Welcome to ITRC's Internet Training

Thank you for joining us. Today's training focuses on the ITRC Technical and Regulatory Guidance Document entitled:

" Characterization and Remediation of Soils at Closed Small Arms Firing Ranges"

The training is sponsored by: ITRC & EPA-TIO

Creating Tools & Strategies to Reduce Technical & Regulatory Barriers for the Deployment of Innovative Environmental Technologies

Presentation Overview:

Remediation of soils at Small Arms Firing Ranges (SAFRs) present unique challenges in that contaminants exist as both discrete particles and as sorbed compounds dispersed throughout the soil matrix. The form and distribution of particulate lead varies based on range use, size and impact velocity of the round, soil characteristics, and past range maintenance practices.

Removal of the discrete particles as part of remedial activities not only reduces the total lead, but also the leachable lead accordingly. Unfortunately, though, simple dry screening seldom, if ever, is suitable to remove these lead particles through all of the size ranges where it is present. The Internet training introduces the participants to the various physical (including hydraulic), chemical, and biochemical mechanisms available to treat or stabilize SAFRs after some unique characterization challenges are overcome. This training is based on the ITRC document entitled: "Technical & Regulatory Guidance Document for Small Arms Firing Range Remediation Technologies."

ITRC – Interstate Technology and Regulatory Council (www.itrcweb.org)

EPA-TIO – Environmental Protection Agency – Technology Innovation Office (www.clu-in.org) – hosts delivery of ITRC Internet-based training courses

ITRC Course Moderator:

Mary Yelken (ITRC Program Advisor – myelken@earthlink.net)

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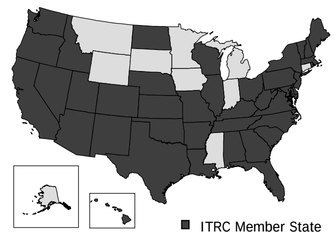
ITRC – Shaping the Future of Regulatory Acceptance

- **Natural Attenuation of Chlorinated Solvents in Groundwater: Principles & Practices**
- **Advanced Techniques for Installation of Permeable Reactive Barriers**
- **Diffusion Samplers**
- **Phytotechnologies**
- **ISCO (In Situ Chemical Oxidation)**
- **Systematic Approach to In Situ Bioremediation (Nitrates, Carbon Tetrachloride, Perchlorate)**
- **Characterization & Remediation of Soils at Closed Small Arms Firing Range**
- **Constructed Treatment Wetlands**
- **Surfactant/CoSolvent Flushing of DNAPL Source Zones**
- **Munitions Response Historical Record Review (MRHRR) Radiation Risk**
- **Radiation Risk Assessment: Updates & Tools**

ITRC Membership

States



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Industry, Academia, Consultants, Citizen Stakeholders

The bulleted items are a list of ITRC Internet Training topics – go to www.itrcweb.org and click on "internet training" for details.

The **Interstate Technology and Regulatory Council (ITRC)** is a state-led coalition of regulators, industry experts, citizen stakeholders, academia, and federal partners that work to achieve regulatory acceptance of environmental technologies. ITRC consists of 40 states (and the District of Columbia) that work to break down barriers and reduce compliance costs, making it easier to use new technologies and helping states maximize resources. ITRC brings together a diverse mix of environmental experts and stakeholders from both the public and private sectors to broaden and deepen technical knowledge and streamline the regulation of environmental technologies. Together, we're building the environmental community's ability to expedite quality decision-making while protecting human health and the environment. With our network approaching 6,000 people from all aspects of the environmental community, ITRC is a unique catalyst for dialogue between regulators and the regulated community.

ITRC originated in 1995 from a previous initiative by the Western Governors' Association (WGA). In January 1999, it affiliated with the Environmental Research Institute of the States, ERIS is a 501(c)3 nonprofit educational subsidiary of the Environmental Council of States (ECOS). ITRC receives regional support from WGA and the Southern States Energy Board (SSEB) and financial support from the U.S. Department of Energy, the U.S. Department of Defense, and the U.S. Environmental Protection Agency.

To access a list of ITRC State Point of Contacts (POCs) and general ITRC information go to www.itrcweb.org.

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Characterization and Remediation of Soils at Closed Small Arms Firing Ranges

Presentation Overview

- What are Small Arms Firing Ranges (SAFR)
- How to systematically evaluate a small arms firing range for remediation (decision tree approach)
- Land Use, Risk Assessment and Bioavailability
- Shotfall/bullet density characterization according to historic use
- Application and performance of various lead treatment technologies
- Limitations
- Regulatory Issues

Logistical Reminders

- Phone Audience
  - Keep phone on mute
  - * 6 to mute your phone and again to un-mute
  - Do NOT put call on hold
- Simulcast Audience
  - Use ? at top of each slide to submit questions
- Course Time = 2 ¼ hours
- 2 Question & Answer Periods
- Links to Additional Resources
- Your Feedback

No associated notes.

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Meet the ITRC Instructors

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Gary. Beyer has worked for the Texas Commission on Environmental Quality and its predesessor agencies for 17 years in various programs, including RCRA Enforcement, Federal Facilities Remediation, and RCRA Corrective Action Teams. As a consensus builder he helped develop the national model for streamlining the military base closure process while closing Naval Air Station Chase Field in Beeville, Texas. He has overseen the remediation of federal firing ranges at Chase Field and Lackland Air Force Base in San Antonio, Texas. He has worked on the ITRC's Small Arms Range Remediation Team since its inception where he brings his perspective on solving complex regulatory problems regarding the handling of lead and lead contaminated soils.

Rick Patterson started the National Shooting Sports Foundation's facility development program in 1997. He subsequently expanded these efforts with the creation of the National Association of Shooting Ranges (NASR), where he currently serves as Executive Director. NASR is dedicated to promoting and protecting target shooting facilities by providing leadership in information, communication and partnerships between ranges, industry and community. The program provides guidance on every aspect of developing and operating a safe and successful target shooting facility. Patterson developed and launched the Facility Development Series of guidance publications, the Rangeinfo Web Site—a comprehensive information resource for range operators and developers—the Range Video Series and the NASR 5-Star rating system. He has also developed successful partnerships with many state and federal wildlife, environmental and occupational health agencies to provide range operators and developers with guidance and resources on issues such as NEPA compliance, environmental management and employee safety. Prior to joining the NSSF team, Patterson was with Coastal-Mart, the retail motor fuel division of Coastal, a Fortune 50 petroleum refiner. He graduated from Montana State University, cum laude, with a degree in organizational and managerial communication. In his spare time Patterson is Chairman of the Roxbury Conservation Commission, a two-term elected member of the Roxbury Republican Town Committee and an avid fly-fisherman, shooter, hunter and maker of bamboo fly rods. He is a former state champion International Handgun Metallic Silhouette Association competitor (AAA division) and was Chairman of Trout Unlimited's intervention in the successful and precedent-setting Shepaug River lawsuit.

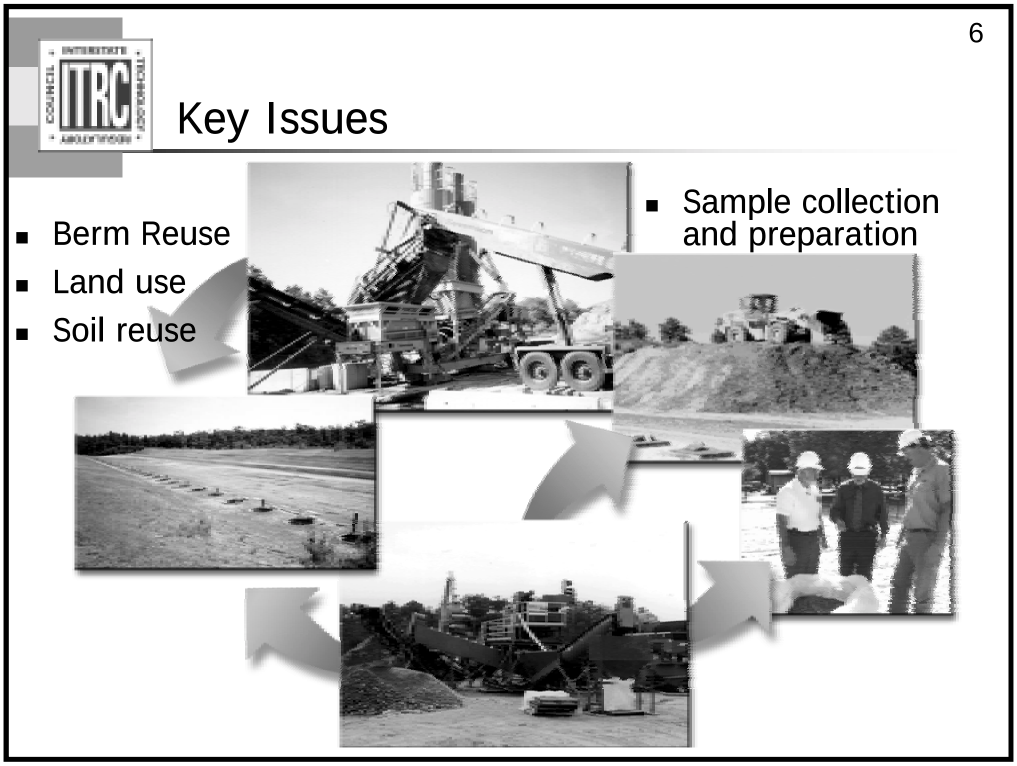
Mike Warminsky is a Technical Director with over 20 years' experience. In this role, he has extensive experience in identifying, developing, and managing multi-disciplinary remedial projects at both Department of Defense (DoD) and industrial facilities, with the last 7 years dedicated to range remediation. His program management skills are complemented by his extensive hands-on field experience in conducting treatability studies, soil treatment process design and implementation, and environmental construction. He has served as a principal team member on numerous underground storage tank closures, as well as, RCRA, ISRA, and CERCLA remedial construction projects, and was the development team leader for a proprietary soil washing system. Mr Warminsky is also a member of the Interstate Technology Regulatory Council (ITRC) Small Arms Range Team and a principal author in drafting the DoD funded guidance document for small arms range remediation/management. In addition, he has authored/presented eleven technical papers/articles and is regarded as an industry expert in the remediation of munitions/firing range sites at military bases.

Purpose of today's training event

- Understand the alternatives prior to remediation of Small Arms firing ranges and how land use affects the decisions
- Recognized shot and bullet distribution patterns
- Understand the techniques and technologies used in each alternative remediation process
- Understand recent regulatory interpretations streamlining some projects

" Characterization and Remediation of Soils at Small Arms Firing Ranges"

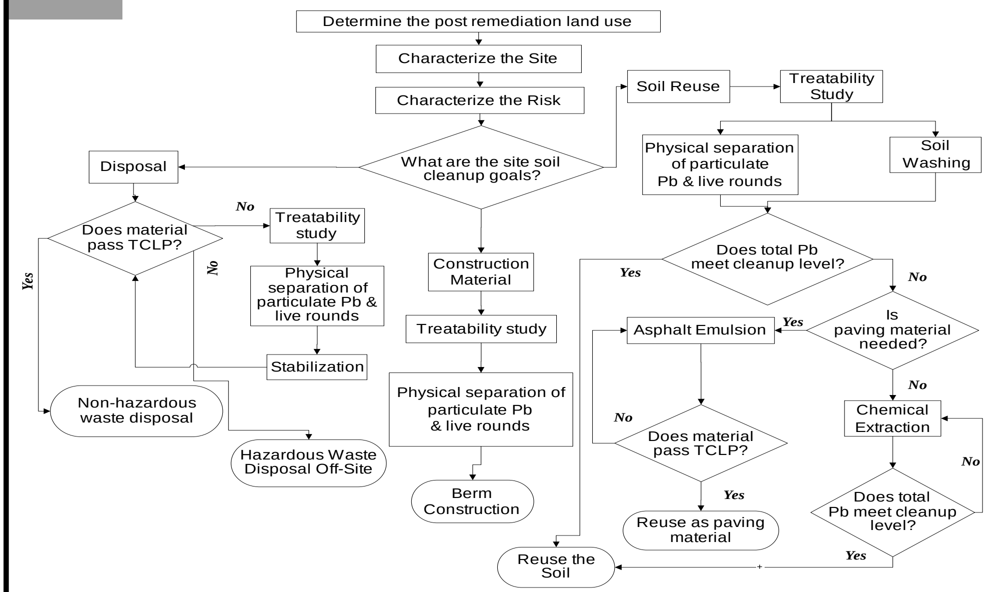
No Associated Notes



ITRC's goal is to identify technical or regulatory barriers that (unintentionally of course) limit or prevent use of new environmental technologies. Later in the presentation we will discuss team recommendations as well as issues we have identified but have not yet resolved.

We will also address several key and somewhat controversial issues, namely berm reuse and sample collection and preparation.

Decision matrix for determining how best to remediate lead contaminated soils at small arms firing ranges [Figure 1-1]



See figure 1-1 in the guidance document for the full page diagram

The purpose of this course is to give everyone involved with the remediation of inactive or closed small arms ranges the tools to allow you to make informed decisions that will result in the selection of an appropriate cleanup technology that meets your needs. We have drawn upon the knowledge and experience of small arms range owner advocates, regulators, and consultants to design a logical and easy to follow decision matrix for determining the best remediation program alternative.

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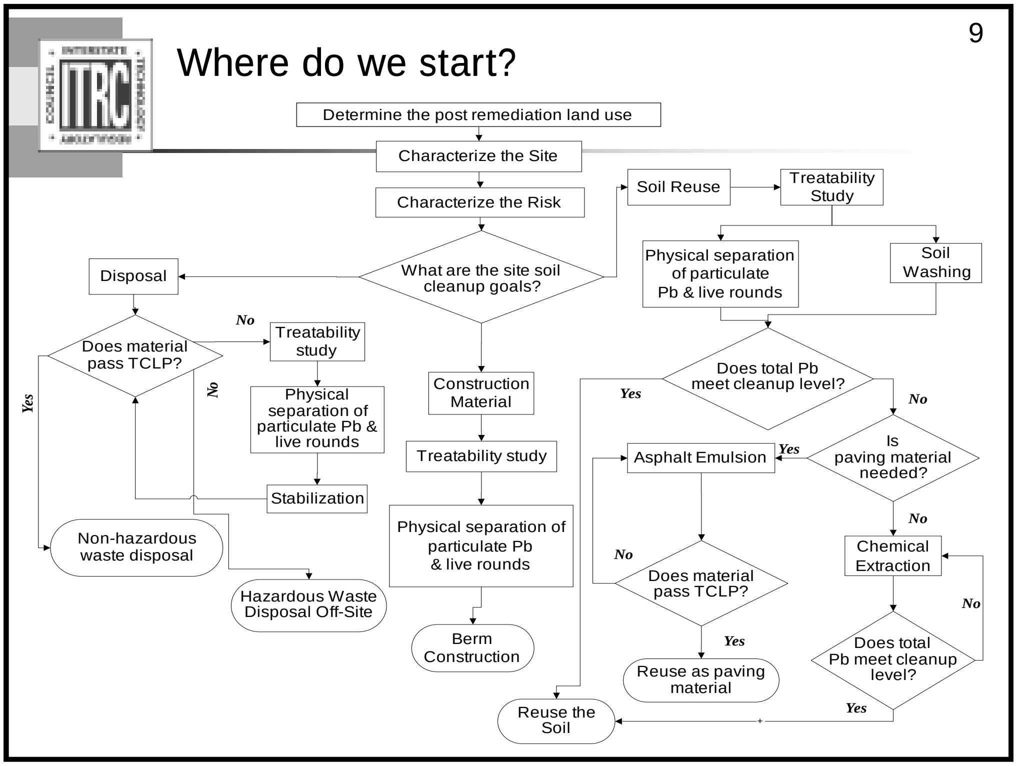
Problem

- **Closed or closing**
  - **DoD**
    - **Over 200 closed site**
- **Active**
  - **DoD**
    - **Over 3000 active SAFRs**
  - **Non-military**
    - **Over 9000**

What is the size and scope of the problem? The US Department of Defense (DoD) oversees more than 3,000 active SAFRs as well as the closure or pending closure of 200 more. In all, the DoD expends over 2 million pounds of lead annually. In addition to DoD facilities, there are an estimated 9,000 non-military outdoor ranges in the U.S. EPA also estimates that 4% of the 80,000 tons of all lead produced in the US in the late 1990s is made into bullets and shot. Several sets of environmental regulations can apply to shooting ranges, both active and inactive or closed. Our training today concentrates on ranges that are being closed or inactive. A future training course will be designed by us for managing lead on active ranges, "Management and Maintenance of lead on Active Small Arms Firing Ranges" Go to www.itrcweb.org and click on FYPP for 2003 proposal - so stay tuned. Until such time, you can develop and implement an environmental stewardship plan or best management practices as outlined by the firearms industry by logging onto www.rangeinfo.org, US EPA and Florida DEP, to prevent environmental and regulatory problems. Federal agencies, specifically DoD, and commercial sporting range operators are proactively developing a greater understanding of lead management and remediation. There are a number of remediation technologies as well as sampling and analysis techniques, which, if appropriately applied, can adequately characterize and remediate lead contamination at any active SAFR



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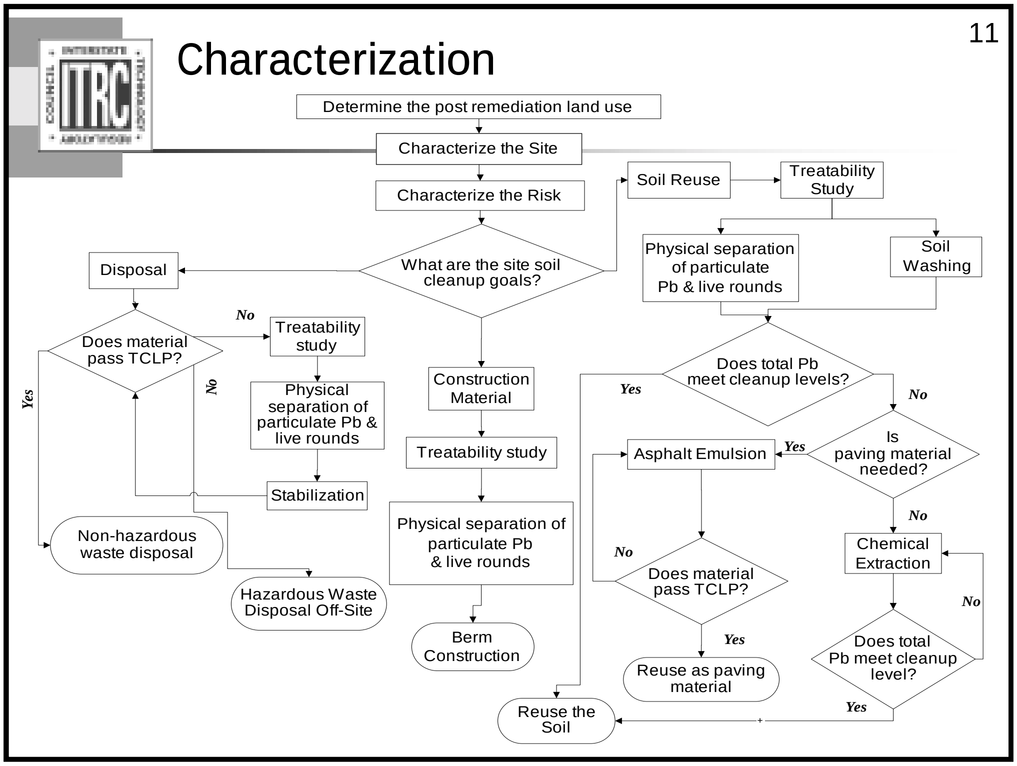
Land Use

- Unrestricted site use
- Residential or rural residential use
- Industrial use
- Reuse as a range
- Dispersed recreational use.

No associated notes



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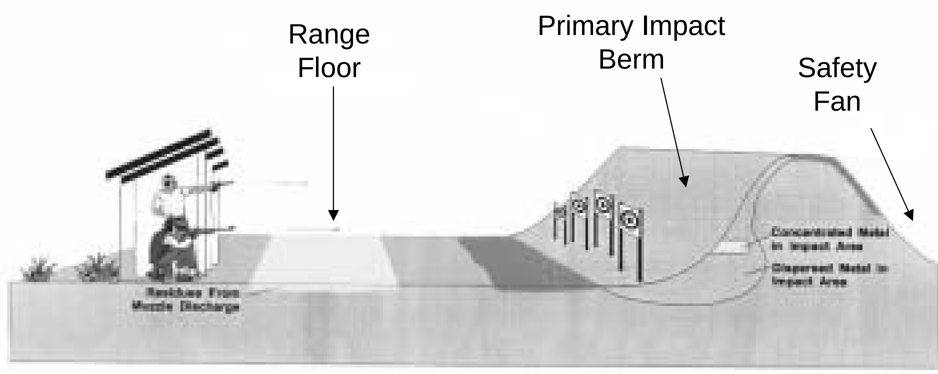
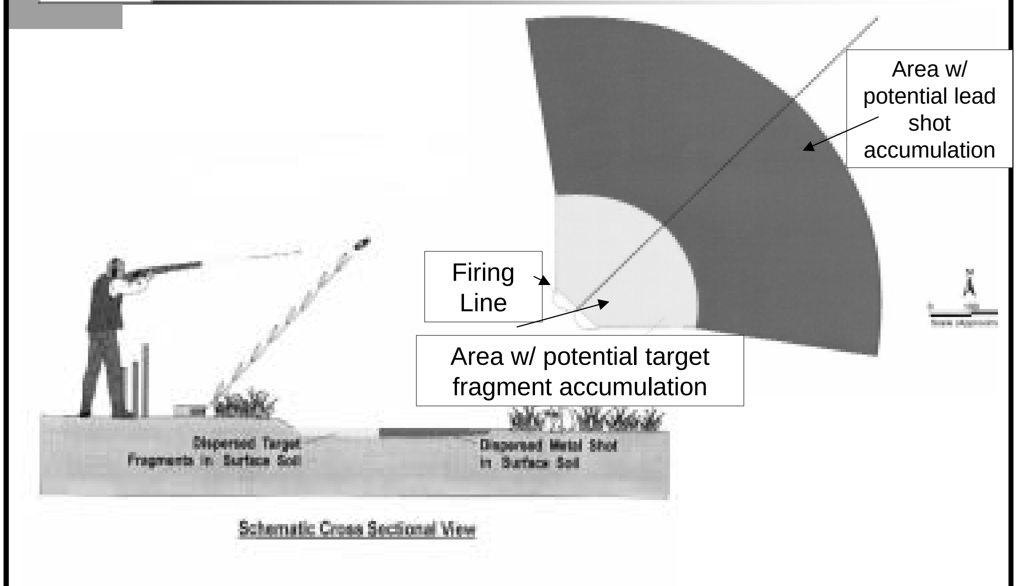
Characterization - Static rifle and handgun range



Lateral Berm Not Shown

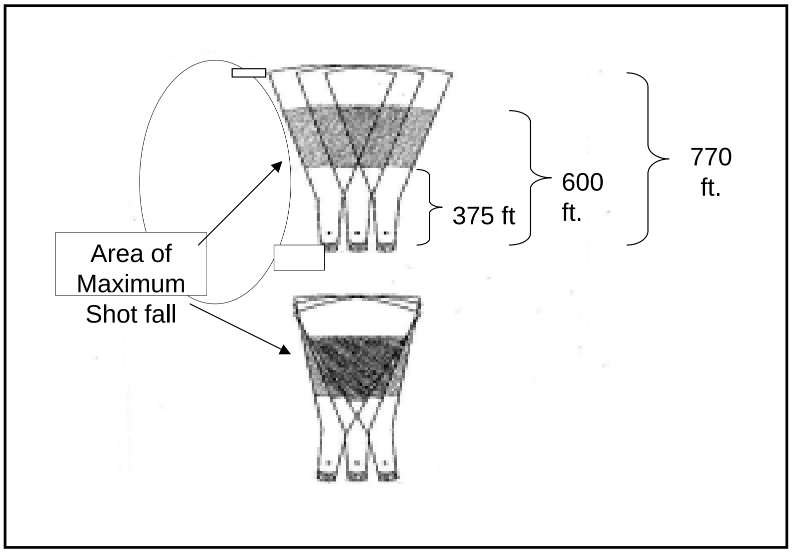
Refer to Figure 2-1 in the document

Characterization - Shotgun range layout



Refer to Figure 2-1 in the document

Characterization - Trap Range layout



Refer to Figure 2-1 in the document

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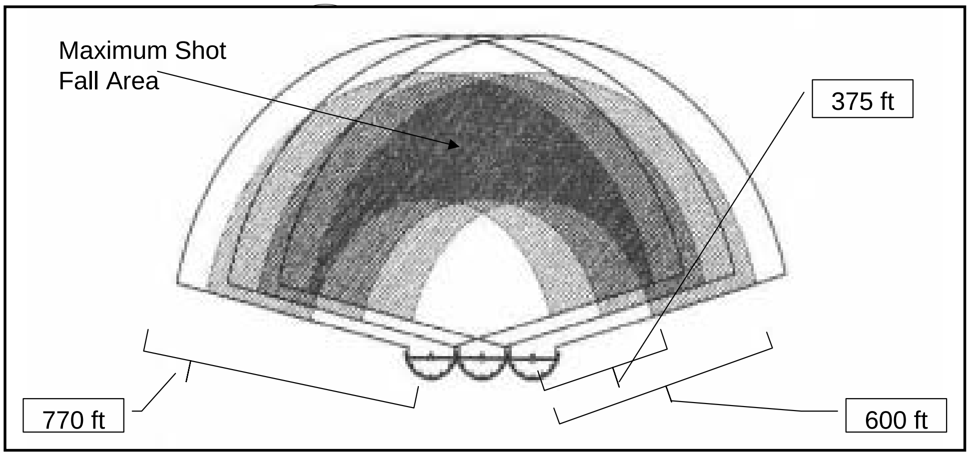
Characterization - Skeet range layout



Refer to Figure 2-1 in the document

Potential Constituents

Constituent	Comment
Lead	Primary constituent of a projectile.
Lead Styphnate/Lead Azide	Primer constituent
Antimony	Increases hardness.
Arsenic	Present in lead. A small amount is necessary in the production of small shot since it increases the surface tension of dropped lead, thereby improving lead shot roundness.
Copper bullet core alloy	Increases hardness.
Tin	Increases hardness.
Copper	Jacket alloy metal
Zinc	Jacket alloy metal
Iron	Iron tips on penetrator rounds
PAHs (Polycyclic Aromatic Hydrocarbons)	Concentration of PAHs in clay targets varies from one manufacturer to the next but may be as high as 1000mg/kg. Existing studies show that PAHs are bound within the limestone matrix of the target and are, therefore, not bioavailable.

Table 1-1, Potential contaminants which may be found at small arms firing ranges. Information obtained from Tables 2-1 & 2-2 in NFESC, 1997

(Leachability of PAHs from Clay shooting targets has been shown to be very low Cite, XX))

Fate & Transport

- Physical processes
  - Bullet fragmentation
  - Wind transport
  - Water transport
- Chemical processes
  - Dissolution Precipitation
    - pH
    - Redox
    - Sorption/desorption

No associated notes

Soil Sampling

- **Challenges**
  - Ranges are site specific
  - Metals are present as both discrete particles (ranging in size from intact bullets or shot to bullet fragments) and as metal complexes in the soil matrix. Typically, by weight, more than 96% of lead is present as intact bullet/shot fragments.
  - Lead bullets striking the impact berms at high speed can vitrify on impact, forming "melts" on individual soil particles;

No associated notes

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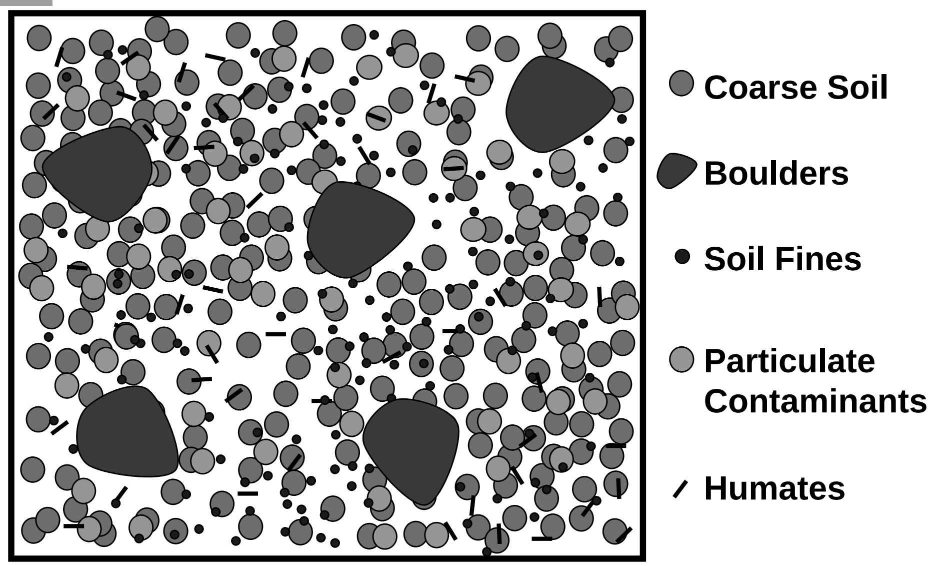
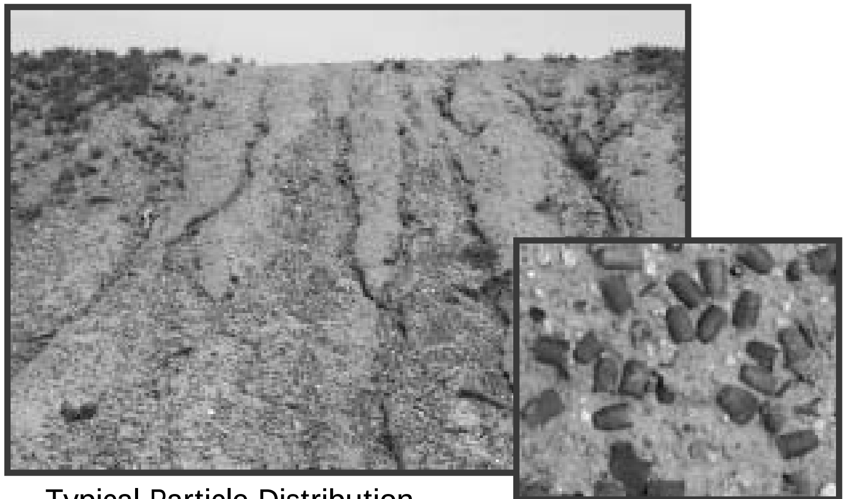
Treatment Issues: The Soil Matrix



No associated notes

Berm Soil



- Typical Particle Distribution

No associated notes

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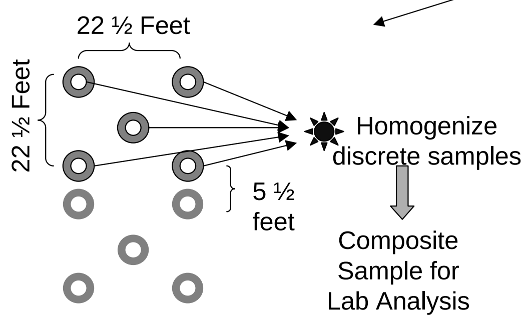
Sample collection

- Field Screening
  - Visual inspection
    - XRF has limited use, but can be helpful delineating horizontal and vertical migration of Pb due to erosion



- Vertical sampling interval
  - **Surface to 6"**
  - **>6" – 12"**
  - **>12" – 24"**
  - **>24" – 36"**
- Horizontal Spacing
  - Collect Discrete Samples on 5 points of an X patterned grid
  - Composite sample results represent entire grid area
  - Statistically minimize the nuggets effect

Composite sampling reference in document

•Jenkins and others from the United States Army Cold Regions Research and Engineering Laboratory (USACRREL

• XRF, used for *in situ* analysis, is sensitive to particle size and distribution

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Sample Preparation for risk assessment

- Remove the following materials from a sample before submitting the soil to laboratory analysis
  - Live materials and anything large enough to be identified by the naked eye
  - #10 sieve is often used
- Differences in surface area and surface charge can cause significant differences in the chemical concentrations found in the various soil size fractions
- Choice of a sample preparation method should result in a sample that is representative of the site and its environment
- Analytical methods
  - Standard EPA SW-846 is Method 3051 for digestion of samples for total metals. Analysis by flame AA or by ICP (SW-846 Standard Method 6010).

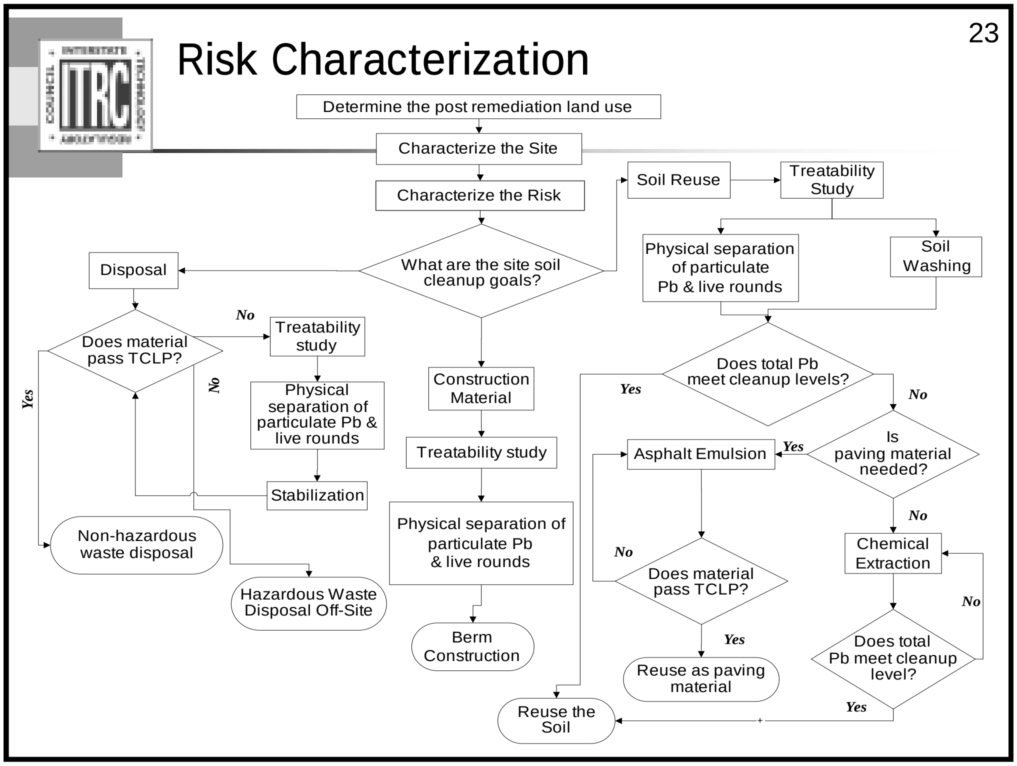
Example of variability

•Measured metal contamination, for example, can vary by over two orders of magnitude between the silt-clay fraction (minus #200-mesh) and medium sand (#10- by #40-mesh) alone.

•Consequently, one sample that contains more minus #200-mesh will generate a higher total metal result than a sample which contained more #10- by #40-mesh soil and so forth

•While, many current analytical methods rely only on using soil that has been passed, uncrushed, through a #30-mesh sieve as the source for analytical tests, some controversy exists in the field as to the best methods. Other sample preparation protocols have been proposed and approved by the governing regulatory body. Differences in sample preparation protocols include the designation of the size of sieve to use or whether to use a sieve at all; and on the degree of disaggregation prior to sieving

•Standard EPA SW-846 is Method 3051 for digestion of samples for total metals. Analysis by flame AA or by ICP (SW-846 Standard Method 6010).



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Risk Assessment

- **Generally required for future site reuse**
- **Risk assessment guidance is available for some land use decisions**
  - **Residential 400 ppm Pb**
  - **Industrial 1000 ppm Pb**
    - **These are EPA's levels - State's levels may vary**
- **Baseline risk assessment**

Lead usually the most important risk driver

•However; cases where other compounds can drive ecological risk: Copper in NY DOD SAFR (need more specific info on this site)

REFERENCES

Human Health Risk

•EPA's Risk Assessment Guidance for Superfund (RAGS) EPA/540/1-89/002 (December 1989)

•ASTMs' Risk-Based Corrective Action (RBCA) (ASTM, 1995)

•State Risk Assessment Guidance

•EPA adult and child lead models

•*Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. (*February 1994)

•*Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil* (December 1996)

Ecological Risk

•EPA's Ecological Risk Assessment Guidance for Superfund (ERAGS), EPA/540-R-97-006 (August, 1997)

Baseline Risk Assessment

- **Use more site-specific information**
  - **Receptor type and exposure, site characteristics**
  - **May incorporate deed restrictions or engineering controls**
  - **Potential for adjustment due to reduced bioavailability of the compound**
    - ***in vivo* vs. *in vitro* methods**
  - **Can develop cleanup goals that are less conservative yet still protective**

Receptor types:

•Residential adult or child

•Industrial/commercial or utility/construction worker

•Recreational user

•Ecological receptor

Deed restrictions may include:

•a ban on the use of groundwater due to elevated lead or other compounds

•a ban on residential use of the site (i.e., for industrial /commercial or recreational purposes only)

Bioavailability:

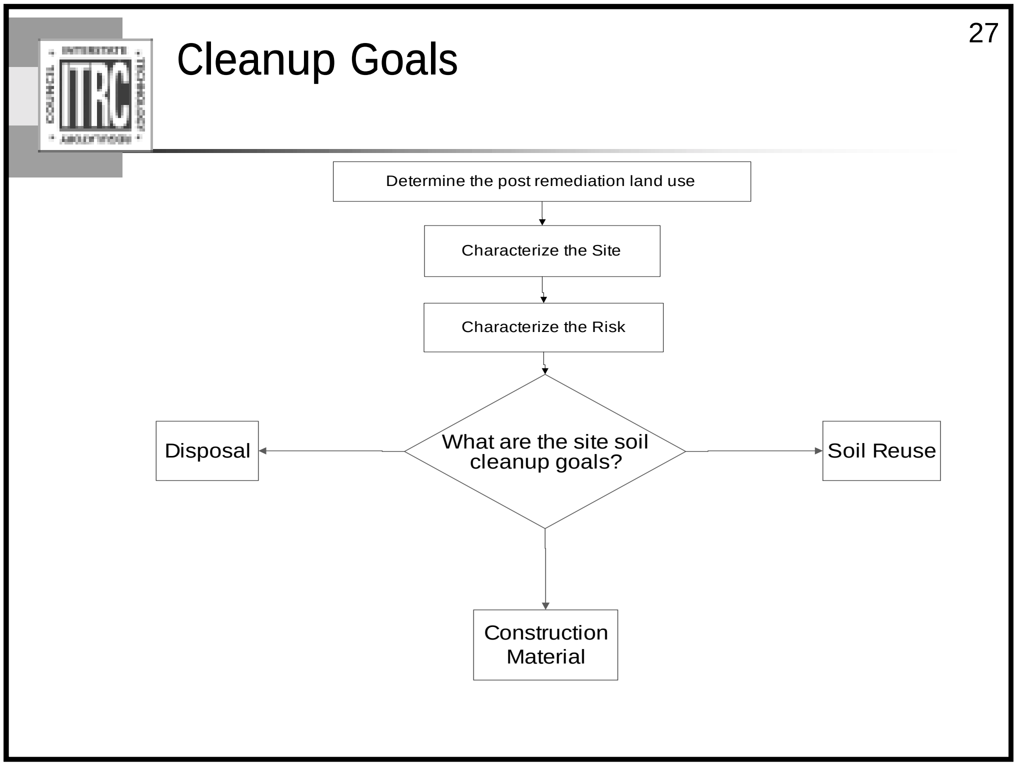
•*In vivo* assays with juvenile swine/monkeys/rats are expensive and time consuming

•*In vitro* methods still under development

•Bioavailability usually incorporated in risk assessment guidance, but adjustment values are generally conservative and may not adequately reflect the risk of exposure to lead or other compounds

Question & Answer

No associated notes



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Technology Selection

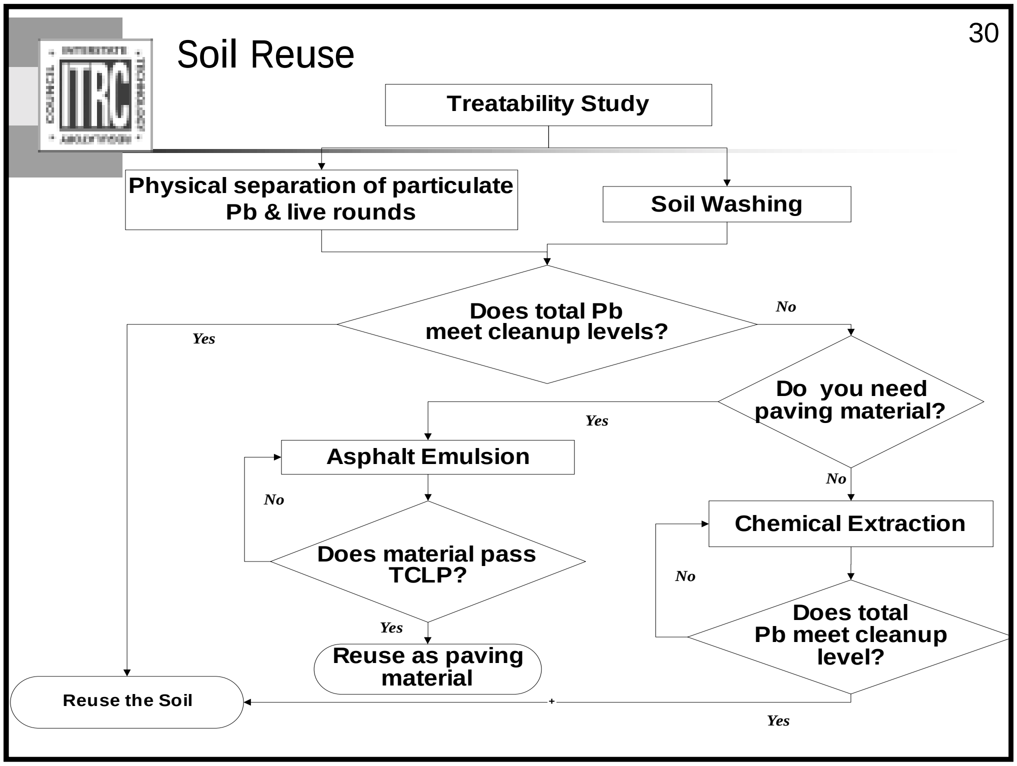
- **Path chosen is driven by cleanup goals <u>and</u> land use considerations**
- **Soil reuse vs. construction material vs. disposal**
- **As Cleanup goals decrease ↓ technology costs increase ↑**
- **Treatability Studies are required to evaluate the performance and costs for each site.**

No associated notes

Soil Reuse

- For a soil reuse path….
  - Allows unrestricted use of property
  - Technology selection is based upon the nature of the soil and reuse considerations
  - Particle separation is the first step
  - Residual treatment is required

No associated notes



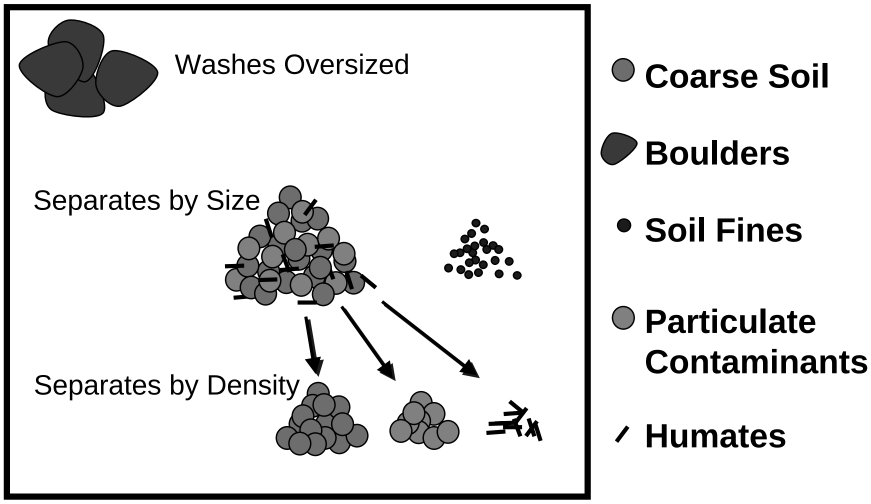
No associated notes

Soil Washing – the first step

- Mineral processing technique used to recover particulate contaminants as refined "products" such as:
  - "scrap metal" per 40 CFR 261.1(c)(6).
- More efficient operations with reduced processing costs consisting of
  - Physical sizing
  - Magnetic separation
  - Soil classification, &
  - Gravity separation

No associated notes

How Does Soil Washing Work?



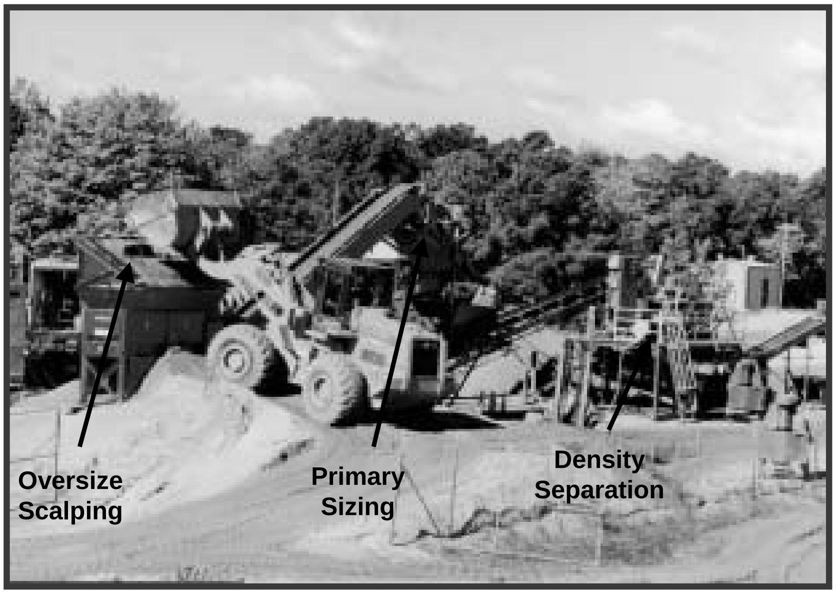
No associated notes

Treatability Study Requirements

- **Bench-Scale process should evaluate full scale unit operations and include analysis of:**
  - **Grain size distribution**
  - **Contaminant by fraction, including quantitative and qualitative evaluation**
  - **Density separation and residual treatment if required**
  - **Detailed in Appendix C of the guidance document**

No associated notes

Physical Treatment Plant



No associated notes

Soil Fraction to Density Separation

From
Primary Sizing

No associated notes

Density (Lead) Separation

Stones “Float”, Metals “Sink”

No associated notes

Metal "Concentrates" Found in Small Arms Range

Exhibit Characteristics of Reactivity for Disposal

Considered "Scrap Metal" for Recycling

No associated notes

Recovered Metals

Transported as Product
Under Bill of Lading

No associated notes

Water Treatment

No associated notes

Ballistic Sand Dewatering

No associated notes

Lead-Free Treated Soil

No associated notes

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Technology Acceptance – Soil Washing

- **Range reuse in a short period of time**
- **Metal recovery and reclamation**
- **Low cost**
  - **$30/ton range to the $80/ton range**
- **Stakeholder issues**
  - **Does not destroy contaminant – Recovers it for recycling**
  - **Wash water may require regulatory approval before release**

No associated notes

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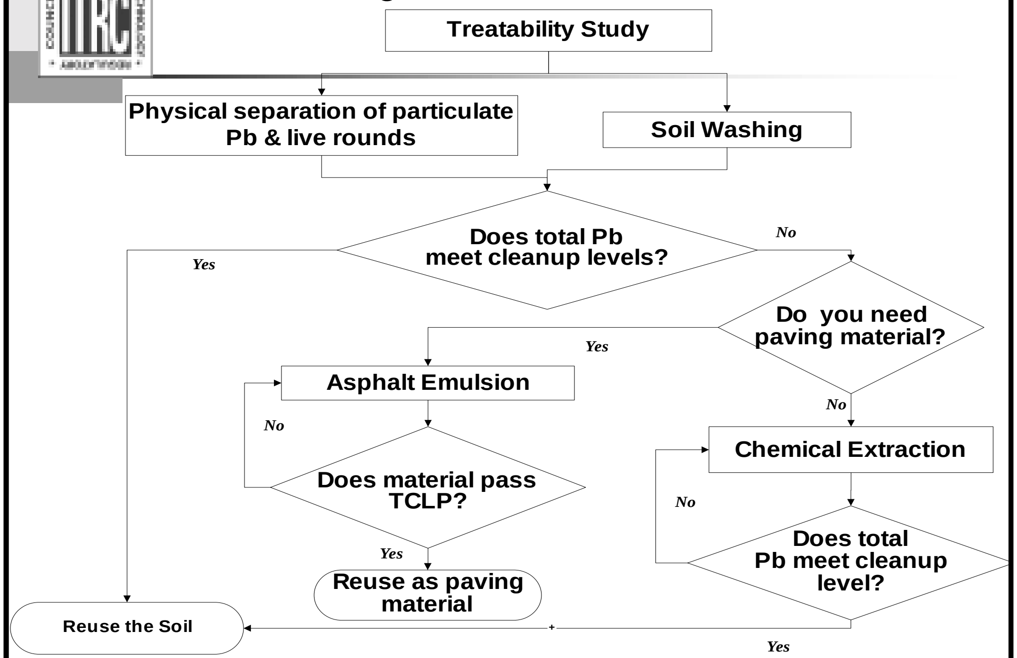
Soil Washing – Residual Treatment



No associated notes

Residual Treatment

- **If soil fails reuse criteria after soil washing:**
  - **Advance to asphalt emulsion treatment**
  - **Incorporate chemical extraction**
  - **Treatability test required and detailed in Appendix D of the guidance document**

No associated notes

Asphalt Emulsion Batching/Encapsulation

- **Tall oil pitch and asphalt-based emulsions**
- **rendering them resistant to leaching to groundwater**
- **reduces infiltration and is resistant to wind and water erosive forces**
- **USEPA issued a determination that use of encapsulation technologies qualifies as recycling for RCRA characteristic wastes**

No associated notes

Necessary testing during treatability studies

- **Chemical fixation/treatment effectiveness**
- **Physical properties of treated soil**

No associated notes

Stakeholder Concerns - Asphalt Emulsion

- Future use of the site and environmental conditions may erode the material used to encapsulate contaminants, thus affecting their capacity to immobilize.
- Certain waste streams are incompatible with variations of these processes, and each application must be carefully tested for long term compatibility before it is used.
- Special concerns may be posed by other types of hazardous waste (e.g. organic chemicals) that may interfere with stabilization processes. Some factors include inorganic acids that will decrease durability of the emulsion; chlorinated organics that may increase set time and decrease durability of the emulsion if the concentration is too high

No associated notes

Chemical Extraction

- Chemical treatment is a proven technology when combined with a physical treatment/soil washing approach
- Involves introducing a leachant to promote the dissolution of residual metals into solution after particulate metal removal.

No associated notes

Chemical Extraction Limitations

- **Feed soil pH and buffering capacity**
- **Cation Exchange Capacity (CEC)**
- **Total Organic Carbon**
- **Iron and manganese levels**

Feed soil pH and buffering capacity

•determines the volume of chemical addition to reach the pH required for efficient leaching

Cation exchange capacity (CEC)

•indicates the ability of the soil to bind lead in an exchangeable form. Generally, CEC is proportional to the clay content of the soil, making sandier soils easier to treat

Total organic carbon

•indicates the volume of organic material (humates) present in the soil on a weight-to-weight basis. Dissolved metals complexed with humates is difficult to remove, and may require separate humate removal step ahead of chemical leaching

Iron and manganese levels

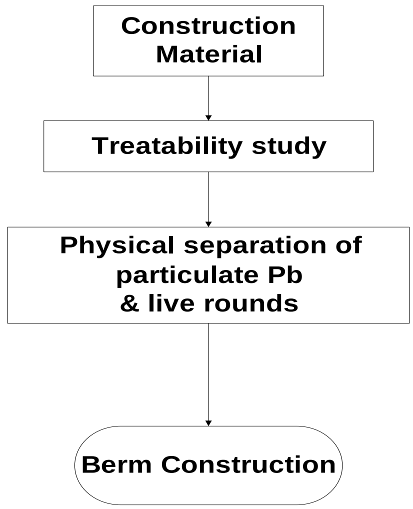
•indicate the presence of iron and manganese oxides that can adsorb lead. These materials tend to bind lead very strongly, and may leach out with other metals, increasing overall chemical consumption during leaching and precipitation steps

Stakeholder Concerns- Chemical Extraction

- While metals that are mixed and bound with organic contaminants can be extracted, the residuals may be restrictive.
- The toxicity of the solvent is an important consideration as traces may remain in the treated soil.
- After acid extraction, any residual acid in treated soil needs to be neutralized.
- In solvent extraction, impermeable membrane liners and covers should be used to reduce solvent evaporation and to protect against rain.

No associated notes

Construction Material



No associated notes

Construction Material

- **A form of soil reuse with “institutional” controls**
  - **Particulate Pb must be removed (physical separation and/or soil washing)**
  - **Soil limited to use as berm construction material for an active range**
  - **Regulatory issues as discussed in subsequent slides**

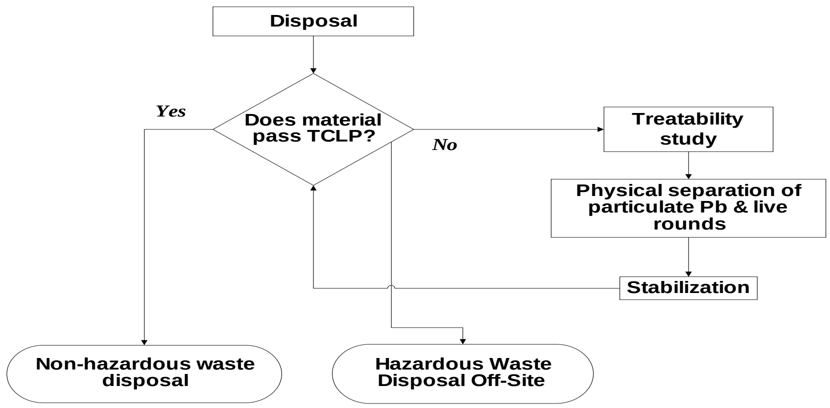
No associated notes

Physical Separation

- Dry Screening
  - A treatability study is required
  - Live round removal
  - Bullet (Projectile) recovery
  - Lower limit of ¼"
  - No density separation step limits effectiveness

No associated notes

Disposal



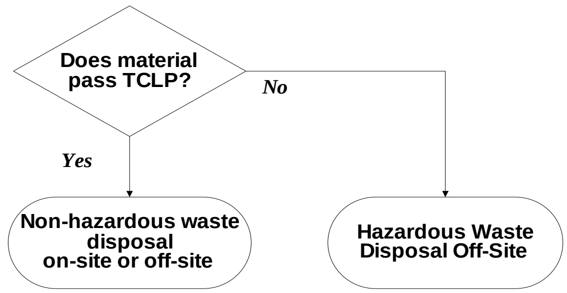
No associated notes

Disposal

- **Disposal can be on-site or off-site**
  - **RCRA regulations apply**
  - **May be additional State requirements as well**
  - **Institutional controls if the material is disposed of on-site**

No associated notes

Direct Disposal

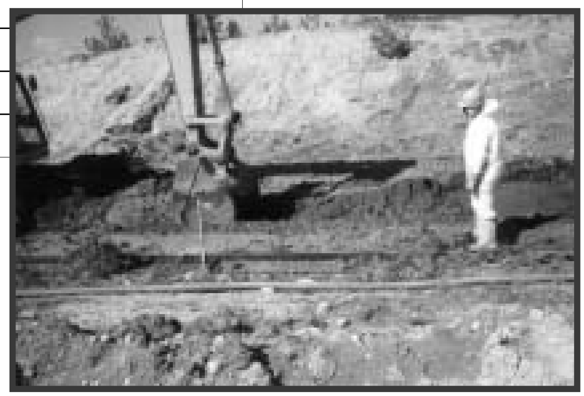


No associated notes

Soil Disposal

- **Dig and Haul**

Element	RCRA TCLP Requirements
As	≥ 5.0 mg/l
Pb	≥ 5.0 mg/l
Cu	None
Sb	None
As	None



No associated notes

Stabilization/Solidification

- **Change the hazardous characteristic of firing range soil prior to long-term management**
- **Control the solubility of metals in range soil for groundwater protection**
- **Does not change the calculated health risk if the soil remains on-site**

No associated notes

Solidification

- **Solidification**
  - **generally refers to adding pozzolanic material to a waste to reduce permeability and increase alkalinity.**
  - **Significant bulking**
  - **Adding alkaline materials to alkaline soil can increase lead solubility**

No associated notes

Stabilization

- **Stabilization of hazardous wastes was developed as a treatment alternative to conventional solidification processes.**
- **Common stabilization compounds used include phosphates, sulfates, hydroxides, and carbonates.**

No associated notes

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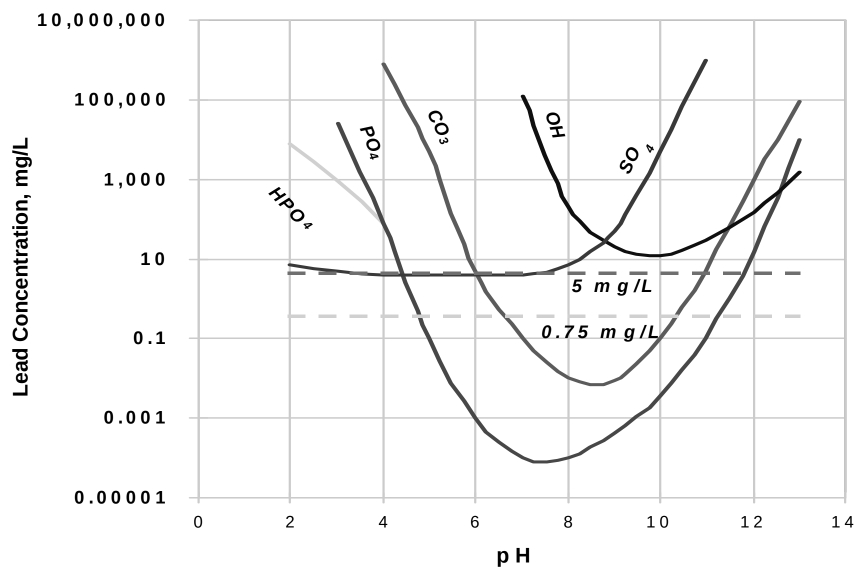
Solubility of Various Lead Compounds as a Function of pH



No associated notes

Performance Tests

- TCLP (Toxicity Characteristic Leaching Procedure)
  - mimic conditions over an extended period in an actively decomposing municipal landfill
- SPLP (Synthetic Precipitation Leaching Procedure)
  - simulate 100 years of leaching with a worst-case acid rain containing nitric and sulfuric acids
- MEP (Multiple Extraction Procedure)
  - simulate 1,000 years of leaching with acid rain. It consists of an initial TCLP, with the leached solids being subjected to nine successive SPLPs

No associated notes

Technology Acceptance - Stabilization

- Complexing agents do not reduce total lead concentrations, and the stabilized soil is often shipped to a landfill for indefinite storage.
- On-site reuse is acceptable with some stabilization technologies.
- The overall benefit of the stabilization approach is that the soil can be shipped to a non-hazardous landfill with lower tipping fees than a landfill designed to receive hazardous waste.

No associated notes

Stakeholder Concerns

- Environmental conditions may affect the long-term immobilization of contaminants.
- Future use of the site and environmental conditions may erode the materials used to stabilize contaminants, thus affecting their capacity to immobilize contaminants.
- Depth of contaminants may limit these processes.

No associated notes

Cost Comparisons

Option	Cost	Long Term Liability	Land Use Restrictions	Perception Factor
Soil Washing	$$$	L	R	Excellent
• **Asphalt Batch**	$	L	R	Good
• **Chemical Extraction**	$$	L	R	Fair
Construction Material	$	LL	RR	Fair
Hazardous Disposal	$$$$$	LLLLL	RRRRR	Poor
Non-hazardous Disposal	$$	LLLL	RRRR	Fair
• **Stabilization**	$$	LLLL	RRRR	Good
• **Solidification**	$$	LLLL	RRRR	Poor

No associated notes

Regulatory Requirements, Barriers & Flexibilities

Classification of Spent Ammunition scrap metal exemption	 40 C.F.R. 261.1 40 CFR 261.4(a)13
Military Munitions Rule	40CFR 266 Subpart M).
Lead Recycling Reclamation recyclable	 40 CFR 261.1(c)(4) 40 CFR 261.6(a)(3)(ii),
Live Rounds	
Soil Recycling	40 CFR 266.20 (b)
Relocating Range Soil for Reuse	

Remediation of shooting ranges is an increasing concern for both range operators and environmental regulators. It has become evident that lead management practices are inconsistent and range operators are often unaware of the appropriate path forward. In response, the USEPA has developed various rules to allow flexibility in the clean up of shooting ranges. These include recycling of scrap metal and the Military Munitions Rule (MMR). While understanding the regulatory flexibilities is imperative to range clean up, it is also important to understand the regulatory barriers. Of particular note is the need to understand both the state and federal regulatory requirements. The sections below outline the regulatory requirements that should be considered during the clean up of small arms shooting ranges.

Spent Ammunition

- 40 C.F.R. 261.1
  - Defines “scrap metal” as bits and pieces of metal parts or pieces that may be combined together with bolt or soldering, which when worn can be recycled.”
- 40 CFR 261.4(a)13
  - processed scrap metal is exempted from RCRA regulation with the intention of promoting safe recycling
- Therefore, as long as the selected reclamation technology meets the definition of processed scrap metal, the reclamation process is exempt from regulation under RCRA
  - See notes page for additional information

A key issue to be resolved is; whether spent ammunition is classified as a solid waste or a contaminant. The Clean Air Act under Section 112(b)3(7) excludes elemental lead as a hazardous air pollutant. Furthermore, under CERCLA, releases of lead particles with a mean diameter of over 100 microns are exempted from being reported. State equivalents of the Clean Water Act or the Solid Waste Disposal Act are the most likely vehicle for development of comprehensive environmental standards at shooting ranges. The USEPA has defined “scrap metal” as “bits and pieces of metal parts or pieces that may be combined together with bolt or soldering, which when worn can be recycled.” 40 C.F.R. 261.1. Since lead shot is a product that is made of metal that can be recycled to recover the metal content, it falls within the definition of scrap metal. In accordance with 40 CFR 261.6(a)3(ii), scrap metal is a solid waste, but is exempt from the regulatory requirements of RCRA Subpart C. Additionally, as outlined in the Federal Register (volume 62, number 91, pages 25997-26040), processed scrap metal is exempted from RCRA regulation with the intention of promoting safe recycling (40 CFR 261.4(a) 13)). Therefore, as long as the selected remediation technology (e.g. soil washing) meets the definition of processed scrap metal, the technology is exempt from regulation under RCRA

MMR (Military Munitions Rule)

- Applies to military and non-military ranges
- Excludes munitions used for their intended purposes from the definition of a solid waste, and therefore as a hazardous waste
- If lead shot at a shooting range has been abandoned (or has been determined to be abandoned) it then becomes solid waste

The USEPA published the RCRA Subtitle C Military Munitions Rule (MMR) in the Federal Register (62 Fed Reg. 6621). It was then adopted in September 1998 (40CFR 266 Subpart M). Though originally intended to apply to federal facilities, the USEPA has taken the position that the MMR also applies to non-military ranges. The MMR excludes munitions used for their intended purposes from the definition of a solid waste, and therefore as a hazardous waste. This includes training, research, development, recovery, collection, and on-range destruction of unexploded ordnance (UXO). The Military Munitions Rule considers range management to be a necessary part of the safe use of munitions for their intended purpose. The exclusion for range clearance applies to the separation of lead and bullets from the soil and redeposition of the soil on the range.

However, use for intended purposes does not include the on-range disposal or burial of UXO when the burial is not a result of product use. Likewise, if lead shot at a shooting range has been abandoned (or has been determined to be abandoned) it then becomes solid waste. If the solid waste accumulates on ground surface and therefore causes lead leaching, it can be considered a hazardous waste. At that point, the lead contamination would be subject to RCRA Subtitle C.

States adopting this rule may set more stringent requirements for determining when military munitions are solid waste; in fact, DOD has established a policy whereby "state environmental regulations that do not affect explosive safety will be followed until any required resolution is affected." The rule does not exempt ranges from Clean Water Act requirements. Using this rule as a precedent, state agencies may elect to implement a regulatory scheme that is protective without requiring a full RCRA permit.

Lead Recycling

- 40 CFR 261.1(c)(4)
  - During firing range maintenance or remediation activities, recovery of bullets and bullet fragments from firing range sands or soils via physical treatment constitutes “reclamation”
- 40 CFR 261.6(a)(3)(ii),
  - recycled scrap metal is classified as a “recyclable material” that is not subject to the requirements for generators, transporters, and storage facilities of hazardous wastes specified in paragraphs (b) and (c) of 40 CFR 261.6.

During firing range maintenance or remediation activities, recovery of bullets and bullet fragments from firing range sands or soils via physical treatment constitutes “reclamation” per 40 CFR 261.1(c)(4). Metal concentrates reclaimed from firing range berms via size classification and density concentration contain more than 50% lead on a dry weight basis. The other metals included in the concentrate are predominantly copper and antimony. The concentrate reclaimed from the firing range material is “scrap metal” per 40 CFR 261.1(c)(6).

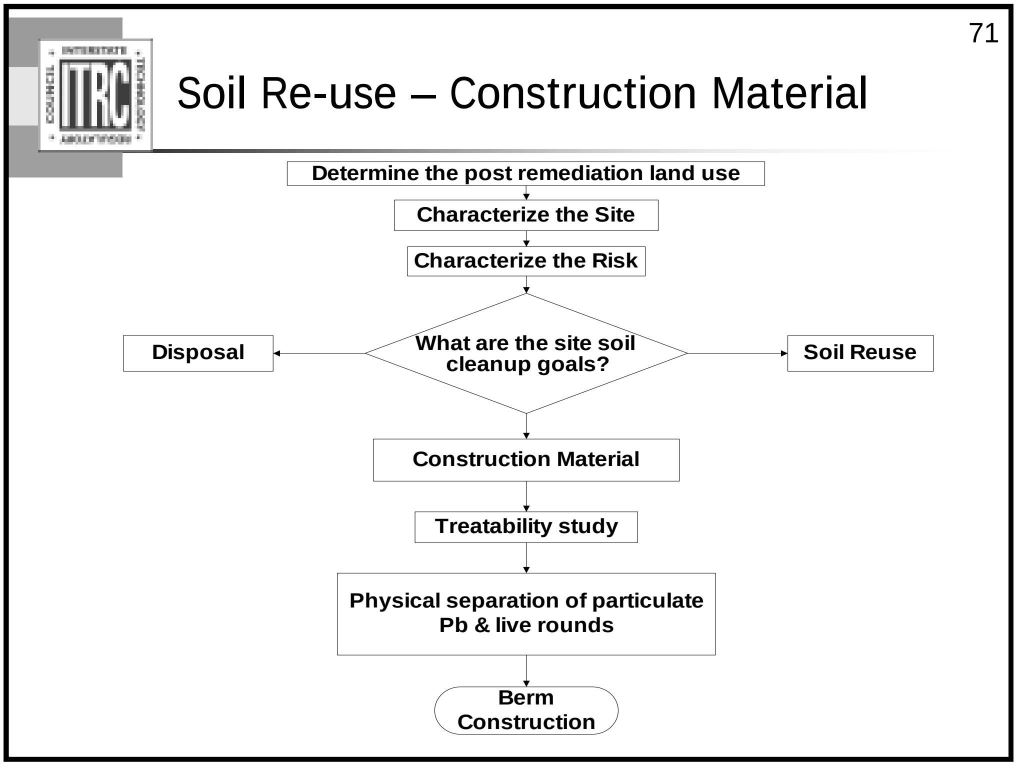
However, scrap metal is not regulated as solid waste or as hazardous waste when recycled. Under 40 CFR 261.6(a)(3)(iv), recycled scrap metal is classified as a “recyclable material” that is not subject to the requirements for generators, transporters, and storage facilities of hazardous wastes specified in paragraphs (b) and (c) of 40 CFR 261.6. Therefore, the scrap metal reclaimed from the firing range sand, or soil, does not need to be regulated or manifested as a hazardous waste during generation or transport to a smelter for recycling. When scrap metals reclaimed from firing range maintenance or remediation activities are recycled using

a smelter, the generator is paid for the value of the reclaimed metals minus any smelter handling fees. All material recovered should be shipped under bills of lading for recycling. Some of the recycling processes automatically bags all recovered metals in DOT compliant super-sacks, which are pelletized for ease of handling and shipment.

Soil Recycling

- 40 CFR 266.20 (b) - Exempt from RCRA regulation if
  - waste that is recycled and "used in a manner constituting disposal", and
  - resulting product is produced for the general public's use, and
  - it contains recyclable materials that have undergone a chemical reaction so as to become inseparable by physical means, and
  - the product meets LDR treatment standards.

Under current regulations, waste that is recycled and "used in a manner constituting disposal" is exempt from RCRA regulation if the resulting product is produced for the general public's use, it contains recyclable materials that have undergone a chemical reaction so as to become inseparable by physical means, and the product meets LDR treatment standards. (See 40 CFR 266.20 (b)).



See figure 1-1 in the guidance document for the full page diagram

The purpose of this course is to give everyone involved with the remediation of inactive or closed small arms ranges the tools to allow you to make informed decisions that will result in the selection of an appropriate cleanup technology that meets your needs. We have drawn upon the knowledge and experience of small arms range owner advocates, regulators, and consultants to design a logical and easy to follow decision matrix for determining the best remediation program alternative.

Relocating range soil for reuse on-site

- It is EPA's position that ranges that reclaim and recycle lead bullets or lead shot may place the soil that is generated during the reclamation process back onto an active range on the same property or facility, or a property adjacent to and under the same ownership as the property where the soil originated, without testing the soil for hazardous waste characteristics.

4.8 Transporting or Relocating Range Soil for Reuse as a Backstop on Range Property At some ranges, it may be possible and desirable to reuse the soil from the backstop of a range that is being closed to construct a new berm or rebuild an existing berm located in another area of the range property. It is EPA's position that ranges that reclaim and recycle lead bullets or lead shot may place the soil that is generated during the reclamation process back on the range without testing the soil for hazardous waste characteristics. This position is consistent with the Military Munitions Rule. Consistent with this approach, range soil that has been processed to reclaim lead for recycling, is considered a construction material if it is used to construct or rebuild a backstop or other shooting range component on the same range property or on an adjacent property under the same ownership and control as the property where the material originated. Range soil includes soil from a former backstop or from other parts of the range. As a construction material, the range soil, even if it contains small amounts of lead fragments or shot after reclamation, is not considered a solid waste and therefore, is not a hazardous waste. If there is a need for backstop construction material elsewhere on the property at which a range is being closed, then the option of reusing the range soils after reclamation should be considered. This approach avoids the costs associated with testing and disposing of the soils from the former backstop as hazardous waste. The cost of the reclamation process is a function of the time, labor, and equipment used to segregate the lead bullet fragments or shot from the former backstop and transport it to a recycling facility/smelter. These costs are offset to some extent (depending on the amount of lead that has accumulated in the backstop and the efficiency of the reclamation process) by the price received from the scrap metal recycler/smelter for the recovered lead. In addition, there is a cost savings related to the construction material for the new or rebuilt backstop.

Relocating range soil for reuse off-site

- Several commenters opposed the off-site equivalent position during the Pre-Concurrence review of the document.
- The team is continuing to considering the following issue
  - "Range soil from a former backstop may (or may not) also be reused, following lead reclamation, for constructing or rebuilding a backstop at a location that is not on the range property. Reclaimers should apply standard BMPs, mentioned in the EPA BMP for Lead at Outdoor Shooting Ranges, to separate the lead from soil ."
    - Since individual states may not permit this action, or may impose additional requirements for transportation, documentation and approvals, state regulatory agencies should be consulted prior to transporting range soils to a property that is not the same as or adjacent to and under the same ownership as the property where the soils originated.

Relocating Range Soil for Reuse Off-Site ? It is EPA's position that range soil from a former backstop may also be reused, following lead reclamation, for constructing or rebuilding a backstop at a location that is not on the range property. Reclaimers should apply standard BMPs, mentioned in the EPA BMP for Lead at Outdoor Shooting Ranges, to separate the lead form soil. Individual states may impose additional requirements for transportation documentation and approvals, however, and therefore, state regulators should be consulted prior to transporting range soils to a property that is not the same as or adjacent to and under the same ownership as the property where the soils originated. Finally, once range soils have been removed and relocated for use in a backstop at another range, assessment of the area under and surrounding the former backstop should be conducted as part of the site characterization performed as part of the range closure and as described elsewhere in this document.

Question & Answer

Go to www.itrcweb.org click on “Guidance Documents” to download the “Technical & Regulatory Guidance Document for Small Arms Firing Range Remediation Technologies.”

Thank you for your participation

Links

To

Resources

Links to additional resources: http://www.clu-in.org/conf/itrc/smart/resource.htm

Your feedback is important – please fill out the form at: at http://www.clu-in.org/conf/itrc/smart/

The benefits that ITRC offers to state regulators and technology developers, vendors, and consultants include:

•helping regulators build their knowledge base and raise their confidence about new environmental technologies

•helping regulators save time and money when evaluating environmental technologies

•guiding technology developers in the collection of performance data to satisfy the requirements of multiple states

•helping technology vendors avoid the time and expense of conducting duplicative and costly demonstrations

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•Sponsor ITRC's technical teams and other activities

•Be an official state member by appointing a POC (Point of Contact) to the State Engagement Team

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