Possible Use of Explosive Destruction Technology at the Pueblo Chemical Depot

U.S. Army Element, Assembled Chemical Weapons Alternatives

March 18, 2010

Presented by:

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Program Manager

U.S. Army Element, ACWA

Agenda

Kevin Flamm

- The ACWA Destruction Program Analysis
- Environmental Assessment and its Role in the Decision
- Explosive Destruction Technologies (EDT) Considerations

Scott Susman

- Pueblo Chemical Weapons Stockpile
- Objectives and Approach
- EDT Summary
- National Research Council EDT Assessment
- EDS/EDT Approach

Jim Richmond

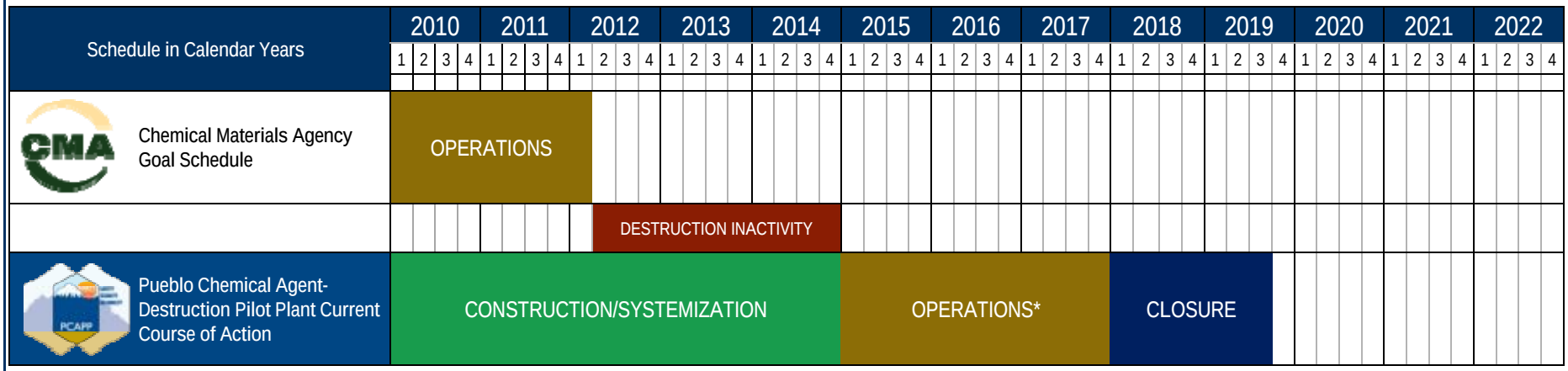
- National Environmental Policy Act Activity Overview and Process
- Environmental Assessment Process

Questions and Discussion

ACWA Chemical Weapons Destruction Program Analysis

U.S. Army Element, Assembled Chemical Weapons Alternatives

A Partnership for Safe Chemical Weapons Destruction



On Oct 1, 2009, the Office of the Secretary of Defense requested that the ACWA Program manager study options for maintaining continuity of destruction operations between Chemical Materials Agency (CMA) completion and ACWA start-up, consistent with ongoing efforts to accelerate destruction operations while maintaining the program's exemplary safety record.

* NOTE: January 2015 projected start of PCAPP operations reflects Systems Contractor current estimate.

The Environmental Assessment and its Role in the Decision

- ACWA has completed an assessment which concluded all options considered have no significant impact to the environment compared to the current mission
- Any decision to proceed with EDT and/or EDS alternatives will be made by the Under Secretary of Defense for Acquisition, Technology and Logistics in his capacity as Defense Acquisition Executive
- The decision will be based on consideration of several factors:
  - Performance (Safe and Environmentally Acceptable):
    - Outcome of National Environmental Policy Act Process
    - Worker Risk
  - Schedule:
    - Ability to meet the December 31, 2017 deadline
  - Cost

Process & Opportunities for Public Comment or Involvement

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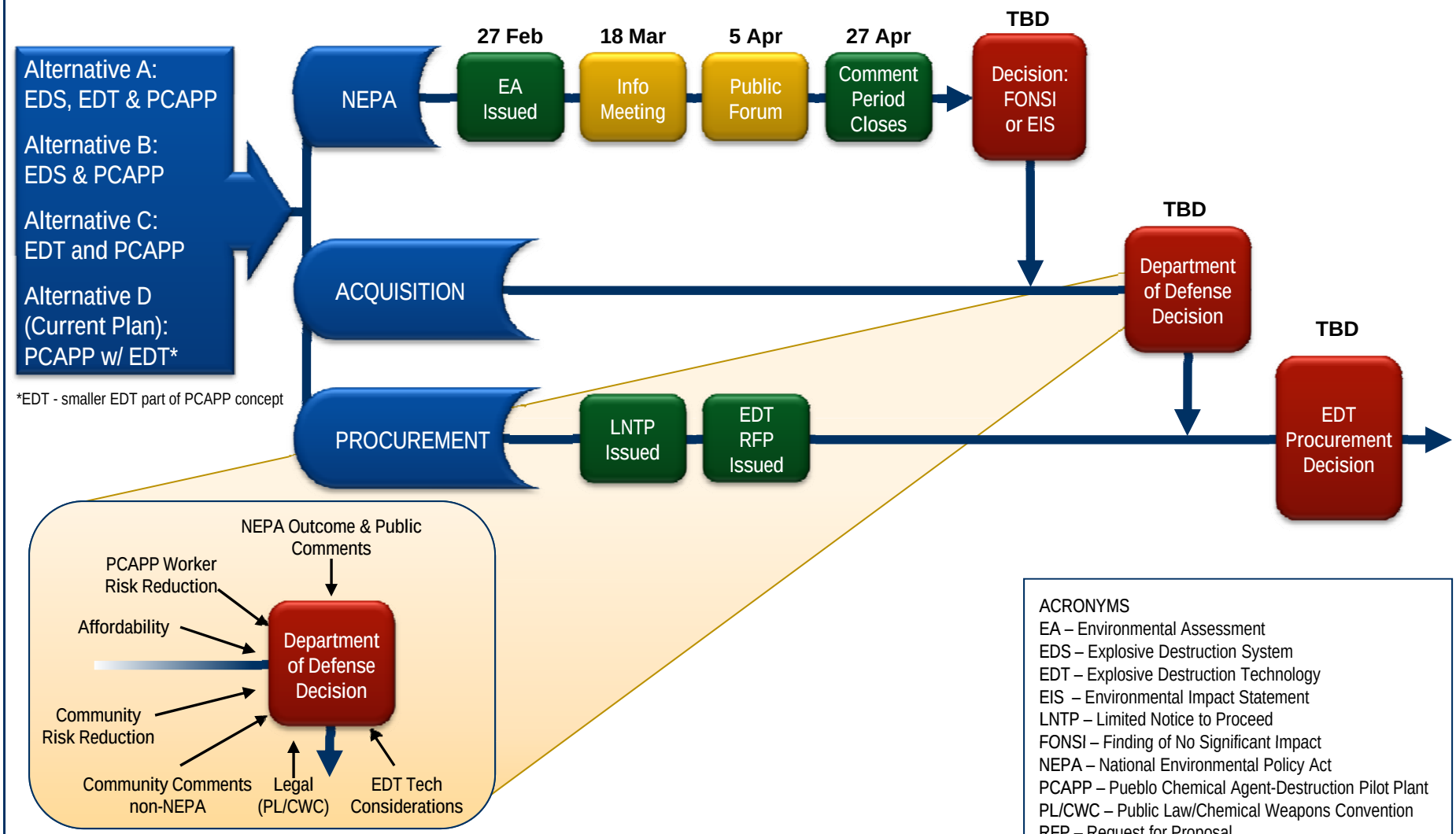

ACRONYMS
EA – Environmental Assessment
EDS – Explosive Destruction System
EDT – Explosive Destruction Technology
EIS – Environmental Impact Statement
LNTP – Limited Notice to Proceed
FONSI – Finding of No Significant Impact
NEPA – National Environmental Policy Act
PCAPP – Pueblo Chemical Agent-Destruction Pilot Plant
PL/CWC – Public Law/Chemical Weapons Convention
RFP – Request for Proposal

Explosive Destruction Technologies Considerations

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- Does it increase confidence in meeting the 2017 Congressional mandate?
- Does it support acceleration of chemical weapons destruction?
- What are the cost impacts?
- Why should the U.S. taxpayer consider this important?
- What is the return on investment to the U.S. taxpayer?
- What would be the impact on the main destruction plant project?
- How will it be deployed and operated?
- How quickly could it be deployed?
- How would the technology be permitted and what is its permitting history?
- What process does the technology use to destroy the chemical agent?
- Has the technology been approved by the Department of Defense Explosives Safety Board?
- How will secondary wastes be handled?
- Are there known stakeholder issues associated with the technology?
- Could use of the technology decrease worker risk associated with handling problematic munitions?
- What would the impacts be on staffing?

Scott Susman
Pueblo Systems Engineer
ACWA Systems Engineering and Operations Team

Agenda

- Pueblo Chemical Weapons Stockpile
- Objectives and Approach
- Explosive Destruction Technologies (EDT) Summary
- National Research Council EDT Assessment
- Proposed Approach for EDT Employment

Pueblo Chemical Weapons Stockpile

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Munition	Agent	Number
Overpacked*	HD/HT	**538**
Palletized Munitions		
- 155mm Projectiles	HD	
- 105mm Projectiles	HD	
Palletized Sub-Total		***84%***
Boxed Munitions		
- 105mm Cartridges	HD	
- 4.2” Cartridges	HD	
- 4.2” Cartridges	HT	
Boxed Munition Sub-Total		***16%***

* Overpacked Munitions not deducted from projectile/cartridge quantities

Objectives and Approach

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- **Objectives**
  - Allow for continuous chemical weapons destruction between the end of Chemical Materials Agency operations and the beginning of Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) operations
  - Increase the confidence PCAPP will meet the 2017 deadline
  - Safe (workers, public, and the environment)
  - Feasible (mature technology proven to be effective)
  - No impact to PCAPP progress (current construction and start-up activities)
  - Cost Effective (have potential for favorable return on investment)
- **Approach**
  - Focus was on existing mature technologies with history of successful mustard agent destruction that could be operated autonomously
  - Led to the investigation of Explosive Destruction Technologies
    - In use by the Army for recovered chemical weapons (Explosive Destruction System – EDS)
    - Already planned to be used at PCAPP for existing overpacks and rejects during operations

Explosive Destruction Technologies Summary

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Explosive Destruction System (EDS)

Transportable Detonation Chamber (TDC)

Static Detonation Chamber (SDC)

Detonation of Ammunition in a Vacuum-Integrated Chamber (DAVINCH)

Explosive Destruction System (EDS)

A Partnership for Safe Chemical Weapons Destruction

- Application: recovered chemical warfare materiel within the United States
  - Owned by the U.S. Army Chemical Materials Agency's Non-stockpile Chemical Materiel Project
- EDS is a trailer-mounted mobile system designed to destroy chemical munitions in a safe, environmentally sound manner
- A sealed, stainless steel vessel provides total containment of blast, vapor, liquid and fragments generated by the process
- EDS uses explosive cutting charges to access the munition and destroy its explosive components; the chemical content of the munition is then **neutralized** by a reagent appropriate to the type of agent present
- Agent destruction is confirmed by sampling the residual liquid and air before reopening the vessel; process waste products are removed, packaged and shipped to an approved disposal facility for final disposition

EDS – Off-Gas Treatment / Waste

- **Off-gas Treatment Consists of:**
  - Carbon filtration of environmental enclosure
- **Waste Material Consists of:**
  - Monoethanolamine (MEA) neutralent
  - Rinse water
  - Decontamination/Clean-up water
  - Lab Waste
  - Scrap Metal
  - Personal Protective Equipment

EDS – Chemical Munitions Destruction Experience

A Partnership for Safe Chemical Weapons Destruction

- **2001 – 2009:**
  - Rocky Mountain Arsenal, CO
  - Camp Sibert, AL
  - Spring Valley, Washington, DC
  - Dover Air Force Base, DE
  - Dugway Proving Ground, UT
  - Aberdeen Proving Ground, MD
  - Numerous munitions types containing the nerve agents GB and VX, mustard, phosgene, and cyanogen chloride

- **2006 – Present:** Pine Bluff Arsenal, AR
  - 1,216 of 1,227 chemical munitions destroyed including German Traktor Rockets, 4.2-inch mortars, 155mm, 105mm, and 75mm projectiles, 100 pound bombs, and miscellaneous munitions containing phosgene, mustard, nitrogen mustard, and several arsenic-based compounds

Static Detonation Chamber (SDC)

- Application:
  - Münster, Germany for destruction of recovered chemical weapons
  - Selected by Chemical Materials Agency to augment the Anniston Chemical Agent Disposal Facility
  - Manufacturer: Dynasafe AB
- The SDC is a nearly spherical, armored, high-alloy steel vessel
- Chemical munitions are placed in a carrier, conveyed to the top of the vessel and fed into an electrically heated detonation chamber
- The high heat (approximately 600°C or 1,100°F) detonates the munition and the chemical agent is destroyed by shock and thermal decomposition
- Gases generated by the detonation are treated by an off-gas system that includes a flameless thermal oxidizer that converts carbon monoxide and hydrogen to CO_2 and water
- The SDC produces no liquid waste; scrap metal is recycled and salts from the off-gas system are be treated and disposed of in compliance with applicable state and federal regulations

Static Detonation Chamber (SDC)

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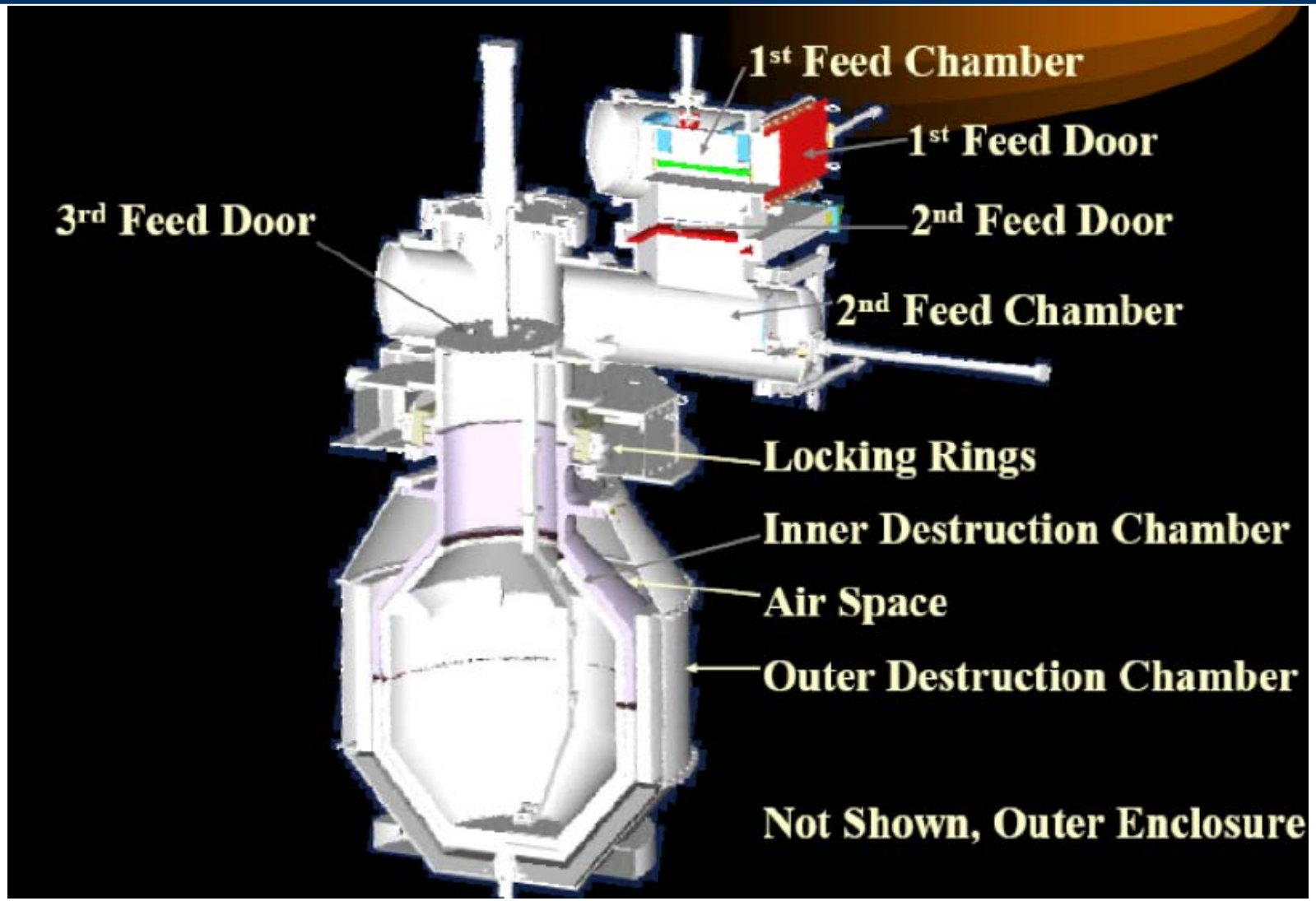

SDC – Off-Gas Treatment / Waste

- **Off-Gas Treatment May Consist of:**
  - Buffer Tank with cyclone filter capability to capture particulates that are recycled back into the system
  - Flameless Thermal Oxidizer (inert ceramic matrix bed inside a refractory lined vessel)
  - Spray Dryer to quickly quench thermal oxidizer exhaust gas to minimize formation of dioxins and furans
  - Baghouse Filter to remove dust and absorb acid gases
  - Additional quench
  - Acid and Neutral Scrubbers (excess scrubber liquid goes to the spray dryer)
  - Induced Draft Fans to maintain the OTS below atmospheric pressure
  - 2 sets of HEPA and Carbon Filters with monitoring

- **Waste Material Consists of:** scrap metal, buffer tank dust, spray dryer salts, bag house adsorbent material, HEPA filters, activated carbon, personal protective equipment and dunnage

SDC – Chemical Munitions Destruction Experience

- **2006 – 2007:** Münster, Germany
  - 13,000 chemical munitions containing mustard, phosgene, and Clark agents
- Previous experience with Conventional Munition Destruction

Transportable Detonation Chamber (TDC)

A Partnership for Safe Chemical Weapons Destruction

- Application:
  - Poelkapelle, Belgium; recovered chemical weapons
  - Schofield Barracks, Hawaii: phosgene-filled 155mm projectiles
  - Undergoing testing at Edgewood, Md.
  - Manufacturer: CH2M Hill
- Self contained, totally enclosed system consisting of a detonation chamber, expansion chamber and emissions control system
- Munitions are wrapped in explosive, placed in detonation chamber and detonated. Bags of water in the chamber absorb blast energy and produce steam which reacts with the chemical agent
- Resulting gases are vented to the expansion chamber and then to the emissions control system
- In the emissions control system a catalytic oxidation unit oxidizes hydrogen, carbon monoxide and organic vapors before the gas stream is vented through a carbon adsorption bed and released
- TDC produces no liquid waste; scrap metal is recycled and emission control system solid wastes are treated and disposed of in compliance with applicable federal and state regulations

TDC – Off-Gas Treatment / Waste

- **Off-Gas Treatment May Consist of:**
  - Reactive bed filter (hydrated lime or sodium bicarbonate)
  - Porous ceramic filter with lime pre-coating (collects particulates)
  - Catalytic oxidizer (CATOX)
  - Chiller
  - Two stage carbon adsorption bed with MINICAMS monitoring
- **Waste Material Consists of:**
  - Scrap metal
  - Pea gravel dust
  - Spent lime solution
  - HEPA Filters
  - Activated Carbon
  - Personal Protective Equipment
  - Dunnage

TDC – Chemical Munitions Destruction Experience

A Partnership for Safe Chemical Weapons Destruction

- **2001-2005:**
  - 2,000+ munitions containing mustard, Clark arsenical agent, and phosgene
- **2003-2004**: Porton Down, UK
  - Series of munitions containing mustard, phosgene, chloropicrin
- **2006:** Porton Down, UK
  - 74 each 25 pounder mustard munitions
- **2008**: Schofield Barracks, Hawaii
  - 1 each 4" mortar containing chloropicrin
  - 10 each 4" mortars containing phosgene
  - 38 each 155mm projectiles containing phosgene
  - 21 each 75mm projectiles containing phosgene
  - 1 each 75mm projective containing chloropicrin

DAVINCH (Detonation of Ammunition in a Vacuum-Integrated Chamber)

A Partnership for Safe Chemical Weapons Destruction

- Application:
  - Kanda Port, Japan: recovered chemical weapons
  - Poelkapelle, Belgium: recovered chemical weapons
  - Selected by Chemical Materials Agency to augment Tooele Chemical Agent Disposal Facility
  - Manufacturer: Kobe Steel, Ltd.
- DAVINCH technology uses a double-walled steel vacuum detonation chamber and an off-gas system
- Chemical munitions are placed in the detonation chamber and destroyed by the detonation of donor explosives surrounding the munitions
- Munitions are shattered by the detonation and the agent is destroyed by the shock and heat of the explosion
- Off-gas system employs a cold plasma oxidizer which converts carbon monoxide to CO_2
- In addition to the scrap metal, which is recycled, DAVINCH produces a small amount of liquid waste from off-gas condensate and rinsate used to cleanse the vessel. Liquid waste will be treated and disposed of in accordance with applicable state and federal regulations

DAVINCH (Detonation of Ammunition in a Vacuum-Integrated Chamber)

A Partnership for Safe Chemical Weapons Destruction

DAVINCH – Off-Gas Treatment / Waste

- **Off-Gas Treatment May Consist of:**
  - Cyclone filter for particulates
  - Cold plasma oxidizer
  - Quencher cooler
  - Condensate Tank
  - Off-gas Retention Tank (hold, test and release)
  - Activated Carbon Filter
- **Waste Material Consists of:**
  - Scrap Metal
  - Condensate water
  - HEPA Filters
  - Activated Carbon
  - Personal Protective Equipment
  - Dunnage

DAVINCH – Chemical Munitions Destruction Experience

A Partnership for Safe Chemical Weapons Destruction

- **2003 – Present:** Kanda Port, Japan
  - 2,678 bombs (as of March 2009) containing lewisite/mustard, Clark I & II vomiting agents
- **2006 – Present:** Poelkapelle, Belgium
  - 1,935 of 3,500 projectiles (as of May 2009) containing Clark agent

National Research Council Assessment of Explosive Destruction Technologies

A Partnership for Safe Chemical Weapons Destruction

- National Research Council (NRC) has examined the Explosive Destruction Technologies twice for the U.S. chemical weapons destruction program:
  - 2006: *Review of International Technologies for Destruction of Recovered Chemical Warfare Material*
  - 2009: *Assessment of Explosive Destruction Technology for Specific Munitions at the Blue Grass and Pueblo Chemical Agent Destruction Pilot Plants*
    - *BGCAPP: 15,000 Mustard-filled 155mm projectiles*
    - *PCAPP: Overpacked and rejected Mustard-filled projectiles*

- Findings:
  - EDTs are mature technologies for chemical munition destruction that have been used primarily for recovered chemical weapon destruction
  - The systems are safe and the committee is confident all can meet U.S. regulatory requirements

"The U.S. chemical weapons destruction program could be enhanced by the selection and acquisition of appropriate EDTs to augment the main destruction technologies…"

Proposed Locations for PCAPP EDS/EDT Systems

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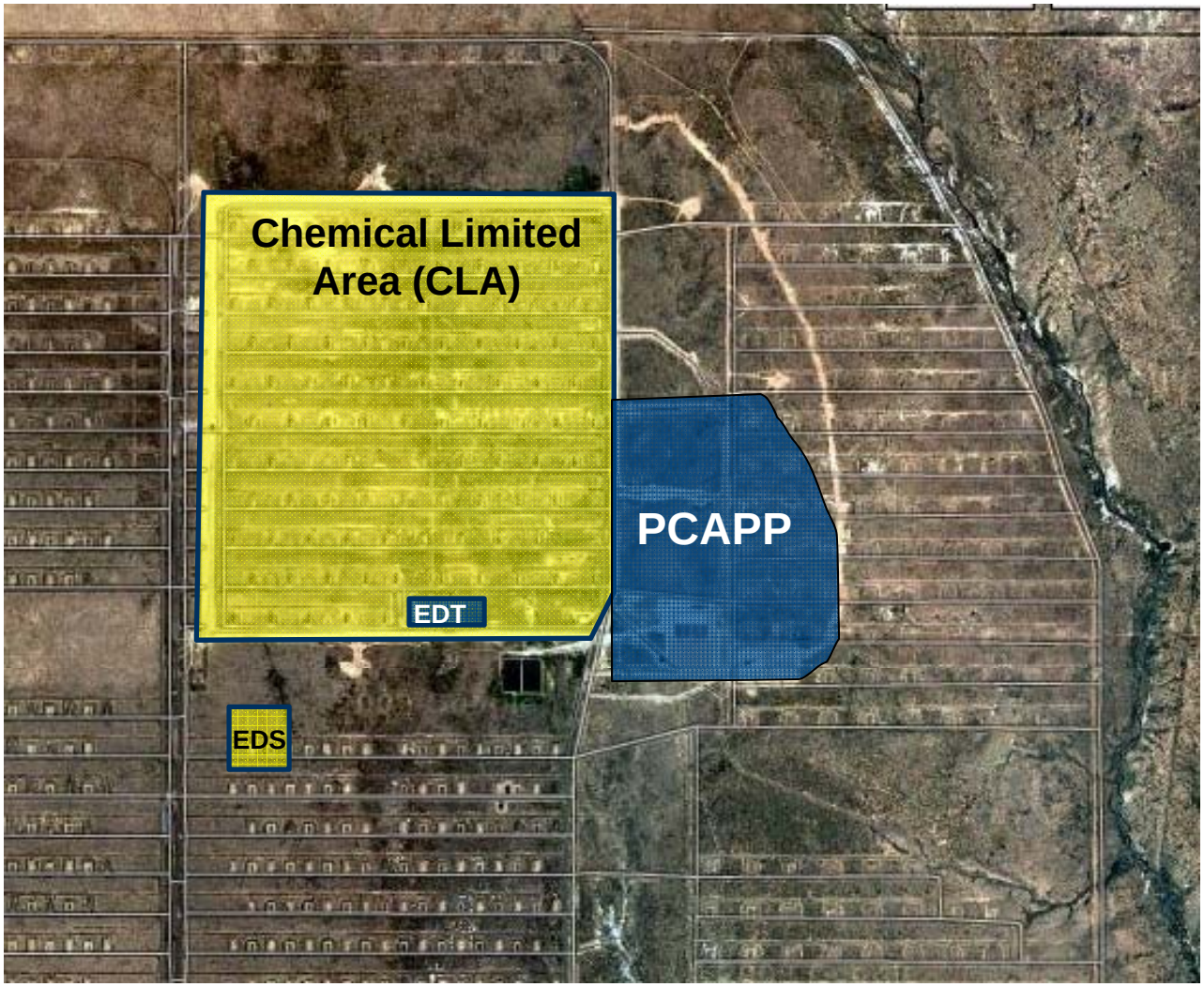

- EDS: Explosive Destruction System (Non-Stockpile system)
- EDT: Explosive Destruction Technology (1 of 3 commercial systems)
- PCAPP: Pueblo Chemical Agent Destruction Pilot Plant

EDS/EDT Approach

- **Explosive Destruction System + Explosive Destruction Technology**
  - Use Explosive Destruction System (EDS) beginning in 2012 to destroy overpacked chemical munitions; Use Explosive Destruction Technology (EDT) early to destroy chemical munitions while PCAPP is coming on line (2014/2015)
    - Two EDS units would be employed in 2012 in advance of PCAPP operations to destroy overpacked munitions and a number of 105mm munitions
    - EDT would be constructed earlier than originally planned, concurrent with EDS operation
    - Upon start-up of EDT, EDS would close
    - EDT would begin destroying 105mm and 4.2 in. munitions and any newly generated overpacked munitions and would continue during PCAPP operations

Approach Timelines

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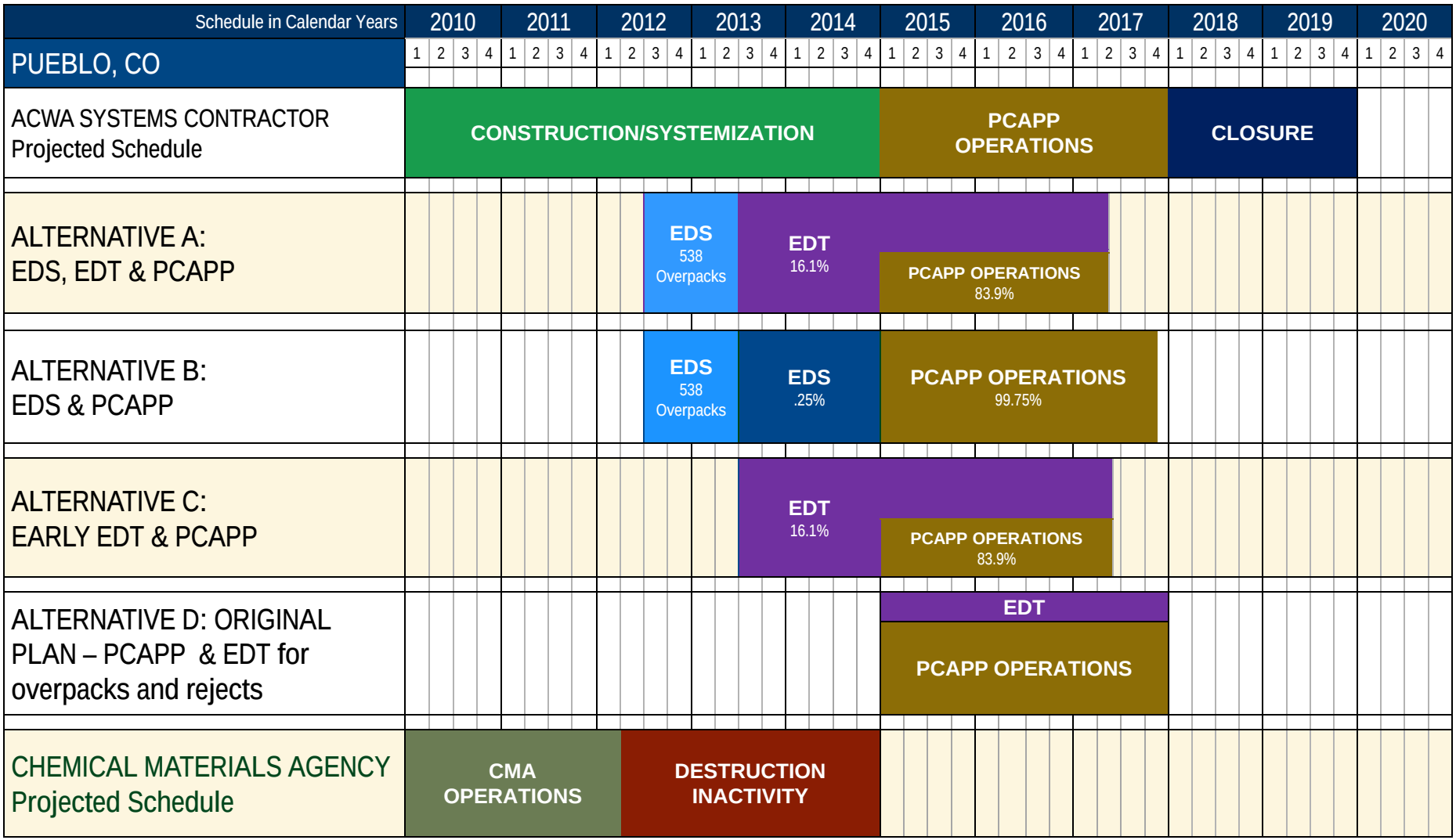

* NOTE: January 2015 projected start of PCAPP operations reflects Systems Contractor current estimate.

Jim Richmond
ACWA Risk Management Team Lead

Agenda

Overview of National Environmental Policy Act Activity for Explosive Destruction Technology at Pueblo Chemical Depot

National Environmental Policy Act (NEPA)

What is NEPA?

- Signed into law Jan. 1, 1970
- First major environmental law in the United States, which established this country's national environmental policies
- Federal agencies are required to determine if their proposed actions have significant environmental effects and to consider the environmental and related social and economic effects of their proposed actions
- Disclosure document that provides information to the public on major Federal actions
- NEPA applies to a very wide range of federal actions that include, but are not limited to, federal construction projects, plans to manage and develop federally-owned lands and new operational programs and activities

The National Environmental Policy Act (NEPA) Process

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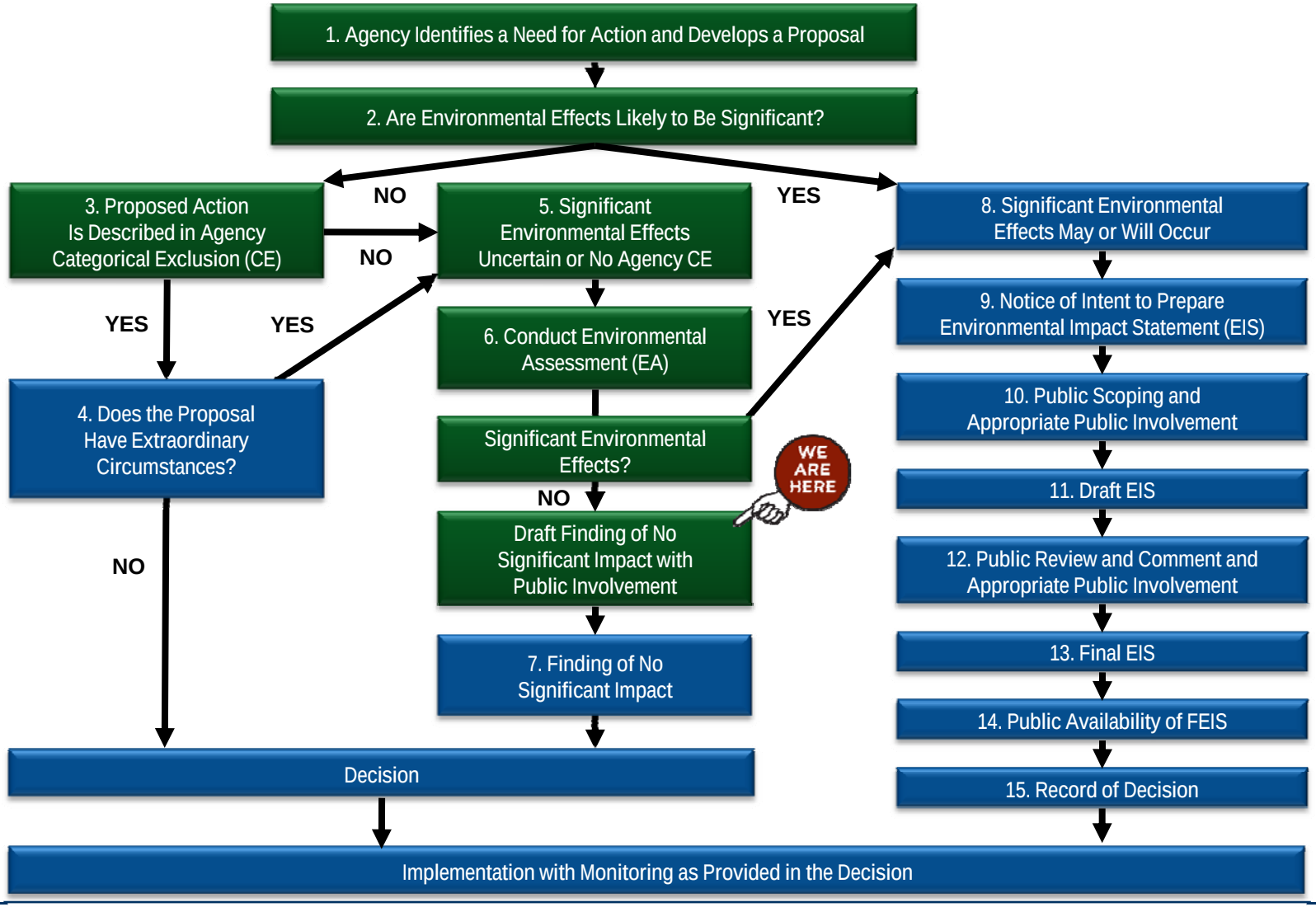

Categorical Exclusion (CE)

3. Proposed Action Is Described in Agency Categorical Exclusion (CE)

- A CE is a category of actions that the agency has determined does not individually or cumulatively have a significant effect on the quality of the environment
- NEPA is required for projects involving chemical weapons or munitions unless categorically excluded

Environmental Effects

5. Significant Environmental Effects Uncertain or No Agency CE

- Small geographical area for EDS/EDT not previously covered by Environmental Impact Statement
- ACWA determined the nature of the environmental impacts for the proposed action would be best addressed through an Environmental Assessment

Areas Assessed for Potential Impacts

- Land Use
- Air Quality
- Water, Ecological, and Energy Resources
- Cultural/Archaeological/Historic Resources
- Waste Management Issues
- Human Health and Safety
- Noise
- Socioeconomic Resources
- Minority and Low-Income Populations/Environmental Justice

Environmental Assessment Findings

- Relative daily water use impact:
  - Negligible increase for construction impacts for EDS and EDT
  - 0.26% increase of project water requirements for EDS and EDT operational impacts
- Relative EDS total waste generation impact:
  - Approximately 59,000 gallons of liquid waste
  - Approximately 65 tons of solid waste (majority from munitions body)
- Relative utilities impact: Utilities construction and use are within existing capacity to run both EDS and EDT units
- Relative impact in other areas were derived from an upper-bound impact established by previous EIS and EA documents
- No significant impact

Public Comments

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- Submit comments on draft Finding of No Significant Impact to ACWA through **April 27**
  - In person: place your completed comment form in the box on the information table
  - Online submission form: http://www.pmacwa.army.mil/info/EA-FNSI_form.html
  - E-mail: ACWAHQ.environmental@conus.army.mil
  - Mail or FAX:

    USAE ACWA
    5183 Blackhawk Road
    ATTN: AMSAW-RM
    Aberdeen Proving Ground, MD 21010-5424
    FAX: 410-436-1992

Questions?

A Partnership for Safe Chemical Weapons Destruction

Questions may be directed to the Outreach Office, Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) or Pueblo Chemical Depot Public Affairs Offices

Pueblo Chemical Stockpile Outreach Office
104 West B Street
719-546-0400

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