DRAFT SUMMARY OF MINUTES OF APRIL 30, 1996 MEETING OF EPA AND REPRESENTATIVES OF LEAD RECOVERY FROM BATTERIES

April 30, 1996, 1:00 - 2:00 p.m.
2800 Crystal Station
Arlington, VA
2nd Floor, Conference Room B

ATTENDEES

Mary Cunningham, EPA/OSW/WTB
Michael Petruska, EPA/OSW/HWMMD
C. Pan Lee, EPA/OSW/HWMMD
Anita Cummings, EPA/OSW/WTB
Suzanne Wade, Versar (Notes-preparer)
Robert Steinwurzel, Swidler & Berlin/ABR
Susan Panzik, S&B
Jean Beaudoin, JCBGI/BCI
Jack Waggener, RCI
Charles M. West, RCI
Katie Champon, WBN

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Introduction

The purpose of this meeting was for EPA and representatives of lead recovery from batteries (Association of Battery Recyclers, Resource Consultants Inc., and Battery Council International) to discuss proposed treatment standards for lead characteristic wastes. Mary Cunningham opened the meeting by explaining the historical background for setting treatment standards under the Land Disposal Restrictions (LDR) Program. For listed waste codes, residuals carry the waste code forever, unless the waste is delisted. After treatment to the LDR levels, listed wastes may be placed in a Subtitle C landfill. For characteristic wastes, residuals are considered characteristic until they no longer exhibit the characteristic of hazardousness. For wastes treated by recovery of lead, residuals may be placed in a Subtitle D landfill if the lead concentration in the leachate is less than the TCLP limit. If this standard is not met, the characteristic waste could be disposed of in a Subtitle C landfill or undergo further treatment until it no longer exhibits the characteristic of hazardousness, at which time it could be placed in a Subtitle D landfill.

Discussion

The following questions, concerns, and issues were discussed:

1. Universe of wastes treated by recovery of lead

   EPA: What other types of wastes are treated with battery wastes? (Cunningham) What are the underlying hazardous constituents? Do the characteristics of the slag

remain the same (no substantial differences) when other wastes are added to the treatment process? (Petruska)

Ind.: Believes the main issue is slag (residuals). If other wastes are going into the blast furnace, are they also "treated" by "recovery of lead"? Feedstock includes Appendix 11 list constituents (lead materials from various industries). (Steinwurzel)

Conclusions: Based on limited information, EPA could state that the primary waste treated is lead and that other wastes do not appear to significally change the characterics of the slag. EPA could ask for public comment on this issue in the Notice of Data Availability (NODA).

2. Lead-contaminated soil and other non-smelter D008 wastes

Ind.: How is lead-contaminated soil to be managed? (Steinwurzel) How are other D008 wastes to be managed that don't go through smelters, such as remedial wastes, building debris, soil and debris. Industry has data on 7 sites for mobile, commercial excavation plus stabilization (pug mill or phosphate stabilization). It was stated that these wastes usually go to Subtitle D landfills after treatment or are capped in place. (Beaudoin)

EPA: In the Phase II Rule, all available data was evaluated when UTS was promulgated. Limited data and comments were received, so the Agency went forward with UTS based on the available data. It was the Agency's belief that existing stabilization processes (as evidenced by the data) are not optimized for the lower UTS levels, so these stabilizatiom data may not be reflective of actual capabilities. (Cunningham) EPA believes stabilization can achieve lower levels, but there is little supporting data. When the Phase II Notice was published, little feedback was received to suggest that characteristic lead wastes are substantially different from metal wastes in EPA's database and couldn't meet UTS. EPA's position with respect to characteristic soil is that it is substantially different from the metal wastes in EPA's database, so it is assigned case-by-case standards. (Cunningham)

Conclusion: EPA: If there is limited capacity, implementation of the rule for these metal-bearing waste streams could be deferred. Otherwise case-by-case standards could be allowed until the HWIR Media Rule is in place. Alternatively, a generic variance could be used. (Petruska)

Ind.: ABR would prefer to defer implementation and maintain the characteristic level of 5 ppm as the standard until HWIR goes into effect. Cleanup limits for Superfund sites include characteristic levels and site-specific standards (ARARs). It was noted that cleanup is usually under state supervision, so more stringent limits may be imposed. (Steinwurzel)

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3. Additional treatment of secondary lead

EPA: What types of treatments are used for secondary lead (after recovery of lead)? East Penn. runs their lead waste through a reverberator repeatedly until it is non-hazardous (i.e., passes TCLP test for characteristic metals). (Petruska)

Ind.: Usually stabilization or further HTMR is used for secondary lead treatment.

Conclusion: See ABR response above.

4. Capacity issues

EPA: Pan Lee is working on capacity issues. Large quantity remediation sites sometimes treat onsite for economic reasons. Mobile, commercial stabilization units are more commonly used. Regions 4 and 10 rejected soil washing as a viable option for most lead-contaminated soil because it only works reliably on sandy soil. Pan Lee noted that LDRs are not in effect if the treatment is in-situ, for example, if surface contamination is present, then chemicals can be plowed into the soil for treatment. It is believed that less than 10 percent of stabilization sites use insitu treatment. (Pan) For abandoned sites it is more economical to do (treatment) (~~stabilization~~) than (~~run the waste through furnace again~~ Send to incinerator) It may be feasible to run the waste through the furnace at RCRA corrective action sites, if there is an operational furnace present. (Petruska)

Ind.: Industry has data on 7 sites for mobile, commercial excavation plus stabilization (pug mill or phosphate stabilization). It was stated that these wastes usually go to Subtitle D landfills after treatment or are capped in place. (Beaudoin) Dozens of Superfund sites involved. Can get lower numbers than characteristic, but not to UTS. Smelters with RCRA Part B permits doing Corrective Action. LDR still applies to corrective action. (Steinwurzel)

Conclusion: Analysis needs to be completed to determine capacity. Not a problem for existing standard, but may be for UTS (see next issue).

5. Capacity of processes to treat below 5 ppm for lead

EPA: What is the capacity of stabilizers treating to below 5 ppm? Some can do it but not all. This could be capacity problem for treatment levels below 5 ppm for lead.

Ind.: Stabilization process is limited by chemical reactions. Not necessarily better to add more of everything. Must be tailored for each site. Some variability must always be expected. Approximately 3 ppm is probably the best consistent target. (West) Feedstock is variable also. (Beaudoin)

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Conclusion: There are probably no capacity problems unless the lead standard is changed to 0.37 ppm, then there could be some problems. The issue of whether to use a variance or an alternate plan is still under consideration.

6. Proposal for contingent management options

Ind.: The idea was introduced for an alternative LDR for generated lead if it can be proven that the lead does not leach. The industry would like to get away from the treatment emphasis on secondary lead and instead try a contingent management scenario like monofills instead of Subtitle C. (Steinwurtzel)

EPA: HWIR may be an appropriate rule to incorporate this type of idea. (Petruska)

Conclusion: See EPA response above.

7. Underlying hazardous constituents

Ind.: Would underlying hazardous constituents (UHC) have to meet BDAT levels? (Champon)

EPA: Flexibility is decreased by specifying treatment method, but then limits are not needed for other constituents. Treaters would only have to meet characteristic level.

Conclusion: See EPA response above.

Closing/Summary

The Notice of Data Availability is scheduled to go out next week. June 30 is the deadline for the rule. Industry does not plan to submit additional data. A videotape of the lead recovery process was provided to EPA.

DRAFT

TO: Stan Moore, Suzzane Wade

FROM: Stephen Schwartz

Appendix A-9

SUBJECT: Phone Calls to TSDs Who Stabilize D008 and Other TC-metal Hazardous Wastes

DATE: 13 May 96

At your request I contacted commercial Treatment, Storage, Disposal (TSD) facilities in EPA Regions 5 and 6 in order to determine if they perceived that there would be any problem to stabilize brass/bronze foundry TC-metal hazardous wastes to Universal Treatment Standard (UTS) levels. More specifically, I asked if they could use conventional stabilization technology to treat foundry sand-type D008 (TC for Lead), including the lead and all Underlying Hazardous Constituents (UHCs), to the UTS levels. Further, I requested any treatability data that the TSDs might have to support their contention that they could perform the required treatment. Attached is a list of the TSDs contacted. Also attached are the records of the telephone contacts, including the details of their telephone responses.

Nine TSDs were contacted, seven of which actually performed stabilization of TC-metal wastes, either on-site, or shipped to one of their facilities elsewhere in the country.

Of the two facilities that did not stabilize wastes, one is primarily a Deepwell disposer, and if they received such waste they would subcontract its treatment. The second of the two did not manage foundry-type wastes, or any other bulk solids, but mostly managed drummed waste.

In general, each of the seven facilities that performed the requested stabilization said that they manage foundry sand D008 wastes, or wastes that they believed were similar. Each said that they didn't believe that there were any significant problems in producing the necessary pozzolonic recipe to stabilize the waste in question to all applicable UTS levels, including the lead component. (Most seemed familiar with the UTS requirement for lead of 0.37 ppm TCLP, rather than the current D008 lead requirement of 5.0 ppm.) One facility said they do this type of stabilization to UTS levels routinely, and find no difficulty 90% of the time. (Initially they were only able to hit all UTS levels about 70% of the time, but have since improved.)

Post-it™ brand fax transmittal memo 7671	# of pages ▸ 10
To Mary Cunningham	From Stephen Schwartz
or Pam Lee	Co. VERSAR
Dept.	Phone #
Fax # 308-8604	Fax #

...., ADDRESS/PHONE OF FIRM: CHEM. WASTE MNGMNT 318/583-2169
7170 JOHN BRANNON RD.
CARLYSS, LA 70663

CONTACT PERSON: RENEÉ DILLION DATE: 10 MAY

1 - Do you receive non-wastewater wastes from brass/bronze foundries? Do you receive similar wastes? If similar, why are they similar?

Typical foundry waste contains fine sand particles contaminated with a few percent lead, zinc, copper.

YES, THEY RECEIVE BRASS/BRONZE FOUNDRY WASTES & SIMILAR WASTES

2 - If so, do you stabilize those wastes with pozzolonic-type stabilizing agents?

YES THEY STABILIZE W/ CEMENT/H_2O MIXTURES — EACH TAILORED TO THE CLIENT.

3 - If so, what typical mix of water/stabilizer/waste do you use?

SEE ABOVE (2)

4- To what TCLP levels are you able to stabilize the BDAT/TC metals? CAN WE HAVE DATA FOR UNTREATED/TREATED METAL CONSTITUENTS? THEY REACH TC & UTS LEVELS — & SHE BELIEVES THEY CAN MEET VHC LEVELS FOR ALL METALS, EVEN THE PRIMARY T.C. METAL. WON'T RELEASE DATA

5- Would you forsee problems in treating these wastes to TC/UTS levels?

SEE (4) ABOVE

--- Rollins Environmental Services (LA). Inc.
P.O. Box 73877
Baton Rouge, LA 70137 302/426-3164

CONTACT PERSON: Fred Gurdess → Richard. Grandfield Colorado 970/386-2293 DATE: 10 May '96

1 - Do you receive non-wastewater wastes from brass/bronze foundries? Do you receive similar wastes? If similar, why are they similar?
Typical foundry waste contains fine sand particles contaminated with a few percent lead, zinc, copper.

Other/Landfill foundry waste in Colorado.

Talked to Colorado — they do stab. Brass/Bronze Foundry wastes & other D008.

2 - If so, do you stabilize those wastes with pozzolonic-type stabilizing agents?
Yes use conventional pozzol. mixtures

3 - If so, what typical mix of water/stabilizer/waste do you use?
Various Recipes —— Not proprietary

4- To what TCLP levels are you able to stabilize the BDAT/TC metals? CAN WE HAVE DATA FOR UNTREATED/TREATED METAL CONSTITUENTS?
Can meet all metal UTS levels, even lead, typically lead is no problem. Won't release data

5- Would you foresee problems in treating these wastes to TC/UTS levels?
No problems —— He'll prove it if we send sample

NAME/ADDRESS/PHONE OF FIRM: ENVIROTEX CORP
16435 S. CENTRAL AVE.
HARVEY, IL 60426
708/596-7040

CONTACT PERSON: DAVID REYES DATE: 10 MAY 96

↳ He'll have someone call from York, PA

1 - Do you receive non-wastewater wastes from brass/bronze foundries? Do you receive similar wastes? If similar, why are they similar?
Typical foundry waste contains fine sand particles contaminated with a few percent lead, zinc, copper.
YES — GET SOME FOUNDRY WASTES.

2 - If so, do you stabilize those wastes with pozzolonic-type stabilizing agents? YES, BUT SOMEWHAT PROPRIETARY

3 - If so, what typical mix of water/stabilizer/waste do you use?
SEE (2) ABOVE

4- To what TCLP levels are you able to stabilize the BDAT/TC metals? CAN WE HAVE DATA FOR UNTREATED/TREATED METAL CONSTITUENTS? NO PROBLEM — GET TO REGULATORY LEVELS — NO DATA AVAIL.

5- Would you forsee problems in treating these wastes to TC/UTS levels?
SEE (4) ABOVE

[illegible]

[illegible], PHONE OF FIRM: AETS/Chem. Waste Mngmnt
W124 N9451 Boundary Rd.
Menomonee Falls, WI 53051 414/255-665.

CONTACT PERSON: Alan Koumtz DATE: 10 May/96

1 - Do you receive non-wastewater wastes from brass/bronze foundries? Do you receive similar wastes? If similar, why are they similar?

Typical foundry waste contains fine sand particles contaminated with a few percent lead, zinc, copper.

Yes they get brass foundry wastes

2 - If so, do you stabilize those wastes with pozzolonic-type stabilizing agents? Stabilize w/ conventional pozz. [illegible]

3 - If so, what typical mix of water/stabilizer/waste do you use?

/see (2) above

4- To what TCLP levels are you able to stabilize the BDAT/TC metals? CAN WE HAVE DATA FOR UNTREATED/TREATED METAL CONSTITUENTS? Currently treat D008 - leads to <5 ppm TCL.

No data available

5- Would you forsee problems in treating these wastes to TC/UTS levels?

Doesn't think that treating to UTS is a problem.

NAME/ADDRESS/PHONE OF FIRM: HELDAGE ENVIRON. SERVICES.
7901 W. MORRIS ST.
INDIANAPOLIS, IN 46231 317/243-0811 x

DATE: 10 MAY/96

CONTACT PERSON: DARCY RAY

1 - Do you receive non-wastewater wastes from brass/bronze foundries? Do you receive similar wastes? If similar, why are they similar?
Typical foundry waste contains fine sand particles contaminated with a few percent lead, zinc, copper.

BELIEVE THEY CAN HANDLE THIS — DON'T KNOW IF THEY ACTUALLY DO HANDLE FOUNDRIES.

2 - If so, do you stabilize those wastes with pozzolonic-type stabilizing agents? USE CEMENT-TYPE STUFF — USE PUG-MILL

3 - If so, what typical mix of water/stabilizer/waste do you use?
CONVENTIONAL — SEPARATE TESTING

4- To what TCLP levels are you able to stabilize the BDAT/TC metals? CAN WE HAVE DATA FOR UNTREATED/TREATED METAL CONSTITUENTS?
TREAT TO F006 CODE LDR VALUES — BELIEVE THEY CAN TREAT — THEY HAVE A MODEL — NO DATA AVAIL

5- Would you forsee problems in treating these wastes to TC/UTS levels?
BELIEVE THEY CAN MEET STANDARDS FOR UTS

[illegible]/PHONE OF FIRM: GNI Group (Disposal Systems)
P.O. Box 1914
Deer Park, TX 77536

713/930-2588

CONTACT PERSON: Bob Griffith
Warren Norris

DATE: 10 May 96

1 - Do you receive non-wastewater wastes from brass/bronze foundries? Do you receive similar wastes? If similar, why are they similar?

Typical foundry waste contains fine sand particles contaminated with a few percent lead, zinc, copper.

Not much foundry waste, but do have sand blast Pb depainting waste.

They're a local outfit. Slip stabilized stuff to Chem. Waste Mngmn't.

2 - If so, do you stabilize those wastes with pozzolonic-type stabilizing agents? Yes

3 - If so, what typical mix of water/stabilizer/waste do you use?

Conventional pozzolines (Fly ash, lime kiln dust, cement dust $FeCl_2$, $FeCl_3$, polymers)

4- To what TCLP levels are you able to stabilize the BDAT/TC metals? CAN WE HAVE DATA FOR UNTREATED/TREATED METAL CONSTITUENTS? Can treat — but don't have data to give.

5- Would you forsee problems in treating these wastes to TC/UTS levels?

Believe they can treat all stuff to UTS levels pass 90% of time.

NAME/ADDRESS/PHONE OF FIRM: Clean Harbors of Chicago
11800 Stony Island Ave.
Chicago, IL 60617
312/646-6202

CONTACT PERSON: Cné Doran
(Sinée)
Tim Getzloff

DATE: 10 May '96

1 - Do you receive non-wastewater wastes from brass/bronze foundries? Do you receive similar wastes? If similar, why are they similar?

Typical foundry waste contains fine sand particles contaminated with a few percent lead, zinc, copper.

Would stabilize in Cincinnati — she'll have someone call me. ✓

Yes, they stabilize brass/bronze foundry waste (although some is not TC ~~[illegible]~~ hazardous)

2 - If so, do you stabilize those wastes with pozzolonic-type stabilizing agents? Yes

3 - If so, what typical mix of water/stabilizer/waste do you use?

Whatever recipe works.

4- To what TCLP levels are you able to stabilize the BDAT/TC metals? CAN WE HAVE DATA FOR UNTREATED/TREATED METAL CONSTITUENTS? Whatever client needs, they can meet — but no data available

5- Would you forsee problems in treating these wastes to TC/UTS levels?

No.

..., STORAGE, AND DISPOSAL FACILITIES CONTACTED

1 - GNI Group (Disposal Systems)
P.O. Box 1914
Deer Park, TX 77536

Mr. Warren Norris - 713/930-2588

2 - Clean Harbors of Chicago
11800 Stoney Island Avenue
Chicago, IL 60617

Mr. Tim Getzloff - 312/646-6202

3 - AETS/Chemical Waste Management
W124 N9451 Boundary Road
Menomonee Falls, WI 53051

Mr. Alan Koumtz - 414/255-6655

4 - Heritage Environmental Services
7901 W. Morris Street
Indianapolis, IN 46231

Ms. Darcy Ray - 317/243-0811 ext.1483

5 - Envirite Corp.
16435 S. Center Avenue
Harvey, IL 60426

Mr. David Reyes - 708/596-7040

6 - Rollins Environmental Services (LA), Inc.
P.O. Box 73877
Baton Rouge, LA 74137

Fred Gurdess - 302/426-3168 &
Richard Grondan - 970/386-2293 (Colorado facility)

7 - Chemical Waste Management
7170 John Brannon Road
Carlyss, LA 70663

Ms. Renee Dillion - 318/583-2169

8 - Treatment One
5743 Cheswood
Houston, TX 77087

Ms. Shiela Armstrong - 502/327-8860 (Louisville, KY facility)

THEY DO NOT HANDLE BULK SOLIDS, INCL. FOUNDRY SAND WASTES.

...Service Company
P.O. Box 709
Texas City, TX 77592

Ms. Tracy Holister - 409/945-3301

DEEPWELL FACILITY. THEY WOULD SUBCONTR
NONWASTEWATERS.

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August 2, 1996

Michael Petruska
Chief, Waste Treatment Branch
Office of Solid Waste
U.S. Environmental Protection Agency
2800 Crystal Drive
6th Floor
Mail Code 5302W
Crystal City, VA 22202

Dear Mr. Petruska:

As a follow up to our June 6, 1996 meeting and in response to the July 22, 1996 letter to the American Foundrymens Society (AFS) from the Office of Solid Waste-Waste Treatment Branch, the following comments are provided on the impact of the land disposal restrictions (LDR), Phase IV rulemaking on the foundry industry. Specifically, AFS was asked to provide information on the ability and the cost involved to treat foundry waste to meet the universal treatment standards (UTS) levels. Attachments 1 and 2 contain specific analytical data, cost data and information on the variability of foundry waste. The information in attachment 1 is provided by RMT and based on their experience assisting foundries solve solid waste problems.

Waste Volume

As noted in our November 27, 1995 comments, the foundry industry generates 410,000 tons per year of hazardous waste. Of this amount, 110,000 tons is air pollution control dust/sludges (APCDS) and 300,000 is waste sand (WS). A majority (73%) of the APCDS is rendered nonhazardous using inline treatment processes and will be unaffected by LDR-Phase IV. The WS and the remaining APCDS, together totaling 330,000 tons, is either treated in tanks (80%) or shipped offsite (20%) for treatment and disposal or for use in other production processes such as a fluxing material at secondary smelters. Of the quantity treated in tanks, approximately 200,000 tons are treated with iron filings to stabilize lead and/or cadmium.

Variability

The comments filed by AFS on LDR-Phase IV included discussions on the variability of foundry waste and the impact this has on assurances of treatment meeting UTS levels and any underlying hazardous constituents. At our June 6, 1996 meeting the OSW requested more information on the variability issue through analytical comparison of untreated to treated waste for various UTS metals. Attachment 1, pages 3-8, contains this information and shows the ranges of cadmium, lead, chromium, copper, and zinc in foundry waste materials. This attachment illustrates the point that while one foundry may have a chromium and cadmium problem another may only have problems with cadmium or high zinc levels placing them at different ends of the treatment scale. Additionally, the attachment shows the substantial differences between foundries on lead and cadmium ranges for the same basic type of characteristic waste stream waste sand.

This variability makes it difficult to treat and consistently (or with any assurance) meet the UTS and underlying constituents. In support of AFS's position, the June 10, 1996 comments filed by the Environmental Technology Council (ETC) to docket F-96-P42A-FFFF show that when their members stabilize foundry waste, 20% of the samples fail UTS for either lead, cadmium, or chromium while meeting UTS for the other two metals. ETC's comments were unsolicited by the foundry industry but independently reaffirm the RMT information appended to this letter.

Off-Site Treatment

In our November 27, 1995 comments, AFS estimated that off-site stabilization costs could range from $150 to $200.00 per ton at commercial sites. Several member foundries recently placed calls to obtain quotations from commercial facilities for treatment of their waste in various regions of the country. The quotations ranged from $120 to $329 per ton, with the average being $245. None of the treatment facilities would guarantee that they would meet UTS and underlying constituents.

Economic Impact

In an earlier analysis, AFS showed that the foundry industry's cost to treat onsite and to meet TCLP levels for lead and or cadmium ranged from $31 to $64.00/ton with the average being $41 per ton (attachment 2). Applying the cost range cited by RMT to meet the UTS levels (attachment 1, page 1 and 2) of an additional $12 to $30.00/ton treated, average of $15 per ton, the new cost range would be $43 to $94.00/ton treated, averaged to $56 per ton.

Using the incremental treatment costs, the additional annual economic impact on the foundry industry to meet UTS will range from $11 million (based on average) to $23 million (based on

high end of cost range). This assumes that the practice of stabilizing materials on site by tank treatment continues with no further regulatory impediments. In the event that this practice is discouraged and all of this waste must be sent to off site treatment and disposal facilities, the annual cost to the foundry will increase by $60 million.

Assessing the impact of these proposed regulations cannot be divorced from the unresolved issue of how the Agency views the foundry industry's use of iron fillings to treat waste sand. The impact of this issue alone, absent any action on LDR-Phase IV, would add a $6 million economic burden on our industry.

Summary

AFS maintains that implementation of UTS will have a sigificant economic impact on the foundry industry in the following ways:

1. The cost increases for on-site treatment to meet UTS will range from $11 million to $24 million.

2. If offsite treatment becomes the only viable option, the foundry industry will be burdened with an additional annual cost of $60 million.

3. It is unlikely that the control technology is in place to allow foundries to meet UTS through on-site treatment.

4. The waste stream variability will result in treatment ineffectiveness and increased cost impacts for significant quantities of materials.

Please contact my office at (800) 537-4237 if you have any further questions.

Sincerely,

Gary E. Mosher
Director of Environmental Affairs

TREATMENT INCREASES DUE TO UTS REQUIREMENTS

The economics associated with treating wastes to meet the proposed universal treatment standards (UTS) can be addressed, in part, by evaluating increases in dosages of reagents required for effective treatment. In some cases, the same treatment approach and reagent dosages may effectively treat foundry wastes to pass either the existing TCLP criteria and also meet the proposed UTS requirements. On the other hand, increased dosages or alternative chemical additives might be required for treating some wastes.

Examples of foundry wastes that would require additional dosages to meet the proposed UTS are attached to this report as Exhibits 1-6. A brief analysis of the costs associated with the dosage increases is presented in Table 1. Estimates were based upon a delivered cost for chemicals of $300 per ton. Most of the examples outlined in Table 1 demonstrate that a cost increase for treatment chemicals of $15-$30 per ton would be required to treat the wastes to UTS levels.

For the example shown in Exhibit 2, none of the dosages tested was effective in treating the waste to UTS levels, although higher dosages would likely work. Based on the results of studies performed on similar foundry waste materials, it is likely that the dosage increase required to treat this waste to meet the proposed UTS would lie in the 80%-100% range. For this waste material, such a dosage increase would likely cost about $9-$15 per ton of waste.

It is likely that the average cost increase (industry-wide) associated with treating wastes to meet UTS standards would be somewhat less than $15 per ton. However, cost increases for specific wastes could be as high as $30 per ton, as is demonstrated in Table 1. For a facility generating 1,000 tons of such a waste per year, the added treatment cost could be as high as $300,000.

Table 1. Dosages of Chemicals Required to Meet UTS

Exhibit Number	Dosage Required to Meet Existing Phase III Regulations (%)	Estimated Dosage Needed to Meet Proposed UTS (%)	Estimated Dosage Increase (%)	Cost Differential
1	30	40	33	$30
2	5	x	x	x
3	5	15	200	$30
4*	15/20	20/25	33/25	$15/$15
5	15	25	67	$30
6	3	7	133	$12

x Treatment was not effective in meeting UTS in treatability study

* Two dosage schemes were included in study

TEST RESULTS

	SAMPLE	SCREENING TCLP TEST RESULTS pH$_f$	Cadmium mg/L	Copper mg/L	Lead mg/L	Zinc mg/L
	Standard TCLP Test					
	Untreated	4.8	25		360	2500
*	+ 10% MgO & 20% TSP	7.0	0.96		<0.2	2.8
	+ 15% MgO & 20% TSP	6.9	1.8		<0.2	8.0
**	+ 20% MgO & 20% TSP	9.3	<0.01	0.029	<0.2	<0.02

* Meets UTS for lead but not for cadmium

** Meets UTS for both lead and cadmium

SOURCE MATERIAL: BAGHOUSE DUST

BENCH SCALE TESTING RESULTS
AUGUST 16, 1990

SAMPLE			TCLP RESULTS		
	pH_s	pH_f	Solution	Cadmium mg/L	Lead mg/L
Untreated	8.9	4.6	2	3.6	450
+ 2.5% TSP	8.5	4.5	2	1.4	14
+ 5% TSP	8.0	5.4	1	0.31	0.7
+ 7.5% TSP	7.4	5.0	1	0.23	0.4
+ 2.5% H_3PO_4	7.6	5.3	1	0.36	1.5
+ 5.0% H_3PO_4	7.3	5.2	1	0.22	0.5
* + 7.5% H_3PO_4	6.8	5.0	1	0.23	0.3

* Meets UTS for lead but not for cadmium

SOURCE MATERIAL: WASTE SAND

TEST RESULTS PROJECT #:

	SAMPLE	SCREENING TCLP TEST RESULTS pH$_f$	Cadmium mg/L	Chromium mg/L	Zinc mg/L
	Untreated	5.97	6.9	12.3	450
*	+ 5% MgO	7.72	0.96	<0.15	4.2
	+ 5% MgO & 5% $FeSO_4$	7.28	1.18	<0.15	21.6
	+ 5% MgO & 10% $FeSO_4$	6.29	2.91	<0.15	183
	+ 5% MgO & 5% TSP	6.24	1.59	0.45	10.8
	+ 5% MgO & 7.5% TSP	5.89	1.80	2.91	10.2
	+ 7.5% MgO & 5% TSP	6.44	1.14	0.27	13.2
**	+ 7.5% MgO & 7.5% TSP	7.47	<0.15	<0.15	<0.15

* Meets UTS for chromium but not for cadmium

** Meets UTS for both chromium and cadmium

SOURCE MATERIAL: BAGHOUSE DUST

WASTE TREATMENT
BENCH-SCALE TREATMENT TESTING RESULTS

SAMPLE COMPOSITE	pH_s	pH_f	Solution	TCLP RESULTS Cadmium mg/L	Lead mg/L
UNTREATED COMPOSITE 1	9.0	7.4	2	4.4	34
+ 5% MgO & 5% TSP	7.5	7.3	2	0.63	<0.1
UNTREATED COMPOSITE 2	7.1	5.6	2	5.2	14
+ 5% MgO & 5% TSP	8.0	6.3	2	2.1	<0.1
* + 5% MgO & 10% TSP	7.4	6.6	2	0.65	<0.1
** + 5% MgO & 15% TSP	6.5	9.0	2	<0.005	<0.1
* + 10% MgO & 10% TSP	7.8	6.8	2	0.46	<0.1
** + 10% MgO & 15% TSP	7.6	9.1	2	<0.005	<0.1
HAZARDOUS WASTE CRITERIA				1.0	5.0

COMPOSITIONAL ANALYSIS

		Cadmium	Lead	Zinc
Composite of All 3 Foundries	composit 1	260	5,700	5,900
	composit 2	370	9,400	100,000

* Meets UTS for lead but not for cadmium

** Meets UTS for both lead and cadmium

SOURCE MATERIAL: WASTE SAND

TEST RESULTS

RMT, INC
March 9, 1995

Project #:

	SCREENING TCLP TEST RESULTS				
	SAMPLE	pH,	Cadmium	Lead	Zinc
			mg/L	mg/L	mg/L
	Untreated	5.73	9.4	19.7	1560
	+ 5% MgO & 5% TSP	6.23	4.3	0.7	760
*	+ 5% MgO & 10% TSP	6.65	0.8	<0.2	38
	+ 10% MgO & 5% TSP (A)	6.25	3.7	0.4	480
	+ 10% MgO & 5% TSP (B)	6.75	4.1	0.4	480
*	+ 10% MgO & 10% TSP	6.74	0.7	<0.2	34
*	+ 15% MgO & 5% TSP	8.27	0.35	<0.2	1.5
**	+ 15% MgO & 10% TSP	9.24	<0.05	<0.2	<0.05
**	+ 15% MgO & 15% TSP	9.07	<0.05	<0.2	<0.05

* Meets UTS for lead but not for cadmium

** Meets UTS for both lead and cadmium

SOURCE MATERIAL: BAGHOUSE DUST

Exhibit 6

SCREENING TCLP TEST RESULTS
RMT, INC
November 8, 1995

Project #:

Sample Type	pH_f	Metal	Conc., mg/l
xxxx xxxx Dust	5.0 (Soln. 1)*	Cd	1.1
		Pb	145.
+ 1% MgO + 1% TSP	5.4 (Soln. 1)*	Cd	0.41
		Pb	0.77
* + 1% MgO + 2% TSP	5.4 (Soln. 1)*	Cd	0.32
		Pb	0.22
+ 1% MgO + 3% TSP	5.4 (Soln. 1)*	Cd	0.37
		Pb	<0.2
+ 1% MgO + 4% TSP	5.5 (Soln. 1)*	Cd	0.28
		Pb	<0.2
+ 1% MgO + 5% TSP	5.5 (Soln. 1)*	Cd	0.25
		Pb	<0.2
+ 3% MgO + 1% TSP	4.9 (Soln. 2)*	Cd	0.94
		Pb	3.8
+ 4% MgO + 1% TSP	5.3 (Soln. 2)*	Cd	0.63
		Pb	0.59
+ 5% MgO + 1% TSP	5.9 (Soln. 2)*	Cd	0.54
		Pb	0.83
** + 6% MgO + 1% TSP	7.8 (Soln. 2)	Cd	<0.05
		Pb	<0.2

* Meets UTS for lead but not for cadmium

** Meets UTS for both lead and cadmium

SOURCE MATERIAL: BAGHOUSE DUST

June 3, 1996

EXHIBIT 7

RMT

FOUNDRY SLUDGE [6] TREATMENT FOR LEAD AND CADMIUM
APPROXIMATE COSTS FOR ALTERNATIVE TREATMENT CHEMISTRIES

Treatment Additive	Typical Dosage Range	Actual Dosage	Unit Price $/Ton of Additive[1]	Final Cost $/Ton of Sludge Treate	Comments
Quicklime[2] (CaO)	10-50%	40%	$80	$32	Produces high pH sludge; treatability highly sensitive to dosage; difficult process control
Lime, hydrated [Ca(OH)][3]	10-60%	53%	$120	$64	Produces high pH sludge; treatability highly sensitive to dosage; difficult process control
Portland Cement	15-100%	69%	$80	$55	Produces high pH sludge; treatability highly sensitive to dosage; difficult process control
EnviroBlend[4]	5-15%	10%	$260	$26	Includes pH buffering
EnviroPhos[4]	5-25%	14%	$220	$31	No pH buffering capacity
Disposal as RCRA hazardous waste	N/A	N/A	N/A	$150-$200[5]	Included for comparison

NOTES:

1 Approximate price of additive delivered to job site in bulk trucks.
2 Laboratory reagent grade CaO powder for screening treatability testing was used, for convenience. Dosage rate for technical grade quicklime is assumed to be 15% higher
3 Quantity estimated based on quicklime data and molecular weight ratio of quicklime and hydrated lime.
4 Dosage rates selected for ease of operation in the flat part of dosage response curve.
5 Includes disposal and transportation cost.
6 25% Moisture, emission control sludge from gray iron foundry cupola.

FOR TCLP LEVELS

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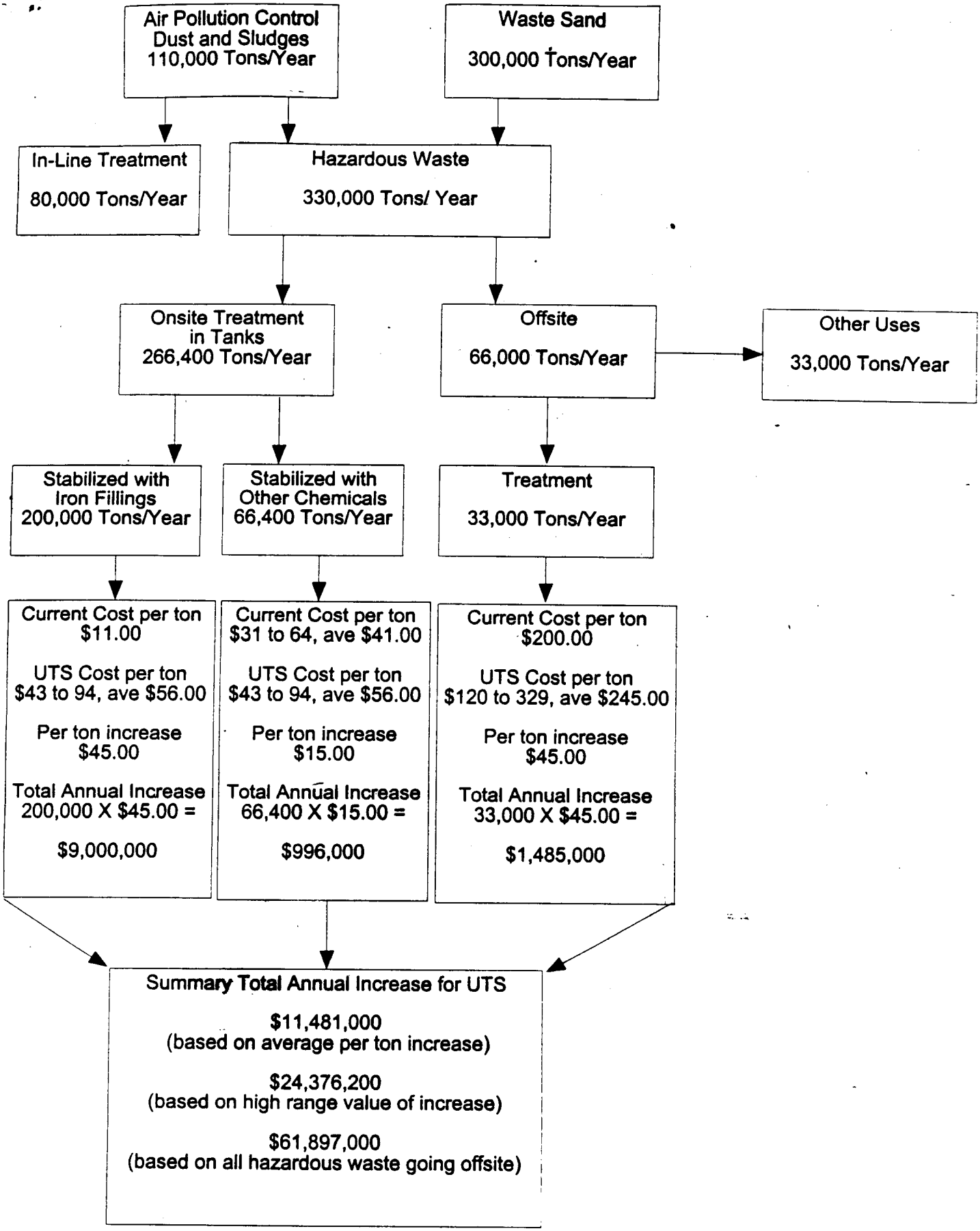
Fate and Cost of Foundry Industry Hazardous Waste