Assembled Chemical Weapons Alternatives
Program Use Of Explosive Destruction Technologies

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Systems Engineering & Operations

PUBLIC RELEASE – UNCLASSIFIED
A Partnership for Safe Chemical Weapons Destruction

- Explosive Destruction Technology (EDT) at PEO ACWA
- Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) Problematic Munitions
- PCAPP EDT Selection and Path Forward
- Blue Grass Chemical-Agent Destruction Pilot Plant (BGCAPP) Problematic Munitions
- BGCAPP EDT Selection and Path Forward
- PCAPP Energetic Disposal
- Recap of EDT at PEO ACWA
Taking advantage of lessons learned from other chemical demilitarization facilities in recognizing the need to plan for problematic munitions that can not be easily processed within the main plant.

Incorporating the use of explosive destruction technologies (EDT) to supplement the main plant in destroying the two remaining U.S. chemical weapons stockpiles at the Pueblo Chemical Agent-Destruction Pilot Plant (PCAPP) and the Blue Grass Chemical Agent-Destruction Pilot Plant (BGCAPP).
PCAPP Problematic Munition Challenges

- **Overpacks**: The Pueblo Chemical Depot currently has more than 500 munitions in overpack containers that have either been drilled and tapped for past agent sampling or have leaked during storage.

- **Rejects**: It is also anticipated that some additional munitions will not be able to be processed through the plant due to difficulties in removing components (fuzes, nose closures, bursters) using existing remote equipment.

- **Energetics components**: These cannot be processed within the demilitarization plant with some of those components requiring further size reduction if processed in an off-site commercial treatment, storage, and disposal facility.
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- Original requirements were derived from the PCAPP EDT Environmental Assessment of pessimistic estimates from early process tests:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>Overpacks</td>
</tr>
<tr>
<td>12,010</td>
<td>Rejects</td>
</tr>
<tr>
<td>425,036</td>
<td>Bursters, Fuzes/boosters, Fuze/burster assemblies</td>
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</tbody>
</table>

- Projected feed was subsequently reduced based on final process tests and review of previous chemical demilitarization experience:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Type</th>
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<tbody>
<tr>
<td>732</td>
<td>Overpacks</td>
</tr>
<tr>
<td>539</td>
<td>Rejects</td>
</tr>
<tr>
<td>125,482</td>
<td>Fuzes/boosters, Fuze/burster assemblies</td>
</tr>
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PCAPP EDT Selection Process

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- Systems Contractor (SC) issued a Request for Proposal (RFP) for an EDT and conducted a Technical Evaluation of commercial vendor proposals before submitting a proposal to the Government for a recommended approach.

- The Government issued the same RFP to the U.S. Army Chemical Materials Activity (CMA) and conducted a Technical Evaluation of the Army’s Explosive Destruction System (EDS) technology using the same evaluation criteria.

- Members of the Colorado Citizens’ Advisory Commission (CAC) were kept informed through briefings/meetings with both Government and SC on the selection process.
Selection of the PCAPP EDS

EDS was selected for use at PCAPP

✓ Provided the best value to PEO ACWA
✓ Allowed early deployment to destroy the existing overpacked munitions
✓ Provided flexibility of deployment depending on trending of reject generation in the plant
✓ Allowed the SC to focus on getting the main plant ready for operations
## Tested EDS improvements result in reducing operational time from 36 hours to 10 hours:

- **Improved valves**  
  - Quarter turn ball valves  
  - Larger throat for faster draining & filling

- **Larger pump and hose for quick transfer of liquids**

- **Steam heating for rapid heating of fill**  
  - Current heating time is 2 hours; Steam heating time is less than 1 hour

- **New three-piece clamp and closure system**  
  - Automated closing system  
  - Faster opening and closing time

- **Cold water injection cooling**
PCAPP EDS Site Layout
PCAPP EDS Construction

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PEO ACWA requested the National Research Council to conduct an assessment to analyze EDT use at Blue Grass and Pueblo.

Tooele projectiles had a high rate of agent solidification, which complicates removal of the mustard agent from the projectile; and stuck bursters, which require human interaction to remove the explosives from the problematic munitions.

Blue Grass has a high number of same-lot problematic munitions as Tooele (20 of the 31 Edgewood Arsenal lot numbers are common to both sites).
Bursterwell and Burster separated from 155mm mustard projectiles at Tooele Chemical Agent Disposal Facility.
Mustard filled projectiles are the oldest component of the Blue Grass Army Depot (BGAD) stockpile

Manufactured between 1941 and 1943 at Edgewood Arsenal (EA) Maryland, today part of Aberdeen Proving Ground

Mustard filled projectiles are the only projectiles at BGAD that have an explosive charge referred to as a burster

Mustard M110 155mm Projectiles

- Agent Type: Levinstein Mustard
- Burster Explosive: Tetrytol
- Percentage of Munition Inventory: 15.2 percent
- Percentage of Agent Inventory: 17.3 percent
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- ACWA and the Blue Grass Chemical Activity (BGCA) conducted an X-ray assessment to learn the extent of agent solidification at Blue Grass
- The X-ray assessment was performed from May to June 2011 and was conducted to a 95 percent confidence level
- All 96 H-filled munitions sampled contained heel
  - Average heel – 54.8 percent
  - Minimum heel – 15 percent
  - Some weapons were completely solidified
- Approximately 6,100 munitions estimated to have greater than 59 percent heel

Images taken May 25, 2011, courtesy BGCA
X-ray Assessment – Agent Heel

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**Round 1: BGX-02-002**
- Massive (100%) visible Heel
- “No liquid” agent line visible
- Additional Heel on side
- Likely highly pressurized

**Round 2: BGX-02-013**
- Large (72%) visible Heel
- Little agent is available
- Additional Heel on side
- Likely highly pressurized

**Round 3: BGX-02-003**
- Heel (17%) is limited in projo tail
- Large amount of liquid agent
- No visible Heel on the side
- Likely low pressurization
Decision to use EDT at Blue Grass

All the mustard munitions at Blue Grass will be processed through the EDT

- More than 15,000 155mm mustard projectiles, with fewer than 200 in overpack containers
- Two Department of Transportation (DOT) bottles containing mustard agent

ACWA decision considerations included:

- Environmental Assessment and resulting Finding of No Significant Impact
- Stakeholder involvement
- Worker safety
- Process throughput
The Static Detonation Chamber was selected based upon competitive procurement process performed by the SC; supplied by UXB International, Inc.

- Spherical, fully-contained and high strength heat resistant stainless steel vessel
- Electrically-generated heat
- Pollution abatement system
- Robust carbon filtration
- Enclosed building
EDT Site Location

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Computer-generated graphic
## PCAPP Energetic Components Requiring Disposal

### A Partnership for Safe Chemical Weapons Destruction

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>155mm projectile burster</td>
<td>~ 300,000</td>
</tr>
<tr>
<td>105mm projectile fuze</td>
<td>~ 28,000</td>
</tr>
<tr>
<td>105mm projectile burster</td>
<td>~ 380,000</td>
</tr>
<tr>
<td>105mm projectile propellant</td>
<td>~ 78,000 lbs</td>
</tr>
<tr>
<td>4.2 inch mortar fuze/burster</td>
<td>~ 97,000</td>
</tr>
<tr>
<td>4.2 inch mortar propellant</td>
<td>~ 60,000 lbs</td>
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PCAPP Energetics Disposal Options – On-site/Off-site

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- Systems Contractor proposed:
  - 155mm projectile bursters, 4.2” mortar fuze and bursters, 105mm projectile fuzes, and any other agent contaminated energetics be processed on site using an EDT
  - 105mm projectile bursters and all propellant be disposed of using a commercial Treatment, Storage, Disposal Facility (TSDF)

- With selection of Explosive Destruction System:
  - On-site destruction of energetics is limited to only those contaminated with agent or contained within a reject
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## Commercial TSDF

### Advantages

- Experience with explosive disposal
- Relatively low cost

### Disadvantages

- Requires cutting of 155mm projectile bursters at PCAPP or TSDF
  - Detonation Risk
  - Potential perceived agent exposure risk if cut at TSDF
- Requires separation of 4.2” mortar burster/fuze assembly
- Risk of not completing destruction in a timely manner and at estimated cost as it is outside Government control
### Anniston SDC

<table>
<thead>
<tr>
<th>Advantages</th>
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<tbody>
<tr>
<td>Experienced crew</td>
</tr>
<tr>
<td>Can accept whole 155mm projectile bursters and 4.2” mortar fuze/burster assemblies</td>
</tr>
<tr>
<td>Dedicated to PCAPP energetics waste disposal</td>
</tr>
<tr>
<td>Significantly more confident in completing destruction on schedule and at estimated cost</td>
</tr>
<tr>
<td>Maintains experienced workforce for cross training opportunities in support of BGCAPP SDC operations</td>
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</tbody>
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- PEO ACWA has made the Anniston SDC available to the PCAPP SC for use in disposal of the PCAPP energetic components

- SC is preparing their Business Case for use of the Anniston SDC
## A Partnership for Safe Chemical Weapons Destruction

<table>
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<tr>
<th>Location</th>
<th>Feed</th>
<th>Technology</th>
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</table>
| **BGCAPP** | • 15,000+ Levinstein Mustard (H) filled 155mm projectiles with known agent heel  
  • 2 DOT Bottles containing mustard | Static Detonation Chamber 1200 |
| **PCAPP** | • Estimated 1300 distilled mustard (HD) filled 155mm and 105mm projectiles and 4.2” mortars  
  • 11 DOT bottles containing HD  
  • Estimated 80 mustard agent contaminated bursters | Explosive Destruction System |
| **Anniston** | Explosive components from PCAPP consisting of:  
  300,000  155mm projectile bursters  
  28,000  105mm projectile fuzes  
  380,000  105mm projectile bursters  
  78,000 lbs  105mm projectile propellant  
  97,000  4.2 in mortar fuzes & bursters  
  60,000 lbs  4.2 in mortar propellant | Static Detonation Chamber 1200 |
Questions?

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Program Executive Office
Assembled Chemical Weapons Alternatives

Pueblo Chemical Agent-Destruction Pilot Plant

Blue Grass Chemical Agent-Destruction Pilot Plant

ACWA

BGCAPP

PCAPP

Bechtel Parsons
Blue Grass