

Impact Assessment and Road Map for Chromium

August 2018

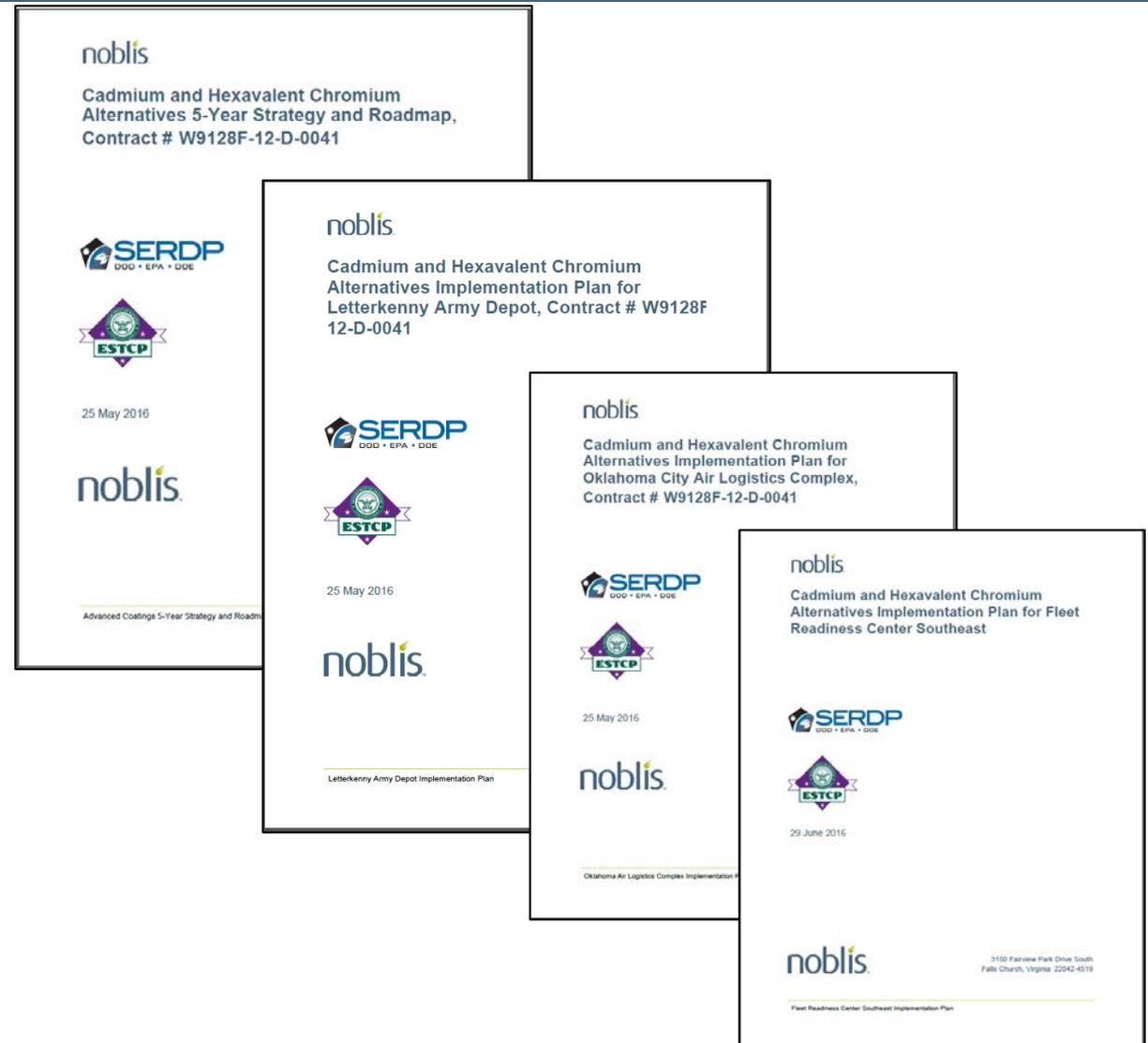
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For the best of reasons

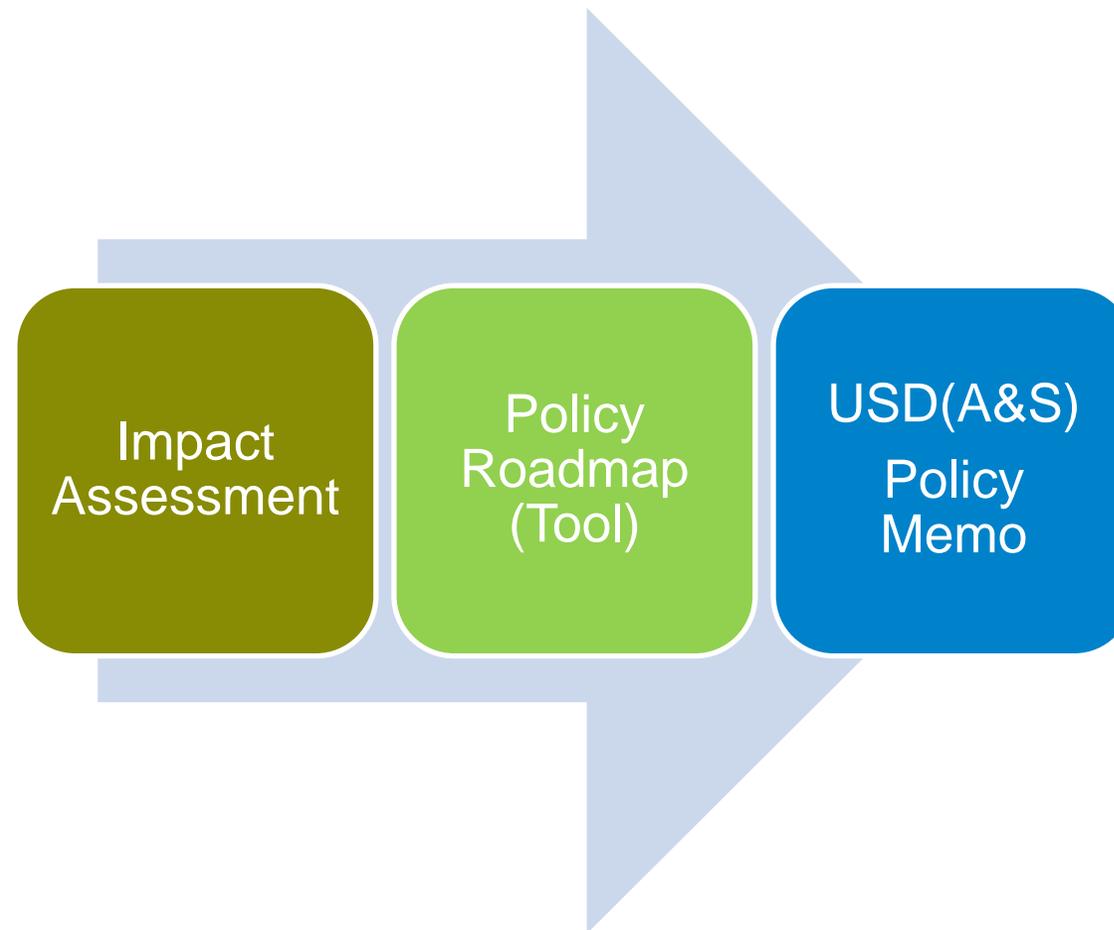
Task Background

- Awarded January 2018
- Kick off meeting February 2018
- Build on and leverage existing SERD / ESTCP Tasks
 - 5-Year Strategy and Road Map
 - Depot level assessments (3)
- Goal
 - Go beyond current SERDP/ESTCP projects



Task Elements and Evaluation Process

- Look at where we are and where we need to be
- Build a roadmap (tool) to get there using different policy options
- Recognize the difficulties to implement the new TWA-TLV and STEL
 - More than just additional supplied air respirators
 - Leverage Services' assessments
- Some technologies flip paradigm
 - Do not mitigate the chrome, but rather mitigate the performance risks and human exposures



Old and New Drivers for Chrome

- RCRA
- CAA
- CWA
- USD(AL&T) memo “Minimizing the Use of Hexavalent Chromium.”
- DFARS, “Minimizing the Use of Materials Containing Hexavalent Chromium” (DFARS Case 2009–D004).
- RoHS
- REACH
 - Increasing application restrictions
 - Sunset dates
 - Potential work place restrictions

- ACGIH

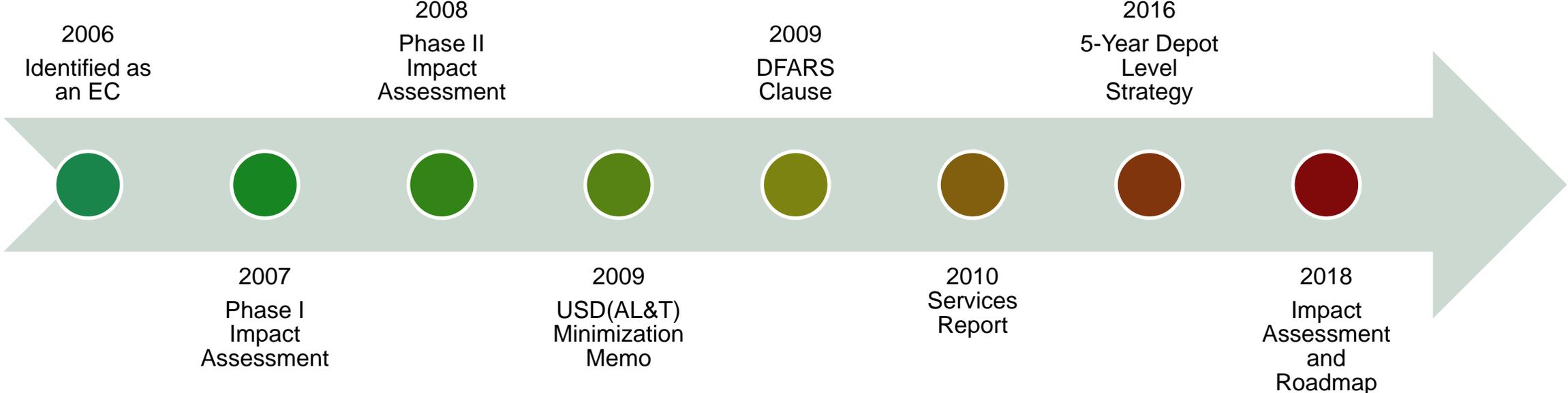
NEW!

- New TLV-TWA for chrome(III) and chrome(VI)
- New STEL for chrome(VI)



Hex Chrome Removal Navy (2004) FA-18

Hex Chrome as an Emerging Contaminant (EC)



NEW!

ACGIH 2018 Adopted Changes for Chromium

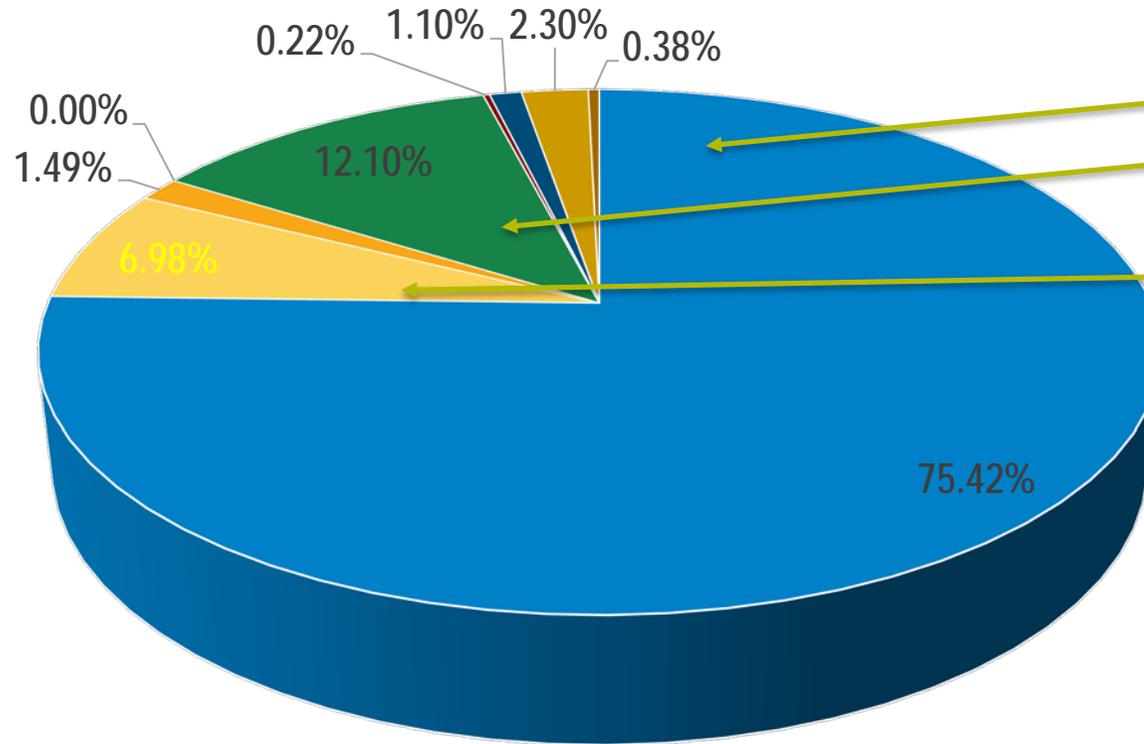
Chromium Compound	OSHA* Permissible Exposure Limit, 8-hour Time- Weighted Average (TWA)	Old ACGIH TLV,** 8-hour TWA	New ACGIH TLV, 8-hour TWA (Inhalable)	Health Effects
Chromium (metal)	1.0 mg/m ³	0.1 mg/m ³	0.5 mg/m ³	- Respiratory tract irritation
Chromium ⁺³	0.5 mg/m ³	0.1 mg/m ³	0.003 mg/m ³	- Skin & respiratory sensitization (water soluble compounds) - Respiratory tract irritation - Asthma
Chromium ⁺⁶	0.005 mg/m ³ (0.0025 mg/m ³ AL)	0.05 mg/m ³ (water soluble)	0.0002 mg/m ³	- Skin & respiratory sensitization - Skin & nasal septum ulcers and septum perforation - Confirmed carcinogen - Sinonasal cancer - Lung cancer
		0.01 mg/m ³ (insoluble)	0.0005 mg/m ³ (STEL ^{***})	

*OSHA = Occupational Safety and Health Administration

**ACGIH = American Conference of Governmental Industrial Hygienists Threshold Limit Value

***STEL = 15-minute Short-Term Exposure Limit

Uses of Chrome⁶⁺



Top Usage of Cr⁶⁺

- Chromated Primers
- Adhesives and Sealants
- Chrome Plating

75+% of Cr⁶⁺ usage is chromate primers...have to replace chromated primers to meet strategic reduction goals

- | | | |
|-----------------------------------|--------------------------|------------------------------|
| ■ Chromated Primers | ■ Chrome Plating | ■ Chrome Conversion Coatings |
| ■ Stainless Steel Passivation | ■ Adhesives and Sealants | ■ Chromate Sealers |
| ■ Topcoats and Specialty Coatings | ■ Coatings Removal | ■ Stainless Steel Welding |

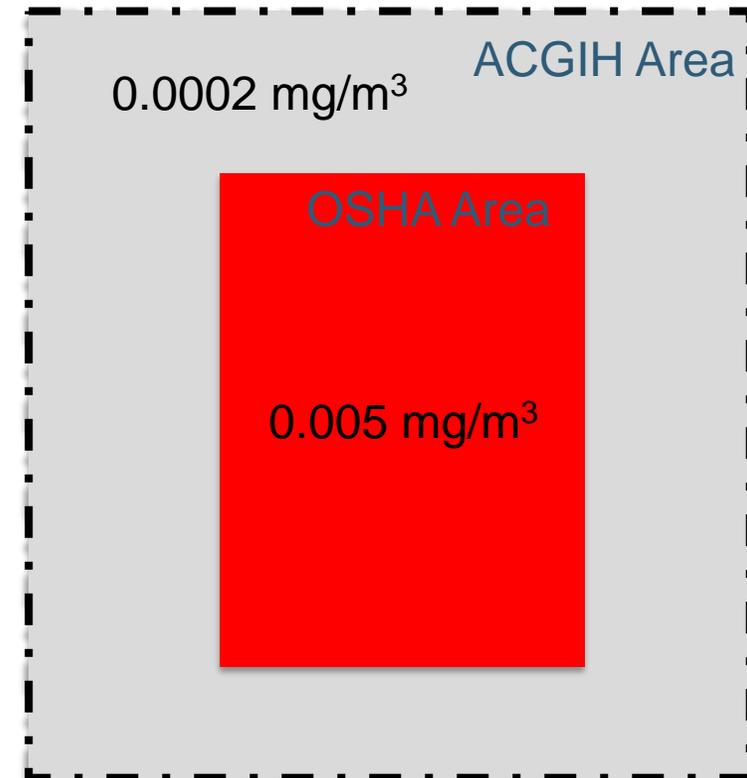
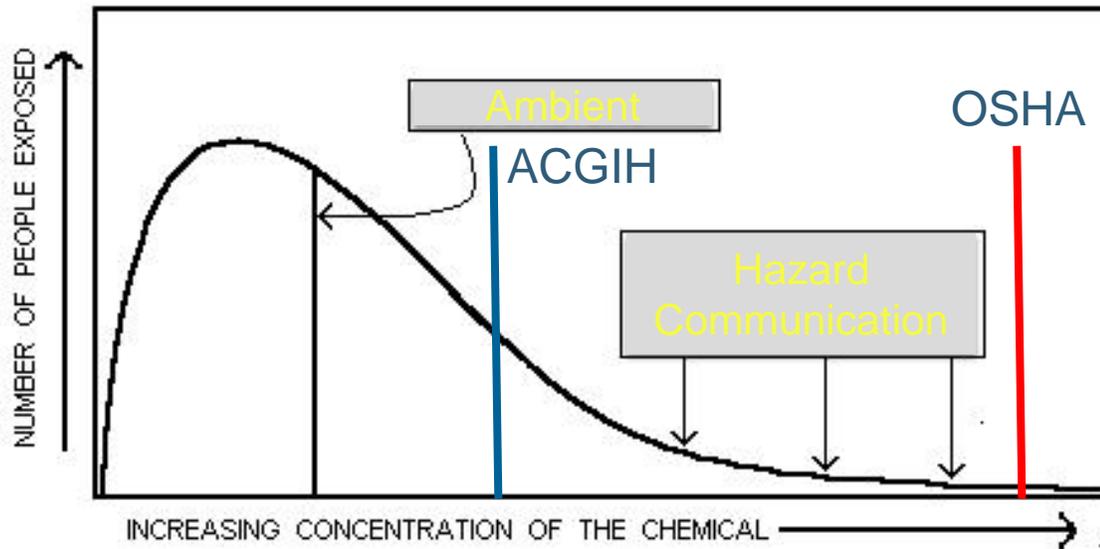
Possible Impacts of ACGIH TLV-TWA Changes

- Exposure Sampling Requirements
 - “Total” vs “Inhalable”—sampling method modification
 - Determine if inhalable sampling is OSHA compliant
- Medical Surveillance
 - Increase in enrolled personnel along with increased costs?
 - Only required when exposed greater than OSHA Action Level (AL) > 30 days
 - OSHA AL (2.5 $\mu\text{g}/\text{m}^3$) vs. ACGIH TLV (0.2 $\mu\text{g}/\text{m}^3$)
- Additional Requirements for Exposure Controls
 - Engineering (ventilation)
 - Administrative (training, restricted access, housekeeping)
 - Respiratory protection
- Hazard Communication
 - collaboration with HR, supervisors, bargaining units (labor unions)

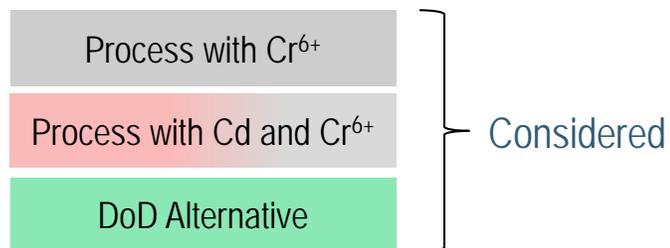
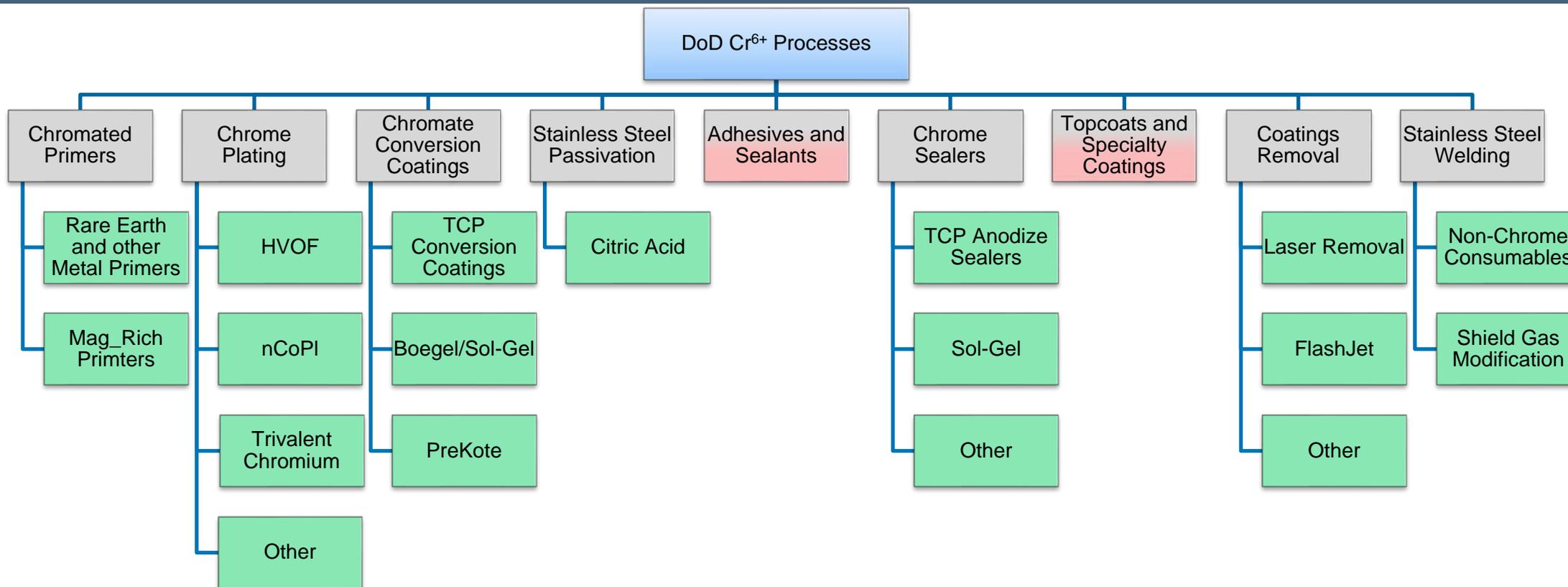
Possible Impacts - Other Operational Issues

- Confusing message to workers
 - Exposures are above the ACGIH TLV-TWA but less than OSHA compliance levels

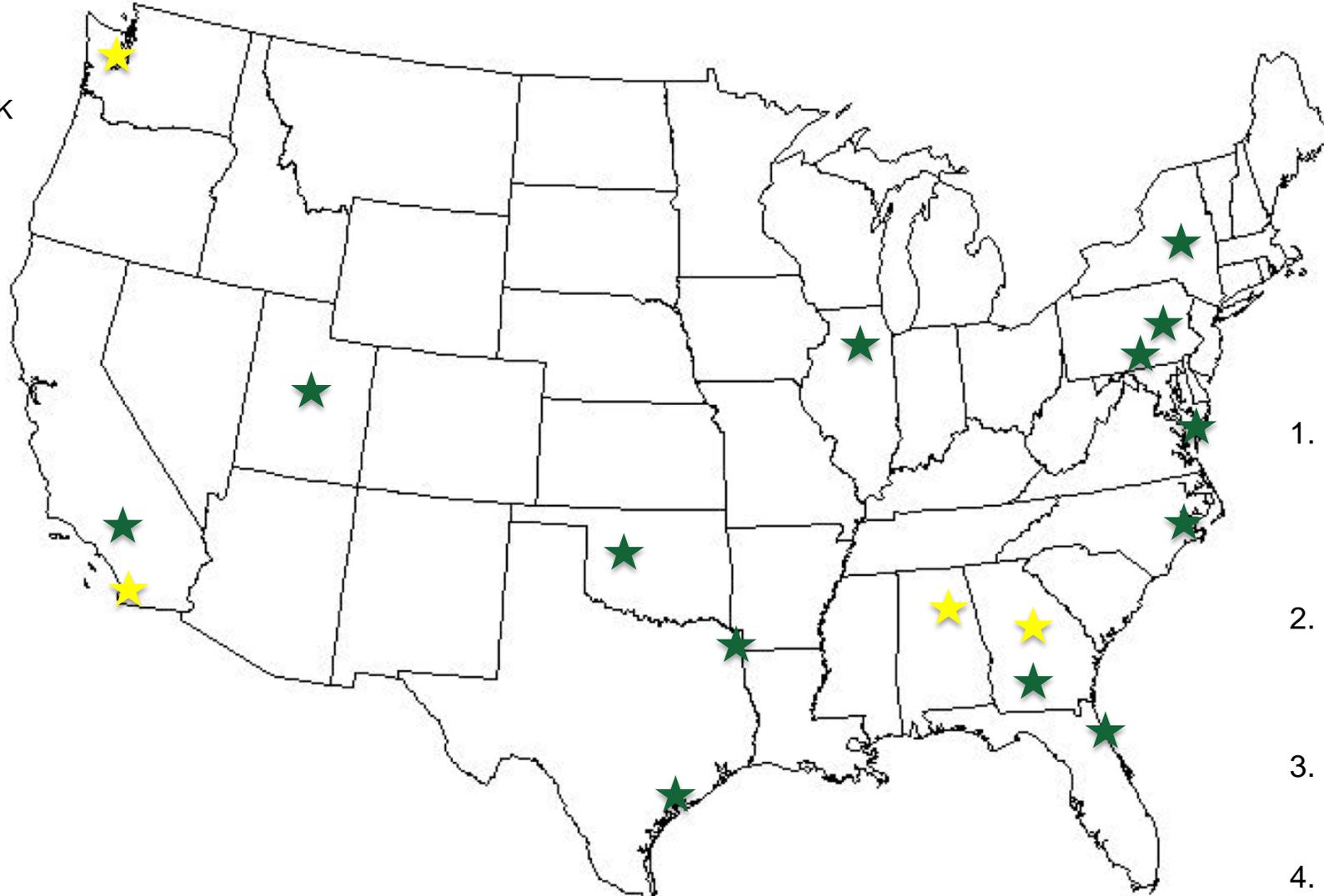
- Designation of “Regulated” Areas
 - Only required when Cr^{6+} concentrations are $>$ OSHA ($5 \mu\text{g}/\text{m}^3$)



Identification of DoD Cr⁶⁺ Processes and Alternatives



Depots Included in Roadmap Tool



OC-ALC^{1,2,4} Oklahoma City, OK
 WR-ALC² Warner Robins, GA
 OO-ALC^{2,4} Ogden, UT

FRCSE^{1,4} Jacksonville, FL
 FRCE^{1,2} Cherry Point, NC
 FRCSW^{2,4} San Diego, CA

NNSY^{1,2,4} Norfolk, VA
 PNSY&IMF² Bremerton, WA
 PSY² Portsmouth, ME

LEAD^{1,2,3} Letterkenny, PA
 CCAD^{2,3,4} Corpus Christi, TX
 ANAD^{2,3,4} Anniston, AL
 RRAD^{2,3} Texarkana, TX/AR
 RIA^{2,3} Rock Island, IL
 TYAD^{3,4} Tobyhanna, PA

MCLB Albany^{1,2} Albany, GA
 MCLB Barstow² Barstow, CA

1. Implementation Plan developed for the depot during either Phase I or Phase II of the Strategy effort
2. Have recent HAZMAT data or information that appears trustworthy
3. US Army Toxic Metals Reduction (TMR) Report
4. Past visits

Roadmap (Conceptual Design)

Process by Depot

	Aerospace Primers	Wash Primers	Chrome Plating	Chromate Conversion Coatings	Chromated Sealers	Adhesives/Sealants	Paint Stripping	Passivation	Welding/Brazing/Soldering	Deoxidizer/Cleaner	Specialty Coatings	Anodize Stripping	Chromic Acid Anodize
OC-ALC	✓		✓	✓	✓	✓	✓				✓		
OO-ALC	✓		✓	✓	✓	✓	✓				✓		
WR-ALC	✓		✓	✓	✓	✓	✓				✓		
LEAD	✓	✓		✓	✓	✓			✓		✓		
CCAF	✓		✓	✓	✓	✓		✓		✓	✓	✓	✓
		✓	✓	✓	✓						✓	✓	
		✓		✓	✓						✓		
TYA			✓	✓	✓							✓	
FRCS	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
FRCE	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		
FRCSW	✓		✓	✓	✓	✓	✓				✓		
NNSY	✓		✓	✓	✓	✓			✓		✓		✓
PNSY			✓		✓				✓				
PSY													
MCLB A												✓	
MCLB B													

Weapons System by Depot

OC-ALC	KC-135	B-1	KC-10
OO-ALC	F-16	A-10	F-22

Potential Alternative by Process, Depot, and Weapons System

Paint Stripping (Chemical) - OC-ALC - KC-135	Laser Depaint
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Relational database sortable by process, depot, weapons system, and alternative

Proposed Depot Visits

Depot	Location	Notes	Timeline
Anniston Army Depot (ANAD)	Anniston, AL	<ul style="list-style-type: none"> HAZMAT data are possibly underreported Several processes use hexavalent chromium (plating, sealing, conversion coatings) Depot is looking at trivalent chromium as alternatives 	Sept/Oct
Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS/IMF)	Bremerton, WA	<ul style="list-style-type: none"> Limited HAZMAT data Largest user of Cr⁶⁺ in NAVSEA Limited processes/environment information 	Sept/Oct
Fleet Readiness Center Southwest (FRC-SW)	San Diego, CA	<ul style="list-style-type: none"> HAZMAT data for 2017 Similar processes to FRC-E and FRC-SE Degree of maintaining tanks and processes is unknown Alternatives implementation is unclear 	Oct/Nov
Warner Robins Air Logistics Complex (WR-ALC)	Warner Robins, GA	<ul style="list-style-type: none"> HAZMAT data for 2015-2017 Largest user of both chrome plating materials and chromated paint strippers in the Air Force Only depot to maintain a completely chrome-free OML plane (F-15) 	Oct/Nov

Depot Descriptions and Associated Weapons Platforms

- Anniston Army Depot (ANAD)
 - ANAD is the designated center for tracked and wheeled ground combat vehicles (minus Bradley), towed and self-propelled artillery, assault bridging systems, individual and crew served small caliber weapons and locomotives, rail equipment and non-tactical generators.
 - ANAD performs depot level maintenance on vehicle systems such as the M1 Abrams tank, M88 Recovery Vehicle, Stryker, M113 M9 Ace Combat Earthmover and the Assault Breacher Vehicle. Major components of each vehicle are also overhauled and returned to stock.
- Puget Sound Naval Shipyard and Intermediate Maintenance Facility (PSNS/IMF)
 - Fleet maintenance, modernization, recycling, and support
- Fleet Readiness Center Southwest (FRC-SW)
 - FRC-SW repairs and maintains Navy and Marine Corps aircraft, including the F/A-18 Hornet, AV-8B Harrier, H-60 Seahawk, H-53 Super Stallion, E-2C Hawkeye and C-2A Greyhound.
- Warner Robins Air Logistics Complex (WR-ALC)
 - WR-ALC provides depot maintenance, engineering support and software development to major weapon systems (F-15, C-5, C-130, C-17 and SOF aircraft).

Conclusion

- Implementation of the new ACGIH TLV-TWA presents logistical challenges
 - ACGIH TLV-TW is most recent in a long line of actions driving DoD to reduce or eliminate Chrome⁶⁺
 - Roadmap tool will enable cross service examination of process, alternative process, depot, and weapon system
- Disclaimer:

The views express are those of the author and do not present the conclusions, findings, statements, or policies of the Department of Defense of the United States Army Corps of Engineers
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Identified Service POCs

- The following were identified in May 2018 as OSD and Service leads for this task
 - Mr. David Asiello, ODASD(EI&E)
 - Dr. Robin Nissan, ODASD(EI&E) SERDP/ESTCP
 - Mr. Ken Dormer for Mr. Forbes SAF/AQRE
 - Ms. Poppy Harrover, OASA(EI&E)
 - Ms. Glenn Williams, AMCOM G4
 - Ms. Michelle Davis, TACOM
 - Ms. Kristen Furman, MARCORSYSCOM
 - Mr. Jim Rudroff, ODASN(EI&E)

 - Mr. James Jennings, Naval Surface Warfare Center Philadelphia Division, identified for chrome conversion coated steel fasteners and chrome passivated stainless steel fasteners