



2012 Minerals Yearbook

LEAD

LEAD

By David E. Guberman

Domestic survey data and tables were prepared by Elsie D. Isaac, statistical assistant, and the world production tables were prepared by Glenn J. Wallace, international data coordinator.

In 2012, domestic mine production of recoverable lead was 336,000 metric tons (t), essentially unchanged from that of 2011. Alaska and Missouri were the principal producing States accounting for most domestic mine production.

In the United States, lead in concentrate was produced at 8 mines that employed about 1,660 people. The value of domestic mine production in 2012 (based on the North American Producer Price) decreased 6% to \$845 million despite production remaining essentially unchanged, owing to a decrease in the average price of lead. Primary lead metal was produced at a smelter-refinery in Missouri.

Secondary (recycled) lead, derived principally from scrapped lead-acid batteries, decreased slightly from that in 2011 and accounted for 91% of refined lead production in the United States in 2012 (table 3). Nearly all the secondary lead was produced by 7 companies operating 14 smelters.

Lead metal was consumed domestically by more than 70 companies to manufacture such products as ammunition; building-construction materials; covering for power and communication cable; lead oxides for ceramics, chemicals, glass, and pigments; lead sheet; solders for construction, electronic components and accessories, metal containers, and motor vehicles; and storage batteries.

Lead-acid batteries, including starting-lighting-ignition (SLI) and industrial types, continued to be the dominant use of lead, accounting for about 88% of reported lead consumption (table 4). SLI battery shipments by North American producers were 125.4 million units in 2012, a slight increase from those of 2011. This total included original equipment (OE) and replacement automotive-type batteries (Battery Council International, 2013, p. 23–24).

World mine production of lead increased by 9%, to 5.17 million metric tons (Mt) from 4.73 Mt in 2011. The United States accounted for about 7% of global lead mine production, unchanged from that in 2011, and ranked third in the world. China and Australia were the two leading producers in 2012; accounting for 54% and 13%, respectively, of global lead mine production. China's share of global lead mine production has increased substantially during the past several years (table 12). World production of refined lead (primary and secondary) was 10.2 Mt, essentially unchanged from that in 2011. The United States was the second leading global producer of refined lead after China and accounted for 12% of global production. China produced about 46% of global refined lead (table 13).

According to the International Lead and Zinc Study Group (ILZSG), global consumption of refined lead was 10.47 Mt in 2012, essentially unchanged from that in 2011. The leading refined-lead-consuming countries in 2012 were China, 44%; the United States, 14%; India, 5%; Germany, 4%; and the Republic

of Korea, 4% (International Lead and Zinc Study Group, 2013b, p. 10–11, 16).

The 2012 average annual London Metal Exchange (LME) cash price was \$0.94 per pound, a decrease of 14% from that of 2011. The North American Producer Price (the weighted average, based on 1993 production figures, of the list prices of those North American primary and secondary producers quoting list prices, in addition to those producers who have switched to LME pricing) decreased by about 6% to \$1.14 per pound in 2012 from \$1.22 per pound in 2011.

Legislation and Government Programs

The Federal Aviation Administration (FAA) was developing a plan to meet the agency's goal of making unleaded fuel available to replace 100-octane low-lead fuel for most of the general aviation fleet by 2018. General aviation is the only transportation sector in the United States that still uses fuel containing the additive tetraethyllead. Piston engine aircraft, about 73% of the 167,000 aircraft in the U.S. general aviation fleet, would be affected by the fuel conversion. In October, the FAA published a final report that addressed numerous challenges to transitioning the piston engine aircraft fleet to unleaded fuel and made recommendations for the transition process. Recommendations included implementation of a development roadmap for fuel producers that identifies milestones in the aviation fuel development process, centralized testing and certification of candidate fuels, and a collaborative industry-government research initiative to facilitate the development of an unleaded general aviation fuel. An unleaded fuel that could be used for the existing general aviation fleet does not exist, and a replacement fuel would need to be developed and certified (Federal Aviation Administration, 2012).

Production

Mine.—In 2012, domestic mines produced 336,000 t of recoverable lead, essentially unchanged from that of 2011 (table 1). Lead mine production in the United States has decreased substantially since 2003 owing to shutdowns and curtailments at zinc and lead mines, with no new significant lead mines opening. In 2012, there were 8 lead-producing mines operating in the United States (table 2) compared with 19 in 2000.

Alaska and Missouri accounted for most of the U.S. mine output of lead. Lead mine production also was reported in Idaho. Domestic mine production data were collected by the U.S. Geological Survey (USGS) from a voluntary survey of lode-mine operators (tables 1–2). All operators of lead-producing mines responded to the survey in 2012.

Teck Alaska Inc. (a wholly owned subsidiary of Teck Resources Ltd., Vancouver, British Columbia, Canada) operated the Red Dog zinc-lead mine in northwestern Alaska under a royalty agreement with NANA Regional Corp., the sole owner of the property. NANA is a corporation organized under the provisions of the Alaska Native Claims Settlement Act. During 2012, Teck reported that production of lead in concentrate at Red Dog increased by about 14% to 95,400 t from 84,000 t in 2011 owing to improved mill recovery rates. The main pit at Red Dog was exhausted of resources during the first quarter of 2012, and mine production primarily came from the Aqqaluk deposit, developed in 2010. The Aqqaluk deposit was expected to provide sufficient ore to enable zinc and lead mining operations at Red Dog to continue until 2030. Proven and probable ore reserves at yearend 2012 totaled 51.3 Mt grading 4% lead. Teck expected production to decline to 85,000 to 90,000 t of lead in concentrate in 2013 (Teck Resources Ltd., 2013a, p. 46; 2013b, p. 31–32, 40).

In 2012, Teck's Pend Oreille zinc-lead mine in northeastern Washington State remained on care-and-maintenance status. A core group of employees remained at Pend Oreille after the shutdown to facilitate a possible restart in the future, and all regulatory and environmental requirements were being met (Teck Resources Ltd., 2013a, p. 47).

Hecla Mining Co. (Coeur d'Alene, ID) operated two lead-producing mines, the Greens Creek gold, lead, silver, and zinc mine near Juneau, AK, and the Lucky Friday lead, silver, and zinc mine in the Coeur d'Alene Mining District in northern Idaho. Hecla's production of lead in concentrate in 2012 decreased by 46% to 19,100 t from 35,500 t in 2011, primarily owing to the temporary closure of the Lucky Friday Mine. Lucky Friday was shut down temporarily in late 2011 because of accidents that killed two miners and a rock burst in December. The Mine Safety and Health Administration (MSHA) ordered Hecla to remove loose material from the Silver Shaft, necessitating all operations at the mine to cease. Hecla submitted a plan to MSHA and received approval to remove loose material and unused utilities and to install a metal brattice wall that would improve shaft functionality. Rehabilitation work continued throughout 2012, and production resumed in early 2013. As of December 31, 2012, total proven and probable lead reserves at the two mines were 543,000 t compared with 535,000 t at yearend 2011 (Hecla Mining Co., 2013, p. 7–16).

Primary Refined.—The Doe Run Resources Corp. (St. Louis, MO) operated the only domestic primary lead smelter-refinery facility, which was in Herculaneum, MO. Concentrates for the smelter-refinery were mainly from four Doe Run mills that were supplied with ore mined from six production shafts along the Viburnum Trend in southeastern Missouri. In 2012, domestic primary refined lead metal production was 111,000 t, a decrease of 6% from 118,000 t in 2011, partially owing to a shutdown during the year. Doe Run suspended operations at the smelter from late March through early May owing to an electrical fire at a substation, and declared force majeure during the shutdown (Prentice, 2012a, b).

In late 2010, Doe Run announced that it would be shutting down the primary lead smelter in Herculaneum in 2013 as part of an agreement with Federal and State regulatory agencies that

limited smelter lead production to about 118,000 metric tons per year (t/yr) until it was closed. In 2012, the company decided not to construct a new commercial-scale primary lead plant based on new lead electrowinning technology it had unveiled in 2010 as a potential replacement for the Herculaneum smelter (Doe Run Co., The, 2012).

Secondary.—The domestic secondary lead industry consisted of several vertically integrated battery producers that operate secondary lead smelters to supply lead for their lead-acid battery plants and several companies that operated stand-alone secondary smelters. The latter typically had tolling agreements with battery manufacturers to recycle their used lead-acid batteries and supply them with secondary lead. Secondary lead production declined slightly in 2012 from 2011, partially owing to a mild winter in most of the northeastern United States that did not generate as many battery failures as colder winters typically do, reducing scrap supply. An increase in exports of spent lead-acid batteries to smelters in Canada and Mexico during the past few years also limited the amount of scrap available to domestic smelters.

Domestic secondary production of refined lead in 2012 decreased slightly to 1.11 Mt from 1.13 Mt in 2011. Secondary lead accounted for 91% of domestic lead refinery production, unchanged from that in 2011. Lead-acid batteries continued to be the dominant source of recoverable lead scrap, accounting for 95% of all secondary lead (table 3). The domestic secondary data were derived by the USGS from monthly and annual surveys of secondary producers and consumers. In 2012, 11 companies producing secondary lead, exclusive of that produced from copper-base scrap, were surveyed; 10 responded, representing about 99% of the total production of secondary lead. Of the total lead recycled in 2012, the majority was recovered by 7 companies operating 14 plants in Alabama, California, Florida, Indiana, Minnesota, Missouri, New York, Pennsylvania, Tennessee, and Texas. Production and consumption for the nonrespondents were estimated by using prior-year levels as a basis (tables 1, 3).

In September, Johnson Controls Inc. (JCI) (Milwaukee, WI), a leading producer of lead-acid batteries for automobiles, opened its new \$150 million secondary lead smelter facility (132,000 t/yr refined lead capacity) in Florence, SC. The plant was the first new secondary lead smelter opened in the United States in about 20 years and primarily would serve customers in the mid-Atlantic region. The Florence smelter was JCI's third secondary lead smelter in North America with the other two in Mexico. Production levels at the plant were expected to ramp up during the fourth quarter of 2012 and throughout 2013 (Johnson Controls, Inc., 2012a, b).

In early November, Exide Technologies (Milton, GA) announced that it would close its 72,000-t/yr secondary lead smelter in Reading, PA, by March 31, 2013. According to Exide, the decision was based on several factors, including price volatility in the lead market and increased operating costs owing to regulatory requirements. The Reading plant was built in 1972, and Exide would have needed to invest substantial capital to bring the smelter into compliance with recent changes to the National Ambient Air Quality Standards and the National Emission Standards for Hazardous Air Pollutants. The company

had also announced plans to shut down a secondary smelter in Frisco, TX, by yearend 2012. Exide's three remaining smelters were expected to provide sufficient lead to meet internal battery manufacturing needs (American Metal Market, 2012d).

Consumption

Reported U.S. consumption of refined lead decreased by 4% in 2012 from that of 2011 owing primarily to decreases in lead used for ammunition and in storage batteries (table 4). Consumption of lead in SLI and industrial type lead-acid storage batteries represented about 88% of the total reported consumption of lead (tables 4–6). Demand for lead was heavily reliant on the lead-acid battery industry and, in turn, the automotive sector. The Battery Council International (BCI) reported that in 2012, North American producers shipped 125.4 million SLI automotive batteries, a slight increase from those in 2011, primarily owing to an increase in shipments of OE batteries for new vehicles. In 2012, 107.8 million replacement SLI batteries were shipped, essentially unchanged from those in 2011, accounting for 86% of all North American batteries shipped in 2012. North American shipments of OE SLI batteries were 17.6 million units in 2012, an increase of 14% from those of 2011. The increase in shipments of OE batteries was attributed to increased production of new vehicles during 2012 compared with production in 2011 (Battery Council International, 2013, p. 23–24; CRU International Ltd., 2013, p. 160).

Metalico Inc. (Cranford, NJ) was a leading domestic producer of lead-base products in 2012. Metalico's lead-fabricating segment produced lead sheet, shot, strip, and various extruded products at four facilities. In 2012, sales of fabricated lead products were valued at \$66.4 million, a 9% decrease compared with lead fabrication sales in 2011. The decrease was attributed to a lower average sales price of fabricated lead products in 2012 compared with that of 2011, and a decrease in quantity sold during that time period (Metalico Inc., 2013, p. 39).

Prices

The average monthly LME cash price for lead was \$2,094 per metric ton in January and trended downward during the first half of the year. Average monthly lead prices reached a low of \$1,854 per ton in June and then increased during the remainder of the year to \$2,275 per metric ton in December. The increase in the LME price during the second half of the year was at least partially attributed to renewed investor interest in metals and other commodities following a decline in activity in early 2012 owing to uncertainty about the global economy. On an average annual basis, the North American Producer and the LME cash prices in 2012 decreased by 6% and 14%, respectively, from the 2011 average prices (CRU International Ltd, 2012, p. 1).

Scrap prices increased during the year. According to American Metal Market, the average monthly price paid by domestic smelters for whole spent lead-acid batteries (the most prevalent form of lead scrap) increased from \$0.30 per pound in January to a peak of \$0.44 per pound in September and was at \$0.37 per pound by yearend 2012. Reflective of the increase in

input costs, lead smelters increased spot premiums (usually over LME price) they charged to lead consumers during the year.

Foreign Trade

Most of refined lead imported in 2012 came from Canada and Mexico. In 2012, imports of unwrought (refined) lead metal in pigs and bars for consumption totaled 349,000 t, an 11% increase from those of 2011. The leading source was Canada, as was the case in 2011, accounting for 69% of unwrought lead metal imports compared with 80% in 2011. Unwrought lead metal imports from Mexico were essentially unchanged from 2011 at 56,100 t, accounting for 16% of refined lead imports in 2012. Refined lead imports from Australia increased to 24,300 t from 504 t in 2011 and accounted for about 7% of total refined lead imports (table 11).

Total domestic exports of unwrought lead in 2012 were 47,000 t, 17% more than those in 2011. Mexico was the leading destination for the unwrought lead exported in 2012, accounting for about 53% of the total. Exports to Belgium, the leading destination in 2011, decreased by 27% in 2012 from those in 2011 (table 10).

Domestic exports of lead in concentrate were 214,000 t, a 4% decrease from those of 2011. Nearly 62% of the lead in concentrate produced domestically was exported in 2012, and 88% of lead in concentrate exports went to China (table 10).

A substantial quantity of lead contained in new and spent lead-acid batteries is traded annually. U.S. Census Bureau trade data indicated that, in 2012, the United States imported about 19.5 million SLI lead-acid batteries for consumption, slightly less than those in 2011. Mexico was the leading provider of SLI batteries, accounting for 61% of those imported in 2012. SLI batteries were also imported from China, Colombia, Germany, Philippines, the Republic of Korea, Spain, and Taiwan. The United States exported about 22.7 million spent SLI lead-acid batteries in 2012, 10% less than those in 2011. Most of those units were shipped to Mexico (90%) and Canada (9%) for recycling. Much of the lead recovered from the exported batteries was reused to manufacture lead-acid batteries at plants in Canada and Mexico, which were exported to the United States.

World Review

World mine production of lead increased by 9% to 5.17 Mt from 4.73 Mt in 2011. The United States accounted for about 7% of global lead mine production, unchanged from that in 2011, and was ranked third in the world. China and Australia were the two leading producers in 2012 accounting for 54% and 13%, respectively, of global lead mine production (table 12). The increase in global mine production was owing primarily to increased production in Australia, China, and Peru that more than offset production decreases in Mexico. In 2012, 144,000 t/yr of global lead mine production capacity was added, principally in Australia, Canada, China, Mexico, and Portugal. Two mines in Australia, with a total production capacity of about 38,000 t/yr, were closed in 2012 (International Lead and Zinc Study Group, 2013c, p. 5–6).

World production of refined lead (primary and secondary) was 10.2 Mt, essentially unchanged from that in 2011. The

United States was the second leading producer of refined lead and accounted for 12% of global refined lead production. China produced about 46% of global refined lead, followed by the United States, with 12%; and Germany, India, and Mexico with 4% each (table 13).

Refined lead production increases, most substantially in China and Mexico but also in India and Japan, offset declines in Australia, Bulgaria, Canada, Kazakhstan, the Republic of Korea, Spain, the United States, and other countries. Secondary lead production represented about 51% of total world refined lead production in 2012. Global secondary production, excluding China, which produces substantially more primary than secondary lead, accounted for 70% of total refined lead production. In 2012, two new lead smelters in China added about 230,000 t/yr of lead smelting. The remainder of the new global capacity (about 265,000 t/yr) was added in Costa Rica, Kazakhstan, and the United States. Smelters in Japan, New Zealand, and the United States closed in 2012, accounting for about 121,000 t/yr of refined lead production capacity (International Lead and Zinc Study Group, 2013c, p. 5–6, 22–27).

According to ILZSG, global consumption of refined lead was 10.47 Mt in 2012 essentially unchanged from that in 2011. The leading refined-lead-consuming countries in 2012 were China, 44%; the United States, 14%; India, 5%; Germany, 4%; and the Republic of Korea, 4%. During the preceding several years, China's consumption drove global growth; however in 2012 consumption in China was essentially unchanged from that in 2011 (International Lead and Zinc Study Group, 2013b, p. 10–11).

European Union.—Recylex S.A. (Paris, France), a leading lead producer in Europe, processed 156,200 t of spent lead-acid batteries, a 5% increase from 148,600 t in 2011. Scrap battery treatment facilities in Belgium, France, and Germany shipped the processed lead-bearing materials to the company's smelters in Belgium and Germany for refining. Total refined lead production from the company's smelters in 2012 was 152,300 t, a 20% increase compared with 126,400 t in 2011. In 2012, the operating performance of the company's main smelter in Nordenham, Germany, was improved (Recylex S.A., 2013, p. 6, 12, 78).

Australia.—Lead mine production in Australia in 2012 increased by about 4% (27,000 t) from that in 2011. Xstrata plc's (Zug, Switzerland) Mount Isa and Lady Loretta Mines in Queensland and the McArthur River Mine in the Northern Territory produced 193,500 t of lead in concentrate, a 15% increase from that in 2011. Contrasting the increase in mine production, primary refined lead production declined by 14% in 2012, owing to an unplanned shutdown of the blast furnace in the third quarter of 2012 at Nyrstar NV's (Balen, Belgium) Port Pirie smelter. In 2012, Nyrstar announced tentative plans to upgrade the Port Pirie lead smelter with an oxygen-enriched bath-smelting furnace to replace the sinter furnace, an electricity co-generation facility, and a new sulfuric acid plant. The upgraded plant would be capable of processing a wider range of metal-bearing feed materials (including internal residues from Nyrstar's zinc smelters and other waste streams)

while reducing airborne metal and dust emissions. (Nyrstar NV, 2013, p. 30–32, 66; Xstrata plc, 2013, p. 26).

In October, Ivernia Inc. (Toronto, Ontario, Canada) announced that it would restart its Magellan lead mine (85,000 t/yr production capacity) in Western Australia in the second quarter of 2013. The announcement followed a July 2012 ruling by the Minister of Environment of Western Australia that approved conditions for the restart. The mine had been shut down since April 2011 owing to concerns about possible lead contamination after lead-bearing mud was detected on shipping containers that had been transported from the mine to the Port of Freemantle. Ivernia expected to sell lead from its stockpiles during ramp-up operations in 2013. Full production at the mine was targeted for yearend 2013, and the restart was expected to cost about \$20 to \$25 million (Frizell, 2012).

Canada.—Xstrata's Brunswick underground zinc-lead mine near Bathurst, New Brunswick, was the leading producer of lead in concentrate in Canada. The mine and mill had capacity to process 3.1 million metric tons per year of ore containing copper, lead, silver, and zinc. In 2012, the Brunswick Mine produced 52,000 t of lead in concentrate, down from 57,000 t in 2011. The Brunswick smelter produced 74,500 t of refined lead compared with 76,500 t in 2011 owing to lower lead content in feed ore. In 2010, Xstrata increased lead reserves at the Brunswick Mine to extend the mine life to 2013, beyond its previously anticipated closure in early 2010 (Xstrata plc, 2013, p. 34).

In 2012, refined lead production at Teck's metallurgical complex at Trail, British Columbia, was 87,900 t, a slight increase from that of 2011 owing to the KIVCET furnace operating at greater feed rates. Teck expected to produce 87,000 t of refined lead at Trail in 2013. Teck recycled 12,000 t of electronic waste at Trail in 2012. Typical electronic waste consists of crushed glass from computer and television screens that contain 8% to 10% lead and other components that contain aluminum, copper, and steel (Teck Resources Ltd., 2013a, p. 47).

China.—China continued to be the leading global producer and consumer of lead in 2012, and was also the leading producer of lead-acid batteries in the world. In 2012, increases in consumption and production of refined lead were modest compared with more significant increases during the past several years. Between 1999 and 2012, China's consumption of lead for the production of lead-acid batteries was attributed to growth in the production of automobiles, electric bicycles (e-bikes), and motorcycles. The number of e-bikes in China increased to more than an estimated 150 million in 2012. Each e-bike typically needed at least one lead-acid battery per year, containing about 10 kilograms of lead, which translated to about 1.5 Mt of lead consumed for this use in 2012. According to ILZSG, consumption of lead in China increased slightly to 4.63 Mt in 2012 from 4.59 Mt in 2011, compared with a 9% increase in 2011 (American Metal Market, 2012c; International Lead and Zinc Study Group, 2013b, p. 11).

Lead in concentrate production in 2012 was about 2.80 Mt, a 17% increase from the 2.40 Mt produced in 2011 (table 8). Inner Mongolia, the leading lead-mining region, produced about

787,000 t of lead in concentrate in 2012, an increase of 17% from that of the previous year.

The China Geological Survey announced that 4 Mt of lead and zinc resources were discovered in 2012. Total refined lead production in 2012 was 4.70 Mt, a slight increase from the 4.60 Mt produced in 2011, owing to a 3% increase in primary refined lead production. Secondary refined lead production was unchanged. Secondary lead producers were affected by increased environmental scrutiny in 2012 that led to temporary shutdowns and decreases in production rates at some plants (Antaiko Lead, Zinc, and Tin Monthly, 2013).

In 2012, China's National and Provincial Governments continued to eliminate smaller lead smelters in an attempt to consolidate production and to shutter lead-acid battery manufacturers that violated environmental regulations or used old production technologies. In separate decisions announced in July and September 2012, the Ministry of Industry and Information Technology (MIIT) targeted a total of 50 lead smelters with about 1.17 Mt of outdated refined lead smelting capacity for closure by yearend 2012. Most of the smelters targeted for closure were relatively small and were operating below production capacity so the impact on total refined lead production was expected to be minimal. The 2012 closures followed similar actions in 2011 when MIIT closed 38 lead smelters with production capacity of about 661,000 t/yr of refined lead. (American Metal Market, 2012a, b; Antaiko Lead, Zinc, and Tin Monthly, 2012; 2013).

Mexico.—In 2012, secondary lead production increased by 40% (87,000 t) from that in 2011. Secondary lead production had increased annually since 2009, partially owing to new secondary production capacity that opened during that time period. JCI operated two large secondary smelters in Mexico that processed spent lead-acid batteries primarily from Mexico and the United States. Its secondary smelter (135,000-t/yr capacity) in Garcia, Nuevo Leon, commenced production in 2011 and continued to ramp up. In 2011, JCI upgraded furnaces at its smelter in Cienega de Flores, Nuevo Leon (135,000-t/yr capacity). The upgrade was part of JCI's strategy to increase lead recycling capacity in North America (CRU International Ltd., 2013, p. 173; Johnson Controls, Inc., 2012a).

Outlook

At its October 2013 meeting in Lisbon, Portugal, ILZSG forecast global increases in lead consumption and production in 2013 and 2014. Global lead consumption in 2013 was expected to increase by 5% to 11.0 Mt and by 4.6% in 2014 to 11.51 Mt, primarily owing to increased consumption in China for use in lead-acid batteries in automobiles, e-bikes, and standby power for telecommunications networks. Analysts have forecast that as many as 200 million e-bikes could be in use by 2015. Global lead mine production in 2013 was forecast to increase by 5.7% from that in 2012 to 5.55 Mt, and by 4.2% in 2014 to 5.78 Mt owing to increased mine production in Australia and China. Global refined lead production was forecast to increase by 4.7% in 2013 to 11.02 Mt and by 4.2% to 11.48 Mt in 2014 owing to refined lead production increases in Australia, Belgium, China, India, Italy, Kazakhstan, and Peru. Note that in some cases, ILZSG world production estimates differ from

USGS data. ILZSG forecast that global refined lead production would exceed consumption by about 22,000 t in 2013, but would be about 23,000 t less than consumption in 2014. According to ILZSG, 2014 would be the first year that global refined lead consumption exceeded production since 2009 (International Lead and Zinc Study Group, 2013a).

References Cited

- American Metal Market, 2012a, China to cut lead, zinc, ferroalloy capacity: American Metal Market, July 10. (Accessed July 10, 2012, via <http://www.amm.com/>.)
- American Metal Market, 2012b, China's nonferrous smelting capacity due for more cuts: American Metal Market, September 12. (Accessed September 12, 2012, via <http://www.amm.com/>.)
- American Metal Market, 2012c, Chinese battery demand growth seen boding well for lead: American Metal Market, November 9. (Accessed November 9, 2012, via <http://www.amm.com/>.)
- American Metal Market, 2012d, Exide to idle Pa. lead recycling plant by March: American Metal Market, November 9. (Accessed November 13, 2012, via <http://www.amm.com/>.)
- Antaiko Lead, Zinc, and Tin Monthly, 2012, Market overview—Zinc: Antaiko Lead, Zinc, and Tin Monthly, August, no. 188, p. 2.
- Antaiko Lead, Zinc, and Tin Monthly, 2013, Market overview—Zinc: Antaiko Lead, Zinc, and Tin Monthly, February, no. 194, p. 13–25.
- Battery Council International, 2013, BCI 2012 monthly shipment report: Chicago, IL, Battery Council International, January 25, 24 p.
- CRU International Ltd., 2012, Quarterly lead industry and market outlook: London, United Kingdom, CRU International Ltd., November, 196 p.
- CRU International Ltd., 2013, Quarterly lead industry and market outlook: London, United Kingdom, CRU International Ltd., February, 192 p.
- Doe Run Co., The, 2012, The Doe Run Company decides not to build new technology plant—Company will focus on exploration, mining, and secondary metal production: St. Louis, MO, The Doe Run Co. news release, July 24. (Accessed August 1, 2012, at <http://www.doerun.com/DoeRunDecidesNotToBuildNewTechnologyPlant/tabid/235/language/en-US/Default.aspx>.)
- Federal Aviation Administration, 2012, Unleaded avgas transition aviation rulemaking committee final report now available: Federal Aviation Administration news release, October 5. (Accessed October 5, 2012, at <http://www.faa.gov/about/initiatives/avgas/archive/2012-10-05/>.)
- Frizell, Samuel, 2012, Ivernia's flagship mine to restart in 2013: American Metal Market, October 12. (Accessed October 12, 2012, via <http://www.amm.com/>.)
- Hecla Mining Co., 2013, 2012 annual report: Coeur d'Alene, ID, Hecla Mining Co., March 29, 96 p. (Accessed September 17, 2013, at <http://216.139.227.101/interactive/hl2012/>.)
- International Lead and Zinc Study Group, 2013a, ILZSG fall 2013 session—Forecasts: Lisbon, Portugal, International Lead and Zinc Study Group press release, October 4, 5 p. (Accessed October 4, 2013, at http://www.ilzsg.org/generic/pages/list.aspx?table=document&ff_aa_document_type=R&from=1.)
- International Lead and Zinc Study Group, 2013b, Lead and zinc statistics—Monthly bulletin of the International Lead and Zinc Study Group: Lisbon, Portugal, International Lead and Zinc Study Group, v. 53, no. 11, November, 77 p.
- International Lead and Zinc Study Group, 2013c, New mine and smelter projects: Lisbon, Portugal, International Lead and Zinc Study Group, January 11, 70 p.
- Johnson Controls, Inc., 2012a, Johnson Controls opens automotive battery recycling facility in Florence, South Carolina: Milwaukee, WI, Johnson Controls, Inc. news release, September 18. (Accessed September 18, 2012, at <http://www.johnsoncontrols.com/content/us/en/news.html?newsitem=http3A2F2Fjohnsoncontrols.mediaroom.com2Findex.php3Fs3D11326item3D2846>.)
- Johnson Controls, Inc., 2012b, Johnson Controls reaches major construction and hiring milestone at state-of-the-art Florence recycling center: Milwaukee, WI, Johnson Controls, Inc. news release, April 19. (Accessed April 19, 2012, via <http://www.johnsoncontrols.com/content/us/en/news.html>.)
- Metalico Inc., 2013, Form 10-K—2012: U.S. Securities and Exchange Commission, 58 p. (Accessed August 17, 2013, via <http://phx.corporate-ir.net/phoenix.zhtml?c=180159&p=irol-sec>.)
- Nyrstar NV, 2013, Annual report 2012: Balen, Belgium, Nyrstar NV, 205 p. (Accessed July 23, 2013, at <http://nyrstar.annual-report.be/2012/index.php>.)

Prentice, Chris, 2012a, Doe Run fire pushes premiums higher: American Metal Market, April 4. (Accessed April 4, 2012, via <http://www.amm.com/>.)

Prentice, Chris, 2012b, Force majeure to send lead premiums on ride: American Metal Market, March 29. (Accessed March 30, 2012, via <http://www.amm.com/>.)

Recylex S.A., 2013, Annual report 2012: Paris, France, Recylex S.A., 136 p. (Accessed September 17, 2013, at <http://www.recylex.fr/en/actionnaires-investisseurs,rapport-annuels.html>.)

Teck Resources Ltd., 2013a, 2012 annual report: Vancouver, British Columbia, Canada, Teck Resources Ltd., 144 p. (Accessed August 15, 2012, at <http://www.teck.com/Generic.aspx?PAGE=Teck+Site%2fInvestors+Pages%2fFinancial+Reporting+Pages%2fAnnual+Reports&portalName=tc>.)

Teck Resources Ltd., 2013b, Annual information form: Vancouver, British Columbia, Canada, Teck Resources Ltd., March 1, 93 p. (Accessed July 5, 2013, at <http://www.teck.com/Generic.aspx?PAGE=Teck+Site%2fInvestors+Pages%2fFinancial+Reporting+Pages%2fPublic+Filings&portalName=tc>.)

Xstrata plc, 2013, Annual report 2012: Zug, Switzerland, Xstrata plc, 196 p. (Accessed June 26, 2013, at <http://www.glencorexstrata.com/investors/reports-and-results/glencorexstrata/2012/>.)

Lead. Ch. in Mineral Commodity Summaries, annual.

Lead. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

Lead. Mineral Industry Surveys, monthly.

Lead (Pb). Ch. in Metal Prices in the United States Through 2010, Scientific Investigations Report 2012–5188, 2013.

Other

China Metal Market—Lead, Zinc & Tin. Beijing Antaika Information Development Co., Ltd., monthly.

International Lead and Zinc Study Group.

Lead. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.

TABLE 1
SALIENT LEAD STATISTICS¹

		2008	2009	2010	2011	2012
United States:						
Production:						
Mine, recoverable lead content:						
Quantity ²	metric tons	399,000	395,000	356,000	334,000	336,000
Value	thousands	\$1,060,000	\$757,000	\$854,000	\$895,000	\$845,000
Primary lead, refined content, domestic ores and base bullion	metric tons	135,000	103,000	115,000	118,000	111,000
Secondary lead, lead content	do.	1,140,000	1,110,000	1,140,000	1,130,000	1,110,000
Exports, lead content:						
Lead ore and concentrates	do.	277,000	287,000	299,000	223,000	214,000
Lead materials, excluding scrap	do.	74,800	82,000	83,500	47,200	53,400
Imports for consumption, lead content:						
Lead in base bullion	do.	2,740	844	602	434	1,020
Lead in pigs and bars	do.	309,000	251,000	271,000	313,000	349,000
Stocks, December 31, lead content:						
Primary lead	do.	W	W	W	W	W
At consumers and secondary smelters	do.	72,500	63,300	64,800	48,300 ^r	72,100
Consumption of metal, primary and secondary, lead content	do.	1,440,000	1,290,000	1,430,000	1,410,000 ^r	1,360,000
Price:³						
North American Producer average, delivered	cents per pound	120.33	86.87	108.91	121.70	114.16
London Metal Exchange, pure lead, cash average	do.	94.79	77.95	97.42	108.92	93.53
World:						
Production, gross weight:						
Mine	metric tons	3,880,000	3,850,000 ^r	4,150,000 ^r	4,730,000 ^r	5,170,000 ^e
Primary refinery	do.	3,980,000	3,860,000	4,220,000 ^r	4,690,000	4,780,000 ^e
Secondary refinery	do.	4,550,000 ^r	4,830,000 ^r	5,110,000 ^r	5,230,000 ^r	5,210,000 ^e
Undifferentiated		196,000	164,000	202,000	208,000 ^r	185,000 ^e

^eEstimated. ^rRevised. do. Ditto. W Withheld to avoid disclosing company proprietary data.

¹Data are rounded to no more than three significant digits, except prices.

²Lead recoverable after smelting and refining. Data in table 12 represent lead in concentrate.

³Platts Metals Week.

TABLE 2
LEAD-PRODUCING MINES IN THE UNITED STATES IN 2012, IN ORDER OF OUTPUT¹

Rank	Mine	County and State	Operator	Source of lead
1	Red Dog ²	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
2	Fletcher	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
3	Brushy Creek	Reynolds, MO	do.	Do.
4	Buick	Iron, MO	do.	Do.
5	Viburnum (#29 and #35)	Washington and Iron, MO	do.	Do.
6	Greens Creek ²	Southeastern Region, AK	Hecla Mining Co.	Zinc-silver ore.
7	Sweetwater	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
8	Galena	Shoshone, ID	U.S. Silver & Gold Inc. ³	Silver ore.

Do., do. Ditto.

¹Represents 100% of U.S. mine production in 2012.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 67, Alaska's mineral industry 2011—Exploration activity.

³On August 13, 2012, U.S. Silver Corp. and RX Gold & Silver Inc. merged to create U.S. Silver & Gold Inc.

TABLE 3
LEAD RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,
BY KIND OF SCRAP AND FORM OF RECOVERY¹

(Metric tons, lead content, unless otherwise specified)

	2011	2012
Kind of scrap:		
New scrap:		
Lead-base	20,100	17,600
Copper-base	--	--
Tin-base	1,530	1,530
Total	21,600	19,200
Old scrap:		
Battery-lead	1,070,000	1,050,000
All other lead-base	40,100	41,700
Copper-base	--	--
Total	1,110,000	1,090,000
Grand total	1,130,000	1,110,000
Form of recovery:		
As soft lead	966,000 ^r	873,000
In antimonial lead	167,000	236,000
In other lead alloys	--	--
In copper-base alloys	--	--
Total:		
Quantity	1,130,000	1,110,000
Value ²	thousands \$3,040,000	\$2,790,000

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Value based on average quoted price of common lead.

TABLE 4
U.S. CONSUMPTION OF LEAD, BY PRODUCT¹

(Metric tons, lead content)

SIC ² code	Product	2011	2012
Metal products:			
3482	Ammunition, shot and bullets	75,100 ^r	73,900
Bearing metals:			
35	Machinery except electrical	W	W
371	Motor vehicles and equipment	W	W
37	Other transportation equipment	W	W
Total		1,150	1,090
3351	Brass and bronze, billets and ingots	1,620	1,300
36	Cable covering, power and communication	(3)	(3)
15	Calking lead, building construction	(3)	(3)
Casting metals:			
36	Electrical machinery and equipment	W	W
371	Motor vehicles and equipment	W	W
37	Other transportation equipment	W	W
3443	Nuclear radiation shielding	W	W
Total		16,000 ^r	16,700
Pipes, traps, other extruded products:			
15	Building construction	6,110 ^r	6,240
3443	Storage tanks, process vessels, etc.	(4)	(4)
Total		6,110 ^r	6,240
Sheet lead:			
15	Building construction	1,680 ^r	3,570
3443	Storage tanks, process vessels, etc.	W	W
3693	Medical radiation shielding	W	W
Total		7,170 ^r	7,390
Solder:			
15	Building construction	W	W
	Metal cans and shipping containers	W	W
367	Electronic components, accessories and other electrical equipment	6,120	6,220
371	Motor vehicles and equipment	W	W
Total		6,170 ^r	6,280
Storage batteries:			
3691	Storage battery grids, post, etc.	417,000 ^r	449,000
3691	Storage battery oxides	837,000 ^r	745,000
Total storage batteries		1,250,000 ^r	1,190,000
27	Type metal, printing and allied industries	(3)	(3)
34	Other metal products ⁵	23,100 ^r	18,500
Grand total		1,390,000 ^r	1,330,000
Other oxides:			
285	Paint	W	W
32	Glass and ceramics products	W	W
28	Other pigments and chemicals	W	W
Total		9,760	9,740
Miscellaneous uses		14,300	20,000
Grand total		1,410,000 ^r	1,360,000

^rRevised. W Withheld to avoid disclosing company proprietary data; included in appropriate totals.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Standard Industrial Classification.

³Included with "Metal products: Other metal products" to avoid disclosing company proprietary data.

⁴Included with "Metal products: Sheet lead: Building construction" to avoid disclosing company proprietary data.

⁵Includes lead consumed in foil, collapsible tubes, annealing, galvanizing, plating, electrowinning, and fishing weights.

TABLE 5
U.S. CONSUMPTION OF LEAD IN 2012, BY STATE^{1,2}

(Metric tons, lead content)

State	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
California and Washington	25,200	1,030	2,120	--	28,300
Illinois	23,900	18,400	--	--	42,300
Iowa, Michigan, Missouri	39,000	--	W	--	39,000
Ohio and Pennsylvania	101,000	98,700	34,600	W	234,000
Arkansas and Texas	1,380	18,600	W	--	20,000
Alabama, Georgia, Oklahoma	13,800	20,900	W	--	34,600
Indiana, Kansas, Kentucky, Minnesota, Nebraska, Tennessee, Wisconsin	234,000	79,700	19,700	W	333,000
Connecticut, Maryland, New Jersey, New York, North Carolina, South Carolina	2,290	--	--	--	2,290
Other States	425,000	65,700	130,000	558	621,000
Total	865,000	303,000	186,000	558	1,360,000

W Withheld to avoid disclosing company proprietary data; included in "Other States." -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes lead that went directly from scrap to fabricated products.

TABLE 6
U.S. CONSUMPTION OF LEAD IN 2012, BY CLASS OF PRODUCT^{1,2}

(Metric tons, lead content)

Product	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
Metal products	47,600	77,900	W	W	131,000
Storage batteries	788,000	225,000	W	W	1,190,000
Miscellaneous ³	29,700	(4)	W	W	29,800
Total	865,000	303,000	186,000	558	1,360,000

W Withheld to avoid disclosing company proprietary data; included in "Total."

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes lead that went directly from scrap to fabricated products.

³Includes other oxides and gasoline additives.

⁴Withheld to avoid disclosing proprietary data; included in "Storage batteries."

TABLE 7
STOCKS OF LEAD AT CONSUMERS AND SECONDARY SMELTERS
IN THE UNITED STATES, DECEMBER 31^{1,2}

(Metric tons, lead content)

Year	Refined soft lead	Lead in		Total
		antimonial lead	Lead in alloys	
2011	29,100 ^r	16,500 ^r	W	48,300 ^r
2012	45,800	23,400	W	72,100

^rRevised. W Withheld to avoid disclosing company proprietary data; included in "Total."

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes stocks at primary refineries.

TABLE 8
PRODUCTION AND SHIPMENTS OF LEAD PIGMENTS AND OXIDES IN THE UNITED STATES^{1,2}

(Metric tons and dollars)

Product	2011				2012			
	Production		Shipments ^c		Production		Shipments ^c	
	Gross weight	Lead content	Quantity (lead content)	Value ^d	Gross weight	Lead content	Quantity (lead content)	Value ^d
Litharge, red lead and white lead, dry	--	--	3,590	8,600,000	--	--	3,600	8,720,000
Lead oxide	827,000	786,000	NA	NA	646,000	614,000	NA	NA
Total	827,000	786,000	NA	NA	646,000	614,000	NA	NA

^eEstimated. NA Not available. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Excludes basic lead sulfate to avoid disclosing company proprietary data.

³At plant, exclusive of container.

TABLE 9
U.S. IMPORTS FOR CONSUMPTION OF LEAD PIGMENTS AND COMPOUNDS, BY KIND¹

Kind	Quantity	Value
	(metric tons, lead content)	(thousands)
2011:		
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	2,320	\$11,800
Litharge	1,360	5,160
Glass frits (undifferentiated)	22,800	45,600
Total	26,400	62,500
2012:		
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,540	9,420
Litharge	1,870	6,280
Glass frits (undifferentiated)	26,500	51,200
Total	29,900	66,900

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF LEAD, BY COUNTRY¹

Country	2011		2012	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Ore and concentrates, lead content:				
Belgium	14,700	\$18,400	1,260	\$1,090
Canada	33,300	72,100	10,100	17,600
China	129,000	222,000	188,000	312,000
Japan	27,600	64,600	5,440	9,710
Korea, Republic of	17,700	46,200	8,290	19,200
Mexico	464	1,120	451	903
Other	240	423	329	358
Total	223,000	425,000	214,000	360,000
Base bullion, lead content:				
China	1	9	--	--
Korea, Republic of	55	718	65	837
Other	14	16	7	15
Total	70	743	72	852
Unwrought lead and lead alloys, lead content:				
Belgium	21,300	19,900	15,500	14,000
Canada	2,830	3,420	2,200	2,380
Chile	763	797	229	671
China	34	108	122	165
India	104	101	93	88
Japan	904	1,840	1,470	898
Korea, Republic of	641	999	431	540
Malaysia	1	3	986	2,110
Mexico	13,300	26,600	25,000	34,900
Other	322 ^r	357 ^r	959	2,060
Total	40,100	54,100	47,000	57,800
Wrought lead and lead alloys, lead content:				
Canada	1,590	4,550	1,450	3,470
Chile	288	514	523	625
China	133	167	183	253
Germany	398	557	158	391
Haiti	196	182	--	--
India	1,600	2,400	1,150	1,640
Mexico	915	1,030	1,080	1,210
United Kingdom	192	397	157	366
Venezuela	651	1,690	7	26
Other	1,070	2,040	1,590	2,460
Total	7,030	13,500	6,300	10,400
Scrap, gross weight:				
Canada	5,010	8,530	4,650	6,120
Chile	325	118	1	5
China	1,510	1,270	1,420	1,770
Honduras	142	42	--	--
India	8,420	9,610	7,260	9,600
Japan	92	169	105	257
Korea, Republic of	10,900	13,200	9,810	10,000
Mexico	829	1,170	485	325
Netherlands	2,620	1,220	--	--
Spain	224	336	90	147
United Kingdom	94	161	59	100
Other	1,010	986	2,020	2,170
Total	31,100	36,800	25,900	30,600

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF LEAD, BY COUNTRY¹

Country	2011		2012	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Base bullion:				
Canada	35	\$86	--	--
Colombia	--	--	118	\$224
Mexico	199	1,350	695	3,540
Spain	--	--	208	141
Venezuela	200	506	--	--
Total	434	1,940	1,020	3,900
Pigs and bars, lead content:				
Australia	504	1,230	24,300	47,600
Belgium	3	60	2,010	3,930
Canada	250,000	627,000	240,000	521,000
China	32	24	5,000	10,200
Colombia	--	--	1,010	2,060
Ecuador	299	688	899	1,740
France	629	1,940	637	1,690
Guatemala	436	1,010	--	--
India	(2)	59	3,890	8,080
Korea, Republic of	--	--	6,870	13,400
Mexico	56,000	53,700	56,100	72,500
Morocco	496	1,160	496	1,160
Peru	121	346	1	9
Russia	3,270	8,530	4,330	8,600
South Africa	246	144	27	128
United Kingdom	1,560	3,630	340	696
Other	1 ^r	10 ^r	2,640	5,810
Total	313,000	700,000	349,000	699,000
Reclaimed scrap, including ash and residues, lead content:				
Canada	481	1,310	694	1,150
Chile	153	272	--	--
Colombia	374	1,120	19	40
Honduras	66	167	526	1,310
Mexico	987	1,600	1,640	1,870
United Kingdom	96	227	--	--
Venezuela	207	618	--	--
Other	31 ^r	58 ^r	57	206
Total	2,400	5,380	2,940	4,580
Wrought lead, all forms, including wire and powders, gross weight:				
Argentina	219	589	141	336
Canada	197	426	252	775
Czech Republic	794	2,840	865	1,570
Egypt	40	131	--	--
Germany	717	4,330	675	3,880
India	144	487	86	295
Japan	75	127	26	193
United Kingdom	193	1,260	179	893
Other	73 ^r	878 ^r	44	429
Total	2,450	11,100	2,270	8,370

^rRevised. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
LEAD: WORLD MINE PRODUCTION OF LEAD IN CONCENTRATE, BY COUNTRY^{1,2}

(Metric tons, lead content)

Country ³	2008	2009	2010	2011	2012 ^c
Argentina	20,788	24,753	22,554 ^r	26,074 ^r	25,000
Australia	645,000	566,000	625,000	621,000	648,000 ⁴
Bolivia	81,602	84,538	72,803	100,051	100,000
Bosnia and Herzegovina ^c	3,300	2,100	3,200	3,700 ^r	3,700
Brazil	25,286	15,890	19,650	15,100 ^r	16,500 ^{p,4}
Bulgaria ^c	15,000	12,000	12,000	12,000	12,000
Burma ^c	1,000 ^r	5,000 ^r	7,000	8,700 ^r	8,800 ⁴
Canada	99,810 ^r	68,839 ^r	64,845 ^r	59,797 ^r	59,429 ^{p,4}
Chile	3,985	1,511	695	841	1,000
China ^c	1,500,000	1,600,000	1,850,000	2,400,000 ^r	2,800,000
Georgia ^c	400	400	400	400	400
Greece ^c	16,000	16,000	18,000	18,000	20,000
Guatemala	53	--	--	--	--
Honduras	12,545	14,471	16,944 ^r	16,954 ^r	15,000
India	87,300	92,000	97,000	115,000	118,000 ⁴
Iran ^{e,5}	26,905 ⁴	20,000	35,000	35,000	35,000
Ireland ^c	50,200	43,000	39,100 ^r	50,700 ^r	51,000
Italy ^c	800	800	800	800	800
Kazakhstan	38,800 ^r	39,400	36,100	34,600	38,500 ⁴
Korea, North ^c	13,000	13,000	13,000	13,000 ^r	13,000
Korea, Republic of	449	2,064	1,168	2,577 ^r	2,500
Macedonia ^c	35,000	38,000	38,000 ^r	36,000 ^r	36,000
Mexico	100,725	143,838	192,062	223,717 ^r	210,382 ⁴
Morocco	33,477 ^r	27,000 ^r	32,461 ^r	30,675 ^r	30,000
Namibia	14,062	10,129	10,140	8,000 ^r	8,000
Peru	345,109	302,459	261,990	230,199 ^r	248,659 ⁴
Poland	87,700	80,400	60,200 ^r	56,000 ^{r,e}	57,600
Russia ^c	60,000	70,000	97,000	94,500 ^{r,4}	95,000
Serbia ^c	1,600	1,800	2,000	1,800	1,800
South Africa	46,440	49,149	50,625 ^r	54,460 ^r	55,000
Sweden ^c	60,000 ⁴	69,000	68,000	62,000	62,000
Tajikistan ^c	800	800	800	800 ^r	800
Turkey ^c	25,000	26,000	23,000 ^r	39,000 ^r	40,000
United Kingdom ^c	500	500	500	500	500
United States	410,000	406,000	369,000	342,000	345,000 ⁴
Uzbekistan	--	--	--	6,000	6,000
Vietnam ^c	14,200 ⁴	7,700 ⁴	7,400	7,400	7,400
Total	3,880,000	3,850,000 ^r	4,150,000 ^r	4,730,000 ^r	5,170,000

^cEstimated. ^pPreliminary. ^rRevised. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²Includes data available through August 30, 2013.

³In addition to the countries listed, lead is also produced in Nigeria, but information is inadequate to formulate reliable estimates of output levels.

⁴Reported figure.

⁵Year beginning March 21 of that stated.

TABLE 13
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2008	2009	2010	2011	2012 ^c
Algeria, secondary ^c	5,000	5,000	11,000	9,000	10,000
Argentina:					
Primary	13,482	12,558	14,245	11,859 ^r	14,000
Secondary	59,000	70,000 ^e	63,000	72,700 ^r	67,000
Total	72,482	82,600 ^{r,e}	77,245	84,559 ^r	81,000
Australia:					
Primary	221,000	204,000	178,000	187,000	160,000 ⁴
Secondary ^e	27,000	25,000	26,000	26,000	24,000
Total	248,000	229,000	204,000	213,000	184,000
Austria, secondary	26,902	22,197	25,499	26,208 ^r	25,000
Belgium, secondary ^c	109,000 ⁴	109,000 ⁴	121,000	121,000	121,000
Bolivia	473	418	310	269	300
Brazil, secondary	95,704	104,160	114,887	138,537 ^r	139,500 ^{p,4}
Bulgaria: ^c					
Primary	77,000 ^r	72,000 ^r	65,000 ^r	55,300 ^r	50,000
Secondary	14,000	11,000 ^r	17,000 ^r	17,000 ^r	16,000
Total	91,000 ^r	83,000	82,000 ^r	72,300 ^r	66,000
Burma, primary	202	200 ^e	--	--	--
Canada:					
Primary	105,526	101,484	105,836	112,531	133,495 ^{p,4}
Secondary	153,568 ^r	157,370	167,101 ^r	169,737 ^r	144,570 ^{p,4}
Total	259,094 ^r	258,854	272,937 ^r	282,268 ^r	278,065 ^{p,4}
China: ^c					
Primary	2,350,000	2,480,000	2,840,000	3,200,000 ^r	3,300,000
Secondary	850,000	1,230,000	1,360,000	1,400,000 ^r	1,400,000
Total	3,200,000	3,710,000	4,200,000	4,600,000 ^r	4,700,000
Czech Republic, secondary ^c	36,000	29,000	30,000	32,000 ^r	30,000
Estonia, secondary ^c	10,000	10,000	10,000	10,000	10,000
France, secondary ^c	88,000 ⁴	88,000	88,000	88,000	88,000
Germany: ^c					
Primary	113,200 ⁴	104,900 ⁴	125,000	136,000 ^r	140,000
Secondary	301,900 ⁴	285,700 ⁴	279,000 ^r	293,000 ^r	290,000
Total	415,100 ⁴	390,600 ⁴	404,000 ^r	429,000 ^r	430,000
Greece, secondary ^c	5,000	4,000	4,000	4,000	3,500
India:					
Primary	62,000	61,700 ^r	75,000	120,000	122,000
Secondary	232,000	275,000	305,000	306,000	310,000
Total	294,000	336,700 ^r	380,000	426,000	432,000
Indonesia, secondary ^c	18,500	18,000	18,000	17,000	17,000
Iran: ^c					
Primary	20,000	20,000	20,000	20,000	20,000
Secondary	55,000	55,000	55,000	55,000	55,000
Total	75,000	75,000	75,000	75,000	75,000
Ireland, secondary ^c	22,500	19,000	20,000	20,000	20,000
Israel, secondary	27,000	26,000	27,000	27,000 ^e	27,000
Italy: ^c					
Primary	47,800 ⁴	15,000	15,000	15,000	15,000
Secondary	164,000 ⁴	134,000	134,000	134,000	134,000
Total	211,800 ⁴	149,000	149,000	149,000	149,000

See footnotes at end of table.

TABLE 13—Continued
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2008	2009	2010	2011	2012 ^c
Japan:					
Primary	107,005	96,794 ^r	101,610	100,078	102,000
Secondary	172,454	150,871	165,613	148,524	150,000
Total	279,459	247,665 ^r	267,223	248,602	252,000
Kazakhstan, primary and secondary	105,766	80,994	103,110	111,249	87,854 ⁴
Kenya, secondary ^c	1,000	500	250	250	250
Korea, North, primary and secondary ^c	9,000	9,000	9,000	9,000	9,000
Korea, Republic of:					
Primary	244,137	216,918	197,900	256,851 ^r	250,000
Secondary	NA ^r	NA ^r	NA ^r	NA ^r	NA
Total	244,137 ^r	216,918 ^r	197,900 ^r	256,851 ^r	250,000
Malaysia, secondary ^{c,5}	73,000	70,000	71,000	70,000	70,000
Mexico:					
Primary ⁶	89,838	100,361	110,980	101,729 ^r	102,000
Secondary ^c	154,000 ^r	154,000 ^r	175,000 ^r	216,000 ^r	303,000
Total ^c	244,000 ^r	254,000 ^r	286,000 ^r	318,000 ^r	405,000
Morocco: ^c					
Primary	45,000	45,000	45,000	45,000	45,000
Secondary	3,000	3,000	2,500	2,500	2,500
Total	48,000	48,000	47,500	47,500	47,500
Netherlands, secondary ^c	17,000	17,000	17,000	17,000	17,000
New Zealand, secondary ^c	9,000	13,000	9,000	9,000	9,000
Nigeria, secondary	NA ^r	NA ^r	NA ^r	NA ^r	NA
Pakistan, secondary ^c	3,000	85 ^{r,4}	2,889 ^{r,4}	2,900	2,900
Peru, primary ⁷	114,259	26,599	--	--	--
Philippines, secondary ^c	34,000	32,000 ^r	30,000 ^r	34,000 ^r	34,000
Poland: ^c					
Primary	38,000	30,000	29,000 ^r	30,000 ^r	30,000
Secondary	70,200	70,400	70,400 ^r	70,000 ^r	70,000
Total	108,000 ^r	100,000 ^r	99,400 ^r	100,000 ^r	100,000
Portugal, secondary ^c	3,000	3,000	3,000	3,000	3,000
Romania: ^c					
Primary	34,000	9,000	8,000	8,000	8,000
Secondary	5,000	5,000	3,000	3,000	3,000
Total	39,000	14,000	11,000	11,000	11,000
Russia, primary and secondary ^c	80,000	73,000	89,000	86,700 ^{r,4}	87,000
Saudi Arabia, secondary	NA ^r	NA ^r	NA ^r	NA ^r	NA
Serbia, primary and secondary ^c	929 ⁴	1,000	1,000	1,000	1,000
Slovenia, secondary ^c	15,000	14,000	14,000	14,000	12,000
South Africa, secondary	62,000	58,000	51,000 ^r	56,000 ^r	56,000
Spain, secondary ^c	125,000 ⁴	125,000 ⁴	165,000	172,000	125,000
Sweden: ^c					
Primary	26,000	26,000	26,000	26,000	26,000
Secondary	40,000	40,000	35,000	35,000	35,000
Total	66,000	66,000	61,000	61,000	61,000
Switzerland, secondary ^c	8,000	8,000	--	--	--
Taiwan, secondary ^c	55,000	40,000	35,000	35,000	35,000
Thailand, secondary	73,303	55,504	55,000	55,000 ^{r,e}	55,000
Turkey, secondary	NA ^r	NA ^r	NA ^r	NA ^r	NA
Ukraine, secondary ^c	7,000	7,000	7,000	7,000	7,000
United Arab Emirates, secondary ^c	2,000	2,000	2,000	2,000	2,000

See footnotes at end of table.

TABLE 13—Continued
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY^{1,2}

(Metric tons)

Country ³	2008	2009	2010	2011	2012 ^c
United Kingdom:					
Primary	139,000	135,000	150,000	150,000 ^e	150,000
Secondary	144,000	144,000	144,000	144,000 ^e	144,000
Total	283,000	279,000	294,000	294,000 ^e	294,000
United States:					
Primary	135,000	103,000	115,000	118,000	111,000
Secondary	1,140,000	1,110,000	1,140,000	1,130,000	1,110,000
Total	1,280,000	1,210,000	1,280,000	1,250,000	1,220,000
Venezuela, secondary ^c	30,000	30,000	30,000	30,000	30,000
Zambia, secondary	NA ^r	NA ^r	NA ^r	NA ^r	NA
Grand total:	8,730,000 ^r	8,860,000 ^r	9,530,000 ^r	10,100,000 ^r	10,200,000
Of which:					
Primary	3,980,000	3,860,000	4,220,000 ^r	4,690,000	4,780,000
Secondary	4,550,000 ^r	4,830,000 ^r	5,110,000 ^r	5,230,000 ^r	5,210,000
Undifferentiated	196,000	164,000	202,000	208,000 ^r	185,000

^cEstimated. ^pPreliminary. ^rRevised. NA Not available. -- Zero.

¹World totals, U.S. data, and estimated data are rounded to more than three significant digits; may not add to totals shown.

²Includes data available through August 30, 2013. Data included represent the total output of refined lead by each country, whether derived from ores and concentrates (primary) or scrap (secondary), and include the lead content of antimonial lead but exclude, to the extent possible, simple remelting of scrap.

³In addition to the countries listed, Colombia, Egypt, El Salvador, Iraq, and Trinidad and Tobago produced secondary lead, but output is not officially reported; available general information is inadequate for the formation of reliable estimates of output levels.

⁴Reported figure.

⁵Metal Reclamation Industries' secondary lead smelter is receiving some primary mine concentrates from the Magellan Mine (Australia). The ore minerals are lead oxides and can be smelted at a secondary smelter.

⁶Includes lead content in antimonial lead.

⁷In 2012, about 312 metric tons of leaching lead were produced. La Oroya smelter and refinery will be re-opened in 2013.