Schedule	•	•	2.1; 2.2
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data	•	•	2.2
10	Conceptual Site Model	2.2.5	Project Background, Overview, and Intended Use of Data	•	•	2.2.4.1.3, 12.2
11	Project Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria	•	•	2.2.4; 5.3; 9.2; 11.3
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria	•	•	5.3.7; 11.3; Tables 11-3 through 11-6

Chapter 5 – Geospatial Data and Systems

Major Subsections	Enhancements	Additions
• Requirements for acquiring and accessing data • DQOs • SOW • Planning considerations • MRS site delineation	• Moved GDS deliverable and mapping requirements to Project Reporting Chapter (13)	• Munitions Response Site Delineation

Chapter 6 – Geophysical Investigation Methods

Major Subsections	Enhancements	Additions
• Geophysical Systems • Geophysical Tools • Positioning and Navigation • Deployment platforms • Data analysis workflow • GSV planning considerations • Special planning considerations	• Tables of land, airborne, and marine geophysical detection technologies	• Geophysical Data Analysis Workflow • MEC Classification techniques and equipment • Geophysical Systems Verification



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Chapter 7 – MC Characteristics and Analytical Methodologies

Major Subsections

- MC sources
- MC overview and analytical instrumentation
- Primary explosives
- Secondary explosives
- Propellants
- Metals
- CAs and ABPs
- Riot control agents
- Incendiaries
- Smokes and obscurants
- Other MC
- PAHs
- Info sources to ID MC in munitions

Enhancements

- Focus on MC characteristics – MC sampling guidance moved to other chapters (8, 10)
- References to analytical methods updated
- Information from latest USACE MC training materials included
- MC quality management moved to QC chapter (11)
- MC sampling considerations moved to separate Site Characterization Chapter (8)

Additions

- MC physical properties provided in appendix D

Chapter 8 – Site Characterization Strategies

Major Subsections

- Overview/Goals/Objectives
- Planning considerations
- Statistical tools
- Locating concentrated munitions use areas
- Characterizing CMUAs
- Characterizing NCMUAs
- Characterizing SA ranges
- MC sampling and analysis
- MRS delineation

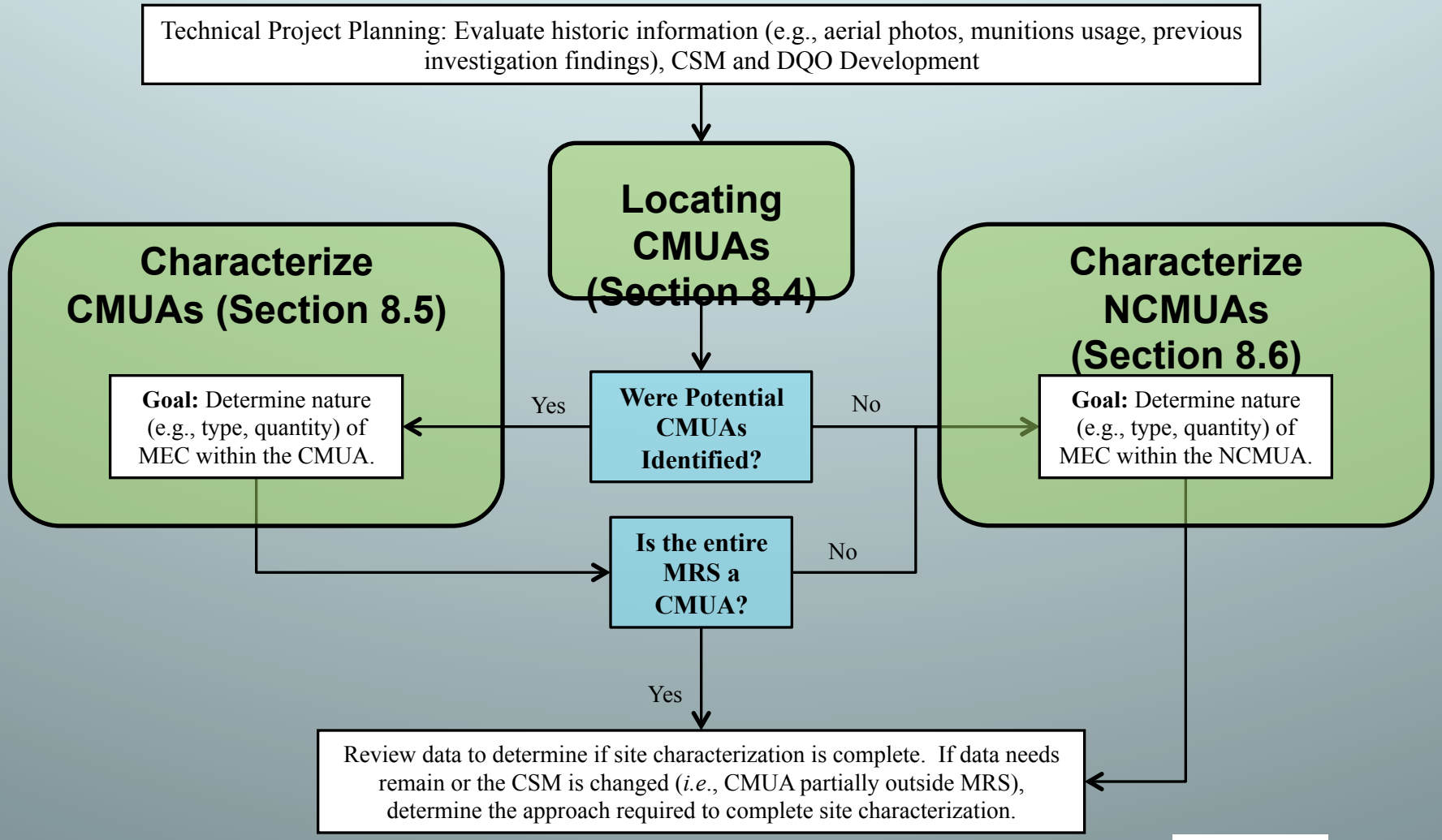
Enhancements

- Planning considerations for MEC and MC characterization
- MC sampling tied to MEC
- New Terminology (CMUA and NCMUA)

Additions

- Site characterization decision logic diagrams
- Statistical tools (VSP, UXO Estimator)
- Incremental sampling guidance
- Planning for chemical data QC
- Characterization of CMUAs and NCMUAs
- Small arms range characterization
- MRS Delineation

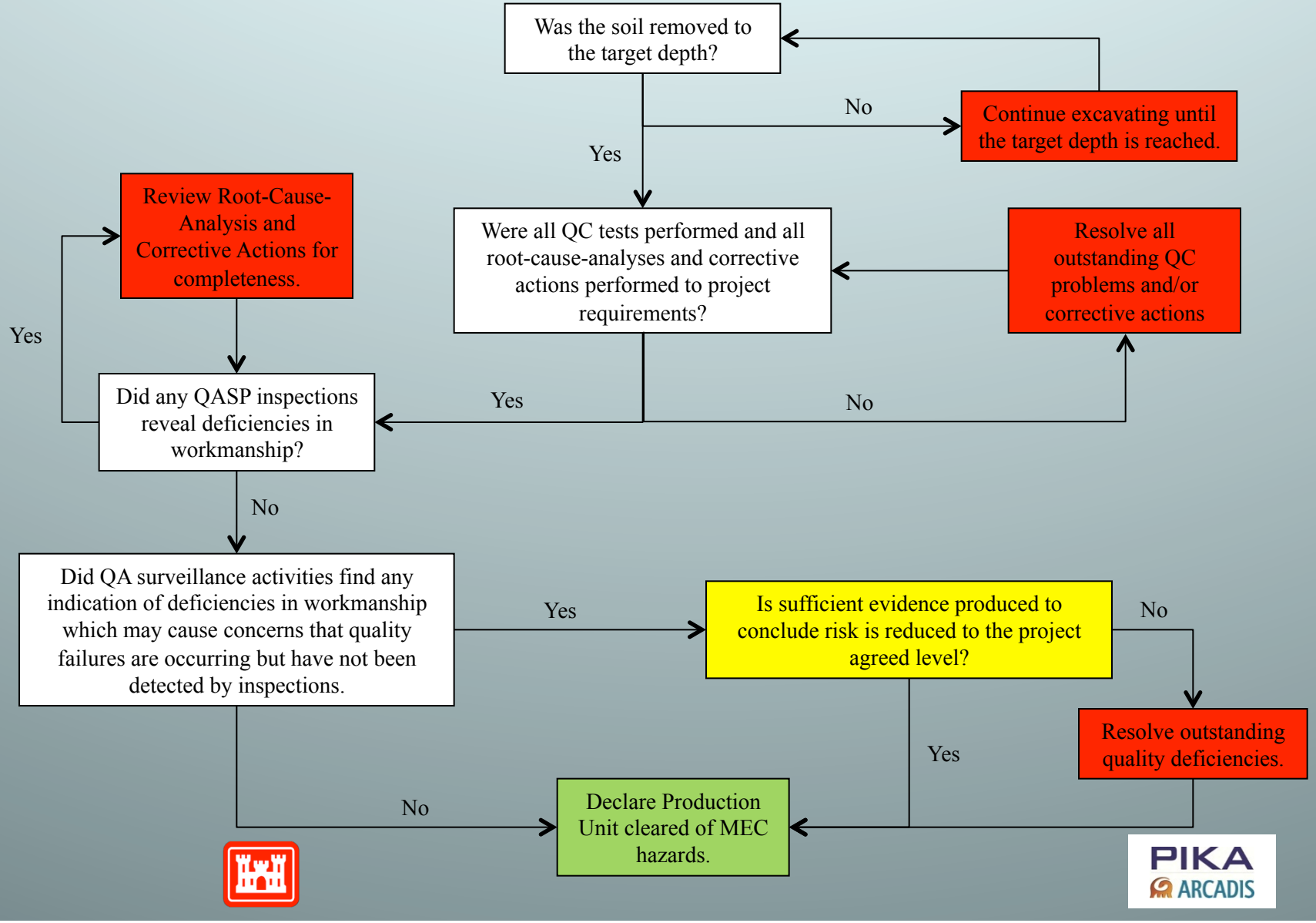
MEC Site Characterization Example



Chapter 9 – Planning Strategies for Remedial/Removal Actions

Major Subsections	Enhancements	Additions
• Geophysical planning strategies • Mass excavation planning strategies	• Classification • Removal decision diagrams	• Mass Excavation Planning Strategies

Example Mass Excavation Removal Decision Logic



Chapter 10 – MC Planning Considerations for Remedial/Removal Actions

Major Subsections	Enhancements	Additions
• Regulatory considerations • SA range cleanup • Energetics and perchlorate considerations	• NA	• New Chapter • SA Range Cleanup • Specific cleanup approaches and technologies

Chapter 11 – Quality Control

Major Subsections

- MEC quality management
- MC quality management
- Geospatial and data systems quality management

Enhancements

- Relocated MC and GDS QC to this chapter

Additions

- Classification
- Tables with RI/RA DGM performance requirements
- Tables with RI/RA analog methods performance requirements

RI DGM Performance Requirements (excerpted)

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[b]
Static repeatability (instrument functionality)[c]	All	Response (mean static spike minus mean static back ground) within +/- 10%	Min 1 daily	Day's dataset fails unless seed item is mapped that day with repeatable anomaly characteristics (see dynamic detection repeatability).
Along-line measurement spacing	All	98% <= 25 cm along line[d]	By dataset	Dataset submittal fails.
Speed	Transects [e]	95% within maximum project design speed or demonstrated speed	By dataset	Dataset submittal fails unless new maximum speed successfully demonstrated at IVS.
Coverage *	Grids	> 90% coverage at project design line spacing and 98% coverage at 1 meter line spacing[f]	By dataset or grid[g]	Submittal fails unless gaps filled, additional data collected, or government refund for missing acreage.
Dynamic detection repeatability (IVS and GSV blind seeding)	IVS (applies to grids and transects)[h]	Peak response repeatable to +/- 25% of expected response[i]	Twice daily.	Submittal fails.
	Blind Seeds (applies to grids and to transects with intrusive)	Peak response > 75% of minimum expected response[i]	1 per day per team based on expected production rate	Submittal fails.
Dynamic positioning repeatability (IVS and GSV blind seeding)	IVS (applies to grids and transects)	Position offset of seed item targets <= 25 cm	Twice daily	Submittal fails.
	Blind seeds (applies to grids)	90% positioning offset is <=25 cm + ½ line/sensor spacing and 100% is <=35cm + ½ line/sensor for digital positioning systems (<=50cm + 1/2 line spacing for fiducially positioned data) OR the positioning DQO required for site specific tasks[j]	1 per day per team based on expected production rate	Submittal fails.

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Chapter 12 – Hazard and Risk Assessment

Major Subsections

- CSM development
- MEC hazard assessment
- MC risk assessment
- Hazard and risk assessment principles
- Risk communication
- Long-term management of residual hazards

Enhancements

- Discussion of HHRA and ERAs

Additions

- MEC HA process
- MC risk assessment guidance
- Risk assessment at underwater MRSs

Chapter 13 – Project Reporting Documents

Major Subsections

- Cultural resources reporting
- Ecological resources reporting
- MRS Prioritization Protocol
- Geospatial data and systems reporting
- IVS or GPO letter report
- Geophysics data deliverables
- MC data deliverables

Enhancements

- Synthesizes reporting requirements

Additions

- IVS
- Ecological and cultural reporting requirements

Appendices

Major Subsections	Enhancements	Additions
• App. A – References • App. B – QASP Template • App. C – Sample Discipline-Specific QA Reports • App. D – Chemical / Physical Properties of MC • Glossary	• App. C provides examples of reports to meet QASP requirements	• App. D – synthesis of MC data.

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Appendix D – Chemical/Physical Properties of Primary Explosives

Table D-1: Chemical/Physical Properties of Primary Explosives

Compound	Chemical Formula	Abbreviation	CAS Number	Molecular Weight	Melting Point (°C)	Boiling Point (°C)	Vapor Pressure (mm Hg)	Water Solubility (mg/L)	Log K_{ow}	K_{oc}	Henry's Law constant (atm-m^3/mole)
Lead azide	N_6-Pb	LA	13424-46-9	291.24	190 (decomp)[a]	350 (explodes)[a]	U [d]	230 @ 18°C[a]	1.47 (est.)[g]	U [d]	U [d]
Mercury fulminate	C_2-Hg-N_2-O_2	-	628-86-4	284.62	210 (explodes)[f]	NA [d]	0.000612 @ 25°C (est.)[b]	100 @ 15.5°C[a]	-4.83 (est.)[b]	11.1 (est.)[b]	U [d]
Diazodinitrophenol	C_6-H_3-N_4-O_5	DDNP	4682-03-5	211.11	230.43 (est.)[b]	538.16 (est.)[b]	1.95×10^{-12} @ 25°C (est.)[b]	630.5 @ 25°C (est.)[b]	2.09 (est.)[b]	NA [d, e]	2.86×10^{-9} (est.)[b]
Lead styphnate	C_6-H-N_3-O_8-Pb	-	15245-44-0	468.3	235 (decomp)[a]	260-310 (explodes)[c]	2.65×10^{-9} @ 25°C (est.)[b]	Practically insoluble in water [a]	1.06 (est.)[b]	3010 (est.)[b]	3.58×10^{-11} (est.)[b]
Tetracene	C_{18}-H_{12}	-	92-24-0	228.30	357[b]	399 (est.)[b]	2.49×10^{-9} [b]	0.00151 @ 25°C [b]	5.76 [b]	6.46×10^{5} [b]	5.01×10^{-6} (est.)[b]
Potassium dinitrobenzofuroxane	K-C_6-H_4-N_4-O_6	KDNBF	42994-94-5	265.20	210 (explodes)[c]	NA [d]	U [d]	2,450 @ 30°C[c]	0.99 (est.)[g]	U [d]	U [d]
Lead mononitroresorcinate	C_6-H_5-N-O_4-Pb	LMNR	51317-24-9	364.32	U [d]	U [d]	U [d]	U [d]	1.31 (est.)[g]	U [d]	U [d]

Frequently Asked Questions

- Can I get a copy of the EM today?
  - No. Not yet.
- Why not?
  - It is undergoing final legal review and not yet approved for public distribution.
- So, when can I get my hands on it?
  - May/June 2013.

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Revised Technical Guidance for Military Munitions Response Actions: Munitions Constituents Aspects

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US Army Engineering and Support Center, Huntsville

28 March 2013

US Army Corps of Engineers
BUILDING STRONG®

MC Aspects – Where are they?
EM 200-1-15: Table of Contents

1. Introduction
2. **Project Planning and Execution**
3. Site Visits
4. **Project Planning Documents**
5. **Geospatial Data and Systems**
6. Geophysical Investigation Methodologies
7. **MC Characteristics and Analytical Methodologies**
8. **Site Characterization Strategies**
9. Planning Strategies for Remedial or Removal Actions
10. **MC Planning Considerations for Remedial or Removal Actions**
11. **Quality Control**
12. **Hazard and Risk Assessment**
13. **Project Reporting Requirements**

- Appendices
  - **App. A – References**
  - **App. B – QASP Template**
  - **App. C – Sample Discipline-Specific QA Reports**
  - **App. D – Chemical / Physical Properties of MC**
- Glossary

Chapter 2 - Project Planning and Execution

- Technical Project Planning (TPP)
- Data Quality Objectives (DQOs)
- Use of Uniform Federal Policy – Quality Assurance Project Plan (UFP QAPP) and EM 200-1-2 in TPP process
- CSM Development per EM 200-1-12 UPDATED 28 December 2012

Where are you taking the samples and Why?
What are the analytes and Why?
What are you doing with the data?

Chapter 4 - Project Planning Documents

- Quality Assurance Surveillance Plan (QASP)
- UFP-QAPP

Document TPP Decisions

  - Recommended Minimum Standard Operating Procedures (SOPs):
    - MC sample collection procedures
    - Hazardous material shipping, if needed (applies to certain MC samples, x-ray fluorescence [XRF] sources, EXPRAY™ kits, etc.)
    - Chemistry data management
    - MC data review
    - Analytical laboratory SOPs
  - No separate Field Sampling Plan required

Chapter 4 - Project Planning Documents

- Environmental Protection Plan **Avoid project pitfalls!**
  - Ensure adequate planning in place for ecological and cultural resources
- Waste Management Plan
  - Ensure adequate planning in place to address generation, management, and disposal of various waste streams, which may include environmental sampling related investigation-derived waste (IDW), Munitions Debris (MD), material contaminated with chemical agent, and the solutions used for decontaminating equipment contaminated with chemical agent.
- Risk/Hazard Assessment Planning
  - Ensure adequate planning for data collection in place to support execution of risk/hazard assessment

Chapter 5: Geospatial Data and Systems

- Environmental Sample Data
  - ►Accuracy requirement specified ±0.3m
- GIS Data Format, Transfer, and Storage
  - ►Ensure environmental sample data is addressed in this discussion

Plan ahead so that Geospatial Data and MC Data can be smoothly coordinated

Chapter 7 – MC Characteristics and Analytical Methodologies

- Sources of MC in Munitions
- MC Analytical Laboratory Instrumentation
- Identifying MC in Munitions
  - Common Operations Reports
  - Technical Manuals and other historic documents
  - Munition Items Disposition Action System (MIDAS) https://midas.dac.army.mil/ (requires CAC and registration; contractors require DoD sponsor)
  - MVS Munitions Database (limited to personnel behind USACE firewall)

Identify what is in the Munitions at YOUR Site and Sample Based on THOSE Munitions

Chapter 7 – MC Characteristics and Analytical Methodologies

- Types of MC
  - Primary Explosives
  - Secondary Explosives
  - Propellants
  - Metals
  - Chemical Agents and Agent Breakdown Products
  - Riot Control Agents
  - Incendiaries
  - Smokes and Obscurants
  - Other Types of Munitions Constituents
  - Polynuclear Aromatic Hydrocarbons (not MC)

- Text provides some or all of the following for each type:
  - Specific compounds within each type
  - Fixed/field laboratory test information
  - Historical use in munitions
  - Limited environmental fate and transport characteristics
  - Limited sampling recommendations, primarily for compounds where sampling is not recommended

Not Just Explosives and Metals

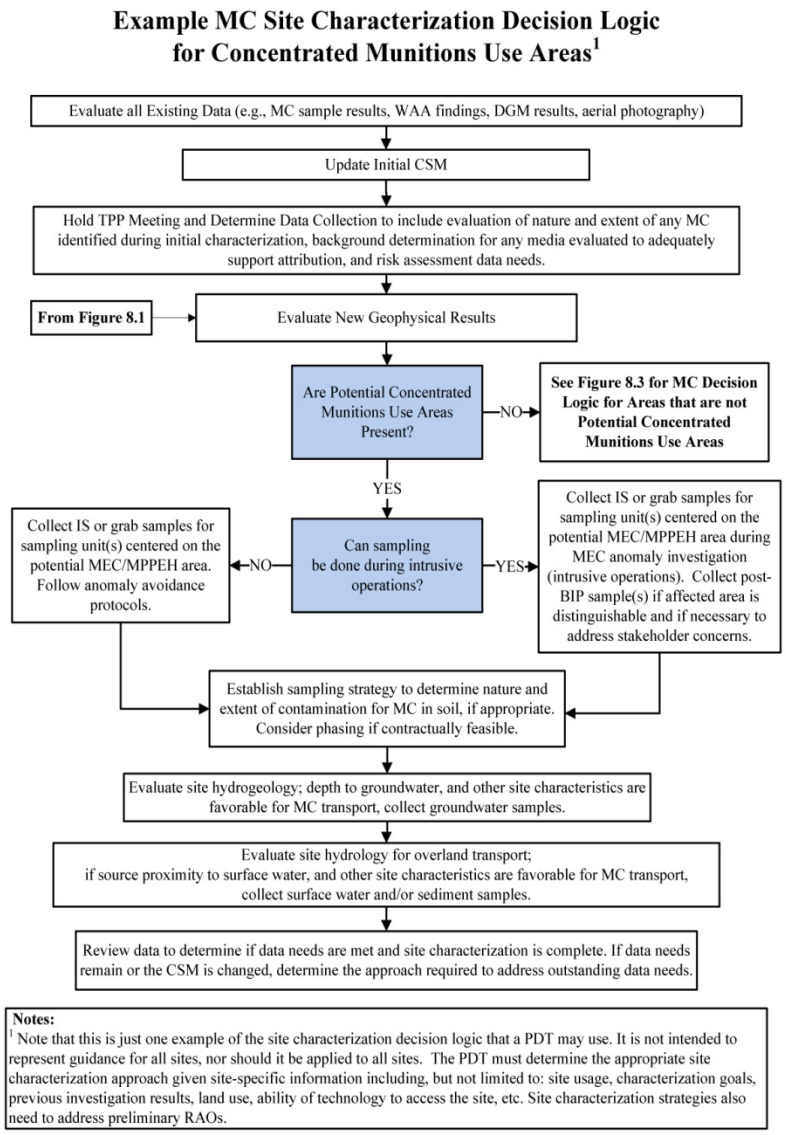
Chapter 7 – MC Characteristics and Analytical Methodologies: Metals in Munitions Compilation

Metal	Occurrence in Munitions	CERCLA Hazardous in Elemental Form	Are Compounds Hazardous Substances?	Common Oxidations States
Aluminum (Al)	Incendiaries, composition explosives, propellants, pyrotechnics (powdered Al), and rocket cases (alloys)	No	Only certain compounds	Al(0); Al(III)
Antimony (Sb)	Alloys with Pb in small arms bullets (99% Pb, 1% Sb) and in pyrotechnics	Yes	Yes	Sb(0); Sb(III); Sb(V)
Copper (Cu)	Cartridge cases (brass), bullet jackets (e.g., gilding metal), pyrotechnics, and bronze gun barrels	Yes	Yes	Cu(0); Cu(I); Cu(II)
Iron (Fe)	Present as steel in cases and projectiles, incendiaries, and pyrotechnics	No	No	Fe(0); Fe(II); Fe(III)
Lead (Pb)	Small arms bullets, primary explosives, primer compositions	Yes	Yes	Pb(0); Pb(II); Pb(IV)
Magnesium (Mg)	Incendiaries, pyrotechnics (photoflash), tracers, and armor piercing bullets	No	No	Mg(0); Mg(II)
Zinc (Zn)	Cartridge cases (brass) bullet jackets (e.g., gilding metal), HC smoke-filled munitions, and pyrotechnics	Yes	Yes	Zn(0); Zn(II)

Before you take the sample: What munitions were on the site and what metals were part of their makeup?

Table 7-9, EM 200-1-15 (in Press) (See EM for less commonly occurring metals)

Chapter 8 – Site Characterization Strategies



- Sample based on identifying either a source or a release of MC
- Coordinate sampling strategy with all data including geophysical results
- Consider whether sampling can be done during intrusive operations
- Collect samples where the evidence of munitions is the strongest during the MEC anomaly investigation (intrusive operations)

EXAMPLE decision logic – Not a Cookie Cutter

Chapter 8 – Site Characterization Strategies

- Small Arms Ranges
  - Example Decision Logic Diagrams
    - Presence or Absence
    - Nature and Extent
  - If MEC or MPPEH (other than small arms) is present, must characterize MEC, not just MC

Can you find a berm or shot fall area?

- Non-Concentrated Munitions Use Areas
  - Consider:
    - Types of munitions used
    - Frequency of use
    - Area over which the munitions were used

If no concentrated sources of MC are present, recommend not sampling!

Chapter 8 – Site Characterization Strategies: Sampling and Analytical Considerations

- MRS Layout
- MEC Depth
- Munition Composition
- Condition of any MPPEH
- Timing for MC Sample Collection if MEC or MD are Present
- Background Conditions
- Regulatory Requirements
- Chemical-specific Screening Levels, ARARs, and TBCs
- Analytical Issues with Energetics
- Site Hydrology and Hydrogeology
- MC Sampling Resources

We can't just run out and start putting dirt in jars!

Chapter 8 – Site Characterization Strategies: Surface Water Sampling

- Surface water sampling for MC must be accompanied by documentation of the characteristics of the surface water body, such as:
  - Size and shape
  - Depth
  - Flow rate (if applicable),
  - pH
  - Temperature
  - Conductivity
  - Dissolved oxygen
  - Turbidity

- If surface water has low hardness and ecological receptors (and low ecological risk screening criteria corresponding to the low hardness), use of the “clean hands” sampling method (EPA 1669) and trace metals analysis (e.g., EPA 1638,) may be appropriate.

Chapter 8 – Site Characterization Strategies: Blow-in-Place Sampling

- Pre-detonation soil sampling is not recommended
- Post-BIP Sampling
  - May be required on a site-specific basis during site characterization activities to determine if a release has occurred as a result of BIP detonation
  - If post-BIP samples are collected, specific DQOs should be established during the TPP process to define the specific uses of the data
  - Recommend IS sampling be used unless there are state or local requirements to the contrary
  - See EM for further recommendations

Chapter 8 – Site Characterization Strategies: Use of Incremental Sampling

- **IS is not mandated at the guidance level**
- During acquisition process, the USACE PDT should make an initial evaluation regarding its use, considering factors such as regulatory acceptance of IS, the lack of published IS laboratory sample processing methods for analytes other than explosives, and the availability of accredited commercial laboratory services, to determine if IS is the best method for the project.
- If the USACE PDT determines that IS is the best choice, the SOW/ PWS should specify its use.
- For performance-based contracts, the contractor may recommend an alternate approach during the proposal phase for government consideration.
- During TPP, as the project's DQOs are established, if it is concluded that the initial determination should be changed (i.e., IS is selected when discrete is in the SOW/PWS or vice versa), contracting personnel should be consulted for direction.
- If IS is determined to be required, the PDT should include personnel knowledgeable and experienced in the design of IS.

IS is a tool in our tool box.

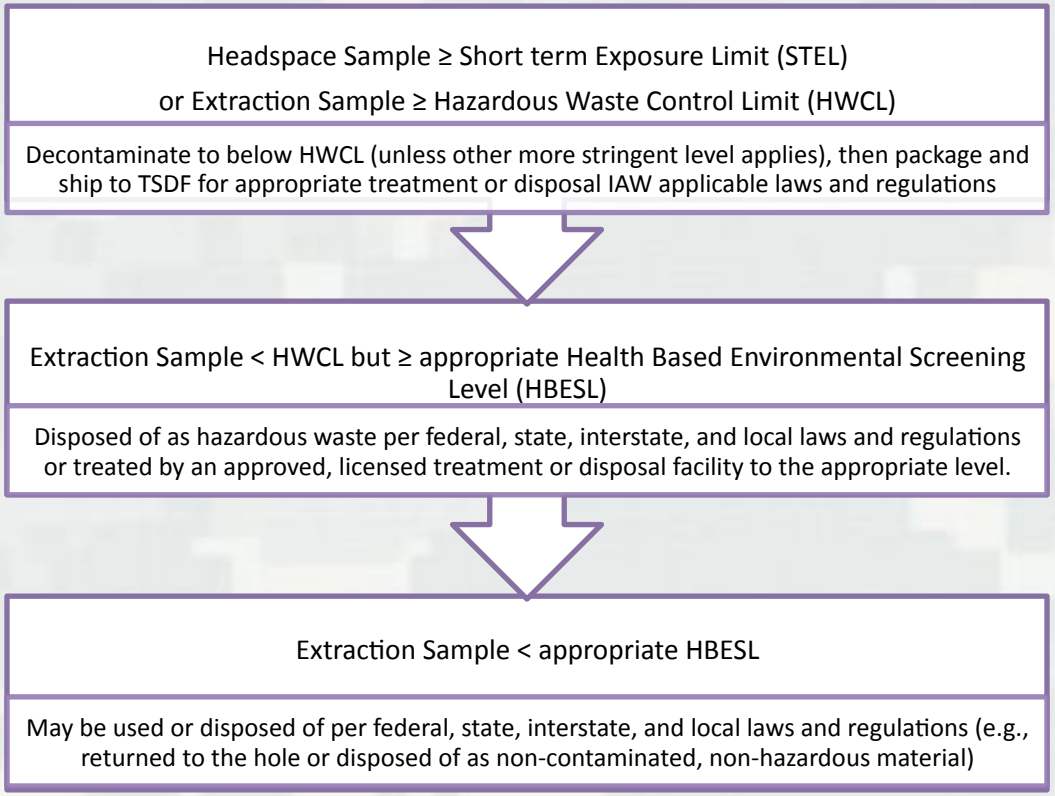
Chapter 8 – Site Characterization Strategies: Background Conditions

- Naturally occurring or anthropogenic background concentrations of metals, perchlorate, fuel oil, PAHs, or other compounds unrelated to munitions may exceed risk screening levels/ regulatory limits
- The use of published regional background data for evaluation of potential MC-related contamination is not recommended.
- Adequate and defensible background determination is key to successful site characterization if MC investigation includes these parameters.
- Each environmental medium should be evaluated to establish background values.

If it isn't from a DoD source, DoD cannot legally spend your tax dollars to clean it up.

Chapter 8 – Site Characterization Strategies: Key Requirements for MC Sampling at CWM Sites

- Incremental sampling is not recommended
- Environmental media samples must be handled differently than standard samples:
  - Onsite lab screens for agent before they are shipped offsite
  - Offsite lab performs total analysis for agent/ breakdown products
  - If total analysis is Non-Detect, the sample can be released for commercial laboratory analysis.



Laboratory limit of quantitation must be below HBESL

Chapter 10 – MC Planning Considerations for Remedial/Removal Actions: Small Arms Ranges

- Recommended Design Parameters*
  - Grain-size distribution of soil
  - Clay content
  - Organic content
  - Soil pH
  - Contaminant form
  - Contaminant distribution vs. grain-size

*In addition to nature and extent

- Soil Treatment Technologies
  - Soil Screening
  - Excavation and Disposal
  - Soil Washing
  - Solidification/Stabilization
  - Chemical Extraction

Effective characterization planning can improve cleanup design process

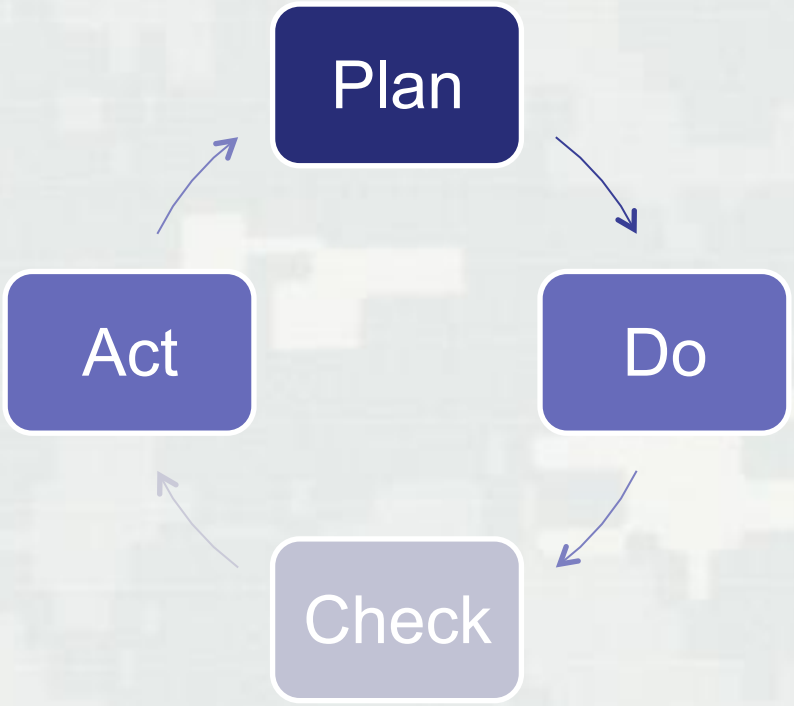
Chapter 10 – MC Planning Considerations for Remedial/Removal Actions: Energetics and Perchlorate

- Soil
  - In-situ biological treatment
    - Vadose zone bioremediation
    - Phytoremediation
  - Ex-situ biological
    - Composting
    - Landfarming
  - Alkaline Hydrolysis
  - Leaching from Vadose Zone Soils
- Groundwater
  - In-situ biological treatment
    - Enhanced anaerobic bioremediation
    - Phytoremediation
  - Ex-situ Treatment
    - Granular Activated Carbon
    - Ion Exchange
    - Fluidized Bed Reactor

Treatment for these MC has rarely been necessary at former ranges

Chapter 11 – Quality Control

- Focus on QC performance IAW project-specific UFP-QAPP to meet project DQOs



"It is easier to do a job right than to explain why you didn't." – Martin Van Buren

Chapter 12 – Hazard and Risk Assessment: Munitions Constituent Risk Assessment

- Human Health Risk Assessment
  - Selecting MC COPCs
  - Exposure assessment
  - Toxicity assessment
  - Risk characterization
  - Evaluation of uncertainties and limitations
- Ecological Risk Assessment
  - Screening Level ERA (SLERA)
  - Baseline ERA (BERA)

Risk assessment for MC = Risk assessment for HTRW

Chapter 13 – Project Reporting Documents

- Reporting Guidance for:
  - Cultural and Biological Resources Field Surveys
  - Cultural Resource Monitoring
  - Biological Avoidance
  - MC Data Deliverables
    - Field Reporting
    - Analytical Laboratory Electronic Data
    - Chemical Data Final Report

Check PWS/ SOW for Contract-specific Requirements

Appendix D - Chemical/Physical Properties Of Munitions Constituents

- MC Classes:
  - Primary Explosives
  - Secondary Explosives, Co-Contaminants, and Breakdown Products
  - Chemical Agents and Agent Breakdown Products
  - Riot Agents and Smokes

Provided to help support MC fate and transport discussions

- Parameters
  - Compound
  - Chemical Formula
  - Abbreviation
  - CAS Number
  - Molecular Weight
  - Melting Point (°C)
  - Boiling Point (°C)
  - Vapor Pressure (mm Hg)
  - Water Solubility (mg/L)
  - Log K_{ow}
  - K_{oc}
  - Henry's Law constant (atm-m^3/mole)

Questions?

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M2S2 Policy Workshop

Revised Technical Guidance for Military Munitions Response Actions

Geophysics

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Outline

- **Terminology**
- Geophysical Data Analysis Workflow
- MEC Site Characterization
- Quality Control Performance Requirements
- Preliminary RAOs

Terminology

- Concentrated Munitions Use Area (CMUA) –
  - High likelihood of finding MEC and high amount of MD from historical munitions use and fragmentation.
  - Entire MRS or areas within MRSs
  - Examples
    - Target areas on ranges
    - explosion sites
    - OB/OD
    - potentially disposal sites where munitions have been disposed of over a relatively large area (i.e., not small, isolated burial pits).
- Non-Concentrated Munitions Use Area (NCMUA) –
  - Low amount of MD and UXO due to limited historical munitions use and fragmentation.
  - May be entire MRSs (e.g., training or maneuver areas) or they may be a portion of an MRS outside of a CMUA (e.g., buffer area)

Terminology (2)

- Targets of Interest (TOI)
  - Anomalies due to UXO, DMM, or other items of interest (e.g., blind seed items)
  - May also include non-hazardous items in some cases (e.g., mortar tail fins)
- Anomaly Classification
  - Refers to determining whether an anomaly's characteristics indicate a target is or is not a target of interest (e.g., potential UXO, ISO).
  - Typically applied to the process of performing inversion of geophysical data to obtain dipole model polarizabilities.
  - Anomaly classification ≠ inversion
    - Advanced classification = advanced sensors, inversion
    - Normal classification = production DGM, thresholds, decay, etc.
  - May also apply to using peak anomaly response + other anomaly selection parameters (e.g., anomaly size, SNR).

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Outline

- Terminology
- **Geophysical Data Analysis Workflow**
- MEC Site Characterization
- Quality Control Performance Requirements
- Preliminary RAOs

Advanced Classification

- Broad guidance included
- Should use if you can make it work, ESTCP, and you're experienced
- See Sections 6.6, 11.2
- SERDP/ESTCP and ITRC
  - http://www.serdp.org/Featured-Initiatives/Munitions-Response-Initiatives/Classification-Applied-to-Munitions-Response
  - http://www.itrcweb.org/Team/Public?teamID=9

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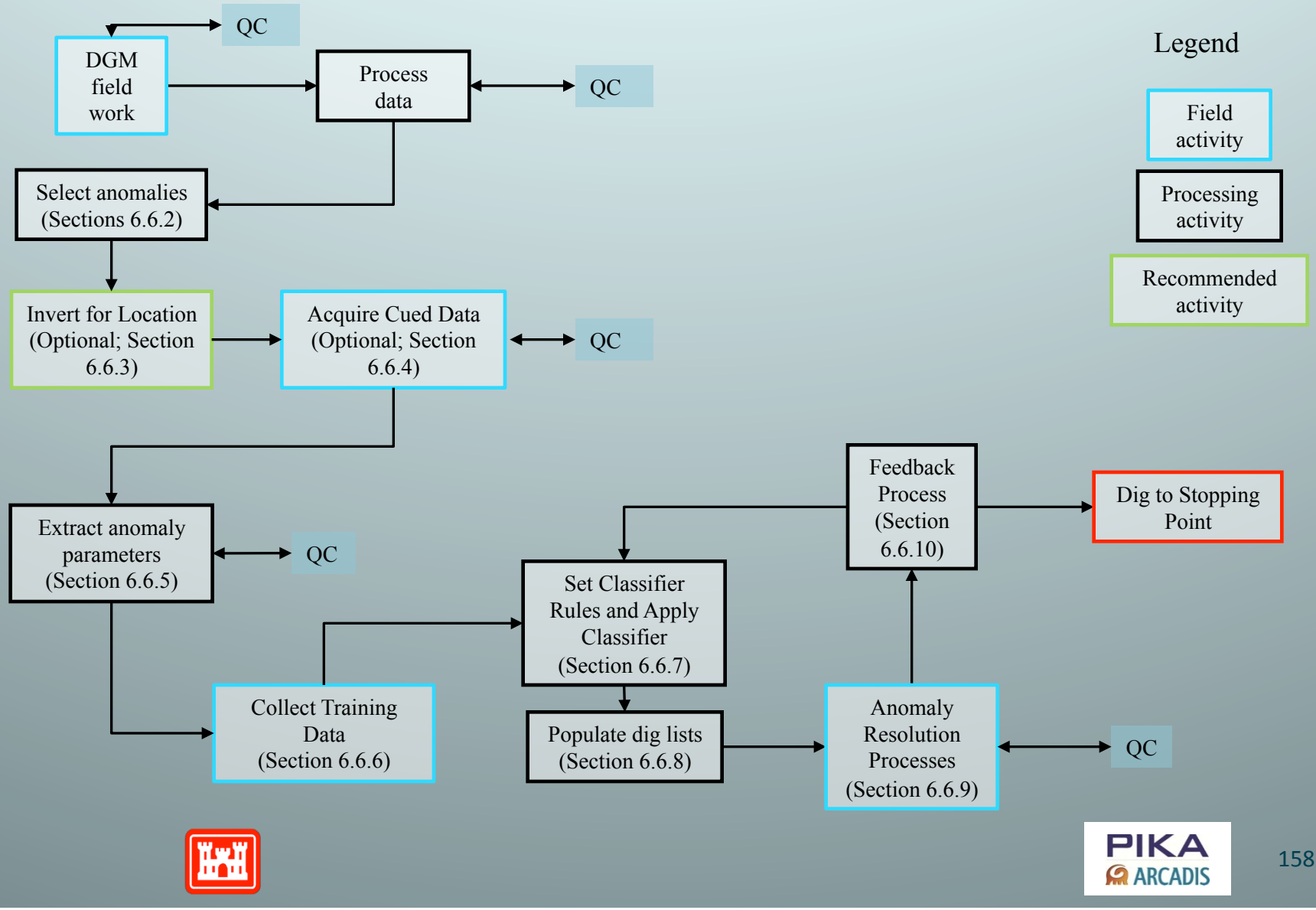
Geophysical Data Analysis Work Flow



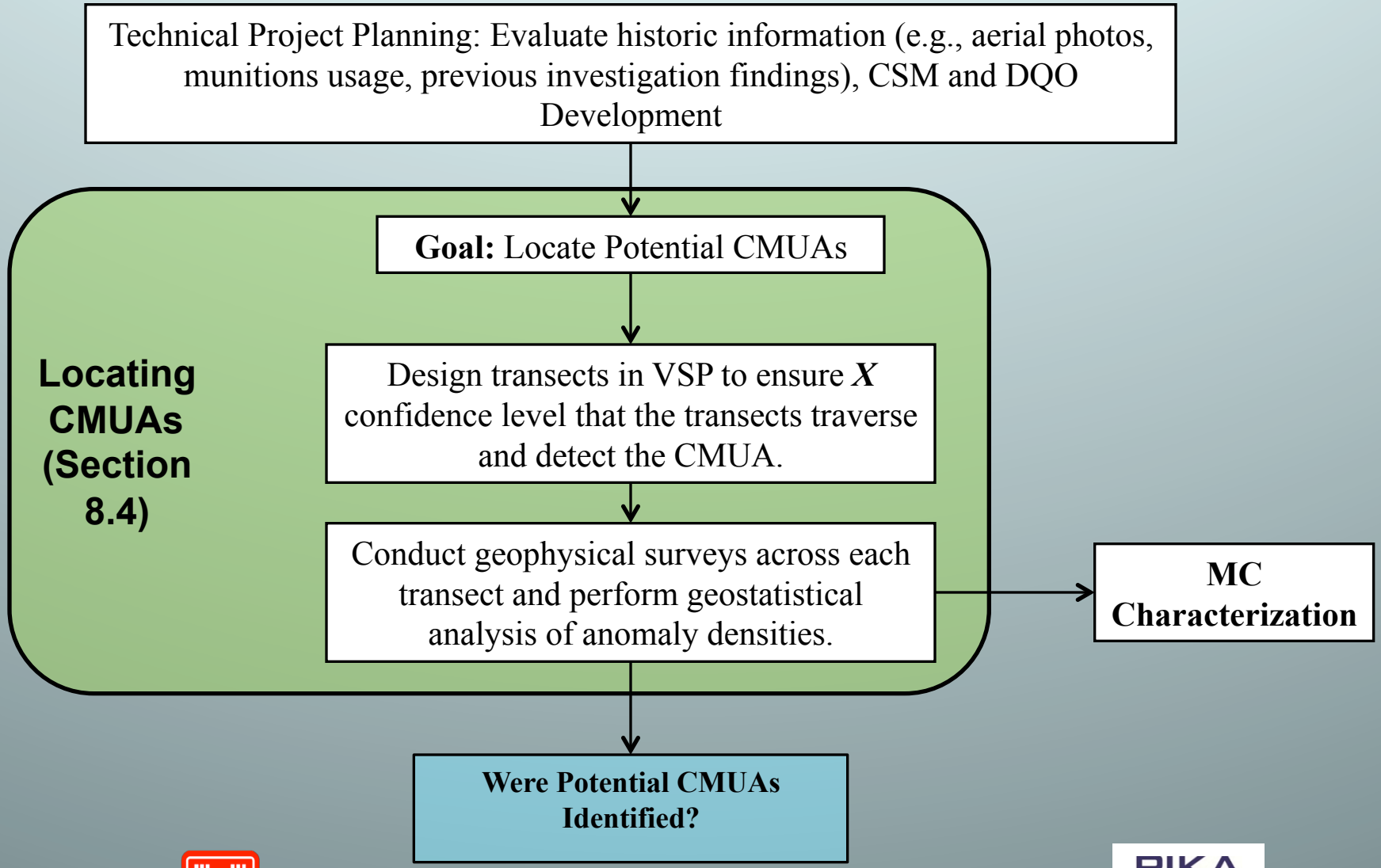
Outline

- Terminology
- Geophysical Data Analysis Workflow
- **MEC Site Characterization**
- Quality Control Performance Requirements
- Preliminary RAOs

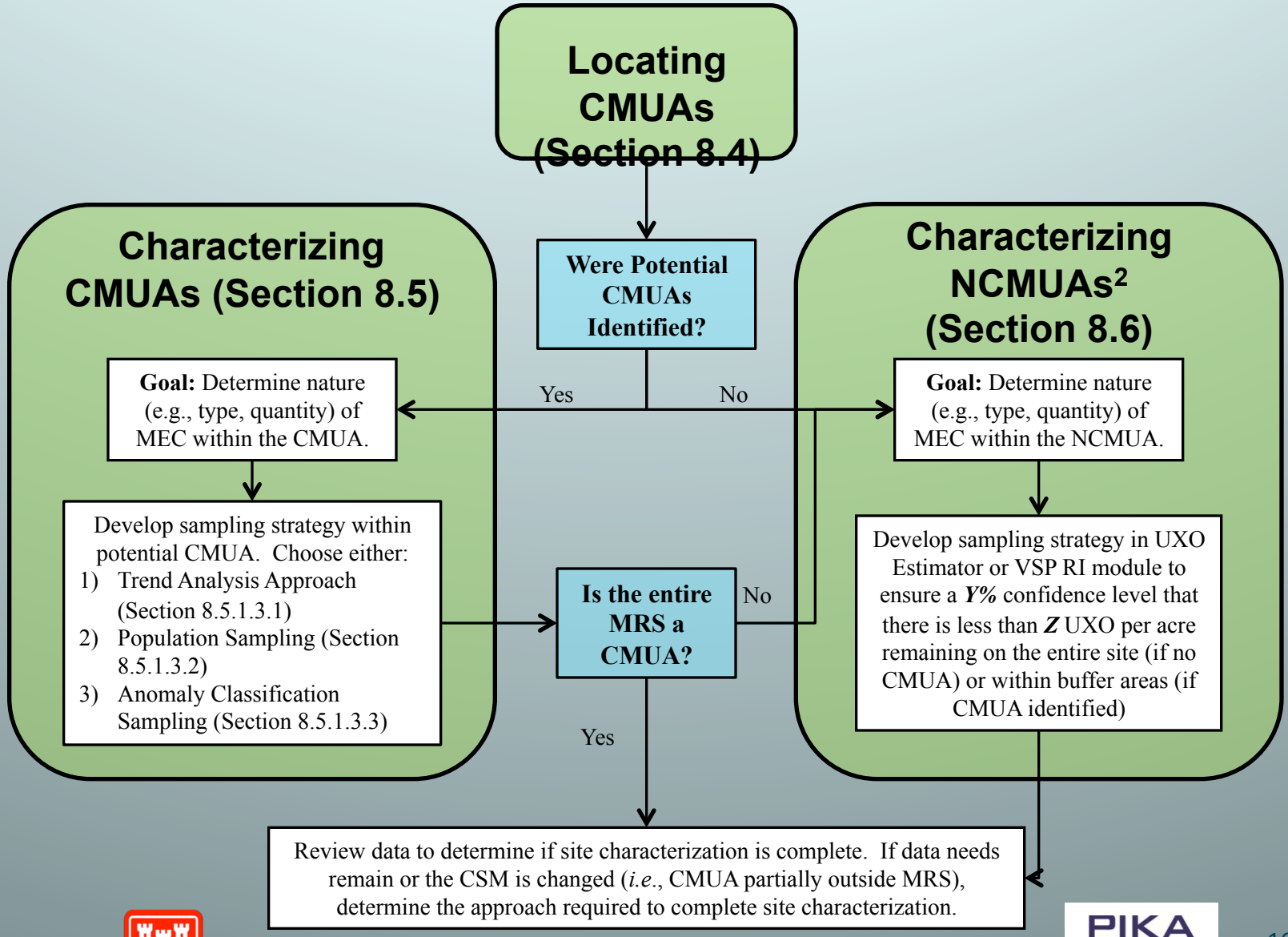
MEC Site Characterization

- Locating CMUAs
  - VSP Transect Design
- Characterizing CMUAs
  - Trend Analysis Approach
  - Population Sampling
  - Anomaly Classification Sampling
- Characterizing NCMUAs

MEC Site Characterization



MEC Site Characterization (cont.)



Geophysical Transects

- Transect design needs to be tied to specific decisions and DQOs.
- DGM, mag and dig, or density (formerly known as instrument aided recon)
  - If you use density , they must be tied to a decision
  - That decision should not include doing transects afterwards.

Outline

- Terminology
- Geophysical Data Analysis Workflow
- MEC Site Characterization
- **Quality Control Performance Requirements**
- Preliminary RAOs

Quality Control Performance Requirements

- Contain QC performance requirements for Remedial Investigation and Removal Actions
- Requirements for both analog and digital geophysics
- Key updates from previous versions:
  - Digital dynamic positioning and detection repeatability
  - Coverage
  - Classification

Performance Requirements for RI using DGM

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[b]
Coverage *	Grids	> 90% coverage at project design line spacing and 98% coverage at 1 meter line spacing[f]	By dataset or grid[g]	Submittal fails unless gaps filled, additional data collected, or government refund for missing acreage.
Dynamic detection repeatability (IVS and GSV blind seeding)	IVS (applies to grids and transects)[h]	Peak response repeatable to +/- 25% of expected response[i]	Twice daily.	Submittal fails.
	Blind Seeds (applies to grids and to transects with intrusive)	Peak response > 75% of minimum expected response[i]	1 per day per team based on expected production rate	Submittal fails.

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Performance Requirements for RI using DGM (cont.)

Requirement	Applicability (Specific to Collection Method/Use)	Performance Standard	Frequency	Consequence of Failure[b]
Dynamic positioning repeatability (IVS and GSV blind seeding)	IVS (applies to grids and transects)	Position offset of seed item targets <= 25 cm	Twice daily	Submittal fails.
	Blind seeds (applies to grids)	90% positioning offset is <=25 cm + ½ line/ sensor spacing and 100% is <=35cm + ½ line/sensor for digital positioning systems (<=50cm + 1/2 line spacing for fiducially positioned data) OR the positioning DQO required for site specific tasks[j]	1 per day per team based on expected production rate	Submittal fails.
	Transects with reacquisition/ digging	Position offset of seed item targets <= 1 meter	1 per day per team based on expected production rate	Submittal fails.

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Performance Requirements for RI using DGM (cont.)

Requirement	Applicability (Specific to Collection Method/ Use)	Performance Standard	Frequency	Consequence of Failure[b]
Dynamic positioning repeatability (IVS and GSV blind seeding)	IVS (applies to grids and transects)	Position offset of seed item targets <= 25 cm	Twice daily	Submittal fails.
Anomaly resolution*[k]	Verification checking by DGM remapping or verification checking with original instrument of anomaly footprint after excavation [m]	Second party checks open holes to determine: 90% confidence < 5% unresolved anomalies[n] Accept on zero.	Rate varies depending on lot size[o.] See Table 6-6: Acceptance Sampling Table for Anomaly Resolution.[p]	Lot submittal fails.

Acceptance Sampling

Confidence Levels	Lot Size (number of anomalies)							
	50	100	200	500	1000	2000	5000	10,000
70% Confidence < 10% unresolved[a]	11	11	12	12	12	12	12	12
80% Confidence < 10% unresolved	14	15	15	16	16	16	16	16
90% Confidence < 10% unresolved	18	20	21	22	22	22	22	22
95% Confidence < 10% unresolved	22	25	27	28	29	29	29	29
70% Confidence < 5% unresolved	17	21	23	23	24	24	24	24
80% Confidence < 5% unresolved	21	27	30	31	31	32	32	32
85% Confidence < 5% unresolved	23	31	34	36	37	37	37	37
90% Confidence < 5% unresolved[b]	27	37	41	43	44	45	45	45
95% Confidence < 15% unresolved	31	45	51	56	57	58	59	59
80% Confidence < 1% unresolved	40	80	111	138	144	154	158	159
85% Confidence < 1% unresolved	43	85	123	158	172	181	186	187
90% Confidence < 1% unresolved[c]	45	90	137	184	205	217	224	227
95% Confidence < 1% unresolved	48	95	155	225	258	277	290	294

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Outline

- Terminology
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- Quality Control Performance Requirements
- **Preliminary RAOs**

Preliminary Remedial Action Objectives

- Preliminary RAO is simply an understanding of the possible interactions, risks, hazards and possible solutions for site specific:
  - Receptors
  - Access and Activities (Pathway)
  - Nature and Source of Problem
- Example:
  A. Prevent or reduce human interaction with surface and subsurface UXO/ DMM in target areas to a depth of 1 foot under current and future recreational use activities.
  B. Demonstrate that not more than one UXO per four acres may be present throughout buffer areas and influence stakeholder behavior
- Developing Preliminary RAOs

  These types of preliminary ROAs help:
  - Build logic of what is a CMUA and what is an NCMUA
  - Guide the institutional analysis
  - Define the final RAOs in the FS

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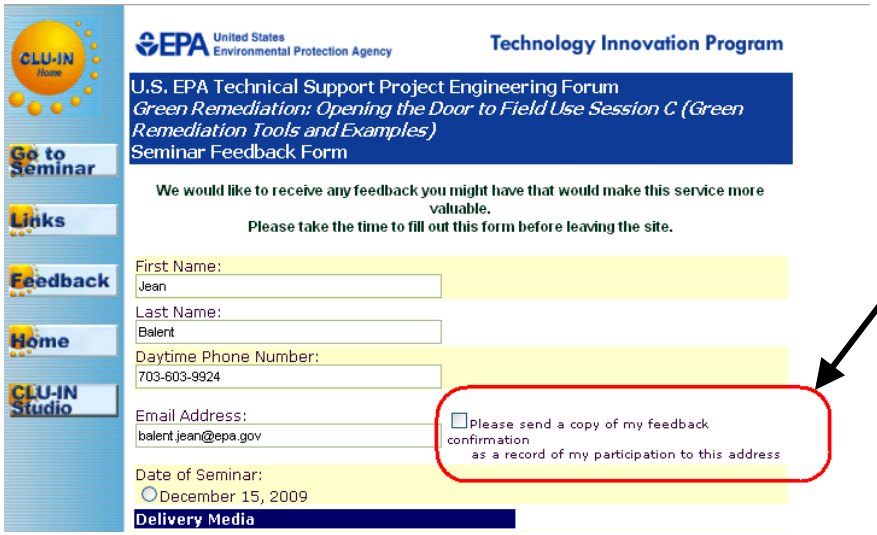

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