



# 2009 Minerals Yearbook

LEAD

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In 2009, domestic lead mine production of recoverable lead was 395,000 metric tons (t), a slight decrease compared with that of 2008. Alaska and Missouri were the dominant producing States with a 94% share of total domestic mine production. Other States with appreciable lead mine production were Idaho, Montana, and Washington. Lead was produced at 11 U.S. mines that employed about 1,200 people. The value of domestic mine production was \$757 million, a 29% decrease from the value of domestic mine production in 2008, owing to a decline in the average price of lead in 2009. Primary lead metal was produced at a smelter-refinery in Missouri.

Secondary lead, derived principally from scrapped lead-acid batteries, accounted for 91% of refined lead production in the United States in 2009. Nearly all the secondary lead was produced by 7 companies operating 15 smelters. Domestic secondary lead production decreased by 3% from that of 2008.

Lead was consumed in about 76 U.S. plants to manufacture such products as ammunition; building-construction materials; covering for power and communication cable; lead oxides in ceramics, chemicals, glass, and pigments; lead sheet; solders for construction, electrical-electronic components and accessories, metal containers, and motor vehicles; and storage batteries.

World mine production of lead increased slightly, to 3.86 million metric tons (Mt) in 2009. The United States accounted for about 11% of global lead mine production and was ranked third in the world. China and Australia were the two leading world lead producers in 2009 accounting for 41% and 15%, respectively, of global lead mine production. World production of refined lead (primary and secondary) increased slightly, to 8.82 Mt in 2009 from 8.70 Mt in 2008. The United States was the second leading producer of refined lead in the world and accounted for 14% of global refined lead production. China produced about 42% of global refined lead production and was the leading producer of refined lead in 2009.

According to the International Lead and Zinc Study Group (2010c, p. 8–9) (ILZSG), consumption of refined lead decreased slightly to 8.63 Mt in 2009 from 8.65 Mt in 2008, the first annual decline in global lead consumption since 2001. The leading refined-lead-consuming countries in 2009 were China, 45%; the United States, 16%; Germany, 4%; and the Republic of Korea, 3%. ILZSG data indicated that there was a global refined lead supply surplus of about 100,000 t by yearend 2009.

Lead-acid batteries, including starting-lighting-ignition (SLI) and industrial types, continued to be the dominant use of lead, accounting for about 89% of reported lead consumption. SLI battery shipments in North America totaled 109.5 million units in 2009, down by 6% from that of 2008. This total included original equipment (OE) and replacement automotive-type batteries.

Following significant declines that took place in the second half of 2008, lead prices steadily increased during 2009. In 2009, the average London Metal Exchange Ltd. (LME) cash price was \$0.78 per pound, a decline of 18% from that of 2008, and the North American Producer price declined by about 28% from that of 2008, to \$0.87 per pound.

## Legislation and Government Programs

Effective February 10, section 101 of the Consumer Product Safety Improvement Act set new limits on the allowable lead content in any product intended primarily for use by children. In general, a children's product that contained more than 600 parts per million (ppm) of lead in any accessible part was to be treated as a hazardous substance. The sale of such products would be banned in the United States and would potentially result in civil and criminal liability. In August 2009, the allowable lead limits in children's products were to drop to 300 ppm, and the limits were to be reduced again in 2011 to the lowest lead level determined to be technologically feasible at the time (U.S. Consumer Product Safety Commission, 2009).

In August, the U.S. Environmental Protection Agency (EPA) announced a series of steps intended to prevent lead poisoning in children. The steps included additional proposed requirements to protect children from lead-based paint, a new effort to ban the manufacture of lead wheel weights, and a lead poisoning prevention video contest. The EPA planned to begin the process to expand coverage and strengthen the requirements of the 2008 Renovation, Repair, and Repainting rule, which was intended to reduce exposures to lead-based paint hazards for young children. The new expanded rule proposed to eliminate a provision that exempted some types of housing from the requirement that contractors are trained, certified, and use lead-safe work practices when renovating, repairing, or painting a pre-1978 home. The EPA expected to finalize this rule by April 2010. The EPA also planned to pursue a ban on the manufacture and distribution of lead wheel weights in response to a 2009 petition from multiple environmental and public health organizations (U.S. Environmental Protection Agency, 2009a).

In December, the EPA strengthened regulations that govern the shipment of hazardous waste from the United States to other countries for recycling. The new measures were meant to increase oversight of existing regulations covered by the Resource Conservation and Recovery Act (RCRA). RCRA gave the EPA the authority to control the generation, transportation, treatment, storage, and disposal of hazardous waste. The new, strengthened regulations were created to insure that hazardous waste (inclusive of lead-acid batteries) could only be exported from the United States to those countries that had the capabilities to recycle those materials in an environmentally

sound manner. The new measures stipulated that shippers of used lead-acid batteries would be required to provide export notification to and receive written consent from destination countries prior to exporting the materials for reclamation (U.S. Environmental Protection Agency, 2009b).

## Production

**Mine.**—In 2009, domestic mine production of recoverable lead was 395,000 t, a slight decline compared with that of 2008. Alaska and Missouri contributed the major share of the U.S. mine output of lead. Lead mine production also was reported in Idaho, Montana, and Washington. The lead-producing mines in Montana and Washington were closed during the first quarter of 2009. Domestic mine production data were collected by the U.S. Geological Survey (USGS) from a precious-metal and base-metal voluntary survey on lode-mine production (tables 1–4).

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 2009, Teck established a new annual record for contained metal production at Red Dog owing to increased mill operating rates and online time. Teck Alaska spent \$6 million to add 14 new employees and consultants that worked exclusively to improve mine productivity, which resulted in multiple process improvements in 2009. Production of lead in concentrate at Red Dog in 2009 increased by about 7% to 131,500 t compared with 122,600 t of lead in concentrate in 2008. Red Dog's shipping season began June 30 and ended on October 18; 220,000 t of lead concentrate was shipped in 2009. The company expected to produce 95,000 t of lead in concentrate at Red Dog in 2010, a decrease from 2009 production, owing to the mining of lower ore grades at the bottom of the main ore pit. At current production rates, the main pit was expected to be exhausted by the end of the first quarter of 2011. To ensure that production at Red Dog continues beyond 2011, Teck planned to begin mining at the adjacent Aqqaluk deposit in 2010. Beginning in 2011, the Aqqaluk deposit would become the main ore supply for the next 20 years. As of yearend 2009, Teck was awaiting the necessary permits from the EPA and the State of Alaska to commence prestripping and initial production at the Aqqaluk site (Teck Resources Ltd., 2010a, p. 27; 2010b, p. 44–45).

Teck's Pend Oreille zinc-lead mine in northeastern Washington, which produced 5,700 t of lead in concentrate in 2008, was placed on care-and-maintenance status in February 2009 owing to reduced metal demand and weakened zinc prices. A core group of employees remained at Pend Oreille after the shutdown to facilitate a possible restart in the future, while approximately 165 other employees were laid off and given severance packages and other benefits. Pend Oreille produced 900 t of lead in concentrate in 2009 before mining operations ceased. Proven and probable ore reserves at Pend Oreille, as of December 31, 2009, reportedly were estimated to be almost 1.9 Mt grading 6.1% zinc and 1.2% lead (Teck Cominco Ltd., 2010a, p. 27; 2010b, p. 45).

In January 2009, Doe Run Resources Corp. (St. Louis, MO) announced a 17% reduction in planned ore production at its southeastern Missouri lead mines in 2009. This adjustment to the original 2009 production plan was made in response to declines in the market price of lead during the second half of 2008. Based on the updated plan, Doe Run expected to produce about 4.5 Mt of ore in 2009. The company also reduced the workforce employed at its mills, mines, and smelters by 10%. The reduction in mine production came 3 months after Doe Run decided to temporarily take one of two blast furnaces offline and reduce production of primary refined lead at its smelter in Herculaneum, MO (Riley, 2009).

In early December 2008, the ore from the Montana Tunnels open pit operation near Helena, MT, was exhausted and the mine ceased operation. Apollo Gold Corp. (Greenwood Village, CO) was operator and a joint-owner of the Montana Tunnels with Elkhorn Tunnels LLC (Denver, CO). During the 4-month period that ended April 30, 2009, the mill processed 1.30 Mt of ore, which had been stockpiled when mining operations stopped at yearend 2008. Payable production of lead in 2009 was 1,510 t, 79% less than the 7,060 t of payable lead produced in 2008. During the third quarter of 2009, Apollo entered into an agreement to sell its 50% interest in the Montana Tunnels to Elkhorn, giving it 100% ownership of the mine. Elkhorn's immediate plans for the mining operations were unclear, but the potential for future mining did exist based on permits that Apollo had previously received that allowed for the expansion of the current pit (Apollo Gold Corp., 2010, p. 12, 60).

U.S. Silver Corp. (Toronto, Ontario, Canada) produced silver-lead ore at the Galena Mine located in the Coeur d'Alene mining district in Shoshone County, ID. In 2009, the company produced 2,920 t of lead in concentrate, a 54% increase from the 1,900 t produced in 2008. The production increases were attributed to improved operational efficiencies and mining techniques and continued progress made on rehabilitation work that the company has been performing since 2007. The company was working to repair and to reopen a key mine shaft that had been closed since 2000 owing to partial collapses and had limited the company's ability to reach some levels of the underground mine. U.S. Silver expected to have access to levels of the mine containing higher grade ore upon completion of the shaft rehabilitation work in 2010 (U.S. Silver Corp., 2009, p. 1, 21).

**Primary.**—Doe Run produced primary lead at a smelter-refinery facility in Herculaneum, MO. Concentrates for the smelter-refinery were provided mainly from four Doe Run mills that were supplied with ore mined from six production shafts along the Viburnum Trend in southeastern Missouri. In 2009, domestic primary lead metal production was 103,000 t, a 23% decrease compared with that of 2008 owing to the closure of one of two furnaces at the smelter. In October 2008, Doe Run had announced that it had planned to temporarily close one of two blast furnaces at its primary lead smelter owing to the decline in lead prices and unfavorable market conditions. The company, which had successfully operated the smelter with a single furnace doing the bulk of the work at times, expected to restart the second furnace when the market recovered (American Metal Market, 2008).

**Secondary.**—Domestic secondary production of refined lead decreased by about 3% in 2009 from that of 2008. Secondary lead accounted for 91% of domestic lead refinery production compared with 89% in 2008. Lead-acid batteries continued to be the dominant source of recoverable lead scrap, accounting for 94% of all lead produced from secondary sources. The domestic secondary statistics were derived by the USGS from a combined secondary producer and consumer survey that included data from monthly and annual surveys. All of the 13 companies producing secondary lead, exclusive of that produced from copper-based scrap, were surveyed; 11 responded, representing about 99% of the total production of secondary lead. Of the total lead recycled in 2009, the majority was produced by 7 companies operating 15 plants in Alabama, California, Florida, Indiana, Louisiana, 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, 4–8).

Exide Technologies (Milton, GA) temporarily closed its secondary lead smelter in Baton Rouge, LA, in the second quarter of 2009 owing to the downturn in the U.S. economy and the lead-acid battery industry. The plant had been operating at about one-half of its production capacity of 60,000 metric tons per year (t/yr) of refined lead. Shutdown procedures began in April 2009, when the plant was scheduled to cease accepting used lead-acid batteries for recycling. Following the closure of the smelter, Exide expected that its Frisco, TX, secondary lead smelter would process some of the material that previously had been processed at Baton Rouge (Ryan's Notes, 2009).

EnviroFocus Technologies, LLC (a wholly owned subsidiary of Gopher Resource Corp., Eagan, MN) planned to spend \$117 million to expand production capacity at its secondary lead smelter in Tampa, FL, by nearly 400%. When the project is completed by yearend 2011, the smelter would have the capacity to produce about 118,000 t/yr of refined lead, primarily from a feedstock of used lead-acid batteries. EnviroFocus planned to increase the number of full-time employees at the plant to 215 to support the added capacity (Schaffer, 2009a).

In early June, lead-acid battery manufacturer Johnson Controls Inc. (JCI) (Milwaukee, WI) announced that it was planning to build a \$100 million battery recycling plant in Florence, SC, that would eventually employ about 200 workers. JCI expected to break ground in the fall and commence production at the facility by yearend 2010. This would be the first recycling plant that JCI operated in the United States. Production capacity at the plant was expected initially to be about 90,000 t/yr of refined lead and would expand to 180,000 t/yr shortly after operations at the facility commence. Upon completion of new secondary lead plants in South Carolina and Mexico (more information can be found under Mexico in the World Review section), JCI expected to have the capacity to internally supply 50% of their lead requirements, compared with the current rate of 15% (CRU International Ltd., 2009a, p. 123; Schaffer, 2009b).

## Consumption

Reported U.S. consumption of refined lead decreased by about 11% in 2009. Significant decreases were reported in

the casting metals, lead-acid storage batteries, and sheet lead end-use sectors. Consumption of lead in SLI and industrial type lead-acid storage batteries represented about 89% of the total reported consumption of lead (tables 5–8). Demand for lead is heavily reliant on the lead-acid battery industry and in turn the automotive sector. The Battery Council International (BCI) reported that North American shipments of SLI automotive batteries in 2009 totaled 109.5 million units, a 6% decrease from those in 2008. This was the second consecutive year that SLI automotive battery shipments declined on a year-by-year basis. Shipments of replacement SLI batteries in 2009 totaled 98.8 million units, slightly less than those in 2008. Replacement batteries represented 90% of all North American battery shipments in 2009 compared with 85% in 2008. North American shipments of OE SLI batteries were 10.7 million units in 2009, a decline of 38% from those of 2008. The dropoff in shipments of OE batteries was attributed to the decline in new vehicle production during 2009 owing to the economic downturn that began in late 2008 and continued throughout 2009. Total domestic vehicle production in 2009 was about 5.6 million units, nearly 34% less than that in 2008. New vehicle registrations declined in 2009, while the average age of the vehicle fleet on the road in the United States increased to 10.2 years, the highest level in history. Maintenance requirements of the aging fleet kept the replacement battery market stable while demand for OE batteries plummeted. As economic conditions worsened in 2009, consumers began to delay preventative vehicle maintenance, such as exchanging older batteries for new units, opting instead to wait until batteries failed before replacing them (Battery Council International, 2010a, p. 3–8; CRU International Ltd., 2010, p. 129–130).

In 2009, the BCI Technical Subcommittee released the results of a study on the frequency rates of different types of failures commonly observed in lead-acid batteries. Failure mode data had been collected by the Technical Committee since 1962 and analyzed every 5 years since 1990. In the most recent report, 1,496 batteries from 10 regions in the United States were sampled between September and December 2009. Based on analysis of the data collected from the sample of failed lead-acid batteries, the BCI reached several conclusions about lead-acid batteries in North America. The group of lead-acid batteries in the sample lasted an average of 55 months before failing, increasing from an average age of 50 months during the last study and 40 months in the 1999–2000 study, indicating that materials, manufacturing process, and vehicle design improvements have extended the average life of lead-acid batteries. Batteries used in hotter southern climates did not last as long as those used in cooler northern climates, and newer lead-acid batteries were more resistant to heat compared with batteries from 10 years ago. Short circuits and plate/grid failures remained the most common types of lead-acid battery failures. The study also indicated that failure rates of serviceable batteries had remained constant at 15%. Separately in 2009, the BCI published a national lead-acid battery recycling rate study for 2004 to 2008 that indicated that the recycling rate of lead contained in lead-acid batteries in the United States was 96% (Battery Council International, 2010b).

In early August, the U.S. Department of Energy (DOE) announced that it was awarding \$2.4 billion in grants to accelerate the manufacturing and deployment of the next generation of batteries and electric vehicles in the United States. The grants, funded by the American Recovery and Reinvestment Act of 2009, were allocated to 48 advanced battery and electric vehicle component development projects in more than 20 States. The battery-related awards were distributed to companies involved in many different battery technologies including lead-acid battery development. Exide was awarded \$34.3 million to produce lead-acid batteries that incorporate advanced carbon technology for hybrid-electric vehicle (HEV) applications. Exide had previously entered into a memorandum of understanding with Axion Power International, Inc. (New Castle, PA), the developer of a patented lead-carbon battery technology called PbC, to develop and deploy new lead-acid batteries that use this technology. The company planned to use the DOE grant to fund development of both PbC and existing absorbed glass mat lead-acid battery technologies for HEV applications. Exide expected that the investment would enable production capacity to expand by about 1.5 million batteries and create 320 new jobs at manufacturing facilities in Georgia and Tennessee (Exide Technologies, 2009b).

Separately, East Penn Manufacturing Co., Inc. (Lyon Station, PA) received a \$32.5 million grant from the DOE to expand production capabilities and to manufacture advanced lead-acid batteries for HEVs. East Penn was planning to use the funding to become a leading source of advanced valve-regulated lead-acid batteries and for further development of the UltraBattery. East Penn had previously entered into an agreement to become the North American producer and distributor of the UltraBattery, an integrated lead-acid battery and supercapacitor that is considered suitable for HEV applications (East Penn Manufacturing Co., Inc., 2009).

The BCI reported that the sales value of industrial-type lead-acid batteries in North America, decreased by about 25% in 2009 compared with those of 2008, and unit sales declined by 11% in 2009 compared with that of 2008. The declines were reported for stationary power and motive power lead-acid batteries. Overall, 2009 shipments of industrial-type lead-acid batteries were valued at about \$1.28 billion compared with sales of \$1.70 billion in 2008. Stationary power batteries accounted for 56% of all industrial-type battery sales, and the remaining 44% was motive power batteries. In 2009, shipments of motive power lead-acid batteries declined by 25% from those in 2008. The majority of the motive power batteries sold in 2009 were those used in industrial trucks such as forklifts and material handling equipment. Demand for replacement motive power batteries remained constant, but sales of OE motive power batteries declined owing to a decrease in sales of new industrial trucks in 2009 compared with those of 2008. In 2009, sales of stationary power type lead-acid batteries that were used in uninterruptible power systems (UPS) applications and telecommunications installations decreased from sales in 2008 owing to a decline in corporate spending (Cullen, 2010).

Metalico Inc. (Cranford, NJ) was a leading domestic producer of nonbattery lead-based products in 2009. Metalico's lead fabricating segment produced lead sheet, shot, strips, and

various extruded products at four fabricating facilities. In 2009, sales of fabricated lead products were valued at \$62.5 million, a 30% decline compared with lead fabrication sales in 2008. The decline was attributed to a reduction in the average sales price of fabricated lead products in 2009 compared with that of 2008 (Metalico Inc., 2010, p. 30, 35).

## Prices

Lead prices increased throughout most of 2009 despite a surplus of refined lead in the global market and a downturn in the global economy that weakened demand for base metals. The LME average cash price for lead was \$1,132 per metric ton in January 2009, but by yearend had increased by 106% to \$2,328 per metric ton, the highest average monthly LME price for lead since April 2008. Significant price increases in 2009 were not necessarily supported by the physical lead market, which was considered to be in surplus for the entire year. Stocks of refined lead held in LME warehouses increased 225%, from 45,150 t in the beginning of January 2009 to 146,775 t by yearend 2009. The industrial sectors of many nations that typically consume significant quantities of lead slowed in 2009, with China being the most notable exception. The loss of refined lead capacity in China owing to temporary smelter shutdowns was another contributing factor to price increases during the second half of 2009. On an annual average basis, the LME cash and North American Producer prices in 2009 were down by \$0.168 per pound (18%) and \$0.335 per pound (28%) respectively, from the average prices of \$0.948 per pound and \$1.203 per pound, respectively, in 2008.

## Foreign Trade

In 2009, imports of unwrought lead metal for consumption totaled 251,000 t, a 19% decrease from those of 2008. The leading source was Canada, accounting for 82% of unwrought lead metal imports. Imports from Mexico decreased by 29% to 41,000 t, and those from Peru were down by 91% to 991 t. Total domestic exports of unwrought lead increased by 14% to 77,600 t. Mexico was the leading destination for the unwrought lead exported in 2009, accounting for about 75% of all shipments. Domestic exports of lead in concentrate were 287,000 t, a 4% increase from those of the previous year. Lead in concentrate exports to China and the Republic of Korea increased, while exports to Canada, Japan, and Mexico declined (tables 10–12).

In 2009, the United States imported about 22 million SLI lead-acid batteries for consumption, essentially unchanged from those of 2008. Mexico was the leading provider of SLI batteries, accounting for 70% of the SLI batteries imported in 2009. SLI batteries were also imported from China, Germany, the Republic of Korea, Spain, and Taiwan. The United States exported about 7.30 million spent SLI lead-acid batteries in 2009, 10% fewer than those of 2008. The majority of those units (88%) were shipped to Mexico for recycling.

## World Review

World mine production of lead increased slightly to 3.86 Mt in 2009. China was the leading producer accounting for about 41% of the world total, followed by Australia, with 15%; the

United States, 11%; Peru, 8%; and Mexico, 4% (table 13). In 2009, four lead mines in Mexico, Peru, Russia, and Spain opened, adding about 129,000 t/yr of new global lead mine production capacity. The most significant of the new mines in terms of added capacity was the Penasquito Mine in Mexico. Six mines with a combined lead concentrate production capacity of 57,000 t/yr closed, four temporarily and two permanently. The mine closures were in Australia, Ireland, Peru, and the United States. Among the major lead-mine-producing countries, decreases took place in Australia, Canada, and Peru while mine production increased in Bolivia, China, Mexico, and Russia. The global economic slowdown caused exploration expenditures for base-metals projects to decline in many regions in 2009 compared with those of 2008. Mining companies cited the decline in global commodity prices and reduced access to capital as reasons for scaling back exploration.

World production of refined lead (primary and secondary) increased slightly, to 8.82 Mt in 2009 from 8.70 Mt in 2008. China was the leading producer of refined lead, accounting for 42% of total world production, followed by the United States, with 14%; Germany, 4%; and Australia, Canada, Japan, the Republic of Korea, and the United Kingdom, 3% each (table 14). Secondary (recycled) lead has accounted for an increasing portion of the total global lead supply during the past 10 years. Secondary lead production represented about 53% of total refined lead production worldwide in 2009 compared with 47% in 1999. In 2009, two lead smelters opened in China and Thailand, adding about 99,000 t/yr of refined lead production capacity. Conversely, six smelters closed in China, Italy, Peru, Romania, Switzerland, and the United States, resulting in a loss of 377,000 t/yr of refined lead production capacity in 2009 (International Lead and Zinc Study Group, 2010d, p. 5–6).

According to ILZSG (2010c, p. 8–9), consumption of refined lead decreased slightly to 8.63 Mt in 2009 from 8.65 Mt in 2008, the first annual decline in global lead consumption since 2001. The leading refined-lead-consuming countries in 2009 were China, 45%; the United States, 16%; Germany, 4%; and the Republic of Korea, 3%. ILZSG data indicated that there was a global refined lead supply surplus of about 100,000 t by yearend 2009.

**Australia.**—Xstrata plc (Zug, Switzerland) received final approval from the Australian Minister for the Environment, Heritage, and the Arts, to proceed with an open pit development plan at its McArthur River zinc-lead mine in Australia's Northern Territory. Operations at the mine, which had been suspended in mid-December 2008 following a federal court ruling that invalidated a previous approval of the development plan, were restarted in late February 2009. Xstrata intended to convert the existing underground zinc-lead mine to an open pit operation in order to extend the life of the mine by about 25 years. The most accessible underground ore at the mine had been extracted, and further underground mining operations were no longer financially viable. The proposed development allowed Xstrata to mine identified reported reserves of 43 Mt of ore containing 11.9% zinc, 5.2% lead, and 53 grams per metric ton silver. Upon receiving final approval for the conversion, Xstrata expected that the construction process would last at least 2 years. Production capacity of zinc-lead-silver bulk concentrates

at McArthur River was reported to be about 320,000 t/yr in 2008. Lead in concentrate production in 2009 was 37,100 t, a slight increase from that in 2008 (McArthur River Mining Pty. Ltd., 2009; Xstrata plc, 2009).

In mid-August, Magellan Metals Pty. Ltd. [a wholly owned subsidiary of Ivernia Inc., (Toronto)] announced that the Western Australian government had given final approval to a plan that allowed for the transport of sealed containers of lead concentrate from the Magellan lead mine in Western Australia to the Port of Fremantle. The plan required Magellan to fund independent auditing, inspection, and monitoring of every shipment from the mine to ensure that lead was not entering the environment along the transport route. Magellan also consulted with all 22 local government authorities along the transport route to develop an emergency response program in the event of a mishap. Mining operations at Magellan had been suspended in April 2007 owing to environmental concerns associated with the transport of lead concentrate from the mine. On September 29, Magellan announced that it had commenced exporting sealed shipments of lead concentrate from existing stockpiles at the mine. The initial shipment consisted of 450 t of lead concentrate that was bagged, loaded into sealed containers, and then transported by road and then rail to the port, where it was shipped to a smelter in China. This was the first in a series of shipments scheduled to continue until 21,000 t of stockpiled lead concentrate was depleted, which was expected to take about 6 months. In late 2009, Ivernia began maintenance and refurbishment projects that would allow concentrating and mining operations to restart at Magellan in early 2010. The primary source of the lead produced at Magellan is a near-surface cerussite (lead carbonate) deposit. When operating at full capacity, the mine was capable of producing about 85,000 t/yr of lead concentrate (Ivernia Inc., 2009a, b).

**Belgium.**—In Belgium, Umicore s.a. (Brussels) announced that it had decided to close the lead sheet operation at its Overpelt facility, which had been operating in a declining market for some time. The European construction industry, which consumed lead sheet products for roofing, experienced a slowdown in activity that began in the fourth quarter of 2008 (Umicore s.a., 2009).

**Bolivia.**—Atlas Precious Metals Inc. was expecting to bring its primary lead-silver smelter in Karachipampa onstream in early 2010. Atlas was planning to begin production at the smelter upon receiving an environmental permit that would allow for the installation of a 500,000-t/yr sulfuric acid plant. When operating at full production, the plant would produce about 21,000 t/yr of primary refined lead, 196 t/yr of silver, and 30,000 t/yr of recovered byproducts such as bismuth crystals, indium, and zinc oxide (Metal Bulletin, 2009a).

**Canada.**—In 2009, lead concentrates were produced at two mines located in British Columbia and New Brunswick. There was a 31% decrease in mine production in 2009 compared with that of 2008 owing to the closure of several mines that had reopened when metal prices were elevated in 2006 and 2007. Primary refined lead metal was produced from domestic and foreign concentrates at two smelters located in New Brunswick and British Columbia. Secondary lead metal was produced from recycled lead (primarily lead-acid batteries) at four sites

in Quebec, Ontario, and British Columbia. Total refined lead production in 2009 was essentially unchanged from that in 2008 (Natural Resources Canada, 2010, p. 1–29).

Xstrata's underground zinc-lead mine near Bathurst, New Brunswick, was the leading producer of lead in concentrate in Canada. The mine had production capacity to process 3.60 Mt of ore containing copper, lead, silver, and zinc on an annual basis. In 2009, Brunswick Mine produced 66,000 t of lead in concentrate, down by 6% from the 70,000 t produced in 2008. The operating status of the Brunswick mine was expected to change during the next 2 years owing to depletion of mineral resources at the site. The mine was slated to reach the end of its life and close in early 2010; however, Xstrata was focusing efforts on extending the life of the mine to yearend 2012 (Xstrata plc, 2010a, p. 95).

In late March, Acadian Mining Corp. (Halifax, Nova Scotia) placed its Scotia open pit, lead-zinc mine in Gays River, Nova Scotia, on care-and-maintenance status owing to the decline in zinc and lead prices in 2008. Between the second quarter of 2007 when operations at the Scotia Mine were restarted and fourth quarter 2008, the company produced about 8,540 t of lead in concentrate. Upon the mine closure, the company planned to primarily engage in the exploration, acquisition, and development of gold, base metal, and barite properties on the Atlantic coast of Canada (Acadian Mining Corp., 2010, p. 4, 91).

Teck announced that 2009 refined lead production at its metallurgical complex at Trail was 72,600 t, a 15% decrease from that of 2008 owing to operational issues in the dressing plant, where the lead is purified. The dressing furnace separates copper and other impurities from lead bullion tapped from the Kivcet furnace before the lead is sent to the refinery. In the fourth quarter of 2009, Teck shut down the primary lead smelter for 20 days to perform maintenance work and repairs after loose bricks were discovered inside the furnace. By yearend 2009, the lead smelter had returned to full production. Teck expected to produce 80,000 t of refined lead at Trail in 2010 (American Metal Market, 2009; Teck Resources Ltd., 2010b, p. 44).

**China.**—China continued to be the leading global producer and consumer of lead in 2009. China was also the leading producer of lead-acid batteries in the world. Between 1999 and 2009, China's demand for lead contained in lead-acid batteries was generated by tremendous growth in the production of automobiles, electric bicycles (e-bikes), and motorcycles, increasing by 23%, 74%, and 8% respectively. The number of e-bikes in China had grown to an estimated 100 million by yearend 2009. Each e-bike needed at least one lead-acid battery per year, containing about 10 kilograms of lead, to operate, which translated to about 1 Mt of lead consumed for this use in 2009. Consumption of lead in China has increased by an average of 20% per year from 1999 to 2009 and was estimated to be about 3.86 Mt in 2009 (International Lead and Zinc Study Group, 2010a, p. 1–14).

Lead in concentrate production in 2009 was 1.60 Mt, a 7% increase from the 1.50 Mt produced in 2008. Mine ore production increased dramatically in the fourth quarter of 2009 from that early in the year, as mining companies attempted to meet their annual production goals. Guangxi, Henan, Hunan,

and Sichuan Provinces had the greatest production increases in 2009 compared with production in 2008. China also imported about 884,000 t of lead in concentrate in 2009, 11% more than lead in concentrate imports in 2008.

Refined lead production in 2009 was 3.71 Mt, a 16% increase from the 3.20 Mt produced in 2008. Despite deteriorating market conditions during the global economic slowdown in 2009 and the Government's emphasis on phasing out smaller nonferrous metal-producing facilities, major producers continued with plans to increase and modernize lead refining capacity in China. In June, Luoyang Yongning Gold and Lead Smelting Co., Ltd. commissioned a new 80,000-t/yr primary lead smelter. Yuguang Gold and Lead Co. Ltd. planned to commission a new 80,000-t/yr lead smelter after the completion of trial production that began in October 2009. In July, Jianxi Copper launched construction of new smelters that were to have the capacity to produce 100,000 t/yr of lead and zinc by yearend 2011. In total, at least 11 lead-smelting projects were under construction and had the potential to add about 600,000 t/yr of refined lead capacity by yearend. Secondary production has become an increasingly significant part of the lead metal supply in China owing to the growing quantities of used lead-acid batteries generated by the automobile and e-bike markets. In 2009, secondary lead production accounted for 35% of total refined lead production in China, compared with 22% in 2005. Secondary lead production was expected to continue to increase and approach 50% of total refined lead output by 2015. In 2009, 157,000 t of refined lead was imported, 409% more than in 2008 (China Metal Market—Lead, Zinc & Tin, 2009a, p. 2; 2009b, p. 1–2; 2010, p. 8–13).

The National Development and Reform Commission released a 3-year plan to consolidate and improve the country's nonferrous metals industry in response to the deteriorating global financial situation. The Government intended to phase out 1.30 million metric tons per year of nonferrous metal production capacity by yearend. The reductions included 300,000 t/yr of copper, 600,000 t/yr of lead, and 400,000 t/yr of zinc smelting capacity. Plants that had been using outdated or obsolete production technologies were to be closed, and the Government encouraged mergers and restructuring in the industry to improve economies of scale. Ultimately, a handful of leading companies would produce the majority of the nonferrous metals in China, potentially creating a more stable production base (Mining Journal, 2009).

In the third quarter of 2009, China's Ministry of Environmental Protection demanded urgent measures to reduce heavy-metal poisoning in response to an increase in such incidents during the year. Multiple lead smelters and lead-acid battery producers were forced to cease operations during 2009 owing to the poisoning of populations living in close proximity to plants in Henan, Hunan, Shaanxi, and Yunnan Provinces. Thousands of children had elevated levels of lead in their blood as a result of pollution generated from lead smelters and battery plants. The most notable of the initial incidents involved elevated lead levels discovered in the blood of more than 600 children living near a lead and zinc smelter in Shaanxi Province in August 2009. The incident led to further investigation of lead smelters by the government and environmental officials and

revealed similar problems in other locations. It was estimated that by fall of 2009, about 400,000 t to 500,000 t of refined lead capacity (9.5% of total capacity) in China had been idled or was under investigation and likely to be closed by authorities owing to environmental concerns. The abundance of smaller lead smelters in China made it more difficult for the government to monitor and regulate lead pollution. These plant closures were a driving force behind a midyear spike in LME lead prices, but they were not expected to have a long-term impact on Chinese refined lead supply. In September, the Ministry of Environmental Protection passed a plan for the comprehensive rectification of heavy-metal pollution, focusing on arsenic, cadmium, chromium, lead, and mercury pollution. Details of the plan were not disclosed in full, but initial action involved sending inspection teams out to major lead-producing provinces to conduct environmental checks. It was expected that during the next few years, federal and regional governments would continue to work towards phasing out older smelting capacity that was often linked to lead poisoning incidents in favor of more modern facilities that are better equipped to limit environmental emissions (Metal Bulletin, 2009b; Metal-Pages, 2009).

**Guatemala.**—In late May, Acumuladores Iberia S.A. (Guatemala City) secured a license from the Guatemalan Government to import used lead-acid batteries. Acumuladores Iberia operated a lead recycling plant in Guatemala City that processed about 120,000 used lead-acid batteries per year from domestic sources. With this new import license, the company would have the capacity to recycle as many as 1.2 million batteries per year and create 150 new jobs. This increased capacity was expected to be significant for the entire Central American region, which had previously been heavily reliant on secondary plants in Mexico for lead-acid battery recycling and refined lead (International Lead Association, 2009).

**India.**—In support of its emerging industrial economy and automotive sector, mine and refined lead production increased in 2009 compared with that in 2008 as did lead-acid battery production. Hindustan Zinc Ltd. (HZL) (Udaipur), India's leading integrated zinc and lead producer, produced 575,000 t of mined zinc and lead in concentrate at its four active mines during the 9 months that ended December 31, 2009, a 7% increase compared with production in the same period of 2008. Construction work continued on schedule at a new zinc and lead smelter in Rajpura Dariba that was expected to produce 100,000 t/yr of primary lead when completed in mid-2010. HZL was also expanding production capacities at its Kayar, Rampura Agucha, and Sindesar Khurd zinc-lead mines for progressive commissioning from mid-2010 to 2012. Upon completion of all of these projects, HZL's total zinc and lead smelting capacity would be 1,060,000 t/yr. HZL's expanded production capacity could help satisfy some of the increased demand for lead in India, which has become heavily reliant on imported lead during the past several years. ILZSG data indicated that India imported 125,000 t of lead metal in 2009, an increase of 20% compared with lead metal imports in 2008 (Hindustan Zinc Ltd., 2010, International Lead and Zinc Study Group, 2010c).

**Ireland.**—In the second quarter of 2009, Lundin Mining Corp. (Toronto) permanently ceased operational mining and

millling at its Galmoy zinc-lead-silver mine in south-central Ireland owing to the decline in zinc prices. During the mine closure process, the company was extracting limited quantities of remnant high-grade ore for shipment to an adjacent mine for processing. These activities were expected to last until 2011 and did not affect the overall plan to permanently close the mine. Galmoy produced 6,720 t of lead in concentrates in 2009, 43% less than the 11,700 t produced in 2008 (Lundin Mining Corp., 2009; 2010, p. 19).

**Italy.**—Glencore International AG (Baar, Switzerland) placed the lead production line at its Porto Vesme metallurgical complex (Sardinia) on temporary care-and-maintenance status. Porto Vesme is an integrated zinc and lead smelting operation that can smelt both primary and secondary materials. Production capacity at the facility was reported to be 120,000 t/yr refined zinc and 80,000 t/yr refined lead. The zinc production line was expected to continue operating at normal production levels (O'Donovan, 2009).

**Mexico.**—In mid-October, Goldcorp Inc. (Vancouver, British Columbia, Canada) announced that the first lead and zinc in concentrates were produced at its Penasquito gold-silver-lead-zinc project in the northeast corner of the State of Zacatecas. The company had committed \$1.6 billion to construct the mine, mills, and associated facilities since it acquired the Penasquito property in 2006. Penasquito consists of two open pit mines, Penasco and Chile Colorado, which produce oxide and sulfide ore. Development of the site proceeded on time and on budget during 2009, and the company planned to begin production in January 2010. By yearend 2009, Goldcorp estimated that Penasquito would have a mine life of 22 years and produce an estimated average of 204,000 t/yr of zinc in concentrates and 90,700 t/yr of lead in concentrates (Goldcorp Inc., 2010, p. 10–11, 58–59).

In August, JCI began construction on a new secondary lead smelter in Villa de Garcia, near Monterrey, in northeastern Mexico that would more than double its secondary refined lead output in Mexico. The facility was expected to initially have the capacity to produce 132,000 t/yr of refined lead and eventually could be expanded to 170,000 t/yr of refined lead. The plant would process about 13 million used lead-acid batteries per year. JCI was planning to have the smelter fully operational by the fourth quarter of 2010. Refined lead production capacity at JCI's existing secondary smelter in Cienega de Flores would be unchanged at 120,000 t/yr (CRU International Ltd., 2009b, p. 121).

**Peru.**—Lead mine production in 2009 was 302,000 t, a 12% decline from the 345,000 t of lead produced in 2008. Peru has been one of the leading global producers of lead concentrates for more than a decade. Several major mines scaled back lead production in 2009, and one lead-producing mine suspended operations in the spring. Volcan Compania Minera S.A.A., a leading lead producer in Peru, reportedly slowed production considerably at its open pit and underground lead mine in Cerro de Pasco in early 2009 owing to declining lead and zinc price. The company also postponed plans to expand its mining operations (CRU International Ltd., 2009b, p. 22).

In March, Glencore temporarily suspended operations at its Iscaycruz zinc-lead operations in the Central Andes owing to



declining global prices for lead and zinc. Iscaycruz consisted of an open pit and underground mine that had the capacity to produce 50,000 t/yr of lead in concentrate and employed about 2,000 workers (Reuters, 2009).

In the second quarter of 2009, Doe Run Peru halted operations at its La Oroya metallurgical complex, 140 km east of Lima owing to environmental and financial problems that kept it from obtaining copper, lead, and zinc concentrates to process. La Oroya had the capacity to produce 120,000 t/yr of refined primary lead. Unsure of the company's financial stability following the late 2008 decline in commodity prices, banks froze credit lines that the smelter needed for working capital to purchase feed concentrates from suppliers. By yearend 2009, Doe Run owed its concentrate suppliers \$100 million and needed an additional \$150 million to complete an ongoing environmental cleanup of La Oroya in which Doe Run had already invested \$307 million. Workers at La Oroya were forced to take a 90-day holiday (receiving partial pay) beginning August 1, 2009, and this holiday was later extended to January 27, 2010. It was estimated that because of these problems La Oroya produced about 25,000 t of refined lead in 2009, 78% less than the 114,000 t of refined lead produced in 2008. As of late 2009, the company was working with the Peruvian Government and its creditors to formulate a plan that would allow Doe Run to restart operations at the facility and complete its environmental obligations, but by yearend no definitive timetable had been established (CRU Lead Monitor, 2009b; Platts Metals Week, 2009a).

**Romania.**—In January, Mytilineos Holding S.A. (Athens, Greece) informed investors that it was temporarily suspending production at its zinc-lead metallurgical facility in Copsa Mica owing to adverse international market conditions for metals and a lack of raw materials for the production of zinc after the world's only bulk concentrate mine (McArthur River in Australia) suspended operations. The plant was operated by Sometra S.A., a subsidiary in which Mytilineos owned a 93% interest. The company drastically reduced personnel at the plant, cutting about 80% of the 1,100 employees that worked in Copsa Mica. In 2008, the last full year of operation, Copsa Mica produced about 65,000 t of refined zinc and 20,000 t of refined lead (CRU Lead Monitor, 2009a; Mytilineos Holding S.A., 2009).

**Russia.**—Highland Gold Mining Ltd. (HGM), (St. Helier, United Kingdom), commissioned the Novosirokinskoye Mine in early October. Novosirokinskoye, in Eastern Siberia, primarily produced lead and zinc concentrates with an expected capacity of about 20,000 to 28,000 t/yr of lead concentrate when operating at full production. HGM planned to test various processing technologies during the remaining portion of 2009 and ramp-up production beginning in January 2010. Novosirokinskoye was scheduled to employ a workforce of more than 1,000 employees (Highland Gold Mining Ltd., 2009).

**Zambia.**—Central Recycling Ltd., a Zambian-registered company, announced that it planned to produce lead metal ingot and lead oxide from used lead-acid batteries at a new lead recycling plant that was under construction in Kabwe. The company expected that it would produce about 2,400 t/yr of lead ingot for export, and its lead oxide production capacity would

depend on the availability of feedstock. Construction of the plant was expected to last until November, and production was to begin by yearend 2009 (Platts Metals Week, 2009b).

## Outlook

At its spring meeting in Lisbon, Portugal, ILZSG forecast global increases in lead mine and refinery production as well as in lead consumption in 2010. Global lead mine production was expected to increase to 4.20 Mt in 2010, a 5% increase from that of 2009 owing to greater output in Australia, China, India, and Mexico. Global refined lead metal production in 2010 was expected to increase to 9.41 Mt, an 8% increase from that of 2009 owing to production increases and new plants in Brazil, China, and India. The majority of new primary and secondary refined lead capacity added in 2010 was expected to be in China.

Global consumption of refined lead in 2010 was forecast to be 9.31 Mt, a 7% increase from that of 2009, according to ILZSG. The global increase in consumption was attributed to a 9% increase in demand for refined lead in China owing to growth in the automotive, e-bike, and industrial battery sectors. Consumption in Europe, India, and the United States was expected to be slightly greater in 2010 than in 2009. In North America, the BCI forecast that total shipments of SLI lead-acid batteries would increase slightly in 2010 from those in 2009. Provided that the majority of vehicles in the current fleet continue to be operated on a regular basis, the replacement SLI battery market was expected to remain stable in the near future. Shipments of OE batteries will be heavily reliant on sales of new automobiles, which were expected to slightly increase on an annual basis during the next few years. North American sales of industrial-type lead-acid batteries were expected to increase in 2010 from sales of 2009 owing to increased demand for motive power and standby batteries from the business sector. Overall, ILZSG expected that production of refined lead would exceed consumption, and the lead market would remain in surplus of about 100,000 t by yearend 2010 (Cullen, 2010; International Lead and Zinc Study Group, 2010b).

A new research collaboration announced in mid-July had the potential to advance current lead-acid battery technology for future use in emerging technologies. Exide announced that it had entered into a cooperative research and development agreement with the U.S. Department of Energy's Savannah River National Laboratory (SRNL) and the University of Idaho to develop and commercialize improvements in lead-acid battery technology. The project was one component of a larger SRNL-sponsored research and development program supporting the Nation's energy security. SRNL expected that the collaborative efforts of the two research institutions and Exide would lead to the development of improved battery materials such as cathode plates, enhance lead-acid battery performance, and lower material costs and weight. Advancements in lead-acid battery chemistry could be used to broaden lead-acid battery opportunities in new markets for HEVs and renewable energy storage. Researchers involved with the project foresaw lead-acid batteries becoming increasingly feasible for supporting the Nation's electric grid as well as providing stand-alone backup power to alternative energy systems such as solar and wind. Potential growth existed in the use of lead in batteries for

microhybrid electric vehicles that have automatic stop-start functionality to cut engine power and operate on battery power when idling, in lead-cooled nuclear powerplants, and as a material component in thermoelectric energy conversion (Exide Technologies, 2009a).

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TABLE 1  
SALIENT LEAD STATISTICS<sup>1</sup>

		2005	2006	2007	2008	2009
United States:						
Production:						
Mine, recoverable lead content: <sup>2</sup>						
Quantity	metric tons	426,000	419,000	434,000	399,000	395,000
Value	thousands	\$574,000	\$715,000	\$1,180,000	\$1,060,000	\$757,000
Primary lead, refined content, domestic ores and base bullion	metric tons	143,000	153,000	123,000	135,000	103,000
Secondary lead, lead content	do.	1,150,000	1,160,000	1,180,000	1,140,000 <sup>r</sup>	1,110,000
Exports, lead content:						
Lead ore and concentrates	do.	390,000	298,000	300,000	277,000	287,000
Lead materials, excluding scrap	do.	64,600	68,500	56,500	74,800 <sup>r</sup>	82,000
Imports for consumption, lead content:						
Lead in base bullion	do.	29	539	1,990	2,740	844
Lead in pigs and bars	do.	298,000	331,000	263,000	309,000	251,000
Stocks, December 31, lead content:						
Primary lead	do.	W	W	W	W	W
At consumers and secondary smelters	do.	46,800	54,800	39,000	72,500 <sup>r</sup>	63,500
Consumption of metal, primary and secondary, lead content	do.	1,490,000	1,490,000	1,570,000	1,440,000 <sup>r</sup>	1,290,000
Price:						
North American Producer average, delivered <sup>3</sup>	cents per pound	61.03	77.40	123.84	120.33	86.87
London Metal Exchange, pure lead, cash average <sup>3</sup>	do.	44.23	58.00	117.00	94.79	77.95
World:						
Production, gross weight:						
Mine	metric tons	3,470,000 <sup>r</sup>	3,590,000 <sup>r</sup>	3,690,000 <sup>r</sup>	3,860,000 <sup>r</sup>	3,860,000
Primary refinery	do.	3,500,000 <sup>r</sup>	3,720,000 <sup>r</sup>	3,790,000 <sup>r</sup>	4,080,000 <sup>r</sup>	3,960,000 <sup>e</sup>
Secondary refinery	do.	3,950,000 <sup>r</sup>	4,050,000 <sup>r</sup>	4,230,000 <sup>r</sup>	4,430,000 <sup>r</sup>	4,680,000 <sup>e</sup>

<sup>e</sup>Estimated. <sup>r</sup>Revised. do. Ditto. W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Data are rounded to no more than three significant digits, except prices.

<sup>2</sup>Lead recoverable after smelting and refining. Data in table 13 represent lead in concentrate.

<sup>3</sup>Platts Metals Week.

TABLE 2  
MINE PRODUCTION OF RECOVERABLE LEAD IN THE UNITED STATES, BY STATE<sup>1</sup>

(Metric tons, lead content)

State	2008	2009
Alaska and Missouri	360,000	370,000
Idaho, Montana, Washington	38,600	24,900
Total	399,000	395,000

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

TABLE 3  
LEADING LEAD-PRODUCING MINES IN THE UNITED STATES IN 2009, IN ORDER OF OUTPUT<sup>1</sup>

Rank	Mine	County and State	Operator	Source of lead
1	Red Dog	Northwest Arctic, AK	Teck Alaska Inc.	Zinc-lead ore.
2	Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
3	Fletcher	do.	do.	Do.
4	Buick	Iron, MO	do.	Do.
5	Viburnum (#29 and #35)	Washington and Iron, MO	do.	Do.
6	Greens Creek	Juneau, AK	Hecla Mining Co.	Zinc-silver ore.
7	Lucky Friday	Shoshone, ID	do.	Silver ore.
8	Sweetwater	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
9	Galena	Shoshone, ID	U.S. Silver Corp.	Silver ore.
10	Montana Tunnels	Jefferson, MT	Apollo Gold Corp.	Gold ore.
11	Pend Oreille	Pend Oreille, WA	Teck Washington Inc.	Zinc-lead ore.

Do., do. Ditto.

<sup>1</sup>The mines on this list accounted for 100% of the U.S. mine production in 2009.

TABLE 4  
LEAD RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,  
BY KIND OF SCRAP AND FORM OF RECOVERY<sup>1</sup>

(Metric tons, lead content, unless otherwise specified)

	2008	2009
Kind of scrap:		
New scrap:		
Lead-base	18,600	20,100
Copper-base	NA	NA
Tin-base	1,530 <sup>r</sup>	1,530
Total	20,100	21,600
Old scrap:		
Battery-lead	1,070,000 <sup>r</sup>	1,040,000
All other lead-base	52,500	47,400
Copper-base	NA	NA
Total	1,120,000 <sup>r</sup>	1,090,000
Grand total	1,140,000 <sup>r</sup>	1,110,000
Form of recovery:		
As soft lead	1,000,000	960,000
In antimonial lead	140,000	151,000
In other lead alloys	2,410	(3)
In copper-base alloys	NA	NA
Total:		
Quantity	1,140,000 <sup>r</sup>	1,110,000
Value <sup>2</sup>	\$3,040,000 <sup>r</sup>	\$2,130,000

<sup>r</sup>Revised. NA Not available.

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

<sup>2</sup>Value based on average quoted price of common lead.

<sup>3</sup>Included with "As soft lead."

TABLE 5  
U.S. CONSUMPTION OF LEAD, BY PRODUCT<sup>1</sup>

(Metric tons, lead content)

SIC <sup>2</sup> code	Product	2008	2009
Metal products:			
3482	Ammunition, shot and bullets	67,400 <sup>r</sup>	67,900
Bearing metals:			
35	Machinery except electrical	W	W
371	Motor vehicles and equipment	W	W
37	Other transportation equipment	W	W
Total		1,250	1,100
3351	Brass and bronze, billets and ingots	2,460	1,370
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		20,100	15,900
Pipes, traps, other extruded products:			
15	Building construction	1,190 <sup>r</sup>	1,130
3443	Storage tanks, process vessels, etc.	(4)	(4)
Total		1,190 <sup>r</sup>	1,130
Sheet lead:			
15	Building construction	16,500	16,300
3443	Storage tanks, process vessels, etc.	W	W
3693	Medical radiation shielding	W	W
Total		26,400 <sup>r</sup>	25,400
Solder:			
15	Building construction	W	W
341	Metal cans and shipping containers	W	W
367	Electronic components, accessories, and other electrical equipment	6,290 <sup>r</sup>	6,160
371	Motor vehicles and equipment	W	W
Total		6,610 <sup>r</sup>	6,450
Storage batteries:			
3691	Storage battery grids, post, etc.	575,000 <sup>r</sup>	389,000
3691	Storage battery oxides	715,000 <sup>r</sup>	750,000
Total storage batteries		1,290,000	1,140,000
27	Type metal, printing and allied industries	(3)	(3)
34	Other metal products <sup>5</sup>	7,670 <sup>r</sup>	5,790
Grand total		1,420,000 <sup>r</sup>	1,260,000
Other oxides:			
285	Paint	W	W
32	Glass and ceramics products	W	W
28	Other pigments and chemicals	W	W
Total		10,700	10,100
Miscellaneous uses		10,800	12,200
Grand total		1,440,000 <sup>r</sup>	1,290,000

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data; included in appropriate totals.

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

<sup>2</sup>SIC Standard Industrial Classification.

<sup>3</sup>Included with "Metal products: Other Metal products."

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

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

TABLE 6  
U.S. CONSUMPTION OF LEAD IN 2009, BY STATE<sup>1,2</sup>

(Metric tons, lead content)

State	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
California and Washington	25,800	1,250	2,380	--	29,400
Illinois	8,150	17,400	--	--	25,600
Iowa, Michigan, Missouri	4,760	--	W	--	4,760
Ohio and Pennsylvania	114,000	70,700	41,500	W	227,000
Arkansas and Texas	71,200	24,200	W	--	95,400
Alabama, Georgia, Oklahoma	31,600	8,310	W	--	39,900
Indiana, Kansas, Kentucky, Minnesota, Nebraska, Tennessee, Wisconsin	158,000	53,200	32,600	W	244,000
Connecticut, Maryland, New Jersey, New York, North Carolina, South Carolina	4,750	2,320	813	--	7,880
Various States	450,000	68,200	94,600	538	613,000
Total	869,000	246,000	172,000	538	1,290,000

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

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

<sup>2</sup>Includes lead that went directly from scrap to fabricated products.

TABLE 7  
U.S. CONSUMPTION OF LEAD IN 2009, BY CLASS OF PRODUCT<sup>1,2</sup>

(Metric tons, lead content)

Product	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
Metal products	52,200	66,700	W	W	125,000
Storage batteries	794,000	179,000	166,000	--	1,140,000
Miscellaneous <sup>3</sup>	22,300	W	W	W	22,300
Total	869,000	246,000	172,000	538	1,290,000

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

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

<sup>2</sup>Includes lead that went directly from scrap to fabricated products.

<sup>3</sup>Included in "Miscellaneous" are other oxides and gasoline additives.

TABLE 8  
STOCKS OF LEAD AT CONSUMERS AND SECONDARY SMELTERS  
IN THE UNITED STATES, DECEMBER 31<sup>1,2</sup>

(Metric tons, lead content)

Year	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
2008	36,000 <sup>r</sup>	20,100 <sup>r</sup>	W	W	72,500 <sup>r</sup>
2009	33,200	20,000	W	W	63,500

<sup>r</sup>Revised. W Withheld to avoid disclosing company proprietary data; included in "Total."

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

<sup>2</sup>Includes stocks at primary refineries.

TABLE 9  
PRODUCTION AND SHIPMENTS OF LEAD PIGMENTS AND OXIDES IN THE UNITED STATES<sup>1,2</sup>

(Metric tons and dollars)

Product	2008				2009			
	Production		Shipments <sup>e</sup>		Production		Shipments <sup>e</sup>	
	Gross weight	Lead content	Quantity (lead content)	Value <sup>3</sup>	Gross weight	Lead content	Quantity (lead content)	Value <sup>3</sup>
Litharge, red lead and white lead, dry	--	--	2,700	\$6,330,000	--	--	2,520	\$3,400,000
Leady oxide	740,000	703,000	NA	NA	757,000	719,000	NA	NA
Total	740,000	703,000	NA	NA	757,000	719,000	NA	NA

<sup>e</sup>Estimated. NA Not available. -- Zero.

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

<sup>2</sup>Excludes basic lead sulfate to avoid disclosing company proprietary data.

<sup>3</sup>At plant, exclusive of container.

TABLE 10  
U.S. IMPORTS FOR CONSUMPTION OF LEAD PIGMENTS AND COMPOUNDS, BY KIND<sup>1</sup>

Kind	Quantity	Value
	(metric tons, lead content)	(thousands)
2008:		
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,500	\$8,700
Litharge	1,900	6,410
Glass frits (undifferentiated)	22,800	47,300
Total	26,200	62,400
2009:		
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,270	6,840
Litharge	971	2,570
Glass frits (undifferentiated)	25,800	37,400
Total	28,100	46,800

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

Source: U.S. Census Bureau.



TABLE 11  
U.S. EXPORTS OF LEAD, BY COUNTRY<sup>1</sup>

Country	2008		2009	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
<b>Ore and concentrates, lead content:</b>				
Belgium	117	\$150	646	\$268
Canada	48,500	78,800	44,700	60,700
China	132,000	84,800	159,000	151,000
Hong Kong	--	--	118	28
India	--	--	115	53
Japan	24,700	12,700	20,500	16,200
Korea, Republic of	54,300	35,400	61,100	45,400
Mexico	16,700	30,500	545	885
Saudi Arabia	--	--	148	46
United Arab Emirates	109	34	--	-
Vietnam	651	203	--	--
Other	7 <sup>r</sup>	7 <sup>r</sup>	38	30
<b>Total</b>	<b>277,000</b>	<b>243,000</b>	<b>287,000</b>	<b>275,000</b>
<b>Base bullion, lead content:</b>				
Japan	82	1,070	--	--
Mexico	519	945	25	99
Other	13 <sup>r</sup>	25	9	14
<b>Total</b>	<b>614</b>	<b>2,040</b>	<b>34</b>	<b>113</b>
<b>Unwrought lead and lead alloys, lead content:</b>				
Belgium	4,250	3,710	9,550	8,500
Brazil	475	408	2,200	2,440
Canada	7,650	11,500	5,390	8,780
Chile	343	367	955	1,240
China	498	411	252	232
El Salvador	110	166	62	72
Germany	1,490	1,210	82	55
Indonesia	194	180	--	--
Ireland	46	28	16	10
Israel	1,150	1,220	64	42
Japan	75	600	87	1,130
Korea, Republic of	1,210	2,260	48	27
Malaysia	72	111	--	--
Mexico	45,900	92,600	58,400	56,900
Panama	--	--	41	62
Philippines	2,340	1,710	46	64
Spain	1,290	1,120	198	225
Taiwan	123	76	4	4
Thailand	230	198	--	--
Turkey	(2)	10	28	17
United Kingdom	204	914	29	37
Venezuela	83	72	--	--
Other	285 <sup>r</sup>	328 <sup>r</sup>	146	207
<b>Total</b>	<b>68,100</b>	<b>119,000</b>	<b>77,600</b>	<b>80,100</b>

See footnotes at end of table.

TABLE 11—Continued  
U.S. EXPORTS OF LEAD, BY COUNTRY<sup>1</sup>

Country	2008		2009	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Wrought lead and lead alloys, lead content:				
Canada	1,760	\$3,030	1,370	\$3,090
Chile	25	48	244	942
China	197	260	165	231
France	98	313	(2)	13
Germany	120	177	24	46
Haiti	134	123	162	160
India	435	560	669	731
Japan	12	25	65	288
Korea, Republic of	127	209	108	449
Malaysia	37	29	9	10
Mexico	1,770	3,110	705	1,170
Singapore	81	124	23	27
Spain	39	79	12	12
United Kingdom	873	1,040	599	786
Other	445 <sup>r</sup>	745 <sup>r</sup>	156	337
Total	6,150	9,880	4,310	8,280
Scrap, gross weight:				
Albania	246	70	169	58
Bangladesh	1,190	441	136	30
Belgium	260	2,000	--	--
Brazil	73	23	20	7
Canada	115,000	60,500	79,000	37,700
China	8,730	4,520	5,150	3,660
Colombia	1,520	368	142	43
Ecuador	232	56	103	23
France	194	45	7	11
Germany	53	45	881	911
Guatemala	--	--	84	28
Honduras	992	219	249	69
Hong Kong	38	29	464	180
India	20,600	6,810	11,000	2,900
Korea, Republic of	20,800	15,900	31,800	21,500
Mexico	466	116	366	556
Nicaragua	143	32	173	94
Pakistan	574	191	971	184
Panama	59	50	225	52
Paraguay	167	120	70	21
Saudi Arabia	90	76	121	123
Spain	36	19	700	379
Taiwan	--	--	4,320	1,470
United Kingdom	1,490	498	477	105
Venezuela	188	65	493	201
Vietnam	--	--	1,530	488
Other	2,100 <sup>r</sup>	597 <sup>r</sup>	1,630	1,700
Total	175,000	92,800	140,000	72,000

<sup>r</sup>Revised. -- Zero.

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

<sup>2</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12  
U.S. IMPORTS FOR CONSUMPTION OF LEAD, BY COUNTRY<sup>1</sup>

Country	2008		2009	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
<b>Base bullion:</b>				
Colombia	543	\$1,180	--	--
Mexico	2,040	4,090	810	\$2,200
Venezuela	20	46	--	--
Other	132 <sup>r</sup>	281 <sup>r</sup>	34	52
Total	2,740	5,590	844	2,250
<b>Pigs and bars, lead content:</b>				
Canada	219,000	492,000	205,000	354,000
China	200	372	--	--
France	7,050	14,600	267	1,080
Germany	1,810	3,300	11	32
Italy	194	554	--	--
Kazakhstan	2,990	5,900	3,500	4,460
Mexico	58,100	97,400	41,100	47,200
Peru	10,600	24,600	991	1,210
Russia	647	2,010	131	240
United Kingdom	8,030	15,700	--	--
Venezuela	1,260	3,370	--	--
Other	85 <sup>r</sup>	186 <sup>r</sup>	112	154
Total	309,000	660,000	251,000	408,000
<b>Reclaimed scrap, including ash and residues, lead content:</b>				
Canada	739	1,420	785	1,900
China	--	--	32	26
Colombia	--	--	105	212
Mexico	438	378	348	357
Russia	37	89	18	28
United Kingdom	1	8	--	--
Other	77	148	46	99
Total	1,290	2,040	1,330	2,620
<b>Wrought lead, all forms, including wire and powders, gross weight:</b>				
Argentina	362	1,060	269	502
Canada	291	1,060	164	501
France	1,010	2,560	--	--
Germany	778	5,220	709	3,740
Mexico	75	169	--	--
New Zealand	177	1,380	15	229
Russia	29	28	--	--
United Kingdom	442	2,100	123	716
Other	86 <sup>r</sup>	390 <sup>r</sup>	63	260
Total	3,250	14,000	1,340	5,950

<sup>r</sup>Revised. -- Zero.

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

Source: U.S. Census Bureau.

TABLE 13  
LEAD: WORLD MINE PRODUCTION OF LEAD IN CONCENTRATE, BY COUNTRY<sup>1,2</sup>

(Metric tons, lead content)

Country <sup>3</sup>	2005	2006	2007	2008	2009
Argentina	10,683	12,064	17,045	20,788 <sup>r</sup>	20,000
Australia	767,000	686,000	641,000	645,000	566,000
Bolivia	11,231	11,955	22,798	81,602	86,394
Bosnia and Herzegovina <sup>e</sup>	1,000 <sup>r</sup>	1,000 <sup>r</sup>	4,000 <sup>r</sup>	3,000 <sup>r</sup>	3,000 <sup>e</sup>
Brazil	23,616	15,764	24,574	24,600	24,800
Bulgaria <sup>e</sup>	13,000 <sup>r</sup>	10,000 <sup>r</sup>	15,000 <sup>r</sup>	15,000 <sup>r</sup>	18,000
Burma <sup>e</sup>	2,000	2,000	2,000	3,600 <sup>r</sup>	3,500
Canada	79,254	83,096	75,135	98,974	68,761
Chile	878	672	1,305	3,985	1,511
China <sup>e</sup>	1,140,000	1,330,000	1,410,000	1,500,000	1,600,000
Georgia <sup>e</sup>	400	400	400	400	400
Greece <sup>e</sup>	1,500	10,500	15,000	16,000	16,000
Guatemala	23	28	363	500 <sup>r,e</sup>	--
Honduras	10,488	11,775	10,215	10,000 <sup>e</sup>	10,000 <sup>e</sup>
India	60,400	69,200	77,500	87,300	92,000
Iran <sup>e,4</sup>	23,000	24,000 <sup>5</sup>	25,000	20,000	20,000
Ireland <sup>e</sup>	63,800	62,000	54,100	50,200 <sup>r</sup>	50,000
Italy <sup>e</sup>	800	800	800	800	800
Japan	3,437	777	--	--	--
Kazakhstan	31,000	48,100	40,200	39,000	39,400
Korea, North <sup>e</sup>	13,000 <sup>r</sup>	13,000 <sup>r</sup>	13,000 <sup>r</sup>	13,000 <sup>r</sup>	13,000
Korea, Republic of	50	17	12	449 <sup>r</sup>	50 <sup>e</sup>
Macedonia	-- <sup>e</sup>	15,600	32,000	34,000 <sup>r,e</sup>	52,000
Mexico	134,388	120,450	120,000	100,725	143,838
Morocco	45,800	53,000	44,800	40,000	40,000 <sup>e</sup>
Namibia	14,320	11,830	10,543 <sup>r</sup>	14,062 <sup>r</sup>	14,100 <sup>e</sup>
Peru	319,345	313,325	329,154	345,109	302,412
Poland	75,100	58,500	59,900	62,200	60,000 <sup>e</sup>
Romania	11,610	6,269	1,000 <sup>r</sup>	-- <sup>r,e</sup>	-- <sup>e</sup>
Russia <sup>e</sup>	36,000	36,000	50,000	60,000	70,000
Serbia <sup>e</sup>	1,000 <sup>6</sup>	1,000	1,000	1,000	1,000
South Africa	42,159	48,273	41,857	46,440	49,149
Sweden	61,000	76,800	62,100	60,000	60,000 <sup>e</sup>
Tajikistan <sup>e</sup>	800	800	800	800	800
Tunisia <sup>e</sup>	8,708 <sup>5</sup>	--	--	--	--
Turkey <sup>e</sup>	19,000	15,000	20,000	30,000	11,000
United Kingdom <sup>e</sup>	500	500	500	500	500
United States	437,000	429,000	444,000	410,000	406,000
Vietnam	7,700 <sup>r</sup>	14,900 <sup>r</sup>	19,200 <sup>r</sup>	19,100 <sup>r</sup>	19,000 <sup>e</sup>
Total	3,470,000 <sup>r</sup>	3,590,000 <sup>r</sup>	3,690,000 <sup>r</sup>	3,860,000 <sup>r</sup>	3,860,000

<sup>e</sup>Estimated. <sup>r</sup>Revised. -- Zero.

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

<sup>2</sup>Table includes data available through July 7, 2010.

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

<sup>4</sup>Year beginning March 21 of that stated.

TABLE 13—Continued  
LEAD: WORLD MINE PRODUCTION OF LEAD IN CONCENTRATE, BY COUNTRY<sup>1,2</sup>

<sup>5</sup>Reported figure.

<sup>6</sup>Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

TABLE 14  
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

Country <sup>3</sup>	2005	2006	2007	2008	2009
Algeria, secondary <sup>c</sup>	5,000	5,000	5,000	5,000	5,000
Argentina:					
Primary	10,607	12,064	11,588 <sup>r</sup>	13,482 <sup>r</sup>	13,000 <sup>c</sup>
Secondary	35,000	37,000	49,000 <sup>r</sup>	59,000 <sup>r</sup>	55,000 <sup>c</sup>
Total	45,607	49,064	60,588 <sup>r</sup>	72,482 <sup>r</sup>	68,000 <sup>c</sup>
Australia:					
Primary	230,000	206,000	202,000	221,000	204,000
Secondary <sup>e</sup>	33,000 <sup>5</sup>	27,000	27,000	27,000	25,000
Total	263,000	233,000	229,000	248,000	229,000
Austria, secondary	24,357 <sup>r</sup>	28,120 <sup>r</sup>	28,564 <sup>r</sup>	26,902 <sup>r</sup>	20,000 <sup>c</sup>
Belgium: <sup>c</sup>					
Primary <sup>4</sup>	63,400	34,000	97,200	80,966 <sup>r,5</sup>	80,000
Secondary	20,000	20,000	20,000	20,000	20,000
Total	83,400	54,000	117,000 <sup>r</sup>	101,000 <sup>r</sup>	100,000
Bolivia	33	318 <sup>r</sup>	301	473 <sup>r</sup>	269 <sup>c</sup>
Brazil, secondary	104,904	142,653	142,450	143,000	143,500
Bulgaria: <sup>c</sup>					
Primary	68,000	64,000	73,000 <sup>5</sup>	73,000	70,000
Secondary	13,000	12,000	14,000 <sup>5</sup>	14,000	13,000
Total	81,000	76,000	87,000 <sup>5</sup>	87,000	83,000
Burma, primary	907	537	165	202	200 <sup>c</sup>
Canada:					
Primary	109,996	115,989	95,577	105,526	101,484
Secondary	120,241	134,475	141,111	153,549	157,370
Total	230,237	250,464	236,688	259,075	258,854
China: <sup>c</sup>					
Primary	1,850,000	2,130,000	2,140,000	2,350,000	2,480,000
Secondary	537,000	590,000	650,000	850,000	1,230,000
Total	2,390,000	2,720,000	2,790,000	3,200,000	3,710,000
Colombia, secondary <sup>e</sup>	12,000	10,000	10,000	10,000	10,000
Czech Republic, secondary <sup>e</sup>	26,000	29,000 <sup>r</sup>	34,000 <sup>r</sup>	36,000 <sup>r</sup>	36,000
El Salvador, secondary <sup>e</sup>	10,000	10,000	10,000	10,000	10,000
Estonia, secondary	7,000 <sup>c</sup>	9,000	10,000	10,000 <sup>c</sup>	10,000 <sup>c</sup>
France:					
Primary	--	4,000	4,000 <sup>c</sup>	4,000 <sup>c</sup>	4,000 <sup>c</sup>
Secondary	104,979	100,195	100,200	88,000	88,000 <sup>c</sup>
Total	104,979	104,195	104,200	92,000	92,000 <sup>c</sup>
Germany:					
Primary	118,778	113,760 <sup>r</sup>	110,934	113,200 <sup>r</sup>	105,000 <sup>c</sup>
Secondary	298,915 <sup>r</sup>	265,190 <sup>r</sup>	294,147	301,900 <sup>r</sup>	286,000 <sup>c</sup>
Total	417,693 <sup>r</sup>	378,950 <sup>r</sup>	405,081	415,100 <sup>r</sup>	391,000 <sup>c</sup>
Greece, secondary <sup>e</sup>	4,000	5,000	5,000	5,000	4,000
India:					
Primary	24,000	49,000	54,000	62,000	65,000
Secondary	35,000	56,000	70,000	76,000	78,000
Total	59,000	105,000	124,000	138,000	143,000
Indonesia, secondary	18,000	19,000	18,500	18,500	18,000

See footnotes at end of table.

TABLE 14—Continued  
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

Country <sup>3</sup>	2005	2006	2007	2008	2009
Iran: <sup>e</sup>					
Primary	21,000	25,000	25,000	20,000 <sup>r</sup>	20,000
Secondary	50,000	50,000	50,000	55,000 <sup>r</sup>	55,000
Total	71,000	75,000	75,000	75,000 <sup>r</sup>	75,000
Ireland, secondary <sup>e</sup>	20,000	22,000	22,500	22,500	22,500
Israel, secondary	28,000	25,000	25,000	27,000 <sup>r</sup>	27,000 <sup>e</sup>
Italy:					
Primary	49,500	34,600	45,000	47,800	15,000 <sup>e</sup>
Secondary	162,000	155,900	165,000	164,000	134,000 <sup>e</sup>
Total	211,500	190,500	210,000	211,800	149,000 <sup>e</sup>
Japan:					
Primary	106,638	108,271	104,527	107,005 <sup>r</sup>	105,000
Secondary	167,980	171,143	171,795	172,454 <sup>r</sup>	170,000
Total	274,618	279,414	276,322	279,459 <sup>r</sup>	275,000
Kazakhstan, primary and secondary	135,446	115,974	117,641	105,853	90,000 <sup>e</sup>
Kenya, secondary <sup>e</sup>	1,000	1,000	1,000	1,000	1,000
Korea, North, primary and secondary <sup>e</sup>	9,000	9,000	9,000	9,000	9,000
Korea, Republic of:					
Primary	180,784	163,379	195,022	244,137 <sup>r</sup>	200,000 <sup>e</sup>
Secondary <sup>e</sup>	55,800	56,000	60,000	60,000	60,000
Total	236,584	219,379	255,022	304,137 <sup>r</sup>	260,000 <sup>e</sup>
Malaysia, secondary <sup>e,6</sup>	71,000	73,000	73,000	73,000	70,000
Mexico:					
Primary <sup>7</sup>	116,539	102,498	102,000 <sup>e</sup>	89,838	100,361
Secondary <sup>e</sup>	110,000	110,000	110,000	110,000	110,000
Total	226,539	212,498	212,000 <sup>e</sup>	199,838	210,361
Morocco: <sup>e</sup>					
Primary	35,000	38,000	45,000	45,000	45,000
Secondary	4,000	3,000	3,000	3,000	3,000
Total	39,000	41,000	48,000	48,000	48,000
Netherlands, secondary <sup>e</sup>	20,000	18,000	17,000	17,000	17,000
New Zealand, secondary <sup>e</sup>	7,000	7,000	7,000	9,000 <sup>r</sup>	13,000
Nigeria, secondary <sup>e</sup>	5,000	5,000	5,000	5,000	5,000
Pakistan, secondary <sup>e</sup>	3,200	3,100	3,000	3,000	3,000
Peru, primary	122,079	120,311	116,774	114,259	26,000 <sup>e</sup>
Philippines, secondary <sup>e</sup>	30,000	30,000	30,000	30,000	30,000
Poland: <sup>e</sup>					
Primary	29,500 <sup>r</sup>	26,200 <sup>r</sup>	37,200 <sup>r</sup>	40,000 <sup>r</sup>	35,000
Secondary	51,500	56,600 <sup>r</sup>	67,000 <sup>r</sup>	68,000 <sup>r</sup>	60,000
Total	81,000 <sup>r</sup>	82,800 <sup>r</sup>	104,000 <sup>r</sup>	108,000 <sup>r</sup>	95,000
Portugal, secondary <sup>e</sup>	4,000	3,000	3,000	3,000	3,000
Romania: <sup>e</sup>					
Primary	32,900	29,100	34,000	34,000	12,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	37,900	34,100	39,000	39,000	17,000
Russia, primary and secondary <sup>e</sup>	66,000	78,000	94,000	80,000	73,000
Saudi Arabia, secondary <sup>e</sup>	36,000 <sup>5</sup>	38,000	38,000	38,000	38,000
Serbia, primary and secondary <sup>e</sup>	2,400 <sup>r,8</sup>	2,600 <sup>r</sup>	1,200 <sup>r</sup>	1,000 <sup>r</sup>	1,000

See footnotes at end of table.

TABLE 14—Continued  
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Metric tons)

Country <sup>3</sup>	2005	2006	2007	2008	2009
Slovenia, secondary <sup>e</sup>	15,000	15,000	15,000	15,000	14,000
South Africa, secondary	65,300 <sup>f</sup>	67,000	59,000 <sup>f</sup>	62,000 <sup>f</sup>	55,000 <sup>e</sup>
Spain, secondary <sup>e</sup>	110,000	110,000	110,000	110,000	110,000
Sweden: <sup>e</sup>					
Primary	27,400	26,000	26,000	26,000	26,000
Secondary	45,600	40,000	40,000	40,000	40,000
Total	73,000	66,000	66,000	66,000	66,000
Switzerland, secondary <sup>e</sup>	9,000	9,600 <sup>5</sup>	9,000	8,000	8,000
Taiwan, secondary	55,000	55,000	55,000	55,000	40,000
Thailand, secondary	61,100	61,160	73,159	73,303 <sup>f</sup>	73,000 <sup>e</sup>
Trinidad and Tobago, secondary <sup>e</sup>	1,000	1,000	1,000	1,000	1,000
Tunisia, secondary <sup>e</sup>	7,000	8,000	9,000	9,000	7,000
Turkey, secondary <sup>e</sup>	6,000	6,000	6,000	6,000	6,000
Ukraine, secondary <sup>e</sup>	6,000	6,000	6,000	6,000	6,000
United Arab Emirates, secondary <sup>e</sup>	2,000	2,000	2,000	2,000	2,000
United Kingdom:					
Primary	161,350	163,700	150,000	150,000	150,000
Secondary	143,000	144,000	150,000	144,000	144,000
Total	304,350	307,700	300,000	294,000	294,000
United States:					
Primary	143,000	153,000	123,000	135,000	103,000
Secondary	1,150,000	1,160,000	1,180,000	1,140,000 <sup>f</sup>	1,110,000
Total	1,300,000	1,310,000	1,300,000	1,280,000	1,210,000
Venezuela, secondary <sup>e</sup>	30,000	30,000	30,000	30,000	30,000
Zambia, secondary <sup>e</sup>	1,000	1,000	1,000	1,000	1,000
Grand total	7,660,000 <sup>f</sup>	7,970,000 <sup>f</sup>	8,250,000 <sup>f</sup>	8,700,000 <sup>f</sup>	8,820,000
Of which:					
Primary	3,500,000	3,720,000 <sup>f</sup>	3,790,000 <sup>f</sup>	4,080,000 <sup>f</sup>	3,960,000
Secondary	3,950,000 <sup>f</sup>	4,050,000 <sup>f</sup>	4,230,000	4,430,000 <sup>f</sup>	4,680,000
Undifferentiated	213,000 <sup>f</sup>	206,000 <sup>f</sup>	222,000	196,000	173,000

<sup>e</sup>Estimated. <sup>f</sup>Revised. -- Zero.

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

<sup>2</sup>Table includes data available through July 7, 2010. 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.

<sup>3</sup>In addition to the countries listed, Egypt and Iraq produced secondary lead, but output is not officially reported; available general information is inadequate for the formulation of reliable estimates of output levels.

<sup>4</sup>Derived by calculating reported total lead output plus exports of lead bullion minus imports of lead bullion.

<sup>5</sup>Reported figure.

<sup>6</sup>Metal 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.

<sup>7</sup>Includes lead content in antimonial lead.

<sup>8</sup>Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.