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Kirk F. Marty

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Via Electronic Mail and U.S. Mail

September 16, 2013

Fouad Dababneh
Enforcement Specialist
U.S. Environmental Protection Agency
Superfund Division, Enforcement and Compliance Assurance Branch
77 West Jackson Boulevard, SE-5J
Chicago, Illinois 60604-3590

Re: Request for Information Pursuant to Section 104(e) of CERCLA
Bautsch-Gray Mine Superfund Site, Jo Daviess County, Illinois

Dear Mr. Dababneh:

Enclosed please find Gold Fields Mining, LLC's Response to U.S. EPA's Information Request under Section 104(e) of CERCLA for the Bautsch-Gray Mine Superfund Site. This Response is submitted in accordance with an extension of time approved by Thomas Turner, Esq., U.S. EPA, Region 5 Office of Regional Counsel.

Please let me know if you have any questions.

Sincerely,

Kirk F. Marty
KFM/kga

Enclosures

Geneva
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Kansas City
London
Miami
Orange County
Philadelphia
San Francisco
Tampa
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PAHC.192903

RESPONSE OF GOLD FIELDS MINING, LLC TO EPA'S REQUEST FOR INFORMATION PURUSANT TO SECTION 104(e) OF CERCLA REGARDING THE BAUTSCH-GRAY MINE SUPERFUND SITE LOCATED IN JO DAVIESS COUNTY, ILLINOIS, CERCLIS ID# ILN000510407

This document responds on behalf of Gold Fields Mining, LLC ("GFML") to the Request for Information Pursuant to Section 104(e) of CERCLA regarding the Bautsch-Gray Mine Superfund Site (the "BGM Site") located in Jo Daviess County, Illinois (the "Information Request"), issued by Sharon Jaffess, Chief, Enforcement and Compliance Assurance Branch, United States Environmental Protection Agency ("EPA"), Region 5.

GFML has made a reasonable inquiry and conducted a diligent search of currently available company records. The responses provided pursuant to this Information Request are not intended and should not be construed as an admission of liability by GFML for the alleged release or threatened release of hazardous substances at the BGM Site, or for any response costs, or damages allegedly attributable to hazardous substances at the BGM Site. GFML specifically denies any liability under CERCLA or any other statute, regulation, or common law for the alleged release or threatened release of hazardous substances at the BGM Site.

GENERAL OBJECTIONS

GFML objects to the Information Request on the following grounds:

1. GFML objects to the Information Request to the extent it:

    a. Is vague, ambiguous, overly broad, or unduly burdensome;

    b. Assumes facts not in evidence;

    c. Exceeds EPA's authority under CERCLA;

    d. Calls for a legal conclusion;

    e. Seeks information that is a matter of public record or is equally available to EPA; or

    f. Seeks documents that are irrelevant or immaterial to the BGM Site and any current regulatory action regarding the BGM Site.

2. GFML objects to the Information Request to the extent it seeks documents that are not within GFML's possession, custody or control. GFML's responses to any of the specific Requests is not intended to be, and should not be construed as, an acknowledgement that the requested documents exist or that they are relevant.

3. GFML objects to the Information Request to the extent it seeks information protected by the attorney-client privilege, the work product doctrine, the joint defense privilege, the common interest doctrine, and any other privilege or immunity. GFML is providing information and documents that are not subject to any applicable privilege or immunity.

4. GFML objects to the Information Request to the extent it seeks trade secrets, proprietary information, or any other commercially-sensitive information that is not available to the general public.

5. GFML has made a reasonable inquiry and conducted a diligent search of available company records, and objects to the extent the Information Request purports to require GFML to conduct more than a reasonable and diligent search for responsive documents and information.

6. GFML's investigation is ongoing, and it reserves the right to supplement and/or amend any responses as necessary and as additional information is obtained.

PRELIMINARY STATEMENT

Upon information and belief, and after diligent inquiry, GFML states that its predecessor, Tri-State Zinc, Inc. ("Tri-State Zinc") conducted mining and/or milling activities at certain real property in Jo Daviess County, Illinois at times from approximately 1944 to approximately 1963. Given that the activities at issue ceased approximately half a century ago, available information relating to such activities is limited. GFML is attaching copies of all the documents in its custody and control it has located which relate to Tri-State Zinc's activities in Jo Daviess County, Illinois. These include the following:

TAB	DESCRIPTION
A	Summary Corporate Minutes of Tri-State Zinc, Inc.
B	Tri-State Zinc, Inc., Minutes of Meeting of Board of Directors, January 16, 1945
C	Tri-State Zinc, Inc., Minutes of Meeting of Board of Directors, December 17, 1946
D	Tri-State Zinc, Inc., Minutes of Special Meeting of Board of Directors, April 5, 1948
E	Tri-State Zinc, Inc., Minutes of Special Meeting of Board of Directors, January 30, 1952
F	Tri-State Zinc, Inc., Minutes of Meeting of Board of Directors, January 21, 1957
G	Tri-State Zinc, Inc., Minutes of Meeting of Board of Directors, June 5, 1957
H	Tri-State Zinc, Inc., Minutes of Meeting of Board of Directors, June 11, 1958
I	Tri-State Zinc, Inc., Minutes of Special Meeting of Board of Directors, July 16, 1959

TAB	DESCRIPTION
J	Tri-State Zinc, Inc., Minutes of Meeting of Board of Directors, July 11, 1960
K	Tri-State Zinc, Inc., Minutes of Meeting of Board of Directors, May 5, 1961
L	Tri-State Zinc, Inc., Minutes of Meeting of Board of Directors, September 3, 1963
M	Tri-State Zinc, Inc., Board of Directors Meeting, October 4, 1967
N	Tri-State Zinc, Inc., Minute Book Index
O	Correspondence from American Zinc Company of Illinois to Tri-State Zinc, Inc., April 28, 1953
P	Correspondence from Tri-State Zinc, Inc. to American Zinc Company of Illinois, May 6, 1953
Q	Correspondence from Tri-State Zinc, Inc. to American Zinc Company of Illinois, March 26, 1956
R	Minerals Yearbook 1957 (excerpt)
S	Minerals Yearbook 1959 (excerpt)
T	Minerals Yearbook 1963 (excerpt)
U	Preliminary Compilation, Mining Properties in the United States Operated by Companies Controlled by Consolidated Gold Fields, Limited, August 1991

ANSWERS TO NUMBERED QUESTIONS

1. On information and belief, and after diligent inquiry, GFML states that its predecessor, Tri-State Zinc, conducted mining and/or milling activities at certain real property in Jo Daviess County, Illinois at times from approximately 1944 to approximately 1963. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

2. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

3. On information and belief, GFML does not currently hold any legal or equitable interest in the BGM Site. Tri-State Zinc previously held leases on certain parcels of real property in Jo Daviess County, Illinois, including leases identified in the documents attached hereto.

4. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto. According to EPA's description of the BGM Site history, including the fact that mining at the BGM Site began during the 1850s, it is likely that hazardous substances existed on the Site prior to Tri-State Zinc commencing activities in Jo Daviess County, Illinois in approximately 1944.

5. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

6. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto. Among these documents are the names of the lessors of various parcels of real property in Jo Daviess County, Illinois, including many individuals, as well as Jo Daviess County and New Jersey Zinc Company.

7. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto. Among these documents are the names of the lessors of various parcels of real property in Jo Daviess County, Illinois, including many individuals, as well as Jo Daviess County and New Jersey Zinc Company.

8. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

9. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

10. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

11. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

12. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

13. Unknown. The documents in the custody and control of GFML relating to Tri-State Zinc's activities in Jo Daviess County, Illinois are attached hereto.

14. GFML is a limited liability company organized and existing under the laws of the State of Delaware, and is the corporate successor to Tri-State Zinc. On information and belief, Tri-State Zinc does not currently exist as a separate corporate entity. GFML became a subsidiary of Peabody Energy Corporation ("PEC") in February 1997, when Hanson PLC (a predecessor owner of PEC) transferred ownership of GFML to PEC in the spin-off of Hanson's energy business, despite the fact that GFML had no ongoing operations and PEC had no involvement in GFML's past operations. GFML is a dormant subsidiary of PEC.

15. See response to Question 13.

16. None

17-21. GFML does not understand EPA to be making a determination of liability at this stage and so it does not understand that the ability to pay for the cleanup conducted by EPA is an issue. In any event, it is unreasonable and unnecessary to seek 67 years of audited financial statements even if such documents existed for the categories of persons listed in request no. 17. Nor does GFML see a basis to seek financial information or tax returns for officers or directors, and does not understand what is being sought in request no. 20. If, for some legitimate reason, EPA is seeking additional financial information, please contact outside counsel, Kirk Marty of Shook, Hardy & Bacon, LLP, to discuss what additional information is being sought and the reason therefore.

I certify under penalty of law that the GFML document search upon which this response was based was conducted under my direction and/or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted herein.

Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

By: Terrance Gilco Faye
Title: Agent, GFML

A

file

SUMMARY CORPORATE MINUTES
OF
TRI STATE ZINC, INC. 1926/May 61

27 Aug 26 - Organized Delaware first meeting

Gold Fields American Development Co. Limited transferred to Tri State Zinc all of its properties in Oklahoma and Kansas (lands, leases or operations) acquired under a contract dated July 20, 1926, made with Foster Naething and Victor Rakowsky.

21 Sept 26 - Authorization for A.J. Klamt to open an account with Conqueror Trust Co of Joplin, Mo.

1 Oct 26 - National Park Bank, N.Y. made depositary of the company.

8 Nov 26 - Authorization to qualify to do business in Missouri.

15 July 27 - Count Dru resigns as Vice Pres. F.C. Baker elected instead. (Mr. Emlaw is chairman).

18 Sep 29 - James Ronaghan resigned as Secy Treas. A.N. Hutt appointed in his place.

25 March 30 - Count Dru resigns as director, replaced by Carl O. Lindberg.

13 June ? - Miss E.S. Dannatt elected Asst. Secy.

4 Feb 35 - Peter Colefax elected Secy Treas. in place of A.N. Hutt.

19 Aug 35 - Pres. Secy authorized to enter into and sign "Supplement to Tailings Contract," dated August 2, 1935, by and between Eagle Picher and Tri-State, authorizing to run tailings ~~over~~ through the Sooner Mill, as well as Ottawa Mill.

8 Sept 36 - Dividend of $50,000 declared, payable 10 September 36.

14 Dec 36 - Dividend of $40,000 declared, payable 16 December 36.

13 May 37 - Dividend of $50,000 declared, payable 18 May 37.

24 Aug 37 - Dividend of $50,000 declared, payable 27 Aug 37.

3 Nov 37 - By-laws amended to set numbr of directors at four. Peter Colefax made a director. Dividend of $50,000 declared, payable 8 November 37.

17 Dec 37 - Dividend of $15,000 declared, payable 21 December 37.

11 April 38 - Manager M.H. Loveman authorized to shut down Ottawa and Sooner Mills.

20 July 39 - Designation of agent for service of process in Kansas.

22 Sept 39 - Dividend of $25,000 declared, payable 27 Sept 39.

22 Dec 39 - Dividend of $40,000 declared, payable 27 Dec 39.

10 Nov 42 - H.S. Emlaw resigned as President of the company and was replaced by Carl O. Lindberg. F.C. Baker resigned as VP and director. M.H. Loveman elected VP and director. Peter Colefax resigned as Secy Treas. and director. Robert Playter elected Secy Treasurer and director. Miss E.S. Dannatt resigned as Asst. Secy.

12 March 43 - Barileing resolutions, relating to account at First National Bank of Joplin, Mo. giving signing power to M.H. Loveman or Victor C. Allen. Same for account at Baxter Springs, Kansas and for account at Miami, Oklahoma, waived surety bond. Rescinded requirement for four directors. H.S. Emlaw resigned.

20 Oct 43 - Number of resolutions relating to OPA - Price controls.

23 Feb 44 - Approved lease on Blue Mound Tailing Pile in Cherokee County, Kansas. One million tons. (Nola Stoskopf & Assoc.) General Manager submits report on gravels of Short Creek, near Galena, Kansas. 500,000 tons, from which a recovery of .55% ZnS is anticipated. Approved acceptance of assignment of lease between F.J. Pickett, Eula Pickett and Missouri Mining Co. and approved spending $30,000 to erect a 1,200 t/p/d mill to treat said gravels. Approved an agreement for 50% interest in Golden Queen Mining Co. for exploration development and mining of Cerro Gordo Mine, Inyo County, California. Designated agent for service of process in Mo.

27 March 44 - Opened payroll account in Galena, Kansas, and a checking account in Joplin, Mo.

16 Jan 45 - Company offered property near Galena, Illinois, which is part of Wisconsin-Illinois zinc fields. Approved development of a mine to be called the Gray Mine and Mill to treat 600 t/p/d. Approved execution of eleven leases in Jo Daviess County Illinois. Approved opening of bank account in Galena, Ill.

17 Dec 46 - Robert F. Playter resigns as Secy Treas. John H. Nicholls appointed. Release of three small tracts in Jo Daviess County, Illinois.

18 June 47 - Fiscal year changed from calendar to July 1 - June 30.

28 Nov 47 - Conveyed surface rights to Eagle-Picher over a tract in Ottawa County, Oklahoma, which had been deeded to Tri State in 1942. Miss H.M. Koeck appointed asst secy in place of Marie Desmond, who died.

14 Jan 48 - Agency fee payable to the Gold Fields American Development raised to 1500 from 1000.

22 Jan 48 - Pay back $50,000 to Golf Fields American, as a reduction of the loan.

24 Feb 48 - Release to Eagle-Picher right to re-mill and re-clean tailings known as Ottawa Pile in Otawa Co., Oklahoma, which right was granted to Tri State in 1942, Assign to Sooner Milling Co. of tailing leases dated March 6, 1942 on Quapaw Indian Lands in Ottawa County, Oklahoma:

Mary Whitebird allotment
Endora Whitebird allotment
Joseph Whitebird allotment
Harry Crawfish allotment

Release to lessors Maude A. Supernaw et al of tailings lease, dated March 6, 1942 on Sin-Tah-Hah-Hah track, Ottawa County, Oklahoma. Assignment to Sooner Milling Co. of a lease of surface rights needed for millsite and tailings located in Quapaw Indian Land, Ottawa County, Oklahoma, granted by Alphonso Greenback et al on December 22, 1945.

5 April 48 - Released a number of leases in Jo. Daviess County, Illinois.

25 May 48 - Approval of a contract for purchase of lead concentrate for smelter at Galena, Ill.

6 Aug 48 - Approval of withdrawal from Kansas and Oklahoma.

17 Jan 49 - Gave participation in operating profits to management 1 1/2% Loveman /3/4% to V.C. Allen.

18 June 51 - Dividend of $125,000 declared, payable June 23, 1951.

30 Jan 52 - Approved release of a large number of leases, all in Jo Daviess County, Illinois. Approved property options and leases in Shenandoah Valley, Virginia.

24 June 52 - Approved a dividend of $300,000 to Gold Fields American, payable the following day.

4 June 53 - Resolutions relating to qualifiying to do business in Virginia and West Virginia and ratified a number of leases in Rockingham County. Zinc concentrate contract with American Zinc extended to December 31, 1960. Fee payable to Gold Fields American Development increased from $18,000 to $21,5000.

6 April 54 - Loveman retires, VC Allen takes over as manager. Pension arrangements spelled out in detail.

16 June 54 - Adoption of new by-laws with clause indemnifying directors.

17 Sept 54 - Annual meetings of Tri State and of Missouri Mining Co. to be held October 5 and annually thereafter.

5 Oct 54 - Annual Meeting Election of directors C.O. Lindberg; M.H. Loveman; Robert F. Playter.

15 Oct 54 - Election of officers. Lindberg, Pres.; Loveman, VP; Nicholls, Secy; Koeck Assistant Secy.

8 Dec 54 - Account opened at Guaranty Trust; 500,000 deposited.

21 March 55 - Account opened in Washington, D.C. for Paul Herbert, company geologist.

14 April 55 - Registration to business in D.C. and Wisconsin. Zigler property in New Market, Virginia abandoned.

29 June 55 - Dividend of $300,000.

7 Sept 55 - Approval of accounts and issuance of proxy to J.H. Nicholls to vote Tri-State's shares at annual meeting of Missouri Mining Co.

4 Oct 55 - Annual meeting of shareholders. Same directors as last time elected.

21 Oct 55 - Directors meeting electing same officers as previously.

26 March 56 - Loveman retires and is replaced by V.C. Allen.

17 May 56 - Reported authorization from British Exchange Control for financing of Bowers-Campbell operation. Gold Fields American Development requested to repay $225,000 left on call. Declared a dividend of $300,000.

2 Oct 56 - Annual meeting appointing directors Allen; Lindberg; Playter.

21 Jan 57 - Officers elected:

R.F. Playter, Pres.
V.C. Allen, V.P.
J.H. Nicholls, Secy Treas.

Appointed agent for service of process in Virginia. Renewed for 3 years Black Jack lease from New Jersey Zinc. Approval of smelter contract with St. Joe and modification of contract to sell zinc concentrate to American Zinc at Galena, Illinois.

5 June 57 - Moved V.C. Allen to New York "in order to be in a better position to supervise both Galena and Timberville operations" and guaranteed sale price of his house in Galena. Authorized payment of $150,000 dividend for fiscal 56.

1 Oct 57 - Annual Meeting of shareholders. Incumbent directors re elected.

11 June 58 - Elected same officers and moved to 123 William St. Closed Timberville temporarily. Extended contract with American Zinc. Put in a pension plan.

11 March 59 - Annual Meeting of shareholders to reappoint incumbents - - V.C. Allen, C.O. Lindberg, Robert F. Playter. Board meeting same day noting that borrowing could not be increased w/o CGF permission. Incumbent officers re-appointed, namely R.F. Playtor, Pres, V.C. Allen, V.P., J.H. Nicholls, Secy Treas.

16 July 59. Allen residence sold for 2 or 3 grand less than guaranteed price.

17 Dec 59 - Lent $650,000 to Buell Engineering Company, Inc. for its purchase of The Northern Blower Co. Black Jack lease extended to 1 Oct 62.

11 Jan 60 - Lindberg resigns as director.

22 Jan 60 - J.H. Nicholls appointed director.

19 April 60 - Loan of additional $50,000 bringing total to $700,000, approved. Auhorized Missouri Mining Company to sell its only remaining asset, the Chitwood land and tailings, for $12,000. Dividend of 200,000 approved. Negotiations with American Zinc, Lead & Smelting reported progressing.

8 June 60 - Hired P.K. Houston, Jr. to supervise drilling program in Tennessee; opened a bank account for him in Knoxville.

11 July 60 - Qualified to do business in Tennessee. Reported drafting joint venture agreement with American Zinc for Tennessee. Approved letting American Zinc turn its immediate debt of $400,000 into loan at 5%. Approved changes in pension plan. Changed agent for service of process in Virginia.

29 July 60 - Tri-State invites Sir George S. Harvie-Watt and wife, chief executive officer of Gold Fields American, to visit U.S. all expenses paid. for a "policy" review.

25 Oct 60 - Change of agent in Virginia approved. (Although it is not clear, it appears that the name "The Gold Fields American Development Company, Ltd." was changed to "Gold Fields Mining & Industrial Limited.") $750,000 interest free loan was approved to parent GFMI Ltd.

5 May 61 - Loan of 400,000 to American Zinc extended, but at 4.5% per annum instead of 5%.

Buell Engineering Co. debt of $700,000 increased by $70,000, plus $30 accrued unpaid interest added to make it $800,000. Joint venture with American Zinc. Tri- State agrees to finance American Zinc's 40%, against indemnity for possible tax increase on distribution. Recommended exercise of Tennessee option.

B

TRI-STATE ZINC, INC.

MINUTES OF MEETING OF BOARD OF DIRECTORS

January 16, 1945

A special meeting of the Board of Directors of Tri-State Zinc, Inc. was held at the office of the Company, 50th Floor, 70 Pine Street, New York, N. Y., on January 16,1945 at 11:00 A. M.

There were present

Messrs. C. O. Lindberg
R. F. Playter

being a majority of the Board and a quorum.

Mr. Lindberg, President, acted as Chairman of the meeting, and Mr. Playter, Secretary, acted as secretary thereof.

The minutes of the previous meeting were read and approve

On motion duly seconded, it was unanimously

RESOLVED, that the accounts of the Company for the year ending December 31, 1943 as shown in the report of the auditors, Messrs. Baird, Kurtz and Dobson, dated March 28, 1944, be, and the same hereby are approved.

The Chairman informed the meeting that early in 1944 the Company had been offered a property in the Wisconsin-Illinois zinc field, near Galena, Ill. An examination was made and it was decided to proceed with the development of the mine, to be called the Gray Mine, and the erection of a mill capable of treating 600 tons daily. With the full approval of the Directors, the General Manager has proceeded to do all things necessary to bring the property into production. On motion duly made and seconded, it was unanimously

RESOLVED, that the action of the officers of the Company in executing the necessary documents to permit the Company to do business in the State of Illinois be, and the same hereby is, ratified and approved.

On motion duly seconded, it was unanimously

RESOLVED, that the action of the officers of the Company in executing eleven lease agreements, covering mining properties located in Jo Daviess County, Illinois, as listed below:

Lease with Wm. Blair Baggaley, dated Apr. 21, 1944, covering "Gray" Farm.
Lease with John G. Gill, dated July 15, 1944, covering Boevers Land.
Lease with John G. Gill, dated July 15, 1944, covering Mougin Land.
Lease with Wm. Blair Baggaley, dated July 25, 1944, covering Frank Bautsch Land.
Lease with Wm. Blair Baggaley, dated July 25, 1944, covering Luning Land.
Lease with Wm. Blair Baggaley, dated July 25, 1944, covering Beadle Land.
Lease with Wm. Blair Baggaley, dated July 25, 1944, covering Fox Land.
Lease with John G. Gill, dated Aug. 24, 1944, covering Mary Bautsch Land.
Lease with New Jersey Zinc Company, dated Oct. 18, 1944, covering Black Jack and Kipp properties.
Lease with John G. Gill, dated Nov. 11, 1944, covering Peters Land.
Lease with John Seidenberg, dated Nov. 21, 1944, covering Seidenberg Land.

be, and the same hereby is, ratified and approved.

On motion duly seconded, it was unanimously

RESOLVED, that the action of the officers of the Company in entering into an agreement with the Interstate Light & Power Co., dated June 8, 1944, and an agreement with the Northern State Power Co., dated June 1, 1944, which agreements provide for the supply of electric power to the Gray Mine, be, and the same hereby is, ratified and approved.

On motion duly seconded, it was unanimously

RESOLVED, that the action of the Vice President and General Manager in opening a payroll bank account in the name of the Company at the First National Bank of Galena, Ill.; and the authorization of M.H. Loveman, Victor C. Allen and J.E. Kaltenbach to sign payroll checks on that account be, and the same hereby is, ratified and approved.

On motion duly seconded, it was unanimously,

RESOLVED, that the action of the Vice President and General Manager in opening a general bank account in the name of the Company at the First National Bank of Galena, Ill.; and the authorization of M.H. Loveman and Victor C. Allen and J.E. Kaltenbach to sign checks on that account be, and the same hereby is, ratified and approved.

On motion duly seconded, it was unanimously

RESOLVED, that the acts performed and the expenditures incurred by the Vice President and General Manager to bring the Gray Mine into production at a daily rate of approximately 600 tons of ore, be, and the same hereby are, ratified and approved.

On motion duly made and seconded, it was unanimously

RESOLVED, that all acts of the officers of this Company in the general conduct of the business during the year ended December 31, 1944, and not elsewhere specifically approved, be, and the same hereby are ratified and approved.

A letter from the Vice President and General Manager was presented to the meeting. In it he recommended the sale of $25,000 of U.S. Treasury Bonds, for the reasons given in the following quotation from his letter:

"Our funds tied up in U.S. bonds is greater than the sum necessary for reserve against taxes and because of the lag between sale of concentrates and the receipt of bonus premiums, which are only paid

January 16, 1945

once a month, our cash in bank is insufficient for working capital. To correct this the sale of the enclosed bonds is necessary."

Upon motion duly seconded, it was unanimously

RESOLVED, that Robt. F. Playter, Treasurer, is hereby authorized and empowered to sell and assign or to request payment or reissue of the following-described United States securities registered on the books of the Treasury Department, and registered securities with respect to which the Treasury Department acts as the transfer agency, in the name of, or assigned to Tri-State Zinc, Inc., Picher, Oklahoma,

Title of Loan	Serial Number	Denomination	Form of Registration
2-1/4% Treasury Bond of 1956-59.	3734D	$10,000	Tri-State Zinc, Inc., Picher, Oklahoma.
	3735E	10,000	
	2761A	5,000	

And it is further

RESOLVED, that any and all assignments and requests for payment or reissue of the above-described securities, heretofore or hereafter made by the above-named officers, are hereby ratified and confirmed.

There being no further business, the meeting adjourned.

Robt. F. Playter.
Secretary

RFP:RL

C

TRI-STATE ZINC, INC.

MINUTES OF MEETING OF BOARD OF DIRECTORS

December 17, 1946.

A special meeting of the Board of Directors of Tri-State Zinc, Inc. was held at the office of the Company at 70 Pine Street, in the City of New York, State of New York, on Tuesday, the 17th day of December, 1946, at 12:00 o'clock Noon, pursuant to waiver of notice.

The following Directors were present:

Mr. Carl O. Lindberg
Mr. Robert F. Playter

Absent: Mr. M. H. Loveman.

The President of the Company, Mr. C. O. Lindberg, presided.

A letter dated September 3rd, 1946 from Mr. Robert F. Playter was presented resigning his office of Secretary and Treasurer of the Company. Upon motion duly seconded, it was

RESOLVED, that the resignation of Mr. Robert F. Playter from the office of Secretary and Treasurer of the Company be accepted and that Mr. John H. Nicholls be and he is hereby appointed Secretary and Treasurer.

The Chairman then stated that the main purpose of the meeting was to pass upon a proposition to release three small tracts covered by the following leases:

1) 1st March 1945. Lessors Ruth and Elmer Lokka, Myrtle and W. R. Virtue and Nellie M. Campbell

covering the following described lands situate in Jo Daviess County, State of Illinois, to-wit:

The East Half of the Northwest Quarter of Section 23, Town 27, Range 1 East of the Fourth Principal Meridian, Township of Rice, being Twenty (20) Acres.

2) 1st February 1945. Lessors Harry L. Heer and Myrtle R. Heer

covering the following described lands situate in Jo Daviess County, State of Illinois, to-wit:

> That part of the Northeast Quarter of the Northwest Quarter of Section 23, Town 27, North Range One (1) East of the Fourth Principal Meridian lying on the West side of the Galena and Hanover Road, containing Twelve (12) Acres, in Rice Township.

3) 1st March 1945. Lessors Frank L. Ware and Bessie I. Ware

covering the following described lands situate in Jo Daviess County, State of Illinois, to-wit:

> All the portion of the Southwest Quarter of the Northwest Quarter of Section 23 lying North and West of the Galena and Blanding Road, excepting a small strip owned by Philip Heckelsmiller, and containing Twenty (20) Acres, Town 27, North Range One East of the Fourth Principal Meridian, Rice Township.

This was recommended by Mr. Loveman as drilling had not indicated any favorable conditions in these three leases.

Upon motion duly seconded, it was

RESOLVED, that the President and Secretary be and they are hereby authorized, empowered and directed to execute a release covering the three above stated leases and affix the seal of the Company thereto.

There being no further business, the meeting adjourned.

President.

Secretary.

JHN:RTE

D

TRI-STATE ZINC, INC.

MINUTES OF SPECIAL MEETING OF BOARD OF DIRECTORS

April 5, 1948

A special meeting of the Board of Directors of Tri-State Zinc, Incorporated, was held in the offices of the Company at 70 Pine Street, New York, N. Y., on Monday, April 5, 1948, at 11 A. M.

There were present:

Messrs. C. O. Lindberg
R. F. Playter

being a majority of the Board and a quorum.

Mr. Lindberg, President, acted as chairman of the meeting and Mr. Nicholls, Secretary, acted as secretary.

The minutes of the previous meeting were read and approved.

It was reported that in view of the fact that drilling on the five leases set out below had indicated nothing to justify their retention, the President and Secretary be authorized to execute releases therefor:

1. Lease granted by W. J. Ehrler and G. B. Ehrler, dated May 3, 1947;
2. Lease granted by W. J. Kilpatrick and Ruth Kilpatrick, dated May 9, 1947;
3. Lease granted by J. W. Moore and B. Moore, dated August 12, 1947;
4. Lease granted by D. Irwin, dated October 16, 1947;
5. Lease granted by E. Bertsch and M. Bertsch, dated October 3, 1947,

all in Jo Daviess County, Illinois.

Upon motion duly seconded, it was

April 5, 1948

RESOLVED, that the President and Secretary be and they hereby are authorized, empowered and directed to execute releases covering the five above stated leases and to affix the seal of the Company thereto.

There being no further business, the meeting then terminated.

Secretary

-JHN.HMK

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TRI-STATE ZINC, INC.

MINUTES OF SPECIAL MEETING OF BOARD OF DIRECTORS

January 30, 1952

A special meeting of the Board of Directors of Tri-State Zinc, Incorporated, was held in the offices of the Company at 70 Pine Street, New York, N. Y., on Wednesday, January 30, 1952, at 11 A. M.

There were present:

Messrs. C. O. Lindberg
M. H. Loveman
R. F. Playter

being all the members of the Board.

Mr. Lindberg, President, acted as Chairman of the meeting, and Mr. Nicholls, Secretary, acted as secretary.

The minutes of the previous meeting held on June 18, 1951, were read and approved.

ABANDONMENT OF LEASES

It was reported that upon the advice of the General Manager, releases had been executed upon the following leases:

Releases dated July 3, 1951

1. Lease granted by Marie Berlage et al. dated August 15, 1950;
2. " " " Edward Biesmann dated June 2, 1950;
3. " " " Edward F. Miller dated August 8, 1950;
4. " " " Edgar and Bertha Deininger dated October 11, 1949;
5. " " " Ole Dittmar et al. dated June 16, 1950;
6. " " " Albert Virtue et al. dated June 30, 1950;
7. " " " Ernest and Daisy Kirschner dated May 26, 1950;
8. " " " Archie and Charles Virtue dated July 19, 1950;
9. " " " Joseph F. and Mabel Bauer dated June 30, 1950;
10. " " " Urban B. Schonhoff et al. dated September 2, 1950;

11. Lease granted by Wm. A. Jennings et al. dated September 28, 1950;
12. " " " Bertha Virtue dated July 13, 1950;
13. " " " Wm. A. Jennings dated September 28, 1950;
14. " " " Jo Daviess County dated June 12, 1950;
15. " " " Philip and Mary Hefel dated March 9, 1951;
16. " " " Henry J. and Edith Heller dated March 1, 1951;
17. " " " William and Myrtle Heller dated March 1, 1951;
18. " " " Charles L. and Agnes Staver dated March 9, 1951;
19. " " " Francis and Cecilia Keleher dated March 1, 1951;
20. " " " Oscar and Emma Groezinger dated July 24, 1946;
21. " " " Clarence Korte dated June 10, 1950;
22. " " " Ellsworth H. and Mildred L. Post dated January 2, 1948

Releases dated October 19, 1951

1. Lease granted by Frank and Elizabeth Erner dated June 15, 1951;
2. " " " Paul M. Gerlich, Jr. et al. dated June 1, 1951;
3. " " " Mary M. Tippett dated June 16, 1951;
4. " " " Raymond and Irene A. Wachter dated June 16, 1951;
5. " " " Howard R. and Catherine I. Willis dated June 16, 1951;
6. " " " Albert J. Schultz dated June 16, 1951;
7. " " " Nicholas R. and Anna A. Weis dated June 16, 1951;
8. " " " Christina Welday dated June 20, 1951;
9. " " " Henry L. and Martha H. Zahrndt dated June 16, 1951;
10. " " " Emma K. Blum dated June 25, 1951;
11. " " " Joseph H. and Vera M. Wienen dated June 26, 1951;
12. " " " Robert C. and Helen M. Foley dated July 2, 1951;
13. " " " Charles L. Tobin et al. dated August 1, 1951;
14. " " " Henry Saam dated August 28, 1951;

15. Lease granted by Louie C. and Myra Hesselbacher dated August 28, 1951;

16. " " " Mary and John Perry dated August 30, 1951;

17. " " " Arthur F. Wachter dated June 21, 1951;

18. " " " L. G. and Theresa M. Hutchings dated July 18, 1951

19. " " " Thomas H. and Helen N. Richards dated June 16, 1951;

20. " " " Arthur A. and Goldie L. Wills dated June 30, 1951;

all in the County of Jo Daviess.

Upon motion duly made and seconded, it was unanimously

RESOLVED, that the action of the officers in completing the 42 Releases set out above be and the same is hereby confirmed.

STATE OF VIRGINIA - SHENANDOAH VALLEY

It was reported that following upon the presentation by Mr. Carl Stehle of a Zinc-Lead proposition in the Shenandoah Valley, Virginia, an inspection of the area was made. Lengthy negotiations took place, as a result of which certain areas (covering two parallel outcrops) were tied up and test drilling was commenced. A free option, dated June 18, 1951, from Carl Stehle on the Bowers and Zigler Leases (in the so-called "West Zone") in Rockingham County was exercised September 7, 1951, by payment of $2,000. The balance of $8,000 due to Mr. Stehle was to be settled by a 15% royalty on net smelter returns. The two leases (expiring November 7, 1959 and October 24, 1959, respectively, but running indefinitely thereafter provided mining continues) were assigned to Tri-State. Terms include a nominal rental and a 5% royalty on net smelter returns. In addition, Tri-State obtained the Campbell Lease (West Zone) for $1,000 in November, 1951, with a further payment of $5,000 (not to be considered as advance royalty) due 12 months thereafter. The lease expires November 9,

1961, (but runs indefinitely thereafter provided mining continues), and terms include a nominal rental and a 5% royalty on net smelter returns. In order to enlist the cooperation of Charles Pavia et.al. (known as the Virginia Syndicate) to Tri-State obtaining leases in the so-called "East Zone", an agreement dated December 13, 1951, was entered into with the Virginia Syndicate as follows:-

Contract dated December 13, 1951, between
Tri-State and Virginia Syndicate

5% royalty to Virginia Syndicate on net smelter returns of production from any leases taken by Tri-State or Virginia Syndicate in areas specified ("East and West Zones").

Tri-State to pay $500 per month advance royalty commencing January 15, 1952, in any month in which Tri-State does not spend $1,500 on prospecting and development work.

Tri-State to pay $500 per month advance royalty commencing January 15, 1953, in any month in which royalties do not reach $500.

Tri-State to refund to Virginia Syndicate all rentals already paid by Virginia Syndicate on any leases taken over by Tri-State.

It was reported that the Drilling program was proceeding satisfactorily and that steps were being taken to obtain leases on additional areas.

Upon motion duly made and seconded, it was unanimously

RESOLVED, that the action of the Officers in,

(1) taking and subsequently exercising an option from Carl Stehle on the Zigler and Bowers Leases,

(2) taking an assignment from Carl Stehle of the said Lease,

(3) obtaining the Campbell Lease, and

(4) entering into an agreement dated December 18, 1951, with Virginia Syndicate

be and the same are hereby approved.

There being no further business, the meeting then terminated.

Secretary

JHN.HMK

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TRI-STATE ZINC, INC.

MINUTES OF MEETING OF BOARD OF DIRECTORS

January 21, 1957

A meeting of the Board of Directors of Tri-State Zinc, Inc. was held at the offices of the Company, 70 Pine Street, New York, N.Y., on Monday, January 21, 1957, at 11 A.M.

There were present:

Messrs. V.C. Allen
C.O. Lindberg
R.F. Playter

being all the Directors.

Mr. C.O. Lindberg, President, acted as chairman, and Mr. J.H. Nicholls, Secretary, acted as secretary thereof.

MINUTES

The minutes of the Board meeting held May 17, 1956, were taken as read, and were confirmed.

DIRECTORATE

It was reported that at the Annual Meeting held on October 2, 1956, the incumbent directors were reelected.

OFFICERS

Mr. C.O. Lindberg stated that since he wished to pass over to Mr. Playter his official functions, he would not be a candidate for reelection. This statement was accepted with deep regret.

The Secretary was instructed to cast one ballot for the appointment of the following nominess to the offices set against their names:

R.F. Playter	President
V.C. Allen	Vice President
J.H. Nicholls	Secretary-Treasurer

The Secretary having cast the ballot, announced the appointments. Regarding the office of Assistant Secretary, reference was made to a resolution concerning Statutory Representation in the State of Virginia occurring later in these minutes.

Mr. R.F. Playter thereupon took the chair.

STATUTORY REPRESENTATION IN STATE OF VIRGINIA

It was reported that under a new Corporation Law enacted by the State of Virginia, effective January 1, 1957, it was no longer possible for the Corporation Trust Company to act as statutory representatives. Therefore the following resolutions were unanimously adopted:

WHEREAS, the Virginia Stock Corporation Act, Chapter 428 of 1956, which became effective on January 1, 1957, provides that, prior to July 1, 1958, each foreign corporation qualified in Virginia on said date shall establish the registered office and appoint the registered agent required by Section 13.1-109 of the Act by filing in duplicate in the office of the State Corporation Commission of Virginia a statement on a form supplied by the Commission, Now, Therefore, Be It

RESOLVED, that the registered office of the corporation in the State of Virginia shall be located and maintained at 904 East Main Street, Richmond 19, Virginia;

RESOLVED, that ROBERT N. HANSON be and he hereby is appointed assistant secretary of this corporation to hold office during the pleasure of the board of directors, with authority limited to acting as registered agent of this corporation in the State of Virginia upon whom any process, notice or demand required or permitted by law to be served upon the corporation may be served pursuant to the laws of the State of Virginia and performing such other duties as may be incident or related to acting as such registered agent and as the president or the board of directors may prescribe;

RESOLVED, that ROBERT N. HANSON, an assistant secretary of this corporation, who is a resident of the State of Virginia and whose business office is identical with the registered office, be and he hereby is designated as the registered agent of the corporation in the State of Virginia;

RESOLVED, that the president or a vice-president of this corporation be and he hereby is authorized and directed to verify under oath and to file or cause to be filed in the office of the State Corporation Commission of Virginia a statement in duplicate, on a form supplied by the Commission, for the purpose of establishing the registered office and appointing the registered agent of the corporation, and to do and perform any and all acts and things necessary or advisable to effect compliance with Section 13.1-128 of the Virginia Stock Corporation Act.

BLACK JACK LEASE

The action of the officers in obtaining a renewal of this lease for three years expiring October 1, 1959 from New Jersey Zinc was approved.

TIMBERVILLE OPERATION

(a) Smelter Contract

The action of the officers in entering into a contract with St. Joseph Lead covering 1957 production (not in excess of 12,000 net tons) and thereafter from year to year subject to cancellation after January 1, 1958 on 120 days' notice, was approved.

(b) Easements to Virginia Electric & Power Co.

The action of the officers in joining Tri-State (as Lessee) to two agreements between (a) Mesdames Garber and Bowers, and (b) Virginia Electric & Power Co., covering easements for pole line and substation, was approved.

GALENA OPERATION

It was reported that with retroactive effect to September 1, 1955, American Zinc had reduced the Treatment charge on zinc concentrates by $2 per ton. The action of the officers in extending the American Zinc Smelter Contract for five years, from September 1, 1956, was approved.

AGENCY FEE

It was reported that with effect from January 1, 1957, Mr. V.C. Allen had joined the staff of Gold Fields American. In view of the fact that the services of Mr. Allen, as General Manager, would, with effect from January 1, 1957, be supplied by Gold Fields American, and that commencement of operations at Timberville would increase the time which Mr. Allen would have to devote to Tri-State matters, it was agreed that the Agency Fee paid to Gold Fields American should be increased.

Upon motion duly seconded, it was

RESOLVED, that effective January 1, 1957, the Agency Fee payable to Gold Fields American Development Company be at the rate of $50,000 per annum.

MISSOURI MINING COMPANY

The action of the officers in appointing J.H. Nicholls proxy to vote the Company's stockholding at the Annual Meeting of Missouri Mining Company, held October 2, 1956, was approved.

U.S. TREASURY BILLS

It was reported that $1,000,000 had been invested in U.S. 91-day Treasury Bills.

There being no further business, the meeting adjourned.

Secretary

JHN:ic

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TRI-STATE ZINC, INC.

MINUTES OF MEETING OF BOARD OF DIRECTORS

June 5, 1957

A meeting of the Board of Directors of Tri-State Zinc, Inc. was held at the office of the Company, 70 Pine Street, New York, N. Y. on Wednesday, June 5, 1957, at 3:30 P. M.

There were present:

Messrs. C. O. Lindberg
R. F. Playter

being two directors, and a quorum.

Mr. R. F. Playter, President, acted as Chairman, and Mr. J. H. Nicholls, Secretary, as Secretary.

MINUTES

The Minutes of the Board Meeting held January 21, 1957, were taken as read, and were confirmed.

TIMBERVILLE OPERATION

It was reported that milling commenced on April 25, 1957.

ZINC PRICE

It was reported that subsequent to the fall in the price of zinc from 12½ cents to 12 cents per pound, early in May, it has been decided to place both the Galena and the Timberville operations on a 5-day week basis effective May 13, 1957. Two further falls in the price of zinc, each of 1/2 cent per pound, had reduced the current price to 11 cents per pound. In addition, the price of lead fell from 16 cents to 15 cents per pound. This affects the Galena operation adversely, but not the Timberville operation.

V. C. ALLEN

Following upon the relocation of Mr. V. C. Allen, Vice

President and General Manager, in New York, in order to be in a better position to supervise both the Galena and Timberville operations, Mr. Allen had been unable to dispose of his residence in Galena. A valuation by the First National Bank of Galena (Illinois) having set a value of $17,500 on this residence, the officers had agreed to guarantee this amount to Mr. Allen and had placed at his disposal $16,000 on account of this guarantee.

Upon motion duly seconded, it was

RESOLVED, that the action of the officers in guaranteeing to Mr. V. C. Allen a price of $17,500 for his property at Galena, and advancing to Mr. Allen $16,000 on account of the guarantee, be and the same hereby are confirmed.

FURTHER RESOLVED, that Mr. V. C. Allen be requested to complete an assignment in due legal form of the property above mentioned in favor of Tri-State Zinc, Inc. whereupon the balance of $1,500 would be placed at his disposal.

U. S. GOVERNMENT SECURITIES

It was reported that upon maturity $1,000,000 U. S. 91-day Treasury Bills had been "rolled over" on two occasions. The current holding would mature August 29, 1957.

THE GUARANTY TRUST COMPANY OF NEW YORK

Upon motion duly seconded, it was

RESOLVED, that the resolution of December 8, 1954 relative to signing authority on the Company's bank account with The Guaranty Trust Company of New York be and the same hereby is rescinded, effective from the date of this resolution;

FURTHER RESOLVED, that, effective from the date of this resolution, the Guaranty Trust Company of New York as a designated depositary of this corporation be and it is hereby

authorized and directed to pay checks and other orders for the payment of money, including those drawn to the individual order of a signer, when signed in the following manner:

either by any two of the following:

R. F. Playter
V. C. Allen
J. H. Nicholls

or by any one of the above mentioned when countersigned by either one of the following:

G. P. Gouck
H. M. Koeck

DIVIDEND

After discussion and upon motion duly seconded, it was

RESOLVED, that a dividend of $150,000 be paid forthwith upon the outstanding stock of the corporation in respect of earnings for the fiscal year ending June 30, 1957.

There being no further business, the meeting adjourned.

Secretary

JHN.HMK

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TRI-STATE ZINC, INC.

MINUTES OF MEETING OF BOARD OF DIRECTORS

June 11, 1958

A meeting of the Board of Directors of Tri-State Zinc, Inc. was held at the office of the Company, 123 William Street, New York, N. Y., on Wednesday, June 11, 1958, at 2 P. M.

There were present:

Messrs. V. C. Allen
C. O. Lindberg
R. F. Playter

being all the directors.

Mr. R. F. Playter, President, acted as Chairman, and Mr. J. H. Nicholls, Secretary, as Secretary.

MINUTES

The minutes of the Board Meeting held June 5, 1957, were taken as read, and were confirmed.

DIRECTORATE

It was reported that at the Annual Meeting held October 1, 1957, the incumbent directors were reelected.

OFFICERS

The Secretary was instructed to cast one ballot for the appointment of the following nominees to the offices set against their names:

R. F. Playter	President
V. C. Allen	Vice President
J. H. Nicholls	Secretary-Treasurer

The Secretary having cast the ballot announced the appointments.

NEW YORK OFFICE

It was reported that effective November 1, 1957, the New York Office was relocated at 123 William Street, New York, N. Y.

TIMBERVILLE OPERATION

It was reported that owing to reductions in the price of zinc, production at Timberville was discontinued in January, 1958. Work on the inclined tunnel was continuing.

GALENA OPERATION

The action of the officers in extending the American Zinc Company of Illinois contract to December 31, 1965 on current terms was approved.

PENSION PLAN

It was reported that steps were being taken to set up a Pension Trust with The Equitable Life Assurance Society of the United States to provide pensions at retirement for those members of the Staff who were on monthly salaries. Estimated first annual premium after deduction of a compulsory 3% of salary contribution was about $11,250. The pension to be provided would represent 1% of salary at inception for each year of past services, plus 1% of annual salary for each year of service to retirement (age 65 or 10 years from entry, if later). An amount of life insurance would be provided to retirement equal to 100 times monthly pension.

U. S. GOVERNMENT SECURITIES

It was reported that during the current year investment in short term Government Bonds had risen to $1,250,000; however, currently, $1,000,000 Treasury Bills expiring August 28, 1958 were held. Upon motion duly seconded, it was unanimously

RESOLVED, that the action of the officers in continuing to invest all or a part of the Company's surplus funds in short term Government securities be and the same hereby is approved.

ANNUAL ACCOUNTS

In view of the wasting nature of the Company's assets, it was decided to set up a General Reserve by transfer from Unappropriated Surplus.

Upon motion duly seconded, it was unanimously

RESOLVED, that as of June 30, 1958, a General Reserve of $1,530,155 be set up in the Company's books of account by transfer from Surplus.

DIVIDEND

After discussion and upon motion duly seconded, it was

RESOLVED, that a dividend of $300,000 be paid forthwith upon the outstanding stock of the Corporation in respect of the fiscal year ending June 30, 1958.

There being no further business, the meeting adjourned.

Secretary

JHN.HMK

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TRI-STATE ZINC, INC.

MINUTES OF SPECIAL MEETING OF BOARD OF DIRECTORS

July 16, 1959

A special meeting of the Board of Directors of Tri-State Zinc, Inc. was held at the office of the Company, 123 William Street, New York, N.Y., on Thursday, July 16, 1959, at 11:00 A.M.

There were present:

Messrs. C.O. Lindberg
R.F. Playter

being two directors, and a quorum.

Mr. R.F. Playter, President, acted as Chairman of the meeting and Mr. J.H. Nicholls, Secretary, as secretary thereof.

FORMER RESIDENCE OF MR. V.C. ALLEN

It was reported that the residence of Mr. V.C. Allen in Galena, acquired by the Company from Mr. Allen in 1957, had been sold for $14,000 to Mr. J.R. Cox.

Upon motion duly seconded, the following resolution was unanimously adopted:

WHEREAS, Tri-State Zinc, Inc., a Delaware Corporation, is the owner of the following described real estate to-wit:

> Lot Number Eight (8) in Block Number One (1) fronting on Prospect Street, on the West side of Galena River, situated in the City of Galena, in the County of Jo Daviess, in the State of Illinois.

WHEREFORE, John Rogers Cox has offered to purchase said real estate for the sum of Fourteen Thousand Dollars ($14,000.00).

Now therefore be it resolved by the Board of Directors of Tri-State Zinc, Inc. and pursuant to the authority given the Board of Directors in the charter and by laws of said Corporation, that Tri-State Zinc, Inc. be and it is hereby authorized to sell the following described real estate to-wit:

> Lot Number Eight (8) in Block Number One (1) fronting on Prospect Street, on the West side of Galena River, situated in the City of Galena, in the County of Jo Daviess, in the State of Illinois.

to John Rogers Cox for the sum of Fourteen Thousand Dollars ($14,000.00).

Be it further resolved that Robert F. Playter and J.H. Nicholls, president and secretary of said Corporation be and they are hereby authorized to make, execute and deliver to John Rogers Cox on behalf of Tri-State Zinc, Inc. a Warranty Deed conveying all right, title and interest that Tri-State Zinc, Inc. has in and to said premises.

There being no further business, the meeting was adjourned.

Secretary

JHN:em

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TRI-STATE ZINC, INC.

MINUTES OF MEETING OF BOARD OF DIRECTORS

July 11, 1960

A meeting of the Board of Directors of Tri-State Zinc, In was held at the offices of the Company, 123 William Street, New Yor N. Y., on Monday, July 11, 1960, at 11 A. M.

There were present:

Messrs. V. C. Allen
J. H. Nicholls
R. F. Playter

being all of the directors.

Mr. Playter, President, acted as Chairman, and Mr. Nichol Secretary, acted as Secretary thereof.

MINUTES

The minutes of the meetings held April 19th and June 8, 1960, were taken as read, and were confirmed.

QUALIFICATION IN TENNESSEE

It was reported that the Company had been qualified to do business in Tennessee.

AMERICAN ZINC, LEAD AND SMELTING CO.
NEGOTIATIONS

It was reported that the drafting of the agreements with American Zinc, Lead and Smelting Co., covering the proposed Joint Venture in Tennessee, was in hand.

AMERICAN ZINC COMPANY OF ILLINOIS
SMELTER CONTRACT

(a) It was reported that the officers of the Company had agreed to certain amendments to the Zinc Concentrate Agreements retroactive to February 1, 1960.

(b) It was reported that American Zinc Company of Illinois had requested that $400,000 of the amounts due by them on account of smelter settlements be placed on a loan basis at 5% interest per annum. Upon motion duly seconded, it was

RESOLVED, that the officers of the Company be and they hereby are authorized to take notes payable November 30, 1960, in the amount of $400,000, from American Zinc Company of Illinois, bearing interest at 5% per annum from June 1, 1960.

EQUITABLE PENSION PLAN

It was reported that it was desirable to amend the Pension Trust Deed in two respects:

(a) To provide for cases where it was not desired to retire employees at the age specified in the Trust Deed;

(b) To provide for transfers of employees within the Group.

Upon motion duly made and seconded, it was

RESOLVED, that the Amendment to the Pension Plan of Tri-State Zinc, Inc., a copy of which is annexed to the minutes of this meeting, is hereby approved and adopted by the Company, and that V. C. Allen, Vice President of the Company is directed to execute said Amendment on behalf of the Company and to deliver a copy of the same to the Trustees under said Plan;

FURTHER RESOLVED, that the officers of this Company are authorized and directed to take such action as may be necessary or advisable to obtain the continued qualification with the United States Treasury Department of the Pension Plan as amended, including without limitation, the making of such further changes in said Plan as may be deemed necessary or advisable.

4.

RESOLVED, that the President or a Vice-President be and he hereby is authorized to make, execute and verify a new Appointment of Registered Agent and Establishment of Registered Office, and to take any and all steps and to do and perform any and all acts and things necessary or advisable to that end.

MISSOURI MINING COMPANY

It was reported that this Company had been dissolved, and that its assets had been liquidated and transferred to Tri-State Zinc, Inc. by June 30, 1960.

There being no further business, the meeting was adjourned.

Secretary

JHN.HMK

3.

CHANGE OF REGISTERED AGENT IN VIRGINIA

WHEREAS this Corporation has heretofore procured a certificate of authority to transact business in the Commonwealth of Virginia, and has heretofore established a registered office and appointed a registered agent in said Commonwealth; and

WHEREAS it is deemed advisable that such registered agent and registered office be changed;

NOW, THEREFORE, be it

RESOLVED, that JAMES R. FARLEY be and he hereby is appointed Assistant Secretary of this Corporation to hold office during the pleasure of the Board of Directors, with authority limited to acting as registered agent for this Corporation in the Commonwealth of Virginia, receiving any process, notice or demand required or permitted by law to be served upon the Corporation in the Commonwealth of Virginia and performing such other duties as may be incident or related to acting as such registered agent and as the President or the Board of Directors may prescribe;

RESOLVED, that JAMES R. FARLEY, an Assistant Secretary of this Corporation, who is a resident of the Commonwealth of Virginia, be and he hereby is appointed as the registered agent of the Corporation in said Commonwealth of Virginia, and that 10 South Tenth Street, Richmond 19, Virginia, which is the address of the business office of said JAMES R. FARLEY, be and the same hereby is established as the registered office of this Corporation in said Commonwealth of Virginia; and

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TRI-STATE ZINC, INC.

MINUTES OF MEETING OF BOARD OF DIRECTORS

May 5, 1961

A meeting of the Board of Directors of Tri-State Zinc, Inc. was held at the offices of the Company, 123 William Street, New York, N.Y., on Friday, May 5, 1961, at 10:30 A.M.

There were present:

Messrs. J. H. Nicholls
R. F. Playter

being two Directors, and a quorum.

Mr. Playter, President, acted as Chairman, and Mr. Nicholls, Secretary, acted as Secretary thereof.

MINUTES

The minutes of the meeting held October 25, 1960, were taken as read, and were confirmed.

AMERICAN ZINC CO. OF ILLINOIS - LOAN

It was reported that at the request of American Zinc Co. of Illinois the Notes for $400,000 payable November 30, 1960, had been renewed to February 28, 1961, at the same rate of interest, namely 5% per annum, and further renewed to May 29, 1961, at 4½% per annum.

Upon motion duly seconded, it was

RESOLVED, that the action of the officers in making two extensions of the Notes for $400,000 due by American Zinc Co. of Illinois, the current Notes expiring May 29, 1961, and carrying interest at the rate of 4½% per annum, be and the same is hereby confirmed and ratified.

BUELL ENGINEERING COMPANY, INC.

It was reported that at the request of Buell Engineering Company, Inc. a further advance of $70,000 had been made on 1st September 1960. Although this had been intended as a temporary accommodation, that company had later requested that it be treated on the same basis as the $700,000 previously loaned, to commence bearing interest at 5% per annum from January 1, 1961. At the same time, $30,000 of accrued interest due by Buell was added to the loan, at that company's request.

Upon motion duly seconded, it was

RESOLVED, that the action of the officers in advancing a further $100,000 to Buell Engineering Company, Inc., bearing interest at 5% per annum from January 1, 1961 (making a total of $800,000 loaned as of that date) be and the same hereby is confirmed and ratified.

ANNUAL ACCOUNTS

Upon motion duly seconded, it was

RESOLVED, that the action of the officers in making a grant of $1,200 to the University of Virginia to be used for Research by the Geology Department be and the same hereby is confirmed.

JOINT VENTURE IN TENNESSEE
WITH AMERICAN ZINC CO. OF TENNESSEE

It was reported that the drilling program in Tennessee having been successfully concluded towards the end of 1960, the preparation of an agreement had been proceeding. This agreement would cover an option to Tri-State Zinc expiring April 1, 1961 (subsequently extended to May 1, 1961 and to May 15, 1961) upon the exercise of which a Joint Venture would commence. With the issue early in May, 1961, of the Title Policy in the form required

by Tri-State Zinc, the agreement was finalized and had been signed by American Zinc. Tri-State's parent company, Gold Fields Mining & Industrial Ltd., had by resolution of its Board of Directors authorized the signature by Tri-State of the agreement and the ancillary documents, subject only to the authority of the British Exchange Control, which was awaited momentarily. Following the completion of the agreement, it was intended to exercise the option and proceed with the Joint Venture.

Upon motion duly seconded, it was

RESOLVED, that Mr. R. F. Playter, President, and Mr. J. H. Nicholls, Secretary and Treasurer, be and they hereby are authorized and directed, upon receipt of notice that the British Exchange Control Authorities have given their approval, to execute and deliver to American Zinc Co. of Tennessee, the following:

1. Joint Venture Agreement as of June 1, 1960, a copy of which is annexed to these minutes;

2. Tailings & Waste Rock Disposal Agreement, a copy of which is annexed to these minutes.

It was further reported that American Zinc Co. of Tennessee had agreed to hold The Consolidated Gold Fields of South Africa, Ltd. parent of the Company's parent, Gold Fields Mining & Industrial Ltd., harmless against certain increased taxation to that Company on the ultimate distribution of Tri-State's share in the proceeds of the Joint Venture in the event of changes in the tax convention between the U.S.A. and the U.K., in accordance with letter attached to these minutes.

Upon motion duly seconded, it was

RESOLVED, that the officers be and they hereby are authorized to obtain from American Zinc Co. of Tennessee written evidence in support of the above undertaking.

It was further reported that Tri-State had agreed to finance American Zinc's 40% share of Advance Development.

Upon motion duly seconded, it was

RESOLVED, that, following upon the signature of the Joint Venture Agreement, Mr. R. F. Playter, President, and Mr. J. H. Nicholls, Secretary and Treasurer, be and they hereby are authorized and directed to execute and deliver to American Zinc Co. of Tennessee the Agreement (copy of which is attached to these minutes) covering the reimbursement by American Zinc of the cost of Advance Development to be borne by Tri-State Zinc, Inc.

It was further reported that in connection with the issue of the Title Policy, a "Notice regarding the Properties" would require signature by the officers, and, upon motion duly seconded, the officers were authorized to sign such Notice.

It was reported that, with the successful completion of the drilling program and advance planning as to shaft location, mill location, etc., it was recommended that the option be exercised prior to the expiry date, May 15, 1961.

Upon motion duly seconded, it was

RESOLVED, that the officers of the Company be and they are hereby authorized and directed, subject to the completion and delivery of the various Agreements and Documents set forth earlier in these minutes, to exercise the option as provided for in Paragraph 2 of the Joint Venture Agreement and thereafter to take all such steps as may be necessary

for the implementation of the Agreement.

It was reported that in consideration of the Joint Venture Agreement, Tri-State had agreed that for the duration of the Joint Venture it would not acquire an interest in zinc mining properties in East Tennessee without giving American Zinc Co. of Tennessee first refusal of such properties.

Upon motion duly seconded, it was

RESOLVED, that the officers were authorized to accept on behalf of the Company the above conditions to be set out in a letter addressed to the Company by American Zinc Co. of Tennessee.

The issue of a Press Release, timed in conjunction with The Consolidated Gold Fields of South Africa, Ltd. and American Zinc Co. of Tennessee, was authorized.

There being no further business, the meeting adjourned.

Secretary

JHN.HMK

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TRI-STATE ZINC, INC.

MINUTES OF MEETING OF BOARD OF DIRECTORS

September 3, 1963

A meeting of the Board of Directors of Tri-State Zinc, Inc., was held at the offices of the Company at 123 William Street, New York, New York, on Tuesday, September 3, 1963, at 11:00 a.m.

There were present:

Messrs. V. C. Allen
J. H. Nicholls

being two directors and a quorum.

Mr. V. C. Allen, President, acted as Chairman of the meeting, and Mr. John H. Nicholls, Vice President, acted as Secretary thereof.

MINUTES

The minutes of the last meeting of the Board of Directors held on May 22, 1963, were taken as read and confirmed.

OPERATIONS

(a) Galena, Illinois

It was reported that operations had been terminated in April, 1963. All leases except the lease of surface rights for the mill site had been abandoned and the major part of the machinery had been disposed of or transferred to New Market, Tennessee.

(b) Timberville, Virginia

It was reported that operations had been terminated in July, 1963. It was intended to leave the mill intact for the time being and arrangements for caretaking had been made.

(c) New Market, Tennessee

It was reported that shaft sinking was completed in June, 1963, and that underground development had commenced. Troubles with the Marion Machinery mills were reported as were the steps taken to rectify the situation.

AUTHORITY TO DO BUSINESS IN THE STATE OF WISCONSIN

Upon motion duly seconded, it was

RESOLVED, that officers of the Corporation be and they hereby are authorized to take all necessary steps to withdraw from the State of Wisconsin.

OFFICERS

The resignation of Mr. J. E. Shipper as Secretary and Treasurer was presented. Upon motion duly seconded, it was

RESOLVED, that the resignation of Mr. John E. Shipper as Secretary-Treasurer be and the same hereby is accepted with regret.

FURTHER RESOLVED, that Mr. G. P. Gouck be and he hereby is appointed Secretary-Treasurer of the Corporation and that Mr. V. A. Filippone be and he hereby is appointed Assistant Secretary-Assistant Treasurer.

ANNUAL ACCOUNTS

Mr. Allen presented the Company's Annual Report for the year ended June 30, 1963, as certified by Messrs. Baird, Kurtz & Dobson, Certified Public Accountants. Upon motion duly made and seconded, it was

RESOLVED, that the accounts of the Company for the year ended June 30, 1963, as shown in the report of the Auditors, Messrs. Baird, Kurtz & Dobson, dated July 24, 1963, be and the same are hereby approved.

MORGAN GUARANTY TRUST COMPANY OF NEW YORK

Upon motion duly made and seconded, it was

RESOLVED, that the resolution dated March 15, 1963, covering signing privileges with the Morgan Guaranty Trust Company of New York be and the same is hereby rescinded; and be it

FURTHER RESOLVED, that with effect from the date of this resolution, checks, notes, drafts, or orders drawn on the Company's account with the Morgan Guaranty Trust Company of New York shall be binding only when signed by both of the following:

V. C. Allen
J. H. Nicholls

or any one of the foregoing if countersigned by the following:

G. P. Gouck

ADJOURNMENT

There being no further business brought before the meeting, it was on motion duly made and seconded, adjourned.

Secretary

JHN:EWR

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TRI-STATE ZINC, INC.

BOARD OF DIRECTORS MEETING

October 4, 1967

A meeting of the Board of Directors of Tri-State Zinc, Inc., was held at 280 Park Avenue, New York, New York on Wednesday, October 4, 1967, at 9:30 a.m.

There were present:

Messrs. V. C. Allen
J. H. Nicholls
W. Mason Smith

being all of the directors and a quorum.

Mr. V. C. Allen, President, acted as Chairman of the Meeting and Mr. V. A. Filippone, Secretary, acted as Secretary thereof.

MINUTES

The minutes of the meeting held on July 12, 1967, were taken as recorded and confirmed.

REPORT OF ANNUAL MEETING OF STOCKHOLDERS

Mr. W. Mason Smith reported that at the Annual Meeting of stockholders, held October 4, 1967, the following directors were elected:

Messrs. V. C. Allen
J. H. Nicholls
W. Mason Smith

ELECTION OF OFFICERS

Upon motion duly made and recorded, and unanimously adopted, the following were elected officers of the company as indicated:

V. C. Allen, President
J. H. Nicholls, Vice President
V. A. Filippone, Secretary-Treasurer

FINANCIAL REPORT

It was reported that the company had a loss of $28,000 for the fiscal year 66/67, consisting of a $17,000 loss from the New Market Zinc Joint Venture and $11,000 in other expenses.

The budget for 1967/68 indicated: Joint Venture income of $526,000; amortization of $197,000, resulting in a Net Profit of $329,000 with no Federal taxes payable.

WITHDRAWAL FROM ILLINOIS

It was suggested that, since the company had disposed of all its property in Illinois, no further business being conducted there, official withdrawal from the State be obtained.

Upon motion duly made and seconded, it was

RESOLVED, that the officers of the Corporation be and they hereby are authorized to take all necessary steps to withdraw from the State of Illinois.

MERGER OF G.F.A.C. AND TRI-STATE ZINC, INC.

Mr. W. Mason Smith reported that a merger between G.F.A.C. and Tri-State Zinc, Inc. was being considered, and that the best approach as to the mechanics was presently being studied.

ADJOURNMENT

On motion duly made and seconded, the meeting was adjourned.

V. A. Fabrizio
Secretary

VAF/bem

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TRI-STATE ZINC, INC.

MINUTE BOOK

INDEX

ACCIDENT, AUTO

New Market 28

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AMERICAN ZINC COMPANY OF ILLINOIS

818 Olive Street

ST. LOUIS 1, MISSOURI

April 28, 1953

Mr. M. H. Loveman
Manager
Tri-State Zinc, Inc.
Post Office Box 1011
Galena, Illinois

Dear Mr. Loveman:

This letter will confirm the discussion today between you, Messrs. Allen, Calhoun, and Dick relative to adjustment in the terms of our ore purchase contract covering zinc concentrates produced from your Galena, Illinois, operation. The adjustment will be effective as of March 1, 1953, provided the following basis is satisfactory with you:

1. When the price of metal is 11 cents a pound or less East St. Louis basis, a reduction of $3 per ton will be made in the base treatment charge of your concentrates.

2. For each .10 cent increase in the price of metal above 11 cents a pound, the reduction would be automatically reduced by 10 cents a ton of concentrates, which means that at 12 cents a pound metal the reduction in the base treatment charge would be $2 a ton. This reduction would continue on a sliding scale basis until the market reaches 13 cents a pound East St. Louis basis, at which time the special allowance would be discontinued.

The foregoing is suggested for the purpose of giving you some relief during the period of low prices of metal and we are perfectly willing to operate the smelter during this period without any return on our capital investment. We are granting a similar adjustment to our other large contract in Wisconsin.

In return for this adjustment you will agree to extend our present contract for a period of 5 years from the present expiration date of December 31, 1955, which would bring the expiration date to December 31, 1960.

I shall appreciate your advising us at your early convenience regarding this.

Very truly yours,

(Signed) H. I. YOUNG

President

HIY:LJ

P

TRI-STATE ZINC, INC.
P. O. Box 1011
GALENA, ILLINOIS

May 6, 1953

Mr. H. I. Young, President,
American Zinc Company of Illinois,
Paul Brown Building,
818 Olive Street,
St. Louis 1, Missouri.

Dear Mr. Young:-

This is in reply to your letter of April 28th covering our discussion of the same date, relative to an adjustment in our zinc concentrate contract covering our Galena, Illinois operation.

With the concurrence of Mr. C. O. Lindberg, we agree to the changes set out in the above letter, including the extension of our present contract for five years, from its expiration date of Dec. 31, 1955 to Dec. 31, 1960.

Very truly yours,

Tri-State Zinc, Inc.

By M.H. LOVEMAN
M. H. Loveman,
Manager.

MHL:chs

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TRI-STATE ZINC, INC.
P. O. Box 1011
Galena, Illinois

March 26, 1956

Mr. Howard I. Young, President,
American Zinc Company of Illinois,
Paul Brown Building,
818 Olive Street,
St. Louis 1, Missouri.

Dear Mr. Young:

Mr. Lindberg has informed me of his approval of the proposed amendments, as shown in the memorandum dated March 19, 1956, to the zinc concentrate contract. A copy of the revised memorandum which includes the changes in paragraph 4 and the addition of paragraph 5, as set out in your letter of March 17th, was forwarded to you in our letter of March 20th.

With kindest regards,

Sincerely yours,

(Signed) V. C. ALLEN

Vic Allen

VCA:js

R

MINERALS YEARBOOK

1 9 5 7

Volume I of Three Volumes

METALS AND MINERALS
(EXCEPT FUELS)

Prepared by the staff of the
BUREAU OF MINES
DIVISION OF MINERALS
Charles W. Merrill, Chief
Frank D. Lamb, Assistant Chief

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1958

FOREWORD

MINERALS YEARBOOK, 1957, published in three volumes, provides a record of performance of the Nation's mineral industries during the year, with enough background information to interpret the year's developments.

Volume I includes chapters on metal and nonmetal mineral commodities, with the exception of the mineral fuels. Included also are a chapter reviewing these mineral industries, a statistical summary, and chapters on mining technology, metallurgical technology, and employment and injuries. An additional chapter in the 1957 volume I compares Bureau of Mines mineral-commodity production data for 1954 with those presented in the 1954 Census of Mineral Industries reports published by the United States Department of Commerce.

Volume II includes chapters on each mineral fuel, an employment and injuries presentation, and a mineral-fuels review chapter that summarizes developments in the fuel industries and incorporates all data previously published in the Statistical Summary chapter. Also now included in this review chapter are data on energy production and uses that have previously been included in the Bituminous Coal chapter.

Volume III is comprised of chapters covering each of the 48 States, plus chapters on the Territory of Alaska, the Territory of Hawaii and island possessions in the Pacific Ocean, and the Commonwealth of Puerto Rico and island possessions in the Caribbean Sea, including the Canal Zone. Volume III also has a Statistical Summary chapter, identical with that in volume I, and another presenting employment and injury data.

The data in the Minerals Yearbook are based largely upon information supplied by mineral producers, processors, and users, and acknowledgment is made of this indispensable cooperation given by industry. Information obtained from individuals by means of confidential surveys has been grouped to provide statistical aggregates. Data on individual producers are presented only if available from published or other nonconfidential sources, or when permission of the individuals concerned has been granted.

MARLING J. ANKENY, *Director.*

Colorado, and Arizona; the group as a whole produced 7,400 tons less than in 1956.

Lead output in Idaho increased to 71,600 tons, the highest level since 1953. Increased output was reported by most of the principal operators. The Bunker Hill mine of the Bunker Hill Co. and the Page mine owned by American Smelting & Refining Co., recorded the largest gains. However, the decline in lead prices during the latter half of the year caused production cutbacks and closures. Idaho mines shut down in 1957 included the Hull lease on the Frisco mine, the Nabob Silver Lead mine, and the Triumph Mining Co. operation. In mid-December the Bunker Hill Co. announced curtailment of its production in the Coeur d'Alene region.

Output of recoverable lead in Utah declined 10 percent, to 44,500 tons, because of the closing of the Eagle-Blue Bell, Chief No. 1, the Plutus mines in June, and the Mayflower-Park Galena (New Park) mines in September. The United States and Lark mine unit continued to be the largest producer in the State. Other important producers in 1957 were United Park City, Mayflower-Park Galena, Calumet, Ophir, and Eagle-Blue Bell mines.

TABLE 3.—Mine production of recoverable lead in the United States, 1948–52 (average) and 1953–57, by States, in short tons

	1948–52 (average)	1953	1954	1955	1956	1957
Western States and Alaska:						
Alaska	110	9	----------	1	1	9
Arizona	24,763	9,428	8,385	9,817	11,999	12,441
California	12,085	8,604	2,671	8,265	9,296	3,458
Colorado	27,881	21,754	17,823	15,808	19,856	21,003
Idaho	83,660	74,610	69,302	64,163	64,321	71,637
Montana	19,721	19,949	14,820	17,028	18,642	13,300
Nevada	8,750	4,371	3,041	3,291	6,284	5,979
New Mexico	5,804	3,943	887	3,296	6,042	5,294
Oregon	5	5	5	3	5	5
South Dakota	5	10	----------	----------	----------	----------
Texas	106	----------	----------	----------	----------	----------
Utah	50,987	41,522	44,972	50,452	49,555	44,471
Washington	8,729	11,064	9,938	10,340	11,657	12,734
Wyoming	----------	----------	----------	----------	----------	----------
Total	242,559	194,329	171,844	182,461	197,758	190,331
West Central States:						
Arkansas	14	----------	----------	----------	----------	----------
Kansas	8,502	3,347	4,033	5,408	7,635	4,267
Missouri	123,476	125,895	125,250	125,412	123,783	128,345
Oklahoma	17,842	9,304	14,204	14,126	12,350	7,153
Total	149,834	138,546	143,487	145,036	143,768	137,765
States east of the Mississippi River:						
Illinois	3,534	3,391	3,222	4,544	3,832	2,970
Kentucky	127	52	80	----------	228	411
New York	1,331	1,435	1,187	1,037	1,608	1,087
Tennessee	80	9	----------	----------	5	----------
Virginia [1]	3,314	2,788	4,324	2,999	3,045	3,139
Wisconsin	1,128	2,094	[2] 1,265	1,948	2,582	1,903
Total	9,514	9,769	10,088	10,528	11,300	10,109
Grand total	401,907	342,644	325,419	338,025	352,826	338,316

[1] Includes 4 tons from North Carolina in 1954, 2 tons in 1955, 10 tons in 1956, and 9 tons in 1957.
[2] Includes 4 tons from Iowa.

Colorado output of lead increased 6 percent to 21,000 tons in 1957. The Idarado Mining Co. mine group continued to be the largest producer in the State. Other important producers included the Eagle mine of the New Jersey Zinc Co. (Eagle County) and the Keystone mine of the American Smelting & Refining Co. (Gunnison County). Mines closed after price declines included the Keystone mine, the Rico group of Rico Argentine Mining Co., and the Leadville properties of Ressurrection Mining Co.

Montana mine production of lead totaled 13,300 tons, 29 percent less than in 1956 and was the smallest since 1946. The Anaconda Co. closed several of its lead-zinc mines in the Butte district (Silver Bow County) in the second half of 1957 and postponed its scheduled mine-expansion program. Production from other Montana mines, principally the Jack Waite and Hand (Maulden) mines, was continued at essentially the same rate as in 1956.

Lead output in Washington increased 9 percent to 12,700 tons, the largest production on record. The principal lead producer was the Pend Oreille Mines & Metals Co. lead-zinc mine in Pend Oreille County. Other mines that produced considerable lead but were predominantly zinc producers were the Grandview (American Zinc, Lead & Smelting Co.) in Pend Oreille County and the Van Stone (American Smelting & Refining Co.). The Van Stone mine was closed in early July 1957.

Although several Arizona mines closed during 1957, the State output of lead increased 4 percent to 12,400 tons. The largest producer, the Iron King mine, operated continuously. Of the other substantial producers, the San Xavier mine suspended operations in June, the Head Center (Athletic) in July, and the Trench unit in October.

California production dropped from 9,300 tons in 1956 to 3,500 tons in 1957. The Anaconda Co. Darwin and Shoshone mine groups, the State's only large lead producers, suspended operations after the mid-year zinc and lead price declines.

In Nevada Combined Metals Reduction Co. closed its mines at Pioche in August, contributing to a 6-percent decline in Nevada production during 1957. New Mexico mines recorded a 12-percent decrease in lead output. The State's principal lead (and zinc) producer, the Ground Hog mine of American Smelting & Refining Co., closed in July, pending higher metal prices.

West Central States.—Kansas, Missouri, and Oklahoma mines yielded 137,800 tons of recoverable lead in 1957—41 percent of the United States domestic total. All production of the West Central States came from the southeast Missouri lead belt and the Tri-State district of Kansas, Oklahoma, and southwestern Missouri.

Mines in southeast Missouri produced 37 percent of the total domestic mine output of lead in 1957—essentially the same as in 1956. The St. Joseph Lead Co., the largest lead-producing company in the Nation on a mine basis, maintained steady output at its Bonne Terre, Desloge, Federal, and Leadwood mine-mill units in St. Francois County and the Indian Creek mine and mill in Washington County. In Madison County the Mine La Motte Corp. and the National Lead Co. each operated a mine group and mill. The ore from the National Lead Co. also yielded byproduct copper, cobalt, and nickel.

Output of recoverable lead in the Tri-State zinc-lead district dropped from 20,400 tons in 1956 to 11,500 tons in 1957 the lowest since railway service was initiated in the 1870's. Nearly all mines in the district

were closed, following the sharp declines in lead and zinc prices. The Nellie B mine of the American Zinc, Lead & Smelting Co. was closed in May, and the Eagle-Picher Co. operated its mines and central custom mill only intermittently. The National Lead Co., second largest producer in the district, operated its Ballard-mine group and mill throughout the year.

States East of the Mississippi River.—Lead was recovered from ores in Illinois, Wisconsin, Kentucky, New York, and Virginia in 1957; but production was 11 percent less than in 1956, owing to cutbacks and closures in the Illinois-Wisconsin district. American Zinc, Lead & Smelting Co. closed its Vinegar Hill Division mines and mill in Wisconsin; Eagle-Picher Co. closed the Linden mine and mill and curtailed activity elsewhere in the district. Tri-State Zinc, Inc., 1 of the 3 leading producers, maintained a fairly high production. Lead-bearing zinc ores of New York and Virginia yielded 4,800 tons of lead in 1957. St. Joseph Lead Co. operated its Balmat mine steadily

TABLE 4.—Mine production of recoverable lead in the United States, 1948–52 (average) and 1953–57, by districts or regions that produced 1,000 tons or more during any year, 1953–57, in short tons

District or region	State	1948–52 (average)	1953	1954	1955	1956	1957
Southeastern Missouri region.	Missouri	121,173	125,278	125,173	125,357	123,395	126,328
Coeur d'Alene region	Idaho	77,867	69,885	64,812	59,820	60,221	67,128
West Mountain (Bingham)	Utah	30,838	29,311	29,671	31,712	33,891	29,490
Metaline	Washington	5,173	8,694	(1)	(1)	9,440	11,971
Tri-State (Joplin region)	Kansas, southwestern Missouri, Oklahoma.	28,641	13,272	18,314	19,679	20,373	11,423
Summit Valley (Butte)	Montana	14,634	16,767	11,516	14,331	14,989	9,617
Park City region	Utah	9,601	4,725	5,432	9,954	9,147	9,421
Upper San Miguel	Colorado	6,507	7,440	5,574	5,098	(1)	7,721
Red Cliff	do	2,617	3,500	2,588	8,171	(1)	4,477
California (Leadville)	do	5,567	3,072	1,936	1,404	1,660	3,694
Upper Mississippi Valley	Iowa, northern Illinois, Wisconsin.	2,222	3,658	3,229	3,809	4,308	3,691
Central	New Mexico	3,231	1,460	5	2,604	4,682	3,519
Austinville	Virginia	3,314	2,785	4,320	2,997	3,035	3,143
Creede	Colorado	1,143	1,696	2,178	1,192	1,266	2,231
Rush Valley & Smelter (Tooele County).	Utah	2,760	2,753	2,454	1,607	2,529	1,977
Tintic	do	5,800	3,590	5,926	5,017	3,061	1,775
St. Lawrence County	New York	1,330	1,435	1,187	1,037	1,608	1,687
Kentucky-Southern Illinois.	Kentucky-southern Illinois.	2,524	1,849	1,348	2,683	2,235	1,500
Ophir	Utah	908	1,157	1,159	(1)	(1)	1,419
Bayhorse	Idaho	1,491	1,484	1,372	1,367	1,607	1,341
Warm Springs	do	2,566	2,568	2,415	2,388	1,804	1,260
Magdalena	New Mexico	1,393	------	47	95	688	1,234
Tyndall	Arizona	86	234	262	595	594	1,162
Las Vegas	Nevada	------	------	------	956	2,698	886
Pima (Sierritas, Papago, Twin Buttes).	Arizona	3,169	------	1	1,105	1,810	780
Northport (Aladdin)	Washington	837	2,164	1,278	2,212	2,065	720
Animas	Colorado	3,063	1,212	------	------	------	633
Hanscomberg	New Mexico	450	1,081	800	517	415	483
Breckenridge	Colorado	309	1,056	1,000	474	553	303
Big Bug [2]	Arizona	3,707	4,839	4,336	4,612	5,776	[illegible]
Eureka	Nevada	18	------	(1)	828	(1)	[illegible]
Coso (Darwin)	California	6,805	3,260	(1)	(1)	(1)	[illegible]
Harshaw	Arizona	1,818	2,104	2,185	(1)	(1)	[illegible]
Eagle	Montana	819	1,179	------	706	1,207	[illegible]
Pioche	Nevada	5,677	3,306	(1)	(1)	(1)	[illegible]
Elk Mountain	Colorado	104	------	(1)	(1)	(1)	[illegible]
Resting Springs	California	(1)	------	------	22	(1)	[illegible]
Pioneer (Rico)	Colorado	1,583	1,871	2,177	(1)	(1)	[illegible]
Snefels	do	965	1,307	1,113	634	525	------

[1] Figure not shown to avoid disclosure of individual company operations.
[2] The following districts or regions are not listed in order of 1957 output.

TABLE 5.—Twenty-five leading lead-producing mines in the United States in 1957, in order of output

Rank	Mine	District or region	State	Operator	Type of ore
1	Federal	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
2	Bunker Hill	Coeur d'Alene	Idaho	The Bunker Hill Co.	Lead-zinc.
3	United States & Lark	West Mountain (Bingham)	Utah	U.S. Smelting, Refining & Mining Co.	Do.
4	Leadwood	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
5	Indian Creek	do	do	do	Do.
6	Desloge	do	do	do	Do.
7	Butte Mines	Summit Valley	Montana	The Anaconda Co.	Lead-zinc.
8	Pend Oreille	Metaline	Washington	Pend Oreille Mines & Metals Co.	Do.
9	Bonne Terre	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
10	Treasury Tunnel-Black Bear-Smuggler Union.	Upper San Miguel	Colorado	Idarado Mining Co.	Copper-lead-zinc.
11	Star	Coeur d'Alene	Idaho	The Bunker Hill Co.	Lead-zinc.
12	Iron King	Big Bug	Arizona	Shattuck-Denn Mining Co.	Do.
13	Page	Coeur d'Alene	Idaho	American Smelting & Refining Co.	Do.
14	Mine La Motte	Southeastern Missouri	Missouri	St. Joseph Lead Co.	Lead.
15	Madison	do	do	National Lead Co.	Lead-copper.
16	United Park City	Uinta	Utah	United Park City Mines Co.	Lead-zinc.
17	Eagle	Red Cliff (Battle Mountain)	Colorado	The New Jersey Zinc Co.	Copper, lead-zinc.
18	Lucky Friday	Coeur d'Alene	Idaho	Lucky Friday Silver-Lead Mines, Inc.	Lead-zinc.
19	Austinville	Austinville	Virginia	The New Jersey Zinc Co.	Zinc-lead.
20	Grandview	Metaline	Washington	American Zinc, Lead & Smelting Co.	Lead-zinc.
21	Mayflower	Blue Ledge	Utah	New Park Mining Co.	Do.
22	Darwin Group	Darwin (Coso)	California	The Anaconda Co.	Do.
23	Sunshine	Coeur d'Alene	Idaho	Sunshine Mining Co.	Silver.
24	Flat Group	Harshaw	Arizona	American Smelting & Refining Co.	Lead-zinc.
25	Daytock	Coeur d'Alene	Idaho	Day Mines, Inc.	Lead.

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MINERALS YEARBOOK

1959

Volume 1 of Three Volumes

METALS AND MINERALS

(Except Fuels)

Prepared by the staff of the
BUREAU OF MINES
DIVISION OF MINERALS
Charles W. Merrill, Chief
Richard H. Mote, Assistant Chief
Donald R. Irving, Assistant to the Chief

UNITED STATES DEPARTMENT OF THE INTERIOR

FRED A. SEATON, Secretary

BUREAU OF MINES

MARLING J. ANKENY, Director

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1960

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FOREWORD

THE THREE-VOLUME Minerals Yearbook for 1959 is being issued in this, the 50th anniversary year of the Bureau of Mines. Although the Bureau of Mines was established in 1910, the Minerals Yearbook is much older, having appeared originally in 1867 as "Reports Upon the Mineral Resources of the United States" under the seal of the Department of the Treasury. Over the years, the series has appeared variously as "Mineral Resources West of the Rocky Mountains," as part of the "Annual Report of the Geological Survey," and as "Mineral Resources of the United States." Under the last-named title, the series first appeared under Bureau of Mines authorship. That was in 1927, and the statistical coverage was for the year 1924.

In 1933, the publication assumed its new and present title of "Minerals Yearbook." Beginning with the 1952 edition, the presentation became a three-volume issue to meet the expanded and specialized needs of the mineral industries and others.

The three-volume issues of the Yearbook follow this pattern:

Volume I includes chapters on metal and nonmetal mineral commodities except mineral fuels. In addition, it includes a chapter reviewing these mineral industries, a statistical summary, chapters on mining and metallurgical technology and employment and injuries, and a new chapter on technologic trends.

Volume II includes chapters on each mineral fuel, an employment and injuries presentation, and a mineral-fuels review chapter that summarizes developments in the fuel industries.

Volume III contains chapters covering each of the 50 States, plus chapters on island possessions in the Pacific Ocean and the Commonwealth of Puerto Rico and island possessions in the Caribbean Sea, including the Canal Zone. Volume III also has a statistical summary chapter, identical with that in Volume I, and a chapter on employment and injuries.

The data in the Minerals Yearbook are based largely upon information supplied by mineral producers, processors, and users, and acknowledgment is made of this indispensable cooperation given by industry. Information obtained from individuals through confidential surveys has been grouped to provide statistical aggregates. Data on individual producers are presented only if available from published or other nonconfidential sources, or when permission of the individuals concerned has been granted.

MARLING J. ANKENY,
Director.

d'Alene district continued to be the State's largest producer. The increase in the Idaho output resulted chiefly from an increased extraction rate at the principal mines in Shoshone County. In the development of deeper ore in the Coeur d'Alene district depths in excess of 4,000 feet were reached. Mining at a depth of 4,420 feet, or 1,720 feet below sea level, was planned for the Sunshine mine. The Hercules mine of Day Mines, Inc., was closed in the latter part of the year.

Utah continued to hold second place among the producers of lead in the Western States. The United States and Lark mine maintained its position as the largest producer in the State; other important producers were the United Park City and Mayflower-Park Galena mines. A merger agreement was reached by Chief Consolidated Mining Co. and Shattuck-Denn Mining Corp. The Bear Creek Mining Co., domestic exploration affiliate of Kennecott Copper Corp., discovered and commenced development of a major silver-lead-zinc ore body in the Tintic district.

Colorado was the third largest lead producer in the Western States. The Eagle mine of New Jersey Zinc Co. at Gilman and the San Miguel property of Idarado Mining Co. were the two major lead producers in Colorado. The newly reopened Rico mine in Dolores County and the Emperius mine at Creede also made significant contributions to the State's lead production.

TABLE 2.—Mine production of recoverable lead in the United States, by States, in short tons

	1950–54 (average)	1955	1956	1957	1958	1959
Western States:						
Alaska	38	1	1	9	2	
Arizona	15,622	9,817	11,999	12,441	11,890	9,999
California	10,466	8,285	9,206	8,458	140	227
Colorado	25,597	15,805	19,856	21,003	14,112	12,907
Idaho	78,874	64,163	64,321	71,627	53,603	62,395
Montana	19,393	17,028	18,642	13,300	8,434	7,672
Nevada	6,152	3,291	6,384	5,979	4,150	1,857
New Mexico	4,169	3,296	6,042	5,284	1,117	829
Oregon	6	3	5	5	1	
South Dakota	3					
Texas	46					
Utah	46,382	50,452	49,555	44,471	40,355	35,630
Washington	10,216	10,340	11,857	12,724	9,020	10,310
Total	216,762	182,461	197,758	190,351	142,824	142,826
West Central States:						
Arkansas	9					38
Kansas	6,846	5,498	7,835	4,217	1,209	481
Missouri	127,744	125,412	123,783	120,345	113,123	105,168
Oklahoma	15,189	14,126	12,350	7,183	3,602	601
Total	149,288	145,036	143,768	137,755	118,114	106,288
States East of the Mississippi River:						
Illinois	2,356	4,544	3,832	2,970	1,610	2,570
Kentucky	73		228	411	516	409
New York	1,345	1,037	1,608	1,667	579	431
Tennessee	31		5			
Virginia [1]	3,133	2,999	3,045	3,152	2,634	2,770
Wisconsin	1,456	1,948	2,582	1,900	800	745
Total	9,393	10,528	11,300	10,100	6,439	6,975
Grand total	375,443	338,025	352,826	338,216	267,377	255,586

[1] Includes 4 tons from North Carolina in 1954, 2 tons in 1955, 10 tons in 1956, and 9 tons in 1957.

TABLE 3.—Principal ores yielding lead and zinc in the United States in 1959, in short tons [1]

States	Lead ore			Zinc ore			Lead-zinc ore			Copper-lead, copper-zinc and copper-lead-zinc ores			Total		
	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Gross weight	Lead	Zinc	Ore, gross weight	Lead	Zinc
Alaska	4,067	233	18	16,139		3,264	346,147	9,720	23,617	96,296	25	10,306	462,672	9,965	37,208
Arizona							1,600	38	49				1,600	38	49
Arkansas							1,545	180	74				2,040	222	73
California	485	62	1	67	2	24	291,792	4,653	24,936	369,064	7,171	10,423	671,380	12,727	35,387
Colorado	10,457	701	4	(2)	(2)	(2)	845,760	50,867	46,251				856,217	51,568	46,255
Idaho	84,917	7,670	833			275	626,626	19,246	968				711,543	26,916	1,076
Illinois	688	610		6,459	13	51	13,135	437		633,013	16,885		653,295	17,945	51
Kansas	500	31	52	700									1,200	31	52
Missouri	5,290,638	101,146	192	596,080	4,522	22,809	1,577	41	25	1,283,679	4,025		5,878,517	105,185	23,026
Montana	17,557	2,280	64				1,034	134	49				614,809	6,953	113
Nevada	4,701	613					74,592	757	4,608				4,793	751	4,608
New Mexico							14,815	657	1,035				14,652	757	1,035
Oklahoma	700	45		350	1	14							15,945	601	14
Tennessee				2,409,225		83,176	457,986	35,712	33,067	3,892,035		6,766	6,759,246	35,943	89,972
Utah		212	29	400		21	856,071	10,298	17,095	671,033	34	54	856,988	10,510	17,150
Washington		20	2	432,836	700	11,316	11,584	45	219	404,390			404,390	745	11,535
Wisconsin						7,885		481	35,599					481	43,484
New Jersey				571,206			860,985						1,432,191		
Pennsylvania						16,718		2,770	14,450					2,770	16,718
Virginia [3]						6,894									20,334
Total	5,416,886	113,636	1,257	4,053,472	5,238	151,617	4,418,876	117,232	221,454	2,232,045	11,240	27,522	16,121,279	247,346	401,640

[1] Does not include lead or zinc recovered from other ores, tailings, slags, dumps, etc., except where exclusion was impossible.
[2] Zinc and lead-zinc ores combined to avoid disclosing confidential data.
[3] Includes some copper concentrates yielding 146 tons of lead.
[4] All ores combined to avoid disclosing confidential data.
[5] Data partly combined to avoid disclosing confidential data.

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Washington was one of the few States showing an increase in lead output. The Pend Oreille mine of Pend Oreille Mines and Metal Co. and the Grandview mine of American Zinc Lead and Smelting Co. were again the major producers. Mining companies opposed the planned construction of two large power dams in the Metaline district, Pend Oreille County, on the grounds that large resources of lead and zinc would be irrevocably lost by flooding.

The decline in lead output in Arizona, which began in 1958, continued through 1959. The Iron King mine operated by the Shattuck-Denn Mining Corp. was the State's leading producer. McFarland & Hullinger closed the San Xavier mine late in the year. The Ari-Vada Corp. began operating the McCracken lead-silver mine near Signal in Mohave County and constructed a new 150-ton mill to process the ore.

Lead production from Montana was the lowest since the economic depression of the early 1930's. The reduced output was attributed chiefly to a prolonged labor strike at the mines in Butte. A sizable block of lead-zinc-silver-gold ore was opened by leasers in a supposedly mined-out area of the Snowshoe mine. A new 100-ton selective flotation concentrator, utilizing jig tailings and ore from the mine, was placed in operation near Libby Mountain by St. Paul Lead Co., of Kellogg, Idaho, and Merger Mines Corp. of Coeur d'Alene, Idaho, joint owners

TABLE 4.—Leading lead-producing mines in the United States in 1959, in order of output

Rank	Mine	District or region	State	Operator	Type of ore
1	Federal	Southeastern Missouri.	Missouri	St. Joseph Lead Co.	Lead.
2	Bunker Hill	Coeur d'Alene	Idaho	The Bunker Hill Co.	Lead-zinc.
3	United States & Lark.	West Mountain (Bingham).	Utah	U.S. Smelting, Refining & Mining Co.	Gold-silver, lead-zinc.
4	Leadwood	Southeastern Missouri.	Missouri	St. Joseph Lead Co.	Lead.
5	Indian Creek	do	do	do	Do.
6	Star	Coeur d'Alene	Idaho	The Bunker Hill Co.	Lead-zinc.
7	Bonne Terre	Southeastern Missouri.	Missouri	St. Joseph Lead Co.	Lead.
8	Pend Oreille	Metaline	Washington	Pend Oreille Mines & Metals Co.	Lead-zinc.
9	Iron King	Big Bug	Arizona	Shattuck-Denn Mining Corp.	Do.
10	Treasury Tunnel-Black Bear-Smuggler Union.	Upper San Miguel	Colorado	Idarado Mining Co.	Copper-lead-zinc.
11	Page	Coeur d'Alene	Idaho	American Smelting & Refining Co.	Lead-zinc.
12	Lucky Friday	do	do	Lucky Friday Silver-Lead Mines Co.	Lead.
13	United Park City	Uintah	Utah	United Park City Mines Co.	Lead-zinc.
14	Butte Mines	Summit Valley	Montana	The Anaconda Co.	Do.
15	Madison	Southeastern Missouri.	Missouri	National Lead Co.	Lead-copper.
16	Mayflower-Galena	Blue Ledge	Utah	New Park Mining Co.	Lead-zinc.
17	Eagle	Red Cliff (Battle Mountain).	Colorado	The New Jersey Zinc Co.	Copper, lead-zinc.
18	Austinville	Austinville	Virginia	do	Zinc-lead.
19	Grandview	Metaline	Washington	American Zinc, Lead & Smelting Co.	Lead-zinc.
20	Jack Waite	Eagle	Montana	American Smelting & Refining Co.	Lead.
21	Emperius	Creede	Colorado	Emperius Mining Co.	Lead-zinc.
22	Sunshine	Coeur d'Alene	Idaho	Sunshine Mining Co.	Silver.
23	Hercules	do	do	Day Mines, Inc.	Lead-zinc.
24	Flux	Harshaw	Arizona	Nash & McFarland	Do.
25	Dayrock	Coeur d'Alene	Idaho	Day Mines, Inc.	Lead.

of the Snowshoe mine. The mill also was to handle ore from other area operators on a custom basis.

Most of the Nevada lead production was recovered as a byproduct of processing manganese and gold-silver ores. The reopening of The New Jersey Zinc Co.'s Hanover mine-mill unit in New Mexico in late summer and the lease of the Linchburg mine by the same company increased the monthly production level in New Mexico by the end of the year.

Missouri continued in first place among the lead-mining States of the Nation. Mines in Oklahoma and Kansas remained closed throughout most of 1959 because of continued low metal prices and the lower grade of the ore.

The output of lead from the mines of the Southeast Missouri Lead Belt, although 7 percent below 1958, represented about 41 percent of the U.S. total. St. Joseph Lead Co. reduced lead mining operations from a 5-day to a 4-day workweek in February because of the declining metal market. The 5-day week was resumed, however, in August and maintained throughout the rest of the year. Development of the company's new Viburnum ore bodies in Crawford, Washington, and Iron Counties, continued. One of the three newly planned shafts was bottomed at approximately 800 feet, and a second shaft was collared and sunk to a considerable depth. Lateral cutting was begun on the bottomed shaft. Ore reserves were large, and the average grade of ore was considerably higher than that of parts of the district previously mined.

A small quantity of lead was recovered by reprocessing tailing dumps; however, no mine production was reported from the once richly productive Tri-State mines in northeast Oklahoma, southeast Kansas, and southwest Missouri.

Lead production from mines east of the Mississippi was derived almost exclusively from processing zinc ores in which lead occurred in small quantities. Improved zinc metal prices at the end of the year foreshadowed a possible improvement in the lead industry in the Eastern States.

SMELTER AND REFINERY PRODUCTION

Refined lead produced in the United States was derived from three sources—domestic mine production, imports of foreign ore and base bullion, and scrap material (treated largely at secondary smelters). The lead was recovered at primary refineries that treated ore, base bullion, and small quantities of scrap and at secondary plants that processed scrap exclusively. Refined lead and antimonial (hard)

TABLE 5.—Mine production of recoverable lead in the United States, by months, in short tons

Month	1958	1959	Month	1958	1959
January	26,123	23,626	August	19,592	21,922
February	23,827	21,449	September	19,570	20,719
March	18,440	21,156	October	21,200	21,208
April	25,896	21,432	November	21,382	20,279
May	24,528	20,375	December	22,716	22,129
June	22,061	21,634			
July	21,142	19,657	Total	267,377	255,586

ment under foreign-aid programs as agent of the International Cooperation Administration (ICA), and administration of Defense Production Act (DPA) programs, including domestic purchase programs. Purchases of zinc produced from domestic ores were made against the maximum stockpile objective for this metal in mid-1959. These purchases are included in the 3,000 tons reported by the American Zinc Institute as being shipped by domestic producers.

Foreign zinc received at GSA warehouses under barter agreements during the year totaled 27,787 tons (40,216 tons in 1958). Such zinc was placed in the supplemental stockpile and could not be removed except by act of Congress.

TABLE 2.—DMEA contracts involving lead and zinc executed in 1959, by States

State and contractor	Property	County	Date approved	Total amount [1]
COLORADO				
Clear Creek Mining Co.	Lake Central project	Clear Creek	Oct. 1	$84,500
IDAHO				
Abot Mining Co.	Pilot group	Shoshone	June 23	43,550
MONTANA				
Baltimore Syndicate	Baltimore mine	Jefferson	July 27	22,930
Howard C. Banks	Hidden Hand	Powell	June 23	13,900
VIRGINIA				
Roland F. Bears, Inc.	Myers	Smyth	June 16	12,990
UTAH				
Glen Larsen	Iron Blossom No. 1	Juab	June 16	43,926
Total				221,796

[1] Government participation was 50 percent in exploration projects for lead and zinc in 1959.

DOMESTIC PRODUCTION

MINE PRODUCTION

Mines in the United States produced 425,300 tons of recoverable zinc in 1959. This quantity was an increase of 3 percent over that of 1958 but was the second smallest annual zinc production since 1933. Continued reduction in output from the West Central States and increased output of States east of the Mississippi River were notable developments. Production in the first half of 1959 was 224,100 tons; the reduced output of 201,200 tons in the second half of the year was largely attributable to labor strikes.

Idaho retained its leadership among the western zinc-mining States and was the second largest producer in the Nation. The Star mine of the Bunker Hill Co. was the largest zinc mine in the State. Other principal producers were the Page mine of American Smelting & Refining Co. and the Bunker Hill mine of the Bunker Hill Co.

TABLE 3.—Mine production of recoverable zinc in the United States, by States, in short tons

State	1950-54 (average)	1955	1956	1957	1958	1959
Western States and Alaska:						
Alaska	1					
Arizona	41,923	22,684	25,580	33,905	28,532	37,325
California	6,009	0,836	8,049	2,999	51	78
Colorado	45,530	35,350	40,246	47,000	37,132	35,388
Idaho	74,802	53,314	49,561	57,831	49,725	55,699
Montana	75,328	68,588	70,520	60,520	33,238	27,848
Nevada	12,251	2,670	7,488	5,292	91	217
New Mexico	27,807	15,277	35,010	32,680	9,034	4,636
Oregon	5					
South Dakota						
Texas	5					
Utah	32,431	43,556	42,374	40,846	44,982	35,223
Washington	21,638	29,530	25,609	24,000	18,797	17,111
Total	338,390	277,811	304,437	295,043	221,582	213,525
West Central States:						
Arkansas	17					49
Kansas	23,237	27,611	28,665	15,859	4,421	1,017
Missouri	9,768	4,476	4,380	2,951	352	92
Oklahoma	46,338	41,543	27,515	14,951	5,257	1,049
Total	79,360	73,630	60,560	33,761	10,050	2,207
States east of the Mississippi River:						
Illinois	19,311	21,700	24,039	22,185	24,940	26,815
Kentucky	1,683		417	837	1,258	673
New Jersey	52,051	11,643	4,667	12,530	607	
New York	43,147	53,016	59,111	64,669	53,014	45,464
North Carolina				2		
Pennsylvania					10,812	16,718
Tennessee	30,155	40,216	46,023	58,063	59,130	89,932
Virginia	13,310	18,329	19,196	23,030	18,472	20,334
Wisconsin	14,886	18,326	23,890	21,575	12,140	11,635
Total	180,543	163,230	177,343	202,931	180,373	209,571
Grand total	598,293	514,671	542,340	531,735	412,005	425,303

The Iron King mine of Shattuck Denn Corp. continued to be the largest producer in Arizona. Cyprus Mines Corp. resumed operations in January at the Old Dick mine and became the second largest producer. The San Xavier mine closed late in the year.

Colorado remained the third largest zinc producer among the Western States. Major producing mines were the Eagle mine of the New Jersey Zinc Co., the Idarado Mining Co. group in San Miguel County, Emperius mine of Emperius Mining Co., and the Rico mine of Rico Mining Co.

Mine output in Utah dropped 22 percent, partly because of a strike at the International Smelting & Refining Co. slag-fuming plant during the latter part of the year. The United States and Lark mine of United States Smelting, Refining & Mining Co. continued to be the largest zinc producer in the State.

Mines in Montana produced 16 percent less than in 1958. A strike at The Anaconda Co. mines at Butte, beginning in August and continuing throughout the year, was the principal reason for the reduction.

The two principal producing mines in Washington were the Pend Oreille of Pend Oreille Mines and Metals Co. and the Grandview of American Zinc, Lead & Smelting Co. Pend Oreille, continuing operation on a curtailed basis, produced 619,800 tons of crude ore, yielding

19,800 tons of zinc and 7,800 tons of lead in concentrates. Total operating costs per ton were held to $3.116, compared with $3.037 for 1958, despite an increase of $0.212 per ton for development expenditures.[4] The Federal Bureau of Mines released a publication[5] on mine production in Pend Oreille and Stevens Counties for the years 1902–56.

Mine output in New Mexico dropped sharply. The United States Smelting, Refining, & Mining Co. Bayard-mine group remained closed throughout the year. Empire Zinc Division of The New Jersey Zinc Co. reopened its Hanover operation early in August after it had been closed since May 1958. By yearend, operations were normal.

TABLE 4.—Mine production of recoverable zinc in the United States, by months, in short tons

Month	1958	1959	Month	1958	1959
January	39,020	35,830	August	29,856	31,728
February	34,693	38,441	September	30,694	30,025
March	36,602	37,428	October	32,738	31,608
April	40,232	38,709	November	33,200	26,026
May	36,208	38,742	December	35,765	39,538
June	33,690	36,921			
July	29,197	32,308	Total	412,005	425,303

Mines in the West Central States of Kansas, Oklahoma, and Missouri produced only 2,200 tons of zinc, compared with 10,100 tons in 1958. All producing mines in the Tri-State district had ceased operating in 1958, and they remained closed throughout 1959. Production resulted from cleanup and mill-tailing operations. There was no recovery of zinc from southeastern Missouri lead ores.

Mine output in Tennessee again set a new record, expanding 52 percent above 1958 to 89,900 tons, and firmly establishing the State as the largest zinc producer in the country. American Zinc Co. completed initial development at its Coy mine and began stoping operations in January. The Young mine increased its annual production rate to 2,500 tons by midyear and planned to attain a 4,000-ton annual rate. New Jersey Zinc Co. brought the Jefferson City mine to planned production, enabling the mill to operate at capacity. At the Flat Gap mine, initial production began in January. By yearend the production rate had increased, and stope preparation had advanced so that mine production was expected to reach mill capacity in 1960.[6]

New York dropped from second to third largest zinc-producing State in the Nation. All production was from Balmat and Edwards mines of St. Joseph Lead Co. The company reported an increase in the workweek from 5 to 6 days in January. This continued until the entire operation was closed by a strike on July 1. Settlement was reached November 2, and work was resumed on the 6-day basis.

In the Northern Illinois and Wisconsin districts, the Eagle-Picher Co. and Tri-State Zinc, Inc., mines operated throughout the year.

[4] Pend Oreille Mines & Metals Co., Annual Report, 1959, pp. 2–8.
[5] Fulkerson, Frank B., and Kingston, Gary B., Mine Production of Gold, Copper, Lead, and Zinc in Pend Oreille and Stevens Counties, Washington, 1902–56: Bureau of Mines Inf. Circ. 7872, 1959, 51 pp.
[6] New Jersey Zinc Co., Annual Report, 1959, pp. 7–8.

American Zinc, Lead and Smelting Co. resumed operations late in the year at both its Vinegar Hill Division mines and Piquette mine.

Zinc output in Virginia increased 10 percent. The Tri-State Zinc Co. reopened its Timberville mine in February after it had been closed for about a year. New Jersey Zinc Co. operated its Austinville mine throughout the year and reopened the adjacent Ivanhoe mine in September after a shutdown of 13 months. At yearend the Austinville concentrating mill was operating almost at full capacity with ore from both mines.

In Pennsylvania the New Jersey Zinc Co. steadily increased the production rate at the Friedensville mine, but at a slower rate than anticipated. The mine-water problem remained difficult and expensive to control. Development of the lower mine levels continued, and by yearend the main haulage incline was connected with the 600-foot level and stoping was initiated on the 800-foot level.

In the Southern Illinois and Kentucky district, zinc produced as a byproduct of fluorspar mining increased slightly, owing to a higher zinc content of the ore.

The Sterling mine of New Jersey Zinc Co., Sussex County, N.J., was maintained on a standby basis; the company staff conducted studies directed toward improved extractive methods when the mine is reopened.[7]

The 25 leading zinc-producing mines in the United States in 1959, listed in table 5, yielded 82 percent of the total domestic output of zinc. The four leading mines supplied 25 percent, and the first eight contributed 45 percent.

SMELTER AND REFINERY PRODUCTION

The zinc smelting and refining industry operated 16 primary reduction plants and 10 secondary plants producing slab zinc, zinc pigments, zinc dust, and zinc alloys. Some manufacturers of chemicals, pigments, diecasting alloys, rolled zinc, and brass also produced secondary zinc.

Primary Smelters and Electrolytic Plants.—The primary reduction plants processed zinc ore and concentrate, zinc fume from Waelz and slag-fuming plants, other primary zinc-bearing materials, and about half of all zinc-base scrap.

Production at primary zinc plants totaled 827,100 tons of slab zinc, of which 28,500 tons was redistilled. Besides slab zinc, primary plants also produced zinc oxide, zinc dust, and zinc-base alloys.

Primary-plant capacity for slab zinc at yearend was reported to be 1,166,800 tons. The five electrolytic plants reported 1,768 of their 4,072 electrolytic cells in use at yearend and an output of 280,800 tons (59 percent of their 479,500 tons of capacity). The seven horizontal-retort plants reported 35,364 of their 44,448 retorts in use during the year. The four remaining primary smelters were the continuous-distilling vertical-retort plants at Meadowbrook, W. Va.; Depue, Ill.; Palmerton, Pa.; and Josephtown, Pa. The first three used New Jersey Zinc Co. externally gas-fired vertical retorts, and the one at

[7] New Jersey Zinc Co., Annual Report, 1959, p. 7.

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MINERALS YEARBOOK

1963

Volume I of Four Volumes

METALS AND MINERALS

(Except Fuels)

Prepared by staff of the
BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • Stewart L. Udall, Secretary

BUREAU OF MINES • Marling J. Ankeny, Director

Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1964

FOREWORD

The 1963 MINERALS YEARBOOK marks the 82d year in wh ch this publication or its predecessors have been issued by the Fede l Government. It also marks the first issue of a fourth volume revi v-ing world mineral production, consumption, and trade on a count -by-country basis. This new international review volume represe s the Bureau's continuing effort to make the Yearbook as useful s possible to industry, Government, and the general public.

Many difficulties had to be surmounted in preparing this new v l-ume. Although it has not been possible in several instances to p e-sent international data comparable to those available for the Unit d States, the International Review should nevertheless prove a valua le reference.

The general content of this four-volume edition is as follows:

Volume I contains chapters on metal and on nonmetal mine l commodities except mineral fuels. In addition, it includes a chap r roviewing these mineral industries, a statistical summary, and ch -ters on mining and metallurgical technology, employment and injuri s, and technologic trends.

Volume II contains a chapter on each mineral fuel and on su h related products as helium, carbon black, peat, coke, and coal chem -cals, and natural gas liquids. Also included are data on employme t and injuries in the fuel industries, and a mineral-fuels revie summarizing recent economic and technological developments.

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Volume IV contains 124 chapters presenting the latest availa mineral statistics for more than 130 foreign countries and are and 1 chapter reviewing minerals in world economy.

To my knowledge, the Minerals Yearbook is the most comprehe sive publication of its kind available. The Bureau will continue i s efforts in the years to come to increase the Yearbook's value to i s many users. Toward that end, the constructive comments an suggestions of readers will be helpful.

MARLING J. ANKENY, *Director.*

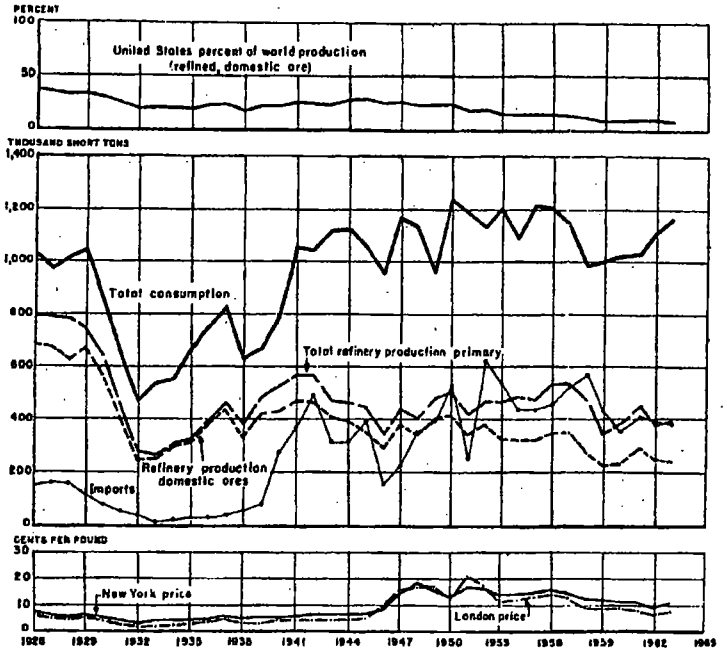

FIGURE 1.—Trends in the lead industry in the United States, 1926–63. Consumption includes primary refined, antimonial, and secondary lead, and lead in pigments made directly from ore. Imports are factored to include 95 percent of lead content or ores, mattes, and concentrates and 100 percent of pigs, bars, base bullion, and scrap.

TABLE 2.—Mine production of recoverable lead in the United States, by States

(Short tons)

State	1954-58 (average)	1959	1960	1961	1962	1963
Arizona	10,906	9,999	8,495	5,937	6,966	5,818
Arkansas		38				
California	4,766	227	440	103	455	832
Colorado	17,720	12,907	18,080	17,755	17,411	19,018
Idaho	64,605	62,395	42,907	71,476	84,058	76,759
Illinois	3,238	2,570	3,000	3,430	3,610	2,901
Kansas	4,544	481	781	1,449	970	1,027
Kentucky	247	409	556	656	743	831
Missouri	122,783	105,165	111,948	98,785	60,982	79,844
Montana	14,445	7,672	4,879	2,643	6,121	5,000
Nevada	4,589	1,357	987	1,791	771	1,138
New Mexico	3,327	829	1,996	2,332	1,134	1,014
New York	1,216	481	775	879	1,063	1,009
North Carolina	5		424	318	219	69
Oklahoma	10,311	601	936	980	2,710	3,192
Utah	45,961	36,630	39,398	40,894	38,199	45,036
Virginia	3,286	2,770	2,152	3,733	4,059	3,509
Washington	10,738	10,310	7,725	8,063	6,033	5,374
Wisconsin	1,698	745	1,165	680	1,394	1,118
Other States	8		23	27	58	30
Total	324,373	255,586	246,669	261,921	236,956	253,369

Improvement in the market for lead, zinc, and silver during 1963 resulted in expansion of activity in exploration and development of lead deposits, as well as rehabilitation of old mines and expansion of current production facilities. Production from a large part of this activity will not be forthcoming until 1964 or later. Some of the activity is, however, reflected in the following comment by States.

The new lead belt in southeast Missouri continued to receive the major lead exploration attention in the United States. Sixteen major companies were actively engaged in prospecting and development in this area during the year and the most favorable area now appears to be a belt some 50 miles long and 5 miles wide extending through Washington, Iron, Reynolds, and Shannon Counties. During 1963 the St. Joseph Lead Co. centralized the operation of eight mines in the old lead belt under the Federal Division. A third production shaft was bottomed at the Viburnum mine and began installation of production facilities. The capacity of the Viburnum concentrator was increased to 7,000 tons of ore per day. Construction of the new Fletcher plant located in the new lead belt in Reynolds County began on June 27 with a planned capacity of 5,000 tons of ore per day and initial production expected in 1966.[2]

The 25 leading lead-producing mines accounted for 92 percent of the total domestic mine production; the 10 leading mines yielded 77 percent and the 4 largest units 53 percent.

Production of lead by Idaho mines decreased 10 percent. Most of the production came from the Coeur d'Alene district with the largest output by the Bunker Hill and Lucky Friday mines, followed by the Star (Star unit area) and Page mines. The accelerated program of development in the Coeur d'Alene area, initiated in 1961, continued and progress was made in expanding ore reserves. The Bunker Hill Co. continued driving a crosscut from the Bunker Hill mine to connect with the 3100 level of the Crescent mine and also accomplished deeper development work in the Star-Morning and Noonday veins. Lucky Friday Silver-Lead Mines Co. extended the main shaft of the Lucky Friday mine to the 3250 level and began a crosscut to the adjoining Jutila property.

Mines situated in Utah reported output of 45,000 tons, an 18-percent increase compared with 1962. The following mines were the significant producers: United States and Lark (United States Smelting, Refining & Mining Co. (USSR & M Co.)), United Park City mines (United Park City Mines Co.), Mayflower (Hecla Mining Co.), and Ophir (USSR & M Co.). Kennecott Copper Corp. began sinking a 1,500-foot production shaft in the Gurgin area of the East Tintic district and shipped development ore to the International Smelting & Refining Co. lead smelter at Tooele. The crosscut driven by USSR & M Co. from the United States and Lark mine toward the Butterfield mine of Kennecott was extended. New Park Mining Co. deepened the Mammoth mine shaft in the Tintic district and completed a crosscut to an ore shoot previously indicated by drilling.

[2] St. Joseph Lead Co. Annual Report, 1963, p. 12.

continued activity at the Sunnyside and Shenandoah mines at Silverton. Consolidated Parnett Co. continued operations at the Wellington mine and concentrator at Breckenridge. The Emperius mine at Creede was reopened, and the Keystone mine at Crested Butte resumed operations. Humphreys Engineering Co. operated the Cascade mine in Clear Creek County.

Lead production of Washington again declined to 5,400 tons. The Metaline district was the main producing area with mines operated by Pend Oreille Mines & Metals Co. and American Zinc, Lead & Smelting Co. Production from the Grandview mine and adjoining Mineral Rights property was substantially reduced in order to augment underground development.

Arizona production declined to 5,800 tons. The principal producer continued to be the Iron King mine of Shattuck Denn Mining Corp. Nash & McFarland increased output from the Flux mine in Santa Cruz County.

Montana production decreased to 5,000 tons. The reduction was due, in part, to decreases in production at the Badger mine at Butte and to decreases in lead recovered as a byproduct of manganese operations in Philipsburg, slag fuming at East Helena, and other small dump reprocessing operations.

The Hanover mine in New Mexico was reopened in October by The New Jersey Zinc Co., and the Kearney mine was a major producer in the State.

Production from the Kansas-Oklahoma area of the Tri-State district, processed principally at the Central Mill operated by The Eagle-Picher Co., increased about 15 percent.

The Illinois-Wisconsin area output decreased from 5,000 tons to 4,000 tons. A fire at the Shullsburg mine operated by The Eagle-Picher Co., necessitated suspension of operations until July when mill rebuilding and a new incline shaft were completed. Eagle-Picher also opened the Booty-Thompson mine in April and trucked the ore to the Graham mill near Galena, Ill. American Zinc, Lead & Smelting Co. operated the Hancock-Winskell and the Thompson-Temperly mines with the ore treated in the Vinegar Hill mills near Shullsburg, Wis. The Ivey Construction Co. operated a mine at Linden, Wis., under lease from The Eagle-Picher Co., and the Grimes Mining Co. began production from a mine and mill on the Burnshaw property.

Nevada increased production although byproduct lead from the Three Kids manganese operation was terminated in 1962. California output was almost double that achieved in 1962.

Lead produced as a byproduct of predominately zinc ore in Kentucky, New York, North Carolina, and Virginia was some 11 percent below the 1962 output.

SMELTER AND REFINERY PRODUCTION

Refined lead was produced in the United States at primary refineries that processed ore and concentrate, base bullion, and small quantities of scrap as well as at secondary smelters that process scrap almost exclusively. The lead was derived from three principal sources—domestic mine production, imports of foreign ore and base bullion, and scrap materials. Refined lead and antimonial lead were produced

at both primary and secondary plants. The following plants comprise the domestic primary lead production facilities:

Smelters:
- American Smelting and Refining Co.
  - East Helena, Mont.
  - El Paso, Tex.
- International Smelting & Refining Co.
  - Tooele, Utah

Smelter-refineries:
- American Smelting and Refining Co.
  - Selby, Calif.
  - Perth Amboy, N.J.
- The Bunker Hill Co.
  - Kellogg, Idaho
- St. Joseph Lead Co.
  - Herculaneum, Mo.
- The Eagle-Picher Co.
  - Galena, Kans.

Refineries:
- United States Smelting Lead Refinery, Inc.
  - East Chicago, Ind.
- American Smelting & Refining Co.
  - Omaha, Nebr.

Major secondary smelting firms that report to the Bureau of Mines are as follows:

American Smelting & Refining Co. (including Federated Metals Division) plants:
- Los Angeles, San Francisco, and Selby, Calif.
- Whiting, Ind.
- Omaha, Nebr.
- Newark and Perth Amboy, N.J.
- Houston, Tex.

Bers & Co., Inc., Philadelphia, Pa.
The Bunker Hill Co., Seattle, Wash.
Continental Smelting & Refining Co., McCook, Ill.
Electric Storage Battery Co., Philadelphia, Pa.
General Battery & Ceramic Corp., Reading, Pa.
Goldsmith Bros. Division of National Lead Co., Chicago, Ill.
Gopher Smelting & Refining Co., St. Paul, Minn.
Gulf Coast Lead Co., Tampa, Fla.
Imperial Type Metals Co., plants: Chicago, Ill., and Philadelphia, Pa.
Industrial Metal Melting Co., Inc., Baltimore, Md.
Inland Metals Refining Co., Chicago, Ill.
Nassau Smelting & Refining Co., Inc., Tottenville, N.Y.
National Lead Co. (including Magnus Metal Division, Morris P. Kirk & Son, Inc., and Master Metals, Inc.), plants:
- Los Angeles, Calif.
- Atlanta, Ga.
- Chicago and Granite City, Ill.
- Indianapolis, Ind.
- Topeka, Kans.
- Baltimore, Md.
- St. Louis Park, Minn.
- St. Louis, Mo.
- Fremont, Nebr.
- Perth Amboy, N.J.
- Depew, N.Y.
- Cincinnati and Cleveland, Ohio
- Portland, Oreg.
- Pittsburgh, Pa.
- Dallas and Houston, Tex.

was terminated and certified as a mineral discovery during the year. The other four remained in force at yearend.

DOMESTIC PRODUCTION

MINE PRODUCTION

Mines in the United States produced 529,300 tons of recoverable zinc, an increase of 5 percent over that of 1962 and the highest annual output since 1957. The only pronounced variation in the year's production pattern was a slightly higher than average rate during the last quarter. States east of the Mississippi River produced 51 percent of the total output; Western States, 46 percent; and West Central States, 3 percent.

The sources of zinc production, classified according to types of ore in 1963 were: 44.7 percent from zinc ores; 43.6 percent from lead-zinc ores; 0.4 percent from lead ore; 6.0 percent from copper-lead, copper-zinc, and copper-lead-zinc ores; and 5.3 percent from all other classifications. Details of this breakdown are in table 3 of the Lead chapter in this volume.

TABLE 2.—Mine production of recoverable zinc in the United States, by States

(Short tons)

State	1934-38 (average)	1959	1960	1961	1962	1963
Arizona	28,432	37,325	35,811	29,585	32,598	25,419
Arkansas		49	50	57	211	
California	3,864	78	485	304	322	101
Colorado	38,976	35,388	31,278	42,047	43,351	48,109
Idaho	54,392	55,899	36,801	58,295	62,885	63,267
Illinois	21,458	26,815	29,550	26,795	27,413	20,387
Kansas	12,123	1,017	2,117	2,446	3,043	3,508
Kentucky	594	678	889	1,147	1,172	1,461
Missouri	3,476	92	2,821	5,847	2,792	921
Montana	56,764	27,848	12,551	10,292	37,678	32,941
Nevada	3,315	277	420	453	281	571
New Jersey	13,373			112	15,509	32,738
New Mexico	18,401	4,536	13,770	22,900	22,015	12,928
New York	50,600	43,464	50,364	54,763	53,654	53,495
North Carolina						13
Oklahoma	28,489	1,049	2,332	5,148	10,013	12,245
Oregon				3		3
Pennsylvania	2,162	16,718	13,746	23,428	24,308	27,389
Tennessee	40,783	82,632	92,394	61,734	71,548	95,847
Texas						
Utah	41,158	35,223	35,476	37,229	34,313	36,179
Virginia	19,163	20,334	19,885	29,168	26,479	23,983
Washington	24,049	17,111	21,317	20,217	21,644	22,270
Wisconsin	18,293	11,636	18,410	13,605	13,292	15,114
Total	494,844	425,303	435,427	464,390	505,491	529,254

Tennessee maintained its rank as the leading producing State with output increasing 34 percent to a record 95,800 tons. American Zinc, Lead and Smelting Co. operated its Mascot, Young and Grasselli mines at capacity; continued development of the New Market mine and mill, a joint venture with Tri-State Zinc Co., Inc., and authorized rehabilitation of the North Friends Station mine and development of a new property to be known as the Immel mine. A total of 1,933,000 tons of ore was milled to yield 93,877 tons of zinc concentrate. When

TABLE 3.—Mine production of recoverable zinc in the United States, by months

(Short tons)

Month	1962	1963	Month	1962	1963
January	38,092	43,776	August	44,616	45,120
February	36,927	41,580	September	42,202	41,439
March	42,929	44,819	October	47,621	47,008
April	42,160	44,862	November	44,280	46,346
May	43,624	45,543	December	42,033	46,004
June	42,451	43,532			
July	38,256	40,925	Total	505,491	529,254

expansion plans are completed the milling capacity will be approximately 3 million tons of ore. The company increased its proven and indicated reserve during the year to approximately 5 million tons of 60 percent zinc concentrate.[2] The New Jersey Zinc Co. operated its Jefferson City mine at near capacity production. The company's Flat Gap mine was idle but scheduled to resume operation in 1964.[3] United States Steel Corp., Tennessee Coal & Iron Division, operated its Zinc Mine Works mine and mill unit during the year. The copper-zinc mines of Tennessee Copper Co. contributed a substantial quantity of zinc output to the State total.

Production in Idaho increased slightly to 63,300 tons of zinc, the largest quantity since 1953; this amount was sufficient to make Idaho the leading producer in the Western States and second in the nation. The Bunker Hill Co. reported 25,345 tons of zinc in concentrate recovered from milling 253,500 tons of ore from its Star Unit mines and 17,694 tons of zinc in concentrate from milling 450,900 tons of ore from its Bunker Hill mine.[4] The Page mine of American Smelting and Refining Company was a substantial producer of zinc.

New York production of recoverable zinc declined slightly to 53,500 tons. St. Joseph Lead Co., the only zinc producer in the State, operated its Balmat and Edwards mines and mills in St. Lawrence County on a 5-day week throughout the year. An expansion program with a target date of July 1, 1965, was in progress at the Edwards mine and mill to increase daily ore capacity from 410 to 600 tons per day.[5]

In Colorado zinc production increased 11 percent to 48,100 tons. Leading zinc producing mines were the Eagle of The New Jersey Zinc Co., and the Idarado of Idarado Mining Co. The Emperius mine operated by Emperius Mining Co. reopened in May after being closed since December 31, 1962. McFarland and Hullinger leased and began operating the Keystone mine of American Smelting and Refining Company. This mine had been closed since 1957.

Zinc production in Utah increased 5 percent to 36,200 tons but was 3 percent below the 1961 output. The United States and Lark mine of United States Smelting, Refining and Mining Co. was the leading zinc producer in the State. Other substantial producers were the United Park City mines of United Park City Mines Co., Mayflower mine of Hecla Mining Co., and the Ophir mine of United States Smelting, Refining and Mining Co. According to its annual report,

[2] American Zinc, Lead and Smelting Co. Annual Report. 1963, 24 pp.
[3] The New Jersey Zinc Co. Annual Report. 1963, pp. 6-7.
[4] The Bunker Hill Co. Annual Report. 1963, p. 12.
[5] St. Joseph Lead Co. Annual Report. 1963, p. 14.

the United Park City Mines Co. mined 54,000 tons of ore yielding 8,557 tons of zinc plus quantities of lead, copper, silver, and gold.

In Montana, zinc production decreased 4,700 tons to 32,900 tons. The Anaconda Company reduced output from the Elm Orlu-Black Rock block caving project at the Badger State mine more than offsetting increased zinc output from its slag-fuming operation at East Helena. Construction of a zinc concentrator at Butte was postponed.[6] The zinc mining operations of Trout Mining Co. and Taylor-Knapp Co. in Granite County were idle during 1963, contributing to the reduced State total.

Zinc production in New Jersey more than doubled to reach 32,700 tons as the Sterling mine of The New Jersey Zinc Co. accelerated operations during the second full year of operation since reopening late in 1961.

Pennsylvania output of zinc increased 13 percent to 27,400 tons, the largest quantity since zinc production was resumed in 1958. The only operating mine was the Friedensville of The New Jersey Zinc Co.

Arizona mine output decreased 23 percent to 25,400 tons. The Iron King mine of Shattuck Denn Mining Corp. continued to be the largest zinc producer in the State. The Old Dick and Copper Queen mines of Cyprus Mines Corp. mined and milled 112,500 tons of ore, yielding 17,600 tons of zinc concentrate and 18,200 tons of copper concentrate. Unless exploration reveals additional ore, the ore deposit will probably be depleted in 1965.[7] Other zinc-producing properties in the State included the Atlas mine of B. S. & K. Mining Co., and the Flux mine of Nash and McFarland. The Johnson Camp mine of McFarland and Hullinger terminated operations in January.

Virginia zinc mine production decreased 9 percent to 24,000 tons. The New Jersey Zinc Co. operated the Austinville and Ivanhoe mines throughout the year. Tri-State Zinc Co. closed its Bowers-Campbell mine at Timberville in July because the orebody was depleted.

In Washington, zinc mine output increased from 21,600 to 22,300 tons. The Pend Oreille mine, Pend Oreille Mines and Metals Co. yielded 16,687 tons of zinc in concentrate and 5,004 tons of lead in concentrate from 651,900 tons of ore mined and milled.[8] American Zinc, Lead and Smelting Co. operated the Grandview and Mineral Rights mines which produced 11,325 tons of zinc plus lead concentrates compared with 12,405 in 1962. The character of the orebody in the Mineral Rights mine was found to be different from that in the Grandview mine, resulting in reduced output and the necessity to materially increase underground development.[9]

Illinois mine output declined 26 percent to 20,300 tons. In northern Illinois, Tri-State Zinc Co., Inc. ceased operations in April at the Gray mine due to depletion of the ore, leaving the Graham operation of The Eagle-Picher Co. as the only producer. Three companies in the southern Illinois fluorspar district continued to recover zinc as a byproduct.

Zinc production in Wisconsin increased 14 percent to 15,100 tons. American Zinc, Lead and Smelting Co. operated its Wisconsin properties at capacity, mining 252,000 tons of ore yielding 16,403 tons of zinc plus lead concentrates compared with 13,926 tons in 1962.[10] The Shullsburg mine of The Eagle-Picher Co. was closed from January 15 to June 21 due to a fire which damaged the headframe and crushing equipment. Ivey Construction Co. started operations at the Linden mine.

[6] The Anaconda Company. Annual Report. 1963, 23 pp.
[7] Cyprus Mines Corp. Annual Report. 1963, pp. 11-12.
[8] Pend Oreille Mines and Metals Co. Annual Report. 1963, p. 3.
[9] Pages 10-11 of work cited in footnote 2.

In the Tri-State District of Oklahoma, Kansas and Missouri production increased from 14,000 to 16,800 tons. The Oklahoma portion of the district accounted for 79 percent of the production, and Kansas produced the remainder. The southwest Missouri portion of the district last reported production in 1957.

Production in New Mexico declined 41 percent to 12,900 tons, the lowest level since 1959. American-Peru Mining Co. mined and milled ore from the Kearney mine plus purchased ore amounting to 154,000 tons averaging 8.19 percent zinc yielding 20,787 tons of zinc concentrate.[11] In October, The New Jersey Zinc Co. began operations at the Hanover mine, which had been closed since December 1, 1962.

Kentucky produced 1,500 tons of zinc as a byproduct from fluorspar mining operations.

Mine production of zinc from Missouri, all as a byproduct from lead mining in southeast Missouri, dropped from 2,800 to 300 tons. The decline resulted from an 8-month strike, settled in March 1963, and a lower zinc content in the mined ore.

The 25 leading zinc-producing mines in the United States listed in table 4, yielded 81 percent of the total domestic output. The four leading mines supplied 25 percent, and the first eight contributed 43 percent.

SMELTER AND REFINERY PRODUCTION

The zinc smelting and refining industry operated 15 primary and 8 secondary reduction plants producing slab zinc. Producers of slab zinc also made zinc compounds, alloys, zinc dust, and rolled zinc.

Domestic smelters had no significant interruption to operation by labor strikes during the year. Increased demand for zinc as the year progressed resulted in a substantially higher output rate in the last quarter compared with the first three quarters of the year.

Actual or projected changes in zinc producing facilities listed in company annual reports were: American Zinc, Lead and Smelting Co. announced intentions to increase the capacity of its Monsanto electrolytic plant by 15 percent by the end of 1964; The Bunker Hill Co. completed installation of a sixth electrolytic cell line; Blackwell Zinc Co. at the Blackwell, Okla. plant closed down the zinc refining unit late in 1963 for rebuilding, modification, and enlargement; Blackwell also nearly completed modification of four furnaces (about one-third of capacity) to a single condenser unit as replacement of the multi-condenser furnaces; The New Jersey Zinc Co. completed construction of three new vertical retort slab zinc furnaces at the Depue, Ill. plant; and St. Joseph Lead Co. had construction in progress at the Joseph-

[10] Pages 10-11 of work cited in footnote 2.
[11] Page 11 of work cited in footnote 2.

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PRELIMINARY COMPILATION
MINING PROPERTIES IN THE UNITED STATES
OPERATED BY COMPANIES CONTROLLED BY
CONSOLIDATED GOLD FIELDS, LIMITED

PRELIMINARY COMPILATION
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PRELIMINARY COMPILATION
MINING PROPERTIES IN THE UNITED STATES
OPERATED BY COMPANIES CONTROLLED BY
CONSOLIDATED GOLD FIELDS, LIMITED

Scope of Report

This report represents a preliminary compilation of mining properties operated in the United States during the years 1904 through 1971, by companies controlled by Consolidated Gold Fields, Limited. The mining companies covered in this presentation consist of the American Zinc, Lead & Smelting Company (and successor companies), and the Tri-State Zinc, Inc.-Missouri Mining Company. It is very possible that a number of mining operations by various subsidiaries of Consolidated Gold Fields, Limited, have escaped detection because of minority interests and joint ventures not being recorded in the standard statistical publications.

Mining Operations

In all, a total of 94 mining operations, located in 15 different states, have been identified; 82 mines in 13 states being operated by the American Zinc, Lead & Smelting Company, and 12 mines in 6 states being operated by Tri-State Zinc, Inc.-Missouri Mining Company. The identified mining operations are mostly mines in which equity interests were 100 percent, but others have been included where equity interests ranged from less than full ownership downward to 9.7 percent. (See individual State Tables for known equity percentages.)

A brief descriptive sketch for each of the mining areas listed is in preparation.

Information Sources

The principal information sources used for this study covering the years 1904 through 1971, consisted of (1) the annual volumes of mineral statistics for the United States, entitled "Mineral Resources" (U. S. Geological Survey), for the years 1908 through 1923; (2) the "Minerals Yearbook" (U. S. Bureau of Mines), for the years 1924 through 1971; (3) the Annual Reports for the American Zinc, Lead & Smelting Company, and successor companies, for the years 1908 through 1977; and (4) miscellaneous production data from my personal engineering files.

In a number of cases, the published historical information was either not recorded, or was not complete, and minor adjustments were made by the writer to bring about a degree of continuity. This review of past mining operations may contain a number of omissions and errors, and should be considered as being a first attempt, subject to later revisions.

Report Organization

The information compiled is presented as a series of tables on a state-by-state basis for each of the two mining organizations involved. The first set of tables is designated as "I. AMERICAN ZINC, LEAD & SMELTING COMPANY AND SUCCESSOR COMPANIES". The second set of tables is designated as "II. TRI-STATE ZINC, INC. and MISSOURI MINING COMPANY". These tables are arranged to show the mining operations by (1) County, (2) Mine Name, (3) Mining District, (4) Percent Equity, (5) Operating Years, and (6) Footnotes.

In addition to the state-by-state tables, two recapitulation tables have been prepared, one for each of the mining organizations mentioned above, with Table A being for the American Zinc, Lead & Smelting Company and Successor Companies, and Table B being for the Tri-State Zinc, Inc. and Missouri Mining Company. These tables show the number of mining properties operated in the United States, and the mining operations by (1) State, (2) County, (3) District, (4) Percent Equity, (5) Operating Years, and (6) Number of Mines. The recapitulation tables are shown on pages 3, 4, and 5, with the state-by-state tables beginning on page 6 and continuing in alphabetical order.

David R Stewart

TABLE A

AMERICAN ZINC, LEAD & SMELTING COMPANY
AND SUCCESSOR COMPANIES

MINING PROPERTIES OPERATED IN UNITED STATES

	State	County	District	% Equity	Operating Years	No. of Mines
1.	Arizona	Cochise	California	23-50+	1952-1953	1
2.	California	Nevada	Middle Yuba River	100	1934-1942	1
3.	Colorado	Ouray	Uncompahgre	100	1946-1949	4
	"	San Juan	Red Mountain	100	1948-1949	1
4.	Kansas	Cherokee	Treece	100	1935-1938	1
5.	Missouri	Jasper	Oronogo-Duenweg	100	1904-1920	3
	"	"	Alba-Neck City	50	1952-1954	1
	"	"	Waco	50+	1922-1927	1
	"	Newton	Granby	100	1916-1920	3
	"	"	S. Duenweg	100	1942-1944	2
	"	"	Diamond	100	1933-1935	2
	"	Lawrence	Stotts City	100	1911-1912	1
	"	"	Aurora	100	1942-1946	3
6.	Montana	Cascade	Neihart	63-70	1921-1929	1
7.	Nevada	White Pine	SE Ely	22-28	1951-1963	1
8.	New Mex.	Grant	Silver City	50-100	1959-1967	1
9.	Oklahoma	Ottawa	Picher	100	1924-1957	10
10.	Tennessee	Knox	Mascot	100	1913-1971	5
	"	Jefferson	N. Friends Station	100	1951-1968	1
	"	"	S. Friends Station	100	1955-1971	1
	"	"	New Market	40-100	1937-1971	3
	"	"	Jeff. City	100	1929-1971	2
	"	"	Mossy Creek	100	1943-1956	1
11.	Utah	San Juan	Big Indian	9.7	1960-1962	2
12.	Washington	Pend Oreille	Metaline	51-100	1937-1963	4
	"	" "	Slate Creek	50+	1951-1956	1
	"	Stevens	Leadpoint	100	1966-1968	1
13.	Wisconsin	Grant	Platteville	60	1908-1916	6
	"	"	"	100	1966-1970	1
	"	"	Hazel Green	60	1910-1912	1
	"	"	Tennyson	75-100	1955-1968	2

Table A (Continued)

State	County	District	% Equity	Operating Years	No. of Mines
Wisconsin	Lafayette	Shullsberg	70	1919-1921	1
"	"	"	100	1962-1965	5
"	"	New Diggings	60-70	1910-1921	7
"	"	"	100	1955-1970	1
		TOTAL MINES			82

TABLE B

TRI-STATE ZINC, INC. and MISSOURI MINING COMPANY

MINING PROPERTIES OPERATED IN UNITED STATES

	State	County	District	% Equity	Operating Years	No. of Mines
1.	Illinois	Jo Davies	Galena	100	1944-1963	6
2.	Kansas	Cherokee	Treece	100	1927-1930	1
3.	Missouri	Jasper	Waco	100	1927-1928	1
	"	"	Joplin	100	1929	1
4.	Oklahoma	Ottawa	Picher	100	1927-1930	1
5.	Tennessee	Jefferson	New Market	50-60	1964-1971	1
6.	Virginia	Rockingham	Timberville	100	1957-1963	1
			TOTAL MINES			12

I. AMERICAN ZINC, LEAD & SMELTING COMPANY AND SUCCESSOR COMPANIES

1. Arizona Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Graham	Grand Reef	Aravaipa	22.50	1920-(?)	1/
Cochise	Hill Top	California	50+	1952-1954	2/

TOTAL OPERATIONS = 1

NOTES:

1/ - The Grand Reef mining property consisted of a number of mining claims and a mill site owned by the Aravaipa Leasing Company, of which the American Zinc, Lead & Smelting Company held a 22.50 percent interest. This property was intermittently operated during the years 1920 through 1947 by various Lessees.

2/ - The American Zinc, Lead & Smelting Company secured an Operating and Profit Sharing Agreement on this property in 1951, and after considerable development work, operated it until 1953. Ore production and grade were too poor to sustain a viable mining operation, and the property was sold in 1954 to the Queen Mining Company.

American Zinc, Lead & Smelting Company (Continued)

2. California Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Calaveras	Carson Hill	Mother Load	(?)	1919	1/
Nevada	Gold Placer	Middle Yuba River	100	1934-1942	2/

TOTAL OPERATIONS = 1

NOTES: 1/ - In 1919, the American Zinc, Lead & Smelting Company acquired a $600,000 equity interest in the Carson Hill Gold Mines, Inc., located in the Mother Load area of Calaveras County. This investment was sold later in the same year for a profit of $450,000.

2/ - In 1934, the American Zinc, Lead & Smelting Company acquired a placer-mining lease and a gold-dredging operation located on the Middle Yuba River of Nevada County. This operation was a dismal failure, and was intermittently operated for a few months in 1935 and 1937. When the lease expired in 1942, the property was abandoned.

American Zinc, Lead & Smelting Company (Continued)

3. Colorado Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
(?)	(?)	(?)	25	1916-1917	1/
Ouray	Bachelor	Uncompahgre	100	1946-1949	
"	Portland	"	100	1946-1947	
San Juan	Koehler-San Antonio	Red Mountain	100	1946-1948	2/
Ouray	Mountain King	Red Mountain	100	1948-1949	
Ouray	Kaemmerling	Red Mountain	100	1949	3/

TOTAL OPERATIONS = 5

NOTES: 1/ - The 1916 Annual Report of the American Zinc, Lead & Smelting Company (pp. 6,7) states that the company, together with the Illinois Zinc Company, the Hegeler Bros. Zinc Company, and the Grasselli Chemical Company, leased and operated a mine in Colorado during the year, which has since been sold at a substantial profit. Name and location of this mine are unknown.

2/ - During early 1946, the American Zinc, Lead & Smelting Company acquired several blocks of mining claims and a mill in the Ouray district. After improving the mill and completing development work, the Bachelor, Portland, Koehler-San Antonio, Mountain King, and Kaemmerling properties were operated between the years 1946 and 1949, after which time, the mill was operated on a custom basis for others, with the mining properties being leased to small producers.

American Zinc, Lead & Smelting Company (Continued)

4. Kansas Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Cherokee	Robinson	Treece	100	1935-1938	1/

TOTAL OPERATIONS = 1

NOTES: 1/ - The only mining operation by the American Zinc Lead & Smelting Company in Kansas was that from the Robinson mine in Cherokee County. This property was acquired in November 1935, through a sublease arrangement with the Kansas Explorations Company (St. Joseph Minerals Corporation), and was operated until December 1938.

American Zinc, Lead & Smelting Company (Continued)

5. Missouri Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Jasper	Hockaday	Oronogo	100	1904-1908	
"	Davey	WC-Cartv.-Pros.	100	1905-1920	
"	Vogey	Duen.-Porto Rico	50-100	1909-1918	1/
Lawrence	Grundling	Stotts City	100	1911-1912	
Newton	Klondike	Granby	100	1916-1920	2/
"	Mascot	"	100	1916-1917	"
"	Golden Rule	"	100	1916-1917	"
Jasper	High Five	Waco	50+	1922-1927	3/
Newton	Smith	Diamond	100	1933-1935	
"	Love	"	100	1933-1935	
"	Henckel	S. Duenweg	100	1942-1944	
"	Smith	" "	100	1942-1944	
Lawrence	Metcalf	Aurora	100	1942-1946	
"	Coleman	"	100	1942-1946	
"	Weirdein	"	100	1944-1946	
Jasper	Quick Seven	Alba-Neck City	50	1952-1954	4/

TOTAL OPERATIONS = 16

NOTES: - (See page 11.)

American Zinc Lead & Smelting Company
5. Missouri Mining Operations (Continued)

NOTES: 1/ - At the time the Vogey property was acquired, in 1909, by the American Zinc, Lead & Smelting Company, it was the site for a number of small mines. Mining operations from 1909 through 1912 were conducted as joint ventures with the former companies. After 1912, all mining was for the account of the American Zinc, Lead & Smelting Company.

2/ - On June 2, 1916, the Granby Mining & Smelting Company was purchased by the American Zinc, Lead & Smelting Company. Following this acquisition, the USGS Minerals Yearbooks show that three of the larger mines in the Granby subdistrict were operated by the American Zinc, Lead & Smelting Company during the years 1916 through 1920. Production tonnage from these mines (Klondike, Mascot, and Golden Rule) may have been from lessees, and not from mining operations by the American Zinc, Lead & Smelting Company.

3/ - The operations at the High Five mine were under a lease and profit sharing agreement with the former owners. The equity percentage is unknown, but probably exceeded 50 percent.

4/ - The Quick Seven mining operation was a 50/50 percent joint venture between the American Zinc, Lead & Smelting Company and Brown & Root, Inc., of Houston, Texas.

American Zinc, Lead & Smelting Company (Continued)

6. Montana Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Cascade	Silver Dyke	Neihart	63.40	1921-1922	1/
"	" "	"	70	1923-1924	2/
"	" "	"	60	1925-1929	3/,4/

TOTAL OPERATIONS = 1

NOTES: 1/ - In 1921, the American Zinc, Lead & Smelting Company acquired a 63.40 percent equity interest in the Silver Dyke mine from its former owners. After extensive development work, a new 500 tpd mill was completed in 1921, which was later enlarged to 950 tpd in 1926, and to 1,000 tpd in 1927.

2/ - American Zinc, Lead & Smelting Company's interest was increased to 70 percent in 1923.

3/ - American Zinc, Lead & Smelting Company's interest was decreased to 60 percent in 1925.

4/ - Because of the exhaustion of known ore reserves, the mine was closed in April 1929, with all mining and milling equipment being liquidated.

American Zinc, Lead & Smelting Company (Continued)

7. Nevada Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
White Pine	Mt. Wheeler	SE of Ely	22.15	1951-1954	1/
" "	" "	" " "	27.50	1955-1959	2/
" "	" "	" " "	27.50	1960-1963	3/,4/

TOTAL OPERATIONS = 1

NOTES: 1/ - This property was a lead, zinc, tungsten, beryllium prospect that was mined for development ore from 1951 through 1963. At the outset, the American Zinc, Lead & Smelting Company held a 22.15 percent interest in this undertaking.

2/ - In 1955, the Cypress Mines, Inc. optioned this property, and continued the development work. Also at this time, the American Zinc, Lead & Smelting Company's equity interest was icreased to 27.50 percent.

3/ - In 1960, with the discovery of beryllium values, the property was again optioned to the Anaconda Company who continued development work until 1963.

4/ - In 1963, with the expiration of Anaconda's option, American Zinc's interest in the property was terminated.

American Zinc, Lead & Smelting Company (Continued)

8. New Mexico Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Grant	Kearney	Silver City	50	1959-1961	1/
"	"	" "	50	1962	2/
"	"	" "	50	1963	3/
"	"	" "	100	1964-1967	4/

TOTAL OPERATIONS = 1

NOTES: 1/ - The American Zinc, Lead & Smelting Company entered into a Joint Venture Agreement, dated 12/23/59, with Hydrometals, Inc. (successor to Peru Mining Company), to operate the Kearney mine in Grant County, New Mexico.

2/ - The Joint Venture name was changed to "American-Peru" in 1963.

3/ - The American-Peru Joint Venture was terminated in May 1963, with the American Zinc, Lead & Smelting Company purchasing the interests of the Hydrometals-Peru group, and thus obtained 100 percent ownership on January 1, 1964.

4/ - The Kearney mine and Deming mill closed in 1967.

American Zinc, Lead & Smelting Company (Continued)

9. Oklahoma Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Ottawa	Douthat	Picher	100	1924-1929	
"	Big Chief	"	100	1926-1931	
"	Kenoyer (No.7)	"	100	1945-1948	
"	Skelton	"	100	1951-1955	1/
"	Admiralty	"	100	1951-1955	"
"	Thomas Buffalo	"	100	1951-1955	"
"	Frank Buffalo	"	100	1951-1955	"
"	Buffalo Calf	"	100	1951-1955	"
"	Rialto	"	100	1951-1957	"
"	Cardin-Hunt	"	100	1951-1957	"

TOTAL OPERATIONS = 10

NOTES: 1/ - Mining properties operated by the Nellie B Division; 100 percent owned by the American Zinc Company of Oklahoma.

American Zinc, Lead & Smelting Company (Continued)

10. Tennessee Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Knox	Mascot 1 (Old Holston)	Mascot	100	1913-(?)	1/
"	Mascot 2 (Old Evans)	"	100	1923-1971	
"	Mascot 3 (Old Roseberry)	"	100	1915-1920	
"	Mascot 4	"	100	1917-(?)	
Jefferson	Jarnagin	Jeff. City	100	1929-1953	
"	Grasselli (JV)	New Market	50	1937-1947	2/
"	Grasselli	" "	100	1947-1968	3/
"	Open-Pit	" "	100	1944-1946	
"	Athletic	Mossy Creek	100	1943-1956	
Jefferson	N.Friends Sta.	N.Friends Station	100	1951-1968	
"	Coy (Emert)	Jeff. City	100	1959-1971	
"	Young	S.Friends Station	100	1955-1971	
"	New Market (JV)	New Market	40-50	1962-1971	4/
Knox	Immel	Mascot	100	1968-1971	5/

TOTAL OPERATIONS = 13

NOTES: (See page 17.)

American Zinc, Lead & Smelting Company
10. Tennessee Mining Operations (Continued)

NOTES: 1/ - The American Zinc Company of Tennessee acquired the Osgood and Holston mining properties, and commenced mining operations at Mascot No. 1 (Old Holston) in June 1913.

2/ - Joint Venture between the American Zinc Company of Tennessee and the Grasselli Chemical Company (Dupont), with the American Zinc Company of Tennessee being the operator.

3/ - The American Zinc Company of Tennessee purchased Dupont's interest, in 1947, becoming the sole owner.

4/ - Joint Venture between the American Zinc Company of Tennessee and Tri-State Zinc, Inc., with mining operations being under American Zinc Company's supervision, and the milling operations under Tri-State Zinc's supervision.

5/ - All mining was ended on November 29, 1971, when all of the mining and milling properties were sold to ASARCO, Inc.

American Zinc, Lead & Smelting Company (Continued)

11. Utah Mining Operations

A. Uranium Reduction Company

County	Mine	District	% Equity	Operating Years	Notes
San Juan	Mamie	Big Indian	9.70	1960-1962	1/
" "	R.D.C.	" "	9.70	1960-1962	2/

TOTAL OPERATIONS = 2

NOTES: 1/ - During 1955, the American Zinc, Lead & Smelting Company entered into a contract with the Uranium Reduction Company to manage the constructions, operations, and finances of its mining and milling of uranium ores in the Colorado Plateau area. Milling operations were commenced in October 1956, and were continued until August 1962, when the operations were sold to the Atlas Corporation. Mining operations were commenced in 1960 and continued into 1962 at the Mamie and R.D.C. mines in the Big Indian district of Southeastern Utah.

2/ - Although the American Zinc, Lead & Smelting Company was the managing agent for the Uranium Reduction Company, its equity interests varied from 14.72 percent in 1955, to 9.81 percent in 1956, to 9.65 percent for years 1957 through 1959, and 9.70 percent for the remaining years 1960 through 1962.

American Zinc, Lead & Smelting Company (Continued)

12. Washington Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Pend Oreille	Metaline Mg. & Lease.Co.	Metaline	51	1937-1944	1/
" "	Grandview	"	50+	1941-1956	2/
" "	Lead Hill	Slate Creek	50+	1951-1956	3/
" "	Grandview	Metaline	100	1957-1963	4/
" "	Mineral Rights	"	100	1960-1963	5/
Stevens	Calhoun	Leadpoint	100	1966-1968	6/

TOTAL OPERATIONS = 6

NOTES: (See page 20.)

American Zinc, Lead & Smelting Company
12. Washington Mining Operations (Continued)

NOTES: 1/ - The American Zinc, Lead & Smelting Company acquired a 51 percent interest in the Metaline Mining & Leasing Company in 1933, consisting of a lease and profit sharing agreement. The property was mined during 1937 through 1944. In 1944, the American Zinc, Lead & Smelting Company disposed of all its interests in the Metaline Mining & Leasing Company.

2/ - In September 1940, the American Zinc, Lead & Smelting Company acquired a lease and profit sharing agreement on mining property of the Grandview Mines, Inc. The Grandview mine was operated during the years 1941 through 1956. The interest in this property owned by the Grandview Mines, Inc. was purchased by the American Zinc, Lead & Smelting Company in 1957, and thus became the 100 percent owner.

3/ - The Lead Hill property was a small open-pit mine, 15 miles from Grandview. It was intermittently mined during the years 1951 through 1956.

4/ - In 1956, the American Zinc, Lead & Smelting Company exercised its Purchase Option on the Grandview mine, and mined this property as the 100 percent owner during the years 1957 through 1963, after which time, the mine was permanently closed.

5/ - The Mineral Rights mine was an adjacent property to the Grandview mine, and was mined during the years 1960 through 1963, when it was permanently closed.

6/ - The American Zinc, Lead & Smelting Company optioned the Anderson Ranch mine in Stevens County in 1963, and constructed a new 1,200 tpd mill. This property was located near Leadpoint, 40 miles northeast from Colville. Mining was commenced in October 1966 and closed in late 1968 due to the poor grade of ore.

American Zinc, Lead & Smelting Company (Continued)

13. Wisconsin Mining Operations

A. Wisconsin Zinc Company

County	Mine	District	% Equity	Operating Years	Notes
Grant	Acme	Platteville	60	1908-1909	1/
"	Empire	"	60	1908-1913	
"	Royal	"	60	1908	
"	Mitchell Hollow	"	60	1908-1909	
Lafayette	Drum	Benton-N.D.	60	1910-1912	
"	Winskell	" "	60	1910-1916	
Grant	Mills	Hazel Green	60	1910-1912	
"	Grant Co.	Platteville	60	1911-1912	
"	East End (Seitz)	"	60	1912-1916	
"	Federal	Hazel Green	60	1913-1916	
Lafayette	Champion	Benton-N.D.	65	1914-1923	
"	Eureka	" "	65	1915	
"	C.A.Thompson	" "	70	1916-1921	
"	Longhorn	" "	70	1918-1921	
"	Copeland	Shullsberg	70	1919-1921	
"	Blackstone	"	70	1920	2/

TOTAL OPERATIONS - 15

NOTES: (See page 23.)

American Zinc, Lead & Smelting Company
13. Wisconsin Mining Operations (Continued)

B. American Zinc, Lead & Smelting Company

County	Mine	District	% Equity	Operating Years	Notes
Grant	Piquette (JV)	Tennyson	75	1955-1965	3/
Lafayette	Blackstone	Shullsberg	100	1955-1968	4/
"	Hancock	"	100	1955-1968	
"	Coulthard	"	100	1955-1966	
"	Temperly-Thompson	New Diggings	100	1955-1969	
"	Winskell	Shullsberg	100	1962-1968	
"	Teasdale	"	100	1964-1965	
"	Champion	New Diggings	100	1965-1970	
Grant	Tennyson 1&2	Tennyson	100	1965-1968	5/
"	Burnham	Platteville	100	1966-1968	
Lafayette	Bear Hole	Shullsberg	100	1969-1970	
"	Crawhall	New Diggings	100	1969-1970	6/

TOTAL OPERATIONS = 12

GRAND TOTAL (minus 3 duplications) = 24

NOTES: (See page 23.)

American Zinc, Lead & Smelting Company
13. Wisconsin Mining Operations (Continued)

NOTES: 1/ - The American Zinc, Lead & Smelting Company purchased a 60 percent interest in the Wisconsin Zinc Company in July 1908. This equity interest was increased to 65 percent in 1914, and to 70 percent in 1917. The American Zinc, Lead & Smelting Company's Annual Reports show the equity interest to have been 87.38 percent in 1951, which was increased to 89.72 percent in 1965.

2/ - Mining operations by the Wisconsin Zinc Company ceased in late 1920, with the mining properties and equipment being taken over by the Mineral Point Zinc Company in 1924.

3/ - Joint Venture, dated 1955, between the American Zinc, Lead & Smelting Company and the Piquette Mining & Milling Company, with the Piquette Company being the operating partner.

4/ - The American Zinc, Lead & Smelting Company purchased the mining properties of the Vinegar Hill Zinc Company on August 1, 1955.

5/ - The American Zinc, Lead & Smelting Company acquired full ownership in the American-Piquette Joint Venture on July 1, 1965.

6/ - All mining operations in Wisconsin ceased in September 1970.

II. TRI-STATE ZINC, INC. and MISSOURI MINING COMPANY

1. Kansas Mining Operations

County	Mine	Subdistrict	% Equity	Operating Years	Notes
Cherokee	Blue Diamond	Treece	100	1927-1930	1/

TOTAL OPERATIONS = 1

2. Oklahoma Mining Operations

County	Mine	Subdistrict	% Equity	Operating Years	Notes
Ottawa	White	Picher	100	1927-1930	1/

TOTAL OPERATIONS = 1

3. Missouri Mining Operations

County	Mine	Subdistrict	% Equity	Operating Years	Notes
Jasper	Tulsa-Ptsbg.	Waco	100	1927	1/
"	" "	Waco	100	1928	2/
"	AWC-Jasper	Joplin	100	1929	2/

TOTAL OPERATIONS = 2

NOTES: (See page 26.)

Tri-State Zinc, Inc. and
Missouri Mining Company (Continued)

4. Illinois Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Jo Davies	Gray	Galena	100	1944-1963	3/
" "	Boutsch	"	100	1946-1954	3/
" "	Heer	"	100	1948-1950	3/
" "	Black Jack	"	100	1948-1953	3/
" "	Luning	"	100	1954	3/
" "	Amelia	"	100	1956-1963	3/

TOTAL OPERATIONS = 6

TRI-STATE ZINC, INC.

5. Virginia Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Rockingham	Bowers-Campbell	Timberville	100	1957-1963	4/

TOTAL OPERATIONS = 1

6. Tennessee Mining Operations

County	Mine	District	% Equity	Operating Years	Notes
Jefferson	New Market(JV)	New Market	50-60	1964-1971	5/

TOTAL OPERATIONS = 1

GRAND TOTAL = 12

NOTES: (See page 26.)

Tri-State Zinc, Inc. and
Missouri Mining Company (Continued)

NOTES: 1/ - The Tri-State Zinc, Inc. and the Missouri Mining Company were sister companies, both wholly owned by Consolidated Gold Fields, Limited, of London, England, and were primarily organized to do business in the Tri-State District of Missouri, Kansas, and Oklahoma. Their mining operations in both Oklahoma and Kansas, during the years 1927 through 1930, were conducted under the name of "Tri-State Zinc, Inc." Their mining operations in Missouri, during the years 1927 through 1929, were conducted by both companies.

2/ - The Tulsa-Pittsburg mine in the Waco subdistrict was operated during the year 1928 by the Missouri Mining Company. The Missouri Mining Company also operated the AWC-Jasper mine in the Joplin subdistrict in 1929.

3/ - In 1944, the Tri-State Zinc, Inc. acquired a group of mining leases in Jo Davies County, located in the Galena district in northern Illinois, and continuously operated in that area during the years 1944 through 1963. Mining operations in this area were conducted on a total of six different property ownerships.

4/ - In 1957, Tri-State Zinc, Inc. acquired mining leases to the Bowers-Campbell mine, located near Timberville, Rockingham County, Virginia. They operated this mine continuously from 1957 through 1963. This mine is located 2.5 miles northwest from Timberville, on State Highway No. 42.

5/ - In 1964, Tri-State Zinc, Inc. entered into a Joint Venture Agreement with the American Zinc Company of Tennessee, to acquire certain mining properties controlled by the American Zinc Company of Tennessee, lying near New Market, Jefferson County, Tennessee. Under this Joint Venture Agreement, the American Zinc Company of Tennessee was to develop and conduct the underground mining, with Tri-State Zinc, Inc. to construct and operate the milling facility. The equity position of the American Zinc Company of Tennessee in this Joint Venture would range from 40 to 50 percent. The Joint Venture was

Tri-State Zinc, Inc. and
Missouri Mining Company (Continued)

operated under the name of "The New Market Zinc Company", with mining operations being carried on during the years 1964 through 1971. Operations on this project ceased in November 1971, when the mineral properties and the mining-milling equipment were sold to ASARCO, Inc.