



Annual Report

June 30, 1964

to

June 30, 1965

**A Division of New Mexico Tech
Socorro, New Mexico**

NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

Stirling A. Colgate, *President*

STATE BUREAU OF MINES AND MINERAL RESOURCES

Alvin J. Thompson, *Director*

THE REGENTS

MEMBERS EX OFFICIO

The Honorable Jack M. Campbell *Governor of New Mexico*

Leonard DeLayo *Superintendent of Public Instruction*

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William G. Abbott Hobbs

Eugene L. Coulson, M.D. Socorro

Thomas M. Cramer Carlsbad

Eva M. Larrazolo (Mrs. Paul F.) Albuquerque

Richard M. Zimmerly Socorro

November 1, 1965

TO: President Stirling A. Colgate
Members of the Board of Regents
Members of the New Mexico Legislature

I am pleased to transmit to you the annual report of the New Mexico Bureau of Mines and Mineral Resources for the fiscal year ending June 30, 1965. Previous reports by the Director of the Bureau have been for a biennial period to conform with the biennial sessions of the Legislature. Beginning with this report, which is for the first year following the establishment of annual sessions of the Legislature, yearly reports will be made.


For the period June 30, 1964 to June 30, 1965, the Legislature appropriated \$365,000 to the State Bureau of Mines and Mineral Resources, an amount which has been approximately the same for the last few years. During this period the Bureau spent \$389,093, drawing on income from the sale of publications and its reserve fund to offset the deficit. This is a report of how the funds were used and what was accomplished with them.

For the 1965-1966 fiscal year, in which the Bureau is now operating, the Legislature appropriated \$400,000 which has had to be augmented, again from surplus, to \$428,700 to take care of anticipated needs. This withdrawal from the surplus has essentially exhausted the reserve fund. In the forthcoming 1966-1967 fiscal year the Bureau will have to depend upon a substantial increase in State appropriations in order to meet its goal of an annual increase of service in support of mineral industry development.

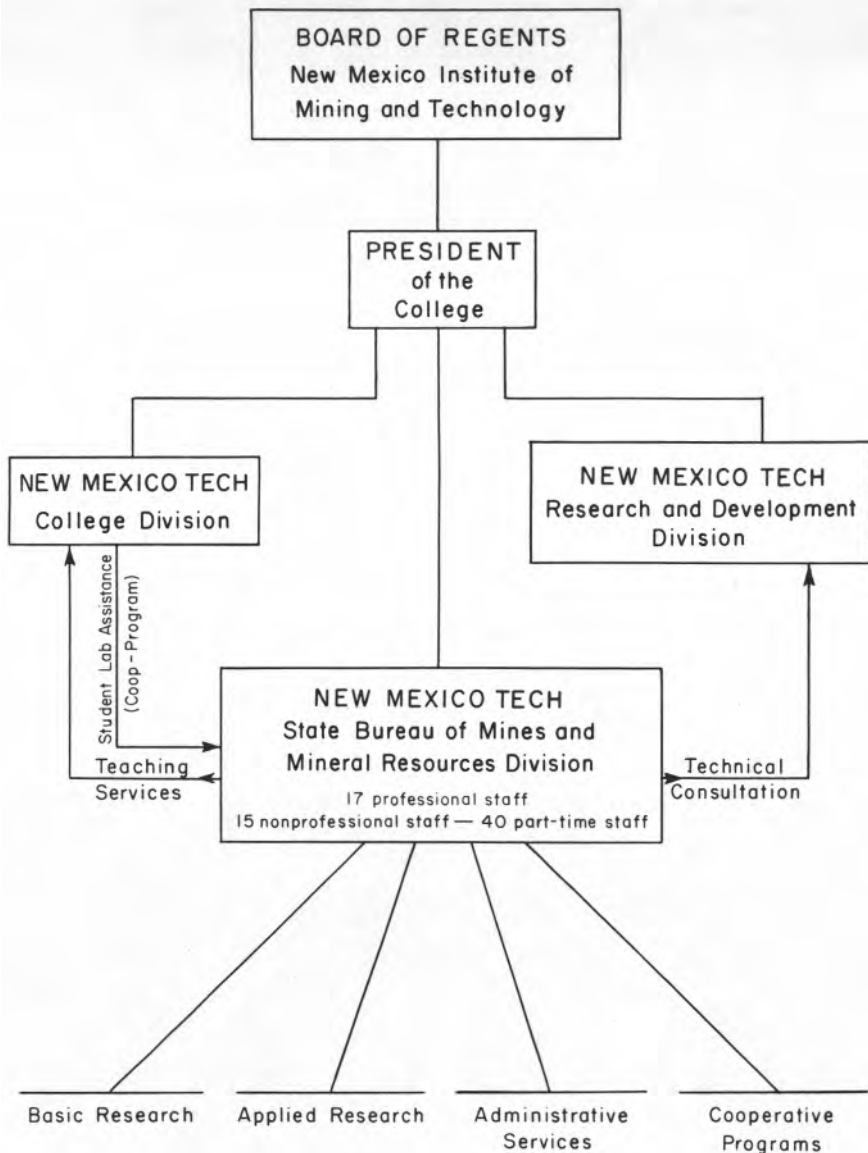
There is a continuing demand for additional services from the Bureau as a result of technological advances and the rapid expansion of the State's mineral economy. The Bureau has every intention of responding to this demand and striving to provide leadership in the development of the State's mineral resources.

This report for the fiscal year 1964-1965 fulfills the requirement set forth in Section 3, Chapter 115 of the Session Laws of the Eighth State Legislature, approved March 4, 1927.

Respectfully submitted,

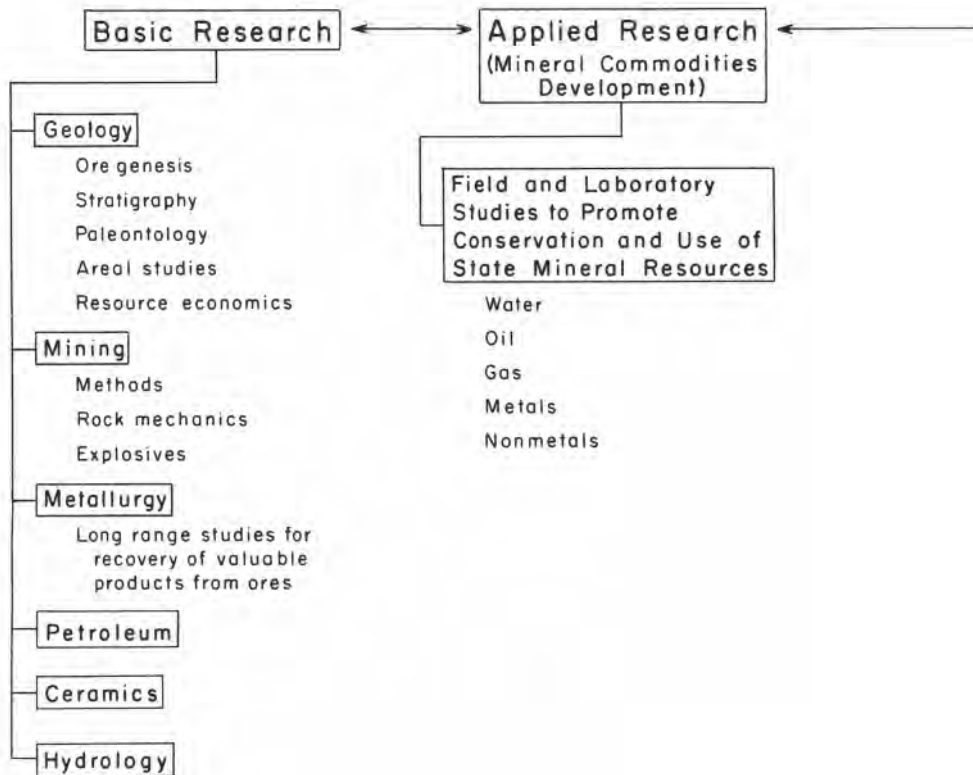

Alvin J. Thompson
Director
State Bureau of Mines and
Mineral Resources

ORGANIZATION AND OPERATION
OF THE
STATE BUREAU OF MINES AND MINERAL RESOURCES



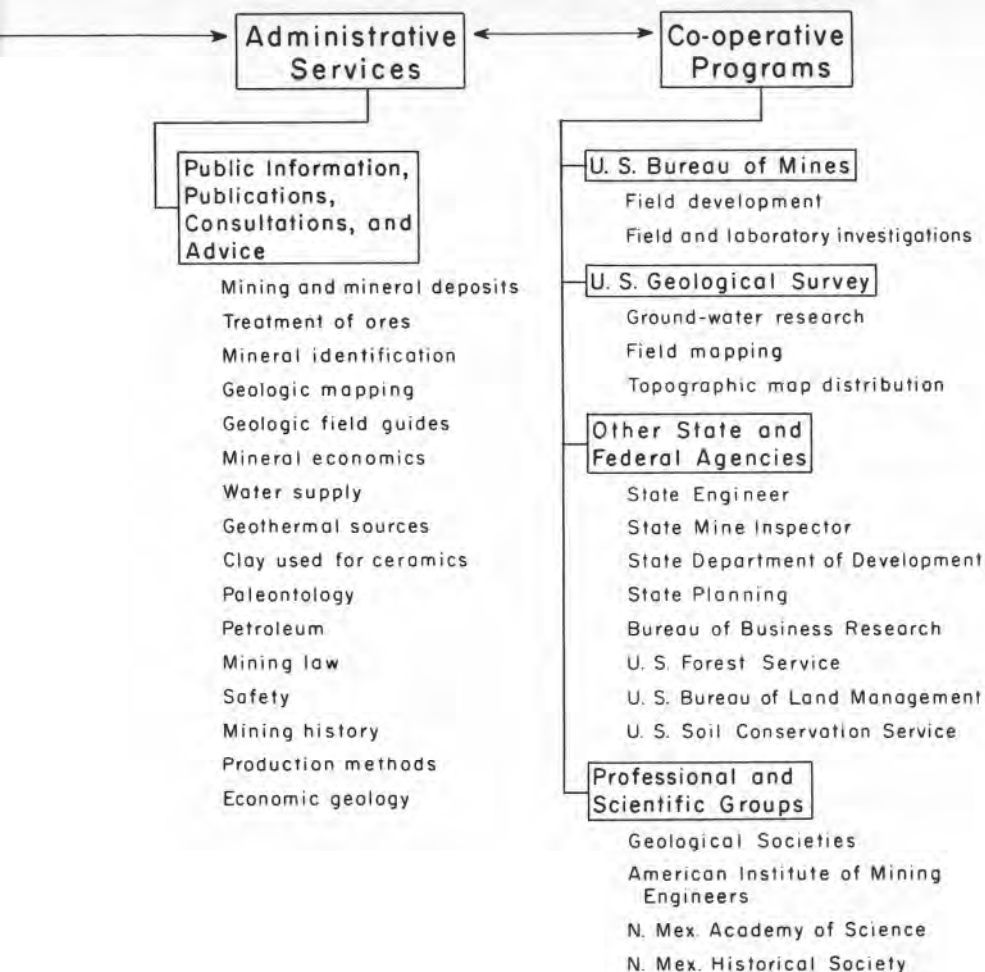
ORGANIZATION AND OPERATION
OF THE
STATE BUREAU OF MINES AND MINERAL RESOURCES

(Continued)



ORGANIZATION AND OPERATION OF THE STATE BUREAU OF MINES AND MINERAL RESOURCES

(Continued)



INTRODUCTION AND SUMMARY

This report for the 1964-65 fiscal year highlights the activities and the achievements of the State Bureau of Mines and Mineral Resources during the past year and provides additional information to supplement the 1962-1964 biennial report.

A chart is included which outlines the Bureau's organization and operations. The investigations carried out by the various departments consist of both basic and applied research. The information gained is supplied to the public by answers to all types of inquiries, by consultations, and by publications. The effectiveness of the Bureau work is enhanced by cooperative activities with numerous other private and public organizations.

Several new or expanded activities during the 1964-1965 period are of special interest. A project was begun on the geology and mineral resources of Rio Arriba County. Preliminary investigations were initiated in the areas of ceramic resources and thermal power development in New Mexico. Research in the field of ore processing was greatly expanded. In connection with these activities, the Bureau began the acquisition of new and markedly improved analytical equipment for determining the components of the extremely wide variety of mineral products with which the State is so unusually endowed. It is confidently expected that these new endeavors will provide an increased return to the State all out of proportion to the funds invested.

Seventeen full-time professional staff members were employed during the fiscal year. These were assisted by fifteen nonprofessional and forty part-time staff members in carrying out normal supporting activities. The supporting activities are briefly described in the text. A financial statement, a list of employees, and a summary of the State's mineral production during 1964 are given at the end of this report. Also included is a statement of objectives and duties of the New Mexico Bureau of Mines and Mineral Resources as presented in the Statutes.

BUREAU OF MINES AND MINERAL RESOURCES

ACTIVITIES

BASIC AND APPLIED RESEARCH

Basic and applied investigations of the Bureau of Mines and Mineral Resources are conducted in geology, mining, metallurgy, petroleum, hydrology, and ceramics. The general nature of the Bureau's activities in these fields has been described in some detail in previous reports.

The various mineral industry projects in which the Bureau has participated during the past year are given in the listing of projects. A large part of the Bureau's total expenditures can be attributed to these activities, which are primarily directed toward developing New Mexico's economy and increasing knowledge of the State's mineral resources.

Studies and projects that have been initiated or have received special attention in the past year are:

Geology and Mineral Resources of Rio Arriba County. On December 8, 1964, the Governor's Advisory Committee on Mineral Development submitted a report recommending a special appropriation to carry out an accelerated program of studies of the mineral resources of Rio Arriba County. Although the special funds were not provided by the legislature, the Bureau used its regular staff to take the initial steps in this project.

Clay Resources Survey. A field investigation was pursued during the year to delineate the potentially valuable clay deposits of New Mexico. Initial data were accumulated and adequate space was obtained on New Mexico Institute of Mining and Technology campus. A laboratory was set up with testing equipment to determine the suitability of the clays for use in making bricks, piping, electrical insulators, and other ceramic products. This project, already started at the Bureau, was also one recommended by the Governor's Advisory Committee on Mineral Development on December 8, 1964. Like the Rio Arriba project, funds have not yet been provided by the legislature for an accelerated program.

Geothermal Studies. Geothermal studies of heat sources were initiated with reference to their possible use for supplying industrial electricity, for changing crop-growing seasons, and for heating of homes.

Ore Processing. Studies were made to determine better ways of extracting metal from ores now being mined in the state, including the possible use of bacteria in mining and the improvement of equipment designs. Pyrometallurgical, hydrometallurgical, and mineral dressing methods were used to an increasing extent in the Bureau's long-range program of research on the recovery of valuable products from New Mexico low-grade and refractory ores.

Mineral Identification. In 1964 and 1965 the Bureau initiated the use of atomic adsorption testing equipment. When its utility is fully developed, it is expected that the speed and accuracy of the analytical work will be increased several fold. Mineral identification and analysis is important to almost every field of mineral research.

ADMINISTRATIVE SERVICES

Data and research results are made available by printed publications; answers to direct inquiries, by phone, letter, or personal visit; and by consultations in the office or in the field. Users of these services during the past year were mining and petroleum company technicians and officials, individuals, libraries, and professional organizations.

Publications

The Bureau produced about 20 publications during the 1964-65 year. Approximately \$30,000 is spent annually in publications.

While a majority of Bureau studies is published, many of the data go into a reservoir of information available in the Bureau files covering not only scientific data, but also useful facts in the areas of mining law, economic geology, safety, equipment design and modification, and history of mines and mining.

Oil Well Records

A library containing logs and cuttings from oil well drilling is maintained and constantly used by the petroleum industry.

Geological Field Guides

The eighth of a series of "Scenic Trips to the Geologic Past" titled "Mosaic of New Mexico's Scenery, Rocks, and History" was produced and has proved to be a best seller in its field, not only to individuals in New Mexico and other states but also to groups such as women's clubs, historical society groups, and classroom teachers.

COOPERATIVE ACTIVITIES

Cooperation with public and professional organizations was another function of the Bureau accented during the past year. Special cooperative activities during the year were:

United States Geological Survey

The Bureau assisted the United States Geological Survey in the preparation of a bulletin, number 87, entitled "Mineral and Water Resources of New Mexico," a special project prepared for the United States Senate Committee on Interior and Insular Affairs.

An investigation was made of ore mineral zoning in cooperation with the United States Geological Survey on a manganese-bearing area in Socorro County.

Bureau of Mines

Assistance was given the United States Bureau of Mines in preparing and publishing a report on barite in New Mexico.

State Planning Office

The Bureau prepared a series of reports for the State Planning Office in connection with the study of the mineral element of the State Resources Development Plan and in the area of geothermal water data.

Department of Development

A Ghost Town Map was prepared by the Bureau for the State Department of Development for use in connection with the promotion of tourism and possible improvement of the economy of the State.

Soil Conservation Service

The Bureau cooperated with the United States Soil Conservation Service in a study of differentiation of soils and Cenozoic sediments.

Forest Service and Bureau of Land Management

The United States Forest Service and United States Bureau of Land Management were furnished basic data on mineral resources for use in the administration of federal lands and in providing historical mining data on lands controlled by them.

State Mine Inspector

In cooperation with the State Mine Inspector the Bureau assembled a directory of mines and mining companies of New Mexico. The information, giving locations of mines, will form a nucleus of source material for historians, prospective mine operators, land purchasers, and lawyers seeking information on estate matters.

New Mexico Institute of Mining and Technology—College Division

Staff members in the Bureau taught courses in mining and geology, and provided lecture service in metallurgy during the 1964-65 fiscal year.

New Mexico Institute of Mining and Technology—Research and Development Division

During the year technical consultation and information were furnished the Research and Development Division of the Institute on a variety of subjects and projects relating to mineral technology.

Other groups

Speakers, papers, committee service, and meeting facilities were provided for the American Institute of Mining Engineers. Editorial assistance was given to the New Mexico Geological Society and the New Mexico Academy of Science in connection with their publications, and assistance was rendered the State Historical Society on the mining history of the State.

SUPPORTING ACTIVITIES

There are several routine services performed by the Bureau not shown on the organizational chart.

Stenographic Services

Stenographic services for the Bureau are in general a function of the Bureau Publications Office. This office also handles the distribution and sale of a large volume of circulars, bulletins, maps, memoirs, and guidebooks.

Publishing

Publishing of manuscripts is a major Bureau activity. After a study is completed by the author-staff member and his manuscript is typed, accurate estimates of the cost involved are determined to find the most economic method of reproduction.

Publications then must be edited and liaison maintained with the printer to avoid costly delays and to ensure prompt proofreading and publication. A part of the Bureau printing is done by the University of New Mexico Printing Plant, where the Bureau takes advantage of quantity purchases of paper stock and superior printing facilities. All other printing, where feasible, is done at New Mexico Tech's photo lab, although its crowded schedule and smaller press facilities limit its use by the Bureau.

Maps and Illustrations

Maps and illustrations are valuable and require expert and accurate draftsmen. A staff under an able scientific illustrator is maintained.

Equipment Inventory and Maintenance is an important function within the Bureau.

A large amount of scientific apparatus and laboratory equipment is inventoried and maintained.

Field work requires trucks and automotive equipment. By careful attention to maintenance, only one pickup truck and one passenger car have been purchased in the past ten years.

The Bureau, as a matter of economy and efficiency, pools its buying activities with the College Division and the Research and Development Division of New Mexico Tech.

1964-1965 PROJECTS

Titles of projects started or completed during the year are given in the following list. Asterisks indicate projects completed with the issuance of a bulletin, circular, memoir, or other printed Bureau report.

GEOLOGY (General)

*Precambrian Geology of La Madera Quadrangle, Rio Arriba County, New Mexico. Edward C. Bingler.

*Geology of the Jarilla Mountains, Otero County, New Mexico. Paul G. Schmidt and Campbell Craddock.

*Reconnaissance Geology of the Little Black Peak Quadrangle, Lincoln and Socorro Counties, New Mexico. Clay Smith. (Reprint)

*A Guidebook of the Ruidoso Country (New Mexico) (A chapter in the New Mexico Geological Society Guidebook.) R. H. Weber.

Dating of Precambrian Rocks (in cooperation with California Institute of Technology). Roy W. Foster.

The Precambrian of New Mexico (in cooperation with the University of Texas). Roy W. Foster.

Quaternary Geology of the Southwest. Frank E. Kottlowski.

A Study of the Geology of the Carrizozo Quadrangle. R. H. Weber.

*Sedimentology of the Upper Cretaceous Rocks of Todilto Park, New Mexico. Max E. Willard.

*Stratigraphy of the Big Hatchet Mountains Area, New Mexico. Robert A. Zeller, Jr.

*Niobium-Bearing Sanostee Heavy Mineral Deposit, San Juan Basin, Northwestern New Mexico. Edward C. Bingler.

An Investigation of Ore Mineral Zoning in a Manganese Bearing Area in the Luis Lopez mining district of Socorro County, in cooperation with the United States Geological Survey. Max E. Willard.

Petrology and Geochemistry of Alkaline Igneous Rocks in New Mexico. Jacques Renault.

*Mineral Deposits of Western Grant County, New Mexico. Elliot Gillerman.

*Petroglyphs of the Sierra Blanca. (New Mexico Geological Society Guidebook). R. H. Weber.

Paleontology

*The Nautiloid Order Ellesmeroceratida. Rousseau H. Flower.

*Nautiloid Shell Morphology. Rousseau H. Flower.

Endoceratida of the El Paso—Part I (world-wide revision of the Group). Rousseau H. Flower.

Tarphyceratida of the El Paso Group. Rousseau H. Flower.

Cephalopods of Garden City and Pogonip. Rousseau H. Flower.

Descriptions and Illustrations of the Fauna of the Bliss Sandstone. Rousseau H. Flower.

General Descriptions and Illustrations of Guide Fossils of the Early Paleozoic of New Mexico. Rousseau H. Flower.

Progress on Devonian Faunas and Formations of New Mexico, with G. A. Cooper and T. E. Dutro. Rousseau H. Flower.

Resource Economy

*Mineral and Water Resources of New Mexico (in cooperation with United States Geological Survey, New Mexico Oil Conservation Commission, New Mexico State Engineer, and United States Bureau of Mines). State Bureau of Mines and Mineral Resources Bulletin 87, for the United States Senate Committee on Interior and Insular Affairs.

*Economic Geology of Coal in New Mexico. Frank E. Kottlowski.

*Barite Deposits of New Mexico. Frank E. Williams, P. V. Fillo, P. A. Bloom.

*Molybdenum Resources of New Mexico. John Schilling.

Definitions, Intentions, and Assumptions of the Mineral Element of the State Resources Development Plan, a study and report to the State Planning Office by William E. Bertholf II.

MINING

Geochemical Study of Magdalena District, New Mexico. Fazlollah Missaghi.

Geochemical Prospecting Studies in New Mexico. Paper presented at a joint meeting (October 23, 1964) of the New Mexico Mining Association and Southwest International Mining Association. Fazlollah Missaghi.

Geochemical Prospecting Study of Baldy (Ute Creek) and Ponil Districts, Colfax County, New Mexico. Fazlollah Missaghi.

*Geology and Geochemical Survey of a Molybdenum Deposit Near Nogal Peak, Lincoln County, New Mexico. George B. Griswold and Fazlollah Missaghi.

Mining Records in County Courthouses of New Mexico. Lucien A. File.

*How to Measure Rock Pressures, New Tools, and Proved Techniques in Mine Designs. George B. Griswold.

Directory of Mines and Mining Companies (in cooperation with William Hays, State Mine Inspector). Lucien A. File.

METALLURGY

*Design of an Apparatus for Determining Isoelectric Point of Charge. Raul A. Deju and Roshan B. Bhappu.

*Sulfonate Flotation of Beryl. Maurice C. Fuerstenau and Roshan B. Bhappu.

*The Role of Hydrolysis in Sulfonate Flotation of Quartz. Maurice C. Fuerstenau, C. G. Martin, and Roshan B. Bhappu.

Initial Studies in the Recovery of Molybdenum from Sulfide and Oxide Ores from Questa Deposit. Roshan B. Bhappu.

Study of Manganese Dioxide Sulphuric Acid Oxidation of Molybdenite. Roshan B. Bhappu.

In-place Leaching of Chalcopyrite from Copper Flat Deposits. Roshan B. Bhappu.

*Recovery of Valuable Minerals from Pegmatitic Ores. Roshan B. Bhappu and Maurice C. Fuerstenau.

Study of Surface Properties of Silicate Minerals (Adsorption and Ion-Exchange Capacities) of Selected Minerals. Roshan B. Bhappu.

Design and Construction of a Rising Current Elutriator. Edward C. Binger.

PETROLEUM

*Stratigraphy and Petroleum Possibilities of Catron County, New Mexico. Roy W. Foster.

Petroleum Developments in New Mexico 1960-1961. Robert A. Bieberman and Mary Ann Grandjean.

HYDROLOGY

*Preliminary Report on New Mexico Geothermal Energy Resources. W. K. Summers.

*Chemical Characteristics of New Mexico Thermal Waters. W. K. Summers.

Ground-Water Resources of Quay County. (United States Geological Survey). Walter Maurant.

An Assembly of Geothermal Water Data for New Mexico. A Report for the State Resources Program of the State Planning Office. William E. Bertholf II.

CERAMICS

A Study of Lightweight Aggregate from Clays and Shales in New Mexico. Roy W. Foster.

A Study of the Production of Lightweight Aggregate from Clays and Shales in New Mexico. Roy W. Foster.

Activation of a Clay Laboratory on the Campus of New Mexico Tech. William L. Hawks.

A Study of the Feasibility of Additional Ceramic Plants in New Mexico. William L. Hawks.

Survey and Utilization of New Mexico Clays. William L. Hawks.

MISCELLANEOUS

*Mosaic of New Mexico's Scenery, Rocks, and History. Paige W. Christiansen and Frank E. Kottowski.

*An Instrumental Study of New Mexico Earthquakes. Allan R. Sanford.

*History of Labor Unions in New Mexico's Nonferrous Metals Mining Industry. (Reprint) Lucien A. File.

PLANNED PROJECTS

New projects not listed in the previous section on which substantial work is anticipated in 1965-1966 by the various departments of the Bureau follow:

GEOLOGY (General)

Sedimentary basins in central and southwestern New Mexico.

Mapping of Las Cruces 15-minute quadrangle.

Oligocene fluorite-barite mineralization in New Mexico.

Late Paleozoic rocks in southwestern New Mexico.

Environments of Late Paleozoic coals in New Mexico and Arizona.

Pennsylvanian-Permian rocks of Joyita Hills.

Clovis and Brownfield quadrangle maps for Geologic Atlas.

Lead in New Mexico.

Geology and mineral resources of the Chupadera Mountains.

Study of clays and heavy minerals to correlate the Cretaceous sedimentary rocks along the west side of the San Juan Basin.

Geology and Ore Deposits of the Sacramento (High Rolls) Mining District, Otero County, New Mexico.

Paleontology

Silurian cephalopods of the James Bay Lowland Revision of the family *Nartheoceratidae*.

A study of the mineral element and service work for the State Planning Office involving studies and reports in the following areas:

Intellectual property—an overview.

Use value, research, and uses.

Education and training of mineral industry personnel.

Mining, milling, production, and reserves.

Background organization and geographic distribution of the mineral element of New Mexico.

Problems of future mineral values, prices, taxes, tariffs, transportation, and mining laws.

Water management coordination and interdisciplinary problems.

History and purpose of a pueblo water right.

Preliminary study of the administration of the supply of water in the New Mexico market.

Research leading to planning of long-range programs in geothermal and ceramic fields for industrial uses, as a joint program for the State Bureau of Mines and Mineral Resources and the New Mexico Tech Research Foundation.

A Bibliography of New Mexico Geology and Mineral Technology 1960 through 1965.

METALLURGY

Correlation of surface properties of silicate minerals to their flotability.

Winning metallic values from leach solutions by absorption processes.

Bacterial and carbonate leaching of oxide-molybdenum ores.

Further studies on recovery of molybdenum from mixed sulfide-oxide ores from Questa deposit.

Recovery of rhenium from molybdenite concentrate.

Determination of optimum hydrocarbon oil for molybdenite flotation.

Preparation of a handbook on analytical procedures.

Detailed analysis of thermal and saline waters.

Desalination of brackish waters using established metallurgical techniques.

In-place leaching of copper and uranium ores.

PETROLEUM

A statistical report on the petroleum developments in New Mexico for 1961 and 1962.

Cataloging and filing of electric, radioactive, sonic, and other types of well logs from 2500 wells, donated to the Bureau by Humble Oil Company.

Oil shale potential in New Mexico.

Subsurface stratigraphy of Valencia County.

Stratigraphy of the Upper Permian rocks of southeastern New Mexico.

CERAMICS

A study of lightweight aggregate from clays and shales in New Mexico.

Common clays of New Mexico and their suitability for structural clay products.

HYDROLOGY

A field inventory of the thermal springs of New Mexico.

Report on findings at the Lordsburg hotspot.

A bibliography of literature on the phenomena of thermal waters.

Chemical analyses of thermal waters.

Economic appraisal of thermal waters of New Mexico.

MINERAL PRODUCTION IN NEW MEXICO

	1964	
	Quantity	Value
*Barite (tons)	*	*
Carbon Dioxide (natural) (cu. ft.)	816,168,000	\$ 61,000
*Cement (tons)	*	*
Clays (except fire clay) (tons)	104,000	167,000
Coal (Bituminous) (tons)	2,969,000	9,763,000
Copper (tons)	86,104	56,140,000
Fluorspar (tons)	137	3,000
Gem stones	--	45,000
Gold (troy ounces)	6,110	214,000
*Gypsum (tons)	*	*
Helium (cu. ft.)	84,526,000	2,958,000
*Iron ore (usable tons)	*	*
Lead (tons)	1,626	426,000
Lime (tons)	25,000	352,000
Manganese concentrate (tons)	5,794	149,000
Manganiferous ore (tons)	46,657	300,000
Mica (scrap) (tons)	6,922	105,000
*Molybdenum (tons)	*	*
Natural gas (cu. ft.)	875,000,000,000	105,000,000
Natural gas liquids:		
LP gases (gal.)	739,190,000	21,641,000
Natural gasolines & cycle products (gal.)	356,047,000	21,570,000
Perlite (tons)	286,329	2,568,000
Petroleum (crude) (42 gal. barrels)	113,863,000	326,565,000
Potassium salts (tons)	2,675,000	104,866,000
Pumice (tons)	260,000	760,000
Salt (tons)	62,000	559,000
Sand and gravel (tons)	8,781,000	10,160,000
Silver (troy ounces)	242,000	313,000
Stone (tons)	2,760,000	4,244,000
**Uranium concentrate (pounds)	9,494,487	75,975,170
Vanadium (tons)	*	154,000
Zinc (tons)	29,833	8,115,000
*Value of items not disclosed, cement, iron ore, molybdenum, gypsum, barite		7,791,000
Total		\$760,964,170

* Figures withheld to avoid disclosing individual company confidential data.

** Atomic Energy Commission figures. Except for uranium, all production figures are from U. S. Bureau of Mines and Minerals Yearbook.

Mineral production in New Mexico continued to climb during 1964, attaining a value of 761 million dollars, up 29 million over the 1963 level. As in prior years, mineral fuels contributed the major portion of the total. Crude petroleum output increased from 110 million barrels in 1963 to 114 million barrels in 1964. In value, the increase was from 317 million dollars to 327 million dollars. Natural gas and the products derived from it in processing totaled in value 148 million dollars in 1964, an increase of 10 million over the preceding year.

The State's 1964 production of uranium concentrate was 9,494, 487 pounds purchased by the Atomic Energy Commission at a cost of \$75,975,170. The decrease of approximately 10 million dollars in uranium production in 1964 as compared to 1963 resulted from the decision by the AEC to stretch out its procurement program through 1970 instead of ending it in 1967. New Mexico continued to provide about 40 percent of the nation's uranium.

As for many years, potash accounted for the major portion of the non-metallic production. Six companies in the Carlsbad area in Eddy County produced potash salts valued at 105 million dollars in 1964. Construction was continued on a multimillion-dollar mine and refinery by a new company, the Kermac Potash Company. New Mexico provided about 90 per cent of the nation's potash in 1964.

Copper is fourth in dollar value of mineral products in the State. Nation-wide, New Mexico ranked third for the second year. The price of copper increased from 30.6 cents per pound to 33.7 cents per pound during 1964. The state's production of 86,000 short tons of copper was valued at 56 million dollars. The all-time production of copper in New Mexico now has a value in excess of one billion dollars.

Sand and gravel production was valued at 10.2 million dollars in 1964, as compared to a valuation of 12.8 million in 1963. The principal use was in highway construction, although substantial amounts were employed in building projects.

Following a marked increase in coal production in 1963, there was another substantial increase in 1964. The total tonnage mined in 1964 was 3.0 million valued at 9.8 million dollars. Further increases appear to be forthcoming in the next few years.

Zinc and lead, which normally are mined together in New Mexico, rose pronouncedly in value over preceding years. A number of important lead-zinc mines that were closed in 1963 were reopened in 1964 when the price of zinc increased from 13 to 14.5 cents a pound, and the price of lead rose from 12.6 to 16 cents a pound. Zinc with a production value of 8.1 million dollars ranked after uranium and copper as the most important metal produced in New Mexico.

New Mexico continued to rank first in the nation in perlite production, accounting for about 80 percent of the nation's total. Product valuation was 2.6 million dollars in 1964, an increase of \$356,000 over the preceding year.

The amount of stone produced in New Mexico in 1964 was 2.8 million tons. This had a value of 4.2 million dollars. The stone was used principally for highway projects, but New Mexico now is mining and processing substantial quantities of decorative building stone.

The production of helium in 1964 reached an all-time high of 85 million cubic feet, valued at 3 million dollars. The output of this gas, which began in 1953, dropped to a low value of 264,000 dollars in 1959 after five years of substantial production that averaged close to a million dollars a year. The value has increased each year since 1959.

As may be seen in the table, a number of mineral commodities were produced other than those mentioned. These together had a total value of 14 million dollars. The production figures for cement, which are withheld as confidential, accounted for a large part of this total. Molybdenum, listed as

another commodity whose quantity and value are withheld as confidential, is expected to become a product of major importance to New Mexico. The Questa Mine of the Molybdenum Corporation of America is now nearing completion of its development program, and a multimillion-dollar operation is anticipated within the coming year.

FINANCIAL STATEMENT

The Business Manager of the New Mexico Institute of Mining and Technology, who supervises the finances of the Bureau, has submitted the following statements.

STATE BUREAU OF MINES

GENERAL

<i>Receipts</i>	<i>1964-1965</i>	
Beginning balance July 1	41,718	
State appropriation	365,000	
Receipts from sales of bulletins, etc.	9,277	
Add prior year adjustments	<u>4,422</u>	
TOTAL revenue		\$420,417
<i>Disbursements and Commitments</i>		
Personal services:		
Regular salaries	186,276	
Part-time salaries	<u>79,665</u>	\$265,941
Travel and automotive:		
Travel and per diem	5,501	
Gas, repairs, and insurance	<u>2,612</u>	\$ 8,113
Repairs and maintenance	<u>1,245</u>	\$ 1,245
Supplies and materials:		
Postage and resale supplies	2,842	
Office supplies	2,597	
Laboratory and scientific supplies	<u>9,708</u>	\$ 15,147
Printing and reproduction	<u>30,146</u>	\$ 30,146
Other operating expenses:		
Telephone and telegraph	3,595	
Professional services	7,903	
Retirement	10,846	
Social Security	4,905	
Overhead	14,600	
Freight, express, insurance, audit repairs, subscriptions, etc.	<u>11,037</u>	\$ 52,886

Capital outlay	\$ 20,027
TOTAL expenditures	\$393,505
Year-end balance	\$ 26,912

FINANCIAL STATEMENT

BASIC GEOLOGY

<i>Receipts</i>	<i>1964-1965</i>	
Beginning balance July 1	—0—	
State appropriation	\$ 10,000	
TOTAL revenue		\$ 10,000
<i>Disbursements and Commitments</i>		
Salaries	\$ 8,000	
Travel	312	
Retirement	520	
Social Security	168	
Overhead	1,000	
TOTAL expenditure		\$ 10,000
Year-end balance		—0—

GROUND-WATER SURVEYS

<i>Receipts</i>	<i>1964-1965</i>	
Beginning balance July 1	—0—	
State appropriation	\$ 10,000	
TOTAL revenue		\$ 10,000
<i>Disbursements and Commitments</i>		
Salaries	8,000	
Printing and publication	1,000	
Overhead	1,000	
TOTAL expenditures		\$ 10,000
Year-end balance		—0—

FINANCIAL STATEMENT

STATE RESOURCES DEVELOPMENT PLAN

<i>Receipts</i>	<i>1964-1965</i>	
Beginning balance July 1	—0—	
State appropriation and Federal contribution	\$ 18,320	
TOTAL revenue		\$ 18,320
<i>Disbursements and commitments</i>		
Salaries	\$ 14,972	
Travel	531	
Retirement	500	
Social Security	247	
Overhead	—0—	
		\$ 16,250
Year-end balance		\$ 2,070

PERSONNEL

Name	Title
Mr. William E. Arnold	Scientific Illustrator
Dr. William E. Bertholf II	Resource Economist
Dr. Roshan B. Bhappu	Senior Metallurgist and Research Professor
Mr. Robert A. Bieberman	Associate Petroleum Geologist
Dr. Edward C. Bingler	Associate Geologist
Mr. Richard Chavez	Laboratory Assistant
Mrs. Lois Devlin	Secretary
Mrs. Myrtie M. Edgar	Secretary
Mr. Lucien A. File	Staff Researcher
Dr. Rousseau H. Flower	Stratigraphic Geologist
Mr. Roy W. Foster	Associate Petroleum Geologist
*Mrs. Mary Ann Grandjean	Secretary
*Mrs. Jeanette Gray	Secretary
Dr. George B. Griswold	Mining Engineer and Associate Professor of Mining
Mr. William L. Hawks	Ceramic Engineer
Mrs. Betty Houston	Secretary
Dr. Frank E. Kottlowski	Economic Geologist
*Dr. Frederick J. Kuellmer	Economic Geologist
*Mrs. Jo Ann Miller	Secretary
Dr. Fazlollah Missaghi	Mining Engineer
*Mr. Raymond Molina	Draftsman
Mr. Robert L. Price	Draftsman
Miss Teri Ray	Publications Journalist
Dr. Jacques Renault	Associate Geologist
Dr. Dexter H. Reynolds	Research Chemist
Mrs. Susan T. Reynolds	Secretary
Mr. Jackie H. Smith	Laboratory Assistant and Technician
Mr. W. Kelly Summers	Ground-water Hydrologist
Mr. Alvin J. Thompson	Director
Mrs. Helen W. Waxler	Secretary
Dr. Robert H. Weber	Economic Geologist
Mrs. Lola M. White	Cartographer
Miss Sharyn Whitmore	Secretary
Mr. Max E. Willard	Economic Geologist

* Not employed at end of biennium.

OBJECTIVES AND DUTIES

The New Mexico Bureau of Mines and Mineral Resources was established in 1927 by an act of the 8th State Legislature as a division of the New Mexico School of Mines. In establishing the Bureau of Mines the Legislature defined the objectives and duties of this new State agency as follows:

(1) To collect, to compile and to publish statistics relative to New Mexico, geology, mining, metallurgy and oil and natural gas and the refining thereof.

(2) To collect typical geological and mineral specimens and samples of products; to collect photographs, models and drawings of appliances used in the mines, mills, smelters, oil wells, natural gas wells and the refineries of oil and natural gas in New Mexico.

(3) To collect a library and bibliography of literature pertaining to the progress of geology, mining, milling, smelting and the production of oil and natural gas and refining the same in New Mexico.

(4) To study the geological formations of the state with special reference to their economic mineral resources, both metallic and nonmetallic.

(5) To examine the topography and physical features of the state with reference to their practical bearing upon the occupation of the people.

(6) To study the mining, milling, smelting operations and oil and natural gas production and the refining of the same carried on in the state with special reference to their improvement.

(7) To prepare and publish bulletins and reports with the necessary illustrations and maps, which shall embrace both a general and detailed description of the natural resources and geology, mines, mineral deposits, both metallic and nonmetallic, oil wells, natural gas wells, reduction plants, smelters, mills, oil refineries and natural gas refineries.

(8) To make qualitative examinations of rocks and mineral samples and specimens.

(9) To assist in the education of miners and prospectors through lectures and publications.

(10) To consider such other kindred, scientific and economic problems and questions as in the judgment of the Board shall be deemed of value to the people of the state.

(11) To communicate special information on New Mexico geology, mining, both metallic and nonmetallic, oil and natural gas and to serve as a bureau of exchange and information on the mineral, oil and natural gas resources of New Mexico.

(12) To cooperate with the University of New Mexico, with the state mine inspector and with other departments of state government as may be mutually beneficial and to cooperate with the United States geological survey and with the United States bureau of mines in accordance with the regulations of those institutions.