LEAD

By Gerald R. Smith

Domestic survey data and tables were prepared by Joshua I. Martinez, statistical assistant, and the world production tables were prepared by Glenn J. Wallace, international data coordinator.

Domestic lead mine production decreased by 3% compared with that of 2001. Alaska and Missouri were the dominant producing States with a 97% share. Other appreciable lead mine production was in Idaho and Montana. Lead was produced at 11 U.S. mines employing about 1,000 people. The value of domestic mine production was about $420 million. A significant portion of the lead concentrates produced from the mined ore was processed into primary metal at two smelter-refineries in Missouri.

Secondary lead, derived principally from scrapped lead-acid batteries, accounted for 81% of refined lead production in the United States. Nearly all the secondary lead was produced by 7 companies operating 15 smelters.

During 2002, U.S. Government agencies issued several proposed rules on matters affecting the lead industry. The proposed rules included the revision of regulations on new uses of lead-containing chemicals in aerosol spray paints, the banning of lead-containing metal-cored candlewicks and candles with such wicks, the approval of a new nonlead form of ammunition for hunting waterfowl, and the modification of the management requirements for lead-containing components discarded from such items as used televisions and computer monitors. In addition, a final rule was issued reclassifying the television and computer components so as to effectively remove them from being defined as "solid waste" in specific regions of the United States. A notice of funding availability also was announced that was intended to pursue additional private sector resources necessary to eliminate lead-based paint hazards in housing.

Lead was consumed in about 120 U.S. plants to manufacture end-use products, including ammunition, batteries, building-construction materials, covering for power and communication cable, and solders for electrical/electronic components and accessories, metal containers, and motor vehicles.

Lead-acid batteries, including starting-lighting-ignition (SLI) and industrial types, continued to be the overwhelmingly dominant use of lead, accounting for about 83% of reported lead consumption. SLI battery shipments in North America totaled 102.5 million units in 2002. This total included original equipment and replacement automotive-type batteries. An estimated 1.08 million metric tons (Mt) of lead was contained in new SLI batteries shipped during the year.

Monthly sales of lead from the National Defense Stockpile (NDS) continued during 2002. Sales totaled about 6,300 metric tons (t) (6,900 short tons), leaving about 172,000 t (190,000 short tons) in the NDS at yearend.

Lead prices declined slightly during the year. The average London Metal Exchange (LME) and North American producer prices were down by $0.011 per pound and $0.001 per pound, respectively, in 2002, from the average prices of $0.216 per pound and $0.436 per pound, respectively, in 2001.

Of the 43 countries in which lead was mined, the top 5 accounted for 74% of the world's total production of 2.9 Mt. Australia was the largest producer, with 23% of the world total, followed by China, 21%; the United States, 15%; Peru, 10%; and Mexico, 5%.

Worldwide reserves of lead contained in demonstrated resources in producing and nonproducing deposits at yearend were estimated to be 68 Mt by the U.S. Geological Survey (USGS). Reserves for the three largest producers in the world—Australia, China, and the United States—were about 15 Mt, 11 Mt, and 8.1 Mt of contained lead, respectively. The reserve base (reserves plus measured and indicated resources that are marginally economic and some of those that are currently subeconomic) for Australia and China was 28 Mt and 36 Mt, respectively. The reserve base for the United States was 20 Mt. The total world reserve base at the end of 2002 was estimated to be 140 Mt.

Legislation and Government Programs

Monthly sales of lead from the NDS continued during 2002. As a result of these sales and the delivery of previously committed inventory, lead disposal from stockpile inventory during 2002 totaled about 6,300 t (6,900 short tons). The Defense National Stockpile Center's (DNSC) Annual Materials Plan (AMP) approved by the U.S. Congress for fiscal year 2002 (October 1, 2001, to September 30, 2002) included a maximum sales authority for lead of 54,400 t (60,000 short tons). Under this authority, disposal of lead from the NDS inventory during the first 9 months of calendar year 2002 was 266 t (293 short tons). The AMP approved by the U.S. Congress for fiscal year 2003 (October 1, 2002, to September 30, 2003) also included a maximum sales authority for lead of 54,400 t. Under the fiscal year 2003 authority, disposal of lead from NDS inventory during the final 3 months of calendar year 2002 amounted to 6,000 t (6,600 short tons), leaving about 172,000 t (190,000 short tons) of lead at yearend. Solicitations were issued by the DNSC in February and November for the sale of lead from the NDS in negotiated long-term contracts extending for a contract period of 360 calendar days. The long-term solicitations included several grades of lead totaling about 12,400 t (13,600 short tons).

On May 9, the DNSC issued a new procedure for purchasing lead from the NDS. The procedure, entitled Basic Ordering Agreement (BOA) DLA-Lead-005, replaced the monthly sealed bid and periodic negotiated method for purchasing lead. Under the new procedure, more frequent lead offerings will be made via posting on the DNSC Web site. The DNSC posting of notice of lead sales was scheduled for each Thursday by noon. Price quotations would then be due from the bidders to the DNSC by 1:00 p.m. on the following Wednesday. In order to qualify for

lead purchases under the BOA, participants will be required to meet certain financial criteria. Initial sales of lead under the BOA began on June 20 (U.S. Defense National Stockpile Center, 2002).

During 2002, U.S. Government agencies issued several proposed and final rules on matters affecting the lead industry, announced funding availability for eliminating lead hazards, and released a draft report on the recommended parameters for ranking the hazards of metals in the environment. In mid-January, the U.S. Environmental Protection Agency (EPA) proposed a rule that would regulate new uses for certain lead-containing chemicals in aerosol spray paints. This significant new use rule (SNUR), covered under the Toxic Substances Control Act, section 5(a)(2), pertains to six chemicals, five of which contain lead. These include lead salts in chromic acid or sulfuric acid, lead-containing compounds of molybdenum and molybdenum-chromium oxide, and the paint pigment known as C.I. Pigment Red 104. The action proposed by the EPA would require persons to give the EPA a 90-day notice if they intend to manufacture, import, or process any of these chemical substances for use in aerosol spray paint for nonindustrial indoor spray application. Upon notification, the EPA would evaluate the intended use and, if necessary, prohibit or limit the activity (U.S. Environmental Protection Agency, 2002c).

In mid-June, the EPA issued a proposed rule that would modify the management requirements for used cathode ray tubes (CRTs) and processed CRT glass discarded from computer monitors, televisions, and other medical, automotive, and appliance-type CRTs. The proposed rule would conditionally exclude these materials from the definition of solid waste when they are recycled, thereby encouraging increased reuse and recycling and improved management of this rapidly growing waste stream. It is estimated that the average quantity of lead in the CRTs of colored televisions and computer monitors is about 1.8 kilograms (kg) (U.S. Environmental Protection Agency, 2002b).

In late July, the EPA announced the finalization and availability of its national action plan for alkyl-lead compounds. The final plan was issued upon completion of the review of public comments on the plan and appropriate revisions to the plan based on these comments. In August 2000, the EPA had issued a notice of availability and solicitation of public comment on the agency's draft national action plan to promote further voluntary reductions of use and exposure to alkyl-lead compounds. Alkyl-lead (such as tetraethyl- and tetramethyl-lead) is used as a fuel additive to reduce "knock" in combustion engines and also to help lubricate internal engine components and protect intake and exhaust valves against recession. Alkyl-lead additives are permitted for use in aviation gasoline for general aviation (piston-engine) aircraft and in fuels for racing vehicles and nonroad vehicles, such as farm machinery, construction equipment, marine vessels, and recreational vehicles. The national action plan was developed pursuant to the EPA's multimedia strategy for priority persistent, bioaccumulative, and toxic (PBT) pollutants. The EPA had issued its final rule on the reporting thresholds for certain other PBT chemicals in October 1999 but had excluded any final action on the alkyl-lead compounds in the rule (U.S. Environmental Protection Agency, 2002a).

In January, the EPA reported its intention to alter the agency's approach to assessing metals and their inclusion in EPA rules and regulations. The specific concern in this matter was prompted by considerable interest in the application of persistence and bioaccumulation assessments to metals in EPA actions, such as the lead rulemaking pertaining to the Toxic Release Inventory (TRI) (U.S. Environmental Protection Agency, 2001). Initially, the EPA developed an action plan designed to identify the primary elements to be addressed and to establish a framework for a review process. This framework effectively would establish guidance for the EPA's program offices as to the manner in which the various environmental properties of metals, such as PBT, should be addressed in assessing the hazards and risks of metals and metal compounds. The EPA submitted the action plan to its Science Advisory Board (SAB) for consultation and review in April (International Lead Zinc Research Organization, 2002c).

Subsequent to the submission of this action plan, the SAB issued a draft report at its meeting in mid-September advising the EPA that it was inappropriate to use the PBT parameters for ranking the hazards of metals in the environment. The EPA has included cadmium, lead, and mercury, along with 27 organic compounds, on a list the agency considers to be PBT chemicals. The conclusions of the SAB's metals assessment panel were to be subsequently considered by the SAB executive committee, after which there was to be a finalization of comments on these conclusions and the development of "white papers" on each of the key scientific issues concluded by the panel (International Lead Zinc Research Organization, 2002b).

In late December, the EPA issued a direct final rule revising its classification of used CRTs. The CRTs employed in color television and color computer monitors contain an average of 4 pounds of lead, distributed in the funnel, glass frit, panel glass, and neck of the CRT. Such CRTs destined for disposal are currently classified as characteristic hazardous wastes under the Resource Conservation and Recovery Act (RCRA) and thus subject to the hazardous waste regulations of subtitle C of the RCRA, unless they come from a household or a conditionally exempt small quantity generator. The EPA's revision of the CRT classification will effectively exclude used CRTs and glass once in CRTs from the definition of "solid waste" in EPA region III. This region includes the Mid-Atlantic States of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia as well as the District of Columbia. The direct final rule will support an ongoing e-Cycling Pilot Project in EPA region III that is promoting reuse and recycling of electronics. The EPA has proposed a similar rule to reclassify used CRTs and certain other electronic materials that would be effective nationwide (U.S. Environmental Protection Agency, 2002d).

In a related development, the Governor of the State of New Jersey signed into law a bill that would require State environmental regulators to develop and distribute educational materials that will encourage the recycling and reuse of consumer electronic equipment. The new legislation will also require that a pilot electronics recycling project be established within the State's Department of Environmental Protection. This project will focus on evaluating the feasibility of requiring statewide mandatory source separation and recycling of used computer monitors, television sets, and other consumer electronic equipment or other devices that contain CRTs (International Lead Zinc Research Organization, Inc., 2002a).

In a related international development, the European Parliament ratified a new law pertaining to waste electrical and electronic equipment (WEEE) requirements. The law states that, beginning in 2005, producers of electronic goods will pay for managing post-consumer waste. Consumers will be able to return used items, such as computer monitors and televisions, to the manufacturer free of charge. Under the new law, National Governments and local authorities must ensure that consumers do not dispose of WEEE in household waste. The United Kingdom has imposed a compulsory collection target of 4 kilograms per year of WEEE per household, starting at the end of 2006 (Metal Bulletin, 2002d).

The U.S. Department of the Interior's Fish and Wildlife Service issued a proposed rule in May that would approve gun shot formulated of 65% tungsten, 21.8% tin, 10.4% iron, and 2.8% nickel as a nontoxic (nonlead) form of ammunition for hunting waterfowl. Under authority contained in the Migratory Bird Treaty Act of 1918, the Fish and Wildlife Service controls the hunting of migratory game birds and, since the mid-1970s, has sought to identify shot that does not pose a significant toxicity hazard to migratory birds or other wildlife. Currently, steel, bismuth-tin, tungsten-iron, tungsten polymer, tungsten-matrix, and tungsten-nickel-iron shot are approved for permanent use as a nontoxic form of shot (U.S. Department of the Interior, 2002).

The Consumer Product Safety Commission (CPSC), under the authority of the Federal Hazardous Substances Act, issued a proposed rule in April that would ban certain lead-containing metal-cored candlewicks and candles with such wicks. Under the CPSC proposal, metal-cored candlewicks that contain more than 0.06% lead by weight would be declared hazardous substances and thus would be prohibited from use. The CPSC had issued an advance notice of proposed rulemaking on this matter in early 2001 in response to petitions from public citizens, the National Apartment Association, and the National Multi-housing Council that requested that the CPSC ban candles and candlewicks containing lead. The concern of these petitioners was that lead emissions to the air during candle burning could represent a potential health hazard under some use conditions. Certain candlewicks contain a metallic core to provide structural rigidity of the wick during candle production and subsequent burning of the wick. The metallic core may be primarily lead or may consist of a zinc-lead or tin-lead alloy. In issuing its proposed rule, the CPSC had concluded that lead emissions during the burning of such candles could expose children to indoor air lead concentrations that could result in elevated blood lead levels (U.S. Consumer Product Safety Commission, 2002).

In September, the EPA announced its intent to enter into cooperative agreements with States, Territories, Indian tribes, intertribal consortia, and the District of Columbia to provide financial assistance to develop and conduct lead-based paint programs authorized under section 404 of the Toxic Substance Control Act. The programs are intended to ensure that individuals conducting lead-based paint activities are properly trained and certified and that renovation contractors provide appropriate lead information to building owners and residents. A total of $12.5 million was allocated by the EPA for these programs (U.S. Environmental Protection Agency, 2002e).

In August, the U.S. Department of Housing and Urban Development (HUD) issued a notice of funding availability for the agency's Lead Elimination Action Program. The program was authorized under HUD's fiscal year 2002 appropriations and was intended to pursue additional private sector resources needed to eliminate lead-based paint hazards in housing. Grants of 24-month duration, totaling $6.5 million, were to be awarded on a competitive basis to nonprofit and for-profit entities with fund raising and/or leveraging skills that can be directed toward mobilizing resources to address this hazard-elimination objective. Resources generated by awardees were to be used and/or distributed to assist National, State, and local entities actively committed to lead hazard control in residential structures (U.S. Department of Housing and Urban Development, 2002).

Production

Primary.—In 2002, domestic mine production of lead decreased by about 14,000 t, or 3%, compared with that of 2001. The major share of the U.S. mine output of lead continued to be derived from production in Alaska and Missouri. Appreciable lead mine production also was reported in Idaho and Montana. Domestic mine production data were collected by the USGS from a base-metal voluntary survey on lode-mine production of copper, lead, and zinc. All lead-producing mines responded to the survey. The lead concentrates produced from the mined ore were processed into primary metal at two smelter-refineries in Missouri (tables 1-4).

Doe Run Resources Corp., St. Louis, MO, produced primary lead at two smelter-refinery facilities in Missouri. Concentrates for the smelter-refineries were provided from four Doe Run mills that were supplied with ore mined from production shafts along the Viburnum Trend in southeastern Missouri. In June, the company finalized an arrangement that would secure additional financing and enable the company to restructure its outstanding debt. The offer submitted to bondholders at that time allowed the holders of notes due in 2003 and 2005 to either exchange the notes for new ones or return them for cash at a reduced value. After several revisions to the exchange offer, an agreement was reached with bondholders in late October, which effectively reduced Doe Run's outstanding debt by about $119 million. In addition, bondholders were provided with an option to purchase up to 40% of Doe Run's stock (American Metal Market, 2002c; Ryan's Notes, 2002a, c). Doe Run's issued and outstanding stock are indirectly owned by The Renco Group, Inc., a New York, NY-based, privately held company with investments in natural resources and industrial operations.

Teck Cominco Alaska Inc. (a wholly owned subsidiary of Teck Cominco Ltd., Vancouver, British Columbia, Canada) operated the Red Dog zinc-lead mine in northwestern Alaska under a leasing 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. A mill optimization project completed in the fourth quarter of 2001 resulted in record production of lead in concentrate at Red Dog during 2002, increasing by 13% to 107,900 t compared with 95,300 t in 2001. The average mill recovery of lead at Red Dog was 60.2% in 2002, compared with 59%

in 2001. Proven ore reserves at Red Dog, as of December 31, 2002, were estimated to be 28.9 Mt grading 21.4% zinc and 5.7% lead. Probable reserves at the nearby Aqqaluk deposit, as of December 31, 2002, were estimated to be 56.1 Mt grading 16.5% zinc and 4.1% lead. Capital expenditures during 2002 were focused principally on projects aimed at reducing fugitive dust at the shipping port and at improving the surface of the road used to haul concentrate to the port.

Development of Teck Cominco's Pend Oreille zinc-lead mine near Metaline Falls, WA, continued during 2002. Construction of an internal shaft was completed, and a ramp was extended by 2,000 feet (610 meters) to provide access to the Yellowhead zone of the mine. Upgrades to the electrical power distribution at the site, including underground, also were completed by yearend. In 2003, Teck Cominco planned to refurbish the surface concentrator and the underground crusher and conveyor system and to install the tailings pond liner. Production at Pend Oreille was expected to begin in early 2004. Probable ore reserves at Pend Oreille, as of December 31, 2002, were estimated to be 5.7 Mt grading 7.7% zinc and 1.4% lead (Teck Cominco Ltd., 2003, p. 14-27).

Hecla Mining Company, Coeur d'Alene, ID, operated the Lucky Friday Mine in Mullan, ID, throughout 2002. Lucky Friday is an underground silver-lead mine (100% owned by Hecla) that has been a producing mine for Hecla since 1958. Commencing in the fourth quarter of 2001, production at the mine was decreased to approximately 30% of full production as a result of declining metal prices. A further decrease in production was made in 2002 to a level of about 9,150 t compared with 19,000 t in 2001 and about 29,000 t in 2000. Hecla estimated that, with minimal additional development, the mine could continue to be operated at the lower production levels through 2004, provided the cost of operating was less than the cost of placing the property on care-and-maintenance status. Ore was processed during the year in a conventional flotation mill with a capacity of about 1,000 metric tons per day (t/d). In 2002, ore was processed at a rate of about 475 t/d. Both silver-lead concentrates and zinc concentrates were produced at the mill, with 94% of the silver, 93% of the lead, and 75% of the zinc being economically recovered. All lead, silver, and zinc concentrate production from the Lucky Friday operation was shipped to Teck Cominco's smelter in Trail, British Columbia, Canada, in 2002. Total mineralization at Lucky Friday was estimated to be about 1.0 Mt grading 8.5% lead at yearend 2002.

Hecla Mining also held a 29.7% interest in the Greens Creek Mine on Admiralty Island, near Juneau, AK, through a joint-venture arrangement with Kennecott Greens Creek Mining Co. (the manager of the mine) and Kennecott Juneau Mining Company (wholly owned subsidiaries of Kennecott Corporation). Greens Creek lies within the Admiralty Island Monument area and includes 17 patented lode claims and one patented millsite claim. In addition, it includes property leased from the U.S. Forest Service and has title to mineral rights on 7,500 acres (3,040 hectares) of Federal land adjacent to the mine properties. The mineral rights were acquired pursuant to a 1996 land exchange agreement whereby the Greens Creek joint venture transferred private property valued at $1.0 million to the U.S. Forest Service in exchange for access to the potential resources within the acquired Federal land. About 1,800 t/d of ore was mined at Greens Creek from the underground 200 South, Southwest, and West ore zones in 2002 and milled onsite to yield lead, zinc, and bulk concentrates, as well as a gold-silver doré. Total production of lead in concentrate was about 25,000 t in 2002, compared with about 22,600 t in 2001. Estimated reserves at the Greens Creek Mine at yearend 2002 were 6.4 Mt grading 4.2% lead compared with 6.9 Mt grading 4.6% lead in 2001 (Hecla Mining Company, 2003, p. 21-25).

Secondary.—Domestic secondary production increased by about 1% in 2002. Secondary lead accounted for 81% of domestic lead refinery production compared with 79% in 2001. Lead-acid batteries continued to be the dominant source of recoverable lead scrap, accounting for 91% 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 15 companies that produced secondary lead, excluding that produced from copper-based scrap, were surveyed; 12 responded, representing about 99% of the total production of secondary lead. Of the total lead recycled in 2002, about 99% 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 based on prior-year levels (tables 1, 5-9).

At yearend 2002, East Penn Manufacturing Co., Inc., Lyon Station, PA, announced plans to significantly increase its secondary lead production capacity. The permitting process for the construction of two reverbatory furnaces and a blast furnace reportedly was initiated. The additional units would effectively increase East Penn's secondary lead production capacity to about 145,000 metric tons per year (t/yr) from the current level of about 82,000 t/yr. According to an East Penn spokesperson, the units were not likely to be operational until 2005. The expansion is expected to significantly reduce the company's current reliance on other North American secondary producers to process a portion of the battery scrap received through its battery manufacturing and battery return program (Ryan's Notes, 2002b).

Exide Technologies Inc., Princeton, NJ, a major producer of recycled lead and a manufacturer of lead acid batteries, received approval in May from the U.S. Bankruptcy Court in Delaware to use its $250 million debtor-in-possession (DIP) financing facility. The DIP financing was used to fund operations and pay obligations to employees and suppliers (American Metal Market, 2002b). Exide Technologies and its three U.S. subsidiaries—Exide Delaware, Exide Illinois, and Royal Battery Distributors—had filed for Chapter 11 bankruptcy protection on April 15, 2002. The company, at that time, had arranged for additional financing, which would allow it to continue normal operations, subject to court approval (Metal Bulletin, 2002e).

Environment

The Lead Industries Association, Inc. (LIA), Sparta, NJ, closed down at the beginning of April, and filed for Chapter 7 bankruptcy liquidation in New Jersey. According to LIA, the company closed because of "a lack of insurance to cover

litigation." LIA, founded in 1928, had been a defendant in litigation starting 14 years ago and additional litigation had accumulated since then. Most of the suits were related to lead in paint in which LIA was named as one of many defendants (Battery Man, 2002; Platts Metals Week, 2002g).

Consumption

Reported consumption of lead decreased by 7% in 2002 because the demand for lead slowed in many end-use sectors. A continuing lackluster demand for industrial-type sealed lead-acid batteries in backup power systems was evident when telecommunications companies scaled down investment plans significantly. In addition, the demand for original equipment automotive batteries declined slightly as a result of slow growth in the U.S. economy. The decline in demand for original equipment automotive batteries and industrial-type batteries was countered somewhat by a moderate increase in the demand for replacement automotive batteries. The demand for replacement batteries is related principally to seasonal temperature extremes that effectively increase the rate of automotive battery failures. Consumption of lead in SLI- and industrial-type lead-acid storage batteries represented 83% of the total reported consumption of lead. Industrial-type batteries included stationary batteries (such as those used in uninterruptible power-supply equipment for computer and telecommunications networks, hospitals, and load-leveling equipment for commercial electrical power systems) and traction batteries (such as those used in airline ground equipment, industrial forklifts, and mining vehicles). Of the 88 consuming companies to which a USGS survey request was sent, 70 responded, representing about 98% of the total reported U.S. lead consumption.

Total North American SLI battery shipments were 102.5 million units in 2002 (Brown, 2003). The total included original equipment and replacement automotive-type batteries. Using an estimate of 10.6 kg (23.3 pounds) of lead per unit, SLI shipments in 2002 accounted for about 1.08 Mt of lead. SLI batteries included those used for automobiles, buses, general utility vehicles, golf cars, marine craft, motorcycles, tractors, and trucks (tables 6-13).

World Review

World production of refined lead decreased to 6.39 Mt in 2002 from 6.47 Mt in 2001. Other statistics for 2002, as reported by the International Lead and Zinc Study Group, are as follows: World consumption increased to 6.56 Mt from 6.49 Mt in 2001; commercial stocks of refined lead in industrialized countries were 477,000 t, or 5 weeks of consumption, at yearend 2002 compared with 437,000 t at yearend 2001 and 435,000 t at yearend 2000; and significant exports of refined lead to industrialized countries from developing Asian countries, notably China, continued during 2002, although decreasing by about 10% to 548,000 t compared with those of 2001 (International Lead and Zinc Study Group, 2003a, p. 6-21).

Lead prices declined slightly, returning to their 2000 levels. The average LME and North American producer prices were down in 2002 by $0.011 per pound and $0.001 per pound, respectively, from the average prices of $0.216 per pound and $0.436 per pound, respectively, in 2001.

The structure of the lead mining and refining industries was affected by a number of changes, including the opening and development of new facilities, as well as the closing, expanding, modernizing, reopening, restructuring, and selling of existing facilities (tables 14, 15).

New Mines, Plants, Properties, and Resources.—Canadian Zinc Ltd. received additional permits for exploration and development at its wholly owned Prairie Creek Mine and mill in the Northwest Territories, Canada. Under one of the permits, the company will conduct a drilling program designed to further define and extend the existing zinc-lead-silver deposit. The current resource estimate is 11.8 Mt, grading 12.5% zinc, 10.1% lead, and 161 grams per metric ton silver. In addition to the drilling program, Canadian Zinc has applied for permits to operate a pilot plant and to drive a second decline into the deposit. Prairie Creek consists of a fully operational mine and mill infrastructure that was built in the 1980s by a previous owner. Although the facility was financed to within a few months of startup, its operation was aborted as a result of final funding difficulties and depressed metal prices. Under Canadian Zinc's development plans, the company hoped to progress to a full bankable feasibility study at Prairie Creek by early 2003 (Northern Miner, 2002).

Stockholm, Sweden-based Boliden AB intersected a polymetallic mineralization in underground drilling conducted at its base-metals mine near Garpenberg, Sweden. The new mineralization zone, called Lappberget, is between the Garpenberg and Garpenberg Norra Mines. Drilling results indicated lead and zinc concentrations as high as 6.0% and 11.7%, respectively. Work continued during the year to establish the tonnage and average grade of the Lappberget zone (Mining Journal, 2002a).

In China, the Beijing-based Metallurgical Construction Corp. (MCC) signed a memorandum of understanding with Pakistan Mineral Development Corp. (PMDC) to develop the Duddar lead-zinc deposit in the Baluchistan region, 130 kilometers (km) northeast of Karachi, Pakistan. The deposit had been explored by Pasminco Ltd. in the 1990s, when a total resource of 14.3 Mt was defined, averaging 8.6% zinc and 3.2% lead. Upon completion of the necessary construction at the Duddar Mine and concentrator, PMDC anticipates production of about 60,000 t/yr of zinc concentrate grading 54% zinc and 10,000 t/yr of lead concentrate grading 64% lead. According to PMDC, MCC will invest the capital necessary to complete the construction at Duddar, subsequently taking an 87% equity in the joint venture and reducing this equity to 83% after 5 years (Metal Bulletin, 2002b).

In Australia, Perth-based Kagara Zinc Ltd. reported further significant mineralization from a diamond-drilling program at its Dry River South base-metals deposit in Queensland, a part of the company's Mt. Garnet project. Drill results showed zinc concentrations ranging from 5.7% to 21.4% and lead concentrations ranging from 1.8% to 10.4%. Current resources at the Dry River South deposit are estimated to be 760,000 t (Mining Journal, 2002c).

United Kingdom-based MinMet plc reported results of a completed core drilling program at its 70% owned El Aguila

polymetallic property in central Peru. The mineralization levels determined from the drilling ranged from 6.5% to 11% lead and 2.3% to 12.3% zinc. El Aguila is about 14 km from the Cerro de Pasco lead-silver deposit. MinMet acquired its interest in El Aguila from Denver, CO-based Apex Silver Mines Ltd. in March 2002 (Mining Journal, 2002d).

In Ireland, Arcon International Resources plc continued exploration drilling at its Galmoy base-metals mine, intersecting further high-grade zinc-lead and silver mineralization. Zinc concentrations ranging from 13.8% to 33.9% and lead concentrations ranging from 3.7% to 22.6% were reported (Mining Journal, 2002e).

Closings, Curtailments and Restructuring.—Japan's Mitsubishi Materials Corp. announced its withdrawal from the primary refined lead business in April, citing a decline in domestic demand and lower profits from its operation. During fiscal year 2001, Mitsubishi had produced 37,000 t of refined lead, of which 12,000 t was primary lead produced on its behalf by Toho Zinc Co., Ltd. In the future, Mitsubishi will focus only on the production of secondary lead. This lead will be derived principally from the recycling of spent lead acid batteries by its 80% owned subsidiary Hosokura Smelting & Refining Co., Ltd. in Miyagi Prefecture (Metal Bulletin, 2002h).

Also in Japan, several producers of refined lead announced plans to decrease their production targets for 6 months, beginning in October 2002. Mitsui Mining and Smelting Co., Ltd. lowered its lead output target during this period to 33,000 t, 4.6% lower than in the same period of 2001-02. Similarly, Sumitomo Metal Mining Co., Ltd. lowered its target to 10,800 t, a 16.9% reduction, and Mitsubishi Materials lowered its target to 10,800 t, down by 38.9% from the same period a year earlier. Declining domestic demand was cited as the most significant reason for the cuts in production (Platts Metals Week, 2002e).

Australia's Pasminco Ltd. began its emergence from court administration in October, following the signing of the company's deeds of arrangement. In May, the administrators had been granted approval to propose this deed to its creditors rather than proceed with a more complex and time-consuming creditor arrangement scheme. The signing of the deed enabled Pasminco to move into the implementation phase of a planned restructuring, during which the firm's assets could be transferred to a new holding company, Pasminco Resources Ltd. According to the company, new funding was effectively in place, enabling Pasminco to operate during the deed period, leading up to a plan for the raising of equity. Under the restructuring plan, creditors will exchange their debt for equity in the new entity, then subsequently sell down a part of that equity. Pasminco had been operating under administrators since September 2001 when the company's debt levels became excessive (American Metal Market, 2002g). As part of Pasminco's long-term strategy to restructure the company, it announced that the Cockle Creek zinc and lead primary smelter in New South Wales would be permanently closed sometime within the period 2006 to 2008. Pasminco planned to continue operating the smelter at its capacity of 90,000 t/yr zinc and 35,000 t/yr lead bullion until closure (Metal Bulletin, 2002i).

BHP Billiton, Sydney, Australia, announced that it would close its Pering lead-zinc mine in South Africa at the end of 2002 rather than early 2004, as originally planned. According to the company, the depressed market conditions necessitated that the closing date be accelerated. Billiton, however, planned to continue at full production until the mine was closed. An average of 39,000 t/yr of zinc concentrate and 6,000 t/yr of lead concentrate have been produced at the Pering Mine, during a period of 16 years (American Metal Market, 2002a).

China's Xinli Nonferrous Co. announced plans to decrease its refined lead output by 10,000 t to 60,000 t in 2002, citing low metal prices and a shortage of lead concentrate. However, Xinli continued with its plan to construct a new 100,000-t/yr plant in Qujing City, Yunnan Province. Construction began in April and was expected to be completed by the second half of 2004. The new plant will replace Xinli's existing plant in Kunming City. Permanent closure of the existing plant is anticipated by 2005 (Platts Metals Week, 2002j).

China's West Mining Co. lead refining operations remained closed at the end of the year, after having been shut down in May, when losses were incurred as a result of weak lead prices. West Mining had planned to produce 60,000 t of refined lead in 2002, but final output, reportedly, was well below this level. Although refining operations were shut down, mining operations continued throughout the period. A firm schedule had not been set for resuming the lead refining operations (Platts Metals Week, 2002k).

In Japan, Toho Zinc Co., Ltd. and Mitsui announced the finalization of an agreement to consolidate their production. In April 2003, Mitsui stopped crude lead production at its Takehara smelter in Hiroshima, where it produced 12,000 t/yr of crude lead from concentrates and 40,000 t/yr of refined lead. Instead, Mitsui will provide Toho's 120,000-t/yr Chigirishima smelter with sufficient feed, on a consignment basis, to produce 12,000 t/yr of crude lead for subsequent electrolytic refining at the Takehara facility. Mitsui's exit from primary lead processing at Takehara will enable it to begin secondary production there. Toho will benefit from the agreement by effectively lowering its operating costs at Chigirishima through increased utilization of its blast furnaces (Metal Bulletin, 2002j).

Canadian lead-acid battery recycler Nova Pb, Inc. received environmental approvals to recycle aluminum pot liners no longer needed at smelters. This new recycling activity will require the use of a rotary kiln previously devoted to lead smelting. As a result, Nova's lead smelting capacity will decrease to 50,000 t/yr from the current 100,000 t/yr. According to Nova, the company will remain in the lead recycling business, and all current commercial commitments will be respected (American Metal Market, 2002f).

In Canada, Noranda Inc. announced plans to reduce lead output at its Brunswick primary smelter in Belledune, New Brunswick, by 22,000 t/yr. Beginning in July 2003, the smelter will be operated on a 4-months-off/8-months-on basis, reducing lead production to 78,000 t/yr compared with the current production level of 100,000 t/yr. A company official cited decreasing treatment charges as the principal reason for the reduction in smelter output. Concentrates sourced from Noranda's Brunswick Mine will continue to be processed at the smelter, but concentrates from third-party sources will no longer be processed (Metal Bulletin, 2002g).

Reopenings and Expansions.—China's Chizhou Non-Ferrous Metal Group reported that it was in the process of

commissioning a new 50,000-t/yr refined lead production line at its facilities in Guichi City, Anhui Province. The addition of this line will increase overall lead output at the plant to 60,000 t/yr. Chizhou further noted that the construction of an additional 100,000-t/yr production facility was scheduled to be completed by the end of the year (Metal Bulletin, 2002c).

China's Shenyang Industrial & Technologies Co. (formerly Shenyang Smelter) announced plans to resume lead production by 2003. Environmental issues at the Shenyang plant had forced it to be closed in mid-November 2001. Current plans, drafted by the municipal government in Shenyang, would have the smelter relocated to a suburban site from its present urban site. However, no firm decision had been made regarding the exact location or production capacity of the new plant. The lead production capacity of the present plant is 80,000 t/yr, but only 20,000 t was produced in 2001 as a result of significant reductions in the workforce during the year (Platts Metals Week, 2002i).

China's Yuguang Gold and Lead Group increased production of refined lead in 2002 by about 14% compared with that of 2001. The production increase resulted from the completion of expansion projects in late 2001 and in May 2002 that boosted capacity to 140,000 t/yr from the previous 80,000 t/yr. Yuguang planned to produce 130,000 t of refined lead in 2002, up from 112,000 t in 2001 (Platts Metals Week, 2002l).

Elsewhere in China, the Chunxing Group announced that it would delay its lead recycling project until the end of the first quarter of 2003, citing weakness in the price of lead as the principal reason for the delay. The project was scheduled to be completed by the end of 2002. Upon completion, production capacity at the Chunxing facility will be doubled to 200,000 t/yr. According to the company, production at Chunxing was expected to be about 80,000 t in 2002 (Platts Metals Week, 2002d).

In Australia, BHP Billiton announced plans in October to complete a feasibility study on expansion of its Cannington lead-silver mine by the end of 2002. The expansion will increase the ore processing level to about 2.4 million metric tons per year (Mt/yr) from the current 2.0 Mt/yr. According to the company, the increase in metal production resulting from the expansion will be slightly offset by a decline in the grade of ore being processed. Pending approval by BHP Billiton's executive board, the expansion project was expected to be completed in about 1 year. Production of lead from the Cannington Mine was about 230,000 t in the fiscal year ending June 30, 2002 (Platts Metals Week, 2002c).

Indian Lead Ltd., a significant privately owned secondary lead producer in India, reopened its 20,000-t/yr smelter at Thane, near Mumbai. Following financial difficulties, Indian Lead had been placed under the control of India's Board for Industrial and Financial Reconstruction. However, the company subsequently secured a strategic partner to invest in the plant and gained final approval of a rescue plan from the Government that allowed the plant to reopen. The company also expected to restart production at its nearby Wada unit, which had a capacity of 40,000 t/yr. According to Indian Lead, the availability of spent lead-acid batteries improved in India during the year as a result of Metal Scrap Trading Corp.'s collection program that supplies the batteries to environmentally certified recyclers. Indian Lead is also equipped to process lead concentrates in its lead production (Metal Bulletin, 2002f).

Transfers of Ownership, Sales Offerings, and Mergers.— North Korea reportedly was seeking investors to revitalize the country's lead and zinc industries. The Pyongyang, North Korea-based Korea Zinc Industrial Group was offering to create a joint venture with an overseas bank, producer, or trader to modernize its Komdok mining complex and Danchon and Munpyong smelters. Both lead and zinc concentrates are produced at the Munpyong smelter. The smelter is operated using imported concentrates as well as concentrates processed from domestically mined raw materials (American Metal Market, 2002e).

Australia's Pasminco Ltd., a major producer of lead and zinc, completed the sale of its Broken Hill zinc-lead-silver mine in New South Wales to another Australian miner, Perilya Ltd. It was anticipated that Perilya would operate the mine at full production levels. A 50% reduction in output had been expected in 2002, had Pasminco continued its ownership of the mine. The sale was made as part of a restructuring plan designed to assist Pasminco in repaying its substantial accumulated debt. As part of the sales agreement, supply contracts were formalized that would continue the delivery of Broken Hill concentrates to Pasminco's Port Pirie lead smelter and Hobart zinc smelter. Perilya also announced that it had agreed to merge with Ranger Minerals Ltd. The merger would ensure funding of Perilya's operational plan for the Broken Hill Mine, a plan that would extend the life of the mine to at least 2011. The proposed merger was subject to approval by Ranger shareholders, as well as agreement on several other undisclosed conditions. In a related action by Pasminco, the company reportedly decided to retain ownership of its Century Mine but planned to sell its Elura Mine, its Cockle Creek smelter, and its U.S. assets in Tennessee (Platts Metals Week, 2002a, h).

In November, Pasminco completed an exclusive agreement with Consolidated Broken Hill Ltd. (CBH) that allowed CBH to negotiate the purchase of the Elura zinc-lead mine at Cobar in New South Wales. According to CBH, any sales agreement would include arrangements for the distribution of concentrate produced at Elura. Pasminco currently uses Elura as a source of concentrate for its Cockle Creek smelter, which has a production capacity of 90,000 t/yr of zinc and 35,000 t/yr of lead bullion. Production at Elura is about 73,000 t/yr of zinc and 42,000 t/yr of lead in concentrate. The exclusive period for due diligence, negotiation, and completion of documentation for any sale of Elura was extended into early 2003. In a separate arrangement, CBH and Clough Engineering Ltd. agreed to conduct due diligence jointly and would operate the mine in a 50-50 partnership. Reserves at Elura, as of March 2002, totaled 4.6 Mt, grading 8.8% zinc and 5.0% lead (Platts Metals Week, 2002b).

Elsewhere in Australia, Perth-based Kagara Zinc Ltd. agreed to acquire the Red Dome zinc-lead property in Queensland from Niugini Mining Ltd. Red Dome includes the Mungana property with indicated and inferred resources estimated to be 1.2 Mt, grading 11.9% zinc and 2.6% lead. The acquisition, with exploration licenses over a 388-square-kilometer area, lies adjacent to Kagara's Walsh River tenements in the Chillagoe region (Mining Journal, 2002b).

The United Nations Interim Administration Mission in Kosovo (UNMIK) sought potential investors and lenders for the Trepca lead-zinc-silver mines complex during the year. Trepca is currently under administration by UNMIK following the conflict in Kosovo in 1999. Potential interested parties were permitted to visit the assets and conduct due diligence investigations until July. After evaluation of offers from interested parties, UNMIK planned to award contracts by the end of 2002. The Trepca complex comprises three clusters of mines and associated milling, smelting, and refining operations. UNMIK has outlined plans for possible restart of all of these facilities. Total lead resources at Trepca's northern cluster is estimated to be 3.4 Mt grading 8.2% to 11.7% lead. The resource at the southern cluster is estimated to be 3.5 Mt grading 4.9 to 9.6% lead (Mining Journal, 2002f).

Johnson Controls, Inc., Milwaukee, WI, a manufacturer of automotive lead-acid batteries, announced plans to purchase European battery manufacturer Varta AG's automotive battery division. Varta operates six battery plants and controls about 30% of the Western European automotive battery market. The sale of Varta to Johnson Controls was subject to approval by European antitrust authorities and the Varta board of directors and shareholders. It was anticipated that the sale would be completed by the end of 2002 (Platts Metals Week, 2002f; Ryan's Notes, 2002d).

Metalico, Inc., Cranford, NJ, and Mayfield Manufacturing Co., Birmingham, AL, recently announced plans to merge their lead fabrication units. The new company will be named Mayco Industries LLC with Metalico assuming administrative and financial responsibilities for its operation. Metalico's lead fabrication plants are in Atlanta, GA, and Granite City, IL, and Mayfield's plant and headquarters are in Birmingham. Metalico will continue to produce lead shot as a separate entity and independently operate its Santa Rosa, CA, lead products plant. Metalico's secondary lead smelters in Tampa, FL, and College Grove, TN, were not included in the merger transaction (American Metal Market, 2002d).

Outlook

An increase of 1.9% in world consumption of lead is expected in 2003, driven mainly by further growth in China. In the United States, a decline of about 2% is predicted, owing principally to a continued slow recovery in the telecommunications sector and its adverse effect on demand for industrial-type lead acid batteries. Overall demand for refined lead in Europe is expected to remain at a level similar to that of 2002. Lead mine output worldwide is projected to increase by 2.8%, after declining sharply in 2002. The forecasted increase in mine production is attributed mainly to an increase in Australian output and to a full year of operation at the Tara Mine in Ireland, following its reopening in September. World production of refined lead is anticipated to decline by 1.8% in 2003 as a result of the recent closure of refineries in Canada, France, and the United Kingdom. Net exports of refined lead from China to industrialized countries in the Western World are expected to remain at a level similar to that of 2002 (International Lead and Zinc Study Group, 2003b).

In China, the projected growth in the Chinese economy is poised to increase domestic demand for lead and zinc, according to the State Economic and Trade Commission (SETC). Consumption in China is set to exceed 800,000 t of lead and 1.5 Mt of zinc by 2005. In the period 1999 through 2001, lead and zinc consumption rose to 700,000 t/yr from 240,000 t/yr for lead and to 1.3 Mt/yr from 370,000 t/yr for zinc. The SETC, however, stated that while economic data obtained near the end of the year indicated a more buoyant lead and zinc demand in China, problems with excess capacity could prove to be a drawback to this growth. The SETC indicated further that the country was committed to closing the smaller as well as the less efficient smelters (Metal Bulletin, 2002a).

Lead-acid batteries will continue to dominate the demand for lead for the foreseeable future. Demand for replacement automotive-type batteries is expected to be decreasing in the North American market through 2007, mainly as a result of improved quality that is extending the life of batteries. In the original equipment market, consolidation among vehicle producers and retailers and a trend toward globalization will require that battery manufacturers also consolidate and become more globally oriented. Vehicle production outside of North America is expected to increase significantly through 2007, specifically in Asia and South America. In the Western European market, declining vehicle production in 2003 has placed the demand for original equipment batteries in a slow-growth mode. However, rising vehicle production in Eastern Europe will likely offset some of this decline, resulting in a more stable demand situation in the overall European market. Demand for industrial batteries will continue to be down in both the North American and European markets, mainly as a result of slow growth in the telecommunications sector and delayed investment in a third-generation mobile phone infrastructure (CRU International Ltd., 2003).

Mine production in the United States should decline by about 2% in 2003 as a result of additional temporary production cutbacks at several of the larger facilities. Refined lead production from primary refineries also will decline by about 2% as a result of temporary production cutbacks. Secondary production of lead is expected to remain at a level comparable with that of 2002 but could rise slightly should weather-related temperature extremes increase the demand for replacement automotive-type batteries.

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TABLE 1
SALIENT LEAD STATISTICS[1]

(Metric tons unless otherwise specified)

		1998	1999	2000	2001	2002
United States:						
Production:						
Mine, recoverable lead content[2]						
Quantity		481,000	503,000	449,000	454,000	440,000
Value	thousands	$480,000	$485,000	$431,000	$437,000	$423,000
Primary lead, refined:						
Domestic ores and base bullion		337,000	350,000	341,000	290,000	262,000
Foreign ores and base bullion		W	W	W	W	W
Secondary lead, lead content		1,120,000	1,110,000	1,130,000	1,100,000	1,120,000
Exports, lead content:						
Lead ore and concentrates		72,400	93,500	117,000	181,000	241,000
Lead materials, excluding scrap		100,000	103,000	92,000	52,400	43,400
Imports for consumption:						
Lead in ore and concentrates		32,700	12,300	31,200	2,240	6
Lead in base bullion		464	90	65	--	--
Lead in pigs, bars, and reclaimed scrap		267,000	311,000	356,000	271,000	210,000
Stocks, December 31:						
Primary lead		10,900	12,300	18,600	W [3]	W [3]
At consumers and secondary smelters		77,900	78,700	106,000	100,000	105,000
Consumption of metal, primary and secondary		1,630,000	1,680,000	1,720,000	1,550,000 r	1,440,000
Price, North American producer average, delivered[4]	cents per pound	45.27	43.72	43.57	43.64	43.56
World:						
Production:						
Mine	thousands metric tons	3,060	3,070 r	3,180 r	3,150 r	2,910 e
Refinery[5]	do.	3,100	3,320 r	3,610 r	3,570 r	3,530 e
Secondary refinery	do.	2,870 r	2,850	2,970 r	2,900 r	2,860 e
Price, London Metal Exchange, pure lead, cash average[4]	cents per pound	23.96	22.78	20.57	21.58	20.52

eEstimated. rRevised. W Withheld to avoid disclosing company proprietary data; included with "Domestic ores and base bullion." -- Zero.

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

[2]Lead recoverable after smelting and refining. Number in table 14 represents lead in concentrate.

[3]Included with stocks at consumers and secondary smelters.

[4]Platts Metals Week.

[5]Primary metal production only; includes secondary metal production, where inseparable.

TABLE 2
MINE PRODUCTION OF RECOVERABLE LEAD IN THE UNITED STATES, BY STATE[1]

(Metric tons)

State	2001	2002
Alaska and Missouri	423,000	428,000
Other States[2]	30,900	12,300
Total	454,000	440,000

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

[2]Idaho, Montana, and Nevada.

TABLE 3
LEADING LEAD-PRODUCING MINES IN THE UNITED STATES IN 2002, IN ORDER OF OUTPUT

Rank	Mine	County and State	Operator	Source of lead
1	Red Dog	Northwest Arctic, AK	Teck Cominco Alaska Inc.	Lead-zinc ore.
2	Brushy Creek	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
3	Fletcher	do.	do.	Do.
4	Sweetwater	do.	do.	Do.
5	Buick	Iron, MO	do.	Do.
6	Greens Creek	Juneau, AK	Kennecott Greens Creek Mining Co.	Zinc ore.
7	Viburnum #28	Iron, MO	Doe Run Resources Corp.	Lead ore.
8	Casteel	do.	do.	Do.
9	Lucky Friday	Shoshone, ID	Hecla Mining Company	Silver ore.
10	Montana Tunnels	Jefferson, MT	Montana Tunnels Mining, Inc.	Zinc ore.
11	McCoy/Cove	Lander, NV	Echo Bay Mines Limited	Gold ore.

TABLE 4
REFINED LEAD PRODUCED AT PRIMARY REFINERIES IN THE UNITED STATES, BY SOURCE MATERIAL[1]

(Metric tons unless otherwise specified)

Source material		2001	2002
Refined lead:			
Domestic ores and base bullion		290,000	262,000
Foreign ores and base bullion		W	W
Total		290,000	262,000
Calculated value of primary refined lead[2]	thousands	$279,000	$252,000

W Withheld to avoid disclosing company proprietary data; included with "Domestic ores and base bullion."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Value based on average quoted price.

TABLE 5
LEAD RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,
BY KIND OF SCRAP AND FORM OF RECOVERY[1]

(Metric tons unless otherwise specified)

		2001	2002
Kind of scrap:			
New scrap:			
Lead-base		47,300	34,800
Copper-base		8,080 r	7,780
Total		55,300 r	42,600
Old scrap:			
Battery-lead		1,000,000	1,010,000
All other lead-base		35,500 r	53,100
Copper-base		6,420 r	5,700
Total		1,040,000 r	1,070,000
Grand total		1,100,000	1,120,000
Form of recovery:			
As soft lead		734,000 r	754,000
In antimonial lead		291,000 r	289,000
In other lead alloys		61,400 r	58,400
In copper-base alloys		14,500 r	13,500
Total:			
Quantity		1,100,000	1,120,000
Value[2]	thousands	$1,060,000	$1,070,000

rRevised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Value based on average quoted price of common lead.

TABLE 6
U.S. CONSUMPTION OF LEAD, BY PRODUCT[1]

(Metric tons)

SIC code	Product	2001	2002
	Metal products:		
3482	Ammunition, shot and bullets	53,600	57,600
	Bearing metals:		
35	Machinery except electrical	W	W
36	Electrical and electronic equipment	W	W
371	Motor vehicles and equipment[2]	498	374
37	Other transportation equipment	W	W
	Total	837	406
3351	Brass and bronze, billets and ingots	2,590	2,730
36	Cable covering, power and communication	W	W
15	Calking lead, building construction	927 r	1,060
	Casting metals:		
36	Electrical machinery and equipment	W	W
371	Motor vehicles and equipment	24,100	29,400
37	Other transportation equipment	W	W
3443	Nuclear radiation shielding	2,360 r	1,290
	Total	31,800 r	34,800
	Pipes, traps, other extruded products:		
15	Building construction	2,370 r	2,250
3443	Storage tanks, process vessels, etc.	(3)	(3)
	Total	2,370 r	2,250
	Sheet lead:		
15	Building construction	16,300 r	18,100
3443	Storage tanks, process vessels, etc.	(3)	(3)
3693	Medical radiation shielding	6,080 r	7,550
	Total	22,400 r	25,600
	Solder:		
15	Building construction	1,190	1,320
	Metal cans and shipping containers	W	W
367	Electronic components, accessories and other electrical equipment	3,690	3,970
371	Motor vehicles and equipment	W	W
	Total	6,120	6,450
	Storage batteries:		
3691	Storage battery grids, post, etc.	655,000 r	554,000
3691	Storage battery oxides	694,000 r	641,000
	Total storage batteries	1,350,000 r	1,190,000
371	Terne metal, motor vehicles and equipment	(4)	(4)
27	Type metal, printing and allied industries	(5)	(5)
34	Other metal products[6]	17,100	24,200
	Total	1,490,000 r	1,350,000
	Other oxides:		
285	Paint	W	W
32	Glass and ceramics products	W	W
28	Other pigments and chemicals	W	W
	Total	43,900	51,900
	Miscellaneous uses	14,500 r	34,200
	Grand total	1,550,000 r	1,440,000

rRevised. W Withheld to avoid disclosing company proprietary data; included in appropriate totals.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes "Terne metal, motor vehicles and equipment."
[3]Included with "Building construction" to avoid disclosing company proprietary data.
[4]Included with "Bearing metals, motor vehicles and equipment."
[5]Included with "Other metal products" to avoid disclosing company proprietary data.
[6]Includes lead consumed in foil, collapsible tubes, annealing, galvanizing, plating, electrowinning, and fishing weights.

TABLE 7
U.S. CONSUMPTION OF LEAD IN 2002, BY STATE[1, 2]

(Metric tons)

State	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
California and Washington	26,000	26,600	2,330	--	54,900
Florida and Georgia	18	658	33,800	--	34,500
Illinois	23,600	26,300	10,700	--	60,600
Iowa, Michigan, Missouri	1,760	4,160	4	--	5,920
Ohio and Pennsylvania	66,600	42,900	64,000	630	174,000
Arkansas and Texas	37,300	18,600	9,360	--	65,200
Alabama, Louisiana, Oklahoma	17,900	2,040	--	--	19,900
Colorado, Indiana, Kansas, Kentucky, Minnesota, Nebraska, Tennessee, Wisconsin	275,000	69,200	33,800	135	378,000
Connecticut, Maryland, New Jersey, New York, North Carolina, South Carolina	21,900	8,480	18,400	--	48,800
Various States	318,000	176,000	103,000	--	597,000
Total	788,000	375,000	275,000	765	1,440,000

-- Zero.

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

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

TABLE 8
U.S. CONSUMPTION OF LEAD IN 2002, BY CLASS OF PRODUCT[1, 2]

(Metric tons)

Product	Soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
Metal products	62,200	81,800	12,700	765	158,000
Storage batteries	667,000	292,000	236,000	--	1,190,000
Other oxides	W	--	--	--	W
Miscellaneous	58,700	329	27,100	--	86,200
Total	788,000	375,000	275,000	765	1,440,000

W Withheld to avoid disclosing company proprietary data; included with "Miscellaneous." -- Zero.

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

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

TABLE 9
STOCKS OF LEAD AT CONSUMERS AND SECONDARY SMELTERS
IN THE UNITED STATES, DECEMBER 31[1, 2]

(Metric tons of lead content)

Year	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
2001	59,100 [r]	27,000 [r]	14,100	131	100,000 [r]
2002	53,200	31,200	20,100	154	105,000

[r]Revised.

[1]Data are rounded to no more than three significant digits.

[2]Includes stocks at primary refineries.

TABLE 10
PRODUCTION AND SHIPMENTS OF LEAD PIGMENTS AND OXIDES IN THE UNITED STATES[1, 2]

(Metric tons and dollars)

	2001				2002			
	Production		Shipments		Production		Shipments	
Product	Gross weight	Lead content	Quantity	Value[3]	Gross weight	Lead content	Quantity	Value[3]
Litharge, red lead and white lead, dry	992	819	21,500	15,000,000	758	636	20,400	13,500,000
Leady oxide	729,000 r	693,000 r	NA	NA	661,000	628,000	NA	NA
Total	730,000 r	694,000 r	NA	NA	662,000	628,000	NA	NA

rRevised. NA Not available.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Excludes basic lead sulfate to avoid disclosing company proprietary data.
[3]At plant, exclusive of container.

TABLE 11
U.S. IMPORTS FOR CONSUMPTION OF LEAD PIGMENTS AND COMPOUNDS, BY KIND[1]

Kind	Quantity (metric tons)	Value (thousands)
2001:		
White lead carbonate	1	$13
Red and orange lead	33	244
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	7,120	21,600
Litharge	9,090	5,250
Glass frits, undifferentiated	18,300	18,800
Total	34,500	45,900
2002:		
White lead carbonate	--	--
Red and orange lead	15	106
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	8,040	20,600
Litharge	3,820	2,030
Glass frits, undifferentiated	21,400	21,400
Total	33,300	44,200

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

Source: U.S. Census Bureau.

TABLE 12
U.S. EXPORTS OF LEAD, BY COUNTRY [1]

(Lead content unless otherwise specified)

Country	2001 Quantity (metric tons)	2001 Value (thousands)	2002 Quantity (metric tons)	2002 Value (thousands)
Ore and concentrates:				
Belgium	33,900	$7,750	22,500	$4,930
Canada	18,300	14,500	10,800	7,110
Japan	45,000	10,200	44,500	10,200
Korea, Republic of	16,700	12,000	42,200	13,400
Mexico	40,800	23,400	52,800	32,600
Netherlands	11,700	2,510	16,100	3,610
United Kingdom	9,080	2,350	--	--
Other	5,580	4,560	51,700	15,300
Total	181,000	77,400	241,000	87,200
Ash and residues:				
Belgium	13,500	1,750	--	--
Canada	687	888	--	--
Total	14,200	2,640	--	--
Base bullion:				
Belgium	18	233	243	260
Canada	462	1,140	--	--
Mexico	2,790	7,420	--	--
Other	199	525	13	127
Total	3,470	9,320	256	387
Unwrought lead and lead alloys:				
Canada	1,250	880	1,430	940
Germany	59	194	9	61
Hong Kong	(2)	10	--	--
India	297	248	1	6
Israel	105	635	661	2,260
Japan	18	36	--	--
Korea, Republic of	726	508	101	99
Mexico	14,400	9,450	22,100	12,800
Thailand	--	--	26	122
United Kingdom	32	132	6,040	2,620
Other	157	784	999	776
Total	17,000	12,900	31,400	19,700
Wrought lead and lead alloys:				
Australia	80	129	80	112
Belgium	225	2,420	117	1,070
Canada	5,310	4,870	3,190	4,870
China	728	486	1,110	1,060
Colombia	75	172	3	28
France	351	357	272	390
Germany	3,640	2,120	2,960	2,610
Hong Kong	167	878	414	1,920
Israel	94	477	28	312
Korea, Republic of	153	2,700	859	706
Kuwait	34	461	--	--
Mexico	4,480	6,920	1,170	5,320

See footnotes at end of table.

TABLE 12--Continued
U.S. EXPORTS OF LEAD, BY COUNTRY [1]

(Lead content unless otherwise specified)

Country	2001 Quantity (metric tons)	2001 Value (thousands)	2002 Quantity (metric tons)	2002 Value (thousands)
Wrought lead and lead alloys--Continued:				
Netherlands	120	$271	191	$320
Saudi Arabia	370	4,210	149	1,720
Singapore	501	741	398	520
South Africa	43	81	28	207
Taiwan	102	271	29	169
United Arab Emirates	52	51	2	3
United Kingdom	664	1,110	310	836
Other	478 r	2,540 r	424	2,120
Total	17,700	31,300	11,700	24,300
Scrap, gross weight:				
Argentina	73	1,290	--	--
Canada	54,900	7,830	40,900	4,700
China	47,500	13,100	53,500	14,300
Dominican Republic	117	118	318	456
France	--	--	33	9
Haiti	14	6	--	--
Hong Kong	193	165	--	--
India	1,050	890	1,450	770
Japan	1	3	26	269
Korea, Republic of	473	99	5,540	1,170
Mexico	1,610	548	3,040	924
Spain	1,900	418	640	141
Taiwan	9	103	--	--
United Kingdom	3	7	--	--
Other	129	246	508	592
Total	108,000	24,900	106,000	23,300

rRevised. -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 13
U.S. IMPORTS FOR CONSUMPTION OF LEAD, BY COUNTRY[1]

Country	2001 Quantity (metric tons)	2001 Value (thousands)	2002 Quantity (metric tons)	2002 Value (thousands)
Ore and concentrates, lead content:[2]				
Poland	2,240	$449	--	--
Other	--	--	6	$8
Total	2,240	449	6	8
Pigs and bars, lead content:				
Australia	18,600	8,790	2,630	1,290
Belgium	--	--	82	60
Canada	167,000	93,200	172,000	89,100
China	56,300	27,700	28,200	12,100
Colombia	276	109	--	--
Germany	120	299	--	--
Kazakhstan	4,240	2,060	--	--
Mexico	12,400	5,330	7,460	3,530
Peru	2,330	1,260	--	--
Other	10,000	4,680	197	549
Total	271,000	143,000	210,000	107,000
Reclaimed scrap, including ash and residues, lead content:				
Canada	1,490 r	454 r	300	228
Colombia	4,800 r	1,890 r	1,580	611
Mexico	3,140 r	1,630 r	622	834
Netherlands	203	93	--	--
United Kingdom[3]	31 r	24 r	--	--
Other	569 r	256 r	71	66
Total	10,200 r	4,350 r	2,570	1,740
Wrought lead, all forms, including wire and powders, gross weight:				
Australia	23	99	18	87
Belgium	6	68	4	26
Canada	3,270	4,860	4,300	5,250
China	5,360	3,530	597	1,810
El Salvador	177	146	--	--
France	2	37	15	206
Germany	1,000	2,840	1,000	2,710
Guatemala	(4)	2	--	--
Hong Kong	15	65	3	42
Italy	29	135	45	306
Japan	74	518	50	557
Mexico	131	527	61	168
Netherlands	770	1,940	625	1,470
New Zealand	54	347	41	321
Peru	181	116	50	27
Taiwan	470	1,090	226	642
United Kingdom	640	1,560	490	1,360
Other	315	1,150	464	1,200
Total	12,500	19,000	7,990	16,200

rRevised. -- Zero.

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

[2]Also includes other lead-bearing materials containing more than 5 troy ounces per short ton of gold or more than 100 troy ounces per short ton of total precious metals.

[3]Also includes other lead-bearing materials containing more than 10% by weight of copper, lead, or zinc (any one).

[4]Less than 1/2 unit.

Source: U.S. Census Bureau.

TABLE 14

LEAD: WORLD MINE PRODUCTION OF LEAD IN CONCENTRATE, BY COUNTRY[1, 2]

(Metric tons)

Country[3]	1998	1999	2000	2001	2002[e]
Algeria	730	1,215	818	1,033 [r]	1,000
Argentina	15,004	15,256	14,115	12,334 [r]	12,011 [p]
Australia	618,000	681,000	739,000	714,000	683,000 [4]
Bolivia	13,848	10,153	9,523	8,857 [r]	8,900
Bosnia and Herzgovina[e]	200	200	200	200	200
Brazil	7,567	10,281	8,832	9,754 [r]	9,800
Bulgaria	24,200	17,000	10,500	18,000 [r]	19,000
Burma[e]	2,200	1,800	1,200	1,300	1,200
Canada	189,752	162,180	152,765	150,389 [r]	99,036 [p]
Chile	337	606	785 [r]	1,193 [r]	1,200
China[e]	580,000	549,000	660,000	676,000 [r]	600,000
Colombia	272	166	226	225 [e]	225
Ecuador[e]	200	200	200	200	200
Georgia[e]	200	200	200	200	200
Greece[e]	18,000	16,000	18,235 [4]	27,700	29,300
Honduras	4,329	3,764	4,805	6,750	8,128 [4]
India	39,300	32,100	28,900	27,000	29,000
Iran[e, 5]	11,000 [4]	11,000	15,000	15,000	15,000
Ireland	36,528	43,831	57,825	44,500 [e]	44,500
Italy[e]	6,800 [4]	6,000	2,000	1,000	1,000
Japan	6,198	6,074	8,835	4,997	5,723 [4]
Kazakhstan	30,000	34,100 [e]	40,000	37,700	40,000
Korea, North[e]	70,000	60,000 [r]	60,000 [r]	60,000 [r]	60,000
Korea, Republic of	3,558	1,822	2,724	988 [r]	1,000
Macedonia[e]	26,000	26,000 [4]	25,000	25,000	25,000
Mexico	166,060	125,656	137,975	136,413 [r]	140,000
Morocco	79,300	79,900	81,208 [r]	76,747 [r]	75,000
Namibia	13,568	9,885	11,114 [r]	13,025 [r]	13,680 [4]
Peru	257,713	271,782	270,576	289,546 [r]	290,000
Poland	59,600	62,900 [r]	51,200 [r]	52,600 [r]	53,000
Romania	15,144 [r]	20,484 [r]	18,750 [r]	19,676 [r]	20,000
Russia	13,000	13,000	13,300	12,300 [e]	13,500
Serbia and Montenegro	12,000	3,200	9,000	15,000 [e]	10,000
South Africa	84,128	80,191	75,262	50,771	49,444 [4]
Spain	21,900	41,800	40,300	49,500	23,600
Sweden	114,430	116,300	106,584 [r]	85,975 [r]	37,600
Tajikistan[e]	800	800	800	800	800
Thailand	6,700	11,900	15,600	12,900	13,000
Tunisia	4,274	6,599	6,602	6,450	4,600
Turkey	13,500 [e]	14,225	17,270	18,000 [e]	18,000
United Kingdom[e]	1,600	1,000	1,000	1,000	1,000
United States	493,000	520,000	465,000	466,000	451,000 [4]
Vietnam[e]	1,000	1,000	1,000	1,000	1,000
Total	3,060,000	3,070,000 [r]	3,180,000 [r]	3,150,000 [r]	2,910,000

[e]Estimated. [p]Preliminary. [r]Revised.

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

[2]Table includes data available through July 1, 2003.

[3]In addition to the countries listed, lead is also produced in Nigeria, but information is inadequate to estimate output.

[4]Reported figure.

[5]Year beginning March 21 of that stated.

TABLE 15

LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country[3]	1998	1999	2000	2001	2002[e]
Algeria:[e]					
Primary	900	900	900	900	900
Secondary	6,100 [4]	4,800 [r]	5,200 [r]	5,100 [r]	5,100
Total	7,000	5,700 [r]	6,100 [r]	6,000 [r]	6,000
Argentina:					
Primary	300 [e]	495 [e]	8,665	9,473 [r]	10,567 [p]
Secondary	30,057	25,195	27,000 [r]	25,960 [r]	31,000 [p]
Total	30,357	25,690	35,665 [r]	35,433 [r]	41,567 [p]
Australia:					
Primary	173,000	240,000	223,366	270,000	181,000 [4]
Secondary	33,000	32,828	28,430	33,000	30,000
Total	206,000	272,828	251,796	303,000	211,000
Austria, secondary[e]	23,100 [4]	24,000	24,000	22,000	24,500
Belgium:					
Primary[e, 5]	74,300	82,900	98,000	76,000	76,000
Secondary	17,200	20,300	20,000 [e]	20,000 [e]	20,000
Total	91,500	103,200	118,000 [e]	96,000 [e]	96,000
Brazil, secondary[6]	48,000	52,000	50,000	50,000 [r]	50,000
Bulgaria:					
Primary[e]	62,975 [4]	71,600 [r]	74,100 [r]	75,000 [r]	75,000
Secondary[e]	23,100 [r]	10,000 [r]	10,000	13,600 [r]	10,000
Total	86,075 [r]	81,600 [r]	84,100 [r]	88,600 [r]	85,000
Burma, primary	1,936	1,666	1,054	1,005 [r]	1,000
Canada:					
Primary	129,750	137,172	159,192 [r]	127,007 [r]	133,815 [p]
Secondary	135,737	129,243	125,641 [r]	103,921 [r]	117,449 [p]
Total	265,487	266,415	284,833 [r]	230,928 [r]	251,264 [p]
China:[e]					
Primary	665,000	821,000	998,000	984,000 [r]	1,100,000
Secondary	92,000	97,000	102,000	211,000 [r]	150,000
Total	757,000	918,000	1,100,000	1,200,000 [r]	1,250,000
Colombia, secondary[e]	12,000 [4]	12,000	12,000	12,000	12,000
Czech Republic, secondary[e]	15,000	15,000	15,000	15,000	15,000
France:					
Primary	146,000	124,000	100,000 [e]	96,000 [e]	76,000
Secondary	172,000	155,000	158,000 [e]	142,000 [e]	128,000
Total	318,000	279,000	258,000 [e]	238,000 [e]	204,000
Germany:					
Primary	176,800	169,557	210,000 [e]	232,000 [e]	240,000
Secondary	203,400	204,000	205,000 [e]	142,000 [e]	150,000
Total	380,200	373,557	415,000 [e]	374,000 [e]	390,000
India:[e]					
Primary	70,000	72,000	70,000	74,000	53,000
Secondary	25,000	20,000	26,000	20,000	20,000
Total	95,000	92,000	96,000	94,000	73,000
Iran:[e]					
Primary	9,000	12,000 [r]	15,000 [r]	12,000	12,000
Secondary	38,000 [4]	38,000	38,000	38,000	38,000
Total	47,000 [4]	50,000 [r]	53,000 [r]	50,000	50,000
Ireland, secondary[e]	11,000	12,000	12,000	13,000	13,000
Israel, secondary	12,000	13,000	13,000	20,000	22,000
Italy:					
Primary	57,400	66,954	75,000 [e]	82,000 [e]	75,000
Secondary	141,900	148,354	160,000 [e]	121,000 [e]	130,000
Total	199,300	215,308	235,000 [e]	203,000 [e]	205,000
Jamaica, secondary	800 [e]	--	--	--	--

See footnotes at end of table.

TABLE 15--Continued
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country[3]	1998	1999	2000	2001	2002[e]
Japan:					
Primary	144,542	125,514	129,469	127,358	107,744 [4]
Secondary	157,555	167,915	182,209	175,088 [r]	172,620 [4]
Total	302,097	293,429	311,678	302,446 [r]	280,364 [4]
Kazakhstan, primary and secondary	118,632	160,000 [e]	185,800	158,700 [r]	161,800 [4]
Kenya, secondary	1,000	1,000	1,000	1,000	1,000
Korea, North, primary and secondary[e]	80,000	75,000	75,000	75,000	75,000
Korea, Republic of:					
Primary	133,066	140,317	170,704	161,000 [r]	170,000
Secondary[e]	10,000	10,000	10,000	10,000	10,000
Total[e]	143,000	150,000	181,000	171,000 [r]	180,000
Macedonia:[e]					
Primary	26,000 [4]	19,000	19,000	19,000	19,000
Secondary	2,415 [4]	738	1,000	1,000	1,000
Total	28,415 [4]	19,738 [4]	20,000	20,000	20,000
Malaysia, secondary[e]	35,000	33,000	35,300	42,000	40,000
Mexico:					
Primary[7]	163,206	111,136	143,223	143,523 [r]	145,000
Secondary[e]	10,000	10,000	10,000	10,000	10,000
Total[e]	173,000	121,000	153,000	154,000 [r]	155,000
Morocco:					
Primary	60,929	65,209	66,812	58,178 [r]	58,000
Secondary[e]	3,000	3,000	3,000	3,000	3,000
Total[e]	63,900	68,200	69,800	61,200 [r]	61,000
Namibia, primary[8]	236	--	--	--	--
Netherlands, secondary	13,200	19,900	20,000 [e]	24,000 [e]	25,000
New Zealand, secondary[e]	6,000	6,000	10,000	10,000	10,000
Nigeria, secondary[e]	5,000	5,000	5,000	5,000	5,000
Pakistan, secondary[e]	2,000	2,000	2,000	3,000	2,000
Peru, primary	109,492	111,276 [r]	116,412	121,181 [r]	120,000
Philippines, secondary	17,000 [e]	12,389	16,218	24,000 [e]	24,000
Poland:					
Primary[e]	49,300	50,000	35,412 [4]	45,000 [r]	45,000
Secondary[e]	15,000	13,985 [4]	20,000 [r]	20,000 [r]	20,000
Total	64,300	63,985	55,412 [r]	65,000 [r, e]	65,000
Portugal, secondary[e]	6,000	6,000	6,000	6,000	6,000
Romania:[e]					
Primary	15,000 [r]	13,000 [r]	25,000 [r]	24,000 [r]	25,000
Secondary	3,000 [r]	3,000	3,000	3,000	3,000
Total	18,000 [r]	16,000 [r]	28,000 [r]	27,000 [r]	28,000
Russia, primary and secondary[e]	36,000	62,000	59,000	67,500	60,350 [4]
Serbia and Montenegro, primary	23,756	3,690	1,242	-- [e]	170
Slovenia, secondary[e]	14,000	14,000	15,300	15,000	15,000
South Africa, secondary	39,200	40,000	53,000	53,000 [r, e]	53,000
Spain, secondary[e]	90,000	96,000 [4]	120,000	98,000	98,000
Sweden:					
Primary	40,600	38,000 [e]	30,604 [r]	31,322 [r]	30,000
Secondary	52,000	48,000 [e]	47,255 [r]	44,056 [r]	39,700
Total	92,600	86,000 [e]	77,859 [r]	75,378 [r]	69,700
Switzerland, secondary[e]	7,600	7,000	8,000	9,000	9,000
Thailand:					
Primary	3,219	3,025	3,390	3,300	3,300
Secondary	18,906	23,741	23,803	23,200	23,000
Total	22,125	26,766	27,193	26,500	26,300
Trinidad and Tobago, secondary[e]	1,600	1,600	1,600	1,600	1,600

See footnotes at end of table.

TABLE 15--Continued
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country[3]	1998	1999	2000	2001	2002[e]
Turkey:[e]					
Primary	8,000	4,000	4,000	4,000	4,000
Secondary	4,000	4,000	2,000	2,000	2,000
Total	12,000	8,000	6,000	6,000	6,000
Ukraine, secondary	9,000 [e]	9,902	15,034	12,000 [e]	12,000
United Kingdom:					
Primary	186,212	185,422	166,411	203,000 [e]	205,000
Secondary	162,651	162,651	170,740	163,000 [e]	165,000
Total	348,863	348,073	337,151	366,000 [e]	370,000
United States:					
Primary	337,000	350,000	341,000	290,000	262,000 [4]
Secondary	1,120,000	1,110,000	1,130,000	1,100,000	1,120,000 [4]
Total	1,450,000	1,460,000	1,470,000	1,390,000	1,380,000 [4]
Venezuela, secondary[e]	25,000	25,000	30,000	30,000	30,000
Grand total:	5,970,000 [r]	6,170,000 [r]	6,580,000 [r]	6,470,000	6,390,000
Of which					
Primary	2,870,000 [r]	3,020,000 [r]	3,290,000 [r]	3,270,000 [r]	3,230,000
Secondary	2,870,000 [r]	2,850,000	2,970,000 [r]	2,900,000 [r]	2,860,000
Undifferentiated	235,000 [r]	297,000 [r]	320,000 [r]	301,000 [r]	297,000

[e]Estimated. [p]Preliminary. [r]Revised. -- Zero.

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

[2]Table includes data available through July 1, 2003. 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.

[3]In addition to the countries listed, Egypt produced secondary lead, but output is not officially reported; available general information is inadequate for the formulation of reliable estimates of output levels.

[4]Reported figure.

[5]Derived by calculating reported total lead output plus exports of lead bullion minus imports of lead bullion.

[6]Source: Lead and Zinc Statistics, Monthly Bulletin of the International Lead and Zinc Study Group, v. 42, no. 6, June 2002.

[7]Includes lead content in antimonial lead.

[8]Includes products of imported concentrate.