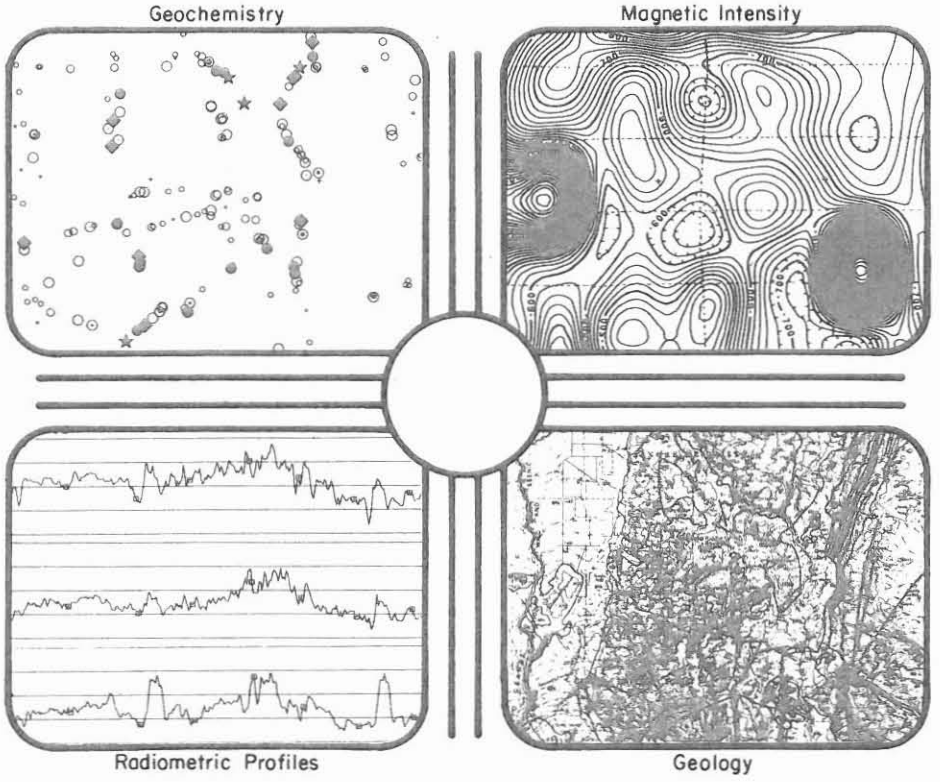
NATIONAL URANIUM RESOURCE EVALUATION (NURE) DATA

AVAILABLE THROUGH
NEW MEXICO BUREAU OF MINES AND MINERAL RESOURCES



by Virginia T. McLemore and Richard M. Chamberlin 1986

New Mexico Bureau of Mines and Mineral Resources
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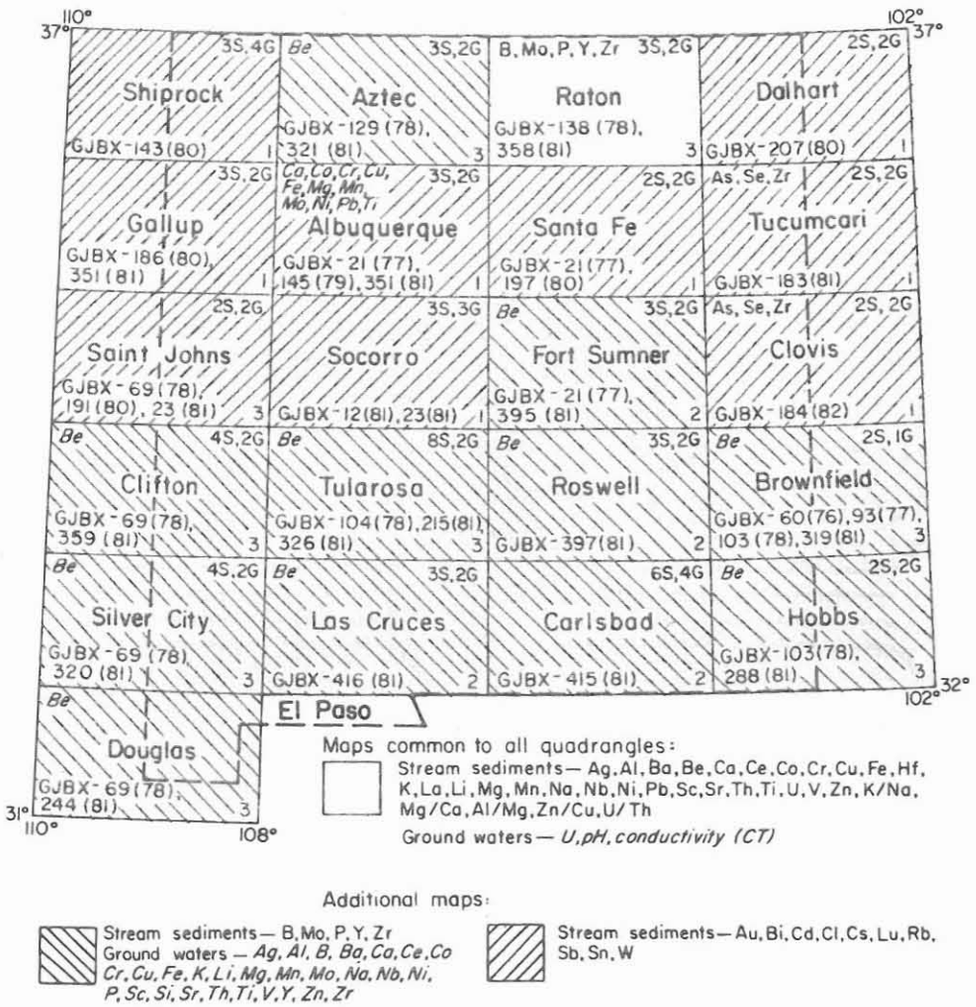


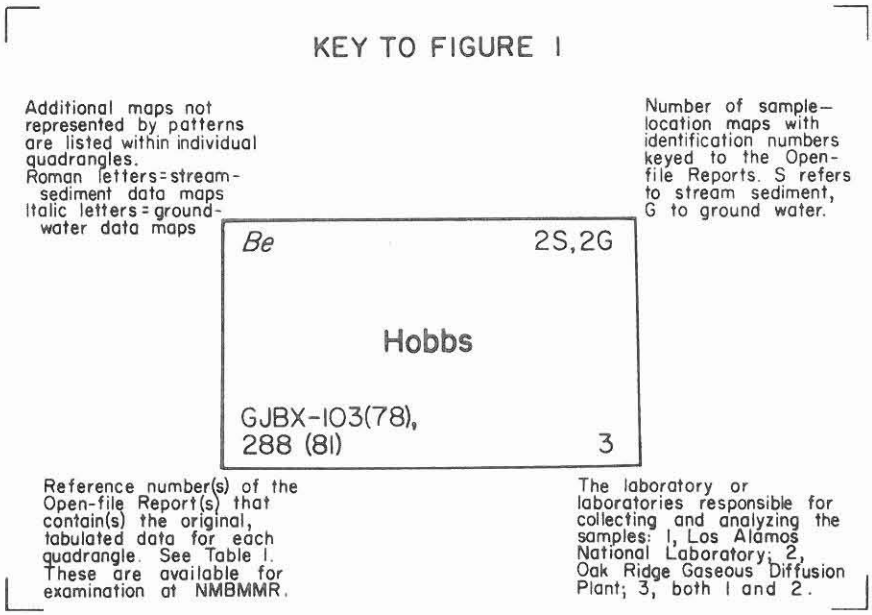
FIGURE 1—INDEX MAP FOR NURE GEOCHEMICAL RECONNAISSANCE MAPS OF NEW MEXICO.

COVER—NURE DATA FROM THE RATON QUADRANGLE. Scale has been reduced here to 1:1,000,000.

Introduction

A regional geochemical (stream sediments and ground waters) and geophysical (magnetic and radiometric) database now exists for the state of New Mexico. These data were generated from reconnaissance surveys of 1° x 2° quadrangles (1:250,000 scale) as part of the National Uranium Resource Evaluation (NURE) program and are available through the New Mexico Bureau of Mines and Mineral Resources (NMBMMR). Integration of NURE data with available geologic maps and other geologic reports will provide a better understanding of the geology of New Mexico.

The NURE program was established in 1974 and terminated in 1984. It was administered by the Grand Junction Office of the U.S. Atomic Energy Commission and succeeding agencies, the U.S. Energy and Development Administration and the U.S. Department of Energy (DOE). The main purposes of the NURE program were to provide an assessment of the nation's uranium resources and to identify areas favorable for uranium mineralization. Elements of the NURE program include: geochemical surveys (Hydrogeochemical and Stream Sediment Reconnaissance, HSSR), compilation of quadrangle geologic maps, geophysical surveys (Aerial Radiometric and Magnetic Survey, ARMS), quadrangle assessments for uranium resources, miscellaneous geologic investigations, and drilling projects. Data have been released by the DOE as open-file reports and maps. Although the NURE program was intended to aid in evaluation of potential uranium resources, much of the geochemical and geophysical data can be used to assess areas for other types of mineral resources and to identify regional geologic,



geochemical, and geophysical features. Most of the geochemical and geophysical data collected in New Mexico have not been interpreted because of time and budget constraints placed on the NURE program.

Plotting large amounts of geochemical data on maps virtually requires computer assistance, a costly step which many geologists may not find feasible. Therefore, at the request of the NMBMMR, Bendix Field Engineering Corporation (BFEC), the prime contractor to the Grand Junction Office of the DOE, generated computer plots showing distribution patterns of 32 to 40 elements per quadrangle in each of the 1° x 2° quadrangles covering New Mexico (Fig. 1)—a total of 1,220 geochemical reconnaissance maps that present over one million bits of data. BFEC and the DOE also provided the NMBMMR with copies of original NURE geologic maps and magnetic contour maps (Table 1).

The purpose of this pamphlet is to briefly describe the NURE data, to suggest potential uses of the data, and to indicate the availability of specific data for inspection or purchase. The NMBMMR has acquired most of the NURE data concerning New Mexico. NURE open-file reports (Tables 1, 2) are available for inspection at NMBMMR or can be purchased from the U.S. Geological Survey (see p. 10 for address). Blueline prints of the geochemical reconnaissance and sample identification-number maps (Fig. 1), geologic maps, and magnetic contour maps (Table 1) are available for purchase from NMBMMR by using the order form on p. 11.

NURE geochemical reconnaissance maps

Approximately 21,000 stream-sediment and 13,000 ground-water samples were collected in the New Mexico area for analyses of uranium and as many as 43 additional elements as part of the HSSR program. The resulting data were released in tabular form as open-file reports (Table 1) and on magnetic computer tapes. Available geochemical reconnaissance maps generated by BFEC for each quadrangle in New Mexico are shown in Fig. 1; data for the El Paso quadrangle were not plotted on maps.

The objective of the HSSR program was to define uranium provinces (at a scale of 1:250,000) by collecting and analyzing samples of various types of sediments and waters; additional elements were used as pathfinders. The program was intended to outline general regions favorable for uranium mineralization; it was *not* designed to delineate specific orebodies. Sampling and analytical procedures were optimized for uranium analyses and for rapid, inexpensive determination of pathfinder elements. With the exception of uranium, analytical precision was sacrificed in favor of analytical speed. "Anomalies" (unusual patterns) are difficult to interpret unambiguously. An unusually high concentration of an element surrounded by samples with normal concentration can be interpreted many ways without other, more constraining, data.

Each geochemical reconnaissance map presents the following information: quadrangle name, element or other parameter plotted (e.g., pH, conductivity), sample medium (stream sediment or ground water), analytical laboratory (Oak Ridge or Los Alamos), a 1:250,000-scale map with distinctive symbols (maximum of 15) that indicate the incremental concentration of the element at each sample location, a chart of concentration increments and equivalent symbols, a graph of

TABLE 1—NURE QUADRANGLE REPORTS AVAILABLE AT NMBMMR. See Table 2 for supplemental reports. **a**—for inspection only at NMBMMR, **b**—blueline prints can be purchased from NMBMMR, **c**—NMBMMR Bulletin 98 and Geologic Map 53 can be purchased from NMBMMR.

Quadrangle	HSSR open-file reports[a]	HSSR pilot studies and detailed reports[a]	Geologic maps[b]	ARMS open-file reports[a]	Magnetic contour maps[b]	1° x 2° quadrangle evaluation reports[a]	Drilling project reports[a]
Albuquerque	GJBX-145(79)	GJBX-21(77), 351(81)	USGS OF-78-467	GJBX-116(79)	GJM-401(83)	PGJ/F-016(82)	GJBX-101(79), 98(80), 215(80), 312(81)
Aztec	GJBX-129(78), 321(81)	——	NURE	GJBX-65(80)	GJM-400(83)	PGJ/F-012(82)	GJBX-101(79), 98(80), 215(80), 312(81)
Brownfield	GJBX-60(76), 93(77), 103(78), 319(81)	——	Geologic atlas of Texas map series[a]	GJBX-33(76)	GJM-371(83)	——	——
Carlsbad	GJBX-415(81)	——	NURE	GJBX-412(81)	GJM-394(83)	——	——
Clifton	GJBX-69(78), 359(81)	——	NURE	GJBX-23(79)	GJM-411(83)	PGJ/F-116(82)	——
Clovis	GJBX-184(82)	——	Geologic atlas of Texas map series[a]	GJBX-33(76)	GJM-370(83)	——	——
Dalhart	GJBX-207(80)	——	NURE, Geologic atlas of Texas map series[a]	GJBX-46(80)	GJM-368(83)	PGJ-081(82)	——
Douglas	GJBX-69(78), 244(81)	——	NURE	GJBX-23(79)	GJM-413(83)	PGJ/F-118(82)	——
El Paso	GJBX-125(82)	——	NURE, Geologic atlas of Texas map series[a]	GJBX-412(81)	GJM-405(83)	——	——
Fort Sumner	GJBX-395(81)	GJBX-21(77)	NMBMMR Bull. 98[c]	GJBX-412(81)	GJM-392(83)	——	——
Gallup	GJBX-186(80)	GJBX-351(81)	USGS I-981[a]	GJBX-116(79)	GJM-409(83)	PGJ/F-013(82)	——
Hobbs	GJBX-103(78), 288(81)	——	Geologic atlas of Texas map series[a]	GJBX-228(80)	GJM-372(83)	——	——
Las Cruces	GJBX-416(81)	——	NURE, NMBMMR GM-53[c]	GJBX-412(81)	GJM-404(83)	——	——
Raton	GJBX-138(78), 358(81)	——	NURE	GJBX-9(80)	GJM-390(83)	GJQ-005(80)	——
Roswell	GJBX-397(81)	——	NURE	GJBX-412(81)	GJM-393(83)	——	——
Saint Johns	GJBX-69(78), 191(80)	GJBX-23(81)	NURE	GJBX-126(79)	GJM-410(83)	PGJ-011(82)	——
Santa Fe	GJBX-197(80)	GJBX-21(77)	NURE	GJBX-9(80)	GJM-391(83)	PGJ/F-021(82)	——
Shiprock	GJBX-143(80)	——	USGS I-345[a]	GJBX-116(79)	GJM-408(83)	PGJ/F-024(82)	——
Silver City	GJBX-69(78), 320(81)	——	NURE	GJBX-23(79)	GJM-412(83)	PGJ/F-131(82)	——
Socorro	GJBX-12(81)	GJBX-21(77), 23(81)	USGS OF-78-607	GJBX-163(79)	GJM-402(83)	PGJ/F-068(82)	——
Tucumcari	GJBX-183(81)	——	NURE, Geologic atlas of Texas map series[a]	GJBX-33(76)	GJM-369(83)	——	——
Tularosa	GJBX-104(78), 326(81)	GJBX-215(81)	NURE	GJBX-67(79)	GJM-403(83)	GJQ-014(82)	——

cumulative probability and standard deviation from the median, a histogram, and a statistical summary (median, mean, standard deviation, maximum, minimum, number of samples). Serious users of these geochemical maps who want to follow up on apparent anomalies should examine the appropriate open-file report for complete analyses of pertinent samples (identified by cross reference with sample identification-number maps). The sample identification-number maps are included in the open-file report, or blueline copies are available for purchase from NMBMMR (see p. 10 for ordering information).

Increment schemes specified by NMBMMR for the geochemical maps are intended, as much as possible, to allow maximum resolution of geologically significant geochemical patterns and to permit recognition of both obvious and subtle geochemical anomalies that may indicate favorable areas for mineral exploration. When *all* the geochemical data are collectively interpreted and integrated with available geologic and geophysical data, the NURE geochemical maps can be an important tool in mineral exploration or for mineral-resource assessments. These geochemical maps can also provide new insights in regional geologic, stratigraphic, hydrologic, and environmental studies.

In addition to identifying areas favorable for uranium mineralization, NURE geochemical reconnaissance maps can be useful in detecting areas favorable for copper, lead, zinc, nickel, cobalt, chromium, vanadium, manganese, iron, and possibly silver mineralization; molybdenum distribution in southern New Mexico can be examined. These maps may aid in delineating areas favorable for non-metallic resources such as zeolites, clay minerals, high-calcium limestone, and barite. Unfortunately, NURE sampling and analytical methods were such that gold, tin, and tungsten maps are of relatively little value. *Guidelines for using NURE geochemical reconnaissance maps of New Mexico* (NMBMMR Open-file Report 218) will provide additional information on the reliability and application of these maps.

The NMBMMR has used NURE geochemical reconnaissance maps in assessing regional mineral-resource potential (NMBMMR Open-file Reports 179, 192, and 211). Interpretation of the NURE geochemical data may provide clues to regional geochemical patterns related to specific geological environments. Most geochemical patterns reflect regional lithologic trends. The HSSR data provide an estimate of the regional background levels of some toxic elements (Pb, Be, Se, As, etc.) that may be of value in environmental studies. In addition, the HSSR data may have applications to geologic-site characterization studies such as proposed nuclear-waste depository sites. Additional uses of the geochemical data may be realized as scientists begin to interpret and evaluate the data.

NURE geologic maps

Geologic reconnaissance maps of 1° x 2° quadrangles (scale 1:250,000) were compiled from available published and unpublished geologic maps as part of the NURE program unless a geologic map of a particular 1° x 2° quadrangle was published or open-filed by another federal or state agency. Available NURE geologic maps for 1° x 2° quadrangles in New Mexico are indicated by the acronym

NURE in Table 1. If a NURE map does not exist for a particular quadrangle, an appropriate reference is given. NMBMMR Bulletin 98 is *Geology of the Fort Sumner sheet* by V. C. Kelley; NMBMMR Geologic Map 53 is *Geology of northwest part of Las Cruces 1° x 2° sheet* by W. R. Seager, R. E. Clemons, J. W. Hawley, and R. E. Kelley. Ordering information is given on p. 10.

NURE magnetic contour maps

Residual-intensity magnetic-anomaly contour maps for 1° x 2° quadrangles (scale 1:250,000) in New Mexico were compiled from data collected as part of the ARMS program. Radiometric data and individual flight-line magnetic profiles are included in the ARMS open-file reports (Table 1). The magnetic contour maps were processed by BFEC at a contour interval of 20 gammas from data collected at approximately 400 ft above the ground and at flight-line spacing of 3 or 6 mi. Instrumentation used had a sensitivity of ¼ gamma and estimated accuracies of ± 5 gammas in flat-gradient areas and ± 10 gammas in steep-gradient areas.

The main purpose of the ARMS program was to collect radiometric and magnetic reconnaissance data as quickly as practical. The radiometric data were most important to the ARMS program; therefore, the surveys were conducted at optimum flight-line spacing, altitude, and other conditions for such data. Collection of the magnetic data was of secondary importance and was compiled over several years by as many as five contractors with different detectors. Although variations in instruments and correction factors have led to numerous small offsets of magnetic contours at quadrangle boundaries, regional magnetic trends and patterns are generally continuous across the boundaries.

A more comprehensive, and in some areas more detailed, aeromagnetic contour map of New Mexico at 1:500,000 scale has been published by the New Mexico Energy Research and Development Institute (NMERDI) as part of *Geothermal Resources Map of New Mexico*. The aeromagnetic data is plotted on one of three overlays; the other two overlays contain Bouguer gravity and hydrology–geochemistry data. The complete set, base map and overlays, is available from NMBMMR for $30.00. The aeromagnetic map is a compilation of over 30 detailed aeromagnetic surveys flown or contracted by the U.S. Geological Survey (USGS) since 1947. NURE magnetic data were used to supplement the data in areas not covered by the USGS surveys.

NURE subsurface data

The NMBMMR Library of Subsurface Data has on file and available for inspection geophysical logs (1 inch = 20 ft and 1 inch = 500 ft; density, neutron, and spontaneous potential), lithologic logs, cuttings, and core from several holes drilled in the Chaco Canyon area of the San Juan Basin. These holes were drilled to approximately 4500-ft depth for the NURE program. DOE Open-file Report GJBX–101(79) is the engineering report concerning these drill holes; the geology and geochemistry are described in DOE Open-file Reports GJBX–98(80), 215(80), and 312(81).

Additional NURE data

Topical NURE open-file reports for 1° x 2° quadrangles evaluated in New Mexico are listed in Table 1 and are available for inspection at NMBMMR. Supplemental NURE reports on other areas in New Mexico are listed in Table 2; citations of these and other NURE reports can be obtained from NMBMMR bibliographies, DOE Preliminary Map 35 (index map of open-file reports), and DOE bibliographic index GJBX–127(81).

TABLE 2—SUPPLEMENTAL NURE REPORTS. These reports are available for inspection at NMBMMR or for purchase from USGS and, where noted, from NMBMMR.

Title of report	NURE report number
Uranium deposits of the Grants, New Mexico, mineral belt, pt. I, by D. G. Brookins	GJBX–16(76)
Uranium deposits of the Grants, New Mexico, mineral belt, pt. II, by D. G. Brookins	GJBX–141(79)
Geology and recognition criteria for uraniferous humate deposits, Grants uranium region, New Mexico—final report, by S. S. Adams and A. E. Saucier	GJBX–2(81)
Multidisciplinary studies of a uranium deposit in the San Juan Basin, New Mexico, by D. Sayala and D. L. Ward	GJBX–2(83)
A study of the Morrison Formation in the San Juan Basin, New Mexico and Colorado, by R. S. Sears, D. K. Marjaniemi, and J. T. Bloomquist, 1974	GJO–912–20
Measured sections and analyses of uranium host rocks of the Dockum Group, New Mexico and Texas, by R. E. Dickson, D. P. Drake, and T. J. Reese	GJBX–9(77)
Preliminary study of the uranium potential of Tertiary rocks in the central San Juan Basin, New Mexico, by H. P. Vizcaino and A. J. O'Neill	GJBX–78(77)
Preliminary study of favorability for uranium of the Sangre de Cristo Formation in the Las Vegas Basin, northeastern New Mexico, by R. T. May, J. R. Strand, B. E. Reid, and W. R. Phillips	GJBX–82(77)
Preliminary study of the favorability for uranium in the Madera Limestone, and Cutler and Chinle Formations of the Sierra Nacimiento–Jemez Mountains area, New Mexico, by H. P. Vizcaino, A. J. O'Neill, and F. E. Dotterrer	GJBX–4(78)
Preliminary study of the uranium favorability of the Journada del Muerto Basin and adjacent areas, south-central New Mexico, by C. J. Templain and F. E. Dotterrer	GJBX–80(78)
Uranium- and thorium-bearing pegmatites in the United States, by J. W. Adams, J. T. Arengi, and I. S. Parrish	GJBX–166(80)
Uranium potential of southwestern New Mexico (southern Hidalgo County), including observations on crystallization history of lavas and ash tuffs and the release of uranium from them—final report, by A. W. Walton, T. L. Salter, and D. Zetterlund	GJBX–169(80)
Geology and recognition criteria for sandstone uranium deposits of the Salt Wash type, Colorado Plateau Province, by J. K. Thamm, A. A. Kovschak, Jr., and S. S. Adams	GJBX–6(81)
Radioactive occurrences in veins and igneous and metamorphic rocks of New Mexico with annotated bibliography, by V. T. McLemore	GJBX–100(82) (also NMBMMR OF–155)
Uranium and thorium occurrences in New Mexico—distribution, geology, production, and resources, with selected bibliography, by V. T. McLemore	GJBX–11(83) (also NMBMMR OF–183)
An investigation of sedimentary, mineralogical, chemical and color patterns and associations in the Rio de Oro mine, McKinley County, New Mexico, by S. R. Austin	GJBX–30(83)
Trend orebodies of the Section 27 mine, Ambrosia Lake uranium district, New Mexico, by E. W. Kendall, 1972	GJO–936–2
Reports on investigations of uranium anomalies (Mt. Withington cauldron, Socorro County), by C. S. Goodknight and J. A. Burger	GJBX–222(82)
Reports on field investigations of uranium anomalies (Costilla massif, Taos County, and Tusas Mountains, Rio Arriba County), by C. S. Goodknight	GJBX–1(84)

ORDERING INFORMATION

Blueline prints of NURE geochemical reconnaissance maps, sample identification-number maps, geologic maps, and magnetic contour maps (scale 1:250,000) can be ordered from the NMBMMR by using the following order form. Please be sure to distinguish the quadrangle, element(s), and sample medium (stream sediment or ground water) for each map you want to purchase (see Fig. 1).

TYPE OF MAP	PRICE PER MAP
NURE geochemical reconnaissance map	$3.00
NURE sample identification-number map	$3.00
NURE geologic map (uncolored)	$2.25
NURE magnetic contour maps	$2.25
Geothermal Resources Map of New Mexico (NMERDI) (Postage is included in the price of this publication.)	$30.00/set
NMBMMR Bulletin 98 (Fort Sumner)	$3.00
NMBMMR Geologic Map 53 (Las Cruces, NW)	$10.00

Orders are postpaid and tax exempt. Postage and handling fees for orders:

less than $5.00—no charge
$5.00-$25.00—$1.50
each additional $25.00—add $1.50

A $5.00 service charge is required on all international orders, plus postage and handling.

NURE open-file reports (Tables 1, 2) are available for inspection at NMBMMR or can be purchased from U.S. Geological Survey, Open-file Services Section, Building 41, MS 306, Box 25046, Federal Center, Denver, Colorado 80225; telephone (303) 236-7476.

Magnetic tapes containing the ARMS and HSSR data can be purchased from U.S. Geological Survey, EROS Data Center, User Services, Sioux Falls, South Dakota 57198; telephone (605) 594-6142.

The geologic atlas of Texas maps, in color, are available for inspection at NMBMMR or can be purchased from Texas Bureau of Economic Geology, University of Texas, University Station, Box X, Austin, Texas 78712.

NURE-DATA ORDER FORM

To: Publications Room 107
New Mexico Bureau of Mines and Mineral Resources
Socorro, New Mexico 87801

NURE geochemical reconnaissance maps (Fig. 1)

Quadrangle	Sample medium (stream sediment) or ground water)	Elements	# of maps

subtotal _____ × $3.00 _____

NURE sample identification-number maps (Fig. 1)

Quadrangle	Sample medium (stream sediment) or ground water)	# of maps

subtotal _____ × $3.00 _____

NURE geologic maps (Table 1)

Quadrangle	Quantity	Price

NURE magnetic contour maps (Table 1)

Quadrangle	Map number	Quantity	Price

Other publications (Tables 1 and 2)

	Quantity	Price
Geothermal Resources Map of New Mexico (NMERDI)		
NMBMMR Bulletin 98		
NMBMMR Geologic Map 53		

Ship to: _____

_____

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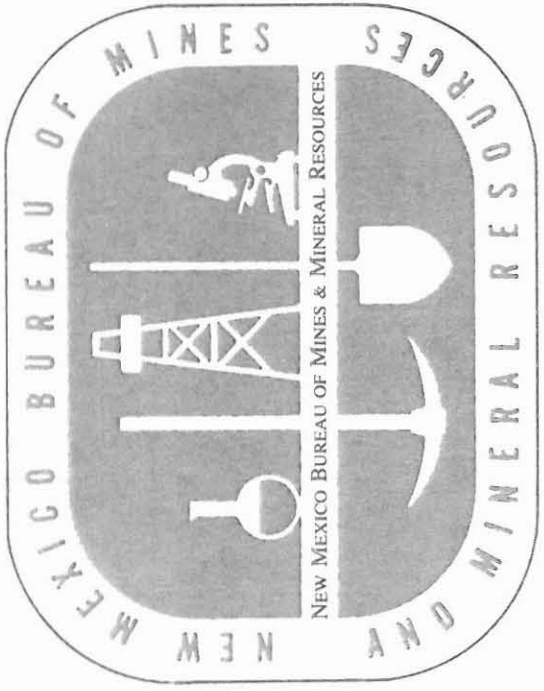
_____

Postage & handling _____

Total _____

Make checks payable to
New Mexico Bureau of Mines

Signature: _____ Date: _____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