RCRA Expert Brownbag Webinar

RCRA's Land Disposal Restrictions Program – The New Challenges that Lie Ahead

October 4, 2017

Today's Presentation

- Presentation is divided into four parts:
  - History of LDR program
  - Overview of LDR requirements
  - Implementing the LDR program
  - LDR Issues and Challenges

LDR History

- In 1984 as part of HSWA, Congress created the Land Disposal Restrictions (LDR) Program (40 CFR Part 268).

- Purpose of LDR program is to MINIMIZE short- and long-term threats to HHE by reducing the TOXICITY or MOBILITY of hazardous constituents before they are land disposed.

- Adds a second level of protection over that from physical barriers established in RCRA.

LDR History

- Starting in 1986, EPA developed the LDR program in nine stages (rulemakings).
  - Congress set schedule for wastes listed pre-1984 beginning with treatment standards for:
    - Solvent and Dioxin wastes
    - California List
    - "Thirds"
  - Four "phases" for newly identified or listed wastes
- LDR program firmly established by 1998.
- Resources can be found on EPA's LDR website:
  - LDR - Summary of LDR Requirements,
  - Land Disposal Restrictions – Davis and Harford

What Does the LDR Program Do?

- LDR program PROHIBITS hazardous wastes from land disposal.
- Establishes treatment standards that must be met BEFORE land disposal can occur.
- Allows TREATMENT to be accomplished either by:
  - meeting a concentration-based standard
  - method of treatment

What is Land Disposal?

- 268.2 defines LAND DISPOSAL as placement in or on the land, except in a corrective action management unit or staging pile, and includes, but is not limited to, placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, underground mine, or cave, or placement in a concrete vault or bunker intended for disposal purposes.

Part Two

Overview of LDR Requirements

LDR Basics

- The LDR program contains three key regulatory prohibitions:
  - DISPOSAL Prohibition (40 CFR 268.40)
    - Requires treatment
  - DILUTION Prohibition (40 CFR 268.3)
    - Ensures proper treatment
  - STORAGE Prohibition (40 CFR 268.50)
    - Prevents indefinite storage

LDR Basics

- LDRs attach at the POINT OF GENERATION not the point of disposal.
- Once attached, LDRs apply until treatment standards are met.
- Listed wastes meeting LDRs must be disposed in a subtitle C hazardous waste landfill. Note: There are exceptions!
- Characteristic wastes that are de-characterized and meet LDRs can be disposed in a non-hazardous waste landfill. Note: There are exceptions!

LDR Basics

- There are two types of treatment standards
  - TECHNOLOGY-based (40 CFR 268.42 Table 1)
    - Specified technology such as CMBST or DEACT must be used.
    - Established because of lack of analytical method.
  - CONCENTRATION-based (40 CFR 268.40)
    - Specified concentration limits must be met.
    - Organics (total analysis) and Metals and characteristic organics (TCLP).
    - Any treatment is allowed except dilution. Note: There are exceptions!

LDR Basics

- 268.40 contains treatment standards for all wastes (characteristic, listed, and treatment subcategories or treatability groups)
- Separate standards for "WASTEWATERS" and "NONWASTEWATERS"
- Wastewaters are defined as wastes containing less than 1% by weight of TOC and less than 1% by weight TSS
- For each LISTED waste (F, K,U and P), 268.40 identifies the REGULATED HAZARDOUS CONSTITUENTS that must meet LDR treatment standards before land disposed can occur.

Characteristic Waste and UHCs

- Unlike listed wastes that have regulated hazardous constituents, CHARACTERISTIC wastes (D- Wastes), have UNDERLYING HAZARDOUS CONSTITUENTS (UHCs).

- Both the characteristic and all UHCs must meet treatment standards before land disposal can occur.

- UHCs are any constituent listed in 268.48 which can reasonably be expected to be present at the POINT OF GENERATION of the hazardous waste at a concentration above its treatment standard.

- Generators may use KNOWLEDGE or TESTING to determine the presence of UHCs in characteristic waste or ask treater to do so.

TREATMENT STANDARDS FOR HAZARDOUS WASTES—Continued

[Note: NA means not applicable]

Waste code	Waste description and treatment/Regulatory subcategory [1]	Regulated hazardous constituent		Wastewaters	Nonwastewate
		Common name	CAS [2] number	Concentration [3] in mg/L; or Technology Code [4]	Concentration [5] mg/kg unless no as "mg/L TCLP"; Technology Coc
		Phenanthrene	85–01–8	0.059	5.6
		Toluene	108–88–3	0.080	10
		Chromium (Total)	7440–47–3	2.77	0.60 mg/L TCL
		Nickel	7440–02–0	3.98	11 mg/L TCLP
K016	Heavy ends or distillation residues from the production of carbon tetrachloride.	Hexachlorobenzene	118–74–1	0.055	10
		Hexachlorobutadiene	87–68–3	0.055	5.6
		Hexachlorocyclopentadiene	77–47–4	0.057	2.4
		Hexachloroethane	67–72–1	0.055	30
		Tetrachloroethylene	127–18–4	0.056	6.0
K017	Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin.	bis(2-Chloroethyl)ether	111–44–4	0.033	6.0
		1,2-Dichloropropane	78–87–5	0.85	18
		1,2,3-Trichloropropane	96–18–4	0.85	30
K018	Heavy ends from the fractionation column in ethyl chloride production.	Chloroethane	75–00–3	0.27	6.0
		Chloromethane	74–87–3	0.19	NA
		1,1-Dichloroethane	75–34–3	0.059	6.0
		1,2-Dichloroethane	107–06–2	0.21	6.0
		Hexachlorobenzene	118–74–1	0.055	10
		Hexachlorobutadiene	87–68–3	0.055	5.6
		Hexachloroethane	67–72–1	0.055	30
		Pentachloroethane	76–01–7	NA	6.0
		1,1,1-Trichloroethane	71–55–6	0.054	6.0
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production.	bis(2-Chloroethyl)ether	111–44–4	0.033	6.0
		Chlorobenzene	108–90–7	0.057	6.0
		Chloroform	67–66–3	0.046	6.0
		p-Dichlorobenzene	106–46–7	0.090	NA
		1,2-Dichloroethane	107–06–2	0.21	6.0
		Fluorene	86–73–7	0.059	NA
		Hexachloroethane	67–72–1	0.055	30
		Nephthalene	91–20–3	0.059	5.6
		Phenanthrene	85–01–8	0.059	5.6
		1,2,4,5-Tetrachlorobenzene	95–94–3	0.055	NA
		Tetrachloroethylene	127–18–4	0.056	6.0
		1,2,4-Trichlorobenzene	120–82–1	0.055	19
		1,1,1-Trichloroethane	71–55–6	0.054	6.0

	Water Reactive Subcategory based on 261.23(a)(2), (3), and (4). (Note: This subcategory consists of nonwastewaters only).	NA	NA	NA	DEACT and meet §268.48 standards[6]
	Reactive Cyanides Subcategory based on 261.23(a)(5).	Cyanides (Total)[7] Cyanides (Amenable)[7]	57-12-5 57-12-5	Reserved 0.86	590 30
D004[9]	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for arsenic based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Arsenic	7440-38-2	1.4 and meet §268.48 standards[6]	5.0 mg/L TCLP and meet §268.48 standards[6]
D005[9]	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for barium based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Barium	7440-39-3	1.2 and meet §268.48 standards[6]	21 mg/L TCLP and meet §268.48 standards[6]
D006[9]	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for cadmium based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Cadmium	7440-43-9	0.69 and meet §268.48 standards[6]	0.11 mg/L TCLP and meet §268.48 standards[6]
	Cadmium Containing Batteries Subcategory. (Note: This subcategory consists of nonwastewaters only).	Cadmium	7440-43-9	NA	RTHRM
	Radioactively contaminated cadmium containing batteries. (Note: This subcategory consists of nonwastewaters only)	Cadmium	7440-43-9	NA	Macroencapsulation in accordance with 40 CFR 268.45.
D007[9]	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for chromium based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Chromium (Total)	7440-47-3	2.77 and meet §268.48 standards[6]	0.60 mg/L TCLP and meet §268.48 standards[6]
D008[9]	Wastes that exhibit, or are expected to exhibit, the characteristic of toxicity for lead based on the toxicity characteristic leaching procedure (TCLP) in SW846.	Lead	7439-92-1	0.69 and meet §268.48 standards[6]	0.75 mg/L TCLP and meet §268.48 standards[6]
	Lead Acid Batteries Subcategory (Note: This standard only applies to lead acid batteries that are identified as RCRA hazardous wastes and that are not excluded elsewhere from regulation under the land disposal restrictions of 40 CFR 268 or exempted under other EPA regulations (see 40 CFR 266.80). This subcategory consists of nonwastewaters only.)	Lead	7439-92-1	NA	RLEAD
	Radioactive Lead Solids Subcategory (Note: These lead solids include, but are not limited to, all forms of lead shielding and other elemental forms of lead. These lead solids do not include treatment residuals such as hydroxide sludges, other wastewater treatment residuals, or incinerator ashes that can undergo conventional pozzolanic stabilization, nor do they include organo-lead materials that can be incinerated and stabilized as ash. This subcategory consists of nonwastewaters only.)	Lead	7439-92-1	NA	MACRO

9 268.4

Development of Treatment Standards

- Treatment standards were developed based on BEST DEMONSTRATED AVAILABLE TECHNOLOGY or BDAT.
  - Organics – incineration
  - Inorganics – stabilization or HTMR

- Wastes used to develop the treatment standards were considered to be the MOST DIFFICULT TO TREAT wastes.
  - Highest concentration of hazardous constituent
  - Multiple hazardous constituents

- TREATMENT STANDARDS were developed using the following formula:

  TS = Mean concentration of the treated hazardous constituents X VF

- The use of this formula establishes a treatment standard that should be achievable 99% of the time by a WELL-DESIGNED, WELL-OPERATED system.

Development of Treatment Standards

- In the EARLY stages of the LDR program, treatment standards were based on BDAT (best demonstrated available technology) for EACH waste.
- As we proceeded with rulemakings, Unintended consequence emerged: Numeric standards from BDAT could vary among wastes.
- To simply LDR program, EPA set a SINGLE numeric value for each hazardous constituent…UNIVERSAL TREATMENT STANDARDS (UTS). (1994 Phase II rule)
- In the Phase IV Rule (1998), EPA promulgated new UTS treatment levels for 12 metal constituents based on dual BDATs of stabilization and High Temperature Metals Recovery (HTMR) -- applying to ALL hazardous wastes with metals either as a regulated constituent (listed waste) or as a UHC (characteristic waste).

Development of UTS for Metals

- The STABILIZATION conducted at Rollins Environmental Services in Deer Trail, Colorado was determined to be BDAT for METALS.
  - Commercial TSDF on 5700 acres (9 square miles)
  - Active area 325 acres, remainder farmed for wheat.
  - Effect of LDRs at this facility was pronounced:
    - 1991, 7000 tons treated
    - 1996; 100,000-120,000

- Key Treatment Characteristics:
  - Treatment conducted in a RCRA- permitted containment building
  - Treatment of a variety of metal wastes with high concentrations (% levels)
  - Size reduction (hammer mill and shredding)
  - Homogenous Mixture
  - Use of Portland cement as treatment reagent
  - Optimal Waste to reagent ratio (less than 2:1).
  - 90 minutes of total mixing time
  - Grab samples collected
  - The entire process receipt, treatment and disposal requires 36 to 40 hours.

ICF
CONSULTING GROUP

ICF Incorporated
9300 Lee Highway
Fairfax, VA 22031-1207
703/934-3000 Fax 703/934-9740

November 21, 1996

MEMORANDUM

TO: Anita Cummings, Mary Cunningham, and Elaine Eby

FROM: Howard Finkel

SUBJECT: Final Draft Site Visit Report for the August 20-21 Site Visit to Rollins Environmental's Highway 36 Commercial Waste Treatment Facility Located in Deer Trail, Colorado

---

Rollins Environmental operates the Highway 36 Land Development Company, which is a commercial waste treatment and disposal facility located in Deer Trail, Colorado. The Highway 36 facility is approximately 70 miles east of Denver and is situated on a 5,700 acre (9 square miles) parcel. The active area of the facility (i.e., the portion inside the fenced boundary) is approximately 325 acres. This permitted acreage is surrounded by a buffer zone of roughly 400 acres. The remaining acreage is leased to a farmer who grows wheat. The climate is arid, as the site has an annual rain fall of only 15 inches and an annual evapotranspiration rate of more than 50 inches. Although the site is located in a remote area, there was one visible residence located several miles North of the facility.

Overview of Operations

LDR Phase IV BDAT Descriptions, Mean Treatment Concentrations, and LDR Universal Treatment Standards

Constituent	Raw Mean Concentration of BDAT Treatment (mg/L TCLP)	Mean Concentration of BDAT Treatment (mg/L TCLP transformed from natural log mean)	Number of Observations	UTS (mg/L TCLP)	Technology
antimony	0.21	0.14	51	1.15	stabilization
barium	2.6	1.4	12	21.0	stabilization
beryllium	0.19	0.12	7	1.22	stabilization
cadmium	0.025	0.017	38	0.11	HTMR
chromium	0.10	0.066	38	0.60	HTMR
lead	0.12	0.060	19	0.75	stabilization
nickel	2.9	2.4	117	11.0	HTMR
silver	0.032	0.024	111	0.14	HTMR
thallium	0.092	0.086	15	0.20	stabilization
vanadium	0.57	0.57	1	1.6	stabilization

Alternative LDR Treatment Standards

- ALTERNATIVE TREATMENT STANDARDS address wastes that don't fit the general LDR framework.

- Alternative treatment standards are listed in separate subparts in CFR

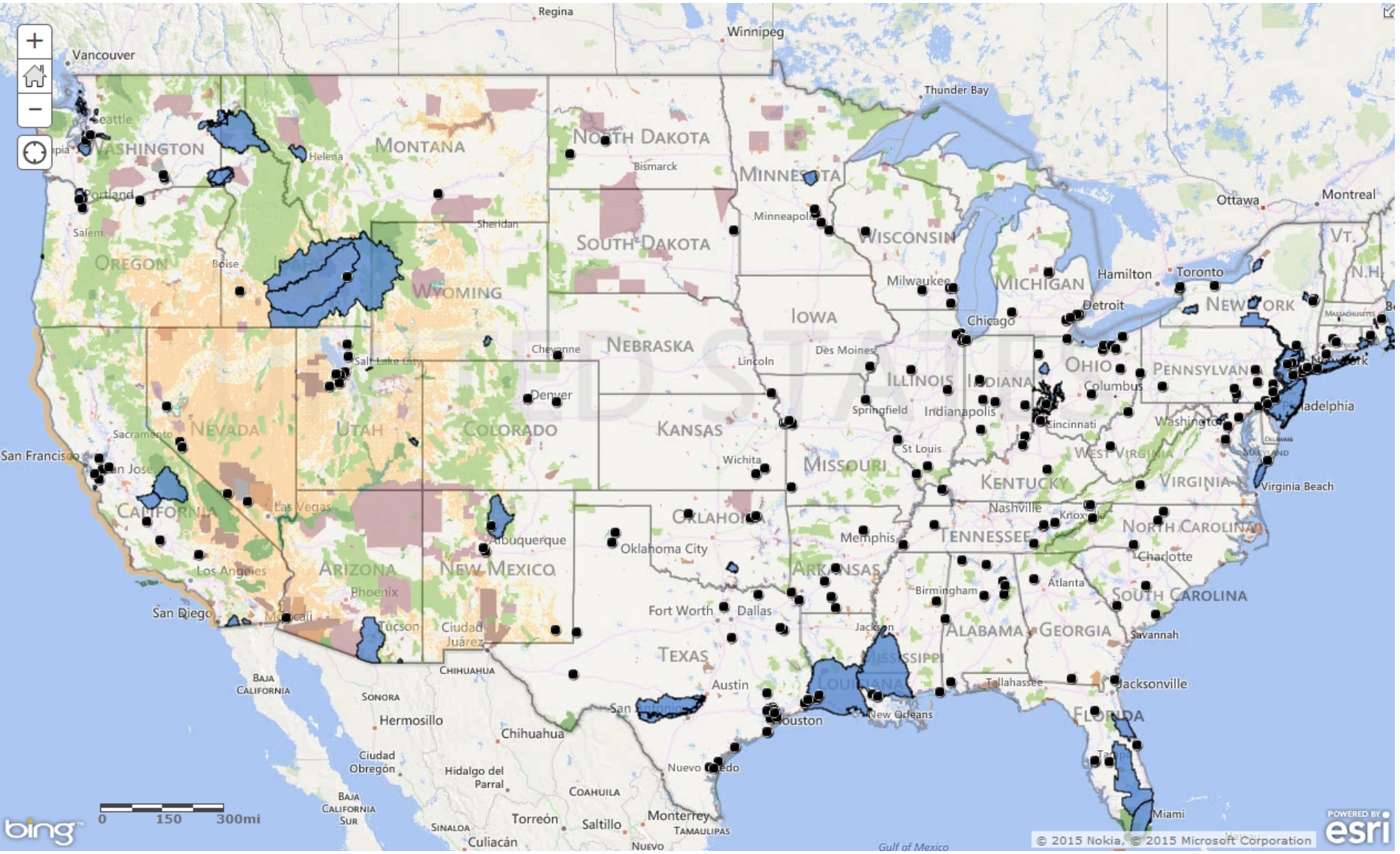
Alternative LDR Treatment Standards

- Soil (268.49)(Phase IV)
  - 90% reduction, capped at 10x UTS
- Debris (268.45)(Phase II)
  - Any manufactured object, plant, animal matter, or geologic material bigger than a tennis ball that is contaminated with a listed or characteristic waste.
  - EXTRACTION, DESTRUCTION, IMMOBILIZATION
- Lab Packs (268.42)
  - Drum, container filled with small containers
  - Alternative LDR of incineration (some exclusions)
- Treatability Variance (268.44)
- Determinations of Equivalent Treatment (DET) (268.42(b))
- No Migration Variance (268.6)

Part Three

Implementing the LDR Program

LDR Treatment Facilities



Implementing the LDR Program

- Proper Waste Characterization
- Proper Treatment
  - System is WELL-DESIGNED and WELL-OPERATED
  - Aware of "Waste Characteristics Affecting Performance"
  - No mixing of waste with soil, debris, to get alternative treatment standard.
- Storage both Pre and Post Treatment must be in a tank, container, containment building
- Sampling should be conducted often enough to ensure consistent treatment from a well-designed and well-operated treatment process.

Compliance With LDRs

- Compliance with LDR treatment standards is based on:
  - GRAB sampling for D004-D011 WWs and for all NWWs.
  - COMPOSITE sampling for all other WWs.

- Wastes treated by a TECHNOLOGY standard can be land disposed without testing.

- GRAB samples normally reflect maximum process variability and thus would reasonably characterize the ranges of treatment system performance.

- Grab samples are in keeping with the ultimate objective of the LDR program - all of the hazardous waste land disposed has been treated to MINIMIZE threats to HHE.

Compliance With LDRs

- The WASTE ANALYSIS PLAN or WAP provides the basis for monitoring a facilities compliance with LDR. 40 CFR 268.7(b) states that facilities (TSDFs and generators that treat) must test their wastes according to the FREQUENCY specified in WAP, the LDR regulations do not require testing of every batch or load.

- The DISPOSAL facility is ultimately responsible if it disposes of a wastes not meeting LDR.

- ENFORCEMENT of LDRs is based on GRAB sampling. Can be in compliance with WAP but not LDR.

Measuring Compliance With LDRs
Preamble From Phase IV Second Supplemental 62 FR at 26047, May 12, 1997

7. Demonstrating Compliance by Grab or Composite Sampling

EPA has long preferred that compliance with the LDR standards for nonwastewaters be based on grab samples (a one-time sample taken from any part of the waste), rather than composite samples (a combination of samples collected at various locations for a given waste, or samples collected over time from that waste). This is because ''grab samples normally reflect maximum process variability, and thus would reasonably characterize the range of treatment system performance.'' (See 54 FR at 26605–06, June 23, 1989; 55 FR at 22539, June 1, 1990.) This type of sampling is in keeping with the ultimate objective of the land disposal restrictions program: that all of the hazardous waste to be land disposed be treated in a way that minimizes the threats that land disposal could pose, not just that some average portion of the waste be so treated (a possible result of using composite sampling). In addition, there is an implementation advantage to use of grab sampling, since enforcement for EPA, authorized states, or citizen groups is facilitated if enforcement can be based on individual sampling events (as occurs with grab sampling).

The universal treatment standards for nonwastewaters are consequently enforced on the basis of grab sampling. The revisions to those standards for toxic metals reproposed today would likewise be enforced on the basis of grab sampling, and, in all cases are based on grab sampling data. EPA intends to

Part Four

LDR Issues and Challenges

LDR Issues and Challenges

- Put Piles
- In-Cell Macroencapsulation of Mixed and Hazardous Debris
- Effective Treatment
- Effective Sampling
- WAPs

What is a Put Pile?

- A PUT PILE is a mound or accumulation of TREATED hazardous waste that is TEMPORARILY "put" not placed in or on a permitted hazardous waste landfill before compliance with LDR standards are VERIFIED.

- This practice is NOT COMPLIANT with LDRs, hazardous waste awaiting treatment VERIFICATION must be stored in a tank, container, or containment building it cannot be placed on the land (e.g., landfill, waste pile).

Put Piles

- In 2014, EPA-HQ responded to a request from Region 9 for a memo RE-AFFIRMING that HW must meet treatment standard BEFORE placement in a landfill.
- This memo is known as the BARNES MEMO.
- Support for an ENFORCEMENT action (Clean Harbors – Buttonwillow).
- Memo was sent to all Regional RCRA, Superfund, and Enforcement DDs.
- Key points of Memo:
  - Waste must meet treatment standard BEFORE land placement unless there is a NO MIGRATION VARIANCE in play.
  - Wastes placed on the land that meets LDRs upon verification testing is NOT ILLEGAL.
  - The statute draws no distinction in the duration of disposal. TEMPORARY placement in a land disposal unit is "land disposal" just as much as is PERMANENT disposal.
  - CONTAINERS located in or on a landfill are also considered land disposal.

APR 11 2014

OFFICE OF
SOLID WASTE AND
EMERGENCY RESPONSE

ORANDUM

ECT: Land Disposal Restriction (LDR) Requirements

M: Barnes Johnson, Director
Office of Resource Conservation and Recovery

Barnes Johnson

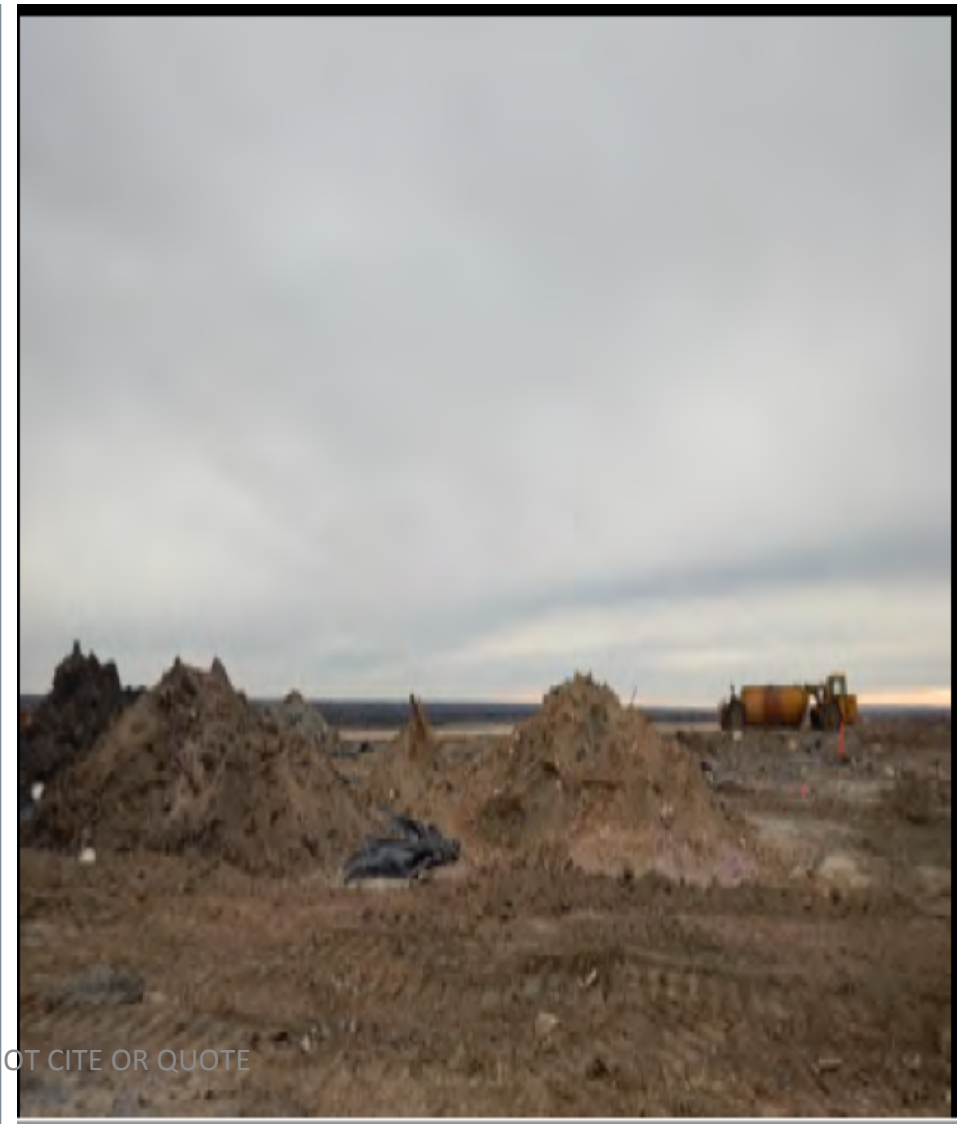
Regional RCRA Division Directors
Regional Superfund Division Directors
Regional Enforcement Division Directors

ions have been raised on whether hazardous wastes that are prohibited from land disposal can be rarily put or placed in or on a landfill (or on synthetic material in or on a landfill) before it is med that the waste meets the applicable LDR treatment standards. In short, the answer is ited wastes (wastes that do not meet the applicable treatment standard) cannot be placed in or on isposal units unless the unit satisfies the statutory no migration standards. Thus, if a prohibited is placed in or on a land disposal unit before it is confirmed that the waste meets the treatment

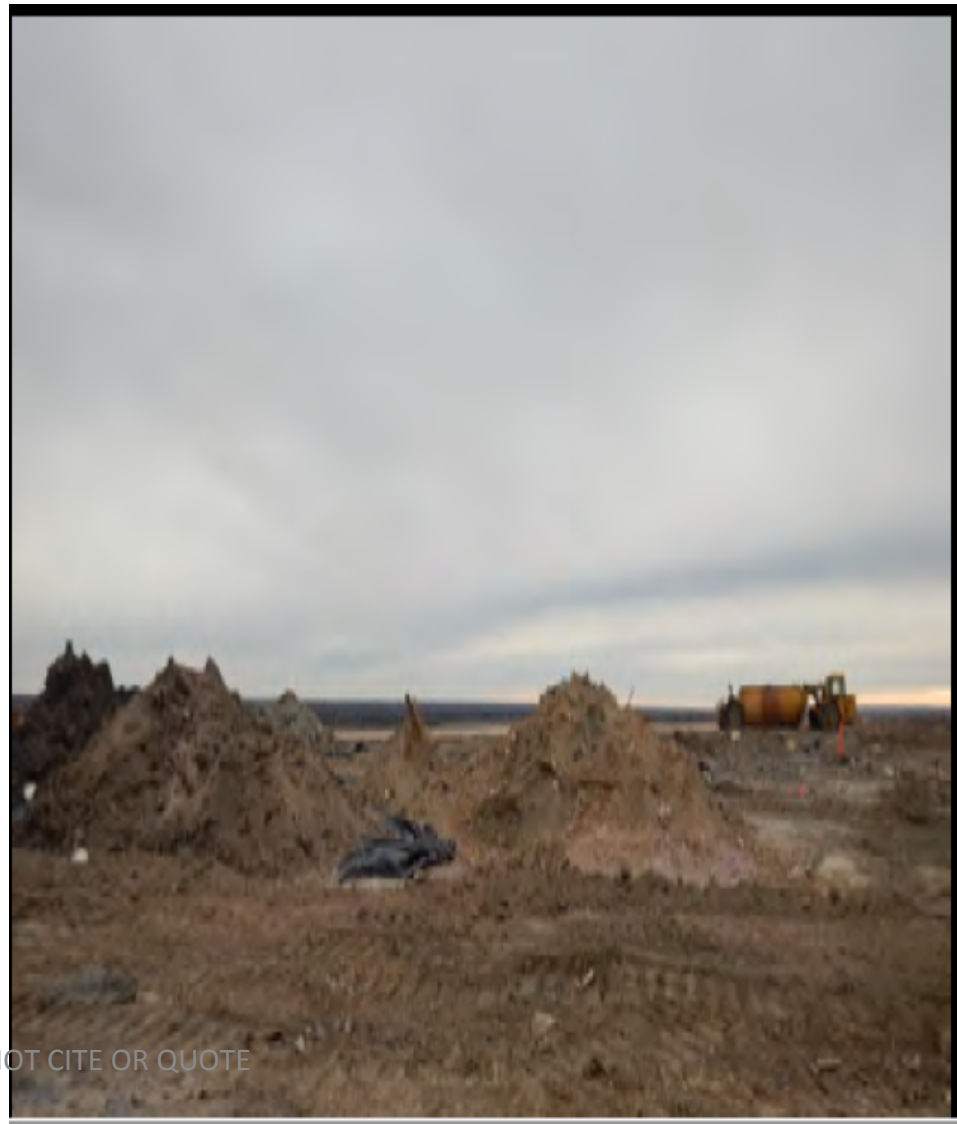
Put Piles

- After memo was released, numerous TSDFs were discovered using PUT PILES.
- Practice outlined in WASTE ANALYSIS PLANS and for some facilities practice had been in use for over 20 years.
- The challenge has been to bring these facilities into compliance with LDRs.

Put Piles



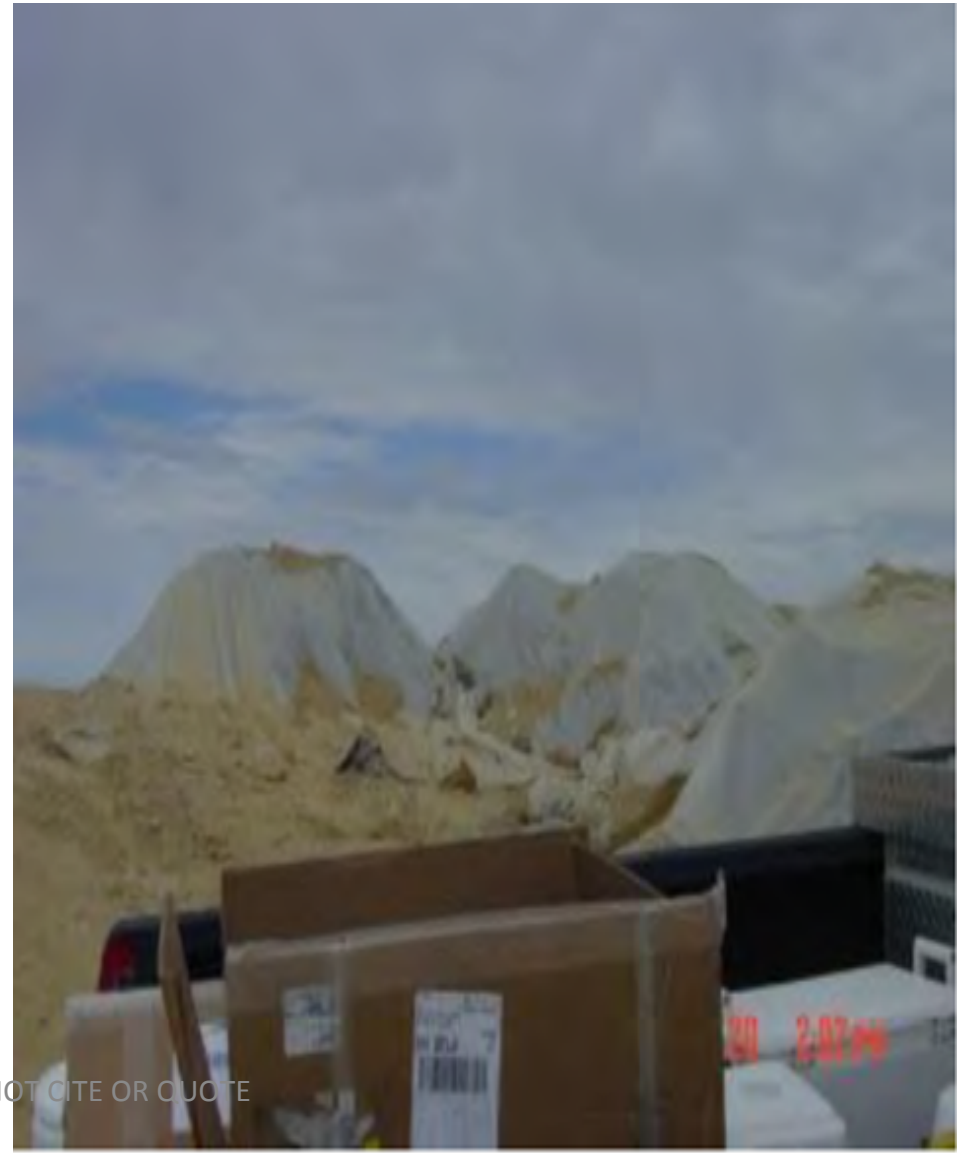
Put Piles



Put Piles

Put Piles

Put Piles



Put piles

Put Piles

Put Piles

Put Piles and LDR Compliance

- Voluntary removal from WAP
- WAP Re-evaluated at next permit renewal.
- CAFO (consent agreement and final order)
- No Migration Variance

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

18 APR 2017

CERTIFIED MAIL-RETURN RECEIPT REQUESTED 7007 1490 0004 0562 8722

Kelly Dixon
Director, Land Division
Oklahoma Department of Environmental Quality
707 N. Robinson
Oklahoma City, Oklahoma 73101

Re: Clean Harbors Lone Mountain facility (CHLM)

Dear Ms. Dixon:

Last August, ODEQ hosted the meeting with Clean Harbors and EPA Region 6 to discuss paths forward to address all of the areas of concern identified in EPA's December 2015 RCRA inspection. All of the areas of concern have either been addressed or will be addressed in the course of the permit renewal process. We concur with the draft meeting summary and paths forward prepared by ODEQ (enclosed).

We appreciate ODEQ's addressing the issues with Clean Harbors.

Sincerely

In-Cell Macroencapsulation of Hazardous Debris

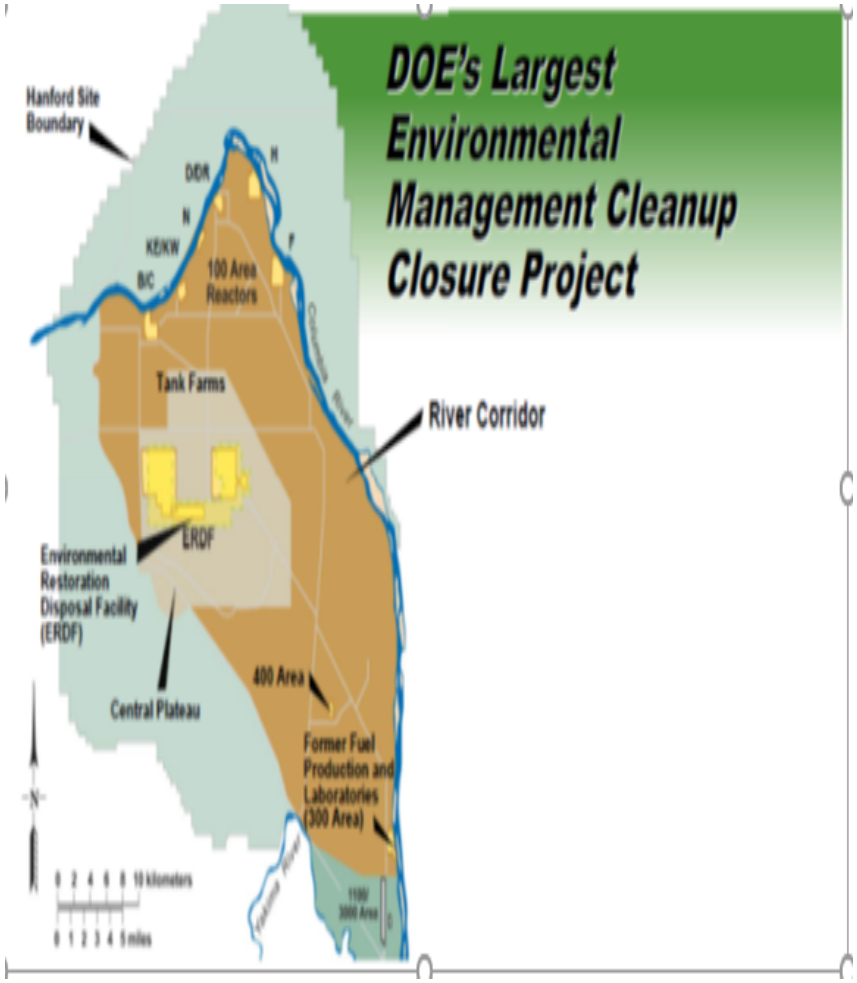
Macroencapsulation of Debris

- 40 CFR 268.45 Macroencapsulation: Application of surface coating materials such as polymeric organics (e.g., resins and plastics) or use of a jacket of inert inorganic materials to substantially reduce the surface exposure to potential leaching media.

- Encapsulating material must completely encapsulate debris and be resistant to degradation by the debris and its contaminants and materials into which it may come into contact after placement (leachate, other waste, microbes).

In-cell Macroencapsulation of Mixed Debris
The Hanford Facility
Richland, Washington

- Located in southeastern Washington state, Hanford is a 586-square mile site created in 1943 as part of the Manhattan Project.
- The operation of Hanford's plutonium producing facilities continued beyond WWII through the Cold War.
- A total of nine nuclear reactors were constructed along the Columbia River.
- In 1989, production stopped and work shifted to cleanup (chemical waste and radionuclides).
- One of the largest and most complex cleanup projects.



In-cell Macroencapsulation of Mixed Debris
The Hanford Facility
Richland, Washington

- 43 million cubic yards of radioactive waste.
- 130 million cubic yards of contaminated soil and debris.
- 475 billion gallons of contaminated water was discharged to soil, contaminating over 80 square miles of GW.

Loading contaminated soil into a truck. A former plutonium production reactor is in the background

In-cell Macroencapsulation of Mixed Debris
The Hanford Facility
Richland, Washington

- Several years ago, an NEIC (EPA's National Enforcement Investigations Center) RCRA inspection observed the treatment of mixed debris in a land disposal unit.

- Similar treatment was also observed at the facility's Environmental Restoration Disposal Facility or ERDF – a CERCLA operation.

- DOE immediately stopped practice in both areas (RCRA and CERCLA).

- In-cell MACROENCAPSULATION was also stopped at the ERDF because of an ARAR (Applicable or Relevant and Appropriate Requirements) that required compliance with LDRs.

ERDF Aerial View
Designed to hold 28 MT of Waste

Mixed Debris Being Treated in ERDF With MACROENCAPSULATION

Macroencapsulation In-Trench Treatment

Step 1 – Offload into a staging area inside of the trench

Step 2 - Encapsulate with grout

Macroencapsulation Out-of-Trench Treatment

Step 1 – Offload into a staging area outside of the trench

Step 2 – Protect from elements

Macroencapsulation Out-of-Trench Treatment

Step 3 – Relocate to treatment area

Step 4 – Spray primer

Macroencapsulation Out-of-Trench Treatment

Step 5 – Spray first coat of foam

Macroencapsulation Out-of-Trench Treatment

Step 6 – Spray second coat of foam

Step 7 – Spray third coat of foam

Macroencapsulation Out-of-Trench Treatment

Step 8 – Spray first coat of encapsulating coating

Step 9 – Spray second coat of encapsulating coating

Macroencapsulation Out-of-Trench- Treatment

Step 10 - Reposition debris to complete the process

Step 11 - Complete foaming

Macroencapsulation Out-of-Trench Treatment

Step 12 - Complete coating

Step 13 - Load finished debris

Macroencapsulation Out-of-Trench Treatment

Step 14 Transporting finished debris into trench

Step 15 – Off loading treated debris into trench

Problem for Hanford
How to Get to Two-Step Macroencapsulation Process?

- Investigated various OPTIONS FOR COMPLIANCE, including an ARAR waiver (greater risk to HHE or equivalent standard of performance), no migration petition under RCRA.

- Each option had possible ramifications for program offices (Superfund, RCRA).

- Decision was made to go with ARAR WAIVER for the large pieces of mixed debris because compliance with the existing ARAR for LDRs (treatment outside the land disposal unit) would result in greater risk to human health and the environment than any other alternative option.

Proposed Plan for an Amendment to the Environmental Restoration Disposal Facility Record of Decision, Hanford, Washington

U.S. Department of Energy, Richland Operations Office
U.S. Environmental Protection Agency
Washington State Department of Ecology

Public Comment Period
September 28, 2015 – October 28, 2015

How You Can Participate in this Decision-Making Process:

Read this proposed plan and review supporting information in the Administrative Record.

Comment on this proposed plan by mail, e-mail, or fax on or before October 28, 2015.

Kristen Skopeck, U.S. Department of Energy, Richland Operations Office
P.O. Box 550, A7-75
Richland, WA 99352
Phone: 376-5803
Fax: 376-1563
Email: kristen.skopeck@rl.doe.gov

See pages 14 and 15 for more information about public involvement and contact information.

Inside This Plan

Figure 1. The Environmental Restoration Disposal Facility (ERDF)

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) propose to amend the Environmental Restoration Disposal Facility (ERDF) Record of Decision (ROD) to waive a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) applicable or relevant and appropriate requirement (ARAR), pursuant to CERCLA Section 121(d)(4), because compliance with that requirement will result in greater risk to human health and the environment than alternative options.

The ARAR that DOE and EPA are proposing to waive is the *Resource Conservation and Recovery Act of 1976* (RCRA) and *Washington Administrative Code* (WAC) land disposal restriction (LDR) prohibition

DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

U.S. Department of Energy
Environmental Restoration Disposal Facility
Hanford Site – 200 Area
Benton County, Washington
CERCLIS ID: WA1890090078

STATEMENT OF BASIS AND PURPOSE

This sixth Record of Decision (ROD) amendment to the *Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility* (EPA/ROD/R10-95/100) has been developed in accordance with the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Act of 1986*; and, to the extent practicable, the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300). This ROD amendment, and supporting information, is contained in the Administrative Record for the Environmental Restoration Disposal Facility (ERDF).

The State of Washington concurs with the ROD amendment.

In-Cell Macroencapsulation of Hazardous Debris

More Examples

LF Treatment at TSDFs

- Analysis of other WAPs identified more facilities conducting IN-CELL MACROENCAPSULATION of debris (hazardous or mixed).
- At some facilities, the practice had been ongoing for over a decade.
- The challenge here is to get this facilities into compliance with the LDRs.
- Let's first look at some LDR-compliant MACROENCAPSULATION treatments for hazardous debris (i.e., treatment outside the landfill)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

September 19, 1995
Mr. Kevin J. Igli
Vice President, Environment, Health & Safety
Chemical Waste Management, Inc.
3001 Sutterfield Road
Oak Brook, Illinois 60521 .

Dear Mr. Igli:

Thank you for your letter of June 15, 1995, regarding macroencapsulation of hazardous debris. You referred to an interpretive guidance memorandum sent by EPA's Office of Solid waste to EPA Region VIII on February 16, 1994 regarding the macroencapsulation of mixed hazardous/radioactive debris waste, and requested clarification on the memorandum's applicability. Specifically, you requested EPA's determination on whether CWM's macroencapsulation process addresses the requirements of 40 CFR 268.45, Table 1.

As your letter pointed out, EPA has specified two definitions of macroencapsulation: a specified technology for D008 radioactive lead solids, and one for hazardous debris. In 40 CFR

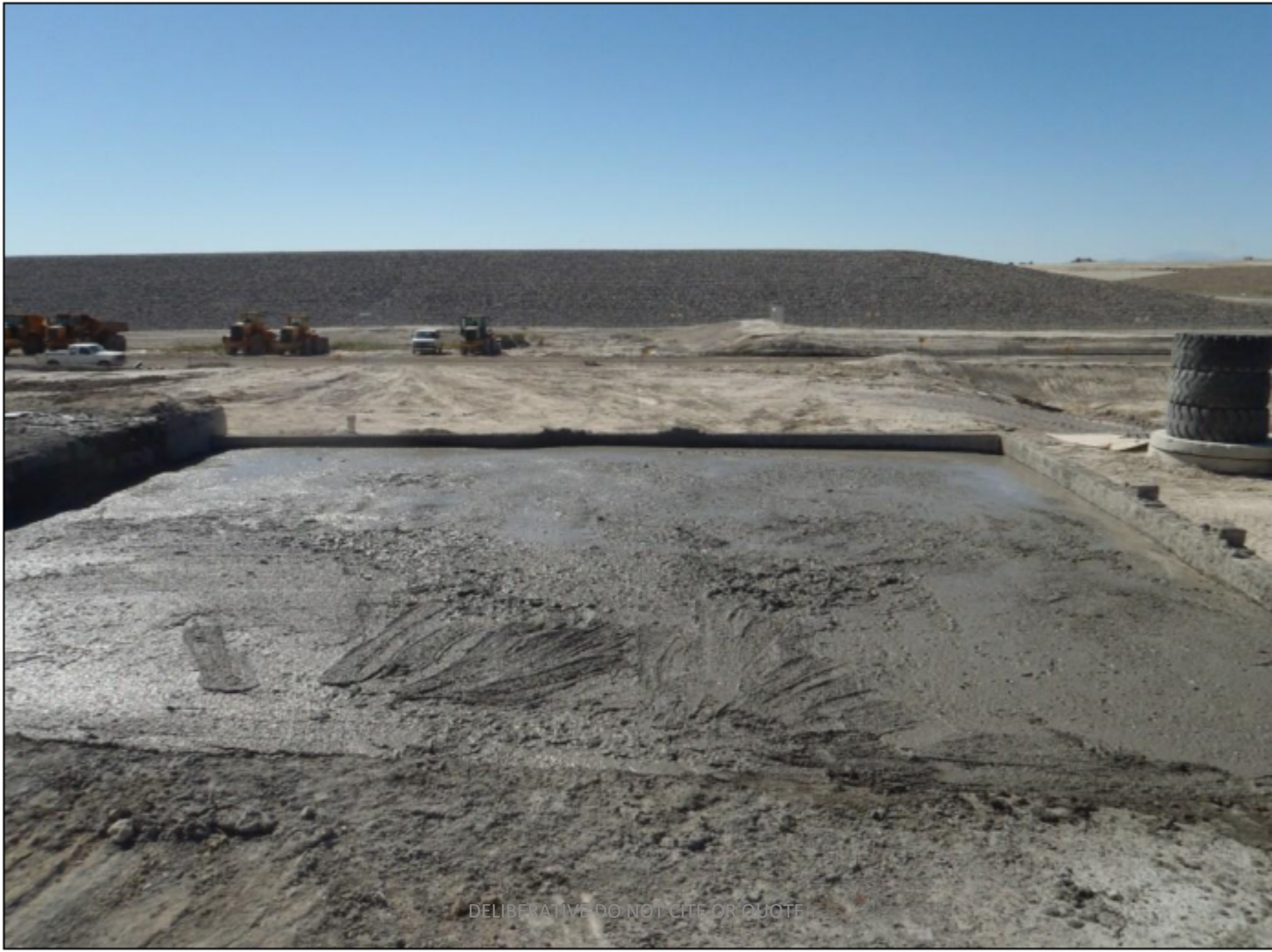
Macroencapsulation of Debris

Macroencapsulation of Debris

Macroencapsulation of Debris

IN-CELL MACROENCAPSULATION OF DEBRIS


HITACHI



On-Going LDR Challenge

- The RCRA Permit expired at this facility in 2014
- Facility would like to continue treating mixed debris using this method.
- EPA and the State are working together to bring this facility into LDR compliance.

ATTACHMENT II-1-5

MACROENCAPSULATION PLAN

1. PURPOSE AND SCOPE.

This attachment outlines the requirements for macroencapsulation ("MACRO") at the Permittee's Facility. The requirements in this plan apply to MACRO operations.

2. DEFINITIONS.

a. MACRO is defined as follows:

i. MACRO for Radioactive Lead Solids (LDPE MACRO or MACRO Vault): MACRO with surface coating materials such as polymeric organics (e.g. resins and plastics) or with a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. MACRO for radioactive lead solids specifically does not include any material that would be classified as a tank or container.

ii. MACRO for Hazardous Debris (LDPE MACRO, MACRO Capsule, or MACRO Vault): Macroencapsulation with surface coating materials such as polymeric organics (e.g. resins and plastics) or with a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media.

b. LDPE MACRO Form (MACRO Form) is defined as hazardous debris, radioactive lead solids waste, or both, that has been macroencapsulated by low-density polyethylene. Wastes that meet MACRO criteria can be managed as a container.

c. MACRO Capsule is defined as hazardous debris that has been macroencapsulated in a closed container.

d. MACRO Vault is defined as hazardous debris, radioactive lead solids waste, or both that has been macroencapsulated by placing in an engineered vault, filling void spaces, and applying surface coating materials such as polymeric organics (e.g. resins and plastics) or with a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. MACRO Vaults may be constructed directly in the Mixed Waste Landfill Cell in accordance with the applicable requirements of this Attachment.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

SEP 2 5 2014

CERTIFIED MAIL - FIRST CLASS MAIL
RETURN RECEIPT REQUESTED

Ref: 8P-R

Scott T. Anderson, Director
Division of Solid and Hazardous Waste
Department of Environmental Quality
P.O. Box 144880
Salt Lake City, Utah 84114-4880

RE: EPA Comments on of the draft Permit for the Energy Solutions Hazardous Waste Treatment, Storage and Disposal Facility; UTD 982598898

Dear Mr. Anderson:

This letter is to notify you that the U.S. Environmental Protection Agency has completed its review of the draft RCRA permit for the Energy Solutions Hazardous Waste Treatment, Storage and Disposal facility located near Clive, Utah. By this letter, and pursuant to 40 C.F.R. § 271.19, EPA is providing notification that the following comments must be fully addressed in the final permit. Modification of the draft permit is required to assure consistency of the permit with the federal hazardous waste program as in effect in the State of Utah. Our comments specifically relate to Module II and Module V of the draft permit as found at http://www.hazardouswaste.utah.gov/CFF_Section/EnergySolutions.htm on the date of this letter. Although EPA has not specifically identified provisions in other portions of the draft permit that must be modified to conform to our comments, it is incumbent upon the applicant or State to conform other portions of the Permit to these comments as well. Our comments are as follows:

1. The last sentence of Permit Condition 2.c. as found in Attachment II-1-5 Macroencapsulation Plan states, *"MACRO Vaults may be constructed directly in the Mixed Waste Landfill Cell in accordance with the applicable requirements of this Attachment."*

   The last sentence of Permit Condition 2.c. does not comply with the Land Disposal Restriction (LDR) regulations found in the Utah Administrative Code (UAC) Rule R315-13 which incorporates by reference 40 C.F.R. § 268.40(a) which prohibits restricted waste from being land disposed prior to meeting the treatment standards of 40 C.F.R. Part 268 Subpart D.

IN -CELL MACROENCAPSULATION
The Burrito Wrap

- Burrito Wrapping is conducted IN THE LANDFILL using plastic wrap and duct tape.

- This treatment technique was described in WAP.

Hazardous Waste Landfill

Sampling and Analyzing Waste for LDR Compliance

9551.1988(01)

TESTING REQUIREMENTS AND SOLIDIFICATION ISSUES UNDER LAND DISPOSAL REQUIREMENTS

OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE

APR -5 1988

MEMORANDUM

SUBJECT: Facility Testing Requirements and Solidification Issues Under the Land Disposal Restrictions Rules

FROM: Sylvia K. Lowrance, Director
Office of Solid Waste

TO: Robert L. Duprey, Director
Hazardous Waste Management Division, 8 HWM
Region VIII

This memo is in response to your memorandum of February 4, 1988 to Marcia Williams requesting clarification of two key provisions of the Land Disposal Restrictions Rules. The issues are related to the testing requirements under 40 CFR 268.7 and the use of solidification/stabilization prior to landfilling.

Issue 1 What are the exact testing requirements (appropriate sampling conditions, analytical methods, frequency and data comparisons) under 40 CFR 268.7(c) for off-site commercial disposal facilities receiving land disposal restricted wastes.

As you note, section 268.7 itself does not specify the frequency of testing required for disposal facilities receiving wastes from off-site (nor does it specify the frequency of testing required for treatment facilities or on-site disposal facilities). In particular, the requirements in section 268.7 only specify the frequency of testing required by generators, treatment facilities or land disposal facilities by reference to the facility waste analysis plan. Specifically, section 268.7(c) requires that the owner or operator of the treatment or land disposal facility must test the waste according to the frequency specified in their waste analysis plan. Those plans may allow

the data to be supplied by the generator or treatment facility, such determinations being the subject of negotiations between the permit writer and the owner/operator during the development of the permit.

I would note that the December 1, 1987 Codification rule (52 FR 45788) does allow the permits to be reopened to incorporate HSWA provisions, and this could be used to reopen and modify the Waste Analysis Plans to require testing at a specified frequency.

We are aware of the potential cost of testing for not only the disposal facility, but also for the treatment facility and the generator. We are also aware of the need for adequate data for compliance monitoring and enforcement purposes. Unfortunately, these factors work in opposite directions, one indicating the need for more testing and the other the need to minimize the testing burden. At the time the rules were written, we felt that the individual permit writer would be in the best situation to determine on a case by case basis the appropriate frequency of testing that would best balance those opposing factors while remaining in compliance with the general parameters outlined under section 264.13 and section 265.13. This point is also addressed at 52 FR 21012, Col 2 (June 4, 1987).

Stabilization – High Failure Rate for LDR

Facilities are required to have a WAP that demonstrates that waste is being treated effectively and consistently

Facility	Permit Required Sampling Frequency	Permit Conditions	Measured Failure or Retreatment Rate
1	5%	1 out of 20 loads sampled and held	30%
2	1 per year	Waste stream must pass 3 consecutive loads to qualify for annual testing	20%
3	All	Batches consist of multiple loads, very heterogeneous treatment residue. Chemical oxidation/stabilization utilized for organics.	50%
4	5%	The 5% are tested on a pre treatment "raw" TCLP; raw results that are greater than one order of magnitude trigger a post-treatment TCLP	25%
5	All	Test the first and last loads from each mixer load treated in the batch for characteristic waste, test composite sample from all loads in batch for delisted K061 wastes	25%
6	1 per year for bulk Every batch for containerized	Ten percent of bulk loads are sampled for fingerprint testing. Treated bulk batches are tested once/year. Containerized loads are tested each batch. Chemical oxidation/stabilization utilized.	25%
	1 every 3	Three passes then once every 3 months. Sample every mixed	

Case Study
Treatment of Characteristic Waste

- First LDR sampling event
- Sampled 3 roll-off boxes, identified by facility as meeting LDRs with COMPOSITE sampling
- 2 GRAB samples collected from each "roll-off" (6 samples total)
- 1 of the 3 "roll-offs" failed for Arsenic in 1 GRAB sample

- Second LDR sampling event
- Sampled 5 roll-off boxes, identified by facility as meeting LDRs based on COMPOSITE sampling
- 3 GRAB samples collected from each "roll-off" (15 samples total)
- 1 of 5 "roll-offs" failed to meet LDR for Chromium in 2 of 3 samples.

Case Study
Treatment of Characteristic Waste

- GRAB Sampling by inspector prevented two non-compliant "roll-offs" from being disposed in a RCRA Subtitle D landfill.

- Assuming that the 8 random roll-off boxes are representative of "roll-offs" treated in the past, its estimated that 25% of the facility's previously treated and DISPOSED roll-off boxes did not meet the LDR treatment standards.

- TAKE HOME - When determining if LDR requirements have been met ALL parts of the waste must be treated to MINIMIZE threats to HHE. In other words, you cannot average out the hot spots by using composite sampling for LDR compliance.

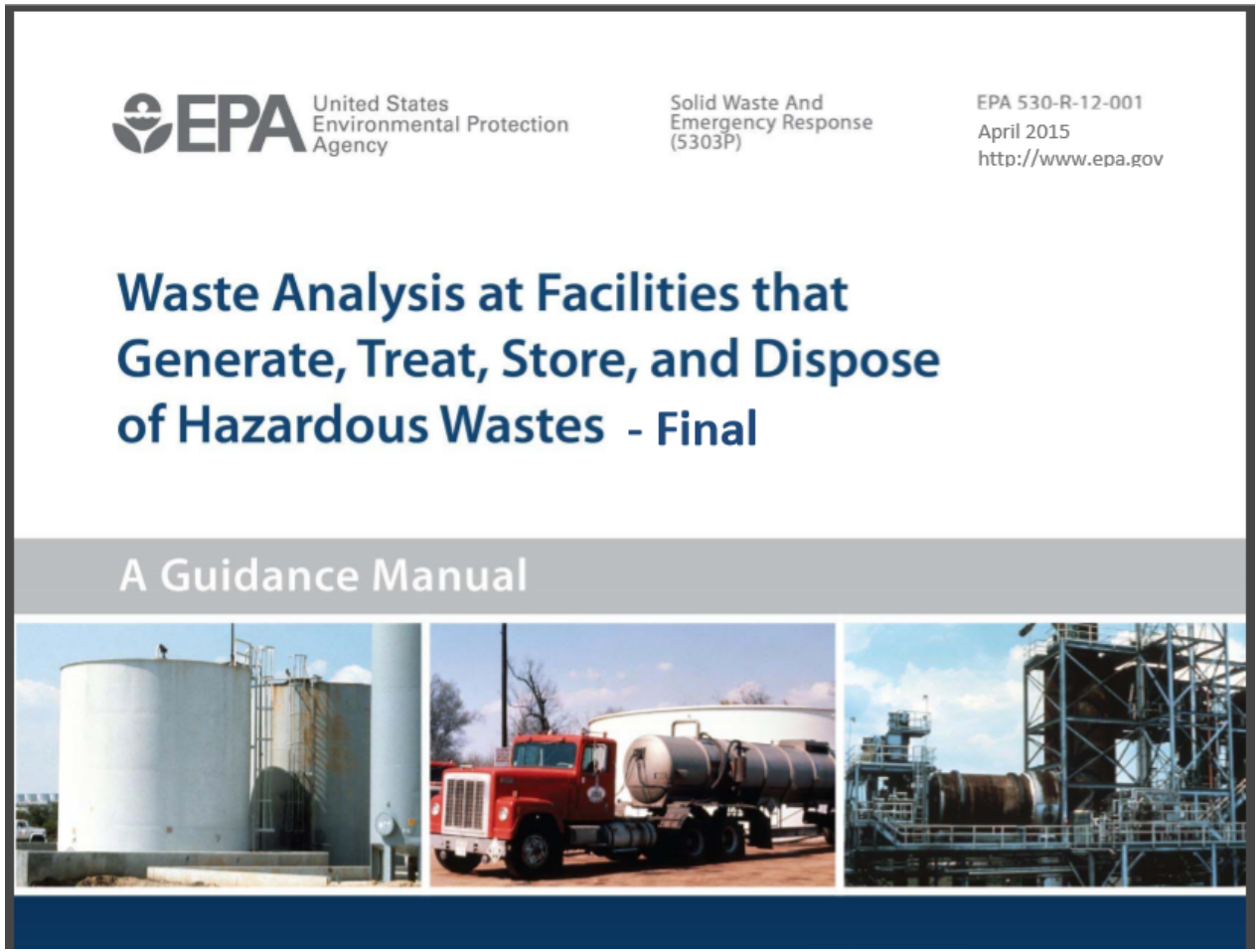
A Component of Effective Treatment

Pug mill vs. Backhoe Mixing

Industry Standard –Backhoe Mixing of Various Types of Wastes

Heterogeneous Wastes and Poor Mixing Can Result in In-effective Treatment.

Waste Analysis Plans and LDR Compliance



Are These Practices Described in the WAP Consistent with LDR Requirements?

Example 1

The Permittee may place stabilized bulk wastes in interim storage while awaiting results of Toxicity Characteristic Leaching Procedure (TCLP) tests to determine the waste's compliance with land disposal restrictions. All such bulk wastes awaiting TCLP test results must be in covered roll-offs or drums which may be stored within the landfill or in other Container Storage Areas at the facility which are allowed by this Permit to store these container types. The placement, storage and ultimate disposition of such waste must be in accordance with the following requirements.

Are These Practices Described in the WAP Consistent with LDR Requirements?

Example 2

Macroencapsulation in a Vault

A macro vault, consisting of a container (e.g. drums and metal boxes, gondola, roll-off box, or intermodal container) or a pit in the cell, is prepared in the landfill cell. As an alternative, concrete forms may be assembled and used as a macro vault.

The hazardous debris waste stream is then loaded into the macroencapsulation vault. Concrete, or other pozzolanic material, is poured into the vault, assuring that void space is minimized.

Example 3

….macroencapsulation of hazardous debris performed in-cell using pozzolanic material. Treatment of hazardous debris via macroencapsulation must meet the following criteria….

MACRO Vault is defined as hazardous debris, radioactive lead solids waste, radioactively contaminated cadmium-, mercury-, or silver-containing batteries, or any combination of these wastes, that has been macroencapsulated by placing in an engineered vault, filling void spaces, and applying surface coating materials such as polymeric organics (e.g. resins and plastics) or with a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. MACRO Vaults may be constructed directly in the Mixed Waste Landfill Cell in accordance with the applicable requirements…

Are These Practices Described in the WAP Consistent with LDR Requirements?

Example 4

Since wastes are treated based on a developed or verified recipe, they are assumed to meet the applicable treatment standards and may be staged in storage or disposal units pending confirmatory analyses. If post-treatment analyses determine a treated batch does not meet applicable standards, the waste will be retrieved for re-treatment or off-site management.

Example 5

Macroencapsulation may be performed at the container building or within the landfill.

In some cases, it is advantageous to macroencapsulate debris subject to this standard in the landfill. The debris is placed in a suitable final location within the landfill, and macroencapsulation is performed in-place with the selected reagent(s) or materials (e.g., HDPE, LDPE, Portland cement, etc.)

In cases where the debris to be encapsulated is too large to manage in containers or the stabilization tanks, macroencapsulation may be conducted within the landfill.

Are These Practices Described in the WAP Consistent with LDR Requirements?

Example 6

When verifying that waste has been treated to meet LDR treatment standards, compliance with concentration level standards is based on grab sampling. When there is any uncertainty in achievement of treatment standards, the treated waste is resampled.

Stabilization may be performed within Mix Bin Tanks or Containers. Treatment may occur with the Container Building, at the outdoor stabilization unit, or within containers. Sampling, analysis verification of the treatment effectiveness and frequency of testing follows the guidelines presented in this WAP

Example 7

Following treatment, the treated waste is sent to the landfill for final disposal and staged in the landfill while applicable verification testing is performed. A maximum of 50 batches may be staged at any point in time for up to 10 working days. The staged waste will be isolated within the landfill and stored on a plastic liner. The facility may submit an extension request to the state if additional time is needed to verify treatment due to sampling and analysis requirements. Wastes treated and staged in an interim processing area that do not meet treatment standards may be re-sampled for verification analyses. If the re-sampling indicated the waste meets the treatment standard the waste is disposed.

Are These Practices Described in the WAP Consistent with LDR Requirements?

Example 8

One grab sample from each batch of treated waste shall be taken. It can be taken from the tank after treatment is completed, during removal from the tank, from the transport vehicle used to move the waste to the staged put-pile" location, or immediately after the "put-pile" is placed.

Are These Practices Described in the WAP Consistent with LDR Requirements?

Example 9

- Waste or residue resulting from the on-site treatment of Land Disposal Restricted wastes will be analyzed and/or evaluated, as needed, against the appropriate treatment standards or prohibitions.

- The facility will conduct post-treatment analysis on the residue as needed to ensure that the process continues to be effective in meeting the treatment standards.

- The treated residue is typically stored in portable containers (e.g., roll-off bins, bigger boxes, etc.) while awaiting the results of the post treatment analysis.

Are These Practices Described in the WAP Consistent with LDR Requirements?
Example 10

"For these wastes, only the first and last boxes of treated wastes from the treatment run will be sampled and analyzed in order to ensure that the process continues to be effective in meeting the treatment standards."

Are These Practices Described in the WAP Consistent with LDR Requirements? Example 11

- Macroencapsulation is defined in 40 CFR §268.42, Table 1 as the application of surface coating materials such as polymeric organics (e.g., resins, plastics) or use of a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. Inert non-waste material, or waste meeting appropriate LDRs, may be used for filler material.

- Samples are collected from the first two batches of each hazardous waste stream treated at the facility, and at least once a year thereafter.

- Since treated wastes are treated based on an established recipe, they are assumed to meet the applicable treatment standard(s) and may be staged pending verification analyses, if applicable.

Are These Practices Described in the WAP Consistent with LDR Requirements?
Example 12

268.42. STABL. Stabilization with the following reagents (or waste reagents) or combinations of reagents: (1) Portland cement; or (2) lime/pozzolans (e.g., fly ash and cement kiln dust) – this does not preclude the addition of reagents (e.g., iron salts, silicates, and clays) designed to enhance the set/cure time and/or compressive strength, or to overall reduce the leachability of the metal or inorganic.

- Stabilization is defined by 40 CFR §268.42 as stabilization with the following reagents (or waste reagents) or combinations of reagents (1) Portland Cement; or (2) lime/pozzolans (e.g., fly ash and cement kiln dust) – this does not preclude the addition of reagents (e.g., iron salts, silicates, and clays) designed to enhance the set/cure time and/or compressive strength, or to overall reduce the leachability of the metal or organic.

- Stabilization is defined by 40 CFR 268.42 as stabilization with the …..and/or compressive strength, or to reduce leachability of hazardous constituents.

- Stabilization is defined as stabilizations with…….or to overall reduce the leachability of the metal or organic. Stabilization is the treatment of appropriate waste streams by use of pozolonic materials or wastes with pozolonic properties to reduce the leachability of organic, inorganic or metals of concern.

Are These Practices Described in the WAP Consistent with LDR Requirements?
Example 13

Post treatment homogenous mix, wet clay consistency

Wrap Up

- LDRs are an important element of the RCRA program.
- It's not all about meeting a number, but rather meeting a number and ensuring that treatment from a well-designed and operated facility occurs.
- Majority of hazardous waste generated in U.S. are characteristic, meaning after meeting LDRs this waste can be disposed in a non-hazardous waste landfill.
- Federal requirements for subtitle D landfills (Part 258) and subtitle C landfills (Part 264) are different
  - Subtitle D composite liner and leachate collection system. Composite liner FML and 2 feet of compacted soil.
  - Subtitle C double liner, leachate collection system and leak detection system. Lower composite liner FML and 3 feet compacted clay.
  - Breech in liner system - leak detection system v. groundwater monitoring
- Concerns with how treatment/sampling is being done.
  - Because LDR does not require testing of each batch of treated waste, there is the potential for untreated, poorly treated, and untested waste to be land disposed.