



August 17, 2012

Sergeant Max Miller  
FOP Lodge #2  
P.O Box 272  
Lawrence, KS 66044

[mmiller@lkpd.org](mailto:mmiller@lkpd.org)

**RE: PROPOSAL: LEAD RECLAMATION AND ENVIRONMENTAL MAINTENANCE  
FRATERNAL ORDER OF POLICE (FOP) LODGE #2 RANGE IN LAWRENCE COUNTY, KS**

Dear Sergeant Miller:

MT2, LLC (MT2) is pleased to present this proposal for lead reclamation as part of environmental maintenance Fraternal Order of Police Lodge #2 Pistol/Rifle Range located at 768 East 661 Diagonal Road in Lawrence, Kansas.

MT2's project objectives are to support the FOP Lodge #2 (Range) in mitigating potential physical, occupational, and environmental hazards associated with high concentrations of lead in the backstop berms at the range; as well as achieving compliance with US EPA, Kansas Department of Health and Environment, and NRA recommended firing range environmental Best Management Practices (BMPs).

MT2 has reviewed a range checklist and photos provided by you as well as aerial images of the site. In August 2012, an MT2 range engineer visited the site to observe site conditions. These data have been evaluated and MT2 is presenting this fixed price proposal for lead reclamation and environmental maintenance services at the pistol/rifle range including excavation and removal (via screening) of the lead bullets and bullet fragments from the backstop berm and range floor soils, recycling of recovered lead, and re-installing soils back onto the firing range berms and floor to allow for continued use. The value of the recycled lead will be provided to the Range as an off-set to project costs. In addition, MT2 can impart optional range improvements and services such as:

- Chemically treat the lead fines remaining in the screened soil with ECOBOND® to significantly reduce the leachability of lead (Pb) into surface soils per US EPA BMPs before replacing screened soils to the range at a minimal price that can be paid using proceeds from lead recycling.
- Remove soil around the target stand area and construct a 2 tier timber knee wall to protect target stands from potential damage,
- Install Range-provided sand to the bullet impact zone of re-constructed backstop berm
- Purchase and install rock-containing "socks" to function as a check dam for drainage control
- Complete an Environmental Stewardship Plan (ESP) for the range to support future range management and ensure compliance with US EPA BMPs.



In general, MT2's proposal is based on:

1. MT2's widely recognized experience as the nation's leader in executing firing range environmental cleanup and maintenance projects for over 600 ranges nationwide.
2. Proven regulatory acceptance by the US Environmental Protection Agency (EPA) and state regulators in over 47 states.
3. Technological superiority of the ECOBOND® technology, physically separating lead and recycling over 10,000,000 pounds of lead and treating over 10,000,000 tons of soil to chemically convert the lead fines into stable, virtually permanent and environmentally safe new compounds.
4. Typical 30% to 50% cost savings over traditional approaches utilizing Fixed Unit Pricing, thus saving clients over \$100 million dollars.

MT2 has recent extensive and directly relevant experience for customer's including the lead remediation and firing range maintenance for the **New York City Police Department** at the Rodman's Neck training facility (estimated 40,000 officers/recruits visit twice a year) and over 50 other law enforcement ranges. Additional satisfied customers include the following.

- Numerous law enforcement agencies representing cities, counties, and states across the nation
- Private clubs nationwide including Colorado Clays, Phoenix Trap & Skeet, Cooper Nuclear, and Sun Valley Gun Club
- All service branches of the U.S. Department of Defense, multiple Army Corps of Engineers Districts, US EPA and various agencies such as the Pennsylvania Game Commission
- Fortune 500 Companies and leading environmental engineering/construction companies

**Our two-fold approach to limiting project** risk includes our MT2 personnel who are highly credentialed and experienced; and MT2's ECOBOND® products and service lines that are proven effective through extensive use. This allows MT2 to provide a guarantee for soils we treat. Additionally, MT2 is backed by **Pollution Liability Insurance** to provide customers, site owners, and others the best available "peace of mind" in dealing with environmental liabilities of reclamation. MT2 offers a **Guaranteed Solution** at a **Guaranteed Price** leading to cost-effective and sound firing range maintenance.

Please contact me at (888) 435-6645 to or at [jbarthel@mt2.com](mailto:jbarthel@mt2.com) to discuss this proposal in further detail.

Sincerely Yours,

James M. Barthel  
President and CEO



# MT2

**Bullet Proof Your Environment!**

## **Proposal**

**Lead Reclamation and  
Environmental Maintenance**

*Prepared for:*

**Fraternal Order of Police (FOP) Lodge #2  
Firing Range**

*Prepared by:*

**MT2, LLC**

**14045 W 66th Ave; Arvada, CO 80004**

**www.mt2.com**

**888-435-6645**

*August 17, 2012*

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MT2, LLC (Metals Treatment Technologies) has prepared this Proposal to address the specific requirements of the project referenced within this Proposal and contains proprietary and confidential information. This Proposal is the sole property of MT2 and must be returned upon demand. By accepting this Proposal, the recipient agrees to keep confidential the information and concepts contained herein or made in connection with any further investigation of the Company. Any disclosure, copying, distribution or use of the contents of this Proposal for other than the above stated purpose is prohibited. By accepting this Proposal the recipient agrees not to disclose copy, distribute or use this information for other than its intended purpose, as stated above, in whole or in part without the prior written consent of MT2.

## **Table of Contents**

I.	OVERVIEW / PROJECT DESCRIPTION .....	1
	SITE DESCRIPTION.....	1
II.	RECOMMENDED TECHNICAL APPROACH.....	3
	Step 1 – Mobilization for Range Maintenance.....	3
	Step 2 – Excavation and Screening.....	3
	Step 3 – Optional Guaranteed ECOBOND® Treatment.....	4
	PROJECT SCHEDULE .....	5
III.	FIXED PRICING.....	6
IV.	MT2 FIRING RANGE/LEAD MAINTENANCE EXPERIENCE.....	7
V.	OVERVIEW OF ECOBOND® TECHNOLOGY .....	11

## I. OVERVIEW / PROJECT DESCRIPTION

The project objective is to support the FOP Lodge#2 in achieving compliance with US EPA firing range Best Management Practices (BMPs) for Lead at Outdoor Shooting Ranges. Lead reclamation and environmental maintenance efforts will focus on the pistol/rifle range. MT2 proposes to remove (via screening) the lead bullet fragments from the backstop berm and range floor soils, recycle recovered lead, and re-install soils back onto the firing range berms to allow for continued use.

As optional services and if requested, MT2 will provide the following as range improvements:

- Chemically treat the lead fines remaining in the screened soil with ECOBOND® to significantly reduce the leachability of lead (Pb) into surface soils per US EPA BMPs before replacing screened soils to the Ranges.
- Install Range-provided sand to the bullet impact zone of re-constructed backstop berm
- Remove soil around the target stand area and construct a 2 tier timber knee wall to protect target stands from potential damage,
- Purchase and install rock-containing “socks” to function as a check dam for drainage control
- Complete an Environmental Stewardship Plan (ESP) for the range to support future range management and ensure compliance with US EPA BMPs.

## SITE DESCRIPTION

The focus of lead recovery and range environmental maintenance activities will be the Pistol/Rifle Range backstop, apron area and range floor that are reported to have been used since the 1970's. Records indicate that this range has not been subject to lead removal. Using information reported by the range managers, it is estimated that as much as 4-7 tons of lead (depending on the mix of ammunition used) may have been discharged at the Pistol/Rifle Range over the last 40 years.

Range/Berm	Height (ft)	Width (ft)	Depth (ave. ft bgs)	Est. Soil Volume (cyds)
Pistol/Rifle Range Backstop Berm Impact Zone	15	60	2.0	67
Pistol/Rifle Range Backstop Berm Apron Area (behind targets & in front of impact zone)	12' by 60'		0.5	13
Pistol/Rifle Range Floor Shooting Position (Scrape)	75' by 60'		0.2	33
			Total	113

The following site map illustrates the location of the ranges at the facility.

**Facility Map: FOP Lodge #2 Pistol/Rifle Range, Lawrence, Kansas**



## II. RECOMMENDED TECHNICAL APPROACH

This technical approach will: remove lead-impacted soil from the backstop berm impact zones, range floors between the target stands and impact zones, and range floor at the pistol/rifle range. MT2 will recover the lead fragments by screening the soils, processing them through our proprietary equipment, and return processed soils to the range berm. As an option, MT2 will treat the remaining soil and lead fines with ECOBOND® Pb stabilization reagent per EPA guidelines prior to returning the screened soils to the impact berm. ECOBOND® treatment allows for a virtually permanent long-term solution to reducing lead leachability that is superior to approaches that only temporarily adjust the soil pH such as lime. In addition, MT2 will provide optional services to impart range improvements and/or develop an Environmental Stewardship Plan (ESP) as recommended by the USEPA BMPs.

### ***Step 1 – Mobilization for Range Maintenance***

The major work tasks to accomplish range maintenance are as follows:

- Mobilization, Site Set-Up and Preparation:

Upon agreement to proceed, MT2 will mobilize to the firing range site.

- Mobilization activities will include personnel and equipment mobilization, work plan and Health and Safety Plan preparation;
- Site walk-over with a Range representative to determine areas of excavation and processing;
- Establishing temporary access, site access control, traffic control, and placing appropriate signage;
- Installing storm water management and soil erosion control measures, if required;

**Services provided by others include:**

- Obtaining all necessary permits (with the support of MT2);

### ***Step 2 – Excavation and Screening***

MT2 will excavate from 0.5 to 2.0 feet of soil from the different areas described above; or deeper if concentrations of bullets appear economically feasible to recover at deeper depths. Bullets and bullet fragments in the soils will be screened and containerized to achieve approximately 80%-95% removal of lead fragments using appropriately sized, “dry screening” equipment. The remaining excavated materials will be screened to remove oversized materials and debris. These materials and the screened fine sands may be treated as an option, to reduce lead leachability as described below prior to being returned to their origin. Water may be added to achieve lead dust control and to support treatment (Task 3 below).



Removed metal fragments and shooting related materials will be staged securely in a location and recycled. MT2 will coordinate and ship the containerized recovered lead to a licensed lead recycler, providing the Range with the transport documentation and evidence of recycling. The full value of the recycled lead minus the cost for containers, pallets and transportation will be returned to the range as an off-set to project costs.

**Step 3 – Optional Guaranteed ECOBOND® Treatment**

If requested, MT2 will apply ECOBOND® to the screened soils containing the lead fines, which can be highly leachable and potentially harmful to the environment. Application of a lead stabilization reagent such as ECOBOND® to firing range soils is a Best management Practice (BMP) for range soils as identified in the US EPA Best Management Practices at Outdoor Shooting Ranges (USE EPA 2005).

MT2 maintains a broad portfolio of patented and proprietary chemical metals stabilization processes; known as ECOBOND® that provide permanent stabilization of all heavy metals including lead. The resulting treated soils contain extremely stable metal compounds that virtually eliminate the leaching of metals to the environment. The strength and effectiveness of the stabilization has been verified using the EPA's TCLP test parameters and Multiple Extraction Procedure (MEP) tests as presented in the attached ECOBOND® Overview.

ECOBOND® is a dry, granular, nonhazardous product that has been approved and accepted by the US EPA and Kansas Department of Health and Environment. It will be applied at a small rate not to exceed 2-3% by weight based on MT2 experience at similar ranges and will not change the physical characteristics of the soil. Prior to soil mixing, MT2 may moisten the soil as necessary, to minimize dusting caused by mixing activities and support subsequent soil treatment.

Treatment criteria will be achieved to ensure returned soils are less than the EPA Resource Conservation and Recovery Act (RCRA) hazardous lead Toxicity Characteristic Leaching Procedure (TCLP) of 5.0 mg/L which will also reduce the potential for lead infiltration to groundwater as measured by SPLP.

Following a 12–24 hour post-treatment curing period, MT2 will take a five point composite sample from treated soil. Samples will be sent to a certified laboratory for lead TCLP analysis. Should sample results indicate a failure to achieve RCRA 5.0 mg/L standard based on composite sample results, MT2 will retreat the soil at no additional cost. TCLP results for treated soils will be provided to the range for review prior to return of the successfully treated soils to the backstop berms and results included in the range maintenance report or the optional Environmental Stewardship Plan (ESP) issued at the completion of the project.

**Step 4 – Range Restoration and Optional Range Improvements**

MT2 will utilize construction equipment to replace soils to their berm of origin and rough grade these materials to conform with the original configuration of the range. As an optional service, MT2 can place materials such as ballistic sand provided by the Range to approximate the original berm configuration and enhance future lead reclamation as well as:

- Remove soil around the target stand area and construct a 2 tier timber knee wall in to protect target stands from potential damage,
- Purchase and install rock-containing “socks” to function as a check dam for erosion/drainage control

**MT2 ECOBOND® ADVANTAGE**

**Lower Cost:** Typically 30%-50% lower cost

**Reduction of Environmental Liability:** Significantly reduces potential of long-term liabilities

**Proven Technology:** Technology previously approved by EPA and state regulators with guaranteed, field validated reliability

**Best Available Technology:** Permanent and irreversible chemical process, strength and durability to 1,000 years verified by EPA approved testing



Upon completion of lead reclamation and Environmental Maintenance tasks, MT2 will perform general site cleanup, but no reseeding or other upgrades have been incorporated into this proposal. Prior to final payment, MT2 will develop a range maintenance report to provide the Range with proper record keeping as recommended by the US EPA and NRA.

**Optional Environmental Stewardship Plan (ESP):** As an optional service MT2 can develop an Environmental Stewardship Plan (ESP) to summarize range conditions and provide BMP recommendations pertaining to range maintenance and operations. This plan will assist the facility in ensuring compliance with EPA and State of Kansas regulations, as well as shooting range BMPs over the life cycle of the range. It can be completed independently of berm maintenance services proposed above or performed in conjunction with either option.

### **PROJECT SCHEDULE**

The estimated baseline schedule is approximately one (1) week to perform lead reclamation and screening. An additional three (3) days may be required to complete optional ECOBOND® treatment and optional range improvements. As indicated above, the project schedule depends on “dry” conditions prior to and during on-site operations. MT2 will coordinate a mutually-agreed upon schedule with the range and mobilize within two weeks after receipt of “Notice to Proceed” issued by client. MT2 is presently anticipating arrival at the site in the late fall of 2012.

### III. FIXED PRICING

MT2 has evaluated lead content and range conditions at the FOP Lode#2 Range during a site visit on August 10, 2012 developed a fixed price for lead reclamation and environmental maintenance services.

Results of MT2's assessment indicate that sufficient lead exists to pursue lead reclamation and recycling and provide the revenue from recycling to the Range as an off-set to project costs. The following is MT2's pricing for the various lead reclamation and Environmental maintenance at the range.

Lead Recovery and Range Maintenance Task	Quantity	Unit	Total Price
1. <b>Pistol Rifle Range</b> - Mobilization, Lead Recovery, Lead Recycling <sup>1/</sup> , Replacement of Screened Soil to Berms, Demobilization	Up to 115 CYDS	Lump Sum	\$27,000 <sup>2/</sup>
2. <b>Option: Guaranteed ECOBOND® Treatment</b> of screened soils to less than 5.0 mg/L TCLP	Estimated 115 CYDS	LS	\$2,200 <sup>3/</sup>
3. <b>Option: Berm Improvement</b> - installation of Range -provided sand on berm faces	60 cyds	\$8/cyd	\$480 <sup>3/</sup>
4. <b>Option: Purchase and Install 2-tier Timber Knee Wall (120 LF of timbers)</b>	1	LS	\$ 4,500 <sup>3/</sup>
5. <b>Option: Purchase and Install Rock Socks for Erosion/Drainage Control</b>	1	LS	\$ 1,400 <sup>3/</sup>
6. <b>Option: Environmental Stewardship Plan (ESP)</b>	1	Lump Sum	\$3,500 <sup>3/</sup>

<sup>1/</sup> MT2 does not guarantee the value or quantities of recycled lead. MT2 will provide the Range 100% of the value of lead recycling minus the cost of containers, pallets, transport and applicable taxes to be used to off-set project costs. It has been conservatively estimated that as much as 4-8 tons of lead may be recovered at the Pistol/Rifle Range and based on current range lead recycling values, the lead recycling credit to the Range may range from \$2,500 to \$5,000.

<sup>3/</sup> Can be paid to MT2 from the Range's share of recycling proceeds and price is valid if completed at the time of lead reclamation.



## IV. MT2 FIRING RANGE/LEAD MAINTENANCE EXPERIENCE

### NYPD Firing Range

### Lead Recovery & Contaminated Soil Remediation

**Client:** New York City Police Department

**Location:** Rodman's Neck, Bronx, New York

**Date:** 2002 - ongoing

The City of New York contacted MT2 to implement a multi-year Operations and Maintenance Plan at the New York Police Department (NYPD) outdoor firing range located at Rodman's Neck in the Bronx. The range consists of one continuous two-tiered earthen berm, which is approximately 1,200' x 40'. The berm is separated into six ranges by a series of "fingers" approximately 20 feet high. Over 40,000 officers and recruits train at this range annually.



MT2 performed on-site services demonstrating the ability to perform lead recovery and ECOBOND® technology treatment of lead contaminated soil to background levels to enable re-use of soil on-site; thus providing substantial cost savings. Following the onsite demonstration, MT2 implemented a maintenance program that includes recovery of lead bullets and bullet fragments from impact areas; sampling, analysis and monitoring soil and groundwater conditions; recycling recovered lead; and chemically converting potential leachable lead fines remaining in the soils utilizing MT2's patented ECOBOND® technologies such that the resulting soils are considered non-hazardous and can be replaced back onto berms. **To date, MT2 has recovered approximately 500,000 pounds of lead.** MT2 successfully and safely completed the following work activities:

- Screened berm materials through a multi-tiered screening device to separate debris, gravel rock and bullet fragments
- Performed lead treatment utilizing ECOBOND® treatment to the following treatment criteria:
  - TCLP USEPA Method 1311 to < 5.0 mg/l
  - Multiple Extraction Procedure USEPA Method 1311 to < 5.0 mg/l
  - SPLP USEPA Method 1312/6010 to < 0.172 ppm
  - pH of soil ranges between of 6.0 and 9.0
- Recovered lead bullet fragments for recycling
- Reconstructed firing range for re-use by NYPD
- Annual and bi-annual soil and groundwater sampling to ensure compliance with Best Management Practices
- Expediting schedule to meet City's firearms training program

#### KEY DATA

**Problem:** Lead contaminated soil including bullet fragments at the site were above RCRA TCLP concentrations and would require expensive disposal to maintain the firing range

**Remedy and Result:** MT2 conducted excavation, physical screening of bullet fragments, ECOBOND® treatment, recycling of lead fragments and re-use of soil on-site

**Contract Value:** \$2,500,000

#### ADVANTAGES

- MT2 technical services and ECOBOND® technologies provided a savings of over \$500,000 as compared to alternative methods
- All soils were reduced from potentially hazardous waste with lead concentrations as high as 837 mg/l to less than 1.0 mg/l by utilizing ECOBOND® technology
- ECOBOND® technology allowed for soils to remain on-site for re-use

**Dallas Police Dept Training Center Ranges Maintenance and Lead Recovery; Dallas, TX:**

MT2 was contracted by the Dallas Police Department to provide range maintenance and lead recovery activities. The project objective was to support the Department in achieving US EPA recommended compliance with established firing range environmental Best Management Practices (BMP) at the Dallas Police Firearms Training Center Main Rifle Range and Main Pistol Ranges. The Main Rifle Range consists of 15 firing lanes while the Main Pistol Range consists of 50 lanes. Use at each range is estimated at approximately 8,000 users per year. Range maintenance included environmental maintenance and lead recovery at the Main Rifle and Main Pistol Ranges at the Center. MT2 performed an initial Environmental Site Inspection (ESI); prepared an Environmental Stewardship Plan (ESP); performed environmental lead maintenance activities in compliance with the ESP including removal (via screening) of lead bullets/bullet fragments from the soil, ECOBOND® chemical treatment of lead fines remaining in the screened soil to significantly reduce the potential leachability of lead into surface and ground water, and re-installation of soils back onto the firing range berms to allow for continued use. MT2 recovered approximately 135,000 lbs of lead for recycling.



**North Las Vegas Police Department Firing Range Remediation – North Las Vegas, NV:**

The City of North Las Vegas contracted MT2 to support the City in providing Environmental Stewardship Management over five year period beginning in 2009. MT2 prepared a site-specific Environmental Stewardship Plan to document current range conditions and provide written guidance for planning, implementing, monitoring, and documenting the progress of environmental management at the range. One aspect of this program was to extract lead that had been deposited in the soil at the range, prevent further lead deposits from accumulating in soils, and to make future lead recycling easier with improvements of the bullet collection system. Lead removal was performed to mitigate potential ricochet and “splash back” hazards to ensure the safety of officers training at the range and to protect the environment by preventing lead from leaving the range. To date, MT2 has recovered approximately 40,000 lbs of lead for recycling. MT2 performed on-site services demonstrating the ability to perform lead recovery and ECOBOND® technology treatment of lead contaminated soil to background levels to enable re-use of soil on-site; thus providing substantial cost savings. All site work was performed to meet strict dust control requirements.



**Southern Arizona Law Enforcement Training Academy Firing Range Operations and Maintenance with Metals**

**Reclamation – Tucson, AZ:** MT2 was contracted to provide outdoor firing range operations, maintenance and metals reclamation. MT2’s project tasks included: The SOW tasks for this project included: Range Lead Assessment and delineation of lead-impacted soils; Excavation of lead-impacted range soils; Physical separation of lead bullet fragments from range soils, employing measures to meet Pima County Air Quality/Fugitive Dust Control requirements; Recycling of recovered lead; ECOBOND® treatment to reduce the leachability of lead fines in soils and sediments to levels below US EPA RCRA non-hazardous criteria; Reuse of soil meeting design criteria in backstops where possible; Site restoration with improvements to the range configuration to enhance future lead recovery and recycling and provide further environmental protection and shooter safety including the reuse of chemically stabilized soils, purchase and installation of ballistic sand/material on backstop and berm faces and purchase and installation of erosion control matting; Off-site disposal of stabilized waste soil that cannot be reused on site; Final Reporting; and Completion of a Range Environmental Stewardship Plan (ESP).



**San Bernardino County Sheriff’s Dept. Firing Range Maintenance and Lead Recovery – San Bernardino, CA:**

MT2 was contracted by the San Bernardino County Sheriff’s Department to provide outdoor firing range lead maintenance activities for the Fire Arms Training Range. The Department required maintenance to remove bullet and bullet fragments in order to improve shooter safety and environmental conditions at the range. The facility consists of three pistol ranges, a long rifle range and a two-position trap and skeet range. Based on usage records, 60 Agencies have utilized the facility and shoot an estimated one million rounds a year, plus an estimated 150,000 to 200,000 shot gun rounds are fired a year at the trap and skeet range. MT2’s project objectives were to support the Department in mitigating potential physical, occupational, and environmental hazards associated with high concentrations of bullet fragments in the action pistol pits soils/berms; as well as achieving compliance with US EPA and NRA recommended firing range environmental Best Management Practices (BMPs). MT2 range maintenance tasks included 1) Excavation of impacted backstop berms and removal (via screening) bullets and bullet fragments from soil; 2) Recycling of recovered bullets and bullet fragments; 3) Re-installation of processed soils onto a firing range berm to allow for continued use; and 4) Shot recovery and recycling.



**Colorado Dept. of Corrections Training Range Lead Recovery and Contaminated Soil Remediation – Canñon City, CO:**

The Colorado Department of Corrections selected MT2 to perform lead recovery and lead contaminated soil remediation. The Colorado State Penitentiary Training Range, located in Canñon City Colorado, consists of three ranges that required lead maintenance. The range consists of one continuous two-tiered earthen berm, which is approximately 1,200' x 40'. The berm is separated into six ranges by a series of "fingers" approximately 20 feet high. MT2 conducted on-site services demonstrating the ability to perform lead recovery and ECOBOND® technology treatment of lead contaminated soil to background levels to enable re-use of soil on-site; thus providing substantial cost savings.



**Concord Police Association Firing Range Lead Recovery and Maintenance; Concord, CA** – MT2 was contracted by the Concord Police Association to perform environmental lead recovery, monitoring, and maintenance activities at the police academy range. MT2's project objectives were to support the Academy in improving shooter safety and in mitigating potential physical, occupational, and environmental hazards associated with high concentrations of lead in the range soils/berms at the Association's firing range; as well as achieving compliance with USEPA and NRA recommended firing



range environmental Best Management Practices (BMPs). All lead management activities were performed to EPA Firing Range Best Management Practices guidelines and applicable state of California regulations. MT2 excavated, screened and processed approximately 125 cyds of berm materials. Recovered bullets and bullet fragments were treated to below RCRA TCLP standard, manifested and disposed of off-site as special waste at a regulated landfill. The range consists of 20 shooting lanes within the 50-yard pistol range and the 150-yard range used for rifle training. Range maintenance included

1) Excavation of the backstop berm to remove (via screening) bullets and bullet fragments from soil; 2) Recycling of recovered bullets and bullet fragments; and 3) Re-installation of soils onto the firing range berm to allow for continued use.

**Wichita Falls Range Remediation – Wichita Falls, TX:** MT2 was contracted by the City of Wichita Falls to support the upgrade of their range. This included dismantling and recycling of the previous range systems, firing range lead recovery and maintenance, and ECOBOND® stabilization treatment of lead contaminated soils at the City's outdoor firing range located at State Highway 240 in Wichita Falls. MT2 provided lead remediation to standards acceptable for future improvement and expansion or range facilities. MT2's patented ECOBOND® treatment technology allowed the soil to be treated in-place thus providing cost savings of \$50,000. Treated soils were re-utilized in the upgrade of the range providing additional significant client savings.

## V. OVERVIEW OF ECOBOND® TECHNOLOGY

MT2 maintains a broad portfolio of patented and proprietary chemical metals stabilization processes; known as ECOBOND® that provide permanent stabilization of all heavy metals. The MT2 processes are previously approved by the US EPA and are non-hazardous. The resulting treated soils contain extremely stable metal compounds that virtually eliminate the leaching of metals to the environment. The strength and effectiveness of the stabilization has been verified using the EPA's TCLP test parameters and Multiple Extraction Procedure (MEP) tests.

Advantages of ECOBOND® chemical stabilization also include its robust capability and ease of application. The technology can be applied in a wet or dry form and can be used to stabilize metals in-situ or ex-situ. These varied applications make it ideal for use at a wide range of metals contaminated sites. At some sites the technology can be surface applied and mixed into soil in its dry form. At other sites the technology can be sprayed in its wet form onto the contaminated material in a topical fashion. In addition to the technical and application advantages, the cost of utilizing chemical stabilization to treat heavy metals contamination is attractive. By being able to treat metals contamination to EPA RCRA or Universal Treatment Standards (UTS), stabilized waste can often be left on-site rather than transported off-site to a hazardous landfill. The disposal cost savings for stabilized metals can often be measured in the hundreds of dollars per ton.

### MT2 ECOBOND® ADVANTAGE

**Lower Cost:** Typically 30%-50% lower cost

**Reduction of Environmental Liability:** Significantly reduces potential of long-term liabilities

**Proven Technology:** Technology previously approved by EPA and state regulators with guaranteed, field validated reliability

**Best Available Technology:** Permanent and irreversible chemical process, strength and durability to 1,000 years verified by EPA approved testing

**Table 1 MT2 Metals Treatment Results (TCLP)**

Waste Stream	Metals	Pre Treatment	Post-Treatment	Regulatory Standards	
		TCLP (ppm)	TCLP (ppm)	RCRA (ppm)	UTS (ppm)
Mill Tailing	As	2,200.0	1.030	5.0	5.000
Sludge	Cd	160.0	0.100	1.0	0.110
Mill Tailing	Cr	14.0	<0.050	5.0	0.650
Industrial Site	Ba	249.0	0.030	100.0	210.0
Industrial Site	Pb	980.0	0.250	5.0	0.750
Firing Range	Pb	977.0	0.180	5.0	0.750
Mine Tailing	Zn	108.0	2.000	NA	4.300
Mill Tailing	Se	190.0	0.890	1.0	5.700
Chemical Waste	Hg	500.0	0.070	0.2	0.025

TCLP = Toxicity Chemical Leaching Procedure

**Table 2 MT2 Lead (Pb) Treatment Results (SPLP)**

Project Location	Metal	Pre Treatment	Post-Treatment	Regulatory	
		SPLP	SPLP	Standards	
		(mg/L)	(mg/L)	RCRA (ppm)	UTS (ppm)
Florida Soils/Sediment					
Sample 1	Pb	0.17	0.0140	5.0	0.750
Sample 2	Pb	0.11	BDL	5.0	0.750
Sample 3	Pb	4.70	0.0130	5.0	0.750
Massachusetts Inland Soils/Sediment					
Sample 1	Pb	3.30	0.0530	5.0	0.750
Sample 2	Pb	3.30	0.0550	5.0	0.750
Sample 3	Pb	3.30	0.1400	5.0	0.750
Utah Soils					
Sample 1	Pb	3.79	0.0800	5.0	0.750
Sample 2	Pb	2.17	0.0900	5.0	0.750
New York Soils/Sediments					
Sample 1	Pb	1,040	0.0184	5.0	0.750
Sample 2	Pb	1,090	0.0330	5.0	0.750
Sample 3	Pb	2,220	0.0104	5.0	0.750

SPLP = Synthetic Precipitate Leaching Procedure

Heavy metals contamination can be found associated with spent battery recycling sites, electroplating facilities, process sludge, military sites, firing ranges, brownfields redevelopment, lead based paint coated buildings and structures, and associated with mining activities. Our services and technologies have been applied to project work for the following types of commercial, industrial and government clients:

Commercial and Industry Applications: mining and smelting operations, battery recycle and disposal sites, military and private firing ranges, brownfields/real estate development, process wastes and sludge, and electric arc steel manufactures.

Government Agencies and Programs: Environmental Protection Agency, Department of Energy, Department of Defense, Bureau of Reclamation, U.S. Army Corps of Engineers and State Environmental and Health Agencies.

MT2's ECOBOND® process utilizes a combination of proprietary materials that are nature's best stabilizers of leachable metals. ECOBOND® compounds have extremely low Ksp (solubility potential) values indicating that it is virtually impossible to dissolve these metal complexes (Table 3). This technique has been used to stabilize heavy metals for a number of years and have proven superior to cementation and other methods that rely on increasing the alkalinity of the matrix to immobilize the metals. Unlike many stabilizing compounds, the MT2's reagents bond directly with metals and are not subject to long-term pH related deterioration.

**Table 3 - Ksp (Solubility Potential) of Various Lead-Phosphate Minerals**

Lead Species / Mineral Name	Formula	Log Ksp
Salt	NaCl	0.0*
Quartz	SiO <sub>2</sub>	-4.0
Anglesite	PbSO <sub>4</sub>	-7.7
Cerussite	PbCO <sub>3</sub>	-12.8
Galena	PbS	-27.5
Fluoropyromorphite	Pb <sub>5</sub> (PO <sub>4</sub> ) <sub>3</sub> F	-71.6
Hydroxypyromorphite	Pb <sub>3</sub> (PO <sub>4</sub> ) <sub>3</sub> OH	-76.8
Plumbogummite	PbAl <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> (OH) <sub>5</sub> H <sub>2</sub> O	-99.3
Corkite	PbFe <sub>3</sub> (PO <sub>4</sub> )(SO <sub>4</sub> )(OH) <sub>6</sub>	-112.6

*\*For comparison purposes*

The EPA's TCLP is one measure of the long-term stability of a treated waste because it simulates the leaching effect of water or acid that may come into contact with stabilized metals. To simulate a longer period of environmental exposure, the Multiple Extraction Procedure (MEP) test has been developed. The MEP test consists of multiple acid extractions and pH adjustments that are similar to the TCLP test. However, different leachates are used for each of ten separate extractions. It is estimated that each TCLP extraction simulates 100 years of stability and after ten MEP extractions, 1,000 years of metals stability are simulated. The durability of similar treated materials has been tested by numerous MEP tests and has been evaluated in the EPA's Superfund Innovative Technology Evaluation (SITE) program. The MEP test is just one of the tests that have been conducted to establish the long-term stability of chemically stabilized waste. See Table 4.

**Table 4 - Example of Treatment Results using MEP Testing of MT2 Stabilized Lead Contaminated Soil**

	Crookville Lead Superfund Site	Crookville Lead Superfund Site	Lead Paint Sand Blast Grit	Lead Paint Sand Blast Grit	Lead Paint Sand Blast Grit
Pre Treatment Lead TCLP	32	980	26	34	49
MEP Extraction Post Treatment					
#1 – 100 years	0.08	<0.05	<0.05	<0.05	<0.05
#2 – 200 years	0.14	0.13	<0.05	<0.05	<0.05
#3 – 300 years	0.21	0.05	<0.05	<0.05	<0.05
#4 – 400 years	0.13	0.06	0.13	0.23	0.08
#5 – 500 years	0.14	0.08	0.31	0.12	0.07
#6 – 600 years	<0.05	0.15	0.15	0.06	0.06
#7 – 700 years	0.16	<0.05	0.19	0.03	0.04
#8 – 800 years	0.25	0.18	0.19	0.05	0.06
#9 – 900 years	0.26	0.53	0.18	0.06	<0.05
#10–1,000 years	0.23	0.33	0.14	<0.05	<0.05
<b>Average MEP Extraction</b>	<b>0.165</b>	<b>0.161</b>	<b>0.14</b>	<b>0.075</b>	<b>0.056</b>



In summary, MT2's proprietary ECOBOND® technology has previously been approved by the U.S. Environmental Protection Agency as well as state regulators. ECOBOND® provides an advanced in situ and ex situ treatment for a wide variety of metals utilizing innovative methods with standard equipment, converting RCRA hazardous waste into non-hazardous material. MT2's state-of-the-art technologies and experienced personnel provide clients with technical and field services producing substantial cost savings. MT2's ECOBOND® technologies are broadly applicable for chemical conversion and stabilization for:

- Soils, Silts and Sediments
- Process Waste and Sludges
- Firing Ranges/Shooting Ranges
- Lead Paint and Glass
- Mine/Smelter Sites
- Former Disposal Locations
- Brownfields Sites
- Battery Recycling Site

The advantages of ECOBOND® technologies and MT2 services include:

- Lower Cost: Typically 30%-50% lower cost than other alternatives
- Reduction of Environmental Liability: Significantly reduced potential of long-term liabilities through improved best management practices
- Eliminates Generation of Hazardous Wastes: No hazardous waste manifesting, substantial disposal cost reduction and reduced liability
- Proven Technology: Technology previously approved by EPA and state regulators in over seven (7) years of operations with guaranteed, field validated reliability
- Best Available Technology: Permanent and irreversible chemical process, strength and durability to 1,000 years verified by EPA approved testing.



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