

## Continental Aluminum Exposure Investigation Executive Summary

### Introduction

The Michigan Department of Community Health (MDCH), under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR), conducted an Exposure Investigation (EI) in the area around Continental Aluminum, in Lyon Township, Oakland County. As defined in the ATSDR *Public Health Assessment Guidance Manual*, an EI is the “collection and analysis of site-specific information and biologic tests (when appropriate) to determine whether people have been exposed to hazardous substances.”

ATSDR and MDCH became involved at this site when Lyon Township officials “petitioned” (requested) that the federal health agency assess the public health impact of emissions from Continental Aluminum, a secondary aluminum smelter in local operation since 1998. (MDCH conducts public health assessments at sites of environmental concern in Michigan for ATSDR.) Since the smelter began operations, area residents have complained of odor and smoke events and adverse health effects. Upon visiting the site and reviewing available environmental data, ATSDR and MDCH concluded that more information was needed and that an EI was the most appropriate action to take to determine if chemical concentrations in the air were responsible for the health symptoms reported by the community.

The EI took place from March 1 to May 31, 2004. Air samples were analyzed for chemicals likely to be released by a secondary aluminum smelter. Samples for metals, mercury, and acidic aerosols were taken at air-monitoring trailers set up for the EI at Dolsen Elementary School. (The school is downwind from the smelter.) “Grab” samples were taken where verified odor events occurred and at corresponding control sites and analyzed for “volatile organic compounds” (chemicals that easily become vapors). Weather data were recorded as well.

Measured concentrations of chemicals were compared to “screening levels.” Screening levels are concentrations below which no adverse health effects would be expected. If the measured concentration of a chemical exceeded its screening level, then the *risk* of adverse health effects from exposure would be increased (though adverse effects might not necessarily occur) and the presence of the chemical would need further evaluation.

### Metals

Secondary aluminum smelters recycle aluminum in scrap metal. The pollution control equipment at Continental Aluminum directs the emissions from the charge well (the section of the furnace in which the scrap is charged) to “baghouses,” in which the emissions are neutralized with lime and then passed through ductwork lined with bags. These bags filter out and collect the solid waste generated during the neutralizing step. The EI sampled for metals as airborne particulates (i.e., dust) in case some emissions from the charging process were bypassing the filtering steps.

Ten 24-hour filter samples were taken during the EI. Two blank (not exposed) filters were analyzed as well. All filters were analyzed for aluminum, barium, beryllium, cadmium, chromium, copper, lead, manganese, selenium, and zinc. (These metals were of the greatest concern to the petitioners.)

Most metals were well below their lowest respective, health-based screening level (see table below). The metals that were closest to their screening levels were chromium and manganese, but the concentrations were still below values of concern to human health. Beryllium, cadmium, and selenium were, for the most part, not detected in the samples. The remaining metals were detected both in samples and in blanks.

<b>Airborne Metal Particulates: 24-hour samples</b>		
<u>Chemical</u>	<u>Highest Concentration (mg/m<sup>3</sup>)</u>	<u>Lowest Screening Level (mg/m<sup>3</sup>)</u>
Aluminum	0.00055	0.15
Barium	0.00011	0.5
Beryllium	(not detected)	0.002
Cadmium	0.0000013	0.005
Chromium	0.0000055	0.000006
Copper	0.000047	100
Lead	0.000013	0.05
Manganese	0.000016	0.00004
Selenium	0.000012	0.2
Zinc	0.000064	10

No adverse health effects would be expected following exposure to the levels of metals found.

#### Mercury

Mercury emissions have been reported for a secondary aluminum smelter other than Continental Aluminum. Elemental mercury vapors are known to damage nerve tissue. Additionally, mercury released to the air can enter the food chain as methylmercury and build up in fish tissue, presenting a potential risk to humans or animals eating contaminated fish. It was not known if the emissions from Continental Aluminum contain mercury.

Elemental mercury vapor was continuously monitored during the EI by a machine called a Tekran. Every five minutes, the Tekran reported the previous five-minute average. There were occasional spikes in the reported concentrations, but those concentrations were below the screening level for short-term exposure (1,800 ng/m<sup>3</sup>). The average concentration over the entire EI period,  $3.6 \pm 1.2$  ng/m<sup>3</sup>, was well below all screening levels for elemental mercury. However, this average value was above background (normal, nonindustrial) values recorded in Michigan. MDCH referred the matter to the Michigan Department of Environmental Quality (MDEQ), who conducted additional monitoring in 2005 to verify concentrations and identify the source. The additional data, along with the EI data, indicated that Continental Aluminum did not appear to be the

source of the mercury. The source is likely east of New Hudson, the town in which Continental Aluminum is located.

Inhalation of mercury at the values found during the EI and subsequent monitoring by MDEQ should not result in adverse health effects.

#### Acidic Aerosols

As discussed earlier under Metals, the emissions from the charge well must be neutralized. The smelting process can generate acidic emissions, specifically hydrogen chloride and/or hydrogen fluoride. Some of the health complaints reported by the community included irritation and burning of the mucous membranes (i.e., eyes, nose, and throat), which can be caused by acidic aerosols. The EI sampled for acidic aerosols in case some emissions from the charging process were bypassing the neutralizing steps.

The acid monitor continuously monitored for the presence of acidic aerosols and reported the results in real time. Acidic aerosols were detected intermittently on 17 days during the EI. Based on the levels seen and the health effects that would be expected at certain concentrations, MDCH determined that the acid detected likely was not hydrogen fluoride. If the detected acid was hydrogen chloride, the higher concentration detected exceeded only long-term screening levels. Because exposure is intermittent and not long-term, no adverse health effects would be expected.

#### Volatile Organic Compounds

Volatile organic compounds (VOCs) are chemicals that easily enter the vapor state and may produce an odor. Descriptions of some odors detected during odor events associated with Continental Aluminum suggested that the smell could have been produced by VOCs.

During the EI, community members would report odor events to a local person (usually fire department personnel) who had been trained to take an air sample. If the sampler could verify the odor at the location it was first detected, he would immediately take a sample of air, using an evacuated canister called a Summa (“sū-mah”) canister. Following this action, the sampler would then proceed to a pre-selected location and take a sample of air in a second canister, to be used as a control comparison. The canisters were shipped to an independent laboratory for VOC analysis. A total of 10 sample-pairs (20 Summa canisters) were collected. Additionally, four blank (unopened) canisters were sent for analysis, as part of Quality Assurance/Quality Control (ensuring that analytical results of the air samples were reliable).

Due to the low level of detection, almost half of the VOCs tested for were detected in the canisters. There did not appear to be a trend in the data that would indicate a consistent source. Occasionally, control concentrations were higher than odor-event concentrations. Overall, all VOCs were well below their lowest, respective screening levels (see table below). The chemicals closest to their screening levels were benzene and 1,3-butadiene, but the concentrations were still below values of concern.

<b>Volatile Organic Compounds (VOCs): Grab Sampling</b>				
<u>Chemical</u>	<u>Highest concentration in ppb</u> <u>(# detects)</u>			<u>Lowest Screening</u> <u>Level in ppb</u>
	<i>Odors</i>	<i>Controls</i>	<i>Blanks</i>	
1,1,1-Trichloroethane	ND (0)	0.02 (1)	ND (0)	700
1,2,4-Trimethylbenzene	0.1 (9)	0.1 (8)	ND (0)	25,000
1,3,5-Trimethylbenzene	0.04 (3)	0.04 (3)	ND (0)	25,000
1,3-Butadiene	0.14 (4)	0.15 (1)	ND (0)	0.89
Acetonitrile	0.27 (2)	ND (0)	ND (0)	36
Acetylene	3.35 (10)	8.25 (10)	ND (0)	2,500,000
Benzene	1.67 (10)	0.52 (10)	0.05 (2)	4
Carbon tetrachloride	0.11 (10)	0.11 (10)	ND (0)	50
Chloromethane	0.62 (10)	0.61 (10)	ND (0)	44
Dichlorodifluoromethane	0.60 (10)	0.55 (10)	ND (0)	1,000,000
Dichloromethane	0.21 (9)	0.13 (5)	ND (0)	300
Ethylbenzene	0.19 (9)	0.09 (10)	0.01 (1)	230
m,p-Xylene	0.49 (10)	0.23 (10)	0.01 (1)	100 (total)
m-Dichlorobenzene	ND (0)	0.25 (1)	ND (0)	750
Methyl ethyl ketone	2.77 (7)	1.06 (8)	0.58 (2)	340
Methyl isobutyl ketone	0.09 (1)	0.11 (1)	ND (0)	75,000
Methyl methacrylate	ND (0)	ND (0)	0.17 (2)	100,000
Methyl tert-butyl ether	0.23 (1)	ND (0)	ND (0)	700
o-Xylene	0.22 (7)	0.11 (10)	ND (0)	100 (total)
p-Dichlorobenzene	0.14 (6)	0.26 (6)	0.19 (3)	100
Propylene	2.82 (10)	1.84 (9)	0.21 (1)	24,000,000
Styrene	0.19 (7)	0.05 (2)	0.06 (1)	60
Toluene	1.81 (10)	0.79 (10)	0.07 (3)	80
Trichlorofluoromethane	0.82 (10)	0.82 (10)	0.07 (2)	500,000
Trichlorotrifluoroethane	0.12 (10)	0.12 (10)	0.03 (1)	1,000,000
“ND” = chemical was not detected				

Inhalation of these VOCs at the levels detected during the EI should not result in adverse health effects.

#### Reporting Results and Responding to Public Comment

On February 25, 2005, MDCH released the EI results and public health conclusions in a report for public comment. ATSDR and MDCH concluded that the concentrations of chemicals detected in the air near Continental Aluminum posed no apparent public health hazard: although exposure is occurring, the levels are well below screening levels and not expected to cause adverse health effects.

The public comment period lasted for 60 days, during which MDCH conducted two community meetings and after which MDCH organized the comments received and responded to them. The Responsiveness Summary is included in the Final EI Report as an appendix. Some changes were made to the text of the report, as a result of suggestions

or questions received. However, the public health conclusion remains the same: no apparent public health hazard is present.

ATSDR and MDCH consider their involvement in this site to be finished but remain available for consultation should additional information regarding environmental levels of chemicals or health effects become known.

Additional Information

All public documents generated during ATSDR's and MDCH's involvement at the Continental Aluminum site are available at the MDCH Division of Environmental and Occupational Epidemiology website, <http://www.michigan.gov/mdch-toxics>, under "Health Assessments and Related Documents."

The health assessor responsible for this site, Christina Bush, can be contacted at 1-800-648-6942.