

References

- Battelle Memorial Institute, *Field Demonstration of a Sieving and Stabilization Technology on Lead-Contaminated Soils at a Small Arms Range at Mayport Naval Air Station*, Columbus, Ohio, February 1991
- Brister, B. The Speed Factor, *Field and Stream*, January 1995
- Connecticut Coastal Fisherman's Ass'n v. Remington Arms Co., Inc., 989 F.2d 1305 (2d Cir. 1993)
- George, C.J., Joachim, A., and Le, Phu Trong, *Long-Buried Lead Shot: Its Stability, Possible Transport by Waterfowl and Reexposure by Hydraulic Dredging at Collins Lake*, Department of Biological Sciences, Union College, Schenectady, NY, June 1991
- Long Island Soundkeeper Fund, Inc. v. New York Athletic Club of the City of New York, 1996 U.S. Dist. LEXIS 3383 (S.D.N.Y. 1996)
- Magdits, Louis J., *Recycling Regulations*, Proceeding from the Third National Shooting Range Symposium, June 23-25, 1996, Orlando, Florida
- Middleton, J.R., *Development of Toxic Free Ammunition*, U.S. Armament Research, Development and Engineering Center
- National Rifle Association of America, *Lead Article*, Risk Issues in Health and Safety - Volume I, Pages 6-8, Winter 1990
- National Rifle Association of America, *Metallic "Bullets" Lead Deposits on Outdoor and Indoor Firing Ranges*, 1991
- National Rifle Association, *The NRA Range Source Book: A Guide to Planning and Construction*, June 1998
- National Shooting Sports Foundation, *Environmental Aspects of Construction and Management of Outdoor Shooting Ranges*, June 1998
- Ordija, Victor, *Lessons from Lordship*, Proceedings from the National Shooting Range Symposium, October 17-19, 1993, Salt Lake City, Utah
- Peddicord, Richard K., *Lead Mobility in Soils*, Proceedings from the Third National Shooting Range Symposium, June 23-25, 1996, Orlando, Florida

Sever, C.W., *Lead and Outdoor Ranges*, Proceedings from the National Range Symposium, October 17-19, 1993, Salt Lake City, Utah

Sporting Arms and Ammunition Manufacturers Institute, Inc., *Lead Mobility at Shooting Ranges*, Newtown, CT, 1996

Stansley, W., Widjeskog, L., and Roscoe, D.E., *Lead Contamination and Mobility in Surface Water Trap and Skeet Ranges*, Bulletin of Environmental Contamination Toxicology, Springer-Verlag, New York, NY, 1992

U.S. Department of the Interior, *Pollution Prevention Handbook -- Firing Ranges*, Department of the Interior, Office of Environmental Affairs, Washington, D.C.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C., Directive 9355.4-12, *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, July 14 1994

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington D.C., *A Citizen's Guide to Soil Washing*, EPA 542-F-96-002. , April 1996.

U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. *Physical/Chemical Treatment Technology Resource Guide*, EPA 542-B-94-008. September 1994.

Appendix A: Resources

This manual provides contacts for lead reclamation companies, lead recycling companies, bullet trap manufacturers, and organizations that provide prevention and/or remediation techniques to assist clubs and firing ranges in implementing Best Management Practices for shooting ranges. The list was updated for the June 2005 printing. Vendors who are interested in being added to the list of lead reclaimers or remediation contractors should contact:

Lead Shot Coordinator
RCRA Compliance Branch
US EPA Region 2
290 Broadway
New York, NY 10007-1866
Telephone: (212)637-4145
E-mail: Leadshot.Region2@epa.gov



Lead Recycling Companies

Below is a list of recycling companies for lead in soils and spent lead shot/bullets that were contacted during the writing of this manual. Lead recycling companies smelt lead. It is not inclusive and is included for informational purposes only. Local scrap metal recyclers may also accept spent lead shot or spent bullets. Mention of these companies does not serve as an endorsement by the EPA.

<p>The Doe Run Company Resource Recycling Division HC1 Box 1395 Boss, MO 65440</p> <p>800-633-8566 573-626-3476 Lou Magdits l.magdits@doerun.com</p>	<p>East Penn Manufacturing Company, Inc. P.O. Box 147 Lyon Station, PA 19536 610-682-6361 Rick Leiby</p> <p>Web Site: http://www.eastpenn-deka.com</p>
<p>Exide Spring Valley & Nolan Streets Reading, PA 19612 800-437-8495 Robert Jordan, Maritza Rojas-Suarez</p> <p>Web site: http://www.exide.com</p>	<p>Gopher Smelting and Refining 3385 Highway 149 South Eagan, MN 55121 651-454-3310 800-354-7451 Mark Kutoff</p> <p>Web Site: http://www.gopherresource.com/</p>
<p>Gulf Coast Recycling 1901 N. 66th St Tampa, FL 33619 813-626-6151 William Weston</p>	<p>Kinsbursky Brothers, Inc. 1314 N. Anaheim Blvd Anaheim, CA 92801 714-738-8516 Paul Schneider</p> <p>Web Site: http://www.kinsbursky.com</p>
<p>Reserve Trading Corp. P.O. Box 302 Medina, OH 44258 330-723-3228</p>	

Lead Reclamation Companies

Below is a list of reclamation companies for lead in soils and spent lead shot/bullets that were contacted during the writing of this manual. Lead reclamation companies reclaim lead from ranges. It is not inclusive and is included for informational purposes only. Mention of these companies does not serve as an endorsement by the EPA.

<p>Brice Environmental 3200 Shell St, P.O. Box 73520, Fairbanks, AK 99707 Craig Jones 907-456-1955 www.briceinc.com</p> <p>Reclaims primarily from earthen backstops and sand traps.</p>	<p>En-Range, Inc. 3326 NW 29th St. Miami, FL 33142-6310 Thomas M. Taylor 305-999-9965 Fax 305-635-8645 Email: enrange1@yahoo.com www.en-range.com</p> <p>Provides lead reclamation and other environmental and maintenance services.</p>	<p>Entact 1010 Executive Court Suite 280 Westmont, IL 60559 630-986-2900 www.entact.com</p> <p>Performs physical removal of the lead from backstops, chemical treatment of soils and returns soil to the backstop.</p>
<p>Karl & Associates, Inc. 20 Lauck Road Mohnton, PA 19540 Edmund Karl III 610-856-7700</p> <p>Works primarily in the the mid-Atlantic area. Lead-containing soil is physically removed and sent to licensed disposal sites or licensed recycling facilities.</p>	<p>MARCOR 246 Cockeysville Road Hunt Valley, MD 21030 Dave Jungers 410-785-0001 www.marcor.com</p> <p>Uses a pneumatic separation unit to remove lead from contaminated soil and treats soil to pass TCLP.</p>	<p>Metals Treatment Technologies, LLC (MT²) 12441 West 49th Avenue Suite 3 Wheat Ridge, CO 80033 Jim Barthel 303-456-6977 www.metalstt.com</p> <p>Removes lead from soil and treats soils at all types of ranges.</p>
<p>Sears Trucking Company P.O. Box 38 El Reno, OK 73036 Garland Sears 800-522-3314 Fax 405-262-2811</p> <p>Physically removes lead from soils at trap and skeet ranges.</p>	<p>Solucorp Industries, Ltd. 250 West Nyack Road West Nyack, NY 10994 Mike DeLuca 845-623-2333 Fax 845-623-4987 Email: solucorpmbms@aol.com www.solucorpltd.com</p> <p>Removes and treats soil using their Molecular Bonding System (MBS) soil stabilization technology.</p>	<p>Southern Lead Removal P.O. Box 2645 Daytona Beach, FL 32115 Kevin Gilchrist 386-763-0115 Fax 386-761-6991</p> <p>Removes lead from indoor and outdoor pistol ranges only.</p>
<p>Sport Shooting Services P.O. Box 667 Crawfordville, FL 32326 Ed Tyer 850-926-7375 Cellphone 850-294-0132 Email: enviorange@aol.com</p> <p>Removes lead from earthen berms, uses a shaker and screen system to separate lead from soils, rents screening equipment, and consults on range design, primarily in Florida.</p>	<p>Terra Resources, Ltd. HC4 Box 9311 Palmer, AK 99645 Larry Wood 907-746-4981 Cellphone: (907) 232-5059 Fax: 907-746-4980 www.terrawash.com</p> <p>Uses gravimetric process to separate lead and TerraWash™ soil washing technology.</p>	<p>Waste Recycling Solutions, Inc. 1850 Route 112 Medford, NY 11763 Tommy Arabia, President 631-654-3811</p> <p>Uses a vacuum system to remove lead from trap and skeet ranges.</p>

Other Resources

Below is a list of additional phone numbers that may be of use if you have general questions including questions on range construction, design, and implementing BMPs.

<p>U.S. Fish and Wildlife Service 4401 North Fairfax Arlington, VA 22203 703/358-2156</p> <p>Web site: http://www.fws.gov/</p>	<p>Institute of Scrap Recycling Industries, Inc. 1325 G Street, NW, Suite 1000 Washington, DC 20005-3104 202/737-1770</p> <p>Web site: http://www.isri.org/</p>
<p>Lead Industries Association, Inc. 13 Main Street Sparta, NJ 07871 973/726-LEAD (973/726-5323) fax: 973/726-4484</p> <p>Web site: http://www.leadinfo.com</p>	<p>National Rifle Association of America 11250 Waples Mills Road Fairfax, VA 22030 800/NRA-3888</p> <p>Web site: http://www.nra.org</p>
<p>National Shooting Sports Foundation and National Association of Shooting Ranges 11 Mile Hill Road Newtown, CT 06470 203/426-1320</p> <p>NSSF web site: http://www.nssf.org NASR web site: http://www.rangeinfo.org</p>	<p>Sporting Arms and Ammunition Manufacturers' Institute, Inc. Flintlock Ridge Office Center 11 Mile Hill Road Newtown, CT 06470-2359 203/426-4358</p> <p>Web site: http://www.saami.org</p>
<p>Wildlife Management Institute 1101 14th Street, N.W. Suite 801 Washington, DC 20005 202/371-1808</p> <p>Web site: http://www.wildlifemanagementinstitute.org</p>	

Web Resources

Useful Web Sites	
Description	Web Address
<i>Federal Government Sites</i>	
U.S. EPA's Outdoor Shooting Range Home Page	http://www.epa.gov/region2/waste/leadshot/
U.S. EPA – Military Munitions Rule	http://www.epa.gov/epaoswer/hazwaste/military/ http://www.epa.gov/tribalmsw/thirds/remunition.htm
U.S. Occupational Safety and Health Administration (OSHA)	http://www.osha.gov/
National Institute for Occupational Safety and Health (NIOSH)	http://www.cdc.gov/niosh/
<i>State Government Sites</i>	
Florida: BMPs for Shooting Ranges	http://www.dep.state.fl.us/waste/categories/shooting_range/
Massachusetts : Lead Shot in the Environment	http://www.state.ma.us/dep/files/pbshot/pb_shot.htm
Minnesota: Poster for "Firing Range Hazards"	http://www.cdc.gov/niosh/mnables.html
Ohio: Lead Shot Reclaimers list	http://www.epa.ohio.gov/dhwm/leadrecy.htm
Wyoming: Lead Recyclers List	http://deq.state.wy.us/outreach/lead.htm
<i>Court Decisions</i>	
Connecticut Coastal Fishermen's Association v. Remington Arms	http://www.duedall.fit.edu/summer/rcra.htm
Long Island Soundkeeper Fund and NY Coastal Fishermen's Assoc. v. New York Athletic Club	http://www.epa.gov/region02/waste/leadshot/lisfnyac.htm
<i>Articles and Research</i>	
USAF - Lead Contamination in Soils at Military Small Arms Firing Ranges	http://www.afcee.brooks.af.mil/pro-act/fact/june98a.asp
U.S. Army Env. Center (AEC) – Small Arms Range Technology	http://aec.army.mil/usaec/range/operations03.html http://aec.army.mil/usaec/technology/rangexxi03.html http://aec.army.mil/usaec/publicaffairs/update/win97/range.htm
AEC – Green Bullets	http://aec.army.mil/usaec/publicaffairs/publicity02.html http://aec.army.mil/usaec/technology/rangexxi00a.html http://aec.army.mil/usaec/publicaffairs/update/spr97/bullets.htm
AEC - Recycling of Firing Range Scrap	http://aec.army.mil/usaec/publicaffairs/update/spr99/spr9911.htm
Florida Center for Solid and Hazardous Waste Management	http://www.floridacenter.org/
National Association of Shooting Ranges' Reference Library	http://www.rangeinfo.org/resource_library/facility_mngmnt/

Bullet Trap Manufacturers¹

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Action Target (801) 377-8033 Contact: John Curtis, CEO actiontarget.com	Total Containment Trap (TCT)	\$1,600 to \$1,800 /linear foot (dependent on features selected)	Purchase of Equipment Installation Delivery (Freight included)		Rifle Pistol Armor - piercing* *depends on type of armor-piercing	The TCT is a funnel-style trap that uses steel plates mounted at low angles to direct bullets into a deceleration chamber. The low angles prevent break up of the bullets until they reach the chamber, where the bullets lose energy and drop into removeable storage containers. An optional dust collection unit uses a powerful vacuum to remove lead dust and other fine particles from the collection chamber.	The TCT is designed for both indoor and outdoor applications. It may be used safely with handguns, shotguns, and high-powered rifles, and has been successfully tested and used with 50-caliber fire.
Action Target (Cont.) see details above	Rubber Berm Trap (RBT)	\$1100/linear foot	Installation and Delivery		Rifle or Pistol. Armor-piercing. Cannot use incendiary rounds.	The RBT is very similar in form and function to a traditional sand or earthen berm trap, with the obvious difference being the use of chopped rubber instead of sand as a collection medium. Bullets fired into the trap are absorbed by the rubber and remain there until reclamation through mining of lead from the trap.	Because rubber is a softer collection medium, bullets can be captured with less break-up and fragmentation. The resulting reduction in lead dust levels is especially beneficial in indoor ranges. This benefit is decreased as more rounds accumulate in the trap, causing newly fired bullets to impact bullets already in the trap.

¹ EPA does not endorse any particular bullet containment device or product. Information on this table is offered to readers for a general understanding of some common bullet trap options and is based on vendor marketing literature.

Bullet Trap Manufacturers Con't.¹

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Copius Consultants (516) 783-7489 Contact: Craig Copius	Containment/ Recovery System	Ranges from \$600/linear foot to \$1,000/linear foot (Price varies with specific design selected)	Purchase of Equipment	Shipping	Rifle Pistol Machine gun Shotgun	This is a modification of the sand backstop. Sizes vary depending on the needs and characteristics of the range; however, average height is 10' - 12' and average width is 12' - 14'. The trap utilizes ballistic grade sand to trap bullets and bullet fragments in a sealed system. The system contains collection and filtration systems to ease reclamation and eliminate off-site migration of lead.	Specific recommended bullet trap is based on the following: 1) Type of usage, quantity of usage, etc. 2) Location in country 3) Environmental issues (e.g., location near a waterbody) Price will depend on the design adopted. One unique feature is that shooting can occur at any angle.
Meggitt Defense Systems Caswell (612) 706-6201 Contact: Brian Danielson	Granular Rubber Bullet Traps	\$940 to \$1,300/linear foot (dependent on type of trap and other features selected)	Purchase of Equipment Installation Delivery (Freight included)		Pistol Rifle Armor- Piercing Shotgun Machine gun Tracers (Speak to Sales Rep.)	The trap absorbs bullets fired from any angle or distance. No exposed steel surfaces; bullets are not fragmented. The granulated material used in the trap can be turned over quickly to recover the spent rounds.	Suitable for indoor and outdoor ranges. Eight types of traps available. Custom builds traps. Provides site-specific design, if requested. Reclamation is recommended after approximately 90,000 rounds have been fired (depending on trap type.)

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Bullet Trap Manufacturers Con't.¹

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Range Systems (888) 999-1217 (763) 533-9200 Contact: Steve Thomas range-systems.com	Encasulator Bloc Trap™ Encasulator Granular Trap™	\$800-\$1,250/linear ft (Price varies with design criteria and product selection)	Purchase of Equipment Installation	Freight	Pistol Rifle Shotgun (shot and slugs)	The bullet traps are constructed for maximum bullet retention with minimum space and cost. The bullet traps virtually eliminate ricochet and airborne lead.	Full service shooting range provider from design and engineering to construction and maintenance. Custom-built traps with exclusive patented rubber technology.
Savage Range Systems (413) 568-7001 Contact: Joan Drucker snailtraps.com	The SNAIL™ Trap	Two types of traps: Pistol Wet: \$2,250/linear ft Pistol Dry: \$2,150/linear ft Rifle Wet: \$2,400/linear ft Rifle Dry: \$2,300/linear ft	Purchase of Equipment	Shipping Installation	Rifle (up to .50 cal BMG) Pistol	The SNAIL trap is designed with low angle entrance ramps to guide the bullet into the circular deceleration chamber without scarring the plate. The bullet loses all of its energy in the chamber and drops into a collection system. The use of water and synthetic oil contains the lead particulates and dust, and minimizes friction on the plates.	Usage for indoor and outdoor ranges. Can also be provided with a conveyance system that drops the bullet to a single collection point (e.g., 55-gallon drum) for recycling. Low-maintenance system

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Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Stapp EBC, Incorporated (703) 239-9223 Contact: Matt Ciskowski, P.E. 8101 Ox Road Fairfax Station, VA 22039 Fax: (703) 239-9224 bulletcatcher.com	STAPP Bullet Catcher	Varies by specific design (measured by square foot)	Purchase of Equipment Installation Delivery (Freight)		Pistol & Rifle (best for calibers up to 12mm) Can handle jacketed rounds and tracers	The STAPP bullet catcher (consisting of a bottom rubber liner, drainpipe reservoir, rubber granule fill, and cover layer of rubber) collects lead and any infiltrating water without runoff. The system is constructed over an earthen berm and can be modified to any range configuration. Projectiles are completely collected by the bullet catcher with minimal fragmentation. The surrounding structure is ricochet-proof even under the most extreme temperatures.	Designs are site adapted. Reclamation can be performed by Stapp EBC or by range personnel. Email: mciskowski-trc@verizon.net

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Bullet Trap Manufacturers Con't.¹

Bullet Trap Manufacturer	Designs Available	Estimated Cost of Trap	Price Includes	Not Included in Price	Usage of Trap	Description	General Comments
Super Trap Inc. (951) 736-9440 Contact: Art Fransen, Retired, L.A.S.D. 1601 Commerce St Corona, CA 92880 Fax: (951)736-9450 Email: info@supertrap.com supertrap.com	Gel-Cor™ Class A, Fire-Rated Rubber Bullet Traps ELIXIR™ Tactical Shooting Ranges Super Trap® Range Backstops SACON® Perimeter Facilities, Walls, Blocks & Tiles	Approx \$520 to \$1,600 per linear foot Varies by design, including: - indoor - outdoor - foundation - width of trap	Purchase of Equipment Installation Training	Shipping (Price will depend on destination)	Rifle & Pistol (up to and including .50 cal) Machine Gun Armor Piercing Tracer & Incendiary Ammunition <i>Also:</i> Frangible & Tungsten Traditional & Tactical Shooting	STI specializes in tactical shooting ranges. The firing range system captures and contains bullets whole, using a treated, granular ballistic media of recycled pure SBR (styrene-butadiene rubber), free of all steel and fiber contaminants that could normally allow fires to ignite. The infrastructure is 10 gauge galvanized steel and the hopper/deflection baffle is 3/8" AR 500 steel rifle rated (indoor and outdoor.) Outdoor Ranges: The backstop base typically lies on a graded berm at the appropriate angle determined by the user and STI staff. SACON® can absorb bullets and prevent lead contamination, replacing railroad ties, logs, brick walls and concrete enclosures on firing ranges.	STI's bullet trap systems eliminates hazardous materials contamination (TCLP tests below 1ppm), in addition to preventing ricochets and lead splash-back. Reclamation is recommended after approximately 100,000 to 130,000 rounds per 4 ft lane, based on type of shooter position and layout of targety (static vs. dynamic.) Lead reclamation is performed using a vacuum air density separator system and rubber media is continuously reused. Use of recycled rubber media in the trap may qualify the range improvement for grant funding. Contact regional recycling associations for more information. STI offers more than six versions of Tactical Shooting Ranges, as well as custom built traps.

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