



— BUREAU OF —
RECLAMATION

Kevin L. Kelly
kkelly@usbr.gov
720-663-7944



Hazardous Materials in Coatings

Kevin L. Kelly, Ph.D.
Research Chemist
Materials & Corrosion Laboratory Group

Webinar Objectives

- What are hazardous materials?
- Understand what hazardous materials may be present in existing coatings in Reclamation facilities.
- Regulations and directives for the removal and disposal of hazardous materials in existing coatings.
- Evaluation process for identifying and documenting potentially hazardous waste that may be generated from the removal of existing coatings or equipment with existing coatings.





Bureau of Reclamation

- Established June 17, 1902
- Federal water management agency.
- Most of Reclamation's infrastructure > 50 years.
- Many materials used during construction were not as regulated as they are today.



Environmental Protection Agency

- Established December 2, 1970
- Consolidates federal environmental research, monitoring, and enforcement activities in a single agency.
- Mission: To protect human health by safeguarding air, water, and land.



Hazardous Materials – Working Definition

- An existing material, when being removed and disposed of, generates a solid waste that is subject to hazardous waste regulations.

In other words, we are looking at the potential of an existing material becoming a hazardous waste. If it has the potential of becoming hazardous waste during solid waste generation, we preemptively call it a hazardous material.

- For coatings, a solid waste may be generated during the removal of existing coatings or the removal of equipment that has existing coatings.
- We will not discuss OSHA regulations.....



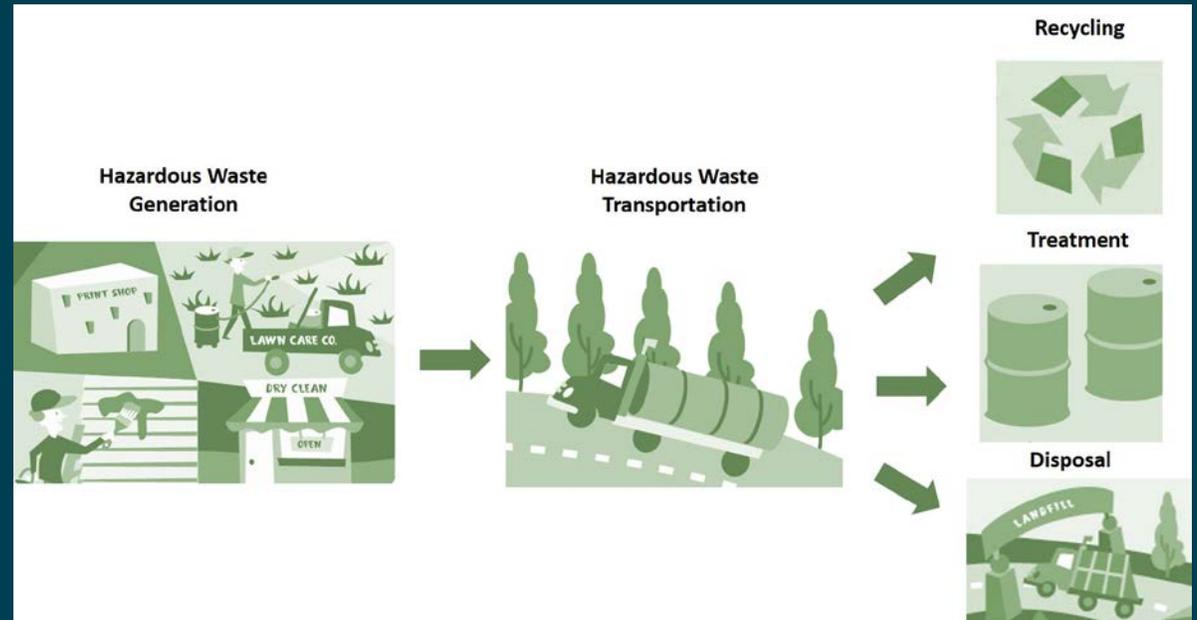
Primary Federal Regulation

Resource Conservation and Recovery Act (RCRA) - 1976

40 CFR 239-282 (www.ecfr.gov)

“Hazardous Waste Cradle to Grave”

- Governs the disposal of solid and hazardous waste.
- Amended the Solid Waste Disposal Act of 1965.



Source: www.epa.gov/hw/learn-basics-hazardous-waste



What is a Solid Waste? (40 CFR 261.2)

A solid waste is any material that is discarded by being:

- Abandoned: A material is abandoned if it is disposed of, burned, incinerated, or sham recycled.
- Inherently Waste-Like: Materials that pose such a threat to human health and the environment that they are always considered solid wastes.
- Discarded Military Munition: Ammunition products and components produced for or used by the U.S. Department of Defense.
- Recycled: Material is recycled to be used or reused, reclaimed, or used in certain ways.



What is a Hazardous Waste?

“Hazardous wastes are solid wastes that cause or significantly increase mortality or serious irreversible or incapacitating reversible illness or that pose a substantial present or potential hazard to human health or the environment when improperly managed.”

Uniform Hazardous Waste Manifest

Please print or type. Form Approved OMB No. 2050-0039

1. Generator ID Number 2. Page 1 of 3. Emergency Response Phone 4. Manifest Tracking Number

5. Generator's Name and Mailing Address Generator's Site Address (if different than mailing address)

Generator's Phone

6. Transporter 1 Company Name U.S. EPA ID Number

7. Transporter 2 Company Name U.S. EPA ID Number

8. Designated Facility Name and Site Address U.S. EPA ID Number

Facility's Phone

No.	U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	9. Containers No. Type	11. Total Quantity	12. Unit (kg, lbs)	13. Waste Codes
1.					
2.					
3.					
4.					

14. Special Handling Instructions and Additional Information

15. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, labeled and prepared, and are in all respects in proper condition for transport in accordance with applicable international and national governmental regulations. I export shipment and am the Primary Exporter. I certify that the contents of this consignment conform to the terms of the attached EPA Acknowledgment of Consent. I certify that the waste information statement identified in 40 CFR 263.20(a) (1) (i) is a large quantity generator or (ii) (1) (i) is a small quantity generator is true.

Generator's Name (Printed) typed Name Signature Month Day Year

16. International Shipments Import to U.S. Export from U.S. Part of entry/leave: Date leaving U.S.

17. Transporter Acknowledgment or Receipt of Materials

Transporter 1 (Printed) typed Name Signature Month Day Year

Transporter 2 (Printed) typed Name Signature Month Day Year

18. Discrepancy

19a. Discrepancy Indication Space Quantity Type Positive Partial Rejection Full Rejection

19b. Alternate Facility (or Generator) U.S. EPA ID Number

Facility's Phone

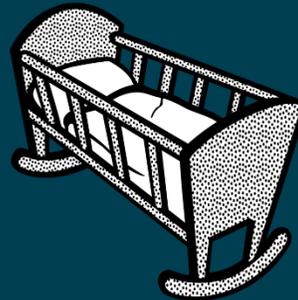
19c. Signature of Alternate Facility (or Generator) Month Day Year

19. Hazardous Waste Report Management Method Codes (i.e., codes for hazardous waste treatment, disposal, and recycling systems)

20. Designated Facility Owner or Operator: Certification of receipt of hazardous materials covered by the manifest except as noted in item 19a

(Printed) typed Name Signature Month Day Year

EPA Form 8700-22 (Rev. 12-17). Previous editions are obsolete. DESIGNATED FACILITY TO EPA's e-MANIFEST SYSTEM



“Cradle to Grave”



All hazardous waste are solid waste, but not all solid waste are hazardous waste.



Reclamation Directive on Hazardous Waste

Reclamation's facility managers shall consider hazardous waste handling before the initial purchase of hazardous materials, hazardous substances, oils, or as early as possible in the design of processes which use hazardous materials or have the potential to generate hazardous wastes. It is Reclamation policy to carefully consider such purchases or designs with the intention of substituting nonhazardous materials or of making process changes where possible to avoid or reduce the generation of hazardous wastes. **Whenever the generation of hazardous waste is unavoidable, Reclamation will ensure effective management is employed to minimize potential releases to the environment and any long-term liability.**

- Reclamation Manual ENV P15 Section 5A



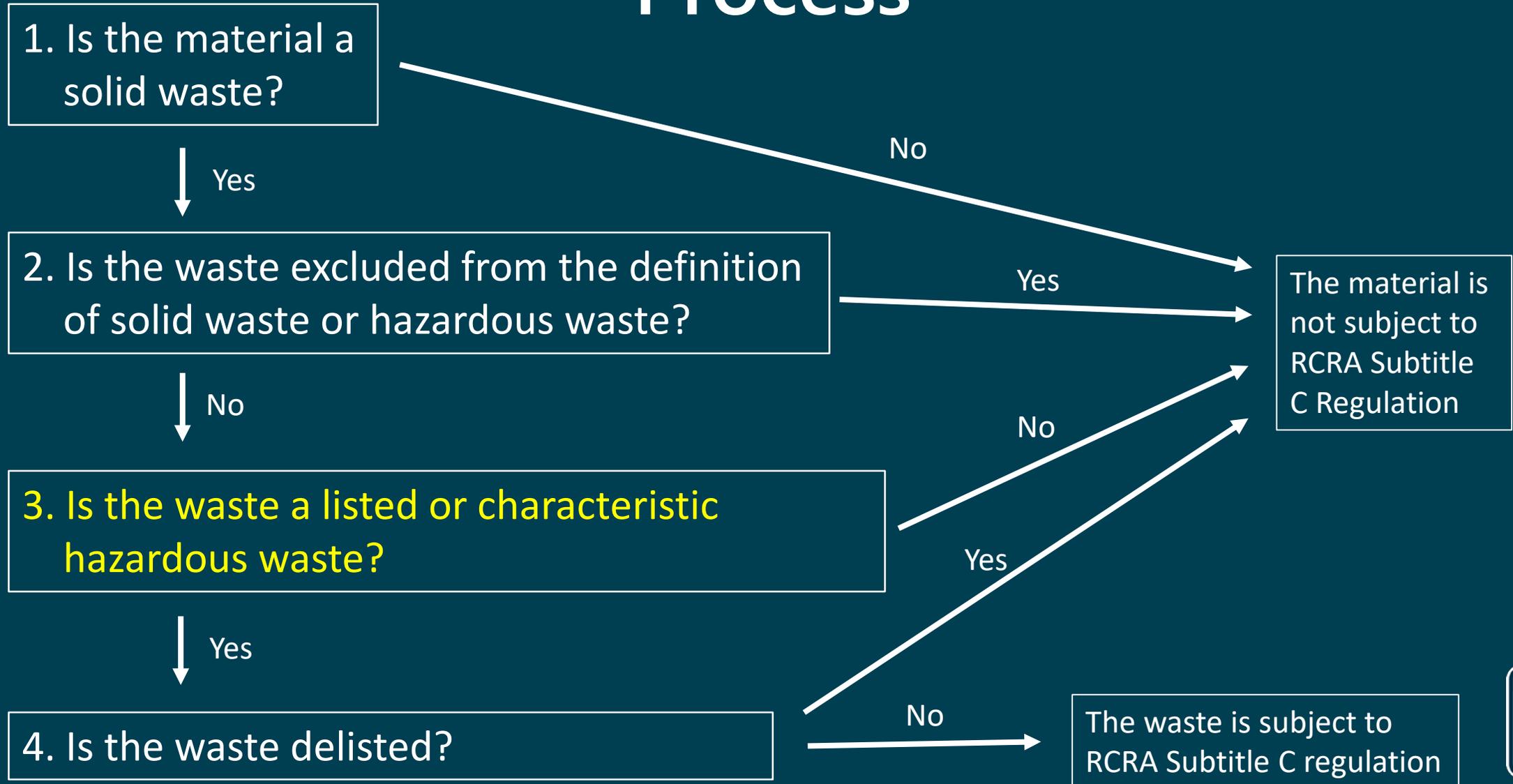
Executive Order 12088

Federal Compliance with Pollution Control Standards

- The head of each Executive agency is responsible for:
 - Ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to Federal facilities and activities under the control of the agency.
 - Compliance with applicable pollution control standards. (including RCRA)
 - “Applicable control standards” means the same substantive, procedural, and other requirements that would apply to a private person.
- Each Executive agency shall cooperate with the Administrator (EPA), and State, interstate, and local agencies in the prevention, control, and abatement of environmental pollution.



The EPA Hazardous Waste Identification Process



The EPA Hazardous Waste Identification Process

3. Is the waste a listed or characteristic hazardous waste?

Four Characteristic Wastes – hazardous waste characteristics that pose a sufficient threat to merit regulation as hazardous.

- Ignitability
- Corrosivity
- Reactivity
- Toxicity



The EPA Hazardous Waste Identification Process

How do we determine **toxicity** characteristic?

Toxicity Characteristic Leaching Procedure (TCLP)

- 40 CFR 261.24
- SW-846 Test Method 1311



DC-20 Rotary Agitator (Analytical Testing Corp)



TCLP (or RCRA) Target Analyte List and Action Levels

EPA Hazardous Waste No.	Contaminant	Regulatory Level (mg/L)	Total Concentration above which a solid waste may fail TCLP (mg/kg)
D004	Arsenic	5.0	100
D005	Barium	100.0	2000
D018	Benzene	0.5	10
D006	Cadmium	1.0	20
D019	Carbon tetrachloride	1.0	20
D020	Chlordane	0.03	0.6
D021	Chlorobenzene	100.0	2000
D022	Chloroform	6.0	120
D007	Chromium	5.0	100
D023	o-cresol	² 200.0	4000
D024	m-cresol	² 200.0	4000
D025	p-cresol	² 200.0	4000
D026	Cresol	² 200.0	4000
D016	2,4 D	10.0	200
D027	1,4-Dichlorobenzene	7.5	150
D028	1,2-Dichloroethane	0.5	10
D029	1,1-Dichloroethylene	0.7	14
D030	2,4 Dinitrotoluene	¹ 0.13	2.6
D012	Endrin	0.02	0.4
D031	Heptachlor (and its epoxide)	0.008	0.16
D032	Hexachlorobenzene	¹ 0.13	2.6
D033	Hexachlorobutadine	0.5	10
D034	Hexachloroethane	3.0	60
D008	Lead	5.0	100
D013	Lindane	0.4	8
D009	Mercury	0.2	4
D014	Methoxychlor	10.0	200
D035	Methyl Ethyl Ketone	200.0	4000
D036	Nitrobenzene	2.0	40
D037	Pentachlorophenol	100.0	2000
D038	Pyridine	5.0	100
D010	Selenium	1.0	20
D011	Silver	5.0	100
D039	Tetrachloroethylene	0.7	14
D015	Toxaphene	0.5	10
D040	Trichloroethylene	0.5	10
D041	2,4,5-Trichlorophenol	400.0	8000
D042	2,4,6-Trichlorophenol	2.0	40
D017	2,4,5-TP (Silvex)	1.0	20
D043	Vinyl chloride	0.2	4

¹ Quantitation limit is greater than calculated regulatory level. The quantitation limits therefore becomes the regulatory level.



Other Federal Regulations -

Toxic Substance Control Act (TSCA) – 1979 (40 CFR 700 – 799)

- Wastes containing PCBs \geq 50 ppm are regulated as hazardous waste.
- TSCA banned manufacturing, processing, distribution, and use of PCBs.

Asbestos Hazard Emergency Response Act (AHERA) – 1986 (40 CFR 763, Subpart E)

- Implemented under TSCA
- Asbestos-containing material (ACM) means any material containing more than 1% asbestos
- Model Accreditation Plan (must be certified)
- Asbestos School Hazard Abatement Reauthorization Act (ASHARA) – 1992
 - Extended AHERA to public and commercial buildings



Other Federal Regulations -

National Emission Standards for Hazardous Air Pollutants (NESHAP) – 1979 (40 CFR 700 – 799)

- Toxic air regulations under the Clean Air Act.
- Includes standards for renovations and demolitions
- Structures to be demolished or renovated, must be thoroughly inspected for the presence of asbestos. (also HAP = Hazardous Air Pollutants)
- Requires filing a notification (usually a state agency)
- Requires work practices designed to minimize release of asbestos fibers, waste packaging, transportation and disposal.



State Authorization Under RCRA

- A rulemaking process where EPA may delegate the primary responsibility of implementing the RCRA hazardous waste program to individual states.
- Currently, all 50 states and territories have been granted authority by the EPA to implement the base program.
- Important for our construction design specifications.
- Requires a lot of research into regulations to find the ones that apply to:
 - Type of hazardous materials to be removed and disposed
 - How will it be disposed of (landfill vs recycling vs treatment)
 - Location of the facility (state and local regulations)
 - Regulations that has “primacy”



Good Example - California

1 H Hydrogen 1.008																	2 He Helium 4.002602	
3 Li Lithium 6.94	4 Be Beryllium 9.012182											5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998403163	10 Ne Neon 20.1797	
11 Na Sodium 22.98976928	12 Mg Magnesium 24.305											13 Al Aluminum 26.9815385	14 Si Silicon 28.085	15 P Phosphorus 30.973761998	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948	
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955908	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938044	26 Fe Iron 55.845	27 Co Cobalt 58.933194	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.921595	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.798	
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90584	40 Zr Zirconium 91.224	41 Nb Niobium 92.90637	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.757	52 Te Tellurium 127.60	53 I Iodine 126.90447	54 Xe Xenon 131.29	
55 Cs Cesium 132.90545196	56 Ba Barium 137.327	57 - 71 Lanthanoids		72 Hf Hafnium 178.49	73 Ta Tantalum 180.94788	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.222	78 Pt Platinum 195.084	79 Au Gold 196.966569	80 Hg Mercury 200.592	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98040	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium (226)	89 - 103 Actinoids		104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (264)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 Ds Darmstadtium (267)	111 Rg Roentgenium (268)	112 Cn Copernicium (285)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (288)	116 Lv Livermorium (293)	117 Ts Tennessine (294)	118 Og Oganesson (294)

57 La Lanthanum 138.90547	58 Ce Cerium 140.12	59 Pr Praseodymium 140.90766	60 Nd Neodymium 144.242	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92535	66 Dy Dysprosium 162.500	67 Ho Holmium 164.93033	68 Er Erbium 167.259	69 Tm Thulium 168.93422	70 Yb Ytterbium 173.045	71 Lu Lutetium 174.9668
88 Ac Actinium (227)	90 Th Thorium 232.0377	91 Pa Protactinium 231.03688	92 U Uranium 238.02891	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (260)

CAM17 Metals

- Antimony (Sb)
- Arsenic (As)
- Barium (Ba)
- Beryllium (Be)
- Cadmium (Cd)
- Chromium (Cr)
- Cobalt (Co)
- Copper (Cu)
- Lead (Pb)
- Mercury (Hg)
- Molybdenum (Mo)
- Nickel (Ni)
- Selenium (Se)
- Silver (Ag)
- Thallium (Tl)
- Vanadium (V)
- Zinc (Zn)

RCRA 8 Metals

- Arsenic (As)
- Barium (Ba)
- Cadmium (Cd)
- Chromium (Cr)
- Lead (Pb)
- Mercury (Hg)
- Selenium (Se)
- Silver (Ag)



What hazardous materials may be found in existing coatings at Reclamation facilities?

- Resource Conservation and Recovery Act
"RCRA 8 Metals"

Arsenic (As)

Lead (Pb)

Barium (Ba)

Mercury (Hg)

Cadmium (Cd)

Selenium (Se)

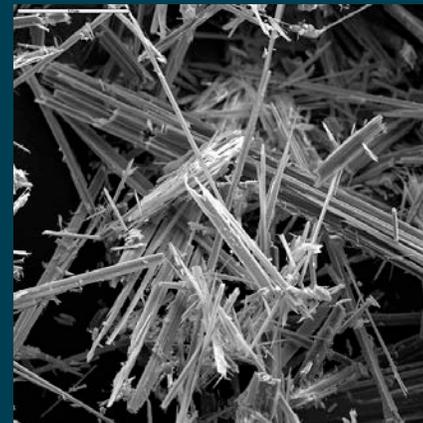
Chromium (Cr)

Silver (Ag)



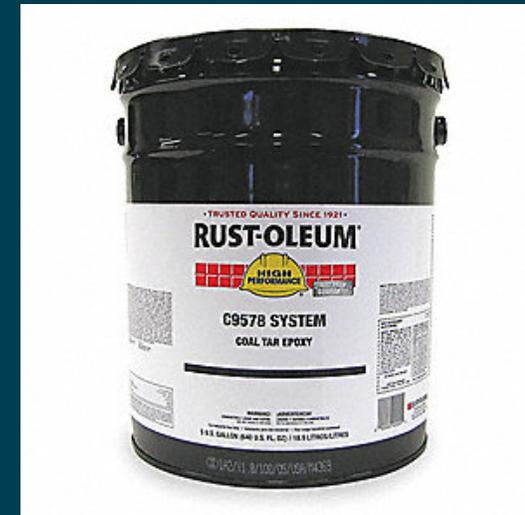
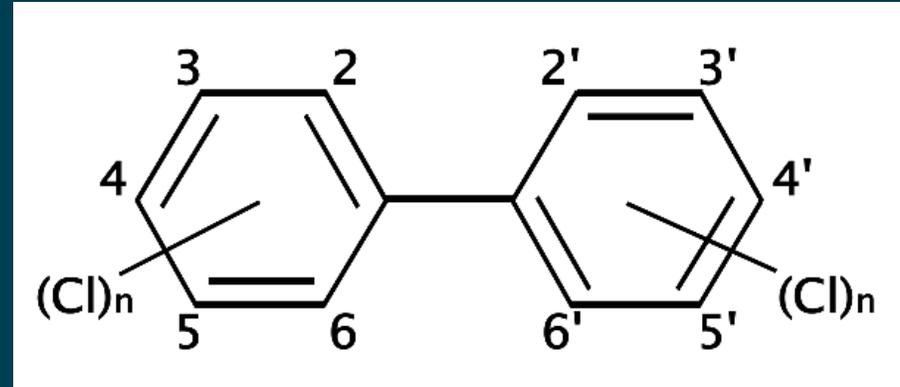
- Asbestos

Naturally occurring silicate minerals



What hazardous materials may be regulated in existing coatings at Reclamation facilities?

- Polychlorinated Biphenyls (PCBs)
 - Arochlor – mixtures of PCB congeners
 - Used as plasticizers in paints
- Coal Tar
 - Byproduct of coking
 - Water-immersed structures
 - Penstocks, roofing, gates, trashracks, etc.



Common Misperceptions

Who is the hazardous waste generator?

- EPA Definition: “*Generator means any person, by site, whose act or process produces hazardous waste identified or listed in [40 CFR 261] or whose act first causes a hazardous waste to become subject to regulation.*”
- Co-generator status is common.
 - “person” = anyone! (could be the contractor)
 - “by site” = physical location where the waste is generated. (assigned an EPA identification number)
- Reclamation must ensure and fully document that the hazardous waste is properly identified, managed, and disposed.



Common Misperceptions

Lead-Based Paint

- Paint or other surface coatings that contain lead ≥ 1.0 mg/cm² or 0.5% by weight or 5,000 ppm by weight.
- Definition applies to a “child-occupied facility.”



X-ray Fluorescence (XRF) Metal Analyzer

- In-situ elemental surface analysis.
- Screening only.
- EPA requires BULK sampling for hazardous waste characterization.



Hazardous Materials Evaluation Process



Kevin Kelly
kkelly@usbr.gov
720-663-7944



Lise Pederson
lpederson@usbr.gov
303-445-3095

1. Contact us
2. Purpose of Evaluation
3. Data Collection
 - Schedule a hazmat survey
 - Perform inspection
 - Archival research
 - Find Relevant Environmental Regulations
4. What we may need from client
 - Scope of work
 - Photographs
 - Historical Data
 - Drawings
5. Final products
 - Survey Report: data, photographs, observations, and recommendations/conclusions
 - Construction Design Specifications (Div 02 and 51)
 - Quantity Estimates



Hazardous Materials Evaluation Process

Hazmat Survey



Ship to Laboratory under Chain of Custody (COC)

Lab Report

Pace Analytical
www.pacelabs.com

Pace Analytical Services, LLC
9608 Loiret Blvd.
Lenexa, KS 66219
(913)599-5665

ANALYTICAL RESULTS

Project: FLATIRONS PIPE REHAB
Pace Project No.: 60269281

Sample: FKK001 Lab ID: 60269281001 Collected: 04/23/18 08:00 Received: 05/01/18 12:59 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference			Analytical Method: EPA 6010 Preparation Method: EPA 3050						
Arsenic	ND	mg/kg	21.7	9.6	10	05/02/18 13:40	05/03/18 14:28	7440-38-2	D3
Barium	493	mg/kg	10.9	1.5	10	05/02/18 13:40	05/03/18 14:28	7440-39-3	
Cadmium	24.0	mg/kg	10.9	1.5	10	05/02/18 13:40	05/03/18 14:28	7440-43-9	
Chromium	10800	mg/kg	10.9	3.1	10	05/02/18 13:40	05/03/18 14:28	7440-47-3	
Lead	163000	mg/kg	21.7	17.1	20	05/02/18 13:40	05/05/18 19:01	7439-92-1	
Selenium	ND	mg/kg	32.6	12.1	10	05/02/18 13:40	05/03/18 14:28	7782-49-2	D3
Silver	6.5J	mg/kg	15.2	3.0	10	05/02/18 13:40	05/03/18 14:28	7440-22-4	
7471 Mercury			Analytical Method: EPA 7471 Preparation Method: EPA 7471						
Mercury	2.6	mg/kg	0.25	0.094	5	05/09/18 13:25	05/09/18 16:39	7439-97-6	

Hazardous Materials Evaluation Process

Pace Analytical
www.paceanalytical.com

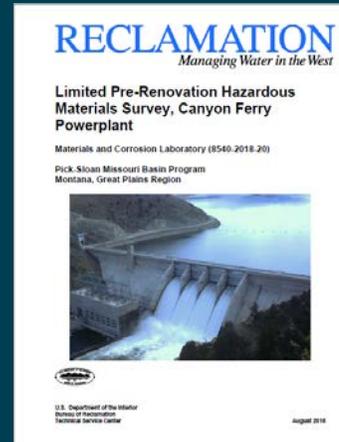
Pace Analytical Services, LLC
9608 Leiret Blvd.
Lewes, KS 66219
(913)999-9665

ANALYTICAL RESULTS

Project: FLATRONS PIPE REHAB
Pace Project No.: 60209281

Sample: FKK001 Lab ID: 6020921001 Collected: 04/23/18 08:00 Received: 05/01/18 12:59 Matrix: Solid
Results reported on a "wet-weight" basis

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP Red. Interference Analytical Method: EPA 6010 Preparation Method: EPA 3050									
Arsenic	ND	mg/kg	21.7	9.6	10	05/02/18 13:40	05/03/18 14:28	7440-38-2	D3
Barium	493	mg/kg	10.9	1.5	10	05/02/18 13:40	05/03/18 14:28	7440-39-3	
Cadmium	24.0	mg/kg	10.9	1.5	10	05/02/18 13:40	05/03/18 14:28	7440-43-9	
Chromium	10800	mg/kg	10.9	3.1	10	05/02/18 13:40	05/03/18 14:28	7440-47-3	
Lead	163000	mg/kg	21.7	17.1	20	05/02/18 13:40	05/05/18 19:01	7439-92-1	
Selenium	ND	mg/kg	32.6	12.1	10	05/02/18 13:40	05/03/18 14:28	7782-49-2	D3
Silver	6.5J	mg/kg	15.2	3.0	10	05/02/18 13:40	05/03/18 14:28	7440-22-4	
7471 Mercury Analytical Method: EPA 7471 Preparation Method: EPA 7471									
Mercury	2.6	mg/kg	0.25	0.094	5	05/09/18 13:25	05/09/18 16:39	7439-97-6	



Survey Reports

Construction Design Specifications

Quantity Estimates



BUREAU OF RECLAMATION ESTIMATE WORKSHEET SHEET _____ OF _____

PROJECT: **Stamper Powerplant Facility Assessment**

WORK ORDER: **HAZMAT** ESTIMATE LEVEL: **40% Scope**

MATERIALS AND CORROSION LAB NO: **66-68548 - Hazardous** UNIT PRICE LEVEL:

NO.	DESCRIPTION	QTY	UNIT	AMOUNT	UNIT PRICE	TOTAL
1	Spiral Case Coating Spot Repair Abrasive blast on pipes and approximately 50% of the total area of spiral cases.	66-40741	35	SP		
2	Drift Tube Coating Spot Repair Abrasive blast on pipes and approximately 50% of the total area of drift tubes.	66-40741	60	SP		

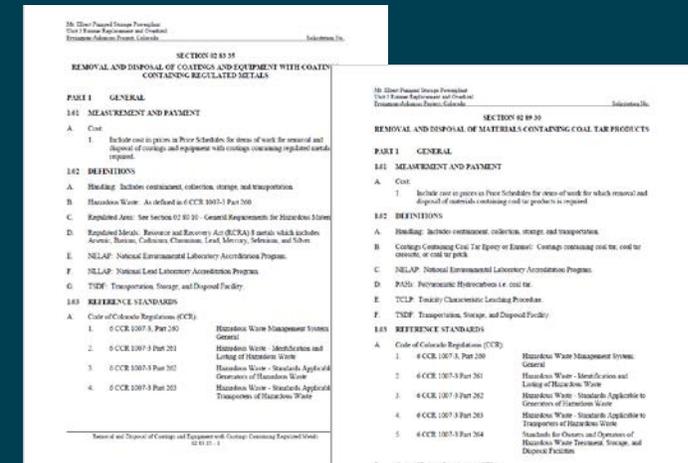
Notes: (Per Item 1.2)
 1. Coating on existing surfaces may contain hazardous materials (heavy metals).
 2. Contractor to assess and dispose of coating containing hazardous materials.
 3. Includes containment, handling of waste streams, packaging, transport, and disposal as approved treatment, storage, and disposal facility.

APPROVED BY: _____ DATE PREPARED: _____

CHECKED BY: _____ DATE CHECKED: _____

DATE PREPARED: _____ PEER REVIEW DATE: _____

DATE CHECKED: _____ PEER REVIEW DATE: _____



Materials and Corrosion Laboratory Group

MCL personnel have specialized training and certifications:

- Coating Specialists, Chemists, and Professional Engineers
- Asbestos Building Inspectors (AHERA)
- Certified Hazardous Materials Manager (CHHM)
- Safety and Health Training:
 - Hazardous Energy Control Program (HECP)
 - Confined Space
 - Fall Protection
 - Personal Protection Equipment
- Special Access Surveys (normally-inaccessible features)
 - Underwater Inspection
 - Rope Access



Materials and Corrosion Laboratory Staff - 8540

Cathodic Protection



Chrissy Henderson, Ph.D.
chenderson@usbr.gov
303-445-2348



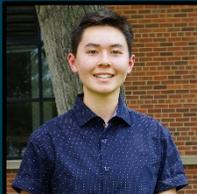
Matt Jermyn
mjermyn@usbr.gov
303-445-2317



Daryl Little, Ph.D.
dlittle@usbr.gov
303-445-2384



David Tordonato, Ph.D., P.E.
dtordonato@usbr.gov
303-445-2394



Grace Weber
gweber@usbr.gov
303-445-2327

Hazardous Materials



Kevin Kelly, Ph.D.
kkelly@usbr.gov
303-445-7944



Lise Pederson, P.E.
lpederson@usbr.gov
303-445-3095

Group Manager



Jessica Torrey, Ph.D., P.E.
jtorrey@usbr.gov
303-445-2376

Protective Coatings



Brian Baumgarten
bbaumgarten@usbr.gov
303-445-2399



Carter Gulsvig
cgulsvig@usbr.gov
303-445-2329



Bobbi Jo Merten, Ph.D.
bmerten@usbr.gov
303-445-2380



Rick Pepin, PCS
rpepin@usbr.gov
303-445-2391



Stephanie Prochaska
sprochaska@usbr.gov
303-445-2323



Allen Skaja, Ph.D., PCS
askaja@usbr.gov
303-445-2396

Questions?

Kevin L. Kelly
kkelly@usbr.gov



— BUREAU OF —
RECLAMATION