



August 28, 2013

Philip M. Fine, Ph.D.
Planning and Rules Manager
South Coast Air Quality Management District
21865 Copley Dr.
Diamond Bar, CA 91765-4178

Exide Technologies
2700 S. Indiana Street
Los Angeles, CA 90023
Phone 323.262.1101
Fax 323.269.1906

Re: Submittal of Rule 1402 Risk Reduction Plan
Exide Technologies, Vernon, California
Facility ID 124838

Dear Dr. Fine:

Exide Technologies is submitting herein its Risk Reduction Plan (RRP), as required by Rule 1402 and following the South Coast Air Quality Management District's (AQMD's) March 1, 2013 approval of Exide's AB2588 Health Risk Assessment. This RRP describes the risk reduction measures implemented to date (*i.e.*, the blast furnace feed chute isolation door), which, pending confirmation source tests, have already reduced risks to below Rule 1402 requirements. Demonstrating its commitment to further emissions reductions, Exide also sets forth additional measures that it plans to take that go beyond the requirements of Rule 1402. The RRP includes updated risk assessment calculations associated with current facility operations, and projects the risk assessment calculations after the installation of further measures.

Exide is presenting a serious plan on an aggressive schedule that would result in significant reductions in calculated potential health risk. We therefore request that all the relevant departments within AQMD review the enclosed RRP and consider the comprehensive approach to risk reduction that Exide presents. We believe it to be especially important that the Planning and Rules group take this RRP into consideration as it develops potential new rules for this industry. Exide continues to believe that any such rules should be based on the reduction of health risk and should not impose particular technologies or emission rates associated with such technologies. The work detailed in this RRP would provide levels of risk reduction comparable to the technologies that AQMD may be considering and would do so in a technically feasible and cost-effective manner. See especially Section 5 of the RRP for details.

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Aspects of the enclosed RRP will require construction permits from AQMD. As described above, many of these measures go beyond the level of performance required under Rule 1402. Accordingly, Exide expects to submit such applications for construction permits prior to AQMD acting upon or approving the RRP for Rule 1402 purposes. We would appreciate the opportunity for a meeting with AQMD to discuss these projects, their timing, and their permitting in the near future.

Please feel free to contact me with any questions or comments you may have regarding the enclosed Risk Reduction Plan. We appreciate the AQMD's assistance during this process.

Sincerely,
Exide Technologies

John Hogarth
Plant Manager

A handwritten signature in black ink, appearing to read "J. Hogarth", is written over a horizontal line. The signature is stylized and cursive.

Enclosure

Cc. Tom Chico, AQMD
Ed Pupka, AQMD
Susan Nakamura, AQMD
Eugene Kang, AQMD
Rizgar Ghazi, DTSC



South Coast Air Quality Management District

Form 400-A

Application Form for Permit or Plan Approval

List only one piece of equipment or process per form.

Mail To: SCAQMD, P.O. Box 4944, Diamond Bar, CA 91765-0944. Tel: (909) 396-3385, www.aqmd.gov

Section A - Operator Information

1. Facility Name (Business Name of Operator to Appear on the Permit): Exide Technologies. 2. Valid AQMD Facility ID (Available On Permit Or Invoice Issued By AQMD): 124838. 3. Owner's Business Name (If different from Business Name of Operator):

Section B - Equipment Location Address

4. Equipment Location Is: Fixed Location. 2700 S. Indiana Street, Vernon, CA 90058. Contact Name: Ed Mopas, Environmental Manager. Phone: (323) 262-1101, Ext. 259. Fax: (323) 262-0642. E-Mail: ed.mopas@exide.com

Section C - Permit Mailing Address

5. Permit and Correspondence Information: Check here if same as equipment location address. 2700 S. Indiana Street, Vernon, CA 90058. Contact Name: Ed Mopas, Environmental Manager. Phone: (323) 262-1101, Ext. 259. Fax: (323) 262-0642. E-Mail: ed.mopas@exide.com

Section D - Application Type

6. The Facility Is: In RECLAIM & Title V Programs

7. Reason for Submitting Application (Select only ONE):

7a. New Equipment or Process Application: Compliance Plan. 7b. Facility Permits: RECLAIM Facility Permit Amendment. 7c. Equipment or Process with an Existing/Previous Application or Permit: Existing or Previous Permit/Application. If you checked any of the items in 7c., you MUST provide an existing Permit or Application Number.

8a. Estimated Start Date of Construction (mm/dd/yyyy): 8b. Estimated End Date of Construction (mm/dd/yyyy): 8c. Estimated Start Date of Operation (mm/dd/yyyy):

9. Description of Equipment or Reason for Compliance Plan (list applicable rule): Rule 1402 Risk Reduction Plan. 10. For identical equipment, how many additional applications are being submitted with this application? (Form 400-A required for each equipment / process) 0

11. Are you a Small Business as per AQMD's Rule 102 definition? (10 employees or less and total gross receipts are \$500,000 or less OR a not-for-profit training center) No. 12. Has a Notice of Violation (NOV) or a Notice to Comply (NC) been issued for this equipment? No. If Yes, provide NOV/NC#:

Section E - Facility Business Information

13. What type of business is being conducted at this equipment location? Secondary lead smelter. 14. What is your business primary NAICS Code? (North American Industrial Classification System) 331492

15. Are there other facilities in the SCAQMD jurisdiction operated by the same operator? No. 16. Are there any schools (K-12) within 1000 feet of the facility property line? No

Section F - Authorization/Signature I hereby certify that all information contained herein and information submitted with this application are true and correct.

17. Signature of Responsible Official: [Signature]. 18. Title of Responsible Official: Plant Manager. 19. I wish to review the permit prior to issuance. (This may cause a delay in the application process.) No

20. Print Name: John Hogarth. 21. Date: 8/20/13. 22. Do you claim confidentiality of data? (If Yes, see instructions.) No

23. Check List: Authorized Signature/Date, Fees Enclosed

Table with columns: AQMD USE ONLY, APPLICATION TRACKING #, CHECK #, AMOUNT RECEIVED \$, PAYMENT TRACKING #, VALIDATION, DATE, APP REJ, DATE, APP REJ, CLASS I III, BASIC CONTROL, EQUIPMENT CATEGORY CODE, TEAM, ENGINEER, REASON/ACTION TAKEN



Risk Reduction Plan Rule 1402

Prepared for:
**South Coast Air Quality Management District
Diamond Bar, California**

On behalf of:
**Exide Technologies, Inc.
Vernon, California**

Prepared by:
**ENVIRON International Corporation
Los Angeles, California**

Date:
August 28, 2013

Project Number:
0721624A



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Transportation Business Group
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Los Angeles, CA 90023
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323.269.1906 fax
www.exideworld.com

Risk Reduction Plan
Exide Technologies, Inc.

Certification [(f)(3)(I)]

I certify that this Risk Reduction Plan meets the requirements for such plans set forth in South Coast Air Quality Management District Rule 1402(f)(3) and that I am officially responsible for the processes and operations of the Exide Technologies lead recycling facility in Vernon, California.



John Hogarth
Plant Manager

A handwritten signature in black ink, appearing to read "Hogarth", is written over a horizontal line. Below the line, the name "John Hogarth" and title "Plant Manager" are printed.

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Executive Summary

In January 2013, Exide submitted a Health Risk Assessment (HRA) for its facility in Vernon, California, pursuant to the requirements of AB2588 and AQMD Rule 1402. On March 1, 2013 the South Coast Air Quality Management District (AQMD) approved Exide's HRA. Since that time, Exide and AQMD have mailed notices and held public meetings informing the neighboring community of the risks presented in that HRA, some of which exceeded Rule 1402's Action Risk Levels requiring reduction.

Following the HRA approval, Exide promptly installed an isolation door on the feed chute to the Vernon facility's blast furnace in order to reduce the potential for arsenic emissions from the Hard Lead Ventilation System stack. Exide conducted preliminary engineering testing of the emissions from that stack in April 2013, the results of which indicate that the isolation door has been effective in achieving the desired emission reductions. Formal emission testing following full AQMD testing protocols to confirm this performance commenced on August 13, 2013.

This Risk Reduction Plan (RRP) presents updated risk information based on the April 2013 preliminary engineering tests along with additional emission and risk reduction measures that Exide proposes to install beyond the isolation door. Complete schedules are provided and an assessment of the expected emission and risk levels following all proposed projects is presented.

Based on available data, including data developed by AQMD, Exide reasonably believes that the isolation door has already achieved emission reductions sufficient to reduce risks to well below the Rule 1402 Action Risk Levels. Exide achieved these reductions prior to the RRP submittal deadline. Confirmatory emissions testing to verify that outcome is currently underway. Exide is committed to install further control equipment for both metals and organic compound emissions even though the data demonstrates that the measure already completed is sufficient to comply with Rule 1402's requirements. These additional measures are expected to be installed within approximately one year of RRP submittal, which is 1/3 of the time allowed under Rule 1402.

1 Introduction

On March 1, 2013 the AQMD approved the HRA submitted by Exide for its facility in Vernon, California. That approval letter summarized the projected risk levels presented in the HRA and identified that several metrics of risk were above the Action Risk Levels set forth in Rule 1402. Pursuant to Rule 1402(f)(2), facilities with risks in excess of these Action Risk Levels must submit a RRP within 180 days of HRA approval which, in the case of the Exide facility, is August 28, 2013. This document is submitted as Exide's RRP in satisfaction of the requirements of Rule 1402(f)(2).

Rule 1402(f)(3) outlines the contents to be included in such Risk Reduction Plans. To facilitate review, this document is arranged following and citing that outline.

Since the approval of this facility's HRA on March 1, 2013, Exide has provided public notice and conducted multiple public meetings in collaboration with AQMD in accordance with Rule 1402(p). Most importantly, Exide promptly addressed the primary source of risk -- arsenic emissions from the facility's Hard Lead Ventilation System stack -- with the installation of a feed chute isolation door on the facility's blast furnace. This proactive measure prevents blast furnace process exhaust from entering that ventilation system. Exide conducted preliminary engineering testing on the Hard Lead Ventilation System stack in early April 2013. Results of that testing indicate that the door has been effective in reducing arsenic emissions from this stack to a degree that reduces the health risks to below the Action Risk Levels required by Rule 1402(e)(1).

Nonetheless, in good faith Exide presents in this RRP additional risk reduction measures which it expects to install by September 1, 2014 to further reduce emissions and health risk from the facility. Exide reserves the right to amend or modify this RRP after completion of the confirmatory tests described herein, and depending on the results of ongoing AQMD rulemaking which may impact the facility.

The primary elements of this plan are as follows:

- An update on the "current" risk from the facility based upon latest available preliminary engineering testing data obtained by Exide and AQMD in April 2013,
- The means by which Exide will confirm this current risk status through comprehensive emission testing,
- "Contingent" additional control measures Exide can pursue should the pending confirmation testing not indicate achievement of the Action Risk Levels (these measures in particular are subject to change pending source testing),
- Additional control measures Exide commits to installing to further reduce emissions, regardless of the outcome of the pending confirmation testing,
- A projection of the future expected risk from the facility after implementation of all these measures, and
- Schedules associated with all these activities.

2 Facility Identification [(f)(3)(A)]

This Plan is for the following facility:

Exide Technologies
2700 South Indiana Street
Vernon, California 90058

AQMD Facility ID 124838
SIC Code 3341, NAICS Code 331492

3 Risk Characterization [(f)(3)(B)]

The January 2013 AB2588 HRA for this facility, as approved in the AQMD's March 1, 2013 letter, indicated the following key risk metrics:

Maximum Exposed Individual Worker cancer risk	156 in one million
Maximum Exposed Individual Resident cancer risk	22 in one million
Cancer Burden	10
Maximum Chronic Hazard Index, Worker	63
Maximum Chronic Hazard Index, Resident	2.9
Maximum Acute Hazard Index, Worker	3.8
Maximum Acute Hazard Index, Resident	0.2

These risks were calculated on the basis of facility-wide emission testing for AB2588 compounds conducted largely in late 2010 and early 2011. Subsequent retesting of emissions from the Hard Lead Ventilation System stack and the Neptune Scrubber stack was conducted in 2012. The risk assessment was conducted using the average emission rates between these 2010 and 2012 tests as fully tabulated in the January 2013 HRA.

Analysis of the HRA results and concurrent research determined that approximately 90 percent of the above-tabulated risks were due to emissions of arsenic from the Hard Lead Ventilation System stack and that the source of that arsenic was the "leakage" of blast furnace process exhaust from its primary ventilation system into hooding served by the Hard Lead Ventilation System. These process exhausts are intended to leave the blast furnace via the downstream afterburner, baghouse, and Neptune Scrubber whose tests indicate very effective control of arsenic emissions. Exide determined that preventing this process exhaust from entering the Hard Lead Ventilation System hooding was the fundamental approach to reducing the arsenic emissions and associated risk.

Promptly after AQMD approval of the HRA on March 1, 2013, Exide designed an isolation door on the charge chute to the facility's blast furnace to minimize the potential for blast furnace process exhaust gases to be drawn into the hooding served by the Hard Lead Ventilation System. This door system was permitted on March 28, 2013, and became operational on April 4, 2013. This door remains closed except to open briefly when charge material is actually being added to the furnace, only a small percentage of the time.

Exide conducted preliminary engineering stack tests on the Hard Lead Ventilation System stack over four days in the first two weeks of isolation door operation. AQMD staff observed many of these tests and AQMD's laboratory was provided physical splits of the samples collected by Exide's testing contractor. In addition, AQMD personnel conducted a test of the emissions of metals from the Neptune Scrubber stack on April 18 and 19, 2013.

Appendix A contains the May 2, 2013 memorandum describing the results of the preliminary engineering stack tests conducted in April 2013 to assess the effectiveness of the isolation door in reducing arsenic emissions from the Hard Lead Ventilation System stack. Key findings of this preliminary engineering assessment are:

- Arsenic emissions from the Hard Lead stack are reduced by 98 to 99 percent,
- Benzene and 1,3-butadiene emissions from the Hard Lead stack are reduced by 96 to 99 percent, and
- The linked reduction in arsenic and organic toxic emissions from the Hard Lead stack supports the conclusion that it was blast furnace process exhaust that previously caused the elevated arsenic emissions.

Emissions measured by AQMD from the Neptune Scrubber stack were comparable to those used in the HRA, indicating that the improved retention of the blast furnace process exhaust gases in the Neptune Scrubber air pollution control system does not adversely affect emissions and risk.

Based on data collected to date, it is currently the case that the “risk due to total facility emissions has... decreased below the levels indicated in the previously approved health risk assessment.”[Rule 1402(f)(3)(B)] Further to the data presented in the Appendix A memorandum, complete risk calculations have been repeated taking all the input data from the approved 2013 HRA and substituting the emissions data collected on April 18th and 19th by Exide from the Hard Lead stack and by AQMD from the Neptune Scrubber stack. This “updated air toxics emission inventory and health risk assessment,” is included as Appendix B. We note and recognize that this update is based on preliminary engineering data, but these are the best data currently available.

In summary, this updated assessment in Appendix B indicates the following key risk metrics:

Maximum Exposed Individual Worker cancer risk	11.2 in one million
Maximum Exposed Individual Resident cancer risk	3.5 in one million
Cancer Burden	0.3
Maximum Chronic Hazard Index, Worker	1.59
Maximum Chronic Hazard Index, Resident	0.15
Maximum Acute Hazard Index, Worker	0.44
Maximum Acute Hazard Index, Resident	0.01

Each of these risk metrics is BELOW the Action Risk Levels specified in Rule 1402.

As specified in the air permit issued for the installation of the isolation door on March 28, 2013, Exide is to conduct further emission testing to confirm these improvements. After consultation with the AQMD, this testing has been expanded to include the full suite of AB2588 metals for

the Hard Lead, Soft Lead, and Neptune Scrubber stacks conducted simultaneously as well as inclusion of the full set of organic toxic air contaminant emissions addressed in the HRA. AQMD will be provided splits of all samples.

Exide was prepared to perform this testing, but the testing was unavoidably delayed because Exide was forced to cease operations for more than seven weeks pursuant to the Department of Toxic Substances Control's April 24, 2013 Suspension Order. Exide recommenced operations after a Judge issued a preliminary injunction staying DTSC's Order. Exide started source tests on August 13, 2013 and tests are expected to continue over 15 days in a period spanning about six weeks.

Initial data for the first of the tests conducted (multiple metals on the three involved stacks) is expected to be available in early September 2013. These data will be provided simultaneously to Exide and AQMD. Exide will assess the implications with respect to risk as the data come in to determine whether any adjustments to this RRP are indicated as being necessary.

Final reports from this confirmatory testing are expected to be submitted to AQMD by October 4, 2013. Exide will submit a revision to Appendix B, the "updated Health Risk Assessment" of current conditions by December 1, 2013 as an update and supplement to this RRP.

4 Sources Requiring Risk Reduction [(f)(3)(C)]

As identified in the January 2013 HRA, 90% of the calculated facility cancer risk is due to arsenic emissions and 4% of the calculated facility cancer risk is due to 1,3-butadiene emissions. Further, the Hard Lead Ventilation Stack accounted for 97% of the facility's annual arsenic emissions and 67% of the facility's 1,3-butadiene emissions. Therefore, the Hard Lead Ventilation System stack is the source requiring risk reduction to achieve the Rule 1402 Action Risk Levels. As shown through the updated risk calculations of Appendix B, which indicate the degree of risk reduction associated with control/reduction of the arsenic and 1,3-butadiene emissions from the Hard Lead Ventilation System stack due to the isolation door installation, control of this stack's emissions will be sufficient to achieve the Action Risk Levels.

Despite Exide's ability to achieve needed risk reductions via the isolation door on the Hard Lead Ventilation System stack, Exide (in good faith and while reserving its legal rights and right to modify) will install additional control measures on a number of other sources to reduce risks even further below those depicted in Appendix B. In particular, Exide will install the following additional air pollution control devices to further reduce calculated risks from the facility:

Secondary High Efficiency Particulate Air (HEPA) filtration will be installed downstream of the following baghouses, reducing their emissions of lead, arsenic, and other toxic metals:

- Hard Lead Ventilation System Baghouse
- Soft Lead Ventilation System Baghouse
- Material Handling Baghouse
- MAC Baghouse

A Regenerative Thermal Oxidizer (RTO) will be installed on the Reverberatory Furnace Feed Dryer exhaust to reduce emissions of 1,3-butadiene and other organic toxics.

Note that the facility has already installed secondary HEPA filtration downstream of both the North and South Torit cartridge collectors and the feed dryer baghouses. These three HEPA installations were made AFTER the testing conducted for the AB2588 Emissions Inventory and the effect of their improvement is NOT reflected in the January 2013 HRA results.

5 Evaluation of Available Risk Reduction Measures [(f)(3)(D)]

This section will first consider the available measures to reduce emissions and risk from the levels presented in the January 2013 HRA, and will then consider the measures available to reduce emissions further from the post-isolation-door levels presented in Appendix B. This two-step evaluation is warranted because the effectiveness of reducing risk through addressing various pollutants and source points is different at each step.

As outlined in Section 1402(f)(3)(D), the factors to be evaluated for risk reduction measures include emission and risk reduction potential, cost, and time to implement. Starting from the risk levels presented in the January 2013 HRA, and as described above, it was clear to Exide and the AQMD that addressing arsenic emissions from the Hard Lead stack (accounting for 90% of the calculated risk) as quickly as possible was the priority. In that respect, the evaluation of available risk reduction measures took on an early focus much in advance of the regulatory requirement to prepare and submit this Risk Reduction Plan. Assessment of the available emissions testing data showed that the elevated arsenic emission rates from this stack were accompanied by organic toxic emissions, giving strong indication that the underlying cause of elevated Hard Lead stack emissions was the entry of blast furnace process exhaust gases leaking from the furnace up through the furnace's charge chute into the Hard Lead Ventilation system hood situated adjacent to the charge chute. Exide and ENVIRON believe that these blast furnace process gases can contain forms of arsenic that are not filterable by mechanical means such that the Hard Lead baghouse would not effectively control them, while the blast furnace process offgas system, including a wet scrubber, can and does control them (as evidenced by the available testing data on that exhaust).

Accordingly, with strong and appreciated AQMD cooperation and assistance, Exide proactively designed and implemented a measure directed at source control rather than "end-of-pipe" control to reduce these emissions. That is, at this initial stage, rather than focusing on alternate air pollution control technologies, the effort was directed toward better control of the process itself to ensure that emissions are directed to the existing air pollution control systems as intended and most suited to controlling those emissions. Exide determined that installation of a retractable isolation door at the blast furnace feed charge chute would provide a physical barrier that would block the potential for passage of process exhaust out of the charge chute approximately 95% of the time (when closed). The door would be controlled to open only as needed to allow the passage of charge materials from the skip hoist bucket into the furnace.

Exide designed and installed this feed isolation door within five weeks of AQMD approval of the January 2013 HRA. Exide worked diligently and in close cooperation with the AQMD, which issued an expedited permit to construct within a month of the HRA approval. The greatest value of this measure was the ability to implement it quickly— well ahead of any regulatory timeframes set forth in Rule 1402.

In terms of the risk-reduction potential of this measure, initial projections were based simply on a rough estimate of the percentage of time that the isolation door would remain closed. That is, Exide expected that the isolation door would reduce the arsenic emissions from the Hard Lead

stack by approximately 95% and that the door would reduce toxic organic emissions from that stack also by the same percentage via the prevention of the entry of furnace process exhaust gases into the hard lead ventilation system.

As presented in Appendix B, the emission reduction effectiveness of the isolation door, based upon the available data from preliminary engineering testing conducted in April 2013, exceeded the 95% expectation for arsenic and toxic organic emissions from the Hard Lead stack. Most importantly, based on preliminary testing all risk metrics are below the Rule 1402 Action Risk Levels following the installation of the isolation door, by a comfortable margin:

Maximum Exposed Individual Worker cancer risk -	11.2 in one million	vs.	25
Maximum Exposed Individual Resident cancer risk -	3.5 in one million	vs.	25
Cancer Burden -	0.3	vs.	0.5
Maximum Chronic Hazard Index, Worker -	1.59	vs.	3
Maximum Chronic Hazard Index, Resident -	0.15	vs.	3
Maximum Acute Hazard Index, Worker -	0.44	vs.	3
Maximum Acute Hazard Index, Resident -	0.01	vs.	3

These performance levels remain to be confirmed via comprehensive emission tests which commenced on August 13, 2013 to be followed by the submittal of an update to Appendix B by December 1, 2013.

As part of the assessment of those comprehensive confirmation tests, AQMD and Exide will be establishing further permit requirements for process parameters and associated monitoring to assure that the facility operation and isolation door function remain consistent with the conditions at the time of the testing.

Contingent Potential Measures

Should the pending emissions tests not confirm that the currently installed isolation door has been sufficiently effective to reduce the facility risk, Exide will pursue and further study one or both of the following improvement measures as contingencies to reduce arsenic emissions from the Hard Lead Ventilation System stack to a degree sufficient for the facility to reduce risks below the AQMD Rule 1402 Action Risk Levels:

1. Upgrade of the feed isolation door from the current configuration involving a sliding door which opens to allow feed to enter the blast furnace to a unit providing an airlock. This might either be accomplished by a rotating drum feed mechanism or via a double door configuration. In either approach, a seal would be maintained even when feed is being introduced. Exide is currently conducting engineering on these options. If necessary as a contingency, Exide would submit an air permit application seeking installation approval by March 1, 2014 and implement the updated door by September 1, 2014 (depending on agency approval and permitting), and/or
2. If the testing indicates that the isolation door is working well, but that insufficient emission reductions from the Hard Lead Ventilation System stack are the result of arsenic emissions from refining kettle arsenic additions, Exide would pursue a separate emission

control system to be applied to the separate ventilation of up to two refining kettles. Arsenic addition would be limited to those separated refining kettles and alternate emission controls applied to that relatively small air flow which is appropriate and effective for the control of unfilterable arsenic compounds. Potential technologies include, but are not limited to, wet scrubbing and adsorption approaches. If necessary, Exide would submit an air permit application seeking installation approval by March 1, 2014 and implement the separate kettle emission controls by September 1, 2014 (depending on agency approval and permitting).

Beyond the above-listed “contingent” measures to address and improve the isolation door effectiveness and/or otherwise specifically reduce the arsenic emissions from the Hard Lead Ventilation System stack, Exide is committed to install other additional and further emission controls on other sources addressing additional pollutants at the facility as outlined in the following section.

Remaining Risk Culpability and Contributors

The isolation door is a measure that has been implemented, is permanent, and its operation is already required by Title V permit. While its effectiveness remains to be confirmed, its presence is required as of the date of preparation of this RRP analysis. With that in hand, we look next to what the risk “profile” from the facility is once the isolation door has the effect of bringing the Hard Lead stack performance into line. From that profile, we evaluate the spectrum of measures that could be employed to further reduce the post-isolation-door risks.

In particular, we present the following tabulations of the contributing sources and pollutants to the summary of risk metrics presented above and in Appendix B for the Post-isolation door case for the Maximally Exposed Individual Worker (MEIW), the highest risk scenario:

Table 1 Contributions to MEIW-Cancer Risk (contributions >1% listed)		
By Chemical		
Chemical Name	Cancer Risk	Contribution
Arsenic	3.45E-06	30.8%
Cr(VI)	2.64E-06	23.6%
1,3-Butadiene	2.09E-06	18.7%
PCBs	8.86E-07	7.9%
Benzene	7.87E-07	7.0%
Lead	4.21E-07	3.8%
Naphthalene	4.21E-07	3.8%
Cadmium	2.06E-07	1.8%
Dioxins	1.93E-07	1.7%
Other Chemicals	1.06E-07	0.9%

Table 1 Contributions to MEIW-Cancer Risk (contributions >1% listed)		
By Source		
Source	Cancer Risk	Contribution
HARDLEAD	2.84E-06	25.4%
SOFTLEAD	2.13E-06	19.0%
DRYER_BH	1.71E-06	15.3%
MAPCO	1.22E-06	10.9%
NEPTUNE	1.09E-06	9.7%
MAC_BH	5.89E-07	5.3%
MAT_STOR	5.07E-07	4.5%
NOR_CART	3.87E-07	3.5%
Other Sources	7.27E-07	6.5%
By Source and Chemical		
Chemical and Source	Cancer Risk	Contribution
Arsenic from HARDLEAD	1.96E-06	17.5%
1,3-Butadiene from SOFTLEAD	1.60E-06	14.3%
Cr(VI) from MAPCO	1.14E-06	10.2%
Cr(VI) from NEPTUNE	6.21E-07	5.5%
PCBs from DRYER_BH	6.10E-07	5.4%
Benzene from DRYER_BH	5.45E-07	4.9%
Cr(VI) from MAC_BH	4.65E-07	4.2%
Arsenic from NOR_CART	3.62E-07	3.2%
Naphthalene from HARDLEAD	3.32E-07	3.0%
1,3-Butadiene from DRYER_BH	2.91E-07	2.6%
PCBs from HARDLEAD	2.71E-07	2.4%
Arsenic from SOFTLEAD	2.47E-07	2.2%
Cr(VI) from MAT_STOR	2.38E-07	2.1%
Arsenic from MAT_STOR	2.31E-07	2.1%
Dioxins from NEPTUNE	1.89E-07	1.7%
1,3-Butadiene from NEPTUNE	1.78E-07	1.6%
Benzene from SOFTLEAD	1.69E-07	1.5%

Table 1 Contributions to MEIW-Cancer Risk (contributions >1% listed)		
Arsenic from MAC_BH	1.19E-07	1.1%
Other chemicals/sources	1.63E-06	14.6%
Total	1.12E-05 or 11.2 in a million	100%

Several conclusions regarding potential further risk reduction are drawn from the above “culpability” tabulations:

- While calculated cancer risk from arsenic remains the highest contributing pollutant, the sources of arsenic contributing to the remaining, or “residual” risk, after the effect of the isolation door are more diffuse, involving more sources, and
- Calculated cancer risk from organic toxic air contaminants accounts for about 40% of this residual risk.

The diffusion of risk among the sources and pollutants leads to an analysis of finding where additional controls on particular sources would have the most effect.

Potential Further Controls

Initially, we consider the effect on reducing this MEIW maximum risk by the implementation of Wet Electrostatic Precipitation (WESP), a technology receiving much attention and even mentioned by AQMD for consideration in its March 1, 2013 HRA approval letter. WESP has proven to be able to achieve very low emission rates of toxic metals, but at very high cost and physical space requirements. Consider that the WESP technology has been employed at another lead recycling facility on Southern California on sources that are analogous to the following stacks at the Exide Vernon facility, listed with their associated risk contribution from all metals to the 11.1 in a million combined MEIW risk after installation of the isolation door.

Table 2 MEIW Cancer Risks of Metal Emissions from Four Exide Stacks	
Source	Combined MEIW risk, all metals
Neptune scrubber	7.09E-07
Hard Lead Stack	2.07E-06
Soft Lead Stack	3.18E-07
Dryer Stack	2.01E-07
Total	3.3E-06 or 3.3 in a million

This analysis assumes that a WESP would be 95% effective in reducing toxic metal emissions. Installation of the 215,000 cfm system (compared to Quemetco’s significantly smaller system size of approximately 100,000 cfm) that would be necessary to control the above-listed sources would have the effect of reducing the MEIW risk by 3.1 in a million, taking the facility-wide total down to 8.1 in a million, a 28% reduction in the overall risk from the facility. Even if the WESP

were perfect in eliminating 100% of the metals emissions from these four stacks, the risk reduction at the MEIW would be 3.3 in a million.

This reduction would have a capital cost on the order of \$30 million based upon both Environmental Protection Agency (EPA) cost estimation data from the development of the revised National Emission Standards for Hazardous Air Pollutants (NESHAPS) for this industry and update cost information presented in the “Feasibility Study, SCAQMD Rule 1420.1(o)” of August 2011 included as Appendix C to this report. Further, as presented in Appendix C, space constraints essentially preclude the installation of such a system at the Exide Vernon facility. EPA directly considered and rejected the imposition of WESP controls as existing or new source MACT in the recent revision to the NESHAP for this industry – a decision recently upheld by a federal appeals court.

By contrast, rather than mandating WESP control, we explore the specific risk drivers (pollutants and sources) making up the residual risk at the Exide Vernon facility and then consider potential technological and cost-effective alternative measures to further reduce that risk to levels akin to what a WESP could potentially provide.

Control of Toxic Organic Emissions

First, we address the residual risk posed by organic toxic emissions, noted above to comprise about 40% of the residual MEIW risk. In turn, this toxic organic contribution to the MEIW risk is essentially equally split between organic emissions from the Soft Lead stack and the Feed Dryer stack, each at about 1.5 in a million risk. The cost to control emissions from a given source is directly proportional in large part to the airflow of the source – handling more flow requires larger devices. And, in the case of organic pollution control devices, typically thermal oxidizers, operating costs (in fuel) will also increase greatly when handling larger flows. For comparison in this case, the flow of the Soft Lead stack is approximately 100,000 cfm while the flow from the Feed Dryer stack is approximately 15,000 cfm – 15% of the Soft Lead stack flow. Thus, one can achieve the same degree of risk control by controlling organic emissions from the feed dryer as from the Soft Lead stack with a unit only 15% of the size.

Beyond the afterburners and inherent reverberatory furnace heat that control toxic organics from the direct furnace process emissions, per the NESHAP for this industry, only one other source that has ever been fitted with toxic organic air pollution control devices, which was for a reverberatory furnace Feed Dryer.

Given this example and the ability to get the most risk reduction from the smallest flow, Exide proposes and commits to the installation of a RTO on the exhaust of its Reverberatory Furnace Feed Dryer. Assuming a nominal 90% expected destruction efficiency, this would reduce facility risk at the MEIW by 1.3 in a million. Order of magnitude estimated capital cost for this unit is \$1 million. Exide expects to be able to have this unit installed by September 1, 2014, pending AQMD permitting, procurement, and installation.

Control of Toxic Metal Emissions

As stated above, the WESP technology is not feasible for the Exide Vernon facility as detailed in the Feasibility Study of Appendix C. Looking beyond WESP toward technologies that are

feasible for further improving emissions of toxic metals, Exide notes that the best-controlled facilities in the industry have deployed or are deploying secondary filtration devices downstream of the primary dust collection baghouses in the form of HEPA filters. The degree of emission reduction that can be achieved by HEPA filters on this industry’s stack emissions is unclear and expectations vary widely. While HEPA filters are rated by definition to filter 99.97% of particles at a 0.3 micron size, it is not appropriate to assume or estimate that placing a HEPA filter downstream of a fabric filter or cartridge collector will reduce metal emissions by a further 99.97%. This is because some relatively significant fraction of the metal emissions exiting a fabric filter will be in the “condensable” size range, that is, material that passes through the filter in the stack testing apparatus and subsequently caught in the wet impingers in the test train. Material small enough to pass through the stack testing filter is also small enough to pass through a HEPA filter. EPA, for example, found in its analysis of the industry’s emission data that “HEPA filters used downstream of a baghouse achieve approximately 20 percent lower outlet concentrations than baghouses alone.” [Docket ID No. EPA-HQ-OAR-2011-0344 item 0055, page 5]. The AQMD established a higher range of expectation in its calculation of the expected improvement from installing HEPA filters downstream of the Exide Vernon facility’s cartridge collectors. The District estimated that such installation would reduce lead emissions by 70.8% and result in outlet lead concentrations downstream of the HEPA filters of 2.715 microgram per dry standard cubic meter (µg/dscm). [see document “HB3151-25 Excess Emissions“ from Case 3151-25, attached as Appendix F to the Feasibility Study in Appendix C] In the case of the remaining arsenic emissions from the Hard Lead stack, preliminary engineering testing conducted on April 19 after the installation of the isolation door found outlet arsenic to be more than 50% in the filterable fraction, consistent with the filterable fraction of lead. To the extent we can expect lead improvement in the 20 to 70% range, these comparisons of filterable fraction composition for arsenic lead us to also expect arsenic improvement in the same range. Based upon that fraction, we expect metals improvement on the order of 50% nominally for stacks fitted with secondary HEPA filters.

This facility has already installed secondary HEPA filters on the MAPCO battery breaker demister (in place for the AB2588 testing and already reflected in the January 2013 HRA), the Feed Dryer stack, and the North and South Torit stacks (none of these improvements reflected in the January 2013 HRA). Exide additionally proposes and commits to installing secondary HEPA filters on all other stacks at its facility, other than the Neptune Scrubber stack which already has the inherent secondary filtration effect of the wet scrubber downstream of its associated baghouses. This would add secondary HEPA filtration to the Hard Lead, Soft Lead, Material Handling, and MAC stacks.

The risk contributions at the MEIW remaining after the isolation door improvement for each of these stacks for which HEPA improvement is not already accounted for in the January 2013 HRA are:

Table 3 MEIW Risks of Metal Emissions from Eight Exide Stacks	
Source	Combined MEIW risk, all metals
Material Handling	5.07E-07

Table 3 MEIW Risks of Metal Emissions from Eight Exide Stacks	
Hard Lead Stack	2.07E-06
Soft Lead Stack	3.18E-07
Dryer Stack	2.01E-07
MAC baghouse stack	5.88E-07
North Torit Stack	3.88E-07
South Torit Stack	5.37E-08
Total	4.1E-06 or 4.1 in a million

A fifty percent reduction in the metals emissions from these stacks via HEPA filtration would reduce MEIW risk by 2.1 in a million. Of this improvement, some is from units already installed but not yet tested. The proposal going forward is to install HEPA units on four additional stacks (Hard Lead, Soft Lead, Material Handling, and MAC) each of roughly 100,000 cfm nominal capacity. Based on Exide experience with the installation of the similarly sized units downstream of the Torit cartridge collectors, Exide expects cost on the order of \$350,000 per unit, or \$1.4 million in the aggregate for four.

In terms of timing, Exide has already applied for (and been issued) an air permit to install the secondary HEPA unit on the Material Handling baghouse and expects to have this unit installed by January 21, 2014. Exide will install the secondary HEPA filters on the remaining units by September 1, 2014, subject to AQMD permit approval.

Overall Reductions

In further reducing the residual risk remaining after the installation of the isolation door at the MEIW (now estimated at 11.2 in a million), the following reductions are expected from the further incremental controls proposed:

Installation of RTO on Feed Dryer	1.3 in a million reduction
Installation of Secondary HEPAs	2.1 in a million reduction
Total	3.4 in a million reduction

Two important points are to be made regarding this proposed degree of further improvement:

- The expected level of risk remaining after the installation of the isolation door is already below the Rule 1402 Action Risk Levels before implementation of any of these additional measures and their associated further reductions, and
- The level of incremental MEIW risk reduction from the proposed suite of additional measures of 3.4 in a million is the same as that which would be achieved by implementation of a WESP on those same source types as the other facility in this industry in Southern California.

6 Specification of Risk Reduction Measures [(f)(3)(E)]

The basic specifications of the measures proposed for achieving compliance with the Action Risk Levels are as follows:

The blast furnace feed chute isolation door, already permitted, installed, and operating, is designed to provide an effective barrier to the passage of blast furnace process gases out through the furnace charge chute when closed. Its system includes an actuator system that drives the door opening and closing in conjunction with passage of the feed skip hoist over the chute to allow charging. This actuation is also fitted with a recorder to log its activity.

The RTO for control of organic toxic emissions from the feed dryer will be specified to the potential vendors to achieve a destruction efficiency of the key risk-driving organic emittents (benzene, 1,3-butadiene, and PCB's) of at least 90 percent. Exide and ENVIRON expect that this level of performance will be achieved by an RTO having basic specifications of residence time in the 0.3 to 1.3 seconds range with temperatures between 1400 and 1500 degrees F. Details will be refined through vendor interaction to seek the 90 percent destruction target.

The secondary HEPA filters to be installed will meet the standard HEPA specification of 99.97% efficiency at 0.3 microns.

More detailed specifications were provided with the air permit application for the feed chute isolation door submitted on March 7, 2013 and approved by AQMD on March 28, 2013. Additional detail and specification of the proposed RTO and secondary HEPA filtration units will similarly be provided with the air permit applications seeking approval for their installation.

7 Schedule [(f)(3)(F)]

Exide believes that the installation of the blast furnace feed chute Isolation Door has already been effective to a degree sufficient to bring the health risks below the Rule 1402 Action Risk Levels. The scheduled activities associated with this measure, therefore, relate to the conduct of testing to confirm that assessment. In terms of the additional measures Exide is proposing in this Plan, Exide is committed in good faith to make those improvements on timelines without waiting for the approval of this RRP as a trigger date. That is, Exide is proceeding with design of the RTO and secondary HEPA installations and will be submitting permit applications for their construction in an expedited fashion.

Details of the scheduled activities are as follows (certain dates and projects are subject to reasonable modification):

Conduct confirmatory isolation door testing and report results	10/4/13
Submittal of revised updated HRA, replacing Appendix B, based on the confirmatory test results	12/1/13
Submit air permit applications for secondary HEPA on Hard Lead, Soft Lead, and MAC baghouses	12/1/13
Submit air permit application for RTO on Feed Dryer	12/1/13
Complete installation of secondary HEPA on Material Handling baghouse	1/21/14
Complete installation of secondary HEPA on Hard Lead, Soft Lead, and MAC baghouses	9/1/14
Complete installation of RTO on Feed Dryer	9/1/14

Per the March 1, 2013 letter approving the January 2013 HRA, Exide is not eligible for time extension, and Section (f)(3)(G) is, therefore, not applicable.

8 Estimation of Post-Implementation Risk [(f)(3)(H)]

Exide has projected the facility-wide risk that would remain after the implementation of all the above-described measures: the blast feed chute isolation door (subject to testing), feed dryer RTO, and secondary HEPA filtration on all sources other than the Neptune Scrubber exhaust. This assessment is presented in Appendix D. A summary of the key results metrics are as follows:

Maximum Exposed Individual Worker cancer risk -	7.8 in one million
Maximum Exposed Individual Resident cancer risk -	2.3 in one million
Cancer Burden -	0.1
Maximum Chronic Hazard Index, Worker -	1.17
Maximum Chronic Hazard Index, Resident -	0.09
Maximum Acute Hazard Index, Worker -	0.43
Maximum Acute Hazard Index, Resident -	0.01

Appendix A

May 2, 2013 Memorandum on Preliminary Testing

MEMORANDUM

TO: Exide Technologies

FROM: Russell S. Kemp, PE
Principal

DATE: May 2, 2013

RE: Assessment of Effectiveness of Blast Furnace Isolation Door
Vernon, California, Facility

As requested, we have conducted an evaluation of the effectiveness of the blast furnace charge chute isolation door installed at the Exide Technologies facility in Vernon, California, in terms of reducing emissions from the Hard Lead Ventilation System stack and reducing overall calculated facility risk. Based upon the details and analysis provided below, we conclude that the isolation door has been effective in its intended purpose and has resulted in reducing the overall calculated facility risks to below the Action Risk Levels specified in South Coast Air Quality Management District (AQMD) Rule 1402, which implements the AB2588 air toxics program. This conclusion is based upon preliminary engineering test data collected on April 9, 10, 18, and 19, 2013 subsequent to the installation of an isolation door on the blast furnace charge chute. These test data have been shared with the AQMD and are subject to confirmation through further detailed emission testing specified in the air permit for the installation of the isolation door issued on March 28, 2013. It is our opinion that these confirmatory official tests will confirm the findings and conclusions presented in this memorandum.

Background

On March 1, 2013, AQMD issued its approval of the AB2588 Health Risk Assessment (HRA) prepared by ENVIRON International Corporation (ENVIRON) and submitted in January 2013. That HRA was prepared in accordance with protocols approved by AQMD with DTSC in a consultative role and is based upon emissions data collected in testing conducted in 2010 and 2012. As summarized in the AQMD letter of March 1, 2013 the calculated health risks exceeded the Public Notice thresholds and Action Risk Levels in AQMD Rule 1402 which implements AB2588.

The primary driver of risk in this HRA was the impact of arsenic emitted from the facility's Hard Lead Ventilation System stack. This ventilation system is comprised of ductwork serving a number of hoods intended to collect metal-bearing dust at points of potential worker exposure around the facility's blast furnace and the refining kettles associated with that furnace. The air collected at these hoods is filtered in a baghouse to remove metals prior to discharge to the atmosphere. Through evaluations performed in 2011 and 2012 it was determined that blast furnace process exhaust was making its way into some of the hooding around the furnace charge chute rather than being confined to its intended path through the furnace afterburner, blast furnace baghouse, and wet scrubber. Operational improvements implemented in 2012 were successful in reducing arsenic emissions from the Hard Lead Ventilation System stack by approximately 70% from that measured in 2010. The HRA submitted in January 2013 and approved on March 1, 2013 was based upon the average of the 2010 and 2012 test results for this stack.

In order to more reliably preclude the entry of blast furnace process exhaust into the Hard Lead Ventilation System, Exide designed an isolation door system for the charge chute which would

provide a more direct and positive barrier for containing the process exhaust gases in the furnace as desired. The AQMD approved a permit application for the installation of this isolation door on an expedited basis on March 28, 2013 and the installation of the door was completed on April 4, 2013.

Testing

ENVIRON developed a testing program for the evaluation of the effectiveness of the isolation door which was shared with AQMD. Emissions testing on the Hard Lead Ventilation System stack commenced on April 9, 2013 with ENVIRON personnel in attendance for all testing. As testing progressed over subsequent days, AQMD personnel observed some of the tests and splits of the physical samples collected by Almega were delivered to the AQMD's laboratory. Preliminary results from the testing were transmitted to AQMD by Almega simultaneously with delivery to ENVIRON and Exide.

Three 2-hour duration tests were conducted on April 9, 2013. At this stage, the isolation door was newly installed and still in a "debugging" mode of operation. Notably, the mechanism experienced jams resulting in leakage, especially during the third run. A single 4-hour duration test was conducted on April 10, 2013. Operation of the door was more steady during this run.

Subsequent to the testing on April 9 and 10, the facility made further improvements to the door mechanism. Four-hour tests on the Hard Lead Ventilation System exhaust were conducted on April 18 and 19. During the testing on the 18th, arsenic was added directly to one of the refining kettles served by the Hard Lead Ventilation System to assess the potential for that activity to affect emissions.

The preliminary results from these four days of testing are presented in **Table 1**. In that Table we also present, for reference, the prior results for arsenic, benzene, and 1,3-butadiene from this stack from 2010 and 2012 which formed the basis of the approved January 2013 HRA. We also compare the emission results obtained since installation of the isolation door with these prior data. As noted above, the reduction in arsenic emissions achieved by operational adjustments between 2010 and 2012 was 70%. The recent data indicate a further reduction beyond the 2012 improvement on the order of 98%. Comparable levels of improvement are also seen in the emissions of benzene and 1,3-butadiene, both of which would be associated with furnace process gases, further demonstrating the effectiveness of the isolation door in minimizing the escape of process gases into the Hard Lead Ventilation System.

Risk

To evaluate the impact of these emissions improvements on calculated risk, we substituted these new emission data for arsenic, benzene, and 1,3-butadiene from the Hard Lead Ventilation System stack into the same HRA protocol and calculation approach as used in the HRA approved on March 1, 2013. That is, we reassessed facility-wide risk including all the other stacks and pollutant data just as they were in the January 2013 HRA with the only adjustment being these alternate emission data from the Hard Lead Ventilation System stack. Results of these analyses are also presented in **Table 1**.

Based upon the April 10, 2013 emission data, highlighted in pink in Table 1, calculated risks are all below the Rule 1402 Action Risk Levels. Residential and sensitive receptor (e.g., schools) cancer risks are all less than 5 in a million. The maximum worker cancer risk is only slightly above 10 in a million.

As stated above, improvements were made to the isolation door system between the testing conducted on April 10 and April 18. The testing conducted on April 18 also had the diagnostic purpose of assessing the potential remaining influence from the addition of arsenic into a refining kettle to adjust alloy specification – an activity typically performed on only a handful of kettle batches each week. Arsenic emissions from the Hard Lead Ventilation System stack were, indeed, higher on April 18 than on the 10th or 19th, but still 98% less than the arsenic emission rate used in the January 2013 HRA. In addition, the 1,3-butadiene emission rates on the 18th and 19th were a factor of ten lower than those measured on April 10, indicating that the door function was improved between the 10th and 18th. Arsenic emissions on the 19th were also substantially lower than those seen during the first week of testing on the 9th and 10th.

A second set of risk calculations was run using the average rates from April 18th and 19th as inputs. This combination is believed to be a conservative projection of the emissions that would be expected during the official testing series which will involve three 8-hour tests. These risk calculations, again simply substituting in data in Table 1 for the Hard Lead Ventilation System stack with all other inputs as they were in the approved January 2013 HRA, indicate essentially the same results as the scenario from the April 10 data. That is, any elevation in arsenic emissions resulting from the occasional addition of arsenic to a refining kettle for alloy adjustment was offset by the further reductions in 1,3-butadiene emissions achieved by the improvements to the isolation door mechanism after April 10.

Results of the Hard Lead Ventilation System stack testing reflect that only one receptor has a calculated cancer risk above 10 in a million and that is the same receptor that had a calculated cancer risk of 156 in a million in the January 2013 HRA.

Most significantly, all these calculated risks based on preliminary emissions testing since the installation of the isolation door meet the risk reduction Action Risk Levels specified in AQMD Rule 1402 of 25 in-a-million cancer risk, hazard index of 3, and cancer burden of 0.5 by a wide margin. It is our opinion that based on these preliminary results, no further risk reduction will be necessary to satisfy Rule 1402.

Summary and Next Steps

It is our understanding that AQMD is reviewing these preliminary test data. In addition, as noted above, the air permit issued on March 28, 2013 calls for triplicate emissions tests conducted simultaneously on the Hard Lead Ventilation System stack and the Neptune Scrubber stack (through which the blast furnace process gases exhaust) to be conducted before August 2, 2013. Given the breadth of the preliminary engineering testing conducted thus far, we believe that the emissions to be measured during these pending tests will be less than the average rates from April 18th and 19th. That is, it is our expectation that the pending official permit-required testing will confirm the analysis contained herein, likely with emissions and risks below those presented.

Table 1 Comparison of Hard Lead System Test Data

Green = ND value entered at detection limit

INITIAL THREE RUNS, 09 April 2013

	2008 lb/hr	2010 lb/hr	2012 lb/hr	%Reduction 2012 v. 2010	2010-2012 avg. used in HRA	4/9/13 Run 1	4/9/13 Run 2	4/9/13 Run 3	4/9/2013 Average	4/9/2013 avg %Reduction from 2010	4/9/2013 avg %Reduction from 2012	4/9/2013 avg %Reduction from HRA
Arsenic	8.50E-04	0.0759	0.0210	72%	0.0486	0.00032	0.00063	0.0031	0.00135	98.2%	93.6%	97.2%
Benzene		1.41	0.531	62%	0.97	0.011	0.0185	0.045	0.02483	98.2%	95.3%	97.4%
1,3-Butadiene		0.345	0.15	57%	0.248	0.0012	0.0017	0.013	0.00530	98.5%	96.5%	97.9%

DETINNING TREATMENT, 10 April 2013

	2008 lb/hr	2010 lb/hr	2012 lb/hr	%Reduction 2012 v. 2010	2010-2012 avg. used in HRA	OUTLET 4/10/2013 lb/hr	4/10/2013 %Reduction from 2010	4/10/2013 %Reduction from 2012	4/10/2013 %Reduction from HRA
Arsenic	8.50E-04	0.0759	0.0210	72%	0.0486	4.00E-04	99.5%	98.1%	99.2%
Benzene		1.41	0.531	62%	0.97	0.045	96.8%	91.5%	95.4%
1,3-Butadiene		0.345	0.15	57%	0.248	0.019	94.5%	87.3%	92.3%

Substituted in for Hard Lead stack with all other inputs same as January 2013 HRA

Purple font indicates value above Notification Threshold
Red font indicates value above Risk Reduction Action Level

MEIW max Worker Cancer Risk	1.07E-05 at receptor 1005
MEIW max Worker Chronic Hazard Index	1.23 at receptor 1005
Acute Hazard Index Max Worker	0.438 at receptor 80
MEIR max Resident Cancer Risk	3.48E-06 at receptor 1016
MEIR max Resident Chronic Hazard Index	0.128 at receptor 1016
Max School Cancer Risk	2.59E-06 Salazar Park Head Start
Max School Chronic Hazard Index	0.1 Salazar Park Head Start
Cancer Burden	0.315

ARSENIC ADDITION IN REFINERY, 18 April 2013

	2008 lb/hr	2010 lb/hr	2012 lb/hr	%Reduction 2012 v. 2010	2010-2012 avg. used in HRA	OUTLET 4/18/2013 lb/hr	4/18/2013 %Reduction from 2010	4/18/2013 %Reduction from 2012	4/18/2013 %Reduction from HRA
Arsenic	8.50E-04	0.0759	0.0210	72%	0.0486	1.16E-03	98.5%	94.5%	97.6%
Benzene		1.41	0.531	62%	0.97	0.0385	97.3%	92.7%	96.0%
1,3-Butadiene		0.345	0.15	57%	0.248	0.0017	99.5%	98.9%	99.3%

TYPICAL OPERATIONS, 19 April 2013

	2008 lb/hr	2010 lb/hr	2012 lb/hr	%Reduction 2012 v. 2010	2010-2012 avg. used in HRA	OUTLET 4/19/2013 lb/hr	4/19/2013 %Reduction from 2010	4/19/2013 %Reduction from 2012	4/19/2013 %Reduction from HRA
Arsenic	8.50E-04	0.0759	0.0210	72%	0.0486	2.10E-04	99.7%	99.0%	99.6%
Benzene		1.41	0.531	62%	0.97	0.0073	99.5%	98.6%	99.2%
1,3-Butadiene		0.345	0.15	57%	0.248	0.0012	99.7%	99.2%	99.5%

Average of results from 18 and 19 April

	2008 lb/hr	2010 lb/hr	2012 lb/hr	%Reduction 2012 v. 2010	2010-2012 avg. used in HRA	OUTLET 18 & 19 avg lb/hr	4/19/2013 %Reduction from 2010	4/19/2013 %Reduction from 2012	4/19/2013 %Reduction from HRA
Arsenic	8.50E-04	0.0759	0.0210	72%	0.0486	6.85E-04	99.1%	96.7%	98.6%
Benzene		1.41	0.531	62%	0.97	0.0229	98.4%	95.7%	97.6%
1,3-Butadiene		0.345	0.15	57%	0.248	0.00145	99.6%	99.0%	99.4%

Substituted in for Hard Lead stack with all other inputs same as January 2013 HRA

Average of 4/18 and 4/19	
Arsenic	6.85E-04 lb/hr
Benzene	2.29E-02
1,3-Butadiene	1.45E-03

Purple font indicates value above Notification Threshold
Red font indicates value above Risk Reduction Action Level

MEIW max Worker Cancer Risk	1.11E-05 at receptor 1005
MEIW max Worker Chronic Hazard Index	1.59 at receptor 1005
Acute Hazard Index Max Worker	0.438 at receptor 80
MEIR max Resident Cancer Risk	3.50E-06 at receptor 1016
MEIR max Resident Chronic Hazard Index	0.144 at receptor 1016
Max School Cancer Risk	2.44E-06 Salazar Park Head Start
Max School Chronic Hazard Index	0.106 Salazar Park Head Start
Cancer Burden	0.322

Appendix B

Updated Emissions Inventory and Health Risk Assessment

Appendix B

Updated Health Risk Assessment

ENVIRON prepared this updated health risk assessment (HRA) to provide preliminary risk metrics reflecting the effects of the isolation door recently installed on the charge chute to Exide's blast furnace. This door minimized the potential for blast furnace process exhaust gases to be drawn into the hooding for the Hard Lead Ventilation System. Preliminary engineering source test results showed that the isolation door was effective in reducing the Hard Lead emissions. The air toxic emissions used in this update are described in Section B.1 below. ENVIRON used the same air modeling and risk assessment methodologies as that of the approved January 2013 HRA. A brief summary of our methodologies is included in Section B.2 below. Section B.3 describes the health risk results.

B.1 Updated Air Toxic Emissions

Exide conducted preliminary engineering stack tests on the Hard Lead Ventilation System stack on four days in the first two weeks of the operation of the isolation door, specifically on April 9, 10, 18 and 19, 2013. In addition, AQMD personnel conducted a test of the emissions of metals from the Neptune Scrubber stack on April 18 and 19, 2013. Presented in Table B-1 and used in this updated HRA are the average data from the sources tests conducted for the Hard Lead Ventilation System stack and the Neptune Scrubber stack on April 18 and 19, 2013. All other air toxic emissions are the same as those in the approved 2013 HRA. Table B-1 also provides the reduction of metal emissions from the Hard Lead Ventilation System stack after the installation of the isolation door, indicating 98 to 99% reduction for arsenic, benzene, and 1,3-butadiene.

B.2 Modeling and Risk Assessment Methods

This updated HRA repeated the risk calculations in the approved 2013 HRA. Emission sources included all nine stacks of the manufacturing processes and two stacks for the natural gas water heaters as point sources, as well as the area sources representing the onsite reentrained road dust. ENVIRON updated the emission data in the approved 2013 HRA with those listed in Table B-1. The updated *.tra file, which imports the emission rates to the HARP program, is included in the CD-ROM in Appendix E of the RRP.

ENVIRON used the same XOQ files that were generated for the approved 2013 HRA in this updated HRA (included in the CD-ROM). ENVIRON used the regulatory default options to generate the XOQ values using Breeze AERMOD version 7.6 (EPA AERMOD version 12060). The source parameters were based on the source test reports that were used in the approved 2013 HRA. The receptor grid covers a 3,600-square-kilometer area surrounding the facility, and census block receptors were identified within this area using United States Census Bureau data. ENVIRON obtained the meteorological data for the Central Los Angeles station from the South Coast Air Quality Management District (SCAQMD)'s website for the years of 2006 and 2007. The elevations for the sources and receptors were extracted from the National Elevation Datasets (NED) on the United States Geological Survey's (USGS) website. The modeling used the Universal Transverse Mercator (UTM) system of coordinates and the World Geodetic System 1984 (WGS84) spheroid.

ENVIRON used HARP (version 1.4f) to calculate the health risks, which is the same version that ENVIRON used for the approved 2013 HRA and the currently available version on the California Air Resources Board (CARB)'s website. An updated HARP Health Value Database was released by CARB on August 1, 2013. This new database contains updated health values for 1,3-butadiene adopted by OEHHA and was used in this updated HRA. The newly adopted values are: 2 $\mu\text{g}/\text{m}^3$ (chronic REL) and 660 $\mu\text{g}/\text{m}^3$ (acute REL), compared to the 20 $\mu\text{g}/\text{m}^3$ (chronic REL) and no acute REL previously.

ENVIRON used the same risk calculation parameters as those in the approved 2013 HRA, which followed the OEHHA Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessment and the SCAQMD's Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act.

The risk reports generated by HARP are included in the CD-ROM.

B.3 Risk Estimates

After the installation of the isolation door, the cancer risk at the Maximally Exposed Individual Worker (MEIW) is estimated to be 11.2 in a million or 1.12E-5 (vs. 156 in a million prior to the door installation). The MEIW is at Receptor 1005 (389900, 3763600) and is located in the railyard north of the facility (see Figure B-1). The cancer risk at the Maximally Exposed Individual Resident (MEIR) is estimated to be 3.5 in a million or 3.5E-6 (vs. 22 in a million previously). The MEIR is at Receptor 1016 (389900, 3764700) and is located in the residential area north of the facility (see Figure B-2). Both maximum cancer risks are below the SCAQMD Rule 1402 Action Level of 25 in a million.

The cancer burden is estimated to be 0.3, which is below the SCAQMD Rule 1402 Action Level of 0.5. The cancer burden in the 2013 HRA was 10.

The Chronic Hazard Index (CHI) at the MEIW is estimated to be 1.59 (vs. 63 previously). The CHI MEIW is at the same location as the cancer risk MEIW (see Figure B-1). The CHI at the MEIR is estimated to be 0.15 (vs. 2.9 previously) and at the same location as the cancer risk MEIR (see Figure B-2). Both CHIs are below the SCAQMD Rule 1402 Action Level of 3.0.

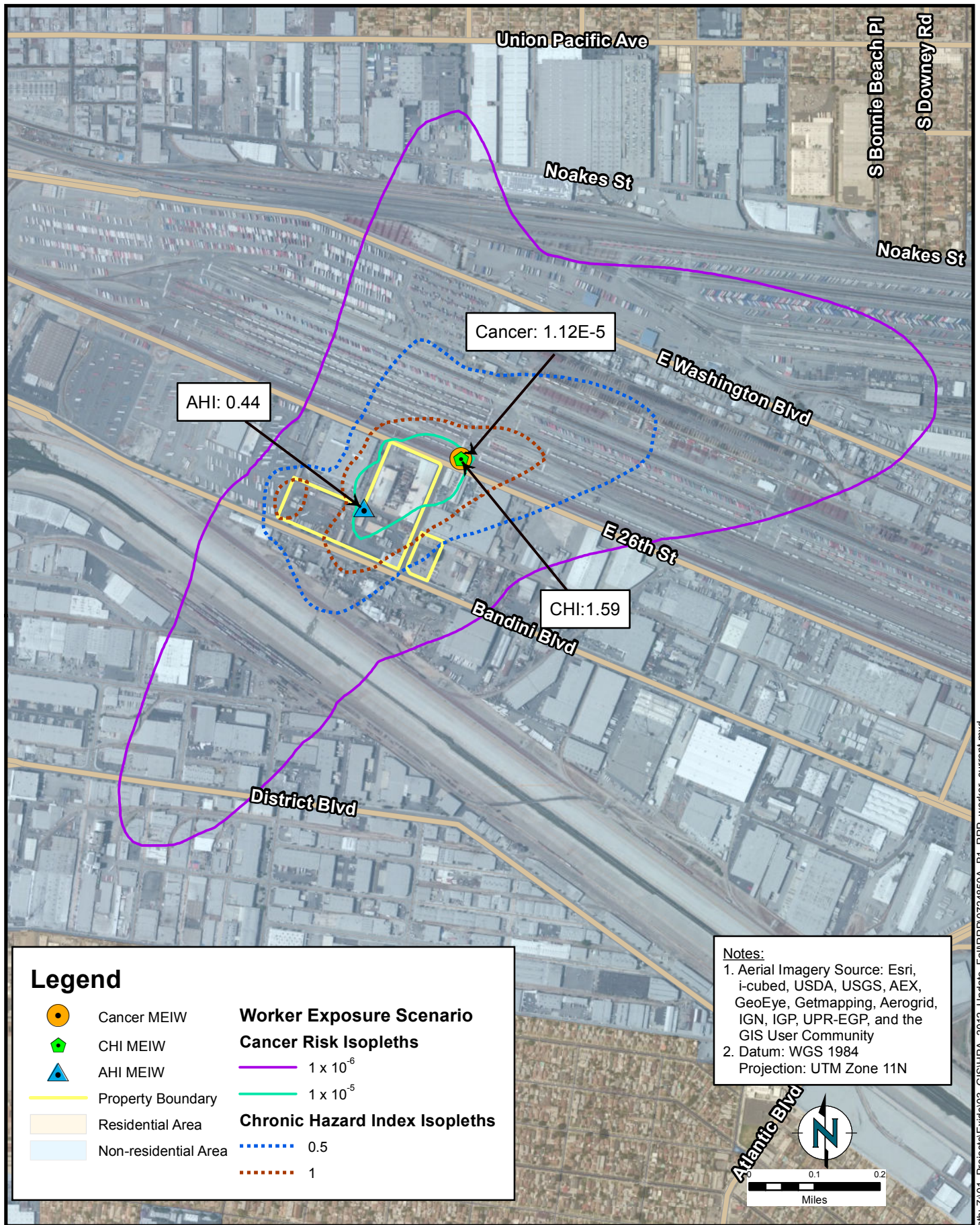
The Acute Hazard Index (AHI) at the MEIW is estimated to be 0.44 (vs. 3.8 previously). It is at Receptor 80 (389659, 3763479) and is located on the western fence line near the railway track. Since the selection for the AHI MEIW included fence line receptors, this AHI MEIW is the same as the AHI PMI (see Figure B-1). The AHI at the MEIR is estimated to be 0.01 (vs. 0.2 previously). It is at Receptor 975 (389800, 3764700) and is located in the residential area north of the facility (see Figure B-2). Both AHIs are below the SCAQMD Rule 1402 Action Level of 3.0.

Table

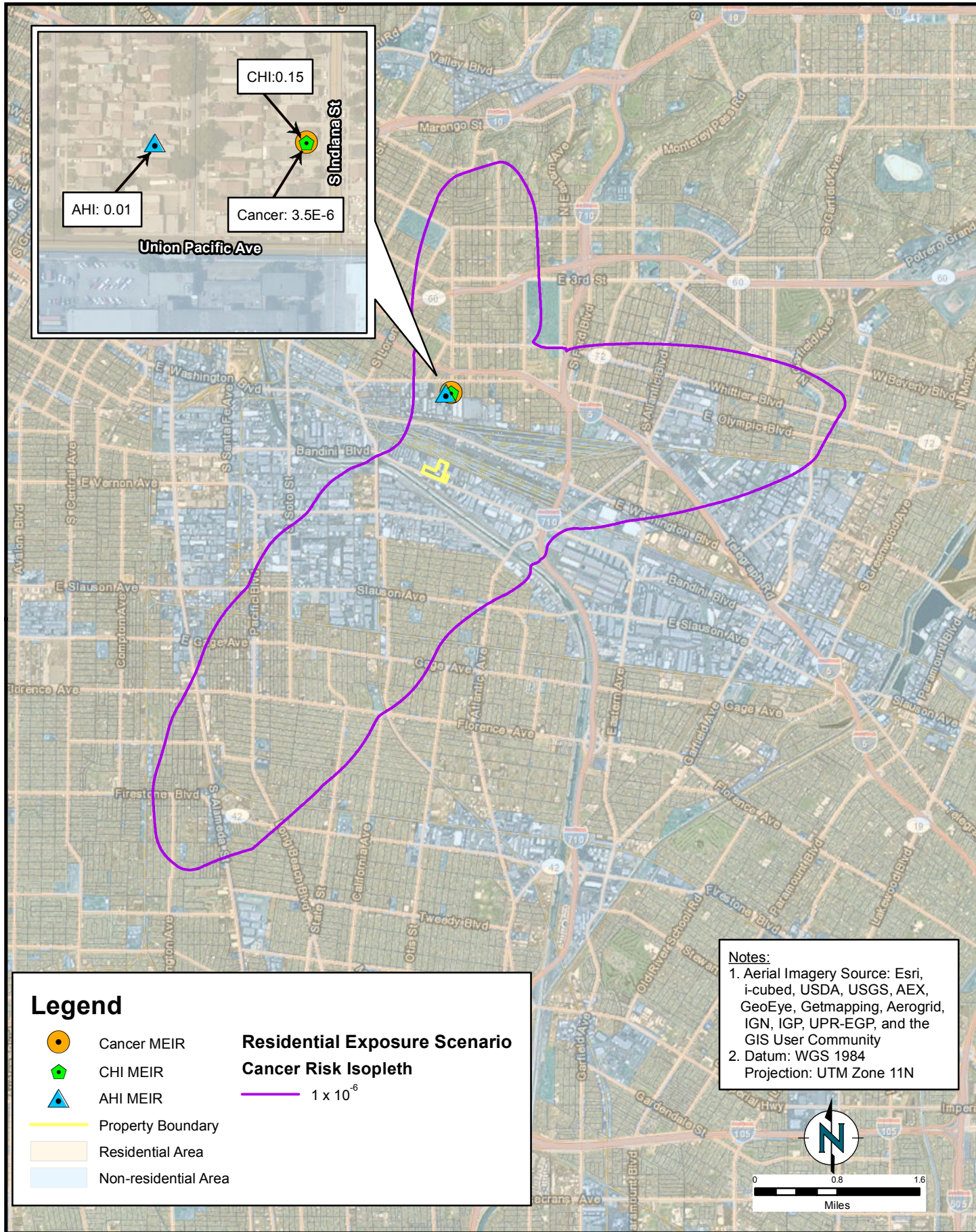
Table B-1 Summary of April 18 and 19, 2013 Source Test Averages

CAS #	Chemical	Annual (lb/yr)	Hourly (lb/hr)	Annual (lb/yr)	Reduction (lb/yr)	Reduction Percentage
		April Test Results for Hard Lead		Data used in the January 2013 HRA for Hard Lead		
7440382	Arsenic	5.98E+00	6.83E-04	4.25E+02	4.19E+02	99%
7439921	Lead	2.67E+01	3.05E-03	1.24E+01	-1.44E+01	-116%
71432	Benzene	2.01E+02	2.29E-02	8.50E+03	8.30E+03	98%
106990	1,3-Butadiene	1.27E+01	1.45E-03	2.17E+03	2.16E+03	99%
		April Test Results for Neptune		Data used in the January 2013 HRA for Neptune		
7440360	Antimony	7.37E-02	8.41E-06	4.50E-02	-2.87E-02	-64%
7440382	Arsenic	4.53E-02	5.17E-06	2.97E-02	-1.56E-02	-53%
7440417	Beryllium	1.02E-02	1.17E-06	0.00E+00	-1.02E-02	NA
7440439	Cadmium	6.89E-01	7.87E-05	5.86E-02	-6.31E-01	-1076%
7440473	Chromium	2.93E-02	3.35E-06	4.96E-02	2.03E-02	41%
7440484	Cobalt	2.69E-02	3.07E-06	1.23E-02	-1.46E-02	-119%
7439921	Lead	1.43E+01	1.63E-03	4.35E+00	-9.93E+00	-229%
7439965	Manganese	5.83E-01	6.66E-05	3.92E-02	-5.44E-01	-1387%
7440020	Nickel	3.11E-01	3.55E-05	2.54E-01	-5.74E-02	-22%
7782492	Selenium	3.29E-01	3.75E-05	7.95E-02	-2.49E-01	-314%

Figures



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Appendix C

Feasibility Study – SCAQMD Rule 1420.1(o)



Feasibility Study
SCAQMD Rule 1420.1(o)

Prepared for:
Exide Technologies
Vernon, California

Prepared by:
ENVIRON International Corporation
Irvine and Los Angeles, California

Date:
August 2011

Project Number:
07-26544A

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- Appendix D. BUSCH FEF-50 Quote
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- Appendix F. HB3151-25 Excess Emissions Calculation

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1 Executive Summary

Exide Technologies, Inc. (Exide) has commissioned this Feasibility Study to comply with SCAQMD Rule 1420.1(o), which requires Exide to evaluate the technical, economic and physical feasibility of achieving a total Pb emission rate of 0.003 lbs/hour from all point sources if emissions are above $0.12 \mu\text{g}/\text{m}^3$ averaged over any 30 consecutive days. We assessed available emission control technologies in order to identify the most cost-effective and efficient technology, or combination of technologies, that could potentially achieve a facility-wide 0.003 lb/hr lead stack emission level.

We considered the following technologies for process source controls: (a) fabric filtration, (b) cartridge collectors, (c) HEPA filters as secondary filtration, and (d) Wet Electrostatic Precipitation (WESP). We also considered Fugitive Emission Filtration (FEF) Units (which include inherent secondary HEPA filtration) as a general ventilation control. Exide already widely employs several of these technologies, and thus appropriately analyzed in detail the two technologies it does not employ, namely the WESP and the FEF Units. After a rigorous analysis, we conclude that neither of the technologies is technically feasible to achieve the 0.003 lbs/hr emission level with any reasonable degree of confidence or with vendor guarantees of performance at such low levels.

In addition, we conclude that none of the technologies are economically feasible. Exide is currently achieving emissions rates below the currently required 0.045 lbs/hr -- a 99% point source reduction. As set forth in its Compliance Plan, by implementing certain point source and fugitive reduction measures, Exide reasonably expects to comply with the National Ambient Air Quality Standard (NAAQS) and Rule 1420.1(d)(2) by January 1, 2012. Even assuming that a combination of technologies might achieve 0.003 lb/hr on a facility-wide basis, it is not reasonably necessary to require Exide to further reduce the mass emissions rate to a level that cannot be guaranteed at a total economically infeasible capital cost of over \$30 million, or an incremental cost of over \$6 million per ton.

Moreover, the facility's space constraints are such that it is not physically feasible to accommodate the potential control technologies within the footprint of the facility.

This Study includes dispersion modeling demonstrating that stack emission control measures already specified in Rule 1420.1 are adequate to attain the $0.15 \mu\text{g}/\text{m}^3$ ambient lead concentration limit. With stack emissions effectively controlled, if additional control measures are necessary to reduce ambient lead concentrations, those measures should be directed toward fugitive emissions reduction.

2 Introduction

2.1 Facility Location

The Exide facility (SCAQMD ID # 124838) is located at 2700 South Indiana Street, Vernon, California. Exide is a secondary lead smelter that recycles lead batteries and other lead-bearing scrap materials. Figure 1 shows the facility and its vicinity. The land use in the immediate vicinity (up to 1.5 kilometers [km] radius) of the facility is industrial and the topography around the facility is primarily flat. The facility's layout showing the locations of the various buildings and the stacks are presented on Figure 2. The nearest residential areas are located approximately 1 km northeast and south of the facility as shown on Figure 3.

2.2 Process Description

Spent lead-acid batteries and other lead-bearing scrap materials are delivered to the facility by trucks, where the batteries and scraps are crushed, separated, and smelted to recover lead and propylene.

The spent lead-acid batteries and lead-bearing scrap are first broken apart and separated into the plastic, lead, and acid components. The plastic is recovered, and the acid is sent to a holding tank. The lead-containing components are transferred into one of the feed rooms, where they are then fed by conveyor to either the Reverberatory (Reverb) furnace (device D119) or the Blast furnace (D128), which are each used to heat the lead until it reaches a molten state.

The lead refining kettles are used to purify the hot, molten lead that is produced during the smelting process. Each kettle sits inside a brick-lined pit, housing natural gas-fired burners. The burners heat the air between the burners and the kettle, thereby heating the kettle. The kettles are continuously heated; however, there are usually only two or three kettles that contain material at any one time. The molten lead in the kettles is repeatedly heated, agitated with a mixer, and allowed to cool, with periodic stirring and additions of refining agents.

The refined lead is then formed into ingots, which are subsequently transferred to the Finished Lead Storage Building.

2.3 Rule 1420.1 Requirements

On November 12, 2008, the United States EPA published the Final Rule in the Federal Register revising the NAAQS from $1.5 \mu\text{g}/\text{m}^3$ to $0.15 \mu\text{g}/\text{m}^3$ measured over a three-month rolling average.

On November 5, 2010, the SCAQMD Governing Board adopted Rule 1420.1 (Emissions Standards for Lead from Large Lead-Acid Battery Recycling Facilities). Rule 1420.1(d)(2) prohibits a covered facility from discharging lead emissions exceeding $0.15 \mu\text{g}/\text{m}^3$ averaged over any 30 consecutive days. The Rule requires covered facilities to implement certain practices and emission control measures to attain the Lead NAAQS and Rule 1420.1(d)(2) standards after January 1, 2012.

Pursuant to Rule 1420.1(o), starting on July 1, 2011, if the facility discharges lead emissions that exceed $0.12 \mu\text{g}/\text{m}^3$ averaged over any 30 consecutive days, the facility shall submit to the SCAQMD a Feasibility Study that addresses the technical, economic and physical feasibility of achieving a total facility mass lead emission rate of 0.003 pounds per hour from all lead point sources.

2.4 Ambient Air Quality Monitoring Results

Monitoring results indicate that on July 30, 2011 the 30-day average ambient concentration at the facility's North, Northeast, and MID monitors exceeded $0.12 \mu\text{g}/\text{m}^3$. Therefore, Exide is submitting this Feasibility Study to fulfill the requirements of Rule 1420.1(o). However, as stated in Exide's Compliance Plan submitted in conjunction with this Feasibility Study, many control measures remain in the progress of being implemented and were not completed by the July 30, 2011 trigger date to meet the $0.12 \mu\text{g}/\text{m}^3$ limit. Exide reasonably believes that it would not have been required to submit this Feasibility Study had all measures (including multiple voluntary "early action" measures) been in place and operational as of July 1, 2011.

3 Feasibility Study Requirements

Rule 1420.1(o) requires that the Feasibility Study address the following elements in determining whether the facility can achieve a total Pb emission rate of 0.003 lbs/hour from all stationary sources:

- Technical feasibility,
- Economic feasibility, and
- Physical feasibility

A discussion of each of these elements is provided in the following sections.

3.1 Current Facility-wide Pb Emission Rate

Table 1 summarizes emissions rates from all Pb point sources from Exide's most recent source tests. The results indicate that the total facility Pb emission rate from all point sources is less than the 0.045 lbs/hr limit established by Rule 1420.1(f)(2).

Table 1 Current Facility-wide Pb Emission Rates

APC#	AQMD Device#	Control Device Description	Area Served	Source Test Date	Source Test Measured (dscfm)	Pb Emissions (lb/hr)
10	C38	North Torit	General Ventilation	10/2010	94,599	0.00141
11	C39	South Torit	General Ventilation	1/4 - 6/2011	110,126	0.0036
13	C156/C157	MAC BHs	GV: RMPS, Kettle Burners, Reverb Feed	12/27/2010	103,920	0.000572
7	C48	Material Handling BH	GV: Material Handling & Blast Feed Room	10/12/2010	95,858	0.00115
9	C165/C172	RMPS MAPCO Demister / HEPA	RMPS	11/10 -12/2010	17,270	0.000358
12	C144/C143	Kiln Dryer BH / Cyclone	Kiln (Rotary Dryer)	9/14/2010	10,392	0.0105
S1	C42/C43	Neptune-Venturi Scrubber	Blast & Reverb furnaces	9/8/2010	18,059	0.000175
5	C46	Hard Lead BH	Hard Lead	10/4,5,7/2010	101,832	0.00102
6	C47	Soft Lead BH	Soft Lead	10/2010	85,435	0.000851
Total					637,491	0.020
						<0.045 limit

While the Pb emission rate from all point sources is more than 50% less than the 0.045 lbs/hr limit, the rate is greater than the 0.003 lbs/hr rate that is the "target level" for this Feasibility Study.

3.2 Characterization of Pb Emission Sources at Exide (Vernon)

There are two general categories of point sources of Pb emissions at the Exide (Vernon) facility. The first source comes from Process Source emissions. The second source comes from

General Ventilation emissions. As of July 1, 2011 Exide had the following air pollution control devices installed for reducing Pb emissions from a variety of sources.

Table 2 Currently Permitted Control Equipment at Exide

Control Device Description	Equipment/Area Controlled
Process Emission Sources	
C40 – baghouse; C41 – baghouse;	Reverb furnace (D119)
C44 – afterburner; C45 – baghouse	Blast furnace (D128)
C42 – venturi scrubber; C43 – tray scrubber; S139 – stack	APC 1 (C40, C41), APC 2 (C44, C45)
Hard Lead baghouse	Lead refining kettles and dross hoppers (D7 – D20), Blast furnace tapping ports and launders (D129 – D134), rotary dryer furnace enclosure (C177)
Soft Lead baghouse	Lead refining kettles and dross hoppers (D24 – D37), Reverb furnace feeders (D117, D118), Reverb furnace tapping ports and launders (D120 – D125), fugitive emissions from Quench Chamber cleanout door (D149)
C143 – cyclone; C144 – baghouse; S145 – stack	Rotary dryer furnace (D115) and screw conveyors (D114, D116)
General Ventilation Sources	
North Torit baghouse	Fugitive emissions from the Smelting and Refining building, fugitive emissions from the Baghouse Row building
South Torit baghouse	Fugitive emissions from the Smelting and Refining building, fugitive emissions from the Baghouse Row building
C156, C157 – MAC baghouses; S158 – stack	RMPS building (C175), lead refining kettle burner stack emissions, rotary dryer hoppers (D109, D110) and conveyors (D111 – D113), South Corridor building (C182)
C159 – cyclone; C160 – baghouse	Fugitive emissions in Blast Furnace Feed Room
Material Handling baghouse	Central Vacuum System A (C159, C160), Central Vacuum System B (C162, C163), Blast Furnace feed hopper (D126)
C165 – packed bed scrubber; C172 – HEPA filter; S166 – stack	Raw Material Preparation System (RMPS) building (C175), Hammermill (D1), Hammermill feed conveyor (D2), Mud holding tanks (D3 – D5)
C162 – cyclone; C163 – baghouse	Fugitive emissions in Blast Furnace Feed Room

3.2.1 Process Source Emissions

Process Source emissions consist of the exhaust from the Rotary Dryer, Blast & Reverb Furnaces, and the Hard & Soft Lead Baghouses. Pb emissions come directly from the feed material processed in these furnaces. The Pb emissions in the exhaust from the furnaces are

controlled by baghouses and subsequently by a wet scrubber prior to discharge to the atmosphere.

The data in Table 1 shows that the total stack exhaust from these sources is approximately 215,000 dscfm with a total Pb emission rate of 0.013 lbs/hr.

3.2.2 General Ventilation Source Emissions

General Ventilation emissions consist of room air that moves through building enclosures in order to meet the negative pressure specified by Rule 1420.1. The data in Table 1 shows that the total stack exhaust from these sources is approximately 400,000 dscfm with a total Pb emission rate of 0.007 lbs/hr.

3.2.3 Consideration of Control Options for Process Sources and General Ventilation

General Ventilation sources must process relatively large quantities of air as compared to the process units in order to meet the requirements for total enclosures. At Exide's Vernon plant, General Ventilation accounts for 65% of the total exhaust flow, but only 25% of the total Pb emissions.

As a result, control options were reviewed to account for the different characteristics of General Ventilation (higher exhaust volume, lower Pb loading) as compared to Process Emissions (lower exhaust volume, higher Pb loading).

3.3 Technical Feasibility

3.3.1 Determining the Technological Process Source Control Options to Achieve a 0.003 lbs/hr Facility-wide Pb Emission Rate

As a threshold matter, in order to assess the feasibility of achieving a 0.003 lbs/hr facility-wide emission rate, it is necessary to set forth the available technological process source control options. If no combinations of the available technologies are capable of meeting the 0.003 lbs/hr limit, then achieving that limit is not technically feasible.

This Feasibility Study builds upon EPA's extensive recent research on process source control technologies potentially applicable for improving lead stack emissions. EPA performed its research during the Risk and Technology Review (RTR) process for revising the National Emission Standards for Hazardous Air Pollutants (NESHAP) for lead smelters. This EPA effort culminated in a Proposed Rule that revised the NESHAP for Secondary Lead Smelting published on May 19, 2011 [76 FR 97]. The rulemaking record includes EPA's Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category [docket item EPA-HQ-OAR-2011-0344-0055] which is attached as Appendix E. In reviewing all the technologies deployed across the industry for the control of lead stack emissions currently and recent developments in those technologies, EPA identified the suite of potential control technologies to include the following.

- Fabric filtration (baghouses of various types and cloth media)
- Cartridge collectors

- HEPA filters as add-on secondary filtration subsequent to fabric filters or cartridge collectors
- Wet Electrostatic Precipitation (WESP)

EPA not only considered the technologies currently applied in this industry but also, “technologies employed by similar industries, and reviewed new or updated NESHAPs for other source categories.” [EPA docket item 0055, page 4] We concur with this evaluation and are aware of no other available cost-effective emission control technologies. Thus, this Feasibility Study appropriately evaluates the four EPA-recognized process-source control technologies.

Of the EPA technologies, Exide already employs fabric filtration, with the highest quality polytetrafluoroethylene (PTFE) membrane-type filter bags, and two cartridge collectors. Additionally, Exide has installed secondary HEPA filtration on the battery breaker scrubber, rotary dryer baghouse, and the facility’s two cartridge collectors, though the degree of improvement resulting from the installations on the rotary dryer baghouse and cartridge collectors is not yet known pending emission testing.

With fabric filtration and HEPA cartridges already installed, we herein examine the two remaining EPA-identified process control technological approaches for improving the facility’s lead stack emissions, namely, (i) the wider deployment of secondary HEPA filtration and (ii) Wet Electrostatic Precipitation (WESP). These measures are considered in the following Sections.

3.3.2 HEPA Filtration

Of the two remaining EPA-identified process control options, the most cost-effective is wider deployment of secondary HEPA filtration. The degree of emission reduction that can be achieved by HEPA filters on this industry’s stack emissions is unclear and expectations vary widely. While HEPA filters are rated by definition to filter 99.97% of particles at a 3 micron size, it is not appropriate to assume or estimate that placing a HEPA filter downstream of a fabric filter or cartridge collector will reduce lead emissions by a further 99.97%. This is because some relatively significant fraction of the lead emissions exiting a fabric filter will be in the “condensable” size range, that is, material that passes through the filter in the stack testing apparatus and subsequently caught in the wet impingers in the test train. Material small enough to pass through the stack testing filter is also small enough to pass through a HEPA filter. EPA, for example, found in its analysis of the industry’s emission data that “HEPA filters used downstream of a baghouse achieve approximately 20 percent lower outlet concentrations than baghouses alone.” [EPA docket item 0055, page 5]. The District established a higher range of expectation in its calculation of the expected improvement from installing HEPA filters downstream of the Exide Vernon facility’s cartridge collectors. The District estimated that such installation would reduce lead emissions by 70.8% and result in outlet lead concentrations downstream of the HEPA filters of 2.715 µg/dscm [see document “HB3151-25 Excess Emissions“ from Case 3151-25, attached as Appendix F]. Thus, taking the District’s calculations at face value, the range of potential improvement by installation of HEPA filtration is 20 to 71%.

Preliminarily, we consider the installation of HEPA filtration downstream of all sources at the Exide Vernon facility. Per the tabulation in Table 1, total exhaust flow is 637,491 dscfm with current actual facility-wide lead emissions of 0.02 lb/hr vs. 0.045 lb/hr allowed. On a mass

basis, even assuming the highest end of the expected range of improvement (71%) due to HEPA installation, facility wide emissions would be $0.02 \times (1-0.71) = 0.0058$ lb/hr, which is double the 0.003 lb/hr target level for this study. A 71% reduction in the 0.045 lb/hr allowable emission rate would be 0.013 lb/hr, or more than four times the 0.003 lb/hr target. Alternatively, assessing the issue from a concentration basis, the District's 2.715 $\mu\text{g}/\text{dscm}$ expected lead concentration downstream of HEPA filtration, if applied to the total facility-wide flow of 637,491 dscfm, would result in facility-wide lead emissions of 0.0065 lb/hr, which is more than twice the target of this Feasibility Study.

In summary, secondary HEPA filtration, even using the high end of expected improvement, still falls well short of the 0.003 lb/hr target for this study. At any other lower degree of HEPA improvement, the gap between the result and 0.003 lb/hr is even wider. In addition, HEPA filtration is not suitable for installation on the hot and moist exhaust gas flow from the facility's direct furnace metallurgical exhaust (Neptune Scrubber), though we included that source in the above evaluation in order to be conservative.

HEPA filtration alone is insufficient to approach 0.003 lb/hr on a facility-wide basis. In particular, in the sections to follow we have considered the most cost-effective combination which would employ WESP to those sources least amenable to HEPA filtration (the process sources) and to enough of the flow from the facility to potentially bring the overall total emission rate under 0.003 lb/hr.

The following two sections (3.3.3 and 3.3.4) introduce both a Process Source Control option (WESP) and a General Ventilation Source Control Option (Fugitive Emission Filtration). Thereafter, Sections 3.3.5, 3.4, and 3.5 address whether these options are technically, economically and physically feasible means of achieving a 0.003 pounds per hour total facility mass emissions rate.

3.3.3 WESP as a Process Source Control

Exide is currently controlling emissions from the blast furnace, reverb furnace, direct hooding serving those furnaces (the hard and soft lead ventilation systems, and the rotary dryer are process sources) using baghouses equipped with polytetrafluoroethylene membrane-type filter bags. Exide fitted the Rotary Dryer Baghouse with secondary HEPA filtration on June 30, 2011. The emission rate for this unit given in Table 1 does not include the degree of improvement from this secondary filtration installation as testing has not yet been completed. Exhaust from the direct blast and reverb furnace is further currently controlled by a wet scrubber downstream of their respective baghouses. For additional reducing Pb emissions from these Process Sources, Exide considered a Wet Electrostatic Precipitator (WESP) as a secondary control option as this is the only technology identified with the potential to achieve emission rates as low as that targeted by this Feasibility Study.

Exide provided process data such as flow rate, Pb loading, moisture content, and exhaust temperature to Envitech so that Envitech could provide Exide a proposal for reducing emissions from Process Sources. Envitech was the vendor that supplied the only WESP currently installed at a secondary lead smelting facility. In a June 16, 2011 e-mail from Andy Bartocci to Russell Kemp, Envitech recommended that "the non-process ventilation sources be treated by another means due to the large volumetric flow rate." Based on Envitech's analysis of the

operating conditions at Exide’s Vernon plant, Envitech provided the following proposed design for control of the process source subset.

In addition, an estimate of the annual operating cost of the WESPs is tabulated below. This estimate can be found in the Cost Impacts analysis tables for Secondary Lead NESHAP Docket Item EPA-HQ-OAR-2011-0344-0040.1 (Proposal May 19, 2011). A copy of US EPA’s Cost analysis and data tables is included in Appendix C. US EPA also provided an estimate of the installed cost for a WESP that was in good agreement with the cost estimate provided by Envitech.

Table 3 WESP Design Parameters

Parameter	Existing Configuration	Proposed Design
Stack Flow (dscfm)	215,879	215,879
Pb Concentration (gr/dscf)	1.1E-6 to 8.5E-6	2.7E-7 to 4.9E-7
Pb Rate (lbs/hr)	0.014	0.001
Installed Cost	N/A	\$30,000,000-Envitech \$33,000,000-USEPA
Annual Operating Cost	N/A	\$712,500 – Envitech, verbal \$1,650,000-USEPA
Footprint (sq. ft)	N/A	7,500

The Envitech proposal calls for two (2) trains of five (5) WESPs each, for a total of ten (10) WESPs. Envitech’s proposal is included in Appendix A. Each train would handle half of the combined gas flow from these sources and would have one stack and two induced draft fans.

3.3.4 Fugitive Emission Filtration Units as a General Ventilation Source Control

Baghouses control fugitive emissions from Material Handling operations, Feed Rooms, and Raw Material areas. General ventilation sources are controlled using cartridge collectors (Torits). The addition of the HEPA after-filters for the Torits was completed in August 2011. Test data to indicate performance subsequent to this addition are not yet available. Based on the large volumetric flow rate from these general ventilation sources, Envitech recommended that a non-WESP option be considered for secondary control of these sources.

For technology with the potential to improve control of the General Ventilation Sources, Exide investigated Busch International Fugitive Emission Filtration (FEF) Units. These units are specially designed to reduce particulates contained in fugitive emissions and general ventilation sources that typically have relatively low particulate loadings when compared to the particulate loading found in process source exhaust. Busch FEF units have integral secondary HEPA filtration as an option and this configuration is the one pursued for this study. Based upon a review of industry data, and specifically of the lead emission concentrations achieved at the Quemetco facility (also in South Coast), Busch FEF units are achieving, in practice, exhaust lead concentration levels among the lowest in the industry. These units are not, however, amenable to installation on the process sources.

Exide provided general ventilation source data such as flow rate, Pb loading, moisture content, and exhaust temperature to Busch International so that they could provide a proposal for reducing emissions from General Ventilation Sources. Based on Busch’s analysis of the operating conditions at Exide’s Vernon plant, Busch was not able to propose a design or extend any performance guarantees for reductions in emissions below the low levels already being

achieved by the existing filtration equipment at the facility. A copy of their letter is included with this report and is found in Appendix B. That is, based on the wide range of potential improvement (possibly as little as 20%, per EPA as cited above), Busch could not guarantee any improvement.

The largest unit that Busch manufactures is FEF-50, which can handle 50,000 scfm of exhaust gas. Given that Exide has approximately 400,000 scfm of total exhaust from General Ventilation sources, Exide would need a minimum of eight (8) FEF-50 units. Exide received a quote from Busch for a single FEF-50 which is included in Appendix D. In order to continually process this exhaust stream, Exide would need to purchase additional units to remain on standby.

Table 4 BUSCH FEF Parameters

Parameter	Existing Configuration	Proposed Design
Stack Flow (dscfm)	401,777	401,777
Pb Concentration (gr/dscf)	2.2E-6 to 10.1E-6	2.2E-6 to 10.1E-6
Pb Rate (lbs/hr)	0.007	0.007
Installed Cost	N/A	\$2,400,000
Annual Operating Cost	N/A	Operating costs not expected to be significantly higher or different than that being currently experienced with the existing control devices.
Footprint (sq. ft)	N/A	2,880 – 4,200

3.3.5 Addressing the Technical Feasibility of WESP and FEF Units

In order to assess the technical feasibility of achieving a 0.003 lbs/hr facility-wide emissions rate, it is necessary to look at all secondary control options as a whole. Based on the assessments provided by Envitech for using WESPs to control Process Sources and Busch International for using FEF HEPA Units to control General Ventilation Sources, it is not technically feasible to achieve a facility-wide Pb emission rate of 0.003 lbs/hr.

A key element of technical feasibility is the ability to craft engineering performance specifications in line with the target emission goal and have vendors guarantee performance consistent with such specifications. Through exchanges with Busch International, we have been unable to secure the necessary guarantees for performance that, when combined with WESP exhaust performance for the process sources, would meet a facility-wide point source Pb emission rate of 0.003 lb/hr. It is possible that such a combined installation (WESP on process sources, HEPA on all others) could achieve emissions in the vicinity of 0.003 lb/hr, but such performance could not be reasonably expected on a repeatable basis nor backed by vendor guarantees. While this particular combined configuration is employed by Quemetco, the Exide Vernon facility is exhausting much more air – the fundamental reason that a 0.003 lb/hr lead emission level cannot be expected even when using the same technologies. From a performance guarantee perspective, it is conceivable that the application of WESP to the entire facility flow could result in a facility-wide emission level guarantee below 0.003 lb/hr but such facility-wide application of the WESP technology was not the recommendation of the WESP vendor which recommends consideration of that technology to address the specific challenges of process gases having the potential to contain ultrafine particulate condensed from gaseous metals. Costs to deploy WESP technology facility-wide would be well more than double those assessed for economic feasibility in Section 3.4 below.

3.4 Economic Feasibility of Achieving a 0.003 lbs/hr Facility-wide Pb Emission Rate

In performing the economic assessment, it is necessary to consider the economics of the entire suite of control options. A particular secondary control option may be economically feasible on its own but may not be sufficient on its own to achieve a facility-wide emission rate of 0.003 lbs/hr. All options must be evaluated as a total package in completing the environmental assessment.

Table 5 shows the cost comparison for the WESP and BUSCH units combined. For comparison, we also show the Cost Analysis for the WESP technology only that was provided by USEPA for the NESHAP Risk and Technology Review found in Appendix C. This column is for the deployment of the WESP for the industry as a whole.

Table 5 Cost Effectiveness Comparison

Parameter	Exide	EPA NESHAP (4)
Capital Costs		
WESP (1)	\$30,000,000	\$400,000,000
Busch	\$2,400,000	n/a
Subtotal	\$32,400,000	\$400,000,000
Annualized Capital Cost		
WESP	\$3,000,000	\$36,000,000
Busch	\$240,000	n/a
Subtotal	\$3,240,000	\$36,000,000
Annual Operating Costs		
WESP (2)(3)	\$712,500	\$9,500,000
Busch	\$0	n/a
Subtotal	\$712,500	\$9,500,000
Total Annualized Costs		
WESP	\$3,712,500	\$45,500,000
Busch	\$240,000	n/a
Subtotal	\$3,952,500	\$45,500,000
Total Pb Reductions		
lbs/yr	1,140	
tons/yr	0.57	13.8
Cost per Ton Pb Reduction		
\$/ton Pb Removed		
Exide-(WESP + Busch) / EPA-WESP	\$6,900,000	\$3,300,000
Exide-(WESP) / EPA-WESP	\$6,500,000	\$3,300,000
(1) In EPA's draft Residual Risk MACT docket, their estimate for the Capital Cost of a WESP for the Vernon facility was \$33,000,000. See docket item 0040.1. (2) EPA's estimate for Annual Operating Costs was \$19,000,000. In discussions with Andy Bartocci of Envitech, we understand that EPA may have included the RTO in the costs. Accordingly, we have reduced the EPA's operating cost estimate by 50%. (3) Exide Annual Operating Costs are estimated as the ratio of the EPA's Operating Cost to Capital Cost. (4) Note, Capital and Operating costs in this column for the EPA NESHAP study are for aggregate costs on an industry-wide basis to deploy the WESP technology at 13 facilities.		

The SCAQMD adopted Rule 1420.1 in order to bring the SCAQMD into compliance with the revised federal NAAQS for lead. Other than assessing annual compliance cost, SCAQMD did not perform a cost-effectiveness analysis for the Rule. In adopting the Rule, SCAQMD required a facility mass emissions rate of 0.045 lbs/hr, which, combined with other Rule measures and

voluntary compliance measures to address fugitive emissions, was found sufficient to achieve the NAAQS. The 0.045 lbs/hr number represents a 99% point source reduction, and further reductions are not economically reasonable or feasible.

EPA has also evaluated the cost effectiveness of the WESP technology (the larger cost element in the above tabulation) as part of the proposal for revisions to the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Secondary Lead Smelting [76 FR 97, May 19, 2011]. EPA's estimated capital cost for installation of a WESP at the Exide Vernon facility was \$33 million which is very near the \$30 million quoted by Envitech. EPA estimates the cost effectiveness as \$3.3 million per ton of reductions in metal HAP emissions (mainly lead compounds).

EPA concluded that these costs were too high to warrant adoption of WESP technology as a NESHAP component, specifically saying:

"...the costs for these additional controls are high. Therefore, we are not proposing a requirement for the installation of a WESP under this ample margin of safety analysis."

[76 FR 97, May 19, 2011 at page 29058]

As was stated in Section 3.3.4, the combination of WESP control for Process Sources and FEF controls for General Ventilation Sources was not technically feasible in achieving a 0.003 lbs/hr limit. In addition, the cost to reduce Pb using the technology reviewed in this study for the Vernon facility are more than double the cost that EPA determined to be too high, primarily because the emission performance currently at the Exide Vernon facility is already better than industry-wide typical performance. That is, deployment of the WESP technology at Exide Vernon would be even less cost effective than deployment for the industry as a whole, because there are fewer emissions to capture by such very expensive technology.

The data presented in this section demonstrate that this combination of controls is not economically feasible in achieving this emission rate. A key element of economic feasibility is also the ability of companies to deploy capital in ways that have certainty of outcome. As noted above, the controls for achieving the general ventilation emission reductions cannot be guaranteed by the vendor to achieve the target levels of reductions. The absence of such guarantees renders the commitment of such a large capital expenditure economically infeasible.

3.5 Physical Feasibility of Achieving a 0.003 lbs/hr Facility-wide Pb Emission Rate

A plot plan showing the configuration of the Exide Vernon facility is shown in Figure 4. This plot plan shows the configuration once the pending "Baghouse Row" enclosure is fully constructed. After this occurs all stationary sources of lead will be operating in total enclosures that will be vented to air pollution control devices.

In addition to the location of buildings, the plot plan also shows the fenceline and the space that would be available for installation of any secondary control devices. A WESP control configuration would consist of two (2) trains of five (5) WESPs each, for a total of ten (10) WESPs. This WESP configuration would occupy and require a footprint of 7,500 square feet.

Each Busch FEF unit has dimensions of 30 feet by 12 feet. The overall FEF footprint for 8 units would be at least 65 feet by 65 feet or 4,225 square feet.

Figure 4 shows the plot plan with the footprint of two trains of five WESPs and eight FEF units superimposed on it. As the graphic shows, there is very little land area available in which to construct and operate the WESPs and FEF units on site. The location indicated on the figure for these installations blocks access to key operations and would not allow the shipment of lead from the shipping warehouse at the northeast corner of the facility and recovered plastic from the north end of the RMPS building.

Additionally, the available land area is used for truck traffic and other operating equipment on site. As such the available “inactive” land area, space that is not currently used, is even smaller. There is not enough “inactive” land area available for locating two trains of five WESPs and eight FEF units.

Therefore, the data presented in this section demonstrate that this combination of controls is not physically feasible in achieving this target emission rate.

4 Ambient Air Quality Modeling

4.1 SCAQMD Modeling Efforts

In its review of Rule 1420.1, the SCAQMD's Stationary Source Committee (SSC) reviewed an ambient air quality modeling analysis performed by SCAQMD staff regarding lowering the facility-wide lead point source emission rate from 0.045 lbs/hr to 0.003 lbs/hr.

At the time that the SCAQMD conducted its modeling, Exide was conducting a series of source tests to collect up-to-date emissions data for use in updating its health risk assessments. The emission rates available to the SCAQMD was 1-2 years old and did not take into account the equipment improvements that had been made in the intervening time.

Nevertheless, even using this older emissions data, the SSC concluded that...

“the other lead-acid battery recycling facility (Exide) can achieve the new lead standard through controlling lead point source emissions to 0.045 lbs/hr and strict adherence to housekeeping provisions of PR 1420.1. At this point, there is not sufficient information to substantiate the need to require this facility (Exide) to go beyond an expected 99% point source reduction at an additional cost of \$15 to \$20 million.”

4.2 Exide Modeling Efforts

In order to confirm the SCAQMD's analysis and update the results using the most recent source test emissions data and the revisions to buildings and stacks, Exide conducted its own ambient air quality modeling. US EPA's AERMOD dispersion modeling runs were made for two scenarios to evaluate the impacts that the Pb reduction measures currently under construction would have on the ambient Pb concentrations measured at the monitors located at and around the fenceline of the Vernon facility. Inputs to AERMOD included:

- Pb emission rates (lbs/hr) from Point Sources
- Scenario 1: using the rates measured from source tests conducted in late 2010 and early 2011 at the facility;

Scenario 2: considering the control efficiencies of the Wet Electrostatic Precipitator (WESP) to be installed for Kiln Dryer Baghouse, Neptune-Venturi Scrubber, Hard Lead Baghouse, and Soft Lead Baghouse, and for HEPA Busch and HEPA Busch for North Torit, South Torit, MAC Baghouse, and Material Handling Baghouse upon the emission rates in Scenario 1.

- Building profile for the new “Baghouse Row” enclosure was used for scenarios 1 and 2;
- Stack heights for the North Torit, South Torit, and MAC Baghouse were increased from 79 feet to 120 feet for scenarios 1 and 2;
- Emissions from fugitive sources were set to zero for scenarios 1 and 2. Once the construction of the “Baghouse Row” building is completed, Pb emissions from fugitive sources will be vented to control devices and should not have any significant impacts, if any, at the ambient monitors.

Table 6 Source Parameters of AERMOD Runs

Source ID	UTM Coordinates (m)		Emission Rate (Scenario 1)	Emission Rate (Scenario 2)	Release Height	Temp	Velocity	Stack Diameter
	X	Y	(g/s)		(m)	(K)	(m/s)	(m)
MAPCO	389705.7	3763538	8.05E-05	8.05E-05	19.35	299.48	4.55	1.09
MAT_STOR	389722.7	3763488	1.18E-03	5.91E-05	34.14	300.93	14.14	2.13
SOFTLEAD	389750	3763554	8.38E-04	4.19E-05	34.14	318.15	14.10	2.03
HARDLEAD	389729.9	3763505	8.35E-04	4.18E-05	34.14	311.76	17.17	2.03
DRYER_BH	389769.8	3763525	1.32E-03	6.61E-05	36.6	375.22	7.47	0.91
NEPTUNE	389751.4	3763527	2.20E-05	1.10E-06	34.14	332.89	8.27	1.16
NOR_CART	389790.5	3763550	3.60E-04	1.80E-05	36.6	298.50	11.29	2.13
SOU_CART	389789.3	3763547	5.29E-04	2.65E-05	36.6	298.89	15.29	2.13
MAC_BH	389740.1	3763479	2.36E-04	1.18E-05	36.6	307.44	18.06	1.82
			0.0054	0.00035	g/s			
			0.043	0.003	lbs/hr			

The modeling results are summarized in Table 5.

Table 7 Lead Concentrations at the Monitors Predicted by AERMOD

Scenario #	Lead Concentrations ($\mu\text{g}/\text{m}^3$)						
	SW_Monitor	SE_Monitor	NE_Monitor	On-Site North	REHRIG	Railway	CP_Monitor
Scenario 1	0.00765	0.00338	0.0437	0.02403	0.04657	0.01339	0.0071
Scenario 2	0.00064	0.00091	0.00689	0.00348	0.00647	0.00134	0.00042

For these modeling runs, the emission rates were based on source tests from late 2010 through early 2011. Additional source testing has been in progress as part of the update for the AB2588 HRA. The emission rates that were used in this modeling did not reflect the improvements due to the recent modifications to the air pollution control equipment. The total facility-wide emission rate for all stationary sources used in the modeling was 0.043 lbs/hr. This is greater than the current actual 0.020 lbs/hr facility-wide rate when the most recent source tests are taken into account, but it is still less than the 0.045 lbs/hr limit set by the rule – indicating that the 0.045 lb/hr facility-wide point source limit established in the Rule is adequate to insure compliance with the ambient standards.

Thus, the modeling results presented in this Study reflect a worst case scenario when the Vernon plant is emitting lead at a rate just below the Rule limit. As the actual facility-wide emission rate is even less than the modeled rate, the ambient impacts would be less than what are reported here, by approximately a factor of two.

For Scenario #1 (consistent with the 0.045 lb/hr facility-wide allowable emission rate), the maximum predicted ambient concentration at a residential receptor is only 0.005 $\mu\text{g}/\text{m}^3$ which is only 3 percent of the 0.15 standard. The maximum predicted ambient concentration at the maximum off-site receptor was only 0.08 which is only 50 percent of the 0.15 standard. That is, stack impacts from emissions consistent with the current 0.045 lb/hr emission level are already contributing less than half the 0.15 $\mu\text{g}/\text{m}^3$ standard, and even less given that actual stack emissions are currently less than half the 0.045 lb/hr limit. Current actual and allowed stack

emission rates are not a hindrance to achieving $0.15 \mu\text{g}/\text{m}^3$ at the facility's ambient monitors and stack impacts at residences are essentially negligible.

The key point of this modeling exercise is to point out that it is not necessary to force the facility-wide lead stack emission rate to 0.003 lb/hr in order to achieve attainment of the NAAQS. Even with stack emissions from the facility just under the 0.045 lb/hr facility wide emission limit of Rule 1420.1, projected impacts are much less than one half of the $0.15 \mu\text{g}/\text{m}^3$ ambient level. Consideration of the feasibility of the 0.003 lb/hr facility-wide stack emission level can only be made in the context of the purpose of the rule from which this feasibility study was commissioned. In that context, this modeling demonstrates that additional stack emissions reductions are not expected to further reduce ambient lead concentrations. Should Exide not meet the $0.15 \mu\text{g}/\text{m}^3$ standard, resources should be directed to towards reducing fugitive emissions rather than stack emissions.

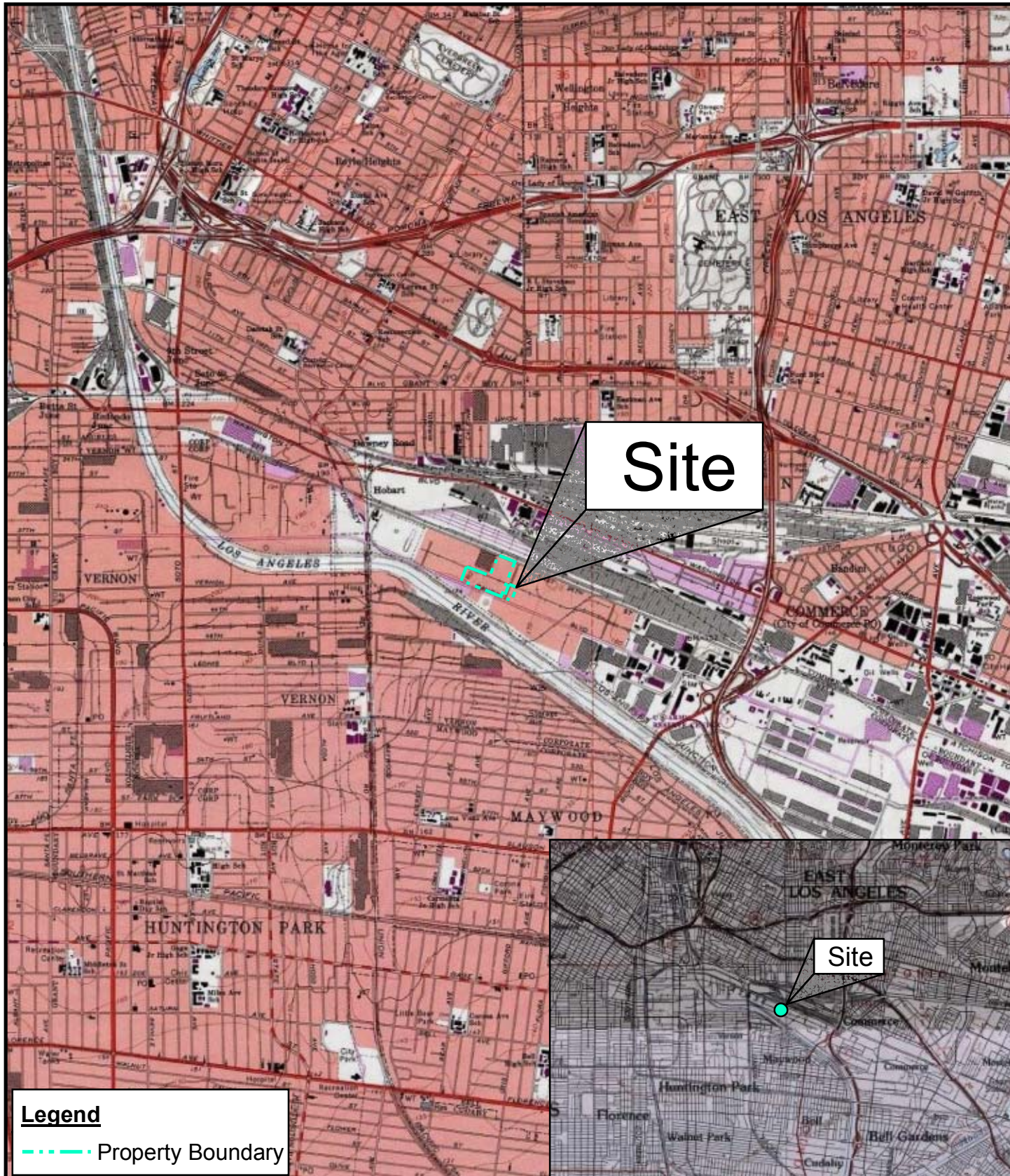
5 Conclusions

Based on the data presented in this study, no combination of Lead emission control technologies is currently available for which vendors will provide performance guarantees that can achieve a facility-wide emission rate of 0.003 lbs/hr from all point sources, thereby rendering such technologies technically infeasible. In addition, the technologies are not economically feasible because their installation would require capital expenditures in excess of \$30 million and annual operating expenses of nearly \$2 million, without expected contribution to the facility's ambient concentration compliance. Moreover, space constraints at the Vernon facility render installation of the technologies physically infeasible.

Exide's existing measures (some yet to be fully implemented) are sufficient to meet the Rule 1420.1 facility-wide emission rate requirement of 0.045 lbs/hr as well as attainment with the ambient Pb concentration limit of $0.15 \mu\text{g}/\text{m}^3$. If for any reason Exide does not meet the ambient standards, in its Compliance Plan Exide has proposed to implement certain measures that are expected to further reduce emissions. Exide's Compliance Plan measures (both "early action" and contingent, as set forth in the Compliance Plan) are appropriately targeted towards fugitive emissions, which primarily drive ambient concentrations.

Accordingly, it is concluded that achieving a 0.003 lb/hr facility-wide lead emission rate level for the Exide facility in Vernon, California, is not technically, economically or physically feasible.

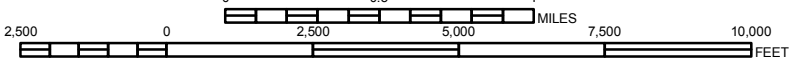
Figures



Legend
 - - - - - Property Boundary

SOURCE:
 U.S.G.S. 7.5 minute series (topographic)
 Los Angeles, CA Quadrangle
 National Geographic TOPOI
 Seamless, scanned images of
 USGS paper topographic maps
 © 2010 National Geographic Society

Map Created with ESRI ArcMap and National Geographic TOPOI™ ©2001 National Geographic Holdings (www.topo.com)



CONTOUR INTERVAL 40 FEET
 NATIONAL GEODETIC VERTICAL DATUM OF 1929
 1:39,382.23



FILE: \\rvine06.rvine.environ.local\EDMS_rvine01_Projects\Exide\03_GIS\HRA 2010 Update\0720431A_FT_Site_Vicinity_Map.mxd

ENVIRON

DRAFTED BY: MMcMeehan DATE: 9/10/2010

Site Vicinity Map

Exide Technologies Facility
 2700 South Indiana Street, Vernon, California

Figure 1

PROJECT: 07-20431A



\\IRVINE06.IRVINE.ENVIRON.LOCAL\EDMS_IRVINE\01_PROJECTS\EXIDE\04_CAD\FIGURES\07-20431AF02 SITE PLOT PLAN.DWG

ENVIRON

Site Plot Plan

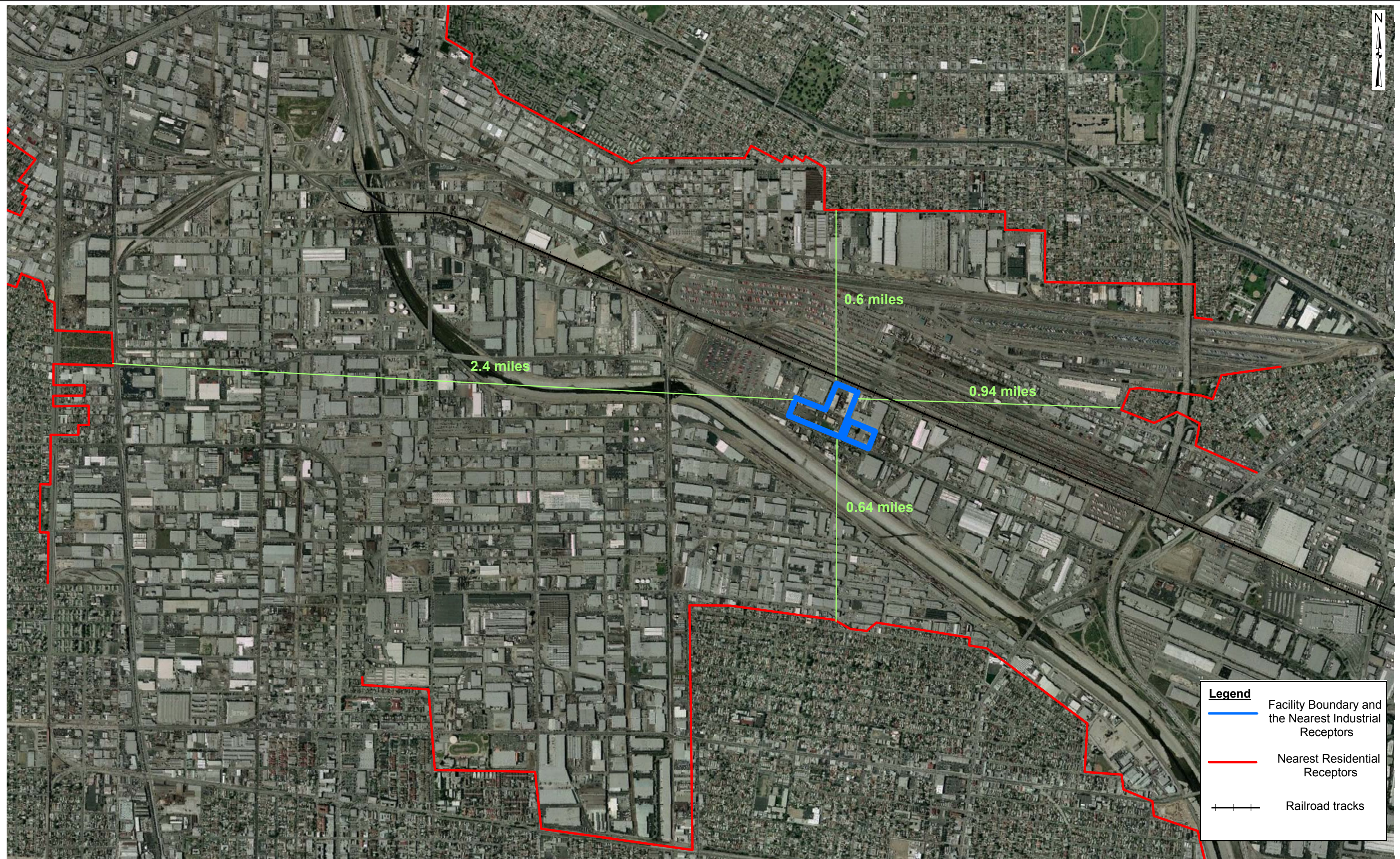
Exide Technologies Facility
2700 South Indiana Street, Vernon, California

Figure
2

DRAFTED BY: SSSHIN

DATE: 9/10/2010

PROJECT: 07-20431A

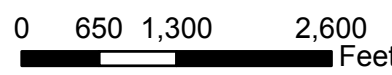


Legend

- Facility Boundary and the Nearest Industrial Receptors
- Nearest Residential Receptors
- Railroad tracks

Locations of the Nearest Residential Receptors

Exide Technologies Facility
2700 South Indiana Street, Vernon, California

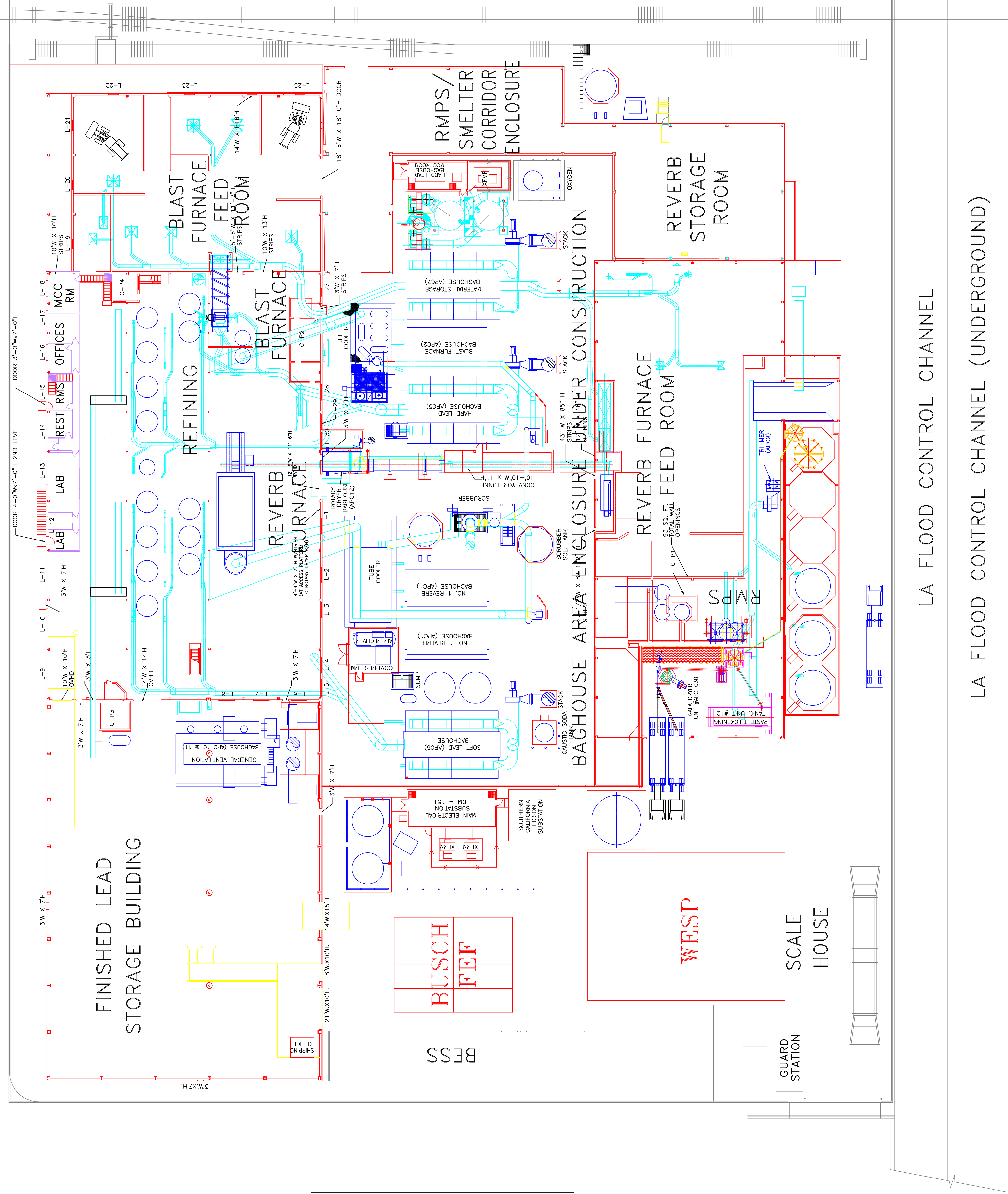


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DATE	06/06/2008
REVISION	07-20431A



FIGURE 4

INDIANA STREET



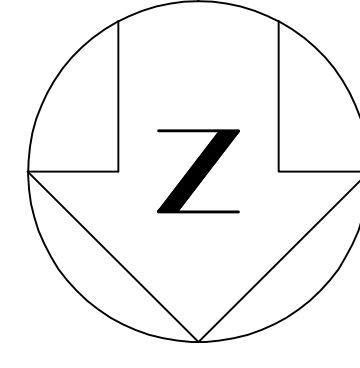
26th STREET

LA FLOOD CONTROL CHANNEL

LA FLOOD CONTROL CHANNEL (UNDERGROUND)

VICINITY & SITE PLAN

(SCALE : 1"=25')
 SITE SIZE: 15 ACRES
 TOTAL BUILDING AREA: 220,000 S.F.



EXIDE Technologies
 Automotive Recycling Division
 2700 S. Indiana St., Vernon, CA 90058

Appendix A
Envitech WESP Proposal for Exide Facility
Located in Los Angeles, CA



June 22nd, 2011

Mr. Russel Kemp – Environ Corporation on behalf of
Exide Technologies
2700 South Indiana Street
Vernon, CA 90058

Dear Mr. Kemp:

Envitech is pleased to offer Exide Technologies this budgetary proposal for a wet electrostatic precipitator (WESP) system to control lead emissions from various “process” sources and hooding located at the Vernon facility. This budgetary proposal is based on inlet conditions provided in the attachment to your May 11th, 2011 email. Our evaluation assumes the kiln dryer will be fitted with a HEPA filter capable of reducing the lead on that source by 95% from 0.0105 lb/hr to 0.000525 lb/hr.

Envitech recommends a wet electrostatic precipitator (WESP) system to reduce lead emissions from the process sources and hooding to 0.001 lb per hour. The system would be comprised of two (2) trains of five (5) WESP’s each. Each train would handle approximately 50% of the combined gas flow from these sources and would have one stack and two induced draft (ID) fans, 1 operating, and 1 spare. A packed bed absorber will be housed in the inlet section of the WESP units to distribute the gas evenly to the collection section and to neutralize any residual SO₂. This will help protect the stainless steel materials of construction.

The information contained in this proposal addresses the questions in your May 11th email. A summary of our responses to these questions are as follows:

- The expected level of emissions of lead from these sources, if controlled by a WESP, on a mass and exit concentration basis.

Envitech Response: The expected lead emissions are as follows:

- Mass Basis: 0.0005 to 0.0009 lb/hr
- Concentration Basis: 2.702E-7 to 4.864E-7 gr/dscf

- The level of emissions of lead from these sources that Envitech would be willing to guarantee if a WESP were employed.
 - We would seek and need that both the expectation and guarantee for lead emissions from this system be less than 0.001 lb/hr Pb on a mass basis as a maximum, but would like to know if even lower values are possible and at what incremental effort.

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June 22nd, 2011



Envitech Response: The performance guarantee is stated in Section 6.0, Performance Guarantee and Warranty. Envitech will guarantee 0.001 lb/hr Pb on a mass basis as a maximum. Lower values are possible, but the size and cost of the system are correlated to the design removal efficiency. We would need to know the target removal to assess the cost.

- We seek cost data on both a bare equipment and turnkey installed basis for any system or solution offered in response to the above.

Envitech Response: The budget estimate for equipment is provided in section 2.0, Budgetary Pricing. The equipment budget is between \$18M to \$22M. The estimated installed cost is \$25M to \$30M

- We seek data in regards to water consumption, wastewater generation rates, and utility consumption for any system or solution offered.

Envitech Response: The water and utility consumption are provided in a table in section 5.5, Operating Parameters and Utilities.

- We seek to know the physical ground footprint of any recommended system.

Envitech Response: The foot print will be approximately 7,500 square feet including the outlet duct and stack. A preliminary general arrangement drawing (29006GA, Rev. 0, attached) is provided for reference and is based on the Quemetco layout of 5 units in a row. An alternate configuration may also be considered depending on the available space. The final footprint area will depend on the final design and arrangement.

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Vernon, CA 90058

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June 22nd, 2011



Thank you for your interest and confidence in Envitech. If you need any additional information, please call me or visit our website at www.envitechinc.com. I look forward to hearing from you.

Sincerely,

Andrew C. Bartocci
National Sales Manger

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2700 South Indiana Street
Vernon, CA 90058

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June 22nd, 2011



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1.0 Scope of Supply

1.1 Equipment

One (1) Envitech Syngas Cleaning System, including:

- Ten (10) wet electrostatic precipitators
- Two (2) Induced Draft Fans
- One (1) lot of instrumentation & control system
- One (1) lot of pumps
- One (1) lot of ducting & stack
- Operation and Maintenance Manuals

1.2 Optional Equipment

- Additional operation and maintenance Manuals.

1.3 Equipment and Services Provided by Others

- Installation of equipment.
- Inlet ductwork to the system.
- Piping, valves & fittings.
- All permits and special clearances required by Local State, or Federal agencies.
- Testing required by an independent third party required to establish performance.

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2.0 Budgetary Price

2.1 Equipment

One (1) Envitech WESP System US \$18,000,000
to \$22,000,000

The price does not include any sales, use, excise, or similar taxes.

- The estimated Installation Cost is \$7,000,000 to \$9,000,000.
- The estimated total installed cost is \$25,000,000 to \$30,000,000.

2.2 Optional Equipment

Option 1: Additional Operation and Maintenance Manuals US \$350

The price does not include any sales, use, excise, or similar taxes.

2.3 Equipment Startup and Training

Equipment start-up and operator training US \$75,000

The following support is included for the price shown above.

	<u>Days</u>
Startup, fine tuning	28
Operator Training	2

Additional days are charged at \$1,500 per day plus travel, food, and lodging at cost plus 15%.

3.0 Exceptions and Clarifications

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Vernon, CA 90058

PREPARED ON
June 22nd, 2011

There are no exceptions or clarifications.



4.0 Shipping and Payment Terms

4.1 Delivery Time

Design drawings for approval: 10 to 16 weeks from receipt of order with down payment

Delivery to carrier: 20 to 24 weeks from receipt of design approval and release for fabrication

4.2 Shipping

Price is F. O. B. Point of Manufacture, including equipment only.

Freight will be added and billed at cost.

4.3 Payment Schedule

Payment will be per a payment schedule to be negotiated at the time of contract.

4.4 Validity

This quotation is budgetary only.

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5.0 System Design

5.1 Design Basis

The proposed system is designed to operate at the following parameters:

Inlet Gas Condition

	Kiln	Blast & Reverb	Hard Lead	Soft Lead	Combined
Gas Flow Rate, dscfm	10,392	19,035	95,037	91,415	215,879
Gas Flow Rate, scfm	11,877	22,989	97,175	93,471	225,512
Gas Flow Rate, acfm	15,245	26,190	102,572	100,130	243,868
Gas Temp, F	216	140	95	104	110
Upstream Press., in.W.C.	-1	-1	-1	-1	-1
Gas Composition, lb/hr					
H2O	4,165	11,093	5,998	5,769	27,025
CO ₂	0	0	0	0	0
O ₂	10,875	19,919	99,452	95,662	224,909
CO	0	0	0	0	0
N ₂	35,815	65,602	327,553	315,050	743,999
SO ₂	0	0	0	0	0
Total	50,854	96,614	432,983	416,481	996,933
Particulate	0.000525*	0.000175	0.00663	0.00665	0.014

*Assumes the kiln is fitted with a HEPA filter capable of reducing lead emissions 95% from 0.0105 lb/hr to 0.000525 lb/hr.

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5.2 Design Considerations

None noted.

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5.3 Principles of Operation

The Envitech WESP System was developed by Envitech through years of research and is highly efficient in controlling metal emissions from industrial sources. The precipitators will be arranged in two (2) trains of five (5) units each. The exhaust gas first enters an inlet header of each train which distributes the gas to each of the WESP units. The WESP operation is further described below.

5.3.1 Wet Electrostatic Precipitator

5.3.1.1 Inlet Conditioning Section

The conditioning section houses the inlet and packed bed section for distributing the air flow equally to all cells of the collector section. The packed bed section is also wetted with recirculation liquid to ensure that the gas is saturated prior to entering the collector section. Acid neutralization with caustic can be used to protect the materials of construction of the collector section.

5.3.1.2 WESP Collector Section

In this section, electrostatic forces remove particles contained in the gas stream. The collector section is an array of grounded collector tubes and discharge electrodes. Voltage in the range of 30 to 40 kV is applied to the discharge electrodes both to charge the particles and to provide a high voltage field. The voltage emanating from disks on the discharge electrodes creates a corona discharge of electrons. Electrons move from the discharge disks to the collector tube. Some of the electrons intercept and charge particles in the gas stream. Once the particles are charged, they are moved across the gas stream by the high voltage field where they deposit on the grounded collector tube. The particles are then intermittently flushed from the collector tube with a stream of water.

PREPARED FOR 5.3.1.3 WESP Outlet and Electrode Housing



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The outlet section contains an entrainment separator. The entrainment separator collects any water drops that were entrained in the gas stream during washing. The outlet section also houses the support structure for the discharge electrodes.

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5.3.1.4 WESP High Voltage Transformer/Rectifier (T/R) with Controller

The power supply package supplies high voltage, full-wave, direct current (DC) power to the WESP. This allows automatic, unattended operation and provides all functions necessary to insure personnel safety and protect the equipment from upsets.

5.1.4.5 WESP Safety Interlock

The WESP is equipped with safety lock key interlocks that are interlocked with the main power to the T/R. This ensures that the high voltage areas in the power supply, the control cabinet, and the WESP cannot be entered without first de-energizing and grounding the bushing at the T/R.

After exiting the top of the WESP, the exhaust gas passes through an outlet header, Induced Draft (ID) fan and stack. There are two (2) ID fans, 1 operating and 1 spare.

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5.4 System Component Specifications

5.4.4 Wet Electrostatic Precipitators

Ten (10) high-efficiency Envitech wet electrostatic precipitators (WESP's).

Component	Description
Type	Upflow
Vessel Shells	316SS
Vessel Geometry	Square
Vessel Cross Section, ft	12 ft. x 12 ft.
Vessel Height, ft	30
Number of units	10 total (2 trains of 5 units each)
Footprint Area, Sq.ft (est.)	7,500
Inlet Conditioning Section	
Flow Distributor	316SS
Collector Section	316SS
Tube Type	Hexagon
Tube Length, in.	72
Tube Side Dimension, in	3
Tube Thickness, in	0.065
Discharge Electrodes	316SS
Type	Rigid Mast
Number of Emitter Disks per Electrode	6
Number of Discharge Crowns per Emitter Disk	25
Discharge Electrode Diameter, in.	1
Discharge Electrode Wall Thickness, in.	0.065
Power Grid Support	316SS
Insulator Support Assembly	
Quantity	4
Shell	CS
High Voltage Insulator	Porcelain
Outlet Section and Power Grid Housing	316SS
Entrainment Separator	316SS
Internal Wash Pipe	316SS
Wash Nozzle(s)	316SS
Access Doors	
Power Grid Housing	2 @ 24 in. \emptyset
Inlet Section	2 @ 24 in. \emptyset
Transformer/Rectifier	
Primary Voltage, V single phase	480
Secondary Voltage, kV	25 to 40

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Component	Description
Secondary Current, mA	1,850
Insulating Fluid	Mineral oil
Voltage Divider Rating, mega ohm	80
Current Limiting Reactor	
Location	LV junction box
Reactance	30%, 40%, 50%
Ambient Temperature, C	40
Temperature Rise, C	55
Type	Full wave rectified DC; mineral oil filled
Rectifier	Silicon diode bridge
Housing	NEMA 3R
Primary Power Rating	480V @ 17 amps
Secondary Power Rating	40 kV @ 242 mA
Transformer Rectifier Controller	SQ-300i
Power Transmission Type	Pipe in guard
Purge Air System	
Heater	
Type	Electric resistance
Quantity	4
Power, kW each	2
Purge Gas Ducting	316SS
Filters	4
Safety Interlock System	All access points, T/R Set and controller

5.4.6 Induced Draft (ID) Fans

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The system includes a total of Two (2) ID fans 1 operating and 1 spare.



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Instrument or Control	Number
Two (2) ID Fans	316SS
Two (2) VFD's	Included
Two (2) ID Fan Inlet Dampers	316SS
Two (2) ID Fan Outlet Dampers	316SS
Fan Motor HP, EA	
Connected	350
Operating	280



5.4.6 Instrumentation and Controls

The WESP system is designed for semi-automatic operation and includes instrumentation and a control system. Motor starters and control room building are by others.

Instrument or Control	Number
Level Transmitter	10
Level Switches	10
pH probe & Transmitter	10
Differential Pressure Transmitter(s)	2
Thermocouples	10
Liquid Flow Transmitter(s)	20
Pressure Gauge(s)	20
Control System	Included
Motor Starters and Control Room	By Others

5.4.7 Pumps

One (1) lot of recirculation pumps. Piping, valves, and fittings are by others.

Component	Description
Ten (10) Recirculation Pumps	20 HP/316SS
Piping, Valves & Fittings	By Others

5.4.8 Ducting & Stack

One (1) lot of interconnecting ducting fabricated as shown below.

Component	Description
Inlet Duct to System Inlet	By Others
Two (2) Inlet Headers	316SS
Two (2) Outlet Headers	316SS
Ten (10) WESP Inlet Dampers	316SS
Ten (10) WESP Outlet Dampers	316SS
One (1) Stack	316SS/70 ft Ht.

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5.5 Operating Parameters and Utilities

Following are the estimated operating parameters for both trains combined :

Operating Parameter/Utility	
System Inlet Pressure, in. WC	-1
Maximum Pressure Drop, in. WC	2
Fresh Water, gpm	2
Blowdown, gpm (estimated) ¹	2
Wash Water Flush, gpm ²	1,440
Electricity, kW	
T/R Set	246
Purge Air System	80
Motor Operating HP	
Recirculation Pumps	200
ID Fans	280
Caustic Consumption, gph ¹	TBD

¹Depends on the inlet SO₂ load which is unknown at this time.

²Operates for 1 min every 1 to 4 hours. The wash water will be rotated between the WESP units at 144 gpm at a time for 1 min every 1 to 4 hours per WESP unit.

6.0 Performance Guarantee and Warranty

6.1 Performance Guarantee

The proposed scrubbing system is designed to meet the following emission criteria:

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Lead (Pb) Outlet	0.001 lb/hr
------------------	-------------



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6.2 System Warranty

The system is warranted for materials and workmanship one year from date of startup or 18 months after delivery, whichever comes first. The system warranty is based on operation of the system in compliance with Envitech's operating instructions, including proper preventative maintenance and the design basis described in section 5.1.

The following are specific exclusions to the warranty:

None noted

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In all situations involving non-conforming or defective products furnished under this warranty, Buyer's exclusive remedy is the repair or replacement of the products. Seller shall in its sole discretion have the option to elect repair or replacement of the products.

Seller shall not be liable for any indirect, special, incidental or consequential loss or damage (including, without limitation, loss of profits or loss of use) suffered by Buyer arising from or relating to Seller performance, non-performance, breach of or default under a covenant, warranty, representation, term or condition hereof.

6.3 Performance Warranty

Subject to the limitations of the General Terms and Conditions and the conditions stated herein, Envitech warrants the performance of the equipment at the performance levels specified above during a performance test to be conducted, or the warranty deemed satisfied, within ninety (90) days after start of initial operation or six (6) months after shipment, whichever occurs first, provided that the equipment, if in operation, has been installed and adjusted in accordance with Envitech engineering drawings and other written instructions. This warranty is conditional upon the Inlet Gas Conditions as specified in *Design Basis*.

Buyer shall give Envitech at least 30 days prior written notice of the date when the equipment will be ready for performance testing. If the equipment is not tested for performance within the time period specified in the above paragraph, through no fault of Envitech, or if Inlet Gas Conditions different than those specified above are encountered during performance testing, then the Envitech performance test obligation and this performance warranty will be deemed satisfied.

The System and Envitech shall be deemed to have satisfied obligations and this performance warranty when the average of three consecutive tests results in concentrations consistent with the applicable performance levels.

Prior to performance testing, Envitech may inspect the equipment at any reasonable time. If the equipment has been damaged after the transfer and passage of the risk of loss and damage from Envitech to the Buyer or mis-installed by Buyer, then Buyer shall at its expense, restore the equipment to operating condition satisfactory to Envitech prior to beginning of performance testing. If the equipment cannot be restored, Envitech will be released from its obligation.

Performance testing will be conducted by an independent testing laboratory, mutually acceptable to Buyer and Envitech. The initial battery of tests will be

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conducted at Buyer's expense (including all fees and charges of the independent testing laboratory, as well as payment for the services, if requested, of an Envitech engineer at Envitech's then current daily service rate plus travel and living expenses). If the equipment performs at the applicable performance levels, as measured by the initial battery of tests, then the Envitech obligations and this performance warranty shall be deemed satisfied.

If the equipment fails to meet the applicable performance levels for reasons which are the fault or responsibility of Envitech, Buyer shall notify Envitech of the nonconformity in writing within 10 days of the knowledge of the nonconformity. Envitech, at its option, may make modifications, additions, or replacements to the equipment as it deems necessary to have the equipment function in accordance with said warranty. Envitech, at its expense, may request the independent laboratory to conduct additional tests to determine if the equipment is meeting the applicable performance levels. However, if the failure of the equipment to perform at the applicable performance levels occurs in whole or in part by reason of the fault or responsibility of third parties or of the Buyer, or its employees, agents or contractors, Buyer shall bear the expense of such additional tests.

Envitech and its engineers are to have access to all records, reports, results and other information relative to the equipment, as well as to all tests conducted by the independent testing laboratory. Immediately after completion of the tests, the Buyer shall cause the independent testing laboratory to transmit an unedited copy of the test reports and results to Envitech. At any time that this performance warranty is satisfied, or deemed satisfied, or Envitech is relieved of performance warranty obligations, any portion of the contract price not yet paid will immediately become due and payable to Envitech.

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7.0 Operation and Maintenance Manual

One printed copy of the operating and maintenance manual is provided. The manual contains all the information needed to operate, maintain, and troubleshoot the incinerator gas cleaning system.

The manual also includes general arrangement drawings, process flow diagrams, P & ID diagrams, wiring diagrams (with pre-wired option), sequence of operations, manufacturers' catalog sheets for purchased components, recommended sources of replacement parts, and spare parts list.

8.0 Training and Start-up

Start-up and installation supervision is provided as outlined in the proposal. Additional training and assistance is available on a per diem basis plus travel costs.

The training covers system design, start-up and shut-down procedures, basic control functions, and trouble shooting. The training schedule can be adjusted to meet the specific needs of various groups of personnel and different plant conditions

9.0 Revision History

Revision	Date	Author	Prepared For	Description
00	06/22/11	ACB	R. Kemp	Preliminary Budget Proposal

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Appendix A: Drawings

The following drawings are for reference only. Equipment, materials of construction and quantities are defined in 5.4 System Component Specifications.

- 29006GA, Rev 0 for Reference Only

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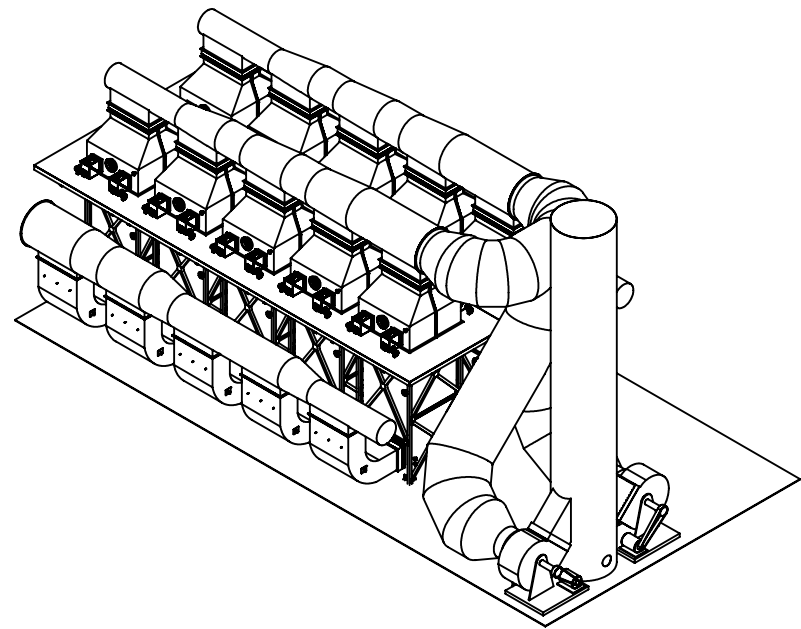
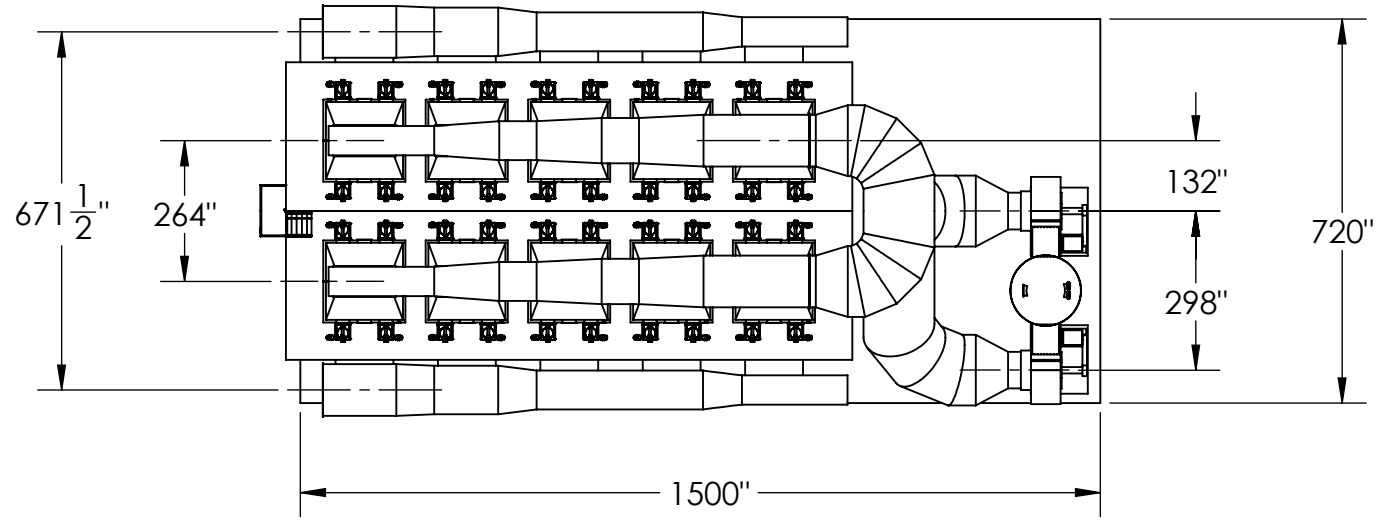
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REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	6/16/2011	R. PATTERSON

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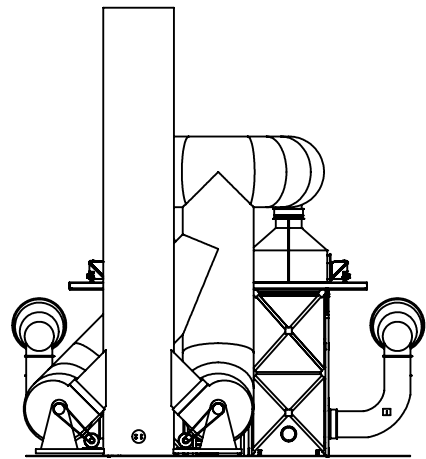
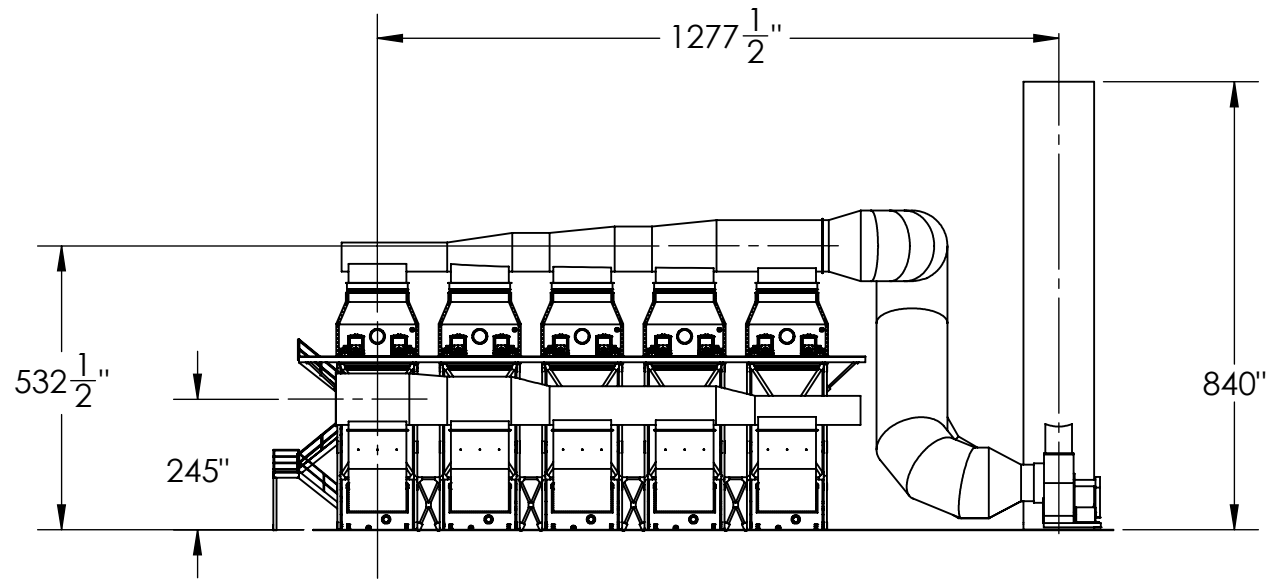


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<p>UNLESS OTHERWISE SPECIFIED:</p> <p>DIMENSIONS ARE IN INCHES</p> <p>TOLERANCES:</p> <p>FRACTIONAL ±</p> <p>ANGULAR: MACH ± BEND ±</p> <p>TWO PLACE DECIMAL ±</p> <p>THREE PLACE DECIMAL ±</p> <p>INTERPRET GEOMETRIC TOLERANCING PER:</p> <p>PROPRIETARY AND CONFIDENTIAL</p> <p>THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF ENVITECH INC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF ENVITECH INC. IS PROHIBITED.</p>	NAME	DATE	 <p>2924 Emerson Street San Diego, CA 92106 (619) 223-9925 (619) 223-9938 FAX</p>						
	DRAWN	AJO		6/16/11					
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	PROJ ENG	AJO		6/16/11					
MATERIAL			<p>TITLE:</p> <p>GENERAL ARRANGEMENT</p>						
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PROJECT:	EXIDE		<table border="1"> <tr> <td>SIZE</td> <td>DWG. NO.</td> <td>REV</td> </tr> <tr> <td>B</td> <td>29006GA</td> <td>A</td> </tr> </table>	SIZE	DWG. NO.	REV	B	29006GA	A
SIZE	DWG. NO.	REV							
B	29006GA	A							
SCALE: 1:36		WEIGHT:	SHEET 1 OF 1						

8 7 6 5 4 3 2 1



Appendix C: Brochures

- Industrial Gas Cleaning System Brochure
- Enviech WESP Cut Sheet

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Appendix C: Terms and Conditions

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ENVITECH

General Terms and Conditions

Acceptance

Unless otherwise provided, this Proposal is subject to acceptance by Buyer within sixty (60) days from the Proposal date. Acceptance of this Proposal is limited to the terms and conditions herein. Envitech rejects all additional or different terms proposed by Buyer, except with Envitech's prior written consent. Buyer will reimburse Envitech for all reasonable costs and all other loss and damage resulting from the amendment or termination of this Proposal.

Terms of Payment

Except as otherwise provided in the Proposal, payment shall be by check or bank transfer according to the *Payment Schedule*. If Buyer fails to make any payments in accordance with the terms and provisions hereof, Envitech, in addition, but not in limitation, to its other rights and remedies, may at its option, either terminate the Contract or suspend further deliveries under it until payments have been brought current.

Shipping

Unless otherwise provided, all shipments shall be made F.O.B. shipping point. Title and risk of damage to or loss of goods shall pass to the Buyer upon delivery by Envitech to the carrier. If the shipment of any or all of the equipment is postponed or delayed by Buyer for any reason, including a Force Majeure situation, Buyer agrees to reimburse Envitech for any and all storage costs and other additional expenses resulting there from.

Force Majeure

Envitech shall not be liable for loss or damage for delay in delivery or failure to manufacture due to causes beyond its reasonable control including, but not limited to, acts of God, the government or the public enemy, riots, embargoes, strikes or other acts or workmen, casualties or accidents delays in deliveries and transposition and shortages of cars, fuel, power, labor, or material.

Material/Workmanship Warranty

Envitech will repair or replace, in its sole discretion, any equipment which has been manufactured to Envitech's special design and sold hereunder which is found to be defective in workmanship or materials, within twelve (12) months from its respective final acceptance date or eighteen (18) months from its respective shipment date, whichever comes first. Buyer's obligations hereunder are subject to the following conditions:

a) Buyer notifies Envitech in writing within fifteen (15) days after such defect becomes apparent and promptly furnishes Envitech full particulars in

connection therewith, together with an opportunity to witness the operation of such defective equipment.

b) Buyer shall have installed (if applicable), operated and maintained the equipment strictly in accordance with Envitech's operating and maintenance instructions, including, but not limited to, the use of only those materials specified in the Proposal and in the inlet quantities stated in the Proposal.

c) The defect has been caused solely by faulty materials or workmanship for which Envitech is responsible, and is not due to such things as erosion, corrosion, or deterioration resulting from the manner in which the equipment is operated, accident (including damage during shipment, neglect, misuse or abuse, or exposure to conditions beyond the environmental power or operating constraints specified by Envitech.

Envitech makes no warranty with respect to equipment and materials not furnished by Envitech pursuant to this Proposal or with respect to equipment furnished by Envitech pursuant to this Proposal which has not been manufactured to Envitech's special design, but will pass on or assign to Buyer to the extent legally permissible, the warranties, if any, obtained from manufacturers of such items of equipment.

Any repairs made under this warranty will be done on site, if feasible, or at the place of manufacture. Any round-trip freight transportation charges required for returning material deemed defective to the place of manufacture must be paid by Buyer. All costs associated with removing or reinstalling the defective equipment will be at Buyer's sole expense.

Limitation of Warranties

The warranties and guaranties furnished by Envitech, as expressly included herein, constitute Envitech's sole obligation hereunder and are in lieu of any other warranties or guaranties, express or implied, including warranties of merchantability or fitness for a particular purpose.

Taxes

Unless otherwise provided, Buyer agrees to pay any tax or import duty imposed by any federal, state, local or municipal Authority upon the equipment or related services described in this Proposal.

Installation

Unless otherwise provided, Envitech shall have no responsibility for, and Buyer hereby waives and relinquishes any claims related to, the installation, start-up and operation of the equipment to be furnished hereunder. If this agreement so provides, Envitech shall furnish advisory personnel to assist in installation and start-up of the equipment and to instruct Buyer's personnel in the operation of Envitech's equipment. Although Envitech will be responsible for mechanical adjustments to its equipment, Envitech has no responsibility for, and Buyer hereby waives and relinquishes any claims related to, correctness of site installation, the appropriateness and compatibility of the installation with respect to Buyer's facility or ability of Buyer's personnel to correctly operate and maintain Envitech's equipment.

Buyer agrees to defend, indemnify and hold harmless Envitech from and against any loss, costs (including reasonable attorneys' fees and costs), claims, suits or causes of action brought, threatened or incurred by or against Envitech arising from or in any way related to the installation, start-up and operation of the equipment to be furnished hereunder.

Inventions and Patents

Envitech grants no license by reason of any sale under any patent rights it may now own or hereafter acquire except the right to use the equipment sold hereby for the purpose for which it is sold under such patent rights, only as it covers said equipment as sold by Envitech. All drawings, novel techniques, special tooling and inventions made or acquired by Envitech or its agents or employees in the fulfillment of this proposal shall be the property of Envitech regardless of whether any order document states a separate price item for tooling or engineering. Buyer agrees to indemnify and hold Envitech harmless from and against any expense or loss from infringement of patents or trademarks arising from compliance with the Buyer's designs, specifications or instructions in the manufacture of the equipment or its use in combination with other equipment or systems.

Limitation of Remedies

Envitech's entire liability and Buyer's exclusive remedy are set forth in this Section:

In all situations involving non-conforming or defective Products furnished under this Agreement, Buyer's exclusive remedy is the repair or replacement of the Products. Envitech shall in its sole discretion have the option to elect repair or replacement of the Products.

Envitech's liability for actual damages for any cause whatsoever shall be limited to the applicable unit price for the specific components of the Product that caused the damages or that are the subject matter of, or are directly related to, the cause of action. This limitation will apply, except as otherwise stated in this Section, regardless of the form of action, whether in contract or in tort, including negligence.

Envitech shall not be liable for any indirect, special, incidental or consequential loss or damage (including,

without limitation, loss of profits or loss of use) suffered by Buyer arising from or relating to Envitech's performance, non-performance, breach of or default under a covenant, warranty, representation, term or condition hereof. Except as specifically provided in the preceding sentence, Buyer waives and relinquishes claims for indirect, special, incidental or consequential damages.

Buyer expressly waives any right to recover punitive damages from Envitech, and Buyer hereby waives and relinquishes any and all punitive damage claims.

The limitations on liability and damages set forth in this section apply to all causes of action that may be asserted here under, whether sounding in breach of contract, breach of warranty, tort, product liability, negligence or otherwise.

Security

Envitech reserves a security interest in the equipment sold hereunder and in all accessions to, replacements for and proceeds of such equipment, until the full contract price, plus all other charges permitted hereunder, including any charges, costs or fees contemplated in the *Attorney's Fees, Venue and Jurisdiction* section below, are paid in full by Buyer. If so requested by Envitech, Buyer shall execute all security agreements, financing statements, promissory notes and all other security documents requested by Envitech in the form determined by Envitech.

Dispute Resolution

The Parties agree that any controversy, dispute or claim arising from or in any way related to this Agreement or the materials or equipment provided by Envitech shall be resolved by binding arbitration. The parties agree that jurisdiction for any arbitration shall be with the San Diego, California office of the Judicial Arbitration and Mediation Service ("JAMS") and the Parties hereby expressly agree to be bound by the then-prevailing JAMS rules applicable to commercial arbitrations.

Any dispute subject to arbitration shall be submitted to a single neutral arbitrator, who, unless otherwise agreed by the Parties, shall be a retired judge or other lawyer who is a member of the arbitration panel of the San Diego office of JAMS and who has substantial experience in the area of the Dispute. JAMS shall submit to each Party an identical list of five proposed qualified arbitrators drawn from the applicable panel of commercial arbitrators. If the Parties are unable to agree upon an arbitrator within thirty (30) days from the date that JAMS submits such list to each Party, then JAMS shall simultaneously submit to each Party a second list of five additional proposed qualified arbitrators drawn from the applicable panel of commercial arbitrators. If for any reason, the appointment of an arbitrator cannot be made from either list, JAMS may make the appointment from among other qualified members of the panel without the submission of additional lists to the Parties.

The Parties shall be entitled to obtain pre-hearing discovery through depositions and requests for the inspection and copying of documents and other items upon reasonable notice and to obtain the issuance of a

subpoena duces tecum therefor in accordance with applicable law, provided that depositions shall not be taken unless leave to do so is first granted by the arbitrator. As between the Parties, the arbitrator shall have the power to enforce the rights, remedies, procedures, duties, liabilities and obligations of discovery by the imposition of the same terms, conditions, consequences, sanctions and penalties as may be imposed in like circumstances in a civil action by a California Superior Court.

Any award rendered by the arbitrator shall be reduced to a judgment and may be entered in any Court authorized to have jurisdiction under this Agreement.

The parties expressly waive any right they may have to a jury trial.

Venue and Jurisdiction

Each Party irrevocably consents to the jurisdiction of the state courts located in San Diego, California, and agrees, subject to the provisions contained in the paragraph entitled "Dispute Resolution" above, that any action, suit or proceeding by or among the Parties (or any of them) may be brought in any such court sitting in San Diego, California, and waives any objection which the Party may now or hereafter have concerning jurisdiction and venue, whether based on considerations of personal jurisdiction, forum non conveniens or on any other ground.

Attorney's Fees

In the event of any litigation, arbitration, judicial reference or other proceeding involving the Parties to this Agreement to enforce any provision of this Agreement, to enforce any remedy available upon default under this Agreement, or seeking a declaration of the rights of a Party under this Agreement, the prevailing Party(ies) shall be entitled to recover from the other(s) such attorneys' fees and costs as may be reasonably incurred, including the cost of reasonable investigation, preparation and professional or expert consultation incurred by reason of such litigation, arbitration, judicial reference or other proceeding.

Sound Levels

The combined sound or noise levels produced by individual sound generating devices, and the exposure of workmen to such, will depend on Buyer's plant noise levels over which Envitech has no control. Therefore, Envitech makes no guarantees, warranties or representations with respect to sound levels. If, after the equipment to be furnished hereunder is installed, it is determined that the system does not meet the maximum permissible sound levels or exposures, or that changes in OSHA requirements necessitate equipment modifications or additions, Envitech shall assist Buyer in designing and providing equipment and materials required, provided that an equitable adjustment of the contract price and proposed schedule is made.

Design Criteria

Envitech's Proposal is based upon design criteria supplied by Buyer and Envitech assumes no responsibility for the accuracy of such criteria. Buyer recognizes, and the parties hereto intend, that Envitech shall not be obligated to meet its performance guarantee hereunder if the actual design conditions are found to be different from those upon which Envitech's Proposal is based.

Additions or Changes in the Work

Buyer agrees to pay Envitech reasonable charges for additional work outside the scope of any contract resulting from Envitech's Proposal as requested by Buyer by changes indicated by Buyer on Envitech's drawings, by letter, or by change order or other written instruction, and an equitable adjustment of the contract price and proposed schedule will be made by the parties.

Termination or Cancellation

In the event that Buyer terminates or cancels all or any portion of its order, Buyer shall compensate Envitech for all costs and expenses already incurred including, but not limited to, the price of any goods or services required to fill said order already committed to by Envitech, a pro rata portion of the contract price representing work completed prior to such termination or cancellation and a reasonable allowance for overhead and profit.

Miscellaneous

This Proposal represents the entire understanding and agreement between the parties hereto with respect to the subject matter hereof and supersedes all prior negotiations, letters and understandings relating to the subject matter hereof and cannot be amended, supplemented or modified except in writing signed by the party against whom the enforcement of any such amendment, supplement or modification is sought.

Failure of Envitech at any time or times to require performance of any provision of this proposal shall in no manner affect its right to enforce the same, and a waiver by Envitech of any breach of any provision of this proposal shall not be construed to be a waiver by Envitech of any succeeding breach of such provision or a waiver by Envitech of any breach of any other provision.

The rights, privileges, duties and obligations covered herein, including the transactions and agreements covered and contemplated hereby, shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns provided, however, Buyer may not assign any of its rights, privileges, duties or obligations hereunder without the prior written consent of Envitech, and any purported or attempted assignment without such written consent shall be null and void *ab initio*.

Appendix B
BUSCH FEF Statement



10431 Perry Highway, Wexford, PA 15090 Ph: 724-940-2326 Fax 724-940-4140

July 7, 2011

ENVIRON International Corporation
1600 Parkwood Circle, Suite 310
Atlanta, GA 30339

ATTN: Russell Kemp, Principal

Dear Russell:

Subject: Busch International Fugitive Emissions Filtration (FEF) Units

This revised letter summarizes several points from our recent conversations.

The Busch FEF Unit is a highly efficient and cost effective way to control fugitive lead dust emissions within lead processing facilities. These units offer the following features and benefits:

- Compact horizontal configuration for roof mounting, inline mounting or tight indoor locations.
- Self cleaning reverse jet pulse high efficiency filter system followed by a HEPA polishing filter stage.
- Easy to service walk-in configuration.
- Cost effective packaged design incorporates the fan, motor, controls and filtration system in one economical package.
- Proven performance on many lead industry and other metallurgical fume applications.

During our discussions, Environ presented outlet emission test data, which is reported to have come from other Busch FEF unit installations within the lead industry. These field tests from 1997-1998 show lead particulate outlet emission concentrations of less than 0.0001 Grains/DSCF. In some cases, outlet concentrations are as low as 0.0000003 Grains/DSCF. These levels are all below emission limits that could be "guaranteed".



Busch International believes that past performance is a good indication of expected future results. This will be true especially for like applications. Note however, that installations of this type are highly variable in nature and the prediction of filter system dust removal efficiency and/or outlet emission concentration is theoretical at these very low levels. The inlet dust loading and particle size distribution associated with each installation will likely vary. For these reasons, Busch expects to see similar outlet emission levels on similar applications in the future, but we cannot guarantee outlet emissions at these low levels

We look forward to the opportunity to work with you further. Please contact Lois McElwee or me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'William W. Frank'.

William W. Frank
President

C: Lois McElwee –Regional Manager

Appendix C
US EPA Draft Cost Impacts for the
Secondary Lead Smelting Source Category
and Data Table

MEMORANDUM

To: Chuck French, U.S. Environmental Protection Agency, OAQPS

From: Donna Lazzari and Mike Burr, ERG

Date: April 2011

Subject: Draft Cost Impacts for the Secondary Lead Smelting Source Category

The purpose of this memorandum is to describe the methodology used to estimate the costs, emissions reductions, and secondary impacts of the proposed revisions to the National Emissions Standards for Hazardous Air Pollutants (NESHAP) for the Secondary Lead Smelting source category. These impacts were calculated for existing units and new units projected to be operational by the year 2014, two years after the rule is expected to be promulgated and the anticipated year of implementation of the revised NESHAP. The results of the impacts analyses are presented for the most stringent regulatory options considered in addition to the regulatory options that were ultimately chosen for proposal. The development of the baseline emissions estimates and the maximum achievable control technology (MACT) floors for this source category are discussed in other memoranda^{1,2}. The organization of this document is as follows:

- 1.0 Summary of Cost Estimates and Emissions Reductions for the Regulatory Options Chosen for Proposal
- 2.0 Regulatory Options Considered for Proposal
- 3.0 Methodology for Estimating Control Costs
- 4.0 Methodology for Estimating Emissions Reductions
- 5.0 Testing and Monitoring Cost Impacts
- 6.0 Summary of Cost by Facility

1.0 SUMMARY OF COST ESTIMATES AND EMISSIONS REDUCTIONS FOR THE REGULATORY OPTIONS CHOSEN FOR PROPOSAL

Regulatory options were considered for control of emissions of metal hazardous air pollutants (HAP), organic HAP, and dioxins and furans (D/F) from stacks and metal HAP from fugitive sources. For all options, total hydrocarbons (THC) are considered a surrogate for organic HAP (other than dioxins and furans) and lead a surrogate for metal HAP. A brief

¹ ERG. Development of the RTR Emissions Dataset for the Secondary Lead Smelting Source Category, Mar. 2011.

² ERG. MACT Floor Analysis for the Secondary Lead Smelting Source Category, Mar. 2011.

description of the options selected for the proposed revisions to the NESHAP and the associated costs and emissions reductions are summarized in Table 1-1. The most stringent options considered in this analysis are summarized in Table 1-2. A more detailed description of all the regulatory options considered for proposal and their associated cost and emissions reductions estimates are presented in section 2.0 of this memorandum.

Table 1-1: Summary of the Estimated Costs and Emissions Reductions of Regulatory Options Selected for Proposal

Option	Description	COST IN \$ MILLIONS (2009 DOLLARS)				Total HAP Emissions Reductions (tons per year)	Cost per ton HAP reduction (\$MM)
		Capital Cost	Annualized Capital Cost	Annual Operation and Maintenance Cost	Total Annualized Cost		
3S	Stack lead concentration limit of 1.0 mg/dscm any stack, and 0.2 mg/dscm facility average	\$7.7	\$0.7	\$0.9	\$1.7	5.9	\$0.29
1D	D/F Concentration based limit	\$0	\$0	\$0.26	\$0.26	30*	\$0.009
3F	Fugitive enclosure + work practice	\$40	\$3.8	\$5.8	\$9.6	9.5	\$1.0
Test, Monitor, Report	Additional Testing, Monitoring	\$0.33	\$0.03	\$1.0	\$1.0		
Total		\$48.0	\$4.5	\$8.0	\$12.6	45.4	\$0.28

*Tons of total organic HAP (3 grams/yr D/F reduction)

Table 1-2: Summary of the Estimated Costs and Reductions for the Most Stringent Options

Option	Description	COST IN \$ MILLIONS (2009 DOLLARS)				Total HAP Emissions Reductions (tons per year)	Cost per ton HAP reduction (\$MM)
		Capital Cost	Annualized Capital Cost	Annual Operation and Maintenance Cost	Total Annualized Cost		
2S	0.009 lb/ton Pb emissions limit	\$23.9	\$2.3	\$2.7	\$5.0	9.6	\$0.52
2D	Beyond the floor D/F limits for	\$5.9	\$0.56	\$2.4	\$2.9	200*	\$0.015

Option	Description	COST IN \$ MILLIONS (2009 DOLLARS)				Total HAP Emissions Reductions (tons per year)	Cost per ton HAP reduction (\$MM)
		Capital Cost	Annualized Capital Cost	Annual Operation and Maintenance Cost	Total Annualized Cost		
	blast furnaces						
1F and 2F	Enclosures, work practices, monitoring	\$40	\$3.8	\$6.1	\$9.9	9.5	\$ 1.04
Test, monitor, report	Additional testing and monitoring	\$0.33	\$0.03	\$1.0	\$1.0		
Total		\$70.1	\$6.7	\$14.4	\$18.8	219	0.086

*We estimate a total of 200 tons of reductions in organic HAP emissions, including 31 grams of dioxins and furans, under this beyond-the-floor option.

2.0 REGULATORY OPTIONS CONSIDERED FOR PROPOSAL

This section provides a detailed description of all regulatory options that were considered for the proposed revisions to the Secondary Lead Smelting NESHAP and their associated costs and secondary impacts.

2.1 Stack Emissions – Metal HAP

The four regulatory options considered for control of metal HAP emissions from stacks are presented in the following sections.

a. *Option 1S*

Regulatory option 1S represents a scenario of reducing the existing lead emissions concentration limit from the 2.0 milligrams per dry standard cubic meter (mg/dscm) to 0.5 mg/dscm. Based on emissions data received in an information collection request (ICR) sent to the industry, 90 percent of the stacks in this source category reported concentrations below 0.5 mg/dscm. Ten emissions points at six facilities reported concentrations above 0.5 mg/dscm; estimates of cost and emissions reductions were made for 8 of these stacks. One facility is currently undergoing an upgrade with plans to replace existing baghouses, and thus, we assumed this would reduce the lead concentration at this stack below 0.5 mg/dscm. For seven of the stacks reporting concentrations above 0.5 mg/dscm, we assumed that a replacement baghouse would be installed. For one stack at which a baghouse was recently installed, we assumed that lead concentrations below 0.5 mg/dscm could be achieved through replacement bags performance of additional maintenance on the unit. One additional stack reported concentrations that were very close to 0.5 mg/dscm; no costs for were estimated for this unit. The total estimated capital cost for the seven new baghouses that would likely be necessary to achieve

concentrations below 0.5 mg/dscm is \$11.8 million, resulting in an annualized capital cost of \$1.1 million. Additional annual operational and maintenance costs, including more frequent bag changes for the baghouses, are estimated at \$1.6 million above the costs of operating the current air pollution control devices. The total estimated annualized cost above current cost for the 8 baghouses is \$2.7 million (2009 dollars). The estimated emissions reductions of Option 1S are 6.5 tons per year of lead and 8.3 tons per year of total metal HAP.

b. Option 2S

Option 2S considers a production-based lead emissions limit. A limit of 0.009 pounds of lead emissions per ton of lead production (lbs/ton Pb) was calculated as a facility-wide emissions limit using a methodology similar to a MACT floor analysis. We estimate that new or improved baghouses would likely be necessary at 19 emissions points at six facilities to meet the limit considered in this option. For facilities that were estimated to be above the limit considered in this option, we sequentially selected stacks for a baghouse replacement or upgrade (based on reported concentration) until the facility was estimated to have emissions below 0.009 lbs/ton Pb. Two of the stacks selected had relatively newer baghouses, and thus, we estimated the cost of changing all the existing bags to a new upgraded filter media and performing additional maintenance for these units. One selected stack had a baghouse that was less than 10 years old; we estimated 25 percent of the cost of a new unit to represent additional filtration media or substantial upgrade to this unit. For the remainder of the selected stacks, assumed replacement baghouses would be needed.

The total estimated capital cost for this regulatory option is \$23.9 million, resulting in an annualized capital cost of \$2.3 million. Additional annual operational and maintenance costs, including more frequent bag changes for the baghouses, are estimated at \$2.7 million above current costs. The total annualized cost above current air pollution control device operating costs for the 19 baghouses is \$5.0 million (2009 dollars). Total anticipated emissions reductions of lead and other metal HAP in this option are estimated at 9.6 tons per year.

c. Option 3S

Option 3S is the regulatory option that was selected by EPA for proposal in the Secondary Lead Smelting NESHAP. This option represents an overall facility-wide flow-weighted average lead concentration limit of 0.2 mg/dscm and a limit of 1.0 mg/dscm for any individual stack. We estimate that this option would require reductions in lead emissions at three emissions points located at two facilities. We assumed that replacement baghouses would be needed at each of these emissions points. The total estimated capital cost for the new baghouses is \$7.7 million, resulting in an annualized capital cost of \$0.7 million. Additional annual operational and maintenance costs, including more frequent bag changes for the baghouses, are

estimated at \$0.9 million above the currently operated air pollution control device operating costs. The total annualized cost above current cost for the three baghouses is \$1.7 million (2009 dollars). Lead emissions reductions for this option are estimated at 4.7 tons per year with total metal HAP emissions reductions of 5.9 tons per year.

d. Option 4S

Option 4S is a regulatory option that considers requiring installation of a wet electrostatic precipitator (WESP) at each facility to control stack emissions of metal HAP. One facility in this source category currently utilizes a WESP to control metal HAP emissions from stacks (i.e., Quemetco, Inc. in City of Industry, CA). Based on emissions data received in the ICR, this facility is the lowest emitting facility in terms of stack emissions of metal HAP. In this option, the other 13 facilities in the source category would be required to install a WESP. Based on the configuration of the existing WESP reported in the ICR, we assumed that facilities that would need to install a WESP under this option would use the WESP to control metal HAP emissions from process and process fugitive emissions sources only. More specifically, we assumed that existing hygiene baghouses would not be routed to the WESP. The total estimated capital cost for installation of a WESP at 13 facilities is \$400 million, resulting in an annualized capital cost of \$36 million. The total annualized cost above current cost is estimated at \$55 million. Lead emissions reductions for this option are estimated at 10.9 tons per year with total estimated metal HAP emissions reductions of 13.8 tons per year.

e. Summary

A summary of the costs and emissions reductions associated with the four regulatory options described above for stack emissions are summarized in Table 2-1.

Table 2-1: Estimated Costs and Emissions Reductions for the Regulatory Options Considered for Stack Emissions of Metal HAP.

Option	Description	COST IN \$ MILLIONS (2009 DOLLARS)				Total HAP Emissions Reductions (tons per year)	Cost per ton HAP reduction (\$MM)
		Capital Cost	Annualized Capital Cost	Annual Operation and Maintenance Cost	Total Annualized Cost		
1S	Concentration limit of 0.5 mg/dscm	\$11.8	\$1.1	\$1.6	\$2.7	8.3	\$0.33
2S	0.009 lb Pb / Ton Pb produced	\$23.9	\$2.3	\$2.7	\$5.0	9.6	\$0.52
3S	Concentration limit of 1.0 mg/dscm any stack, and 0.2	\$7.7	\$0.7	\$0.9	\$1.7	5.9	\$0.29

Option	Description	COST IN \$ MILLIONS (2009 DOLLARS)				Total HAP Emissions Reductions (tons per year)	Cost per ton HAP reduction (\$MM)
		Capital Cost	Annualized Capital Cost	Annual Operation and Maintenance Cost	Total Annualized Cost		
	mg/dscm facility average						
4S	WESP	\$400	\$36	\$19	\$55	13.8	\$4.0

2.2 Stack Emissions – Organic HAP and D/F

The two regulatory options considered for control of stack emissions of organic HAP and D/F are presented in the following sections.

a. *Option 1D*

Option 1D is the regulatory option that EPA chose for proposal in the revised NESHAP for the Secondary Lead Smelting source category. This option represents calculating a MACT floor for D/F emissions from various furnace groupings that were formed based on similar operating characteristics. In addition to the D/F MACT floors, new MACT floors for THC were calculated for furnace types that are not regulated in the existing NESHAP. These include reverberatory furnaces not collocated with blast furnaces, electric arc furnaces, and rotary furnaces. The THC MACT limits for blast furnaces and collocated blast and reverberatory furnaces in the existing NESHAP would remain unchanged under the proposed revisions. We do not anticipate that this regulatory option will require installation of additional controls at any facilities. We do anticipate, however, that four facilities operating blast furnaces will likely increase the temperature of their afterburners to ensure continuous compliance with the new MACT floors for D/F and THC. The cost of the natural gas required to raise the temperature 100 degrees Fahrenheit (°F) at afterburners was estimated at \$260,000 per year (2009 dollars). Under this regulatory option, we estimate D/F emissions reductions of about 2.9 grams per year and organic HAP emissions reductions of about 30 tons per year.

b. *Option 2D*

Option 2D represents a beyond-the-floor option for D/F emissions from blast furnaces that are not collocated with reverberatory furnaces. This option was considered because based on emissions data submitted in the ICR, blast furnaces that are not collocated with reverberatory furnaces contribute approximately 78 percent of the total D/F emissions from the source category. In this option, a Toxic Equivalency Quotient (TEQ) based concentration limit of 17 nanograms per dry standard cubic meter (ng/dscm) (corrected to 7 percent oxygen (O₂)) was

considered. This concentration represents an approximate 90 percent reduction in total D/F emissions from blast furnaces in this source category.

For this option, we assumed that additional afterburner capacity would be needed at five of the six blast furnaces needing D/F emissions reductions. One of the blast furnaces has an afterburner currently installed that meets the requirements of this considered regulatory option. The total estimated capital cost for installation of the additional afterburners is \$5.9 million, which results in an estimated annualized capital cost of \$0.56 million. Annual operational and maintenance costs increases, including additional natural gas fuel, are estimated at \$2.4 million above current control device operating costs. The total annualized cost above current cost for the afterburners is estimated to be \$2.9 million (2009 dollars). Under this scenario, we anticipate D/F emissions reductions of 31 grams per year, with a co-reduction of 200 tons per year of all other organic HAP. We also estimate that this option would result in a significant increase in fuel use along with increased emissions of carbon dioxide (CO₂) and oxides of nitrogen (NO_x) associated with operation of the additional afterburners.

c. Summary

A summary of the costs and emissions reductions associated with the two regulatory described above for D/F and organic HAP emissions are summarized in Table 1-4.

Table 2-2: Cost Estimates and Emissions Reductions for Regulatory Options Considered for Stack Emissions of D/F and Organic HAP.

Option	Description	COST IN \$ MILLIONS (2009 DOLLARS)				Total HAP Emissions Reductions (tons per year)	Cost per ton HAP reduction (\$MM)
		Capital Cost	Annualized Capital Cost	Annual Operation and Maintenance Cost	Total Annualized Cost		
1D	Concentration based MACT limit	\$0	\$0	\$0.26	\$0.26	30*	\$0.009
2D	Beyond the floor for Blast furnaces	\$5.9	\$0.56	\$2.4	\$2.9	200*	\$0.015

* based on total organic HAP

2.3 Fugitive Emissions – Metal HAP

Three regulatory options were considered for control of fugitive metal HAP emissions. Because these emissions cannot be directly measured, a numerical emissions limit was not calculated. Instead, regulatory options were considered that prescribed specific controls or lead

compliance monitoring at the property boundary as a means of demonstrating compliance. The three options considered are as follows:

1. **Option 1F:** This option requires facilities to conduct ambient lead monitoring at or near the property boundary to demonstrate compliance with the National Ambient Air Quality Standard (NAAQS) for lead.
2. **Option 2F:** This option requires facilities to keep all lead-bearing materials and processes enclosed in permanent total enclosures that are vented to a control device. Additional fugitive control work practices would also be required. Compliance with this regulatory option would be demonstrated by ensuring full enclosure plus work practices and ambient lead monitoring at or near the property boundary.
3. **Option 3F:** This is the primary regulatory option selected by EPA for proposal in the revised NESHAP for the Secondary Lead Smelting source category. This option is identical to option 2F with the exception that ambient lead monitoring at or near the boundaries of the facilities would not be required. Instead, compliance would be demonstrated through construction of total enclosures and operation according to a standard operating procedures (SOP) manual detailing how the required fugitive control work practices will be implemented.

In options 2F and 3F, facilities would be required to have all lead manufacturing processes within total enclosures under negative pressure with conveyance to a control device. Although option 1F requires only monitoring at the property boundary, and does not explicitly require total enclosures, we assumed for cost purposes that facilities would need to operate all lead-bearing processes under negative pressure enclosures in order to comply with this option. This estimate is considered to be a high end conservative estimate of costs, particularly for facilities where operations are not close to the property boundary. Based on information submitted in the ICR, the facilities that are currently achieving ambient lead concentrations at or near the lead NAAQS at or near their property's boundaries are facilities that already have their processes totally enclosed. Therefore, we assumed facilities that do not have all of their lead manufacturing processes in total enclosures will construct the appropriate enclosures and reconfigure their facilities to reduce their overall footprint as described in section 3.3 of this memorandum.

The total estimated capital cost for the total enclosures, ventilation systems, and associated control devices is \$40 million, which results in an annualized capital cost of \$3.8 million. The total annual operation and maintenance cost, which includes building and baghouse maintenance, is estimated at \$2.8 million above current cost. The total annualized cost of new enclosures for six facilities is \$6.6 million. Costs associated with the additional work practices are estimated at \$300,000 per facility for 10 facilities at a total cost of \$3 million. The total estimated annualized cost of reducing fugitive emissions for the primary regulatory option selected by EPA for proposal (Option 3F) is \$9.6 million (2009 dollars). For option 1F and 2F, the cost of operating two compliance monitors at or near the property boundary of each facility is

estimated at \$23,000 per facility for a total additional annualized cost of \$322,000. We estimate reductions in fugitive emissions of 8.7 tons per year of lead and 9.5 tons per year of metal HAP.

The estimated costs and emissions reductions associated with the regulatory options considered for fugitive emissions of metal HAP are summarized in Table 1-5.

Table 2-3: The Estimated Costs and Metal HAP Reductions for Fugitive Sources

Option	Description	COST IN \$ MILLIONS (2009 DOLLARS)				Total HAP Emissions Reductions (tons per year)	Cost per ton HAP reduction (\$MM)
		Capital Cost	Annualized Capital Cost	Annual Operation and Maintenance Cost	Total Annualized Cost		
1F and 2F	Enclosure, work practice, monitoring	\$40	\$3.8	\$6.1	\$9.9	9.5	\$1.04
3 F	Enclosure, work practice	\$40	\$3.8	\$5.8	\$9.6	9.5	\$1.0

3.0 METHODOLOGY FOR ESTIMATING CONTROL COSTS

The following sections present the methodologies used to estimate the costs associated with the regulatory options considered for proposal in the revised NESHAP for the Secondary Lead Smelting source category.

3.1 Stack Emissions – Metal HAP

The primary technologies used to control stack emissions of metal HAP in the Secondary Lead Smelting source category are filtration devices such as baghouses or cartridge collectors, some of which have high performance particulate air (HEPA) filters as a secondary filtration device. One facility uses a wet electrostatic precipitator (WESP) downstream of a baghouse as a polishing step to further reduce metal HAP emissions. Data collected in the ICR indicate that baghouses that are properly designed, installed, maintained and operated can meet all of the metal HAP stack emissions limits considered in this analysis except those under option 4S (which included a WESP).

In order to estimate the capital cost associated with a particular option, we first determined which stacks would be required to reduce emissions. For the concentration-based limits, we assumed that the baghouses at any stacks reporting concentrations in the ICR above the considered emissions limit would need to be repaired, improved, or replaced. If the reported concentration was more than 10 percent over the considered limit, we assumed the baghouse would need to be replaced. If the reported concentration was within 10 percent of the considered limit or the unit in question was relatively new (installed after the year 2000), we assumed that

replacement bags or additional baghouse maintenance could sufficiently reduce the concentration. For options that included a flow-weighted average concentration limit or a production based emissions limit, control devices were chosen for replacement or upgrade one at a time, beginning with the highest reported lead concentration, until the facility's emissions were below the considered limit.

In the ICR, EPA requested information on costs of emissions control devices that have been installed in the last five years. Several facilities submitted cost information that was used as a basis for estimating the cost associated with installation of a new baghouse. We compared estimates submitted by all of the facilities and chose the highest of the estimates as the cost model for baghouse installations. We compared estimates using this methodology to estimates derived using techniques described in the sixth edition of the EPA Air Pollution Control Cost Manual (http://www.epa.gov/oaqps001/lead/pdfs/2002_01_cost_control_%20manual.pdf). While the estimates derived using the EPA's manual were higher, we believe using data submitted directly by the industry is likely more representative of actual costs incurred by this source category.

Our cost model included installation of the baghouse and any necessary fans, ductwork, screw conveyors, and site work for each scenario, as appropriate. All costs are based on 2009 dollars. We did not consider the associated downtime for the unit in our costs. We estimated capital costs on the basis of dollars per unit of air flow (i.e., cubic foot per minute) into the device and assumed linearity of cost within the range of air flows considered in our analysis. The total installed capital cost of a typical baghouse designed for a flow-rate of 80,000 actual cubic feet per minute (acfm) was estimated at \$1.4 million. This cost assumes a 20 year life expectancy for the unit and, to be consistent with OMB Guidance in Circular A-4, a seven percent cost of capital as an estimate of the annualized capital cost. The design flow-rate for a baghouse was assumed to be 20 percent higher than the flow-rate measured during a compliance test.

The major operating cost of a baghouse is associated with routine replacements of the filter media (bags). The number of compartments in the baghouse and the number of bags per compartment were estimated using either data submitted in the ICR for the particular unit or data submitted for a similar sized unit if the former data were not available. The estimated number of bags was used to calculate the ongoing maintenance cost of replacing bags. We assumed that facilities would be required to replace bags every two years for the devices that reported emissions above the considered limit. The cost of a replacement bag was estimated at \$200 based on information submitted in the ICR. Other operating and maintenance costs were developed using information submitted in the ICR.

For the WESP option, we used information submitted by Quemetco, Inc. in the ICR as a basis for estimating cost. We assumed that the configuration of the new WESP installations would be similar to that of Quemetco. More specifically, we assumed that facilities would use the WESP to control process and process fugitive emissions sources, but not general building ventilation sources. We used the rapid estimation exponential method described in Perry's Chemical Engineers' Handbook³ to derive an equation representing the expected flow-rate into the WESP at each facility. Our estimate of annualized costs primarily includes electricity to operate the WESP and capital recovery.

3.2 Stack Emissions – Organic HAP and D/F

The formation of D/F occurs in the smelting furnaces and is highly dependent on the operating temperature of the furnace. Very small amounts of D/F were detected in the emissions streams of reverberatory furnaces; higher amounts were detected in the emissions streams of blast furnaces that were not collocated with reverberatory furnaces. Emissions data submitted in the ICR indicate that D/F emissions from collocated blast and reverberatory furnaces are lower than those from blast furnaces not collocated with reverberatory furnaces, indicating that comingling the flue gas streams of a blast furnace with the hotter stream of the reverberatory furnace is an effective D/F control option. Based on information submitted in the ICR, temperatures of the reverberatory stream are typically around 2200°F, likely high enough to raise the overall temperature of the combined blast and reverberatory furnace stream to that typically achieved by an afterburner. Studies of D/F destruction indicate that properly designed and operated afterburners with a sufficient residence time can achieve high destruction efficiency⁴. The majority of the blast furnaces in this source category that are not collocated with reverberatory furnaces use afterburners as a means of controlling organic HAP emissions. However, based on information submitted in the ICR, the majority of these afterburners are not operated at temperatures necessary for efficient destruction of D/F. We estimated that an afterburner operating at 1600°F with a residence time of 2.5 seconds or longer would achieve a 90 percent reduction in D/F emissions.

In order to estimate the capital cost of 90 percent control efficiency for D/F from blast furnaces, information contained in the ICR responses was used to determine the current furnace and afterburner temperature and residence time. We assumed that an existing afterburner would have the capability to increase the operating temperature 100°F without a major modification. Based on information submitted in the ICR, we determined that 5 of the 6 afterburners controlling blast furnaces (not collocated with reverberatory furnaces) in this source category

³ Perry, Robert H & Green, Don W. (1984). *Perry's Chemical Engineers' Handbook*, (6th ed.). McGraw-Hill.

⁴ Ficarella, Antonio and Laforgia, Domenico. Numerical simulation of flow-field and dioxins chemistry for incineration plants and experimental investigation, *Waste Management* 20 (2000) 27-49.

were not capable of achieving a temperature of 1600°F. Therefore, we estimated the capital and operating costs associated with installation of a new afterburner for these sources. Three facilities submitted cost data in the ICR for afterburner installations; the highest of the three estimates was chosen as the basis for our cost estimate. For the capital cost estimate, we assumed that the existing afterburner would remain in place and a new afterburner capable of increasing the temperature of the stream leaving the existing afterburner to a temperature of 1600°F would be installed. We used an equation modeled after equation 2.32 in the EPA Air Pollution Control Cost Manual to scale the size and cost of a thermal incinerator based on the reported flow-rates for each of the blast furnaces. The typical cost for an installed afterburner with a design flow-rate of 17,000 acfm was estimated at \$1.2 million.

The annual cost of operating an afterburner was estimated using the approach described in the EPA Air Pollution Control Cost Manual. The cost of additional fuel required to increase the operating temperature of the afterburners was estimated based on the estimated amount of required natural gas. Other operating and maintenance costs were estimated using an approach described in EPA Air Pollution Control Cost Manual. The annual capital cost was estimated using a 20 year equipment life and a 7 percent interest rate.

3.3 Fugitive Emissions – Metal HAP

There are two general categories of fugitive emissions of metal HAP at a secondary lead facility: process fugitive emissions and fugitive dust emissions from material handling operations and re-entrainment of deposited dust. Process fugitive emissions result from furnace leaks and incomplete capture of emissions during tapping and charging of smelting furnaces. Charge materials contain fine lead-bearing particles that can be liberated during charging operations. Furnace upsets, particularly those caused by wet feed material, can result in overpressure of the smelting furnace. This may cause release of emissions that would normally be contained by negative pressure occurring inside the smelting furnaces. Process fugitive emissions can also result from incomplete capture of emissions at battery breakers, dryers, and refining and casting operations. Fugitive dust emissions can be generated during material handling operations. Lead bearing materials are transported throughout the plant in areas that may be open to the atmosphere. During transport, the material can spill or leak from the transport vehicles and settle on the floors and yards of the facilities. Wind, vehicle traffic, and other forces can then re-entrain the deposited dust as fine airborne particles. Stack emissions containing lead and other metal HAP can also settle onto surfaces near the facility and can be subsequently re-entrained as fine airborne particles.

The current MACT standard for control of fugitive emissions of metal HAP from secondary lead smelters requires process fugitive emissions sources to be captured by negative pressure enclosure hoods and vented to a control device. There is a minimum face velocity

requirement for the enclosure hoods that varies based on the emissions source. As an alternative to an enclosure hood requirement, the facility may operate the process fugitive emissions source in a building that is maintained at a lower than ambient pressure. The building ventilation air is required to be conveyed to a control device. Additional fugitive control work practice requirements in the current MACT standard include wetting of storage piles, cleaning of roadways, and washing of vehicles prior to leaving any areas where lead-bearing materials are handled.

EPA requested information in the ICR regarding the fugitive control techniques employed at each facility. Based on that information, we assessed the relative effectiveness of the controls implemented by each facility and estimated fugitive emissions at each facility based on that assessment (see Draft Development of the RTR Emissions Dataset for the Secondary Lead Smelting Source Category for more details). The facilities achieving low ambient lead concentrations at nearby monitors were assumed to achieve more efficient control of fugitive emissions. We assumed that facilities with ambient monitoring data showing lead concentrations above the lead NAAQS would need to install permanent total enclosures with ventilation to a control device and implement additional work practices to prevent the formation of fugitive dust in other areas of their facilities. This approach may overstate the costs for facilities that choose to demonstrate compliance through monitoring at the property boundary, and where operations are a significant distance from the property boundary.

For each facility, we estimated the area that is currently under a total enclosure ventilated to a control device. We then estimated the additional enclosure area necessary fully enclose the entire process. We assumed facilities that required a substantial area of new enclosures would re-configure their facility in a manner that reduces the overall footprint of the facility.

Enclosure costs were estimated using the EPA Air Pollution Control Cost Manual. We used the 2008 version of the Air Compliance Advisor (ACA) program, a program developed by the EPA to facilitate the calculations required in the EPA Air Pollution Control Cost Manual, to estimate the cost of the building. The costs were then adjusted to 2009 dollars. The costs considered sheet metal walls, 30 feet high interior, automatic roll-up doors, louvers, make up air fans, ductwork, pressure monitors, and smoke detectors. We ran the ACA program for two model buildings. The average building capital cost based on these two runs was estimated at \$40 per square foot. This factor was used to estimate the cost of the additional enclosure area required for all other facilities.

The capital cost of the control devices required to control the enclosure ventilation air was estimated based on the flow-rate required to maintain the building under sufficient negative pressure. Based on information submitted in the ICR, we estimated a flow-rate that would result

in an air turnover rate of five per hour in a building maintained under sufficient negative pressure. We estimated the cost of the baghouse using the methodology described in section 3.1 of this memorandum.

Annualized costs for the enclosures and associated baghouses were based on a 20 year life expectancy and 7 percent cost of capital. Annual operating costs for the baghouse were estimated based on data obtained in the ICR. We chose this methodology because we believed it to be more representative of actual operation and maintenance costs for this situation. Additional operating and maintenance costs were estimated for the enclosures using guidelines supplied in the EPA Air Pollution Control Cost Manual.

We calculated annual costs for required installation of two compliance monitors at the property boundary for each facility under regulatory options 1F and 2F. The monitoring costs were obtained from estimates made for similar monitors in the proposed revisions to the Primary Lead Smelting NESHAP, published February 17, 2011 (76 FR 94106).

We anticipate that the work practices specified in the existing Secondary Lead Smelting NESHAP will not be adequate to maintain fugitive emissions from this source category at an acceptable level. We estimated that an additional four employees per facility (one per shift for four shifts) at an annualized cost of \$300,000 will be needed to implement the following additional fugitive control work practices: maintenance of negative pressure monitors in enclosures, monthly cleaning of rooftops, weekly cleaning of all areas where waste generated by housekeeping activities are stored or disposed of, immediate cleaning after accidental releases, inspections of enclosures once per month, daily inspection of battery storage area and immediate processing of cracked batteries, and thorough cleaning and inspection of any vehicles leaving the process area.

4.0 METHODOLOGY FOR ESTIMATING EMISSIONS REDUCTIONS

This section discusses the methodology used to estimate emissions reductions associated with the control options presented in sections 1.0 and 2.0 of this memorandum.

4.1 Stack Emissions – Metal HAP

a. Option 1S

For Option 1S, the outlet lead concentration reported for each stack in the ICR was compared to the limit considered in this regulatory option (i.e., 0.5 mg/dscm). If the reported concentration was above 0.5 mg/dscm, we assumed that the facility would need to install a new baghouse at that emissions point. We assumed that the outlet lead concentration from the newly installed baghouse would be equivalent to the average of all outlet lead concentrations reported

in the ICR; we calculated this average to be 0.159 mg/dscm. We estimated the expected reduction in emissions as the difference between current stack emissions and the emissions that would occur assuming an outlet lead concentration of 0.159 mg/dscm (see Equation 1).

$$\text{Emissions Reduction} = [(C_i \times F) - (0.159 \times F)] \times H \times T \quad (\text{Eq. 1})$$

Where:

C_i = outlet lead concentration reported in the ICR (mg/dscm),

F = flow rate (dscm/hr),

0.159 = expected outlet lead concentration of new baghouse (mg/dscm),

H = annual hours of operation, and

T = conversion factor for milligrams to tons (1.1×10^{-9}).

We concluded that 8 stacks throughout the industry would need new baghouse installations. One additional source reported an outlet lead concentration above 0.5 mg/dscm. However, they reported an ongoing project that includes upgrading the baghouse in question, and therefore, this source was not included in the emissions reduction calculation.

b. Option 2S

For option 2S, the stack lead emissions reported by each facility in the ICR were summed and divided by the annual lead production (average of 2008 and 2009) reported in the ICR. A statistical equation that considered variability in emissions was used to calculate a production based emissions limit of 0.009 lb/ton Pb. Based on emissions data received in the ICR, six facilities' emissions were above 0.009 lb/ton Pb. We assumed that these six facilities would sequentially replace or improve their existing baghouses one-by-one, starting with the units reporting the highest lead concentrations, until the facility's emissions were below 0.009 lb/ton Pb. Similar to option 1S, we assumed that a new baghouse could achieve an outlet lead concentration of 0.159 mg/dscm. We estimated that a total of 20 emissions points at six facilities would require reductions in lead emissions in this option. Total emissions reductions were calculated using Equation 1. We assumed emissions of other metal HAP would be reduced proportionally to lead emissions.

c. Option 3S

For Option 3S, we considered a facility-wide flow-weighted average lead concentration limit of 0.2 mg/dscm as well as a maximum lead concentration limit of 1.0 mg/dscm applicable to any individual stack. We calculated emissions reductions associated with the maximum concentration limit of 1.0 mg/dscm using a modified form of Equation 1. Based on this analysis, we estimated that three stacks would need replacement baghouses. Additionally, each facility's flow-weighted average lead concentration was calculated based on emissions data submitted in

the ICR. We then compared that value to facility-wide flow-weighted average limit of 0.2 mg/dscm considered in this option. We estimate that five facilities currently have a flow-weighted average lead concentration above the considered limit. We also considered the impacts of the proposed fugitive control standards presented in section 2.3 of this memorandum on the flow-weighted average concentration of each facility. Because we assumed that each facility will be required to have all processes under total enclosures with negative pressure and ventilation to a control device, we assumed that facilities needing additional enclosures would install one additional corresponding hygiene baghouse. Based on the average outlet lead concentration reported in the ICR for similar sources, we assumed that the outlet lead concentration from these hygiene baghouses would be 0.05 mg/dscm. We estimated that three of the five facilities initially identified as having emissions above the limit considered in this option would meet the considered limit after installation of the additional enclosures required in the fugitive control options. Furthermore, we estimate that replacing all baghouses reporting concentrations above 1.0 mg/dscm in combination with the installation of additional enclosures will result in all facilities being in compliance with the limits considered in this option. The total emissions reductions for this option were calculated using Equation 1.

d. Option 4S

For option 4S, we estimated emissions reductions of lead and other metal HAP using information submitted by Quemetco, Inc. regarding the efficiency of the WESP at their facility. Based on this information, we assumed that emissions of lead and other metal HAP from any source expected to be controlled by the WESP would be reduced by 99.98 percent.

4.2 Stack Emissions – Organic HAP and D/F

a. Option 1D

Option 1D considers MACT floor emissions limits for D/F (TEQ) based on furnace type. This option also includes setting MACT floor emissions limits for THC for furnace types that are not regulated in the existing NESHAP (i.e., reverberatory furnaces not collocated with a blast furnace, rotary furnaces, and electric furnaces). Based on our MACT floor calculation (see Draft MACT Floor Analysis for the Secondary Lead Smelting Source Category), we do not anticipate significant D/F or organic HAP emissions reductions associated with this option. However, we assume that facilities operating afterburners will likely increase the operating temperatures to ensure continuous compliance with the considered D/F limit. We believe reduction in D/F and other organic HAP on the order of 10 percent are possible using this assumption.

b. Option 2D

Option 2D is a beyond-the-floor option for D/F that establishes a TEQ concentration limit of 17 ng/dscm for blast furnaces not collocated with a reverberatory furnace. Based on the study reference in section 3.2 of this memorandum, the D/F destruction efficiency of an afterburner operating at 1600°F with a residence time of 2.0 – 2.5 seconds is between 90 and 94 percent. For the purposes of calculating emissions reductions associated with this option, we assumed a 90 percent destruction efficiency of D/F and organic HAP for newly installed afterburners in this source category.

4.3 Fugitive Emissions – Metal HAP

For all the fugitive emissions control options considered, we assumed that all facilities would need to reduce their fugitive emissions to a level that would reduce ambient lead concentrations near their property boundary to levels below the lead NAAQS.

We derived factors to estimate the reductions in fugitive emissions that are likely to occur as a result of enclosing all manufacturing processes material handling operations. Reductions in fugitive emissions of 75 percent from baseline levels were estimated if new total enclosures were installed at a facility where only partial enclosures currently exist. Additional reductions of 80 percent (total reductions of 95 percent) were estimated as a result of implementation of the additional work practices described in section 3.3 of this memorandum. This methodology is described in detail in the Draft Development of the RTR Emissions Dataset for the Secondary Lead Smelting Source Category.

5.0 TESTING AND MONITORING COST IMPACTS

The existing NESHAP requires annual stack testing for lead and allows for reducing stack testing to every two years if the measured lead concentrations are below 1.0 mg/dscm. The regulatory options chosen for proposal in the revised NESHAP require annual stack testing for lead and THC and stack testing once every five years for D/F. The additional costs associated with the stack testing requirements above current costs are anticipated to be \$750,000 per year (an average of \$53,000 per facility).

Bag leak detection systems (BLDS) are required by the existing NESHAP for all baghouses unless a secondary HEPA filter is installed. The proposed revisions to the NESHAP eliminate the BLDS exemption for emissions points where secondary HEPA filters are installed. The capital cost associated with installation of seven new BLDS is \$230,000 and was estimated using the EPA's bag leak detection guidance⁵ and CEMS cost model (<http://www.epa.gov/ttn/emc/cem.html>). The capital cost associated with additional differential pressure monitors for total enclosures is \$97,000.

⁵ EPA Office of Air Quality Planning and Standards Fabric Filter Bag Leak Detection Guidance – (EPA 454/R-98-015).

The total estimated annualized cost for additional testing, monitoring, recordkeeping, and reporting considering the first three years after the proposed revisions are implemented is \$1,020,000. A detailed burden estimate is available in the docket for this rulemaking (*Supporting Statement, National Emission Standards for Secondary Lead Smelting*).

6.0 SUMMARY OF COST BY FACILITY

Table 6-1 is a summary of estimated costs for each of the facilities in the secondary lead smelting source category.

Table 6-1 Summary Cost Estimates by Facility*

Facility	Total Capital Cost	Total Annual Cost
Doe Run	18,200,000	3,550,000
East penn	0	380,000
EnviroFocus	0	390,000
Exide Baton Rouge	7,250,000	1,890,000
Exide Forest City	2,560,000	750,000
Exide Frisco	4,390,000	1,160,000
Exide Muncie	0	360,000
Exide Reading	5,630,000	1,320,000
Exide Vernon	0	87,000
Gopher Eagan	0	350,000
Quemetco (CA)	0	87,000
Quemetco (IN)	0	94,000
RSR	0	87,000
Sanders	9,520,000	2,048,000
Total	47,550,000	12,553,000

*Some of these cost estimates are likely overstated since some facilities may be able to comply with the rule under the alternative compliance option (i.e., monitoring at facility boundary and implementing work practices) and may not need to construct full enclosures. If so, actual costs would be significantly lower than shown here for those facilities.

SourceFile	BaghouseControl EquipmentID	ControlDevic elnstallation Year	InletGasFlowRate_dscfm	NumberOf Compartments	NumberOfBags OrCartridgesPerCompartment	Capital cost Estimate	Annualized Capital cost	Additional Annual O&M	Bag Replacement cost	Total Annualized cost over current cost	Capital cost Estimate by facility	Annualized Capital cost by Facility	Annual O&M by Facility	Bag Replacement cost by Facility	Total Facility Annualized cost above current cost
Buick RRF	CD8-EP08	1967	325,000	14	416	5,625,750	531,031	156,000	349,440	1,036,471					
Buick RRF	CD27-EP71	2003	60,000	4	256	259,650	24,509	28,800	61,440	114,749					
Buick RRF	EP-73		27,166	3	352	470,237	44,387	13,039	63,360	120,786					
Buick RRF	EP-16		33,985	3	352	588,284	55,530	16,313	63,360	135,203	6,943,920	655,457	214,152	537,600	1,407,209
East Penn	S202		30,000	1	384		-	14,400	23,040	37,440	-	-	14,400	23,040	37,440
Exide Frisco	HARDLEADBH	1978	25,616	4	216	443,420	41,856	12,296	51,840	105,992					
Exide Frisco	SPECALLOY	1978	74,382	3	216	1,287,552	121,536	35,703	38,880	196,119					
Exide Frisco	SOFTLEADBH	1978	52,093	6	288	901,733	85,117	25,005	103,680	213,802					
Exide Frisco	NewBLAST-Reverb	1969	62,401	5	200	1,080,165	101,960	29,953	60,000	191,912					
Exide Frisco	FURNFUG	?	113,167	6	288	1,958,924	184,909	54,320	103,680	342,909					
Exide Frisco	RMSTG	?	91,883	8	288	1,590,491	150,131	44,104	138,240	332,475					
Exide Frisco	Dryer BH	?	20,000	4	216		-	9,600	51,840	61,440	7,262,286	685,508	210,981	548,160	1,444,649
Exide Baton Rouge	#1 BH	1973	90,000	10	528	1557900	147,055	43,200	316,800	507,055					
Exide Baton Rouge	#4 BH	1977	45,000	8	288	778,950	73,527	21,600	138,240	233,367					
Exide Baton Rouge	#5 BH	1979	35,000	3	352	605850	57,188	16,800	63,360	137,348	2,942,700	277,770	81,600	518,400	877,770
Exide Reading	C22	1984	80,000	4	264	1,384,800	130,715	38,400	63,360	232,475					
Exide Reading	C11		60,000	5	80	1,038,600	98,036	28,800	24,000	150,836					
Exide Reading	C19		74,945	5	80	1,297,294	122,455	35,974	24,000	182,429					
Exide Reading	C47	2000	84,000	5	276	1,454,040	137,251	40,320	82,800	260,371	5,174,734	488,458	143,494	194,160	826,112
Sanders	BH 1	1970	90,720	10	288	1,570,363	148,231	43,546	172,800	364,577	1,570,363	148,231	43,546	172,800	364,577
					average	1,327,445									
					Total	23,894,004	2,255,425	708,172	1,994,160	4,957,757	23,894,004	2,255,425	708,172	1,994,160	4,957,757

Note: East Penn is not currently within the limit established, however one baghouse had a test with much higher values than previous test. Assume East Penn needs only additional maintenance or bag replacement.

Assumptions:

Costs calculated for limit based on 0.009 lb lead emissions per ton product

Facilities listed would need upgrade/ replacement of existing baghouses

Baghouses selected based on emission rate needed to comply with lb/ton limit

Survey data used for flowrate, number of compartments and number of bags

Cost for baghouses were derived from data submitted in survey - Model facility used

Annualized cost assumes 7% cost of capital, 20 year life

Annual O&M cost derived from data submitted in survey. Compared with cost of replacing bags at \$200/bag for teflon on teflon bag, cost seems reasonable, estimated additional O&M over current is 25%

For cost over current cost of operating a baghouse, estimated that bags would be changed more often than current (2 years vs 5)

Facilities would meet the revised Lead limit for facility wide emissions

Option 1S Conc 0.5

SourceFile	BaghouseControlEquipmentID	ControlDeviceInstallationYear	Pb Conc	Pb Emissions TPY	Anticipated Pb Emission Reduction	InletGasFlowRate_acfm	NumberOfCompartments	NumberOfBagsOrCartridgesPerCompartment	Capital cost Estimate	Annualized Capital cost	Additional Annual O&M	Bag Replacement cost	Total Annualized cost over current cost	cost Effectiveness \$/ton HAP
Buick RRF	CD8-EP08	1967	1.19	3.46	3.0	325000	14	416	5,625,750	531,031	156,000	349,440	1,036,471	
Buick RRF	EP-73		1.27	0.43	0.4	27166	3	352	470,237	44,387	13,039	63,360	120,786	
Buick RRF	EP-16		0.53	0.22	0.2	33985	3	352	588,284	55,530	16,313	63,360	135,203	
Exide Frisco	Feed Dryer	2007	0.585	0.54	0.4	81197	4	216		-	38,974	51,840	90,814	
Exide Baton Rouge	#1 BH	1973	1.26	1.49	1.3	90000	10	528	1,557,900	147,055	43,200	316,800	507,055	
Exide Baton Rouge	EP93-3		0.506	0.34	0.2	44208	3	458		-	21,220	82,419	103,639	
Exide Reading	C22	1984	0.657	0.39	0.3	80000	4	264	1,384,800	130,715	38,400	63,360	232,475	
Sanders	BH 1	1970	0.619	0.72	0.5	90720	10	288	1,570,363	148,231	43,546	172,800	364,577	
Sanders	BH4		0.723	0.31	0.2	35000	3	352	605,850	57,188	16,800	63,360	137,348	
									-	-	0	0	0	
			Total	7.9	6.5				11,803,184	1,114,137	387,492	1,226,739	2,728,368	329,752
					8.3	Total Metal HAP reduction								

Option 1S- Concentration limit established at about 0.5 mg/dscm

Assumptions:

Facilities listed would need upgrade/ replacement of existing baghouses

Survey data used for existing baghouses at facilities.

Cost for baghouses were derived from data submitted in survey - Model facility used

Annualized cost assumes 7% cost of capital, 20 year life

Annual O&M cost derived from data submitted in survey. Added to cost of replacing bags at \$200/bag for teflon on teflon bag, estimated additional O&M over current is 25%

For cost over current cost of operating a baghouse, estimated that bags would be changed more often than current (2 years vs 5)

Baghouses chosen for replacement would allow facilities to meet proposed concentration limit

average lead concentration from all stacks is 0.159, assumption for emission reduction is based on achieving this concentration

SourceFile	BaghouseControlEquipmentID	ControlDeviceInstallationYear	Pb Conc	Pb Emissions TPY	Emission Reduction	InletGasFlowRate_acfm	NumberOfCompartments	NumberOfBagsOrCartridgesPerCompartment	Capital cost Estimate	Annualized Capital cost	Additional Annual O&M	Bag Replacement cost	Total Annualized cost over current cost	cost Effectiveness \$/ton HAP
Buick RRF	CD8-EP08	1967	1.19	3.46	3.0	325,000	14	416	5,625,750	531,031	156,000	349,440	1,036,471	
Buick RRF	EP-73		1.27	0.43	0.4	27,166	3	352	470,237	44,387	13,039	63,360	120,786	
Exide Baton Rouge	#1 BH	1973	1.26	1.49	1.3	90,000	10	528	1,557,900	147,055	43,200	316,800	507,055	
				5.4	4.7			Total	7,653,887	722,473	212,239	729,600	1,664,312	\$ 280,690

Scenario- 1.0 mg/dscm limit and 0.3 mg/dscm average

Metal HAP reduction assuming 5.92

Assumptions:

Facilities listed would need upgrade/ replacement of existing baghouses

Survey data used for existing baghouses at facilities.

Cost for baghouses were derived from data submitted in survey - Model facility used (see tab Baghouse cost)

Annualized cost assumes 7% cost of capital, 20 year life

Annual O&M cost derived from data submitted in survey. Compared with cost of replacing bags at \$200/bag for teflon on teflon bag, estimated additional O&M over current is 25%

For cost over current cost of operating a baghouse, estimated that bags would be changed more often than current (2 years vs 5)

Facilities would meet the revised Lead MACT floor for facility wide emissions

average lead concentration from all stacks is 0.159, an alternate assumption for emission reduction is based on achieving this concentration

Option 3F Fugitive Control Cost

Facility	Total Enclosed Area Needed ft2	Building Capital Cost	New CF to be ventilated	Baghouse Capital (\$)	Total Capital cost	Annualized Capital cost Baghouse + building	Baghouse Annual Operating cost(\$)	Enclosure Annual operating cost	Enclosure and baghouse operating cost	Enclosure and baghouse total Annual cost	Work practice estimate	Annual Operation and Maintenance cost (total)	Total Annual cost
Exide Baton Rouge	66,488	2,659,514	1,994,636	3,031,846	5,691,360	537,224	337,093	66,488	403,581	940,805	300,000	703,581	1,240,805
Exide Forest City	29,880	1,195,185	896,389	1,362,511	2,557,696	241,428	151,490	29,880	181,369	422,798	300,000	481,369	722,798
Exide Frisco	51,281	2,051,220	1,538,415	2,338,391	4,389,611	414,348	259,992	51,281	311,273	725,621	300,000	611,273	1,025,621
Exide Reading	65,816	2,632,620	1,974,465	3,001,187	5,633,807	531,792	333,685	65,816	399,500	931,292	300,000	699,500	1,231,292
Doe Run	141,590	5,663,584	4,247,688	6,456,486	12,120,070	1,144,049	717,859	141,590	859,449	2,003,498	300,000	1,159,449	2,303,498
EnviroFocus	20,139				-						300,000	300,000	300,000
Sanders	111,183	4,447,336	3,335,502	5,069,963	9,517,299	898,366	563,700	111,183	674,883	1,573,249	300,000	974,883	1,873,249
Total listed facilities		18,649,459		21,260,383	39,909,842					6,597,262	2,100,000	4,930,055	8,697,262
Total Level 1 facilities					27,328,729					4,517,552	900,000	2,837,913	5,417,552
Total Level 2 facilities					12,581,114					2,079,710	900,000	1,792,142	2,979,710
Level 3 facilities											900000	900,000	900,000
Total All Facilities					39,909,842	3,767,207	2,363,819	466,236	2,830,055	6,597,262	3,000,000	5,830,055	9,597,262

Assumptions:

Unenclosed or partially enclosed facilities would need to enclose area and vent to baghouse

Unenclosed or partially enclosed facilities would reduce their facility footprint to the size of an enclosed facility with similar production.

Using the reduced footprint methodology, the capital cost of building and baghouse was reduced by up to 40%

Buildings are 30 ft tall

Baghouse cost estimated from data submitted by facilities in survey. EPA cost manual data was significantly higher

Baghouse operating data was submitted in the survey for the control device used to estimate capital cost

Baghouse operating data verified against cost to replace bags on a bi-annual basis, costs were similar

Building O&M cost was estimated at \$1 / ft sq ft. This cost was estimated using the Air Compliance Advisor program for Permanent Total Enclosures

Building cost was estimated at \$40 /ft2. this cost was estimated using two model facilities in the Air Compliance Advisor for Permanent Total Enclosures.

The higher cost estimate of the two facilities in \$/ft2 was used to estimate all facilities

Not enough facility specific information on cost to retrofit was available for an alternate retrofit cost

Cost data for a building was submitted by Quemetco, CA in January 2011. This cost was not considered in the analysis as the cost was very high compared to other estimates

No capital cost was estimated for Envirofocus as this facility is currently undergoing an expansion and upgrade. Practices described will meet control level required.

Level 2 definition - total facility enclosures vented to baghouse

Level 3 definition - Level 2 plus additional work practices equivalent to South Coast California rule

Option 1F &2F

Facility	Total Enclosed Area Needed ft2	Building Capital Cost	New CF to be ventilated	Baghouse Capital (\$)	Total Capital cost	Annualized Capital cost Baghouse + building	Baghouse Annual Operating cost(\$)	Enclosure Annual operating cost	Enclosure and baghouse operating cost	Enclosure and baghouse total Annual cost	Work practice estimate	Annual Operation and Maintenance cost (total)	Ambient Monitoring Cost	Total Annual cost
Exide Baton Rouge	66,488	2,659,514	1,994,636	3,031,846	5,691,360	537,224	337,093	66,488	403,581	940,805	300,000	703,581	23,128	1,240,805
Exide Forest City	29,880	1,195,185	896,389	1,362,511	2,557,696	241,428	151,490	29,880	181,369	422,798	300,000	481,369	23,128	722,798
Exide Frisco	51,281	2,051,220	1,538,415	2,338,391	4,389,611	414,348	259,992	51,281	311,273	725,621	300,000	611,273	23,128	1,025,621
Exide Reading	65,816	2,632,620	1,974,465	3,001,187	5,633,807	531,792	333,685	65,816	399,500	931,292	300,000	699,500	23,128	1,231,292
Doe Run	141,590	5,663,584	4,247,688	6,456,486	12,120,070	1,144,049	717,859	141,590	859,449	2,003,498	300,000	1,159,449	23,128	2,303,498
EnviroFocus	20,139				-						300,000	300,000	23,128	300,000
Sanders	111,183	4,447,336	3,335,502	5,069,963	9,517,299	898,366	563,700	111,183	674,883	1,573,249	300,000	974,883	23,128	1,873,249
Total listed facilities		18,649,459		21,260,383	39,909,842					6,597,262	2,100,000	4,930,055	161,896	8,697,262
Total Level 1 facilities					27,328,729					4,517,552	900,000	2,837,913	69,384	5,417,552
Total Level 2 facilities					12,581,114					2,079,710	900,000	1,792,142	69,384	2,979,710
Level 3 facilities											900000	900,000	161,896	900,000
Total All Facilities					39,909,842	3,767,207	2,363,819	466,236	2,830,055	6,597,262	3,000,000	5,830,055	323,792	9,597,262

Assumptions:

Unenclosed or partially enclosed facilities would need to enclose area and vent to baghouse

Unenclosed or partially enclosed facilities would reduce their facility footprint to the size of an enclosed facility with similar production.

Using the reduced footprint methodology, the capital cost of building and baghouse was reduced by up to 40%

Buildings are 30 ft tall

Baghouse cost estimated from data submitted by facilities in survey. EPA cost manual data was significantly higher

Baghouse operating data was submitted in the survey for the control device used to estimate capital cost

Baghouse operating data verified against cost to replace bags on a bi-annual basis, costs were similar

Building O&M cost was estimated at \$1 / ft sq ft. This cost was estimated using the Air Compliance Advisor program for Permanent Total Enclosures

Building cost was estimated at \$40 /ft2. this cost was estimated using two model facilities in the Air Compliance Advisor for Permanent Total Enclosures.

The higher cost estimate of the two facilities in \$/ft2 was used to estimate all facilities

Not enough facility specific information on cost to retrofit was available for an alternate retrofit cost

Cost data for a building was submitted by Quemetco, CA in January 2011. This cost was not considered in the analysis as the cost was very high compared to other estimates

No capital cost was estimated for Envirofocus as this facility is currently undergoing an expansion and upgrade. Practices described will meet control level required.

Level 2 definition - total facility enclosures vented to baghouse

Level 3 definition - Level 2 plus additional work practices equivalent to South Coast California rule

Secondary Lead Control Cost
Control of THC / Dioxin-Furan

Incremental Improvement with increase in afterburner temperature

Facility	Furnace Type	Blast Furnace Flow rate requiring control (scfm)	Existing Afterburner Operating Temp (deg F) - if no AB, Furnace Temp	Existing AB residence time	Temp increase required (deg F)	Fuel cost
Doe Run	Mixed	10,000	500	-	-	-
East penn	Co-located					
EnviroFocus	Blast					
Exide Baton Rouge	Reverb					
Exide Baton Rouge	Blast	21,505	700	3	100	\$ 78,966.36
Exide Forest City	Blast					
Exide Frisco	Mixed	24,000	1,525	1	75	\$ 66,096.00
Exide Muncie	Co-located					
Exide Reading	Co-located					
Exide Vernon	Mixed					
Gopher Eagan	Co-located					
Quemetco (CA)	Reverb					
Quemetco (IN)	Reverb					
RSR	Reverb					
RSR	Rotary					
Sanders	Blast	16,000	1,300	3	100	\$ 58,752.00
Sanders	Blast	16,000	1,300	3	100	\$ 58,752.00

\$ 262,566

Assumptions

A 10% reduction in D/F and organics is possible with improved operating practices and increase in afterburner temperature of 100 deg F

Beyond the floor MACT for Blast furnaces would require 1600 degree afterburner to achieve control of dioxins

\$/MM BTU Nat Gas

4

Assumed the existing afterburner would remain in place. Additional afterburner fuel cost to increase temperature 100 deg F

Secondary Lead Control Cost
Control of THC / Dioxin-Furan

Beyond the floor option for controlling Blast Furnaces

Facility	Furnace Type	Blast Furnace Flow rate requiring control (scfm)	Existing Afterburner Operating Temp (deg F) - if no AB, Furnace Temp	Existing AB residence time	New AB required (Y/N)	AB Installed cost	Temp increase required (deg F)	Fuel cost	Electricity (KWH)	Electricity \$/yr	Annual Capital Cost	O&M cost	Indirect Operating cost	Total Annual O&M	Annual cost - total
Doe Run	Mixed	10000	500	0	Yes	1,040,310	1100	403,920	839,800	57,526	98,198	13,688	49,825	524,959	623,157
East penn	Co-located				No										
EnviroFocus	Blast				No										
Exide Baton Rouge	Reverb				No										
Exide Baton Rouge	Blast	21505	700	3	Yes	1,259,788	900	710,697	1,805,990	123,710	118,915	13,688	58,604	906,699	1,025,614
Exide Forest City	Blast				No										
Exide Frisco	Mixed	24000	1525	1	Yes	1,294,838	75	66,096	2,015,520	138,063	122,224	13,688	60,006	277,853	400,076
Exide Muncie	Co-located				No										
Exide Reading	Co-located				No										
Exide Vernon	Mixed				No										
Gopher Eagan	Co-located				No										
Quemetco (CA)	Reverb				No										
Quemetco (IN)	Reverb				No										
RSR	Reverb				No										
RSR	Rotary				No										
Sanders	Blast	16000	1300	2.5	Yes	1,170,019	300	176,256	1,343,680	92,042	110,441	13,688	55,013	336,999	447,440
Sanders	Blast	16000	1300	2.5	Yes	1,170,019	300	176,256	1,343,680	92,042	110,441	13,688	55,013	336,999	447,440
						5,934,974		1,533,225		503,384	560,220	68,438	278,461	2,383,508	2,943,728

Assumptions

Beyond the floor MACT for Blast furnaces would require 1600 degree afterburner to achieve control of co-located furnaces

\$/KWH 0.0685

\$/MM BTU Nat Gas 4

Labor cost / hr 25

Electricity KWH calculated from equation in <http://www.epa.gov/ttn/catc/dir1/cs3-2ch2.pdf>

corrected for density of air at 600 deg F

Assumed the existing afterburner would remain in place. Additional afterburner fuel cost to increase temperature to 1600 deg F

Used afterburner cost data submitted in Section 114 survey for three afterburner installations to estimate base capital cost. Used highest of 3 total installed cost

Derived new equation to account for flow rate - modeled after equation 2.32 in EPA cost estimation manual for Incinerators

Operating cost approach developed from EPA cost manual for incinerators.

Used afterburner operating cost data submitted in Section 114 survey as a reference. Cost is similar to that calculated in this sheet.

Cost estimated using Air Compliance Advisor (EPA cost manual program), values significantly higher than these costs. Elected to use industry supplied data as the base

Summary of WESP Control Cost by Facility

Facility	WESP ACFM	Capital cost Estimate	Annualized Capital cost	Operating Cost	Total Annualized Cost
Doe Run	446,428	46,623,434	4,400,922	2,331,172	6,732,094
East penn	167,436	25,885,878	2,443,444	1,294,294	3,737,738
EnviroFocus	79,986	16,617,415	1,568,566	830,871	2,399,437
Exide Baton Rouge	203,901	29,134,304	2,750,072	1,456,715	4,206,787
Exide Forest City	95,362	18,466,254	1,743,084	923,313	2,666,396
Exide Frisco	253,113	33,169,760	3,130,991	1,658,488	4,789,479
Exide Muncie	224,391	30,857,250	2,912,706	1,542,862	4,455,569
Exide Reading	286,727	35,746,589	3,374,225	1,787,329	5,161,555
Exide Vernon	251,490	33,041,957	3,118,927	1,652,098	4,771,025
Gopher Eagan	325,023	38,539,167	3,637,825	1,926,958	5,564,783
Quemetco (CA)	94,556	18,000,000			
Quemetco (IN)	115,468	20,712,408	1,955,105	1,035,620	2,990,725
RSR	145,133	23,758,174	2,242,604	1,187,909	3,430,512
Sanders	245,173	32,541,498	3,071,687	1,627,075	4,698,762
Total		403,094,087	36,350,158	19,254,704	55,604,862

	WESP ACFM	Furnace Only ACFM
Doe Run	446,428	266,855
East Penn	167,436	42,601
EnviroFocus	79,986	35,550
Exide Baton Rouge	203,901	126,340
Exide Forest City	95,362	95,362
Exide Frisco	253,113	52,001
Exide Muncie	224,391	26,497
Exide Reading	286,727	88,779
Exide Vernon	251,490	127,105
Gopher Eagan	325,023	106,060
Quemetco CA	94,556	94,556
Quemetco IN	115,468	48,692
RSR	145,133	113,211
Sanders	245,173	191,322
	2,934,187	1,414,930

**Activated Carbon
Injection Model Costs**

Unit-specific field	Unit-specific field					Unit-specific field					Unit-specific field	
Facility/Unit ID	Annual operating	Exhaust gas flow rate (Q)	Operating labor rate	Activated carbon cost (ACC)	Dust disposal cost (DDC)	Capital recovery factor, 20-yr equipment life, 7% interest (CRF)	Cost index 2008	Cost index 1990	ACI Adjustment Factor (AF) for HG control	ACI Adjustment Factor (AF) for D/F control	Total	Unit cost
Facility name	hr/yr	dscfm	\$/hr	\$/lb	\$/ton						\$	\$/dscfm
FacilityID						= $[i \times (1 + i)^a] / [(1 + i)^a - 1]$, where i = interest rate, a = equipment life					= $4,500 \times (Q/1,976)^{0.6} \times (1.2 \text{ retrofit factor}) \times (575.4/361.3)$	= \$ / Q
Doe Run	8500	266855	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$163,226	\$0.61
East Penn	8500	42601	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$54,284	\$1.27
EnviroFocus	8500	35550	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$48,700	\$1.37
Exide Baton Rouge	8500	126340	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$104,219	\$0.82
Exide Forest City	8500	95362	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$88,034	\$0.92
Exide Frisco	8500	52001	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$61,183	\$1.18
Exide Muncie	8500	26497	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$40,826	\$1.54
Exide Reading	8500	88779	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$84,335	\$0.95
Exide Vernon	8500	127105	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$104,597	\$0.82
Gopher Eagan	8500	106060	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$93,833	\$0.88
Quemetco CA	8500	94556	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$87,586	\$0.93
Quemetco IN	8500	48692	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$58,816	\$1.21
RSR	8500	113211	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$97,579	\$0.86
Sanders	8500	191322	\$51.26	\$1.38	\$42.14	0.09439	575.4	361.3	1.00		\$133,685	\$0.70

\$1,220,904

**Activated Carbon
Injection Model Costs**

Unit-specific field

Facility/Unit ID	Direct Annual	Supervisory		Activated		Indirect Annual	Property taxes, insurance, and		Total Annual Cost	
Facility name	Operating labor	labor	Maintenance	carbon	Dust disposal	Overhead	administration	Capital recovery	Total cost	
	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	\$/yr	(\$/yr) / dscfm
FacilityID	= (0.25 hr/8-hr shift) x H x LR	= 0.15 x (operating labor)	= 0.2 x TCI	= 0.00127 x Q x H x ACC x AF	= 0.00127 x Q x (1 ton/2,000 lb) x H x DDC x AF	= 0.6 x (labor + maintenance materials)	= 0.04 x TCI	= CRF x TCI	= Direct Annual Costs + Indirect Annual Costs	= (\$/yr) / Q
Doe Run	\$13,616	\$2,042	\$32,645	3975365.621	60696.34321	\$28,982	\$6,529	\$15,407	\$4,135,284	\$15.50
East Penn	\$13,616	\$2,042	\$10,857	634631.3571	9689.625141	\$15,909	\$2,171	\$5,124	\$694,041	\$16.29
EnviroFocus	\$13,616	\$2,042	\$9,740	529596.8707	8085.946424	\$15,239	\$1,948	\$4,597	\$584,865	\$16.45
Exide Baton Rouge	\$13,616	\$2,042	\$20,844	1882095.145	28736.04689	\$21,901	\$4,169	\$9,838	\$1,983,241	\$15.70
Exide Forest City	\$13,616	\$2,042	\$17,607	1420617.25	21690.14889	\$19,959	\$3,521	\$8,310	\$1,507,363	\$15.81
Exide Frisco	\$13,616	\$2,042	\$12,237	774664.0971	11827.66125	\$16,737	\$2,447	\$5,775	\$839,346	\$16.14
Exide Muncie	\$13,616	\$2,042	\$8,165	394725.0397	6026.707672	\$14,294	\$1,633	\$3,854	\$444,356	\$16.77
Exide Reading	\$13,616	\$2,042	\$16,867	1322542.192	20192.72753	\$19,515	\$3,373	\$7,961	\$1,406,110	\$15.84
Exide Vernon	\$13,616	\$2,042	\$20,919	1893496.889	28910.13003	\$21,947	\$4,184	\$9,873	\$1,994,989	\$15.70
Gopher Eagan	\$13,616	\$2,042	\$18,767	1579986.426	24123.41594	\$20,655	\$3,753	\$8,857	\$1,671,800	\$15.76
Quemetco CA	\$13,616	\$2,042	\$17,517	1408610.188	21506.82366	\$19,905	\$3,503	\$8,268	\$1,494,969	\$15.81
Quemetco IN	\$13,616	\$2,042	\$11,763	725369.5932	11075.02705	\$16,453	\$2,353	\$5,552	\$788,224	\$16.19
RSR	\$13,616	\$2,042	\$19,516	1686515.588	25749.91554	\$21,104	\$3,903	\$9,211	\$1,781,658	\$15.74
Sanders	\$13,616	\$2,042	\$26,737	2850138.001	43516.23744	\$25,437	\$5,347	\$12,619	\$2,979,453	\$15.57

\$22,305,698

AmbMonitoring Cost

	Cost	Annual cost per monitor	Number of monitors / site	Total Annual cost	Total cost- 14 facilities
Ambient Lead Monitoring (lab analysis) per test	127	7725.8	2	15452	216,323
Ambient Monitoring Equipment Annual Lease	2500	2500	2	5000	70,000
Labor to collect and ship samples, analyze data	22	1338.3	2	2677	37,473
Total monitoring cost				23,128	323,797

Ambient monitors tested once every 6 days

References:

Table 3.5 - Additional Testing and Monitoring Costs, Primary Lead Smelting Technical Support document

Appendix D
BUSCH FEF-50 Quote



10431 PERRY HIGHWAY, WEXFORD, PA 15090
PHONE 724-940-2326 FAX 724-940-4140

TO: ENVIRON INTERNATIONAL CORPORATION
ATTN: RUSSELL KEMP

FROM: LOIS MCELWEE, X 208

SUBJECT: PRELIMINARY PROPOSAL V-6750

DATE: MAY 6, 2011

Russell,

Per your request, we are pleased to furnish budget pricing for Carbon Steel construction, as follows:

One (1) FEF Model FEF-50 air filtration units 50,000 CFM with the following:

- ◆ Fully-welded unit housing with full structural base and open grating in filter section. Grating is Carbon Steel.
- ◆ Pyramidal hopper shipped loose
- ◆ HEPA header sealing system with stainless steel frames and HEPA filter bolt lock type.
- ◆ High capacity absolute 2000 cfm; 99.97% DOP HEPA filters with neoprene gasketing downstream. HEPA filters will be shipped loose for installation by others.
- ◆ Pre-piped pulse system with header, pulse pipes and pulse valves with solenoids. Header and pipes of carbon steel with industrial enamel finish.
- ◆ Primary filtration section includes filter cages, Galvanized Steel 11 gauge wire and pulse filter media installed. Thimbles are 360 degree seal welded.
- ◆ Dirty side – back wall, side walls, roof, tube sheet, doors and inlet collar constructed of Carbon Steel. Floor grating is Carbon Steel.
- ◆ Clean side – two (2) compartments side walls, roof, doors and floor constructed of Carbon Steel.



10431 PERRY HIGHWAY, WEXFORD, PA 15090
PHONE 724-940-2326 FAX 724-940-4140

- ◆ Fan - Backward Inclined belt driven 50,000 CFM with 125 HP motor
- ◆ Outlet Volume Control Damper; manual control
- ◆ Shipped complete with fan and motor wired and installed

Walls and roof are minimum 10 Gauge material and Tube Sheet and floor are minimum 7 Gauge material. Structural base is carbon steel with standard finish. Sandblast epoxy available at additional cost and is recommended for outdoor locations.

Approximate Unit dimensions: 31' long x 11'6" wide x 12' high; hopper top flange is approximately 17' long x 10' wide. T.O.P. is bottom of hopper flange suited for a 9" screw conveyor by others. T.O.P. is flange of fan outlet damper and inlet flange on top of unit.

Total net budgetary price for (1) FEF-50 unit..... \$ 298,000

FOB Factory; freight collect; shipment 22-24 weeks after drawing approval.

Allow 6-8 weeks for drawings.

Pricing is firm for 30 days

Terms net 30 days – progress payments: 20% down payment, 20% completion of sub vendor order placement, 20% issue of shop orders for fabrication, and 40% shipment. Terms and conditions attached.

Lois McElwee

BUSCH INTERNATIONAL

FEF SERIES

Fugitive Emission Filtration Units



A CECO Environmental Company

10431 Perry Highway • Wexford, PA 15090
 Phone: 724.940.2326 • Fax: 724.940.4140
 busch@cecoenviro.com

Provides Secondary Emissions Control of Metallurgical Fumes

Busch International FEF SERIES industrial grade, fugitive emission filtration units use high efficiency self-cleaning fabric filtration tubes. The equipment removes heat and fugitive dusts from metallurgical melting process applications. The modules are factory assembled with filtration system, pulse cleaning, fabric tubes, controls, and main air blower on a common structural base.

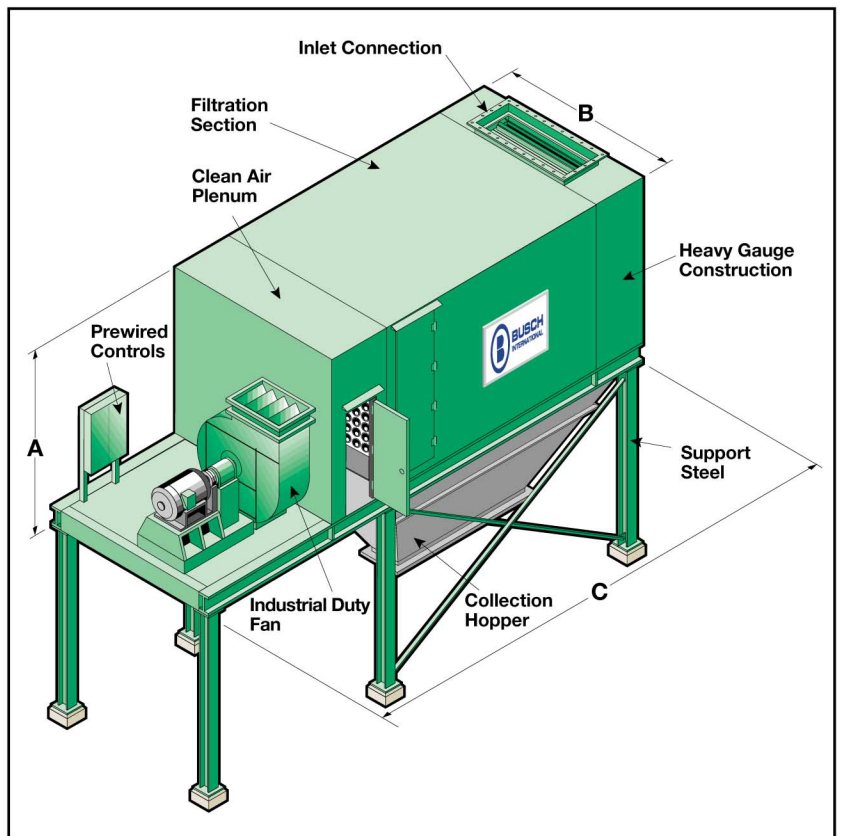
Significant cost savings over field assembled systems are realized because the FEF SERIES units are shipped pre-assembled, wired and factory tested. Minimum field labor is required for unit installation. Only connection to main power and compressed air source is necessary to initiate operation. Multiple modules are arranged for a built-up system with air volume capacity as required to satisfy the project requirements.

The FEF SERIES units come in standard sizes available for simple installation. Unit arrangement and dimensions, location, connections, materials of construction and wiring can be modified to meet individual user specifications. Project costs are often lower when compared to built up systems consisting of baghouse modules, interconnecting duct and separate fans. Construction features include a structural base, steel plate floor, heavy gauge welded housing panels and heavy duty door hardware. Centrifugal fans are minimum Class III construction and are backwardly inclined power limiting design. Direct driven fans eliminate belt maintenance. Electrical enclosures are NEMA 12 or NEMA 4 with wiring in rigid or flexible conduit. Optional electrical enclosures are available to suit plant standards.

FEF SERIES units are designed to store dust within the base of the compartment or storage hopper below.



Collection of secondary lead oxide emissions using four FEF SERIES units.



A typical FEF Series unit arrangement.

Accessories and Options

- Alternate paint systems
- Hoppers for dust storage
- Gas adsorption
- Sound attenuator
- Variable speed drives
- HEPA safety filters
- Dampers
- Screw conveyor
- Stainless steel construction
- Support steel and platforms

Dimensional Data

MODEL NO.	CAPACITY SCFM	DIMENSIONS		
		A	B	C
FEF-10	10,000	5'-6"	5'-0"	18'-0"
FEF-20	20,000	7'-6"	7'-0"	20'-6"
FEF-30	30,000	9'-6"	7'-6"	24'-0"
FEF-40	40,000	10'-0"	10'-0"	26'-0"
FEF-50	50,000	11'-0"	12'-0"	30'-0"

Dimensions and sizes are for reference only.

Appendix E
EPA's Draft Summary of the Technology
Review for the Secondary Lead Smelting
Source Category

MEMORANDUM

To: Chuck French, U.S. Environmental Protection Agency, OAQPS

From: Mike Burr, Donna Lazzari, and Danny Greene, ERG

Date: April 2011

Subject: Draft Summary of the Technology Review for the Secondary Lead Smelting Source Category

This memorandum summarizes the results of an analysis to identify developments in practices, processes, and control technologies for emissions sources of hazardous air pollutants (HAP) from the Secondary Lead Smelting source category. This analysis is part of EPA's review efforts in accordance with section 112(d)(6) of the Clean Air Act (CAA). This memorandum is organized as follows:

- 1.0 Background
 - 1.1 Requirements of Section 112(d)(6) of the CAA
 - 1.2 Description of the Secondary Lead Smelting Source Category and Requirements of the Current NESHAP
- 2.0 Developments in Practices, Processes and Control Technologies
 - 2.1 Stack Emissions
 - 2.2 Fugitive Emissions
- 3.0 Recommended Revisions Based on Developments in Practices, Processes and Control Technologies
 - 3.1 Stack Emissions
 - 3.2 Fugitive Emissions
- 4.0 Conclusions

1.0 BACKGROUND

1.1 Requirements of Section 112(d)(6) of the CAA

Section 112 of the CAA requires EPA to establish technology-based standards for sources of HAP. These technology-based standards are often referred to as maximum achievable control technology, or MACT, standards. Section 112 also contains provisions requiring EPA to periodically revisit these standards. Specifically, paragraph 112(d)(6) states:

(6) REVIEW AND REVISION. – The Administrator shall review, and revise as necessary (taking into account developments in practices, processes, and control technologies), emissions standards promulgated under this section no less often than every 8 years.

1.2 Description of the Secondary Lead Smelting Source Category and Requirements of the Current NESHAP

The current National Emissions Standards for Hazardous Air Pollutants (NESHAP) for the Secondary Lead Smelting source category was promulgated on June 13, 1997 (62 FR 32216) and codified at 40 CFR part 63, subpart X. As promulgated in 1997, the NESHAP applies to affected sources of HAP emissions at secondary lead smelters. The current NESHAP (40 CFR 63.542) defines “secondary lead smelters” as “any facility at which lead-bearing scrap material, primarily, but not limited to, lead-acid batteries, is recycled into elemental lead or lead alloys by smelting.” The secondary lead smelting process consists of: (1) pre-processing of lead bearing materials, (2) melting lead metal and reducing lead compounds to lead metal in the smelting furnace, and (3) refining and alloying the lead to customer specifications. The NESHAP for the Secondary Lead Smelting source category does not apply to primary lead smelters, lead remelters, or lead refiners.

Today, there are 14 secondary lead smelting facilities that are subject to the NESHAP. No new secondary lead smelters have been built in the last 20 years, and no new secondary lead smelting facilities are anticipated in the foreseeable future, although one facility is currently in the process of expanding their operations.

HAP are emitted from secondary lead smelting as stack releases (i.e., process emissions, and process fugitive emissions) and fugitive dust emissions. Process emissions include exhaust gases from feed dryers and from blast, reverberatory, rotary, and electric furnaces. The HAP in process emissions are comprised primarily of metals (mostly lead compounds, but also some arsenic, cadmium, and other metals) and also may include organic compounds that result from incomplete combustion of coke that is charged to the smelting furnaces as a fuel or fluxing agent, combustion of natural gas or other fuels, or combustion of small amounts of plastics or other materials that get fed into the furnaces along with the lead-bearing materials. Process fugitive emissions are released from various sources throughout the smelting process, including smelting furnace charging and tapping points, refining kettles, agglomerating furnace product taps, and drying kiln transition equipment. Process fugitive emissions are comprised primarily of metal HAP. Fugitive dust emissions are emissions that are not associated with a specific process or process fugitive vent or stack. Process fugitive emissions are comprised of metal HAP and result

from the entrainment of HAP in ambient air due to material handling activities, vehicle traffic, wind, and other activities.

The current NESHAP applies to process emissions from blast, reverberatory, rotary, and electric smelting furnaces, agglomerating furnaces, and dryers; process fugitive emissions from smelting furnace charging points, smelting furnace lead and slag taps, refining kettles, agglomerating furnace product taps, and dryer transition equipment; and fugitive dust emissions from roadways, battery breaking areas, furnace charging and tapping areas, refining and casting areas, and material storage areas. For process sources, the current NESHAP specifies numerical emissions limits for total hydrocarbons (THC) and lead compounds for blast furnaces and collocated blast and reverberatory furnaces. Additionally, emissions limits for lead are specified for reverberatory, electric, and rotary furnaces. Lead compound emissions from all smelting furnace configurations are limited to an outlet concentration of 2.0 milligrams per dry standard cubic meter (mg/dscm) (0.00087 grains per dry standard cubic foot (gr/dscf)) (40 CFR 63.543(a)). THC emissions from collocated blast and reverberatory furnaces are limited to an outlet concentration of 20 parts per million volume (ppmv) (expressed as propane) corrected to 4 percent carbon dioxide (CO₂). THC emissions are limited to 360 ppmv (as propane) at 4 percent CO₂ from existing blast furnaces and 70 ppmv (as propane) at 4 percent CO₂ from new blast furnaces (40 CFR 63.543(c)). The current NESHAP does not specify limits for THC emissions from reverberatory furnaces not collocated with blast furnaces, rotary furnaces, or electric furnaces.

The current NESHAP requires that process fugitive emissions sources be equipped with an enclosure hood meeting minimum face velocity requirements or be located in a total enclosure subject to general ventilation that maintains the building at negative pressure (40 CFR 63.543(b)). Ventilation air from the enclosure hoods and total enclosures are required to be conveyed to a control device. Lead emissions from these control devices are limited to 2.0 mg/dscm (0.00087 gr/dscf) (40 CFR 63.544(c)). Lead emissions from all dryer emissions vents and agglomerating furnace vents are limited to 2.0 mg/dscm (0.00087 gr/dscf) (40 CFR 63.544(d)). The current NESHAP also requires the use of bag leak detection systems for continuous monitoring of baghouses in cases where a high efficiency particulate air (HEPA) filter are not used in series with a baghouse (40 CFR 63.548(c)(9)).

For fugitive dust sources, the current NESHAP requires that facilities develop and operate according to a standard operating procedures (SOP) manual that describes, in detail, the measures used to control fugitive dust emissions from plant roadways, battery breaking areas, furnace areas, refining and casting areas, and material storage and handling areas.

2.0 DEVELOPMENTS IN PRACTICES, PROCESSES, AND CONTROL TECHNOLOGIES

For the purposes of this technology review, a “development” was considered to be a (n):

- add-on control technology or other equipment that was not identified during the development of the current NESHAP for the source category;
- improvement in add-on control technology or other equipment that was identified and considered during development of the current NESHAP for the source category that could result in significant additional HAP emissions reductions;
- work practice or operational procedure that was not identified during development of the current NESHAP for the source category; or
- applicable process change or pollution prevention alternative that was not identified and considered during the development of the current NESHAP for the source category.

We investigated developments in practices, processes, and control technologies for three categories of HAP emissions sources from secondary lead smelters: (1) stack emissions of lead and other metal HAP, (2) stack emissions of organic HAP, and (3) fugitive emissions of lead and other metal HAP. To identify developments, we conducted searches of EPA’s RACT/BACT/LAER (Reasonably Achievable Control Technology/Best Available Control Technology/Lowest Achievable Emissions Rate) clearinghouse and the Internet for information on secondary lead smelting and similar processes, examined the Section 114 information collection request (ICR) responses from the 14 secondary lead smelting facilities, reviewed technologies employed by similar industries, and reviewed new or updated NESHAPs for other source categories. The results of these analyses are presented in the following sections.

2.1 Stack Emissions

The current NESHAP specifies emissions limits for metal HAP (using lead as a surrogate) and organic compounds (using THC as a surrogate) from stacks. This section of the technology review will focus on developments in practices, processes, and control technologies applicable to emissions of metal HAP and organic compounds from stacks.

a. Metal Hap Emissions from Stacks

Based on a review of the ICR responses, the most common control technology employed by the industry to control emissions of metal HAP from stacks is fabric filtration (or baghouses). Several types of baghouses are currently used by the industry, including shaker, pulse jet, and reverse pulse jet bag filters. One facility uses a wet electrostatic precipitator (WESP) downstream of a baghouse to further reduce emissions of metal HAP from stacks. Two other facilities have plans to install similar WESP units. Several facilities also reported using HEPA filters as an add-on control downstream of their baghouses. Additionally, some facilities reported using cartridge collectors; however these types of controls are generally suited to reduce

metal HAP emissions from sources that have lower inlet concentrations and are typically not used to control metal HAP in smelting furnace exhaust.

The first part of our analysis included attempting to determine which control technology (e.g., fabric filter, WESP, HEPA filter, cartridge collectors) achieves the greatest control efficiency for metal HAP. We could not directly calculate control efficiencies due to lack of inlet concentration data; however, we compared the outlet lead concentrations from the different control technologies based on emissions data that we received in the ICR.

As displayed in Figure 2-1, the average stack outlet lead concentration from the baghouse and WESP combination was almost 50 times lower than the outlet concentration achieved by using baghouses alone. HEPA filters used downstream of a baghouse achieved approximately 20 percent lower outlet lead concentrations than baghouses alone. Cartridge collectors appear to achieve outlet lead concentrations approximately three times lower than baghouses; however, as mentioned, cartridge collectors are generally limited to emissions points with lower flow rates and inlet loading concentrations.

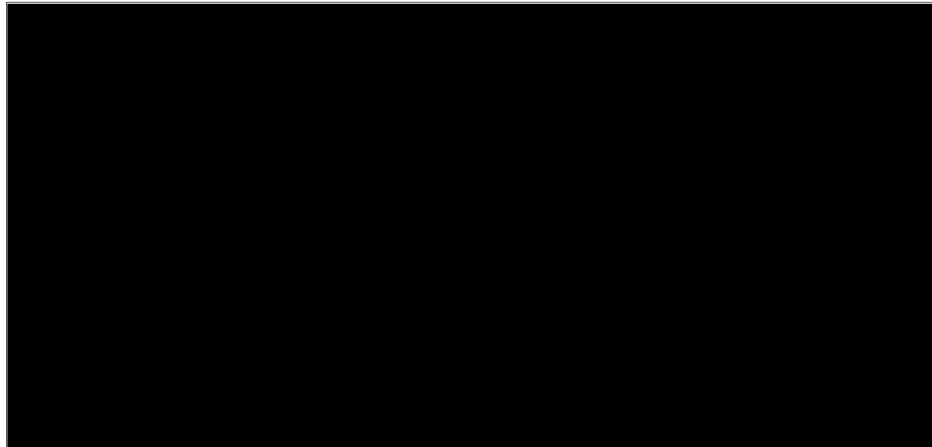


Figure 2-1. Comparison of Control Device Outlet Lead Concentrations from Different Technologies.

Based on emissions data received in the ICR, we also compared the relative performance of each baghouse across facilities and attempted to determine the factors that correlate best with low outlet lead concentrations. The factors that we considered include baghouse type (e.g., shaker, pulse jet, reverse bag pulse), filter material, and age of the unit. Figure 2-2 shows the results of these analyses. Based on our analysis, the most significant factor affecting baghouse performance is the age of the unit. We found that units installed prior to 1989 generally had significantly higher outlet lead concentrations than the newer units. Shaker baghouses appear to have higher outlet lead concentrations than those of the pulse jet or reverse bag pulse type.

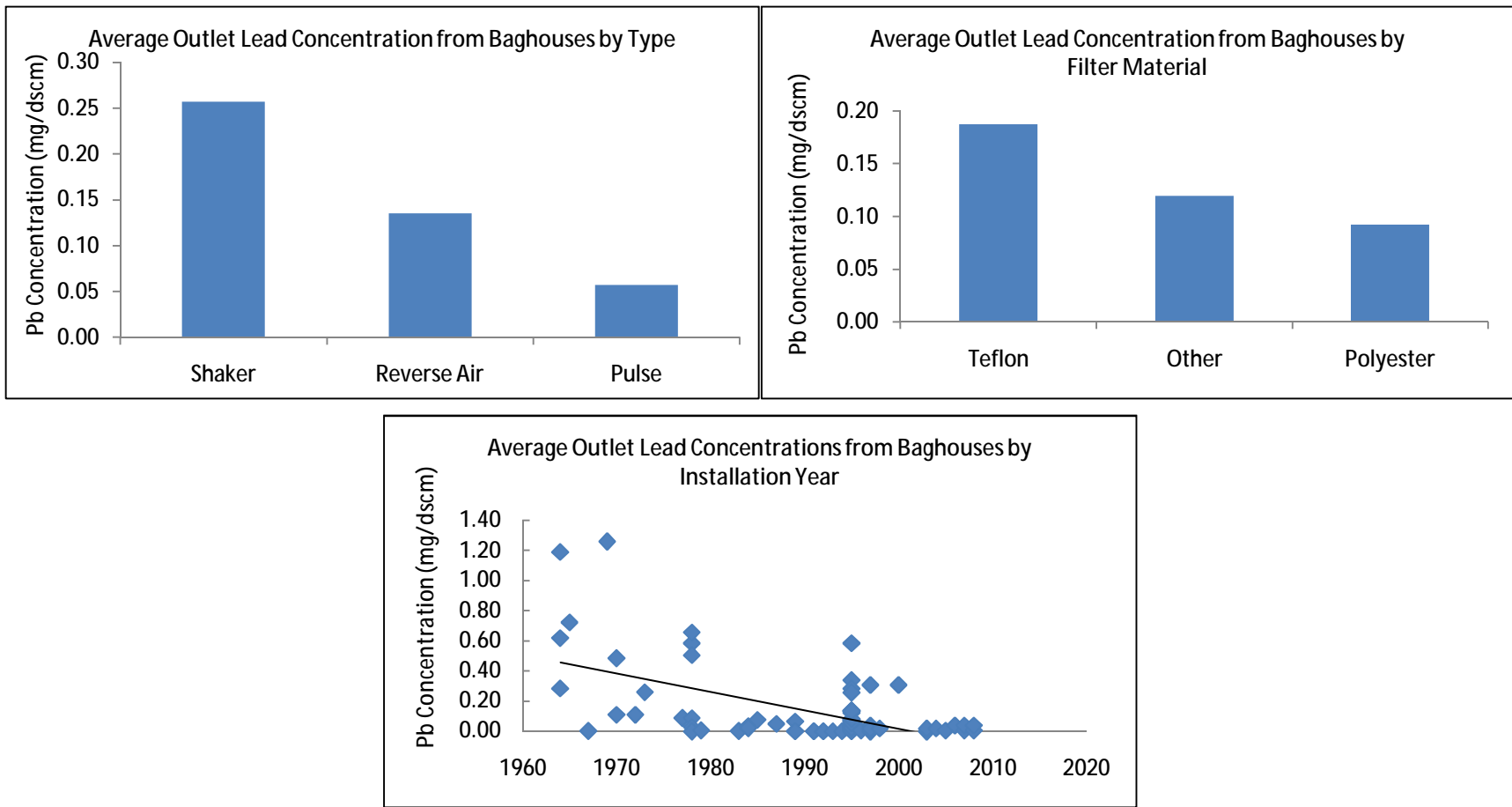


Figure 2-2. Comparison of Baghouse Outlet Lead Concentrations Based on Type (Upper Left), Filter Media (Upper Right), and Installation Year (Bottom).

However, the majority of the older units appear to be shaker types, and thus the age of the baghouse may be the controlling factor. We did not find a significant correlation between the outlet lead concentration and the filtration media used in the baghouses, although one company in the industry suggested, based on its experience, that Teflon (polytetrafluoroethylene) bags specifically supplied by Gore-Tex® performed better than other bag types. The company also suggested that the most critical factors influencing baghouse performance are proper installation and maintenance practices. They mentioned specific practices such as ensuring proper installation of the bags and properly sealing all ducts and dust conveyance devices. Additionally, they claim that replacing torn bags, rather than repairing them, can significantly improve baghouse performance.

Based on our analyses, we believe that the most important development in the control of stack emissions of metal HAP from this source category has been improvement in the performance of baghouses throughout the industry. The biggest indicator of such improvements is the level of metal HAP emissions currently being achieved in the industry in relation to the allowable level in the current NESHAP (referred to as “MACT-allowable”), which is a lead based concentration standard of 2.0 mg/dscm for all stacks. Figure 2-3 shows the lead concentrations reported by the industry in the ICR compared to the lead concentration limit in the current NESHAP. As illustrated by Figure 2-3, the outlet lead concentrations currently being achieved by the industry are far below, and in most cases orders of magnitude below, the concentration limit specified in the current NESHAP. The average reported stack lead concentration was 0.16 mg/dscm with a median of 0.04 mg/dscm. This large discrepancy between actual and MACT-allowable stack lead concentrations is likely a result of improvements in practices, processes, and control technologies that have significantly improved the performance of baghouses employed by this industry since the promulgation of the current NESHAP. We also believe that the concentration data presented in Figure 2-3 clearly show that improvements in baghouse technology and operation have occurred that resulted in the capability of achieving significantly lower stack lead emissions than what is required by the current NESHAP.

b. Organic HAP and Dioxin and Furan Emissions

Based on our review of the ICR responses, we found that emissions of organic HAP from smelting furnaces vary substantially among the different furnace types. In general, emissions of organic HAP from blast furnaces are much higher than those from other furnace types. Information collected in the ICR indicates that this is likely due to the much lower exit temperature of the blast furnace exhaust relative to the other furnace types. The majority of facilities that operate blast furnaces use afterburners to control emissions of organic HAP. The exhaust of reverberatory furnaces is sufficiently hot that the use of an afterburner is generally not

required to meet the current THC limit. Some facilities that operate both blast and reverberatory furnaces comingle the hotter reverberatory furnace stream with the cooler blast furnace stream to control organics in the blast furnace stream. We did not identify new control technologies or developments in the mentioned existing control technologies that would achieve reductions in organic HAP emissions beyond the limits established in the current NESHAP.

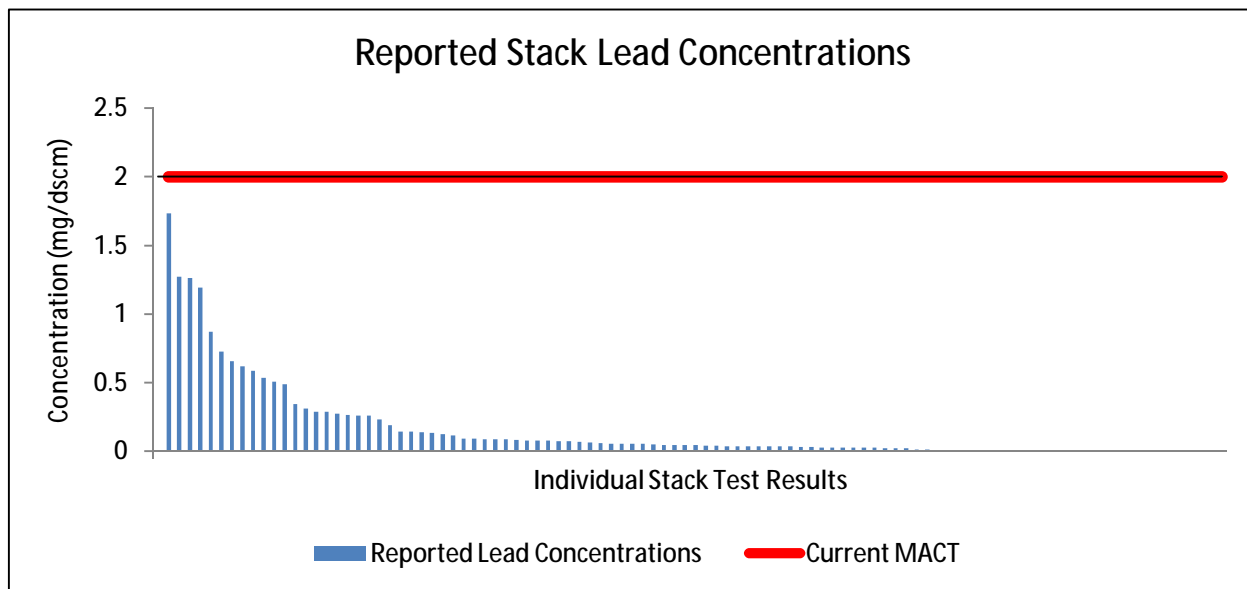


Figure 2-3. Comparison of Stack Lead Concentrations Reported by the Industry with the Current MACT Standard.

Although dioxin and furan (D/F) emissions limits are not specified in the current NESHAP, we investigated technologies available for prevention and/or control of D/F emissions from the smelting furnaces. Based on data submitted by the industry in the ICR, D/F emissions from blast furnaces are one to three orders of magnitude higher than emissions from reverberatory and electric furnaces. The key conditions typically associated with higher D/F emissions, listed in order of relative importance¹, are:

- Poor combustion conditions,
- High particulate concentration in the flue gases of a combustion process,
- Increased residence time for particulate in critical temperature window (150 - 450 degrees Celsius),
- Particulate matter containing metals that can catalyze formation to dioxin,
- Waste or fuel that is comprised of complex organic or lignin-like structure, and

¹ Gullett, Brian (EPA) and Seeker, Randy (EER Corporation), *Chlorinated Dioxin and Furan Formation Control and Monitoring*. Presentation at the Industrial Combustion Coordinated Rulemaking Meeting, September 17, 1997.

- Sufficient chlorine.

We believe the controlling factor for D/F formation in blast furnaces is the relatively low exit temperature of the exhaust stream in comparison to other furnace types.

We identified two technologies employed by this source category that have demonstrated effective control of D/F emissions from blast furnaces: (1) incineration of the furnace exhaust, and (2) comingling of the blast furnace exhaust with the hotter reverberatory furnace exhaust. Based on information submitted in the ICR and information in the literature on dioxin destruction efficiency, operating an afterburner at sufficient temperature (approximately 1,600 degrees Fahrenheit) with adequate residence time (approximately 2.0-2.5 seconds) can achieve significant reductions in D/F emissions from blast furnaces². Additionally, emissions data submitted in the ICR indicate that D/F emissions from collocated blast and reverberatory furnaces are generally lower than emissions from a blast furnace alone. Average exhaust D/F concentrations of the various furnace types are summarized in Table 2-1.

Table 2-1. Summary of Exhaust D/F Concentrations by Furnace Type.

Furnace Type	Average D/F (nanograms/dscm)
Reverberatory furnaces not collocated with blast furnaces, and reverberatory furnaces mixed with electric furnaces	0.10
Blast Furnaces	38.83
Collocated Blast and Reverberatory Furnaces	0.19
Rotary Furnaces	0.14

A review of technologies employed by other industries to control D/F emissions concluded that injecting activated carbon into the exhaust stream can also achieve significant reductions of D/F emissions; however, the costs associated with this technology for this source category were determined to be high (see Draft Cost Impacts of the Revised NESHAP for the Secondary Lead Smelting Source Category).

Because the presence of chlorine is necessary for D/F formation, we also examined the potential sources of chlorine in the feed materials charged to the smelting furnaces. Historically, the plastic battery casings used in the construction of automotive batteries contained polyvinyl chloride (PVC). Although battery casings are no longer made of PVC, the battery casings can sometimes contain small amounts of chlorinated flame retardants. This material may be introduced into the furnace through incomplete separation of the battery casing material from the

² Ficarella, Domenico and Laforgia, Domenico, *Numerical Simulation of Flow-Field and Dioxins Chemistry for Incineration Plants and Experimental Investigation*, Waste Management, 20 (2000) 27-49. <http://www.bvsde.paho.org/bvsacd/cd43/antonio.pdf>

lead-bearing material in the feed preparation process. Chlorine may also be present in the coke fed to the furnace as a fuel and reducing agent. Moreover, we believe that occasionally some older batteries that still contain PVC casings could be processed.

Based on our review, the main control of D/F emissions occurs due to measures initially implemented to control organic HAP emissions (i.e., incineration and co-mingling of furnace exhaust streams). We identified one other control technology with the potential to reduce D/F emissions (i.e., carbon injection); however, the costs to apply this technology were determined to be high.

2.2 Fugitive Emissions

As outlined in section 1.2 of this memorandum, the pollutants emitted from fugitive emissions sources in this source category are metal HAP. Therefore, we focused on identifying advancements in practices, processes, and control technologies related to fugitive emissions of metal HAP. Sources of fugitive emissions at secondary lead smelters include dust from plant roadways, battery breaking operations, material storage areas, and process fugitives that are not captured by a control device.

The minimum requirements for control of fugitive emissions in the current NESHAP for the following specified fugitive sources are:

- Plant roadways – must be cleaned twice per day;
- Battery breaking area – partial enclosure of storage piles and wet suppression with twice daily pavement cleaning;
- Furnace and refining and casting areas – partial enclosure and pavement cleaning; and
- Material Storage and Handling Areas – partial enclosure, wet suppression, and vehicle wash at exits.

Based on our analysis of information received in the ICR, we grouped the facilities into three categories that describe the level of fugitive emissions control implemented. Table 2-2 defines these categories and Table 2-2 summarizes our categorization for each facility.

Table 2-2. Enclosure Category Definitions.

Enclosure Category	Description
Level 1 Enclosure	Facilities described as having Level 1 enclosure meet the enclosure requirements in the current NESHAP. The facilities rely primarily on enclosure hoods to capture process fugitive emissions and partial enclosures with wet suppression for process units and storage areas.
Level 2 Enclosure	Facilities described as having Level 2 enclosure generally employ, in addition to enclosure hoods for process fugitive sources, a combination of negative pressure total enclosures and partial enclosures with wet suppression for process units and storage areas.

Enclosure Category	Description
Level 3 Enclosure	Facilities described as having Level 3 enclosure generally employ, in addition to enclosure hoods for process fugitive sources, negative pressure total enclosures for all process units and storage areas.

Table 2-3. Enclosure Category Assigned to the 14 Secondary Lead Smelting Facilities.

Facility	Enclosure Category
Exide Technologies – Baton Rouge, LA	Level 1
Exide Technologies – Forest City, MO	Level 2
Exide Technologies – Frisco, TX	Level 2
Exide Technologies – Muncie, IN	Level 3
Exide Technologies – Reading, PA	Level 2
Exide Technologies – Vernon, CA	Level 3
Revere Smelting And Refining – Middletown, NY	Level 3
Quemetco Inc. – Industry, CA	Level 3
Quemetco Inc. – Indianapolis, IN	Level 3
Sanders Lead Co. – Troy, AL	Level 1
EnviroFocus Technologies – Tampa, FL	Level 2
Gopher Resources – Eagan, MN	Level 3
Buick Resource Recycling Facility – Boss, MO	Level 1
East Penn Manufacturing – Lyons, PA	Level 3

As displayed in Table 2-3, our analysis concludes that 11 of the 14 facilities are controlling fugitive emissions beyond the levels required by the current NESHAP. Additionally, seven of the 14 facilities have placed all of their process areas in total enclosures under negative pressure with ventilation to a control device. Furthermore, an 8th facility (EnviroFocus Technologies) has a current project to implement level 3 enclosure. Of the seven facilities that are currently level 3 enclosures, several facilities claimed performing additional work practices (beyond the enclosures) that exceed the requirements of the current NESHAP to further limit the formation of fugitive dust in other areas of their facilities. Examples of these work practices include:

- more complete vehicle washing inside buildings;
- improved roadway cleaning techniques and frequency;
- pavement of entire facility grounds;
- cleaning of building roofs and exteriors;

- use of daily ambient monitoring to diagnose plant activities that lead to exceedances of the National Ambient Air Quality Standards (NAAQS) for lead;
- timely cleaning of accidental releases;
- inspection of outside battery storage areas for broken batteries; and
- performance of all maintenance activities inside total enclosures operated under negative pressure.

Our analysis of ambient lead concentration data measured near the facilities indicates that facilities with level 3 enclosure that implement the work practices described above are generally achieving much lower lead concentrations near their property boundaries (see Figure 3-2). For this reason, we believe that developments in practices, processes, and control technologies with regard to fugitive emissions of metal HAP have occurred that can result in reduced metal HAP emissions from fugitive sources beyond the standards contained in the current NESHAP.

3.0 RECOMMENDED REVISIONS BASED ON DEVELOPMENTS IN PRACTICES, PROCESSES, AND CONTROL TECHNOLOGIES

Based on the analyses presented above, we are recommending the following revisions to the current NESHAP with regards to stack and fugitive emissions from the Secondary Lead Smelting source category.

3.1 Stack Emissions

As described in section 2.1 of this memorandum, the concentrations of lead in stacks reported by this industry in the ICR are far below the level specified in the current NESHAP, indicating improvements in the control of metal HAP emissions since promulgation of the current NESHAP. Our analysis indicates that this is primarily a result of improved performance of baghouses. Therefore, we recommend revising the current NESHAP to reflect the level of performance currently being achieved by facilities that implement well-performing baghouses to control emissions of metal HAP from stacks.

When considering the most appropriate form of a revised lead standard for this source category, we considered alternatives to the current form (i.e., outlet lead concentration). However, our analysis indicates that a concentration-based lead standard continues to be the most appropriate form for this industry. We then attempted to determine the appropriate reduction to the current lead concentration limit of 2.0 mg/dscm. As outlined in section 2.1, the average stack concentration of lead reported by the industry in the ICR was 0.16 mg/dscm with a median concentration was 0.04 mg/dscm. Over 96 percent of the reported concentrations were less than half the current limit of 2.0 mg/dscm and over 80 percent of the reported concentrations were at least an order of magnitude less than the current limit. Our analyses conclude that advancements in the performance of baghouses appear to be the controlling factor for these lower concentrations and that reducing the current lead concentration limit from 2.0 to 0.2

mg/dscm would reflect the level of control achieved in practice by facilities that implement well-performing baghouses.

Figure 3-1 compares the lead concentrations reported by the industry in the ICR with a potential revised lead concentration limit of 0.2 mg/dscm. Although the majority of stacks reported concentrations well below 0.2 mg/dscm, a limited number of stacks would need improvements, possibly in the form of improved maintenance practices on their existing baghouses or installation of newer, more efficient units. To provide the facilities flexibility in determining the best approach to meeting a revised concentration limit, we considered proposing a facility-wide flow-weighted average lead concentration limit of 0.2 mg/dscm. For this limit, facilities would assign a weighting factor to each stack lead concentration based on the flow rate of the stack. They would then sum the flow-weighted concentration of all the stacks at their facility to get a facility-wide flow-weighted concentration. A limit in this form would reflect the level of metal HAP emissions control being achieved in practice by well performing baghouses while providing flexibility to the facilities in determining the most cost-effective approach to achieving the necessary reductions.

As required under section 112(d)(6), we considered the costs and other impacts associated with revising the lead concentration limit in the manner described above. As described in the Draft Cost Impacts of the Revised NESHAP for the Secondary Lead Smelting Source Category, we estimate that three baghouses at two facilities would need to be replaced as a result of the revised limit. The estimated total capital cost is \$7.7 million with a total annualized cost of \$1.7 million. We estimate that the revised limit would result in annual reductions of metal HAP of approximately 5.9 tons with co-reductions in emissions of particulate matter (PM) of approximately 56 tons. We do not anticipate additional energy use associated with this revised limit, as only replacement baghouses, as opposed to new additional units, are expected. Furthermore, we do not anticipate any adverse non-air environmental impacts associated with the implementation of this revised limit.

For these reasons, we are recommending that a flow-weighted average lead concentration limit of 0.2 mg/dscm be applied to the sum of all stacks at each facility in this source category. To limit the potential impacts of any individual stack, we are also recommending that a maximum lead concentration limit of 1.0 mg/dscm be applied to individual stacks in this source category. This is warranted given the fact that, as described above, over 96 percent of stack lead concentrations reported in the ICR were less than 1.0 mg/dscm.

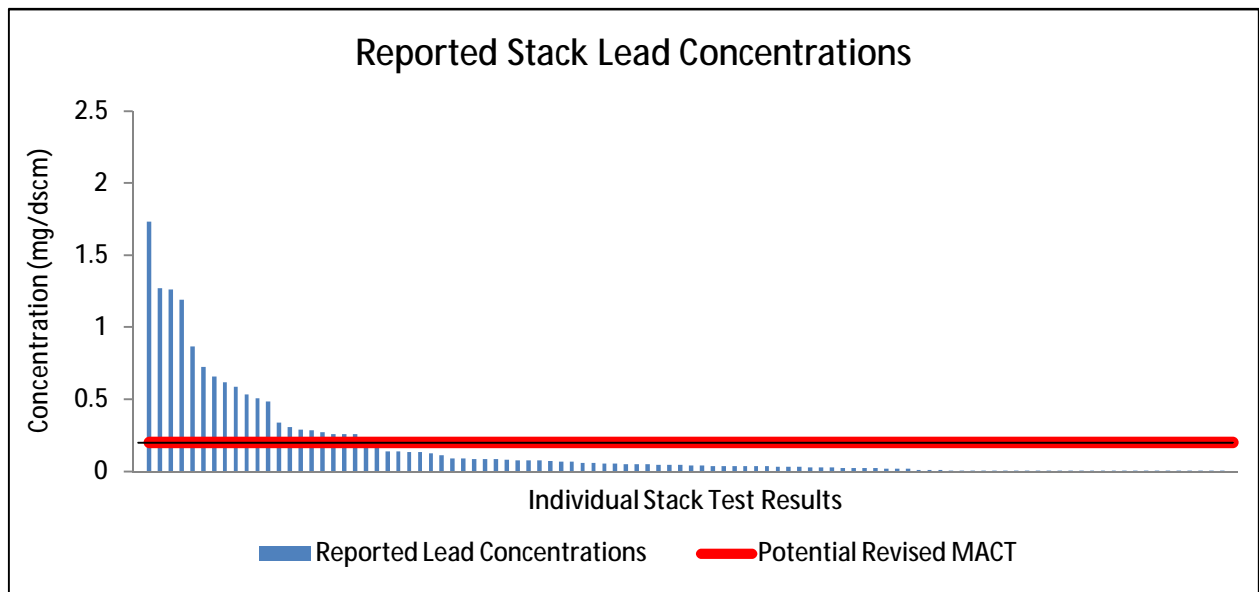


Figure 3-1. Comparison of Stack Lead Concentrations Reported by the Industry with a Potential Revised Lead Concentration Limit.

3.2 Fugitive Emissions

As outlined in section 2.2 of this memorandum, several facilities in this source category are currently implementing controls for fugitive emissions of metal HAP that exceed what is required in the current NESHAP. Based on our analyses, we are recommending revising the current NESHAP to reflect the level of control currently being achieved by the better performing facilities in this source category with regards to fugitive emissions of metal HAP.

Because fugitive emissions cannot be directly captured or measured, the most feasible limit is a work practice standard. Although lack of direct measurement makes comparisons of the efficiency of different control technologies challenging, analysis of ambient lead monitoring data near the facilities has generally been considered an accurate indicator of the level of fugitive emissions of metal HAP. The Draft Residual Risk Assessment for the Secondary Lead Smelting Source Category presents dispersion modeling results for this source category indicating that fugitive emissions are overwhelmingly the most significant source contributing to ambient lead concentrations near the property boundaries of secondary lead smelting facilities. The same modeling results indicate that fugitive lead emissions from this source category could result in exceedances of the lead NAAQS at 12 of the 14 facilities.

We analyzed available ambient monitoring data to determine which facilities were implementing the most effective controls for fugitive emissions of metal HAP. Figure 3-2

displays the annual average lead concentrations at ambient monitoring locations around facilities based on the enclosure category assigned to the facility in section 2.2 of this memorandum. The figure includes concentration data for 12 of the 14 facilities (monitoring data near Exide Baton Rouge and Exide Forest City were not available). All data in this figure were taken from http://www.epa.gov/airexplorer/monitor_kml.htm. The most recent year's monitoring data available (either 2008 or 2009 for each facility) was selected for each facility. In cases where data were available at multiple monitoring locations around a facility, we chose the monitor with the highest annual lead concentration.

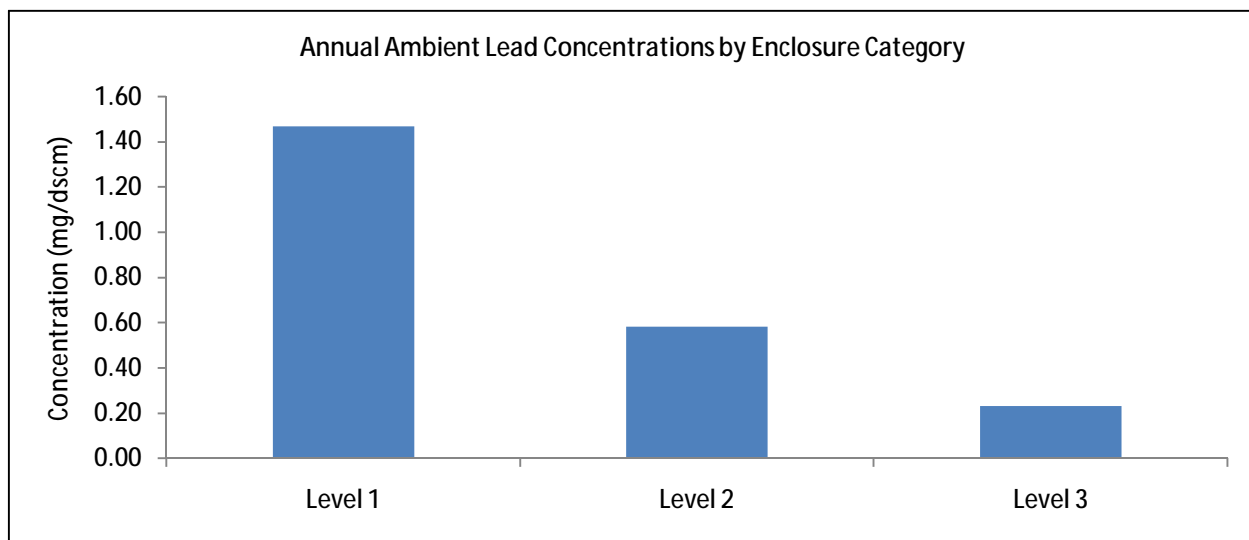


Figure 3-2. Comparison of Annual Ambient Lead Concentrations for Each Enclosure Category.

As the figure shows, facilities categorized as level 3 enclosures achieved significantly lower ambient lead concentrations than those classified as level 1 or 2 enclosures. As previously mentioned, seven of the 14 facilities are currently classified as level 3 enclosures, with an 8th facility planning to implement level 3 enclosures in the near future. Of the facilities classified as having level 3 enclosures, four facilities also implement some or all of the additional work practices mentioned in section 2.2 to further prevent the formation of fugitive dust in other areas of their facilities. Based on this analysis, we concluded that level 3 enclosure plus the implementation of additional fugitive control work practices is necessary to achieve ambient lead concentrations below the NAAQS near the fence line of a facility. Because several facilities are already implementing these controls and because we estimate that these controls are necessary to ensure to ensure ambient lead concentrations below the NAAQS, we recommend revising the current NESHAP to require these controls.

As with the revised stack lead concentration limit discussed in section 3.1 of this memorandum, we considered the potential cost impacts of revising the fugitive emissions standard in the current NESHAP to include the controls mentioned above. As described in the Draft Cost Impacts of the Revised NESHAP for the Secondary Lead Smelting Source Category, we estimate that the total capital cost to implement level 3 enclosure and additional fugitive control work practices throughout the industry is approximately \$40 million with a total annualized cost of approximately \$9.6 million. We estimate reductions in metal HAP emissions of 9.5 tons per year resulting from this revised standard with co-reductions of PM of approximately 104 tons. We do not anticipate any adverse non-air environmental impacts associated with this recommended standard. However, we do anticipate some additional energy use associated with the operation of the new total enclosure. After consideration of the costs, emissions reductions, and other potential impacts, we believe the revision of the fugitive emissions standard for this source category to include the control measures described in this memorandum is warranted and necessary.

As an alternative to requiring level 3 enclosure and the implementation of an extensive list of fugitive control work practices, we recommend that facilities be allowed to demonstrate compliance through ambient lead monitoring. If facilities are able to demonstrate ambient lead concentrations near their facility that are below the lead NAAQS using practices other than those specified above, then it can be concluded that they are achieving a similar level of control as would be achieved by the control measures described in this memorandum. Providing such an alternative would allow the facilities flexibility in determining the most appropriate and cost-effective method of achieving the necessary reductions in fugitive emissions of metal HAP.

4.0 CONCLUSIONS

This review identified several developments in practices, processes, or control technologies that have been implemented in this source category since promulgation of the current NESHAP. Our analysis indicates that several facilities have significantly reduced stack emissions of metal HAP, primarily through improved performance of baghouses. Additionally, several facilities have implemented fugitive emissions control practices that exceed the requirements of the current NESHAP. Based on our review, we conclude that it is feasible and cost-effective for facilities to achieve a facility-wide, flow-weighted average lead concentration of 0.2 mg/dscm with a limit of 1.0 mg/dscm for any individual stack. We conclude that it is feasible for all facilities to fully enclose all process areas under negative pressure of and implement a prescribed list of work practices to limit fugitive emissions. As an alternative, facilities could demonstrate a similar level of control for fugitive emissions by monitoring ambient lead concentrations at or near the facility boundaries to ensure that concentrations remain below the lead NAAQS (i.e., 0.15 $\mu\text{g}/\text{m}^3$). Implementing these controls would achieve

reductions in lead emissions of approximately 13.3 tons with total metal HAP reductions of approximately 15 tons. Additionally, we expect total co-reductions of PM emissions of approximately 160 tons. We estimate that between 48 and 76 tons of the total PM reductions will be reductions in particles with diameters less than 2.5 microns (PM_{2.5}), depending on the nature of the particle size distribution of emissions from this source category. For these reasons, we believe that these controls and measures are cost-effective measures that reflect achievable performance for this industry.

Appendix F

HB3151-25 Excess Emissions Calculation

APPENDIX F

EXIDE HB 3151-25 EXCESS LEAD EMISSIONS

Quemetco room ventilation baghouse exhaust lead concentrations test data

Baghouse ID	Pb Conc. ug/dscm
A	0.567
B	2.840
C	2.780
D	1.300
E	10.100
F	1.060
G	2.850
H	2.280
I	0.661

Average	2.715
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Exide Torit dust collector exhaust lead concentrations test data

Collector ID	Pb Conc. ug/dscm
North	8.93
South	9.68

Average	9.305
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HEPA control efficiency on R2 emissions (E)

$$E = (1 - 2.715/9.305) * 100 = \mathbf{70.819 \text{ Percent}}$$

Excess Pb Emissions (based on test data)

Collector ID	Pb, R2, lbs/hr	Excess Factor	Excess Pb, lbs/hr	Excess Pb, lbs/day
North	0.0029	0.7082	0.0020	0.0486
South	0.0042	0.7082	0.0030	0.0714
Totals	0.0071		0.0050	0.1200

Assumptions: Similar filter media have similar exhaust gas concentrations

Appendix D

Projected Health Risks Following All Proposed Measures

Appendix D

Projected Health Risks Following All Proposed Measures

ENVIRON conducted this health risk assessment (HRA) to provide potential risk metrics that account for all the proposed control measures presented in the Risk Reduction Plan. Potential future control measures include a Regenerative Thermal Oxidizer (RTO) on the exhaust of the Reverberatory Furnace Feed Dryer and secondary HEPA filters on the Hard Lead, Soft Lead, Material Handling, and MAC stacks. ENVIRON used the same air modeling and risk assessment methodologies as that of the approved 2013 HRA, and substituted the 2013 HRA emission data with the projected emissions that account for the RTO and the secondary HEPA filters. Section D.1 includes the air toxic emission inventory, Section D.2 summarizes our methodologies, and Section D.3 describes the health risk results.

D.1 Projected Air Toxic Emissions

The main text of the RRP discussed the potential control efficiencies of the RTO, i.e. 90% reduction for organics, and the HEPA filters, i.e. 50% reduction for metals. Using these control efficiencies, Table D-1 summarizes the reduced air toxic emissions. The percentage of 90% was applied to the toxic organic air contaminant emissions reported for the Feed Dryer stack in the 2013 HRA. The percentage of 50% was applied to the toxic metal emissions reported for the following stacks in the 2013 HRA: Feed Dryer stack, North and South Torits, Hard Lead Stack, Soft Lead Stack, MAC baghouse, and Material Handling baghouse. The toxic air emissions staying the same as the ones in the approved 2013 HRA are not presented. Note that the Feed Dryer stack and North and South Torits have the secondary HEPA filters installed already. However, the emission data in the 2013 HRA didn't reflect such control. Additionally, the toxic air emission data from the April 18 and 19, 2013 source tests described in Appendix B are the basis to calculate the projected emissions (50% reduction) from Hard Lead and Neptune stacks.

D.2 Modeling and Risk Assessment Methods

This HRA repeated the risk calculations in the approved 2013 HRA. Emission sources included all nine stacks of the manufacturing processes and two stacks for the natural gas water heaters as point sources, as well as the area sources representing the onsite reentrained road dust. ENVIRON updated the emission data in the approved 2013 HRA with those listed in Table D-1. The updated *.tra file, which imports the emission rates to the HARP program, is included in the CD-ROM in Appendix E of the RRP.

ENVIRON used the same XOQ files that were generated for the approved 2013 HRA in this updated HRA (included in the CD-ROM). ENVIRON used the regulatory default options to generate the XOQ values using Breeze AERMOD version 7.6 (EPA AERMOD version 12060). The source parameters were based on the source test reports that were used in the approved 2013 HRA. The receptor grid covers a 3,600-square-kilometer area surrounding the facility, and census block receptors were identified within this area using United States Census Bureau data. ENVIRON obtained the meteorological data for the Central Los Angeles station from the South Coast Air Quality Management District (SCAQMD)'s website for the years of 2006 and 2007. The elevations for the sources and receptors were extracted from the National Elevation Datasets (NED) on the United States Geological Survey's (USGS) website. The modeling used

the Universal Transverse Mercator (UTM) system of coordinates and the World Geodetic System 1984 (WGS84) spheroid.

ENVIRON used HARP (version 1.4f) to calculate the health risks, which is the same version that ENVIRON used for the approved 2013 HRA and the currently available version on the California Air Resources Board (CARB)'s website. An updated HARP Health Value Database was released by CARB on August 1, 2013. This new database contains updated health values for 1,3-butadiene adopted by OEHHA and was used in this updated HRA. The newly adopted values are: $2 \mu\text{g}/\text{m}^3$ (chronic REL) and $660 \mu\text{g}/\text{m}^3$ (acute REL), compared to the $20 \mu\text{g}/\text{m}^3$ (chronic REL) and no acute REL previously.

ENVIRON used the same risk calculation parameters as those in the approved 2013 HRA, which followed the OEHHA Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessment and the SCAQMD's Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act. The risk reports generated by HARP are included in the CD-ROM.

D.3 Risk Estimates

When the future controls are considered, the cancer risk at the Maximally Exposed Individual Worker (MEIW) is estimated to be 7.8 in a million or $7.8\text{E-}6$ (vs. 156 in a million in the 2013 HRA). The MEIW is at Receptor 1005 (389900, 3763600) and is located in the railyard north of the facility. The cancer risk at the Maximally Exposed Individual Resident (MEIR) is estimated to be 2.3 in a million or $2.3\text{E-}6$ (vs. 22 in a million in the 2013 HRA). The MEIR is at Receptor 1016 (389900, 3764700) and is located in the residential area north of the facility.

The cancer burden is estimated to be 0.1, which is below the SCAQMD Rule 1402 Action Level of 0.5. The cancer burden in the 2013 HRA was 10.

The Chronic Hazard Index (CHI) at the MEIW is estimated to be 1.17 (vs. 63 in the 2013 HRA). The CHI MEIW is at Receptor 927 (389700, 3763600) and is located immediately west of the flood channel passing by the facility on the west. The CHI at the MEIR is estimated to be 0.09 (vs. 2.9 in the 2013 HRA). It is located at the same location as the cancer risk MEIR. Both CHIs are below the SCAQMD Rule 1402 Action Level of 3.0.

The Acute Hazard Index (AHI) at the MEIW is estimated to be 0.43 (vs. 3.8 in the 2013 HRA). It is at Receptor 80 (389659, 3763479) and is located on the western fence line near the railway track. Since the selection for the AHI MEIW included fenceline receptors, this AHI MEIW is the same as the AHI PMI. The AHI at the MEIR is estimated to be 0.01 (vs. 0.2 in the 2013 HRA). It is at Receptor 975 (389800, 3764700) and is located in the residential area north of the facility. Both AHIs are below the SCAQMD Rule 1402 Action Level of 3.0.

The maximum locations for the worker cancer risk, CHI, and AHI and the contours for the worker cancer risk and CHI are presented on Figure D-1. The maximum locations for the residential cancer risk, CHI, and AHI and the contour for the residential cancer risk are presented on Figure D-2.

Table

Table D-1 Projected Emissions Following All Proposed Measures

Source	Chemical CAS	Chemical Name	Annual (lb/yr)	Hourly (lb/hr)
HARDLEAD	7429905	Aluminum	0.00E+00	0.00E+00
HARDLEAD	7440360	Antimony	9.35E-02	1.07E-05
HARDLEAD	7440382	Arsenic	2.99E+00	3.41E-04
HARDLEAD	7440393	Barium	8.32E-02	9.50E-06
HARDLEAD	7440417	Beryllium	0.00E+00	0.00E+00
HARDLEAD	7440439	Cadmium	2.60E-01	2.97E-05
HARDLEAD	7440473	Chromium	9.77E-02	1.12E-05
HARDLEAD	7440484	Cobalt	1.94E-01	2.21E-05
HARDLEAD	7440508	Copper	1.50E-01	1.72E-05
HARDLEAD	7439921	Lead	1.34E+01	1.53E-03
HARDLEAD	7439965	Manganese	5.65E-02	6.45E-06
HARDLEAD	7439976	Mercury	9.53E-01	1.09E-04
HARDLEAD	7440020	Nickel	4.15E-01	4.74E-05
HARDLEAD	7440224	Silver	0.00E+00	0.00E+00
HARDLEAD	7440280	Thallium	0.00E+00	0.00E+00
HARDLEAD	7440666	Zinc	9.24E-01	1.06E-04
HARDLEAD	18540299	Chromium VI	1.60E-02	1.83E-06
MAT_STOR	7429905	Aluminum	0.00E+00	0.00E+00
MAT_STOR	7440360	Antimony	9.29E-02	1.06E-05
MAT_STOR	7440382	Arsenic	3.25E-01	3.71E-05
MAT_STOR	7440393	Barium	1.55E-01	1.77E-05
MAT_STOR	7440417	Beryllium	0.00E+00	0.00E+00
MAT_STOR	7440439	Cadmium	2.28E-01	2.61E-05
MAT_STOR	7440473	Chromium	7.58E-01	8.65E-05
MAT_STOR	7440484	Cobalt	2.83E-01	3.23E-05
MAT_STOR	7440508	Copper	1.23E+00	1.41E-04
MAT_STOR	7439921	Lead	5.04E+00	5.75E-04
MAT_STOR	7439965	Manganese	0.00E+00	0.00E+00
MAT_STOR	7439976	Mercury	6.22E-03	7.10E-07

Source	Chemical CAS	Chemical Name	Annual (lb/yr)	Hourly (lb/hr)
MAT_STOR	7440020	Nickel	1.73E-01	1.98E-05
MAT_STOR	7440224	Silver	0.00E+00	0.00E+00
MAT_STOR	7440280	Thallium	0.00E+00	0.00E+00
MAT_STOR	7440666	Zinc	9.81E-01	1.12E-04
MAT_STOR	18540299	Chromium VI	5.96E-02	6.80E-06
SOFTLEAD	7429905	Aluminum	1.59E+01	1.81E-03
SOFTLEAD	7440360	Antimony	5.56E-02	6.35E-06
SOFTLEAD	7440382	Arsenic	4.38E-01	5.00E-05
SOFTLEAD	7440393	Barium	8.80E-02	1.01E-05
SOFTLEAD	7440417	Beryllium	0.00E+00	0.00E+00
SOFTLEAD	7440439	Cadmium	4.20E-01	4.80E-05
SOFTLEAD	7440473	Chromium	0.00E+00	0.00E+00
SOFTLEAD	7440484	Cobalt	1.07E-01	1.22E-05
SOFTLEAD	7440508	Copper	3.18E-01	3.63E-05
SOFTLEAD	7439921	Lead	3.73E+00	4.26E-04
SOFTLEAD	7439965	Manganese	0.00E+00	0.00E+00
SOFTLEAD	7439976	Mercury	1.38E-01	1.57E-05
SOFTLEAD	7440020	Nickel	0.00E+00	0.00E+00
SOFTLEAD	7440224	Silver	0.00E+00	0.00E+00
SOFTLEAD	7440280	Thallium	0.00E+00	0.00E+00
SOFTLEAD	7440666	Zinc	1.48E+00	1.69E-04
SOFTLEAD	18540299	Chromium VI	8.19E-03	9.35E-07
SOU_CART	7429905	Aluminum	1.38E+01	1.58E-03
SOU_CART	7440360	Antimony	1.47E+00	1.68E-04
SOU_CART	7440382	Arsenic	2.12E-01	2.42E-05
SOU_CART	7440393	Barium	2.40E-01	2.74E-05
SOU_CART	7440417	Beryllium	0.00E+00	0.00E+00
SOU_CART	7440439	Cadmium	9.59E-02	1.10E-05
SOU_CART	7440473	Chromium	0.00E+00	0.00E+00
SOU_CART	7440484	Cobalt	0.00E+00	0.00E+00

Source	Chemical CAS	Chemical Name	Annual (lb/yr)	Hourly (lb/hr)
SOU_CART	7440508	Copper	2.66E-01	3.04E-05
SOU_CART	7439921	Lead	1.58E+01	1.80E-03
SOU_CART	7439965	Manganese	8.41E-02	9.60E-06
SOU_CART	7439976	Mercury	3.60E-03	4.11E-07
SOU_CART	7440020	Nickel	2.59E-02	2.96E-06
SOU_CART	7440224	Silver	0.00E+00	0.00E+00
SOU_CART	7440280	Thallium	0.00E+00	0.00E+00
SOU_CART	7440666	Zinc	7.93E-01	9.05E-05
SOU_CART	18540299	Chromium VI	3.03E-02	3.46E-06
DRYER_BH	7429905	Aluminum	2.57E+02	2.94E-02
DRYER_BH	7440360	Antimony	1.88E-01	2.15E-05
DRYER_BH	7440382	Arsenic	1.16E-01	1.33E-05
DRYER_BH	7440393	Barium	8.76E-01	1.00E-04
DRYER_BH	7440417	Beryllium	0.00E+00	0.00E+00
DRYER_BH	7440439	Cadmium	4.73E-02	5.40E-06
DRYER_BH	7440473	Chromium	1.38E-02	1.57E-06
DRYER_BH	7440484	Cobalt	6.96E-03	7.95E-07
DRYER_BH	7440508	Copper	6.13E-02	7.00E-06
DRYER_BH	7439921	Lead	4.60E+01	5.25E-03
DRYER_BH	7439965	Manganese	4.95E-01	5.65E-05
DRYER_BH	7439976	Mercury	3.59E-01	4.10E-05
DRYER_BH	7440020	Nickel	4.16E-02	4.75E-06
DRYER_BH	7440224	Silver	1.37E-02	1.57E-06
DRYER_BH	7440280	Thallium	0.00E+00	0.00E+00
DRYER_BH	7440622	Vanadium	1.85E-02	2.12E-06
DRYER_BH	7440666	Zinc	1.86E-01	2.12E-05
DRYER_BH	50000	Formaldehyde	1.67E+01	1.91E-03
DRYER_BH	75070	Acetaldehyde	6.94E+00	7.92E-04
DRYER_BH	91203	Naphthalene	1.17E+01	1.34E-03
DRYER_BH	91576	2-Methylnaphthalene	8.02E-01	9.16E-05

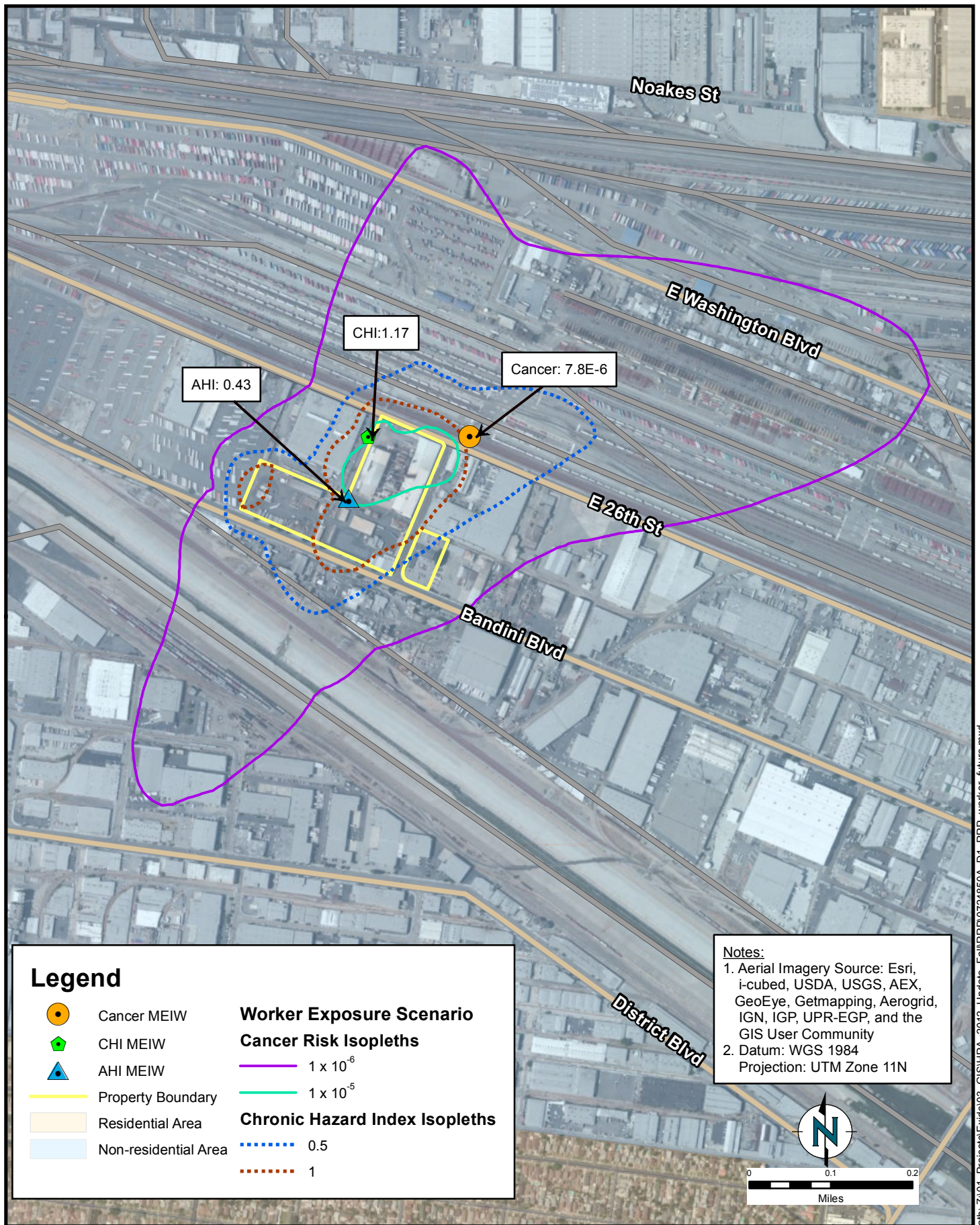
Source	Chemical CAS	Chemical Name	Annual (lb/yr)	Hourly (lb/hr)
DRYER_BH	208968	Acenaphthylene	3.58E-02	4.09E-06
DRYER_BH	83329	Acenaphthene	4.42E-03	5.05E-07
DRYER_BH	86737	Fluorene	1.32E-02	1.51E-06
DRYER_BH	85018	Phenanthrene	1.10E-01	1.25E-05
DRYER_BH	120127	Anthracene	3.17E-04	3.62E-08
DRYER_BH	206440	Fluoranthene	2.71E-02	3.09E-06
DRYER_BH	129000	Pyrene	5.33E-03	6.08E-07
DRYER_BH	56553	Benz(a)anthracene	7.67E-05	8.75E-09
DRYER_BH	218019	Chrysene	4.56E-03	5.21E-07
DRYER_BH	205992	Benzo(b)fluoranthene	1.67E-04	1.91E-08
DRYER_BH	207089	Benzo(k)fluoranthene	0.00E+00	0.00E+00
DRYER_BH	192972	Benzo(e)pyrene	7.59E-05	8.67E-09
DRYER_BH	50328	Benzo(a)pyrene	0.00E+00	0.00E+00
DRYER_BH	198550	Perylene	0.00E+00	0.00E+00
DRYER_BH	193395	Indeno(1,2,3-cd)pyrene	2.68E-05	3.06E-09
DRYER_BH	53703	Dibenz(a,h)anthracene	0.00E+00	0.00E+00
DRYER_BH	1086	TEQ (Min) as 2,3,7,8-TCDD	6.83E-08	7.80E-12
DRYER_BH	1336363	Total PCBs, as MonoCB	5.93E-01	6.77E-05
DRYER_BH	18540299	Chromium VI	1.48E-02	1.69E-06
DRYER_BH	71432	Benzene	1.65E+02	1.88E-02
DRYER_BH	100447	Benzyl Chloride	0.00E+00	0.00E+00
DRYER_BH	75252	Bromoform	0.00E+00	0.00E+00
DRYER_BH	74839	Bromomethane	7.09E-01	8.09E-05
DRYER_BH	78933	2-Butanone	4.36E+00	4.98E-04
DRYER_BH	75150	Carbon Disulfide	7.24E+00	8.26E-04
DRYER_BH	56235	Carbon Tetrachloride	0.00E+00	0.00E+00
DRYER_BH	108907	Chloro benzene	0.00E+00	0.00E+00
DRYER_BH	75003	Chloroethane	0.00E+00	0.00E+00
DRYER_BH	67663	Chloroform	3.59E-01	4.10E-05
DRYER_BH	74873	Chloro methane	6.60E-01	7.53E-05

Source	Chemical CAS	Chemical Name	Annual (lb/yr)	Hourly (lb/hr)
DRYER_BH	75718	Dichlorodifluoromethane	0.00E+00	0.00E+00
DRYER_BH	75343	1,1-Dichloroethane	0.00E+00	0.00E+00
DRYER_BH	75354	1,1-Dichloroethene	2.50E-01	2.85E-05
DRYER_BH	106934	1,2-Dibromoethane	0.00E+00	0.00E+00
DRYER_BH	95501	1,2-Dichlorobenzene	0.00E+00	0.00E+00
DRYER_BH	107062	1,2-Dichloroethane	0.00E+00	0.00E+00
DRYER_BH	78875	1,2-Dichloropropane	0.00E+00	0.00E+00
DRYER_BH	541731	1,3-Dichlorobenzene	0.00E+00	0.00E+00
DRYER_BH	106467	1,4-Dichlorobenzene	0.00E+00	0.00E+00
DRYER_BH	100414	Ethylbenzene	1.28E+00	1.46E-04
DRYER_BH	87683	Hexachloro-1,3-Butadiene	0.00E+00	0.00E+00
DRYER_BH	1634044	Methyl-t-Butyl Ether (MTBE)	0.00E+00	0.00E+00
DRYER_BH	75092	Methylene Chloride	0.00E+00	0.00E+00
DRYER_BH	108101	4-Methyl-2-Pentanone	9.99E-01	1.14E-04
DRYER_BH	191242	Benzo(ghi)perylene	0.00E+00	0.00E+00
DRYER_BH	1330207	Xylenes	1.63E+00	1.87E-04
DRYER_BH	100425	Styrene	3.71E+00	4.23E-04
DRYER_BH	127184	Tetrachloroethene	0.00E+00	0.00E+00
DRYER_BH	108883	Toluene	1.06E+01	1.21E-03
DRYER_BH	79016	Trichloroethene	3.60E-01	4.11E-05
DRYER_BH	75694	Trichlorofluoro methane	0.00E+00	0.00E+00
DRYER_BH	76131	1,1,2-Trichloro-1,2,2-Trifluoroethane	0.00E+00	0.00E+00
DRYER_BH	71556	1,1,1 -Trichloroethane	0.00E+00	0.00E+00
DRYER_BH	79005	1,1,2-Trichloroethane	0.00E+00	0.00E+00
DRYER_BH	79345	1,1,2,2-Tetrachloroethane	0.00E+00	0.00E+00
DRYER_BH	95636	1,2,4-Trimethylbenzene	0.00E+00	0.00E+00
DRYER_BH	120821	1,2,4-Trichlorobenzene	0.00E+00	0.00E+00
DRYER_BH	108054	Vinyl Acetate	3.76E+00	4.29E-04
DRYER_BH	75014	Vinyl Chloride	2.45E-01	2.80E-05
DRYER_BH	106990	1,3-Butadiene	1.46E+01	1.67E-03

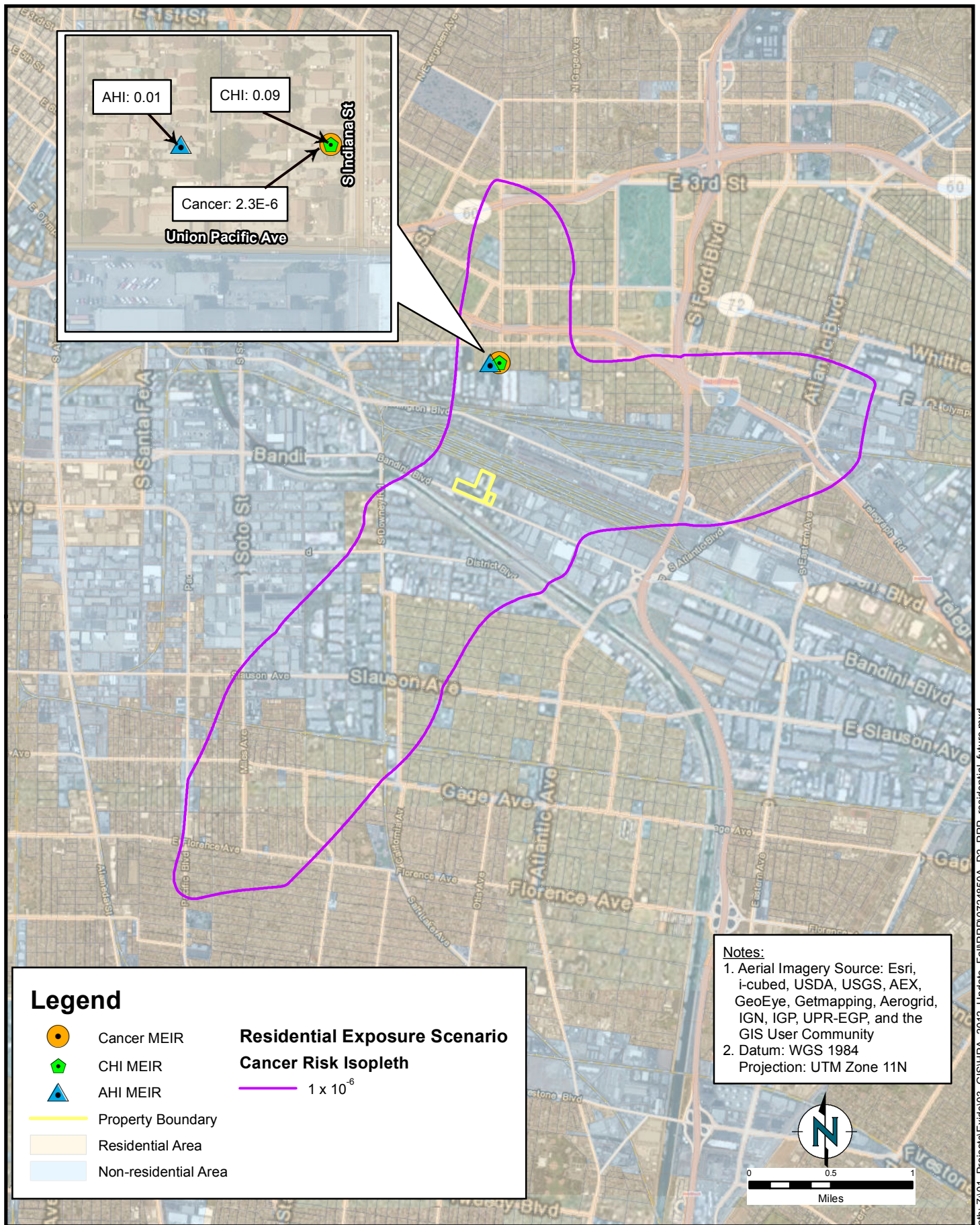
Source	Chemical CAS	Chemical Name	Annual (lb/yr)	Hourly (lb/hr)
DRYER_BH	123911	1,4-Dioxane	0.00E+00	0.00E+00
MAC_BH	7429905	Aluminum	4.56E+02	5.20E-02
MAC_BH	7440360	Antimony	9.29E-01	1.06E-04
MAC_BH	7440382	Arsenic	2.50E-01	2.86E-05
MAC_BH	7440393	Barium	3.39E+00	3.88E-04
MAC_BH	7440417	Beryllium	0.00E+00	0.00E+00
MAC_BH	7440439	Cadmium	0.00E+00	0.00E+00
MAC_BH	7440473	Chromium	1.15E+00	1.32E-04
MAC_BH	7440484	Cobalt	1.09E-01	1.24E-05
MAC_BH	7440508	Copper	0.00E+00	0.00E+00
MAC_BH	7439921	Lead	2.51E+00	2.86E-04
MAC_BH	7439965	Manganese	0.00E+00	0.00E+00
MAC_BH	7439976	Mercury	5.91E-03	6.75E-07
MAC_BH	7440020	Nickel	1.18E-01	1.35E-05
MAC_BH	7440224	Silver	7.31E-02	8.35E-06
MAC_BH	7440280	Thallium	0.00E+00	0.00E+00
MAC_BH	7440666	Zinc	3.45E+00	3.94E-04
MAC_BH	18540299	Chromium VI	1.73E-01	1.98E-05
NOR_CART	7429905	Aluminum	1.39E+01	1.59E-03
NOR_CART	7440360	Antimony	7.93E-02	9.05E-06
NOR_CART	7440382	Arsenic	3.81E+00	4.35E-04
NOR_CART	7440393	Barium	4.86E-02	5.55E-06
NOR_CART	7440417	Beryllium	0.00E+00	0.00E+00
NOR_CART	7440439	Cadmium	1.91E-01	2.18E-05
NOR_CART	7440473	Chromium	0.00E+00	0.00E+00
NOR_CART	7440484	Cobalt	2.21E-02	2.53E-06
NOR_CART	7440508	Copper	0.00E+00	0.00E+00
NOR_CART	7439921	Lead	6.18E+00	7.05E-04
NOR_CART	7439965	Manganese	9.86E-01	1.13E-04
NOR_CART	7439976	Mercury	2.54E-02	2.90E-06

Source	Chemical CAS	Chemical Name	Annual (lb/yr)	Hourly (lb/hr)
NOR_CART	7440020	Nickel	2.26E-01	2.59E-05
NOR_CART	7440224	Silver	4.37E-02	4.99E-06
NOR_CART	7440280	Thallium	0.00E+00	0.00E+00
NOR_CART	7440666	Zinc	1.12E+00	1.28E-04
NOR_CART	18540299	Chromium VI	3.89E-02	4.44E-06

Figures



Path: Z:\01_Projects\Exide\03_GIS\HRA_2012_Update_Fall\RRP\0724850A_D1_RRP_worker_future.mxd



Path: Z:\01_Projects\Exide\03_GIS\HRA_2012_Update_Fall\RRP\0724850A_D2_RRP_residential_future.mxd

Appendix E
HRA CD-ROM

Appendix E – Description of Submitted Files in CD-ROM

- EXIDE-HARP-RRP-current.tra: HARP transaction file for post isolation door assessment
- EXIDE-HARP-RRP-future.tra: HARP transaction file for assessment of all measures
- EXIDE 2012 DISCRETE AND BDRY.SRC: grid and boundary receptor HARP .src file
- EXIDE 2013JAN CENSUS.SRC: census receptor HARP .src file
- GRIDRECEPTOR.XOQ: grid receptor HARP .xoq file
- EXIDE 2013JAN CENSUS.XOQ: census receptor HARP .xoq file
- project-resident-census.sit: Site-specific parameters used for residential risk modeling scenario
- project-worker-sensitive.sit: Site-specific parameters used for worker risk modeling scenario
- HARP risk reports for post isolation door assessment
- HARP risk reports for all measures