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May 13, 2005

Charles M. Auer
Director, Office of Pollution Prevention and Toxics
Environmental Protection Agency - East
Room 3166
1201 Constitution Ave., NW
Washington, D.C. 20460
(202-260-3810)

Re: Citizen Petition under TSCA to Prohibit the Production and Use of *Lead Wheel Weights* in the United States

Dear Mr. Auer**:**

Pursuant to Section 21 of the Toxic Substances Control Act ("TSCA"), 15 U.S.C. § 2620, the Ecology Center hereby petitions the Environmental Protection Agency ("EPA") to establish regulations prohibiting the manufacture, processing, distribution in commerce, use, and improper disposal of lead wheel balancing weights "wheel weights". These actions are necessary to address the significant threat that lead from wheel weights pose to human health. As EPA suggested in its guidance governing TSCA petitions (50 Fed. Reg. 46825 (1985)), the bases for this petition are set forth below in detail and extensive supporting documentation is included in an attached appendix.

A. Lead is a Chemical Substance that is Subject to Regulation Under TSCA

The bio-toxic properties of lead are widely recognized. More recent attention has been given to the effects of lead on the learning abilities of children. "Lead[1] is neurotoxic, and young children are at particular risk of exposure. Numerous studies indicate that blood lead concentrations above 10 μg per deciliter (0.483 μmol per liter) are associated with adverse outcomes on measures of intellectual functioning and social–behavioral conduct. Such studies influenced the identification of a blood lead concentration of 10 μg per deciliter or higher as a "level of concern" by the Centers for Disease Control and Prevention (CDC) and the World Health Organization (WHO).

Continued efforts both in the United States and Europe have been undertaken to identify sources of lead in order to minimize release into the environment. The automotive industry is recognized as the largest user of lead in a number of applications,

[1] Richard L. Canfield et al; Intellectual Impairment in Children with Blood Lead Concentrations below 10 micrograms per deciliter. NEJM, April 17, 2003.

including the use of lead wheel weights.[2] A number of governments have already begun to recognize the threat that lead pollution from wheel weight degradation poses to human health and the environment. Perhaps most significantly, the European Union has amended its directive on end-of-life vehicles to phase-out the use of leaded wheel weights for new vehicles by July 2003 and all vehicles by July 2005.[3] The European phase-out promises to eliminate the threat that leaded wheel weights pose within 2-3 years as existing lead weights are replaced (when tires are naturally replaced due to wear) with non-lead alternatives. New make vehicles will automatically receive lead-free weights. The Ecology Center has conducted research and on the ground demonstrations, which document that the phase out of lead wheel weights is desirable and feasible in the U.S.

B. The Presence of Lead in Highly-Trafficked Areas & End of Life Vehicle Waste

Lead is consistently found to be in high concentrations on roadways and in end of life vehicle waste (commonly called Auto Shredder Residue – ASR). Wheel weights are the second largest ongoing use of lead in vehicles and play a significant role in the lead release to the environment.[4]

High concentrations of environmental lead are directly correlated with traffic volume. Despite the shift towards unleaded gasoline and the largely successful effort to recycle car batteries, lead concentrations remain disproportionately higher around areas of high traffic volume[5,6]. A University of Wisconsin study estimates that 70% of total lead concentrations in residential and institutional urban runoff can be linked back to street traffic. In addition, 94% of total lead concentrations in commercial urban runoff and 89% of concentrations in industrial urban runoff have been traced back to either parking lots or streets[7]. An Australian Environmental Protection Authority study also finds that soils in the inner city and along major traffic routes can have lead concentrations well above recommended levels[8]. And, a University of Alabama study likewise finds that urban lead concentrations are at their highest in vehicle service areas and in street runoff[9].

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[2] Gearhart, Jeff et al; Getting the Lead Out; Impacts of and Alternatives for Automotive Lead Uses. July, 2003. http://www.cleancarcampaign.org
[3] Directive 2000/53/EC of the European Parliament and of the Council on End of Life Vehicles. September 18, 2000.
[4] Gearhart, Jeff et al; Getting the Lead Out; Impacts of and Alternatives for Automotive Lead Uses. July, 2003. http://www.cleancarcampaign.org
[5] Johnson, C.D. and Juengst, D. (1997). Polluted Urban Runoff: A Source of Concern, University of Wisconsin-Extension, Madison, WI.
[6] NSW EPA (2003) Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices. A Guide for Councils. NSW Environmental Protection Authority, Sydney.
[7] Johnson, C.D. and Juengst, D. (1997). Polluted Urban Runoff: A Source of Concern, University of Wisconsin-Extension, Madison, WI.
[8] NSW EPA (2003) *Managing Lead Contamination in Home Maintenance, Renovation and Demolition Practices*. A Guide for Councils. NSW Environmental Protection Authority, Sydney.
[9] Pitt, R. and Lalor, M. (2001). The Role of Pollution Prevention in Stormwater Management. *Models and Applications to Urban Water Systems, Monograph 9.1.*

Streets and parking lots that drain into a storm sewer system have been found to be leading sources of lead[10,11], especially in urban areas[12]. A study done for the National Cooperative Highway Research Program in 2001 cites lead as a major constituent of highway runoff, signaling that lead concentrations from urban runoff (0.40 mg/l) are much higher than those from rural runoff (0.080 mg/l)[13]. These results are corroborated by a Michigan Department of Transportation study that compares lead concentrations in the stormwater of three comparably-sized Michigan cities, Flint, Grand Rapids, and Ann Arbor. Concentrations of lead are shown to be significantly higher for cities that received heavier rainfall (69 ug/l) compared to those that received less rainfall (10 ug/l). The concentrations of lead in rainfall are significantly less than concentrations of lead in runoff[14]. A report issued by the Watershed Professionals Network cites vehicle wear as a major contributor to the persistence of lead in urban runoff[15].

Concentrations in these areas have been found to exceed standards for human and environmental health. A study published in the Journal of Soil and Water Conservation cites the automobile as a leading source of lead contamination in urban runoff. Individual lead samples of stormwater runoff in Lubbock, TX were found to exceed the EPA's Maximum Contaminant Levels (MCLs), reaching values as high as 0.089mg/L. The EPA Office of Water Regulations and Standards (OWRS) ambient water quality criteria for the protection of human health is 0.050mg/L.[16] Furthermore, of the nineteen metals studied, lead was the only one found to exceed MCLs in a dissolved form, reaching a maximum value of 0.022 mg/L[17]. The EPA OWRS sets its chronic MCLs at .0032 mg/L and .0056 mg/L for Freshwater and Marine aquatic organisms respectively.[18] The University of Wisconsin studied sited above finds that 40% of discharges in the storm sewer drainage of a residential area and 70% of discharges from a commercial area have lead levels high enough to kill aquatic life[19]. Additionally, a study done on runoff contamination of Toronto Harbor found lead concentrations to be above its Provincial Water Quality Standards of 5 ug/L. In various parts of the harbor, concentrations were

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[10] Johnson, C.D. and Juengst, D. (1997). Polluted Urban Runoff: A Source of Concern, University of Wisconsin-Extension, Madison, WI.

[11] Zartman, R.E., Ramsey, R.H. III, Huang, A. (2001) Variability of Total and Dissolved Elements in Stormwater Runoff. Journal of Soil and Water Conservation. 56 (3): 263-267.

[12] "Management of Runoff from Surface Transportation Facilities – Synthesis and Research Plan" Prepared for: National Cooperative Highway Research Program. Submitted by: GKY and Associates, Inc: Springfield, Virginia; and Louis Berger and Associates, Inc.: East Orange, New Jersey. March 2001

[13] Ibid

[14] "Highway Stormwater Runoff Study" Prepared for: The Michigan Department of Transportation. Submitted by: CH2MHILL with McNamee, Porter, and Seeley, Inc. April 1998..

[15] Richter, Joanne E. Undated. "Urban Runoff Water Quality: A Salmonid's Perpective." Watershed Professionals Network. www.4sos.org/wssupport/ws_rest/Urban-Runoff.doc. Last accessed: May 2005.

[16] EPA. 1980d. U.S. Environmental Protection Agency. 45 FR 79318, Toxicological Profile.

[17] Zartman, R.E., Ramsey, R.H. III, Huang, A. (2001) Variability of Total and Dissolved Elements in Stormwater Runoff. Journal of Soil and Water Conservation. 56 (3): 263-267.

[18] EPA. 1985f. U.S. Environmental Protection Agency. . 50 FR 30784. Toxicological Profile.

[19] Johnson, C.D. and Juengst, D. (1997). Polluted Urban Runoff: A Source of Concern, University of Wisconsin-Extension, Madison, WI.

found as high as 200 ug/g, far in excess of the Canadian Lowest Effects Level (LEL) guideline of 32 ug/g[20] for aquatic life.

These studies clearly show that lead concentrations remain disproportionately high around heavily-trafficked areas such as urban roads and parking lots. While few studies have analyzed the contribution of lead wheel weights to such concentrations, it is reasonable to assume that wheel weights play a role in lead's persistence in highly-trafficked areas. Given the readily available alternatives, it is clear the best method of prevention is to remove lead weights from sale entirely.

Lead weights also contribute to lead contamination of end of life vehicle recyclable and waste streams. A European Union report explains the shortcomings of alternative lead removal methods. First, the method of dismantling and recycling wheel weights at the end of their life has proven itself unworkable for two reasons. The value of recycled lead is critically low and there is not enough time in the recycling process to remove such an economically impotent part of the automobile.

Secondly, the method of coating weights before they are affixed to the wheel seems inadequate because coating is not environmentally impermeable. Numerous weights fall off during use and coating could not prevent the lead of fallen weights from eventually leaking into the environment[21]. Further, a second report issued by the EU highlights the dangerously high levels of lead that remain in shredder waste: between 4,000 and 25,000 mg/kg. These levels are significantly higher than the EU's orientation for a target describing the maximum tolerable level of lead in shredder wastes: between 100 and 200 mg/kg[22].

Table 1: Lead Content of Auto Shredder Residue (ASR)

	Lead Concentration (mg/kg)	Lead in ASR, Average, metric tons/year [(a)]	
		U.S.	Canada
Umweltbundesamt, Germany [(b)]	3,500-7,050	15,825	1,583
EPA, U.S. [(c)]	570-12,000	18,855	1,886
Department of Health Service, California [(d)]	2,330-4,616	10,419	1,042
Average		15,033	1,504

Notes:

[a] Based on 3 million metric tons of ASR potentially landfilled each year in the U.S. and 300,000 metric tons in Canada.

[b] Weiss, et. Al. Emittlung und Verminderung der Emissionen von Dioxinen and Furan en aus Themischen Prozessen, For chungsbericht 104 03 365/17, Umweltbundesamt (UBA). 1996.

[c] U.S. EPA. PCB, Lead and Cadmium Levels in Shredder Waste Materials: A Pilot Study, EPA 560/5-90-00 BA. April 1991

[20] The Influence of Urban Runoff on Sediment Quality and Benthos in Toronto Harbour" Duncan Boyd. Aaron Todd. Rein Jaagumagi. Environmental Monitoring and Reporting Branch. Ministry of the Environment. June 2001.

[21] "Heavy Metals in Vehicles – Final Report" Compiled for the Directorate General Environment, Nuclear Safety and Civil Protection of the Commission of the European Communities. Knut Sander, Dr. Joachim Lohse, and Ulrike Pirntke. March, 27, 2000.

[22] "Heavy Metals in Vehicles II" Compiled for the Directorate General Environment, Nuclear Safety and Civil Protection of the Commission of the European Communities. Dr. Joachim Lohse, Knut Sander, and Dr. Martin Wirts. July 2001.

[d] Nieta, Eduardo. Treatment Levels for Auto Shredder Waste, State of California Department of Health Services, June 1989.

Table 1 above summarizes the lead concentration found in auto shredder residue(ASR) from three additional sources. ASR is commonly used as daily cover for landfills in the U.S. To prevent lead from entering the environment both during and after vehicle use the most effective action is end the sale of lead wheel weights.

C. The Use of Lead Wheel Weights

Lead wheel weights are used worldwide to balance vehicle tires. An estimated 64 million kg/year (70,000 ton/year) of lead is used worldwide in the manufacture of wheel weights. Automobile and light truck wheel weights vary in size and weight, ranging between 5-150 mm (0.2-6 in) in length and 7-113 grams (0.25-4oz) in weight. A typical vehicle contains between 200 and 250 grams of lead in wheel weights. Excluding the vehicle's lead-acid battery, wheel weights are the number one ongoing automotive use of lead. Recent studies have shown that lead deposition from wheel weights is responsible for a significant, and previously unquantified, volume of lead in the environment.[23] The majority of wheel weights currently in use are clip-on types that are attached at the edge (horn) of a wheel's rim; however some new aluminum rims require adhesive weights due to their shape.

An average vehicle contains ten wheel weights (two on each of the four wheels and two more on the spare). Although some effort is made to collect and recycle these weights at the end of a vehicle's life, most of them are overlooked and often end up in the environment or as contaminants in auto shredders. A disturbingly large number fall off onto the road during vehicle use. In October of 2000, Robert A. Root published a study documenting the rates at which these weights fall off their host vehicles and are gradually abraded into lead dust.[24] His study was the first to examine this phenomenon, and it established that lead wheel weights are, in his words, "a major source of lead exposure that heretofore has not been recognized." The Ecology Center surveyed a one-mile stretch of urban roadway in Ann Arbor in 2002 and recorded very similar lead deposition rates.[25]

Michigan's 8.5 million registered vehicles are serviced with nearly 500 metric tons of lead each year for new tires and repairs, and all registered vehicles combined in Michigan contain nearly 1,700 metric tons of lead in wheel weights. Nationally, using lead wheel weight failure rates from existing research, we can estimate that as much as 1,631 metric tons of lead are deposited on streets in U.S. (see Table 2 & Appendix 1). Approximately 13% of wheel weights fail during the lifetime of typical tires.

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[23] Root, Robert A. Lead Loading of Urban Streets by Motor Vehicle Wheel Weights. Environmental Health Perspectives, Volume 108, Number 10. October 2000.
[24] Ibid.
[25] Lead Use in Ammunition and Automotive Wheel Weights, Ryan Bodanyi, April 2003, University Of Michigan, unpublished thesis.

Table 2: U.S. Lead Wheel Weight Loss Estimates, metric tons

Yearly Weight Loss (urban only)	Mass loss per year	Lead Lost During Tires Life, average 3.5 years	Lead Used (based on average tire life of 3.5 years)	Percent Mass Lost
77,647,528	1,631	6,038	46,086	13%

Sources: Vehicles Miles Traveled and State Motor Vehicle Registrations data from USDOT, Federal Highway Administration, Highway Statistics 2001, Tables VM-2 & MV-1. Lead wheel weight deposition rate derived from Root, Environmental Health Perspectives, Volume 108, Number 10. October 2000 & *Lead Use in Ammunition and Automotive Wheel Weights*, Bodanyi, April 2003, University Of Michigan, unpublished thesis. Lead deposition rate, in weight deposited per vehicle mile traveled, was applied only to urban vehicle miles traveled. Existing studies have only examined urban vehicle travel.

Root estimates that an average of 11.8 kg/km (40 lb/mi) of lead is deposited each year along the 2.4-km (1.5-mi) length of street in Albuquerque. Urban lead deposition, which he estimates at 1.5 million kg/year (3.3 million lb/year), poses a significant lead poisoning threat to poor and minority populations that are already overexposed to lead burdens. Root estimates that wheel weights fall off on major Albuquerque thoroughfares at a rate of 3,730 kg/year (8,200 lb/year).

Root's findings also indicate that lead from fallen weights is rapidly abraded into fine dust particles, which are susceptible to atmospheric corrosion, and normally turn into lead oxides, hydroxides, and bicarbonates under ambient environmental conditions. These conversions make lead more soluble, and increase the risk that lead will contaminate surface, groundwater, and drinking water supplies.

Studies conducted by the Wisconsin Department of Natural Resources in Madison, Wisconsin, have shown that approximately 40% of the runoff from residential areas and 70% of the runoff from commercial areas had lead levels "high enough to kill aquatic life."[26] Concentrations of lead in Madison's runoff ranged from 3-160 μg/L. "The primary source of many metals in urban runoff is vehicle traffic," the authors write. "Concentrations of zinc, cadmium, chromium and lead appear to be directly correlated with the volume of traffic on streets that drain into a storm sewer system. Streets and parking lots are the primary sources of lead in urban (runoff)."

D. Alternatives to Lead Wheel Weights

A number of materials are being introduced as alternatives to the use of lead in wheel weights. External balancing technologies include tin, steel, plastic (various polymers and systems), and a zinc based alloy called ZAMA (an alloy of zinc, aluminum, and copper). Internal balancing systems including injecting various materials into the tire are also being considered as alternatives to wheel weights.

The major commercial suppliers known to be producing lead-free weights include:

Canada
Plombco
http://www.plombco.com/

[26] Johnson, C.D. and Juengst, D. (1997). Polluted Urban Runoff: A Source of Concern, University of Wisconsin-Extension, Madison, WI.

United States
Perfect Equipment – Zinc Weights
http://www.perfectequipment.com/

Europe
Dionys-Hofman – Zinc Weights
http://www.dionys-hofmann.de/25+B6Jkw9MQ__.0.html

Trax – Zinc Weights
http://www.traxjh.com/

Banner Battery – Steel and Zinc Weights
http://www.bannerbatterien.com/eng/bb5/bb53/bb531/bb5311/00936/index.asp

Thailand
PCP Products – Zinc Weights
http://www.pcproductsinter.com/product_z1.html

Japan
Azuma – Iron Weights
http://home1.catvmics.ne.jp/~azuma/

Commercial production of steel adhesive and ram-on weights has been occurring for several years by the Japanese company, Azuma. Several manufacturers in Italy are beginning to produce ZAMA weights, including one of larger wheel weight producers in Europe, Dionys Hofmann. Two of the largest wheel weight manufacturers in North America, Perfect Equipment Inc. in Tennessee and Plombco in Canada, are currently producing coated zinc wheel weights for the U.S. vehicle market. All of these weights have passed Original Equipment Manufacturer (OEM) specifications and many are currently being installed on OEM new vehicles. These same companies also provide zinc wheel weights to the Ecology Center for its lead-free wheel demonstration program in the US (see www.leadfreewheels.org). Based on discussion with the manufacturers we expect the prices of alternative weights to be very similar to the price of comparable lead weights.

E. Commercial Use of Lead-free Alternatives

The major wheel weight manufacturers in Europe (Dionys Hofmann - Germany and TRAX-UK), Japan (Azuma) and North America (Plombco - Canada and Perfect Equipment-USA). Dionys Hoffman is the largest producer of wheel weights in Europe and Perfect Equipment controls 99% of the original equipment market and approximately 50% of the aftermarket in North America. Recently the parent company of Hoffman purchased Perfect Equipment. Most major lead wheel weight producer has commercialized at least one lead-free alternative. All of these manufacturers have invested significant amounts of resources to develop non-lead wheel weights using either zinc, or steel as an alternative to lead weights. However these investments in commercializing lead-free weights are potentially risky if low cost imported lead weights are allowed to continue to be used in the aftermarket.

All of the non-lead weights have been tested in accordance with the standards and specifications already established by the automotive industry for lead wheel weights. Currently, new vehicles exported to Europe are being equipped with zinc weights produced by a US-based wheel weight manufacturer. Honda plants in Marysville and

East Liberty, Ohio have converted to lead-free balancing for all new vehicles.[27] Vehicle production at these 2 plants is approximately 600,000 vehicles per year.

The European market has already made significant shift towards lead-free wheel balancing. Dionys-Hofman has produced and sold over 1 million weight in 2004 and is looking to completely convert its operations to lead-free production.[28]

In Asia, the phase-out of lead-free has progressed even more aggressively. A recent survey of import auto dealers in the Ann Arbor, Michigan area identified which new vehicles are currently being equipped with lead-free wheel weights as original equipment. Steel weights were identified using a magnet. Zinc weights were identified only if they were labeled. The survey results showed (see Table 3) that many of the Asian manufacturers have already converted to lead-free (primarily steel) wheel balancing for many vehicles.

Table 3: Vehicles for sale in the U.S. with lead-free wheel weights

Weight types: FE=Steel Clip; FE/ADH=Steel Tape-a-Weight; PB=Lead; ZN=Zinc

Subaru
- Forrester (FE)
- Legacy (FE/ADH)
- Impreza WRX (FE)
- Outback (FE)
- Impreza RS (FE)

Hyundai
- Elantra GT (FE)
- Tiburon (FE)
- Sonata (FE)
- Accent (FE)
- Santa Fe (FE)

Nissan
- Murano SL (FE/PB)

Toyota
- Rav4L (FE/ADH)
- Rav4L (FE/ADH)
- Highlander (FE/ADH)
- 4Runner (FE/ADH)
- Matrix (FE/ADH)

Honda
- CRV (FE)

Mazda
- Mazda 3 (FE/ADH)
- RX8 (FE/ADH)
- Mazda 6 (FE/ADH)
- MPV LX (FE/ADH)

Suzuki
- XL7 (FE)
- Grand Vitara (FE)
- Vitara V6 (FE)
- Verona (FE)
- Aerio SX (FE)
- Aerio Sedan (FE)
- Forenza (FE)

2004 U.S. sales of new car models identified as having lead-free wheel balancing were over 1.4 million. Total production of these models, both in Asia and the U.S. was over 4.8 million. The Ecology Center estimates that as many as 38 million lead-free weights were installed on these vehicles in 2004 (see Table 4). No European new car imports were identified with lead-free wheel weights. However, European lead-free weights are zinc, which is very difficult to distinguish from lead weights.

Table 4: 2004 US sales & total production for new import cars with lead-free balancing weights

	Sales/Production	Weights	Pounds	Tons
US Sales	1,422,743	11,381,944	551,548	276
Total Production	4,831,481	38,651,848	1,872,997	936

The Ecology Center (http://www.ecocenter.org) is currently conducting a pilot program to replace lead in wheel weights with non-toxic alternatives in government fleets

[27] Personal communication, John Mejia, Plombco, November 2004.

[28] Personal communication, Helmut Ringwald, Dionys-Hofmann, December 2004.

and tire retailers in the select locations in the U.S. More information on the project can be found at http://www.leadfreewheels.org. One of the primary objectives of our program is to evaluate the technical and economic feasibility of alternative weights in comparison with lead weights. To this end, we have established cooperative agreements with tire dealers, vehicle service shops, trade organizations representing the automotive service industry, and state and local government fleets. To date, we have provided retailers, dealers and government fleet service centers with nearly 30,000 non-lead weights (over 2,500 pounds) for use on vehicles. The weights have received positive feedback from fleet managers and the public. These lead-free weights were zinc weights purchased from Perfect Equipment and Plombco.

F: EPA Action is Necessary to Eliminate This Risk

Without EPA action U.S. vehicle manufacturers and tire dealers will continue to use lead wheel weights. Automotive wheel weights are installed as original equipment on new vehicles and in the aftermarket as tires are replaced or repaired. The new vehicle market accounts for approximately 20% of lead wheel weight use. Auto manufacturers in Europe and Asia are already nearing a complete phase-out of leaded weights. Ford, DaimlerChrysler and General Motors have not made any commitments to phase out lead wheel weight use in North America. Of even more concern is the aftermarket, were 80% of lead wheel weights are used by a diverse groups of small, medium and large size businesses. It is very likely that cheap, commodity uncoated lead weights will continue to be used by these businesses. The failure to establish a prohibition on the sale of lead weights will assure that lead wheel weights will continue to be a significant source of lead releases to the environment.

F. Conclusion

Based on the foregoing discussion and the attached references, the Ecology Center respectfully requests EPA to establish regulations pursuant to TSCA - 15 U.S.C. § 2605 (a)(1)(A) - that prohibit the manufacture, processing, distribution in commerce, use, and improper disposal of lead wheel balancing weights. The Ecology Center looks forward to EPA's response to this petition within 90 days, as required by TSCA, 15 U.S.C. § 2620(b)(3).

Respectfully Submitted,

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Appendices:

A) Lead Wheel Weight Loss Estimates By State, Metric tons

B) Getting the Lead Out; Impacts of and Alternatives for Automotive Lead Uses. July, 2003

C) Root, Robert A. Lead Loading of Urban Streets by Motor Vehicle Wheel Weights Environmental Health Perspectives, Volume 108, Number 10. October 2000

D) Lead Use in Ammunition and Automotive Wheel Weights: An Examination of Lead's Impact on Environmental and Human Health, the Alternatives to Lead Use, and the Case for a Voluntary Phase-Out, Ryan Bodanyi

Appendix 1: Lead Wheel Weight Loss Estimates By State, metric tons

State	Yearly Weight Loss (urban only)	Mass loss per year	Lead Lost During Tires Life, average 3.5 years	Lead Used (based on average tire life of 3.5 years)	Percent Mass Lost
Alabama	1,275,058	27	89	847	11%
Alaska	105,097	2	12	120	10%
Arizona	1,508,412	32	110	793	14%
Arkansas	484,724	10	29	373	8%
California	11,483,029	241	998	5,756	17%
Colorado	1,213,316	25	123	930	13%
Connecticut	1,072,692	23	95	583	16%
Delaware	235,067	5	17	131	13%
Dist. of Columbia	173,695	4	11	50	22%
Florida	5,408,484	114	468	2,868	16%
Georgia	2,696,067	57	171	1,461	12%
Hawaii	287,268	6	27	174	16%
Idaho	241,227	5	21	265	8%
Illinois	3,347,677	70	301	1,972	15%
Indiana	1,626,107	34	120	1,125	11%
Iowa	504,132	11	52	664	8%
Kansas	620,160	13	48	466	10%
Kentucky	908,725	19	67	725	9%
Louisiana	877,135	18	72	722	10%
Maine	175,547	4	12	204	6%
Maryland	1,629,952	34	116	788	15%
Massachusetts	2,034,591	43	187	1,040	18%
Michigan	2,844,472	60	228	1,691	13%
Minnesota	1,273,576	27	102	911	11%
Mississippi	518,305	11	26	391	7%
Missouri	1,669,508	35	98	842	12%
Montana	105,328	2	10	207	5%
Nebraska	321,451	7	27	327	8%
Nevada	570,506	12	37	256	15%
New Hampshire	234,372	5	20	220	9%
New Jersey	2,532,933	53	228	1,316	17%
New Mexico	386,714	8	22	286	8%
New York	4,320,090	91	316	2,039	16%
North Carolina	2,142,976	45	136	1,236	11%
North Dakota	86,153	2	8	142	6%
Ohio	2,991,440	63	278	2,111	13%
Oklahoma	1,012,386	21	72	656	11%
Oregon	781,395	16	65	608	11%
Pennsylvania	2,643,680	56	232	1,926	12%
Rhode Island	322,053	7	29	153	19%

South Carolina	778,755	16	49	629	8%
South Dakota	90,090	2	8	161	5%
Tennessee	1,662,884	35	119	1,028	12%
Texas	6,498,963	136	405	2,872	14%
Utah	674,723	14	47	350	14%
Vermont	109,590	2	6	107	5%
Virginia	1,913,885	40	150	1,234	12%
Washington	1,687,340	35	153	1,036	15%
West Virginia	247,017	5	17	290	6%
Wisconsin	1,215,771	26	89	895	10%
Wyoming	103,013	2	6	115	6%
U.S. Total	77,647,528	1,631	6,038	46,086	13%

Sources: Vehicles Miles Traveled and State Motor Vehicle Registrations data from USDOT, Federal Highway Administration, Highway Statistics 2001, Tables VM-2 & MV-1. Lead wheel weight deposition rate derived from Root, Environmental Health Perspectives, Volume 108, Number 10. October 2000 & *Lead Use in Ammunition and Automotive Wheel Weights*, Bodanyi, April 2003, University Of Michigan, unpublished thesis. Lead deposition rate, in weight deposited per vehicle mile traveled, was applied only to urban vehicle miles traveled. Existing studies have only examined urban vehicle travel.