

TENTH ANNUAL REPORT

NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

Fiscal Year July 1, 1973 - June 30, 1974

Issued under provisions of the
Water Resources Research Act of 1964 - P.L. 379-88

J. W. Clark, Director

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Water Resources Research Institute
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TENTH ANNUAL REPORT
NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE
JULY 1973 - JUNE 30, 1974

DIRECTOR'S REPORT
by
John W. Clark

Perhaps the greatest challenge facing New Mexico in the next decade is to provide an acceptable balance of economic and social well-being within a quality environment. We can only achieve this goal through adequate comprehensive planning. Such planning assumes a fundamental knowledge of the natural, physical and social sciences necessary to the political decision making process.

While science and technology are enlarging the range of possible alternatives in water management, momentous changes in society are creating new demands. The seriousness of this problem is noted by a recent study of the General Accounting Office which found that in every river basin studied the quality of water has deteriorated in recent years. This situation is symptomatic of the fact that we have not achieved a sufficient understanding of the basic dimensions of the problem. Much has been accomplished, much more research is necessary.

Water is the most limiting resource in New Mexico and the water that we have is the State's greatest asset. Surface and subsurface water is used to supply growing municipal and industrial demands and to irrigate the land. According to the Senate Select Committee Report of 1961 and the Water Resources Council Report of 1968, a major part of the State is facing the most critical shortage of water in relation to projected demands of any other area of the Nation.

Because New Mexico is primarily a semi-arid region, those few perennial streams within the State have considerably more influence upon the lives and livelihood of the region's inhabitants than any other element of the physical environment. Therefore, any alteration, modification, or subtle change of this resource must be carefully evaluated.

Although a large amount of ground water underlies the State, much of it is either of poor quality or too expensive to develop at present. In the areas where the ground water is of satisfactory quality and can be economically obtained, development and use is underway. The demands on the supply exceeds recharge in many areas and ground water levels are receding.

The most pressing need for a significant portion of the State's population is for improved incomes and economic security. Chronic under-employment is endemic in parts of New Mexico. These factors, coupled with the growth orientation on the part of business and financial institutions, give rise to strong pressures for new industry and employment with minimal consideration for environmental amenities.

The environment versus economic-growth controversy in this region is more explosive in some ways than in other parts of the United States, for almost diametrically opposed in outlook to those looking for improved incomes is a class of people, including a substantial number of professionals and retirees, for whom this region is the last outpost of clear skies and open space; these people are ecologically aware, economically secure, and increasingly organized and vocal. Rural-oriented farming interests use similar ecology and social arguments against the shift from irrigated agriculture to residential use of valley lands.

Within this setting it is important that a plan be developed to determine how New Mexico's water supply needs might be met. This is the objective of the State Water Plan investigations which are currently underway by the Bureau of Reclamation and the New Mexico Interstate Stream Commission in cooperation with other Federal and State agencies. The main thrust of the New Mexico Water Resources Research Institute over the next five years is to contribute research information in support of this plan.

A principal project for this past year A-045-NMEX "Analysis of Alternative Water Use Futures for the Rio Grande Region in New Mexico" is in the final stages of analysis. This project involves a socio-economic model, developed to represent the New Mexico economy, with special emphasis on the Rio Grande region.

One of the key elements of this study is the use of a technical advisory committee composed of representatives from local, state, and federal agencies. As data becomes available it is passed to members of the technical advisory committee. Much of the information developed on the project is used before publication.

Another principal project, B-015-NMEX "Irrigability Classification of New Mexico Lands as a Guide for Water Importation" was completed May, 1974. This project answered the question, how much water could New Mexico use for irrigation if it were available. A separate report was developed for each of the state's 32 counties classifying the lands. Results of this work are being used directly by the U.S. Bureau of Reclamation in the State Water Plan. In addition the Bureau of Land Management, State Land Office, State Highway Department, Environmental Improvement Agency, Planners, and many others have requested and are regularly using the information contained in these reports.

The Institute Director has exerted a considerable effort in support of the Rio Grande Region Environmental Project (RGREP). This study is to provide the basic data and information on which to base a regional management plan that will include appropriate implementation procedures. The region under consideration is the lands along both sides of the 285 river-miles of the Rio Grande from Elephant Butte Reservoir, New Mexico, where the surface water supply for the region is stored, downstream to Fort Quitman, Texas, where the last of this water is used. The river forms the boundary between the United States of America and Mexico for 81 miles in the proposed project area and includes lands in two American states and one in Mexico. The problem is not merely one of drafting an apparently workable management plan, but is the considerably more difficult problem of developing the background information and theory on which the plan is to be based.

The New Mexico Water Resources Research Institute hosted several water related meetings involving state and federal agencies and other organizations, and participated in public meetings and hearings.

BACKGROUND OF THE INSTITUTE

The New Mexico State University Water Resources Research Institute was officially organized and approved by the New Mexico State University Board of Regents in February 1963. The Institute Office was opened on March 15, 1965 in the Agriculture Building on New Mexico State University campus.

The Water Resources Research Act, P.L. 88-379, approved by the President July 17, 1964, became effective for the first 14 institutes with \$75,000 allotted to each for FY-1965 effective as of February 1, 1965. The allotment to each of the 51 state institutes, or centers, for FY-1966 was \$87,500 and a similar amount to each institute for FY-1967. The FY-1968 allotment to each state was \$100,000.

New Mexico State University application for designation as the Institute University was among the first applications sent to Washington, D. C. for approval, being filed September 18, 1964 and resubmitted November 25, 1964. Included in the application was a letter dated September 3, 1964 from the Governor to the Secretary of the Interior, designating New Mexico State University as the location for the New Mexico Water Resources Research Institute.

New Mexico Water Resources Research Institute was the first institute to be officially designated among the 14 institutes authorized as of February 1, 1965 to operate under provisions of Section 100 of the Act. The remaining 37 state institutes were approved for funding May 1, 1965.

The Institute is essentially a planning and coordinating activity for research and graduate training in the area of water resources representing all of the universities and colleges in the State of New Mexico. The objectives of the Institute may be stated as follows:

- (a) To plan and coordinate the water resources research and training activities involving faculty and facilities of the various colleges and universities in the state.
- (b) To arrange and conduct water resources research appropriate to the role and scope of the state's college universities for the benefit of the state and the nation including those sponsored by
 - (1) The Office of Water Resources Research
 - (2) Other Federal agencies
 - (3) State agencies
 - (4) Quasi-public organizations
 - (5) Industry

- (c) To arrange for seminars and conferences involving persons having interest and responsibilities in water problems of the state.
- (d) To provide for publication and dissemination of the results of research conducted by the Institute and other information which bears upon the water resources of the state.

PROGRAM DEVELOPMENT AND REVIEW BOARD

This board originally was designated as the Executive Board. However, the new title, adopted in January 1967 more accurately describes its function. It recommends areas for research concentration, reviews and recommends the relative importance and quality of research proposals, reviews the technical procedures suggested, and recommends means by which certain phases of one project may be coordinated with work being done in other projects in the state. The Board also recommends the projects which qualify on a technical basis, and recommends the priority for project funding each year.

- | | |
|-------------------------|--|
| Dr. Gary Hufbauer | - Economist, College of Arts and Sciences,
University of New Mexico |
| Dr. Gerardo W. Gross | - Geophysist
New Mexico Institute of Mining and Technology |
| Dr. A. A. Baltensperger | - Agronomist
New Mexico State University |
| Dr. Fred Downs | - Economist
New Mexico State University |
| Prof. Albert Utton | - Professor of Law
University of New Mexico |
| (To be filled) | - New Mexico Institute of Mining and Technology |
| Prof. J. W. Clark | - Civil Engineer, Chairman and Director of
Institute, NMSU - Ex-officio |

The Board held two meetings during 1973-74 to consider research proposals and to discuss the total water resources research program. Also discussed were Operation and Publication objectives and procedures.

The procedure followed by the Board in reviewing project proposals is as follows:

1. All proposals are called and received by the Director's Office and copies are distributed to each member of the Review Board well in advance of scheduled meetings.
2. Each Principal Investigator is invited to appear before the Board to make a 10 minute statement on his proposal, with questions from the Board following his presentation. Usually one of these meetings is held at the University of New Mexico in Albuquerque, or New Mexico Institute of Mining and Technology, and the other at New Mexico State University, Las Cruces.
3. Following the hearings on all of the project extensions from the current year plus those proposed for the next fiscal year, the Board uses a rating process to select the order in which all worthy projects may be funded. Some projects usually receive outright rejections by the Board due to lack of water orientation or due to poor preparation and presentation.
4. From the group of projects recommended by the Board, the Director works up a schedule of funding which will fit within the money available. This procedure results in some quite acceptable projects not being accepted, due to lack of funds. Often there is considerable consultation between the Director and the Investigators and the Board members during the process of fitting projects into the limited budget.

INTERUNIVERSITY MEMORANDUM OF AGREEMENT

A memorandum of Agreement between the University of New Mexico, New Mexico Institute of Mining and Technology and New Mexico State University Water Resources Research Institute was entered into on the 8th day of July, 1966. The agreement forms a definite basis for accounting for the Federal and matching funds on the projects at the two institutions which have projects operating through the Water Resources Research Institute. The Agreement includes a copy of (1) Public Law 88-379, (2) Public Law 89-404 which Acts together established and funded the Water Resources Research Program, (3) Rules and Regulations pursuant to the Water Resources Research Act of 1964, (P.L. 88-379), (4) Policy Statement issued by the Office of Water Resources Research, and (5) a statement regarding Acknowledgement on Publications for use of Water Resources Research Act funds. A complete copy of the Agreement, including the several documents listed above, as signed by Presidents of each of the three universities involved was supplied to the Comptroller's Offices and the Office of Water Resources Research, and copies of the Agreement were made available to others as required in the project operations.

A supplement to the July 6, 1966 Agreement was signed effective July 1970 to provide for the administration and allocation of the State appropriations made by the 1970, 1971 and future Sessions of the New Mexico Legislature.

COOPERATION

Cooperation between Universities, State and Federal agencies, and others interested in water has been excellent. The use of a Technical Advisory Committee on a project by project basis has proved to be an effective mechanism for optimizing cooperation. The following Technical Advisory Committee on project A-045-NMEX has met on several occasions jointly with the three University study group:

Technical Advisory Committee - A-045-NMEX

Mr. Robert F. Stephens	U.S. Bureau of Sport Fisheries and Wildlife
Mr. William E. Hale	U.S. Geological Survey
Mr. T. A. Garrity	U.S. Bureau of Indian Affairs
Mr. W. J. Anderson	U.S. Bureau of Land Management
Mr. James Kirby	U.S. Bureau of Reclamation
Mr. Rowland Fife	U.S. Bureau of Reclamation
Mr. Wayne Cunningham	Elephant Butte Irrigation District
Mr. Ralph Bell	U.S. Soil Conservation Service
Mr. Phil Mutz	New Mexico Interstate Stream Commission
Mr. Pete Metzner	Middle Rio Grande Council of Governments
Mr. Charles F. Youberg	Middle Rio Grande Council of Governments
Mr. Larry Bronaugh	U.S. Bureau of Indian Affairs
Mr. Mike Martinez	U.S. Bureau of Land Management
Mr. Edwin A. Lewis	U.S. Bureau of Reclamation
Mr. Robert Schembera	U.S. Bureau of Reclamation
Mr. Fred Allen	New Mexico State Engineer Office
Mr. Earl Sorensen	New Mexico State Engineer Office
Mr. Ed Gray	U.S. Soil Conservation Service
Mr. Clyde Wilson	U.S. Geological Survey

ANNUAL NEW MEXICO WATER CONFERENCE

The first Annual New Mexico Water Conference was held in 1956. Since then eighteen conferences have been held. The nineteenth was scheduled for April 4-5, 1974. This meeting was postponed due to the energy crisis. It was felt it would be irresponsible from a conservation standpoint to hold the meeting during the critical energy use period. A set of papers carrying out the proposed conference theme "Water in Food and Fiber Production" is being distributed to all persons who attended the 1973 Water Conference.

The Advisory Committee

S. E. Reynolds
N.M. State Engineer

Boyce C. Williams
Agronomy-Soils, NMSU

W. P. Stephens, Director
Department of Agriculture, NMSU

Ms. Mally Ribe
N.M. League of Women Voters

Warren Weber, Area Engineer
U.S. Bureau of Reclamation

Lloyd A. Calhoun
N.M. Electric Service Company

Jesse V. Lunsford
Civil Engineering, NMSU

Wm. D. Hurst, Regional Forester
Forest Service, USDA

Eldon G. Hanson, Head
Agricultural Engineering, NMSU

Dr. Carl F. Tarlowski
N.M. Regional Health Director

Gary L. Cunningham
Biology Department, NMSU

Raw Cauwet
Information Services, NMSU

Ralph Charles
Middle Rio Grande Flood Control

Hoyt Pattison
N.M. Representative, Curry County

Wayne P. Cunningham
Elephant Butte Irrigation Dist.

Willis H. Ellis
Professor of Law, UNM

L. P. Reinig, Head, Engineering Dept.
Los Alamos Scientific Laboratories

Willis H. Ellis
Professor of Law, UNM

Rogers Aston
South Spring Foundation

James Kirby
Extension Economist

Col. James L. Sutton
Corps of Engineers - U.S. Army

Charles M. Hohn
Extension Engineer, NMSU

Carrol Hunton
N.M. Farmers Home Administration

Gene O. Ott, Management Specialist
Extension Service, NMSU

Wm. E. Hale, District Chief
U.S. Geological Survey

Peter Hanagan, Executive Director
N.M. Oil and Gas Association

George R. Dawson, Head
Agricultural Economics NMSU

H. E. Gary
Farmer, Rincon, N.M.

T. G. Gebhard, Jr.
Director of Utilities

John W. Clark, Director
Water Resources Research Institute

The Annual Water Conference serves a public service by bringing together 200 to 300 leaders each year to discuss water resources which are important to New Mexico and the Nation.

The water conferences are contributing materially to the growth and development of the Water Resources Research Institute and the Institute can greatly assist the water conference. Both are needed in the overall water research and development program in the State of New Mexico.

The annual conference is planned and conducted by an interdisciplinary New Mexico State University Committee with the assistance of a statewide committee of 25 members serving as a Water Conference Advisory Committee. Much credit for the success of the conference goes to dedicated members of these two committees.

STATE'S CONTRIBUTION

Stucky Hall, a building to house the New Mexico Water Resources Research Institute, was completed in 1970. This building was built entirely with state bond money and is located on the New Mexico State University campus. The New Mexico Legislatures have appropriated the following amounts to the Institute for research support:

1970 -	\$104,000
1971 -	\$108,000
1972 -	\$113,000
1973 -	\$118,000
1974 -	\$126,000

These funds are being used for matching funds and for state supported projects.

REGIONAL COOPERATION

The Institute is involved in two regional analysis of priority water resource problems: (1) Consortium of Water Institutes and Centers, Colorado River - Great Basin, including the states of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming, and (2) Southern Plains River Basin Region, Colorado, Arkansas, New Mexico, Louisiana, Oklahoma, Kansas, and Texas.

A regional project "Regional Water Management with Full Consumptive Use" is being conducted in cooperation with Texas A & M University through the Annual Allotment program.

Mr. Willard C. Lewis, Special Assistant to the Secretary, Southwest Region, U.S. Department of the Interior, visited our Institute and discussed opportunities for consultation and collaboration with Interior field agencies.

EXAMPLES OF RESEARCH FINDINGS AND THEIR APPLICATION TO WATER RESOURCE PROBLEMS

A-045-NMEX - Analysis of Alternative Water Use Futures for the Rio Grande Region in New Mexico.

This project was designed to test the effects of transfers of water, land, and recreation on the economy of the several segments of the 400 mile long Rio Grande Valley from Colorado to Texas through New Mexico.

A key element of this study has been the use of a technical advisory committee composed of representatives from local, state, and federal agencies. As data has become available it has been passed on to members of the technical advisory committee. Through the advisory committee some preliminary results have been used as inputs into the New Mexico State Water Plan; the "Upper Rio Grande Basin Water and Related Land Resources" by the U. S. Department of Agriculture River Basin Planning Group in Albuquerque; the Middle Rio Grande Council of Governments in their inventory of resources; U. S. Geological Survey, in the ground water investigation of the Mesilla Valley; Bureau of Reclamation in constructing enterprise budgets for the Upper Rio Grande Basin in connection with the San Juan-Chama Diversion.

Los Alamos Laboratories is using two of the technical completion reports already published, WRRR Reports No. 21 and 22, to gain agricultural base line data for a preliminary impact statement.

A-048-NMEX - Calcium Carbonate Equilibria in Soils and Irrigation Water.

Irrigation water degradation is of the utmost interest to water and soil scientists throughout the world yet meaningful and accurate equations to describe the equilibria of one of the most important solid phases controlling water quality, calcium carbonate, are lacking. The objectives of this study were to develop a model capable of describing carbonate equilibria in aqueous systems open to the air, and to test the model against data for aqueous and soil-water systems.

A chemical model was developed that adequately described calcite equilibria over a range of ionic environments. The model includes equations to account for activity coefficient and ion-pair effects, and was verified utilizing data from the literature for aqueous systems open to the air.

Although the project was essentially a theoretical study of calcite equilibria in aqueous systems, the results have application to sanitary engineers, soil scientists, and geologists. Parts of the model developed in the study have already been used to explain the limiting value of hardness removal in water treatment procedures which up to now had been unexplainable. The model may also be used in computer simulation of solute movement studies through calcareous soils. Workers at the U. S. Salinity Laboratory have used certain portions of the model in a computer simulation of salt movement in soils. More work with these personnel to modify the model for use in soil systems is anticipated.

B-032-NMEX - Analysis of Water Characteristics of Manufacturing Industries and Their Adaptability to Semi-Arid Regions.

Historically the arid and semi-arid areas of the Southwest have exhibited almost a complete dearth of manufacturing processes. Such areas must give more careful and considered thought to the water related impact of an industry than has generally been the case. Three significant categories into which an industrial water-using firm's impact can be classified are: 1) the polluting effect of its effluent, 2) its withdrawal demand for new water, and 3) its consumptive use of water. For informed planning more information is required concerning the present operating characteristics of major water-using industries in these categories and their technological ability to adapt to the economic and environmental conditions in the Southwest.

The industries chosen for study in this project were petroleum refining and coal gasification. Selection criteria were a probability of the industry locating in New Mexico due to natural resources or close proximity to markets, a large diversity in water use patterns and process substitution possibilities, and the type of aqueous effluents and the potential for recovery of useable water.

Interest in a study of this nature has been expressed by state officials involved in determining the impact of industry upon the economy and environment of New Mexico. The results of this work should permit a ranking of other industries from a water-use viewpoint through the application of the concepts presented and allow comparative evaluations to be made. It is expected that this report will serve as a model for groups in determining the types of water using industry to attempt to bring into semi-arid regions, New Mexico in particular.

ANNUAL REPORT -- TITLE I PROJECT

OWRR Project No. A-040-NMEX
 NMSU Project No. 3109-51
 Agreement No. 14-31-0001- 3831
 FGST-COWRR Research Category: _____

Analysis of Nutrient Supplies for Algae in Elephant Butte Reservoir and an Analysis of Mercurials in the Elephant Butte Ecosystem

Name and Location of University Where Project is Being Carried Out:

University of New Mexico - Albuquerque

Proj. Began--Month: July ; Year: 1972 | To Be Completed--Month: June ; Year: 1973
 -----Extended through December 1973

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
John D. Garcia	Ph.D.	Biology
David E. Kidd	Ph.D.	Biology
Gordon V. Johnson	Ph.D.	Biology

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Susan R. Mazarr		Senior biology major

A. Research Project Accomplishments

Nitrate nitrogen, total dissolved phosphate and ortho phosphate were determined on membrane filtered water samples collected monthly from July, 1972 through July, 1973 at a station near the dam and at stations representing the upper end of the Reservoir. Nitrate nitrogen ranged from 0.23-0.94 mg N/liter for both sampling stations. Total dissolved phosphate ranged from 0.058-1.4 mg P/liter near the dam and from 0.07-2.0 mg P/liter at the upper Reservoir stations. Separation of the total dissolved phosphates into ortho, organic and condensed forms at several times during the year indicated that virtually all the phosphate was in the ortho and organic forms and negligible condensed (poly) phosphate was present. This indicates that Elephant Butte Reservoir did not contain significant amounts of undegraded phosphate compounds derived from detergents. The percentage of the total dissolved phosphate in the ortho form ranged from 0-100% with a mean of 29% near the dam and from 1.5%-84% with a mean of 23% at the upper end of the Reservoir.

B. Publications

Ph. D. Dissertation: Garcia, John D. 1973. A Study of Mercurials in the Elephant Butte Reservoir Ecosystem. University of New Mexico, Albuquerque.

Kidd, D. E., G. V. Johnson, and J. D. Garcia. 1974. An Analysis of Mercurials in the Elephant Butte Ecosystem. Water Resources Research Institute Report No. 035.

Johnson, G. V., D. E. Kidd, and J. D. Garcia. 1974. An Analysis of Nutrient Supplies for Algae in Elephant Butte Reservoir. Water Resources Research Institute Report No. 037.

C. Project Status

Project completed December 30, 1973.

D. Application of Research Results

The results of the mercury distribution study at Elephant Butte Reservoir were reported by Dr. John Garcia to the Arizona-New Mexico Division of the American Fisheries Society in Farmington, New Mexico in February, 1973. The results and recommendations of the mercury study at Elephant Butte Reservoir have been circulated by television, radio and newspapers throughout the state of New Mexico. A graduate student from the Fisheries Section, Department of Animal, Range, and Wildlife Science, New Mexico State University has requested that the reports from this study be made available to the Fisheries Section. The results of this investigation should be of value to various state agencies including the New Mexico Department of Game and Fish and the Environmental Improvement Agency as well as several Federal agencies.

OWRR Project No. <u>A-041-NMEX</u>	Water Resources Problems and Research Needs of New Mexico
NMSU Project No. <u>3109-53</u>	
Agreement No. <u>14-31-0001- 3831</u>	
FCST-COWRR Research Category: _____	

Name and Location of University Where Project is Being Carried Out:

New Mexico State University - Las Cruces

Proj. Began--Month: July ; Year: 1972 | To Be Completed--Month: June ; Year: 1973
 Extended through December 1973

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Bobby J. Creel	M.S.	Agricultural Economics

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
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A. Research Project Accomplishments

An inventory of the agencies, institutions, and organizations with water-related research interest was completed. This inventory was used not only for the project, but also by the Institute in its information dissemination activities. Key personnel of the following agencies were interviewed to determine their water research needs and problems:

- New Mexico State Forestry Department
- North Central New Mexico Economic Development District
- New Mexico Department of Development
- Bureau of Land Management
- New Mexico State Engineer Office
- New Mexico State Planning Office
- U.S. Army Corps of Engineers
- Bureau of Reclamation
- Middle Rio Grande Council of Governments
- Soil Conservation Service
- U.S. Geological Survey

Bureau of Indian Affairs
New Mexico State Land Office
New Mexico Game and Fish Department
New Mexico Municipal League

A mail questionnaire was distributed to about 75 irrigation water users associations and groups within the state. The information developed has been completed and a priority water research needs list developed.

B. Publications

Technical completion report has been submitted.

C. Project Status

Project completed June 1974.

D. Application of Research Results

All agency personnel interviewed have indicated a keen interest in the project. Cooperation has been excellent. The results will be used by the agency people in their planning and cooperative programs. The primary users will be the Institute and project investigators in developing a research program aimed at solving the priority water research problems of the state.

OWRR Project No. A-043-NMEX

NMSU Project No. 3109-54

Agreement No. 14-31-0001- 4031

FCST-COWRR Research Category:

Predicting Consumptive Use with
Climatological Data

Name and Location of University Where Project is Being Carried Out:

New Mexico University, Las Cruces, New Mexico 88003

Proj. Began--Month: July 1 ; Year: 1973 To Be Completed--Month: June 30 ; Year: 1975

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
E. G. Gregory	M.S.	Agronomy
Eldon G. Hanson	M.S.	Head, Ag. Engineering

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Donald McClanahan	M.S.	Irrigation and drainage
Michael Davalos	Undergraduate	Agricultural Engineering
Robin Coultis	"	Range Science
Steven McClanahan	B.A.	History

A. Research Project Accomplishments.

During 1973-74, five sites were established to measure consumptive use of water by crops using the soil moisture depletion method according to the procedure described in the project proposal. Two sites with alfalfa and corn were located at the San Juan Branch Experiment Station near Farmington, New Mexico, and three sites with alfalfa, onions, and cotton were located at or near the Plant Science Farm of the New Mexico Agricultural Experiment Station near Las Cruces, New Mexico.

Additional consumptive use data for onions and sweet corn, 1971 to 1973, and alfalfa, 1963 and 1964 have been computed for this report from records of other projects which used moisture depletion measurements for scheduling irrigation treatments.

The occurrence of deep drainage, which has long been a question with moisture depletion measurements, is identified and discussed. A relatively low-cost lysimeter has been developed to monitor deep drainage and to measure consumptive use. The construction and potential use of the lysimeter is described in the report.

B. Publications.

Annual Report for 1973-74 (thirty pages)

C. Project Status.

To be continued until June 30, 1975.

D. Application of Research Results.

The New Mexico State Engineer and the Bureau of Reclamation has maintained close cooperation during 1973-74. These organizations are vitally interested in having additional data available by which consumptive use and irrigation requirements may be determined.

E. Work Remaining, and Progress Contemplated During Next Year.

Continue making measurements of consumptive use of water by crops specified in the proposal. Results of the two years will be evaluated to determine adjustments that should be made with consumptive-use coefficients that are used currently to estimate water requirements of crops.

OWRR Project No. A-044-NMEX

NMSU Project No. 3109-55

Agreement No. 14-31-0001- 4031

FCST-COWRR Research Category:

Experimental Calibration and Field Test of
Thermal Probe for In-Situ Groundwater
Flow Measurements

Name and Location of University Where Project is Being Carried Out:

New Mexico Institute of Mining and Technology - Socorro

Proj. Began--Month: July ; Year: 73

To Be Completed--Month: June ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Marshall Reiter	Ph.D.	Geophysics
Alan Sanford	Ph.D.	Geophysics

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Stephen McLin	M.S.	Hydrology

A. Research Project Accomplishments.

We have completed construction on the large calibration tank as described in the proposal to WRRRI. Presently we are taking and analyzing the calibration data and attempting to perfect the experimental techniques involved with the data gathering process. Each experimental run requires about one half day, and after several runs are completed, considerable time is involved in data reduction and analysis.

B. Publications

None

C. Project Status.

Incomplete.

D. Application of Research Results.

None until calibration is completed.

E. Work Remaining, and Progress Contemplated During Next Year.

An extension has been requested in order to properly acquire and analyze the data.

OWRR Project No. A-045-NMEX
 NMSU Project No. 3109-56
 Agreement No. 14-31-0001-4031
 FCST-COWRR Research Category: _____

Analysis of Alternative Water Use Futures
 for the Rio Grande Region in New Mexico

Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces; New Mexico Inst. of Mining and Technology, Socorro;
 University of New Mexico, Albuquerque

Proj. Began--Month: July ; Year: 1973 | To Be Completed--Month: June ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Robert R. Lansford	Ph.D.	Agricultural Economics
Shaul Ben-David	Ph.D.	Economist
Thomas G. Gebhard, Jr.	Ph.D.	Civil Engineer
Lynn Gelhar	Ph.D.	Hydrologist
Bobby J. Creel	M.S.	Agricultural Economist

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
James A. Larson	B.S.	Agricultural Economics

A. Research Project Accomplishments

An interdisciplinary approach to the solution of the water resource problems of the Upper Rio Grande region in New Mexico was centered around a socio-economic model, developed to represent the New Mexico economy, with special emphasis placed upon the Rio Grande region.

Three sets of alternatives were considered: 1) growth without a water constraint; 2) growth, holding surface water constrained; 3) growth, holding both surface and ground water constrained.

Without a water constraint in the Rio Grande region, both production and depletions are expected to exhibit the largest increase (59.7 percent and 47.4 percent, respectively). With a surface water constraint, the value of production is reduced by \$18.1 million and water depletions decreased 18.1 percent by 2020. With a total water constraint, the value of production decreased \$4.1 million below that expected when using only a surface water constraint, and water depletions are reduced about 8.4 percent.

The Upper Rio Grande region is expected to follow the general trend of the total Rio Grande region but at a lower growth rate.

The Middle Rio Grande Region is expected to follow the general trend of the total Rio Grande region but at a higher growth rate.

The Socorro Region is expected to follow the general trend of the total Rio Grande region but at a lower growth rate, and Lower Rio Grande Region is expected to grow at a slightly higher growth rate than the total region.

Another analysis utilizing the low and high population growths indicates there are sufficient water resources in the Rio Grande region to carry on a viable regional economy, either with a low population projection or a high population projection, without affecting the flow of the Rio Grande, this permitting New Mexico to meet its Rio Grande Compact commitments to Texas.

The level of population growth and domestic per capita consumption of water are critical in determining use of the limited water resources of the Rio Grande in New Mexico. A gradual increase in domestic per capita water consumption schedules causes major structural shifts in the agricultural production sectors and reductions in the value of agricultural production. An educational program for the general public in the Rio Grande Region of New Mexico on conserving water may be in order to reduce or slow down the increase in domestic per capita consumption of water.

B. Publications

Lansford, R. R., et al. An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico-- Upper Rio Grande. N. M. Water Resources Research Institute Report No. 21, New Mexico State University. November 1973.

Lansford, R. R., et al. An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande in New Mexico-- Middle Rio Grande. N. M. Water Resources Research Institute Report No. 22, New Mexico State University. December 1973.

Lansford, R. R., et al. An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio Grande In New Mexico-- Socorro Region. N. S. Water Resources Research Institute Report No. 23, New Mexico State University. February 1974.

Lansford, R. R., et al. An Analytical Interdisciplinary Evaluation of the Utilization of the Water Resources of the Rio grande in New Mexico-- Lower Region. N. M. Water Resources Research Institute Report No. 24, New Mexico State University. March 1974.

C. Project Status.

The project will be continued for three to six months without additional funds to complete analysis of additional alternatives. The primary reason for the delay in completing the project on time was computer problems encountered at the University of New Mexico. The model is large and some of the alternatives so complex that the computer must be completely utilized when running these alternatives for periods of time up to four hours. It has been difficult to get the necessary time to complete these analyses on time.

D. Application of Research Results.

One of the key elements of this study was the use of a technical advisory committee composed of representatives from local, state, and federal agencies. As data became available it was passed on to members of the technical advisory committee. Through the advisory committee some preliminary results have been used as inputs into the New Mexico State Water Plan; the "Upper Rio Grande Basin Water and Related Land Resources" by the U. S. Department of Agriculture River Basin Planning Group in Albuquerque; the Middle Rio Grande Council of Governments in their inventory of resources; U. S. Geological Survey, in the ground water investigation of the Mesilla Valley; Bureau of Reclamation in constructing enterprise budgets for the Upper Rio Grande Basin in connection with the San Juan-Chama Diversion.

Los Alamos Laboratories is using WRRRI Report No. 21 and 22 to gain agricultural base line data for a preliminary impact statement.

E. Work Remaining.

The completion of analysis of additional alternative futures for the Rio Grande Region. These alternatives include: 1) alternative population growth rates; 2) alternative domestic per capita water consumption schedules; 3) inter-regional transfers of water; 4) maximum growth, and 5) combinations of the above alternatives.

An article has been submitted to the Journal of Natural Resources.

ANNUAL REPORT -- TITLE I PROJECT

OWRR Project No. A-046-NMEXNMSU Project No. 3109-57Agreement No. 14-31-0001- 4031

FCST-COWRR Research Category: _____

The Determination of Content and Origin of
Lead in Surface and Ground Waters in North-
eastern New Mexico

Name and Location of University Where Project is Being Carried Out:

New Mexico Highlands University
Las Vegas, New Mexico 87701Proj. Began--Month: July ; Year: 1973To Be Completed--Month: June ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Sigfredo Maestas	Ph.D.	Chemistry
Anthony F. Gallegos	Ph.D.	Biology

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Donald H. Vigil	B.S.	Chemistry
Marilyn Agbayani	-	Biology/Chemistry

A. Research Project Accomplishments

The major project accomplishments to date include: (1) development of suitable sampling techniques for natural waters, aquatic species, biological samples, river sediments, and soils for chemical analysis; (2) development and modification of existing techniques for the analysis of lead in waters and biological and soil samples and for the analysis of cadmium, silver, copper, zinc and other heavy metals in waters; (3) development of suitable analytical techniques for the analysis of Pb-210 (a radioisotope) in waters, biological materials and soils; (4) collection of analytical data of lead, silver, and cadmium in natural waters, soils, and biological samples in northeastern New Mexico; (5) collection of some analytical data for the lead content of air in the same geographic area; (6) collection of analytical data for the content of Pb-210 in water and other natural samples of the region; and (7) the organization of data to facilitate the determination of the origin of lead in waters in the northeast region of New Mexico and the Pecos Wilderness.

The sampling experiments indicate a seasonal variation in the heavy metal content of natural waters. Secondly, conditions and amount of precipitation which occur immediately prior to the sampling determine the amounts of heavy metals present in surface waters. Systematic and select sampling of streams and lakes in the northeast region of New Mexico and in areas in the periphery of the Pecos Wilderness have been conducted over a two year period of time.

Analytical techniques which have been developed or adapted for the determination of trace metals include for the most part methods with the use of the carbon furnace in atomic absorption spectrometry. The use of the carbon furnace for the determination of Pb, Ag, Cd, Cu, Zn, and other heavy metals has proved to be the most reliable means of analysis for samples in which the metal concentration seldom exceeds 0.5 ppm. Preconcentration techniques, together with flame atomic absorption spectrometry, have been used for the determination of the metal content of some samples. Electrochemical methods for the determination of Pb in some samples (such as bone) have proved to be satisfactory for samples containing 1-5 ppm of the metal.

The determination of Pb-210 in soils, sedimentary deposits, and biological materials is readily accomplished with the analysis of the radionuclide by liquid scintillation spectrometry. Methods for the isolation of the radioisotopes Pb-210 and Po-210 have been developed in this laboratory. The analysis of Pb-210 in waters, although less readily accomplished, has been done with the same technique after tedious preconcentration of natural samples.

The analytical data now available indicate that the amounts of lead found in natural waters in the remote region of northeastern New Mexico result from atmospheric deposition (by precipitation primarily). The amounts of lead in surface and ground waters are generally small and are practically identical to the amounts found in precipitation occurring in the same areas.

B. Information Reported to Date

Abstract: "Determination of Lead Content in Fish Bone and Tissue," Robert Thatcher, Henry Martinez, and Sigfredo Maestas, Bulletin of the New Mexico Academy of Science, 13 (2), 36, December 1972.

Paper presented at the Fall Meeting of the New Mexico Academy of Science.

Paper on the content of lead in aquatic species presented at the Annual meeting of the Rocky Mountain Section of the American Association for the Advancement of Science, Lubbock, Texas, April 1973.

C. Project Status

In progress; completion date is September 1, 1974.

D. Application of Research Results

Available to data banks. Description present in the data bank of the New Mexico Environmental Institute.

E. Work Remaining

The project will be completed by September 1 of the current year. Completion of survey to include summer 1974 is one objective. Data on the other heavy metals (Fe, Mn, Zn, Cu) from sources of combustion which may be present in water are being obtained.

OWRR Project No. A-047-NMEXNMSU Project No. 3109-58Agreement No. 14-31-0001- 4031

FCST-COWRR Research Category: _____

IMPROVED WASTEWATER TREATMENT IN ARID
AREAS

Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces, New MexicoProj. Began--Month: July ; Year: 1973To Be Completed--Month: June ; Year: 1974Principal InvestigatorsDegreeDisciplineExtended through
December 1974

William A. Barkley

Ph. D.

Civil Engineering

Student Assistants 1/Degree Held
(if any)Discipline or Academic BackgroundJoseph Archuleta
Harold HancockCivil Engineering
TechnicianA. Research Project Accomplishments

The purpose of this investigation was to study the mechanism of dual flocculant agents in destabilizing synthetic colloidal systems. A synthetic colloidal system was selected in order to achieve satisfactory reproducibility. The flocculating agents selected were aluminum sulfate and organic polyelectrolytes. Both cationic and anionic polyelectrolytes were tested. Preliminary testing evaluated the range of concentrations of both flocculants which, when used in conjunction, caused either partial or full latex colloidal destabilization. An experimental design was developed which incorporated these concentration ranges and the time lag between the addition of the two flocculants. Dependent parameters used to evaluate the results included zeta potential, turbidity, aluminum concentration, and gravimetric analysis. Final experimental work is being completed.

B. Publications

None

C. Project Status

The project is incomplete. The work will be finished by December 31, 1974.

D. Application of Research Results

The results of the work will be applicable to all water treatment systems using dual flocculant systems. In addition it will define proper usage for industrial effluents using dual flocculants in coagulation treatment.

E. Work Remaining, and Progress Contemplated During Next Year

Experimental work is in the final stage with completion expected by August 31, 1974. Data evaluation and final report preparation will be complete by December 31, 1974.

OWRR Project No. A-048-NMEX
 NMSU Project No. 3109-59
 Agreement No. 14-31-0001- 4031
 FCST-COWRR Research Category: _____

Calcium Carbonate Equilibria in Soils and Irrigation Waters

Name and Location of University Where Project is Being Carried Out:
New Mexico State University, Las Cruces

Proj. Began--Month: July 1 ; Year: 73 To Be Completed--Month: June 30 ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
G. A. O'Connor	Ph. D.	Soil Chemistry

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Weldon McFarland	M.S.	Soil Chemistry
Fernando Cadena C.	M.S.	Civil Engineering

A. Research Project Accomplishments

Calcite solubility is of major importance to numerous scientists and yet attempts to characterize the system in terms of basic chemical thermodynamics have met with limited success. Some approaches have been successful, but have necessitated oversimplification of the system, inclusion of crystal lattice modification consideration, or have resulted in dependences of K_{sp} values on ionic strength. The model reported herein adequately describes calcite equilibria in aqueous solutions without any of these undesirable characteristics. Equations accounting for activity coefficients and various ion-pair formations were sufficient to describe calcite equilibrium in solutions of widely varying ionic characteristics. Sixty out of the 73 solutions analyzed yielded calculated K_{sp} values for calcite ranging from 2.6 to 4.0×10^{-9} . The average is slightly lower than the values normally reported by soil scientists, but would appear to more realistically characterize solutions commonly encountered in nature.

The model has not been applied to soil systems, but a similar (unpublished) model has been developed independently by workers at the U. S. Salinity Laboratory in Riverside, California. Their model is fairly successful in describing CaCO_3 much higher than that reported.

B. Publications

1. O'Connor, G. A. and Cadena C., Calcite equilibrium in mixed ion aqueous solutions open to the atmosphere. (in journal review)

C. Project Status

Project completed June 30, 1974. Completion report has been submitted.

D. Application of Research Results

Although the project was essentially a theoretical study of calcite equilibria in aqueous systems, results of the research should have application to sanitary engineers, soil scientists, and geologists. Parts of the model developed in the study have already been used to explain the limiting value of hardness removal in water treatment procedures which up to now had been unexplainable. The model may also be of use in computer simulation of solute movement studies through calcareous soils. Workers at the U. S. Salinity Laboratory have used certain portions of the model in a computer simulation of salt movement in soils. We anticipate working with these personnel to modify the model for use in soil systems.

Owrr Project No. B-015-NMEX
 NMSU Project No. 3109-109
 Agreement No. 14-31-0001-3110
 FCST-COWRR Research Category: _____

Irrigability Classification of New Mexico
 Lands as a Guide for Water Importation-
 Phase II

Name and Location of University Where Project is Being Carried Out:
New Mexico State University, Las Cruces

Proj. Began--Month: July; Year: 1969 | To Be Completed--Month: June; Year: 1973
 -----Extended through May 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
J. U. Anderson	Ph. D.	Soil Classification and Mineralogy
H. J. Maker	B.S.	Soil Classification

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
None		

A. Research Project Accomplishments.

Reports describing the nature and distribution of soil associations, the nature and properties of representative soils in the associations, and the suitability of these soils for irrigation and many other uses have been published for Rio Arriba, McKinley, Taos, and Valencia counties. A summary report describing the irrigation suitability of soils in the entire state by associations has been completed. This report shows that, on the basis of soils, more than 11 percent of the state is highly suitable for irrigation, and an additional 27 percent is moderately suitable.

B. Publications

Maker, H. J., J. J. Folks, J. U. Anderson, and V. G. Link. 1973. Soil Associations and Land Classification for Irrigation, Rio Arriba County. N. Mex. Agr. Exp. Sta. Res. Rept. 254.

Maker, H. J., H. E. Bullock, Jr., and J. U. Anderson. 1974. Soil Associations and Land Classification for Irrigation, McKinley County. N. Mex. Agr. Exp. Sta. Res. Rept. 262.

Maker, H. J., L. W. Hacker, and J. U. Anderson. 1974. Soil Associations and Land Classification for Irrigation, Valencia County. N. Mex. Agr. Exp. Sta. Res. Rept. 267.

Maker, H. J., J. J. Folks, J. U. Anderson, and V. G. Link. 1974. Soil Associations and Land Classification for Irrigation, Taos County. N. Mex. Agr. Exp. Sta. Res. Rept. 268.

Anderson, J. U. and H. J. Maker. 1974. Suitability of New Mexico Lands for Irrigation. N. Mex. Agr. Exp. Sta. Res. Rept. 276.

C. Project Status.

Completed

D. Application of Research Results.

Results of this work are being used directly by the U. S. Bureau of Reclamation in the State Water Plan as their estimate of amount, suitability, and location of irrigable lands in New Mexico. In addition, the demand for the county reports on soil associations and land classification for irrigation continues to be high, and we find that these are being used effectively by many people concerned with broad area planning, and by many who want generalized information about our soils.

OWRR Project No. B-029-NMEX

NMSU Project No. 3109-132

Agreement No. 14-31-0001-3619

FCST-COWRR Research Category:

Utilization of Rain Water in a Semi-arid region

Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Plains Branch Station, Clovis, New Mexico

Proj. Began--Month: July ; Year: 1970

To Be Completed--Month: June ; Year: 1975

Principal Investigators

Degree

Discipline

H. D. Fuehring

Ph. D.

Agronomy (Soils)

Student Assistants 1/

Degree Held
(if any)

Discipline or Academic Background

None

A. Research Project Accomplishments.

An experiment on the effect of bare contributing watersheds on the yield of crops in adjacent growing beds was established in the fall of 1970. To date, grain sorghum and sunflower yields from the total area (growing bed plus contributing watersheds) have been decreased by increasing watershed, but yields considering only the area of growing bed were considerably increased with increasing contributing watershed. During 1972 and 1973, when rainfall averaged about 20 inches per year, some growing bed yields were comparable to yields of irrigated crops. It appears that the best practical application of using micro-watersheds may involve cropping the shed areas in regular dryland winter wheat-fallow rotations with summer row crops grown on narrow beds between the shed areas. A small experiment was established in the fall of 1973 to explore this aspect. Winter wheat and winter barley yields on the growing beds were not increased sufficiently by contributing watersheds to merit further consideration.

The use of an antitranspirant foliar application (atrazine) has increased the yield of grain sorghum up to 30 percent under conditions of no contributing watershed and considerable moisture stress. The increase was greater with increasing application of nitrogen fertilizer. There is considerable potential for increased water use efficiency through application of anti-transpirants to grain sorghum foliage once the conditions of response are established.

B. Publications.

A paper has been submitted for publication in the Agronomy Journal and is in the reviewing process (Yield of dryland grain sorghum as affected by antitranspirant, nitrogen, and contributing micro-watershed).

C. Status of Project.

Three years work has been completed. Extremely dry weather since fall, 1973, has delayed seeding of the 1974 crops.

D. Application of Research Results.

Results will be needed when, or if, irrigation wells become depleted of water and area reverts to dryland farming. Principles involved will be applicable to other semiarid regions or for land now being dry-farmed in the area.

E. Work Remaining and Progress Contemplated During Next Year.

The 1974 crops have just been seeded but rain is needed immediately.

ANNUAL REPORT -- TITLE I PROJECT

OWRR Project No. B-032-NMEX
 NMSU Project No. 3109-139
 Agreement No. 14-31-0001- 3620
 FCST-COWRR Research Category:

Analysis of Water Characteristics of
 Manufacturing Industries and their
 Adaptability to Semi-Arid Regions

Name and Location of University Where Project is Being Carried Out:

New Mexico State University - Las Cruces
 University of New Mexico - Albuquerque

Proj. Began--Month: July ; Year: 1971 To Be Completed--Month: June ; Year: 1973

Extended through December 1973

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Shaul Ben-David	Ph.D.	Economics
Harry G. Folster	Ph.D.	Chemical Engineering

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Jerry Strange	B.S.	Chemical Engineering
Wayne Dunlap	B.S.	Chemical Engineering
Hsien-Yen Isao	B.S.	Chemical Engineering
Roger Melton	B.S.	Chemical Engineering
James Doty		Economics
Leland Griffin	B.S.	Chemical Engineering
Naheed Hassein	B.S.	Industrial Engineering
Judy Nelson	B.S.	Economics

A. Research Project Accomplishments

Two industries were selected: petroleum refining and coal gasification. Several criteria were used in making this selection. First priority was given to industries with a high likelihood of locating in New Mexico either due to natural resources or close proximity to markets. Second, industries were chosen which showed a large diversity in water use patterns and substitution choices. Another major consideration was the type of aqueous effluents and the potential for recovery of useable water.

B. Publications

Ben-David, S., F. L. Brown, Jr., H. G. Folster and E. F. Thode. 1974.
Analysis of Water Characteristics of Manufacturing Industries and their Adaptability to Semi-Arid Regions. Water Resources Research Institute Report No. 040.

C. Project Status

Completed, May 1974.

D. Application of Research Results

Interest in a study of this nature has been expressed by state officials involved in determining the impact of industry upon the economy and environment of New Mexico. It is expected this report will serve as a model for groups making a determination of what types of water using industry to attempt to bring into semi-arid regions and, in particular, New Mexico.

NMSU Project No. 3109-142
 Agreement No. 14-31-0001- 3951
 FCST-COWRR Research Category: _____

An Interdisciplinary Analysis of the Water Resources of the High Plains of New Mexico

Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces
 New Mexico Institute of Mining and Technology - Socorro

Proj. Began--Month: July ; Year: 1972 | To Be Completed--Month: June ; Year: 1973
 ----- Extended through June

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Robert R. Lansford	Ph.D.	Agricultural Economics
William Brutsaert	Ph.D.	Hydrology
Bobby J. Creel	M.S.	Agricultural Economist

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
George Hoffman	B.S.	Hydrology - NMIMT
James A. Larson	B.S.	Agricultural Economist - NMSU

A. Research Project Accomplishments

An interdisciplinary approach to the solution of the water resources problems of the Southern High Plains in New Mexico was made possible by the integration of hydrology and geology with economics. Research procedures developed to carry out this study were closely coordinated by the investigators to achieve the primary objective of evaluation of the social and economic impacts of alternative water-use policies.

A linear programming model was developed to represent the Southern High Plains economy. Inputs into the model were obtained from separate studies covering the hydrological, agricultural, municipal, and industrial areas.

Three sets of alternatives were considered: (1) growth without a water constraint; (2) growth, decreasing pumpage 10 percent after 1966; (3) growth, increasing pumpage 10 percent after 1966.

Without a water constraint, both production and depletions are expected to exhibit the largest increase (54.5 percent and 66.9 percent, respectively). When a 10 percent decrease in pumpage constraint is imposed in the year 2020, the value of production is reduced by \$19.02 million; employment by 2931 employees; and water depletions decreased about 62 percent. When a 10

percent increase in pumpage constraint is imposed, the value of production is decreased \$47.1 million below the expected when compared to a 10 percent decrease in pumpage, and water depletions are reduced only slightly (31,900 acre-feet).

B. Publications

None. But a manuscript has been prepared, reviewed and corrections made. It is waiting for reproduction. The title of the manuscript is: Water Resources Evaluation of the Southern High Plains of New Mexico.

C. Project Status

The project has been terminated.

D. Application of Research Results

The personnel in the New Mexico State Engineer Office have expressed interest in the results of this project. The results have been discussed with these people and representatives of the U. S. G. S. in Albuquerque.

E. Work Remaining and Progress Contemplated

The only work remaining is the publication of the manuscript.

OWRR Project No. B-038-NMEX
 NMSU Project No. 3109-140
 Agreement No. 14-31-0001- 3914
 FCST-COWRR Research Category:

Aquifer Parameters by a Chemical Tracer
 Technique

Name and Location of University Where Project is Being Carried Out:

New Mexico Institute of Mining and Technology, Socorro, N. M. 87801

Proj. Began--Month: July ; Year: 1972 | To Be Completed--Month: June ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
G. K. Billings	Ph. D.	Geochemistry
G. W. Gross	Ph. D.	Geophysics
V. LeFebre	Ph. D.	Chemistry

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Larry Holt	M.S.	Geochemistry
George Linn	M.S.	Geology
Shaun Ross	-	Geology

A. Research Project Accomplishments

Soil column tests and chemical analyses of water samples from the Roswell ground water basin indicate that the water is saturated with calcite before entering the aquifer. Calcite precipitation and dissolution occurring within the aquifer result from nonlinear mixing effects. Mixing caused by leakage from the unconfined to the confined aquifer is clogging the confined aquifer with a calcite precipitate. The gypsum content of certain wells has been increasing over a number of years for the same reason. In view of these findings the conclusion was reached that the original idea of using changes in calcium and bicarbonate concentrations as a measure of residence time could not be applied to the study area. Instead, it appeared that concentration changes in groundwater samples and crystalline calcium carbonate precipitates in fractures of core samples from the San Andres aquifer could be explained in terms of nonlinear mixing effects which, by themselves, give clues about source of recharge waters and their circulation patterns.

B. Publications. None

C. Project Status. Incomplete.

D. Application of Research Results

The results of this research should lead to a better understanding of the inter-aquifer flow in the basin, and of the effects of continued decline of piezometric heads. These results should be of interest to the Pecos Valley Artesian Conservancy District which, through its manager, Mr. Ray Wyche, has given invaluable help to this project.

E. Work Remaining

Because of the personnel changes that took place during the year, plus the change in orientation necessitated by the findings summarized under (A), progress on this project has not been as originally anticipated. For this reason we are requesting an extension.

OWRR Project No. B-040-NMEX
 NMSU Project No. 3109-148
 Agreement No. 14-31-0001- 4106
 FCST-COWRR Research Category: _____

Water Use and Urban Development in the Albuquerque Area

Name and Location of University Where Project is Being Carried Out:

University of New Mexico, Albuquerque, New Mexico.

Proj. Began--Month: July 1 ; Year: 73 | To Be Completed--Month: June ; Year: 75

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Peter Lupsha	Ph.D.	Political Science
Don Schlegel	Ph.D.	Architecture

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Ouida Martin	M.A.	City Planning
Robert Anderson	B.A.	Political Science

A. Research Project Accomplishments

During the year January-June 1974, the following aspects of the Water Use Project were completed as proposed on page 6 of the initial proposal.

- (1) Data was gathered on the location of water use by types.
- (2) User addresses were collected in cooperation with the City Water Billing Department.
- (3) The dimensions of the survey were outlined.
- (4) A survey instrument was developed.
- (5) A selected number of water use decision makers were interviewed, and a range of decisional alternatives and use options and priorities developed with these decision makers:

William Ott, City Engineer
 Dan Reddy, Assistant City Engineer

(6) A design for the pretest of the survey instrument was set up.

B. None

C. Project will continue through June 1975.

D. We note that we have had excellent cooperation from the City and State, and that a great deal of interest on the part of water decision-makers has been generated and their inputs into the survey accounted for. It appears that the survey will have the desired effect, providing not only base line data for the development of a planning tool, but also providing much useful information to city planners for policy alternatives on water use in the future. It will also be very useful in improving the Demand Model developed by Berry and Bonem.

COWRR Project No. B-041-NMEX
 NMSU Project No. 3109-149
 Agreement No. 14-31-0001- 4107
 FCST-COWRR Research Category:

Application of Environmental Tritium in the
 Measurement of Recharge and Aquifer Parameters
 in a Semi-Arid Limestone Terrain

Name and Location of University Where Project is Being Carried Out:
 New Mexico Institute of Mining and Technology, Socorro, New Mexico 87801

Proj. Began--Month: July 1 ; Year: 1973 || To Be Completed--Month: June ; Year: 1975

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
G. W. Gross	Ph. D.	Geophysics
D. D. Rabinowitz	Ph. D.	Hydrology

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Roberta Hoy	-	Geoscience (Geology)
John McDermott	M.S. candidate	Geoscience (Hydrology)

A. Research Project Accomplishments.

D. D. Rabinowitz left New Mexico Institute of Mining and Technology in January, 1974, and G. W. Gross took charge. Attempts to find a suitable replacement for Rabinowitz have not been successful to the date of this writing. The present report only covers the work by G. W. Gross (February through June, 1974). A systematic sampling program was instituted on selected wells in the Roswell Basin. A total of twelve days were spent in the field on three separate field trips. Emphasis was placed on the Pecos Valley Conservancy District's ten observation wells and several flowing wells in the recharge area, which had not previously been sampled. These wells are considered to be of prime importance for the study of recharge processes. All but two of the observation wells have water level recorders which have been in continuous operation since about 1956. One of these wells (No. 2: 21 miles west of Roswell) has been selected for a pilot study which is being carried out by Mr. John McDermott, a Master's degree candidate in Hydrology. He is digitizing the complete set of records from this well for the purpose of carrying out a spectral cross correlation study with meteorologic parameters (atmospheric pressure, precipitation, temperature). This is the first step in using these records in the analysis of recharge processes, complementary to the tritium dating studies being done in our laboratory on water samples from the same wells.

B. Publications

Three papers have been prepared and submitted for publication to Journal of Hydrology, where they are presently under review.

D. D. Rabinowitz, G. W. Gross, and Ch. R. Holmes:

Environmental Tritium as a Hydrometeorologic Tool in the Roswell Basin, New Mexico.

I. Tritium Input Function and Precipitation/Recharge Relation.

II. Tritium Patterns in Ground Water.

III. Hydrologic Parameters.

C. Project Status.

The project will continue in the next fiscal year. The measurement of tritium in water samples has fallen rather far behind schedule during the past fiscal year. In large measure, the efforts of G. W. Gross since taking over the tritium laboratory have been directed toward streamlining and accelerating the operation. Considerable instrumental difficulties, which frequently accompany such changes in direction, have thwarted these efforts thus far.

D. Application of Research Results.

We have been closely working with the Pecos Valley Artesian Conservancy District whose manager, Mr. Ray Wyche, has made available to us his well records as well as given us access to his carefully maintained observation wells. The results of this study can be expected to be of immediate interest to the Conservancy District.

E. Work Remaining and Progress Contemplated.

We expect to gather the data required for the two major objectives of the project: (1) To compute a groundwater residence time for the Artesia region of the basin; (2) to verify or refine the recharge relationship proposed in our report WRRRI No. 016 and to ascertain whether it can be generalized for the southern (Artesia) part in the basin.

Owrr Project No. B-046-NMEX
 NMSU Project No. 3109-154
 Agreement No. 14-31-0001-4164
 FCST-COWRR Research Category:

REGIONAL WATER MANAGEMENT WITH FULL CONSUMPTIVE USE
 TITLE I PROJECT

Name and Location of University Where Project is Being Carried Out:
 New Mexico State University - Las Cruces, N.M.; University of New Mexico -
 Albuquerque, N.M.; Texas A & M University, College Station, Texas

Proj. Began--Month: Jan. ; Year: 1974 To Be Completed--Month: Dec. ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Robert R. Lansford	Ph.D.	Agricultural Economics
Shaul Ben-David	Ph.D.	Economics
John W. Adams	Ph.D.	Agricultural Economics
Donald L. Reddell	Ph.D.	Hydrologist

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>

A. Research Project Accomplishments

One of the key elements of this study is the use of a technical advisory committee composed of representatives from local, state, and federal agencies. The research group met with the technical advisory committee on April 22, 1974. Among the agencies represented were: Bureau of Reclamation, U. S. G. S., Soil Conservation Service, City of Las Cruces, City of El Paso, Elephant Butte District, El Paso County Water Improvement District No. 1, Texas Water Rights Commission, Texas Water Development Board, West Texas Council of Governments, Official from Texas Governor's Office, Southern Rio Grande Council of Governments, New Mexico Interstate Streams Commission, New Mexico State Planning Office, Rio Grande Compact Commission, New Mexico Water Quality Control Commission and Greater Agricultural Income Now Committee.

The model has been chosen, and the needed data identified and methods of obtaining it outlined.

B. Publications

None

C. Project Status

Project will continue until December 31, 1975.

D. Application of Research Results

Members of the advisory group should find various uses of the results obtained from this study. The advisory group will receive preliminary results as they become available for their own use.

E. Work Remaining and Progress Contemplated During Next Year

All of the analysis should be completed during the next fiscal year and the start of final report begun.

ANNUAL REPORT -- TITLE I PROJECT

OWRR Project No. C-4060
 NMSU Project No. 5700-311
 Agreement No. 14-31-0001-
 FCST-COWRR Research Category: _____

REDUCTION PEAK WATER CONSUMPTION IN URBAN
 AREAS

Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces, New Mexico

Proj. Began--Month: July ; Year: 1972 | To Be Completed--Month: August ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
D. J. Cotter	Ph. D.	Horticulture
D. B. Croft	Ph. D.	Psychologist
J. W. Clark	C. E.	Sanitary Engineer
B. J. Reeves	M. S.	Horticulture

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
J. T. Hughes	M. S.	Botany
Elbert Graves	B. S.	Biology
Kathleen Winkles	B. S.	Education

A. Research Project Accomplishments

The major thrust of activities for the project during 1972-73 has centered about testing and refinement, and subsequent application of the residential landscape description questionnaire (RLDQ) to urban residential landscapes. Water usage data was available for most of the landscapes evaluated. The instrument met semantic and statistical criteria and had a very high reliability. Results now show that the RLDQ can be used as an assist in identifying attributes of a landscape which contribute to its overall beauty and those which lead to less water to maintain the landscape. The following four areas are measured by RLDQ: harmony, composition, accent and uniqueness. Uniqueness correlated negatively with landscape water use per square foot. Composition negatively correlated with total gallons applied to a landscape.

The progress on obtaining definitive data on the knowledge about water usage by urban dwellers is currently under way. Two completed preliminary studies show consumers do not have sufficient knowledge on how to use water wisely. For example, luxuriant water users consider themselves to be good stewards of water, that is, those consumers who felt they could not conserve water in their landscapes used twice as much water on their landscapes as those who felt they could conserve water. Programs for the conservation of water on New Mexico State University Campus has been developed and implemented. To date, water savings of 37% on fescue and 11% on hybrid bermuda have been achieved on campus.

Cooperative arrangements with Las Cruces Municipal Water and Utilities Department is under way for the purpose of counseling with high water users and encouraging adaption of conservative measures.

B. Publications

Cotter, D. J. and Fabian Chavez. Factors affecting water application rates and urban landscapes, Journal ASHS, accepted for publication April, 1974.

C. Project Status

Project will continue to August 31, 1974.

D. Application for Research Results

The results obtained to date suggest that a significant means of reducing urban water usage lies in the area of consumer education. Application of RLDQ would identify specific landscape attributes conserving of water.

E. Work Remaining

1. The analysis of data currently under way, is nearing completion.
2. Completion of final report.

ANNUAL REPORT -- TITLE I PROJECT

OWRR Project No. 13030 GLM
 NMSU Project No. 5700-308
 Agreement No. 14-31-0001-
 FCST-COWRR Research Category: _____

Quality and Quantity of Return Flow as Influenced
 by Trickle and Surface Irrigation

Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces, New Mexico 88001

Proj. Began--Month: July ; Year: 1972 | To Be Completed--Month: December ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Peter J. Wierenga	Ph.D.	Soil Physics
Ted C. Patterson	M.S.	Agricultural Engineering

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Ron van de Pol	B.S.	Water Science and Engineering
Buck Sisson	M.S.	Soil Physics
Bill Boyle	B.S.	Chemistry

A. Research Project Accomplishments

The results from the two cropping years so far show no effects of irrigation treatments on the quality of the irrigation return flow. Neither soil water depletion, nor irrigation efficiency had a significant effect on the salinity in the soil profiles as measured at the end of each cropping season. The yield from the trickle irrigation plots was about the same as from the surface irrigated plots during the 1973 cropping year. Trickle yields in 1972 were significantly higher than surface yields.

The amount of irrigation water applied during the 1973 growing season was 22.8 inches averaged over all treatments. The amount applied to the trickle plots was 13.3 inches, considerably less than to the surface irrigated plots.

Changes in soil salinity were measured by taking samples at 20 centimeter depth increments at 2 locations in each surface irrigated plot and under the trickle line and in between the trickle lines on the trickle irrigated plots. Pre-irrigation caused a decrease in salt level in the surface soil but an increase in the subsoil. The effects of surface irrigation treatments on soil salinity were not significant at the 5% level at any depth. Preirrigation through the trickle system caused a very significant decrease in soil salinity in between

the trickle lines at the 0-20 centimeter depths and at the 20-40 centimeter depths. Below 40 centimeters, differences were not significant. Preirrigation had a favorable effect on soil salinity below the trickle line. Between the lines, soil salinity was also reduced by preirrigation through the trickle system. Measurements from the salinity sensors around the trickle lines show that preirrigation with 200 millimeters of water through the trickle system is very effective in moving the salts away from the trickle lines. Due to the large buffering capacity of the soil at the experimental site, considerably more time is required before the effects of changes in irrigation management can be measured on the quality of drainage return flow.

B. Publications

Wierenga, P. J. and T. C. Patterson. 1974. Quality of irrigation return flow in the Mesilla Valley. Proceedings of the 10th International Congress of Soil Science, Moscow, USSR, August 12-20.

Patterson, T. C. and P. J. Wierenga. 1974. Irrigation return flow as influenced by drip irrigation. Proceedings international drip irrigation congress. San Diego, California. July 7-14.

Abstracts

Wierenga, P. J. 1973. Irrigation management and its effect on the quality of drainage return flow. Abstract in Science and Man in the Americas Desert and Arid Lands Central Theme, AAAS, Mexico City, June 20 - July 4,

C. Project Status

Project will be completed by December 31, 1974.

D. Application of Research Results

Organizations that have an interest in this project are the City of Las Cruces, the Bureau of Reclamation, the Elephant Butte Irrigation District and the Environmental Improvement Agency in Santa Fe, New Mexico.

E. Work Remaining, and Progress Contemplated During Next Year

Harvesting of cotton, determining yield and quality collection of soil samples from the field plots, analysis of the soil samples, analysis of data and writing of the final report.

OWRR Project No. _____
 NMSU Project No. 3109-134
 Agreement No. 14-31-0001-
 FCST-COWRR Research Category: _____

Cropland Uses and Agricultural Water Depletions
 in New Mexico

Name and Location of University Where Project is Being Carried Out:

New Mexico State University, Las Cruces

Proj. Began--Month: July ; Year: 1972 To Be Completed--Month: June ; Year: 1973

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Robert R. Lansford	Ph.D	Agricultural Economics
Bobby J. Creel	M.S.	Agricultural Economics

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
James A. Larson	B.S.	Agricultural Economics

A. Research Project Accomplishments

A survey was conducted to determine the use of irrigated cropland in 1973, in cooperation with the Statistical Reporting Service, Soil Conservation Service, and Agricultural Stabilization and Conservation Service (all of the U. S. Department of Agriculture), New Mexico Cooperative Extension Service, New Mexico State Engineer Office, and the New Mexico Department of Agriculture.

The major irrigated crops in New Mexico in 1973 were: alfalfa, 234,560 acres; sorghum, 216,210 acres; and cotton, 149,810 acres. Relative to the 1972 planted acreage, alfalfa and cotton decreased by 9,500 acres and sorghum increased by 4,400 acres. These three crops accounted for approximately 57 percent of the total cropland in the state in 1972.

The diversions and depletions for irrigation water in New Mexico are being estimated by the Blaney-Criddle method as used by Henderson and Sorensen.

B. Publications

None, but an agricultural experiment report is being planned.

C. Project Status

Terminated June 30, 1974.

D. Application of Research Results

The Statistical Reporting Service of the U. S. Department of Agriculture and the New Mexico State Department of Agriculture use the data in preparing state and county estimates of agricultural crops in New Mexico. Data generated from this project have been used in the New Mexico State Water Plan. Basic agricultural data such as these are used by many organizations and firms. Agricultural firms are anxious for this type of data.

E. Work Remaining

The diversions and depletions for irrigation water in New Mexico are being estimated. The delay in completing this phase of the project was caused by the delay in obtaining climatological data from the weather bureau which came in mid-June.

ANNUAL REPORT -- TITLE I PROJECT

OWRR Project No. _____	Predicting the Quality of Irrigation Return Flow
NMSU Project No. <u>3109-136</u>	
Agreement No. <u>14-31-0001-</u>	
FCST-COWRR Research Category: _____	

Name and Location of University Where Project is Being Carried Out:
 New Mexico State University, Las Cruces, New Mexico

Proj. Began--Month: July ; Year: 1972 | To Be Completed--Month: June ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Peter J. Wierenga	Ph. D.	Soil Physics

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Rein van Genuchten	M.S.	Soil Physics, Soil Plant Relations
Susan Gomez	B.S.	Chemistry

A. Research Project Accomplishments

During the past year a comparison was made between observed ionic distribution in large columns and those calculated using a computer program for the simultaneous transfer of water and salts in soils. The observed ionic distributions were obtained from large lysimeters irrigated with saline water of a known composition. Samples of the soil solution were removed through extraction cups at depths of 25, 50, 75, 100, 125 and 150 centimeters below the soil surface inside the lysimeters. Changes in the composition of the drainage water from the lysimeter columns was also measured. The agreement between observed and computed results was good as far as the water movement part of the model was concerned. Observed water content generally agreed with measured water contents inside the column. Observed and computed calcium distributions within the column agreed with a calcium sodium exchange constant of 3.5 was used in the computer model. The use of a calcium sodium exchange coefficient of 0.71 as published in the literature was totally inadequate for the soil in this study. The prediction of magnesium distribution within the soil profile was adequate when the calcium magnesium exchange coefficient of 0.87 was used in the model. The calcium magnesium exchange coefficient usually found in the literature is 0.67.

Comparison between observed and predicted distributions of chloride, sulfate carbonates and bicarbonates were quite adequate. It appears that the computer model used in predicting the salt distribution is adequate when proper coefficients are used for the exchange coefficients for calcium-sodium and calcium-magnesium. These coefficients were found to be quite different from those published in the literature. Values found in the literature were usually obtained under saturated conditions. However, this experiment was conducted during non-saturated flow and it is quite possible that exchange coefficients determined during saturated conditions are quite different from those obtained during actual unsaturated conditions as is normally the case under field conditions.

In a separate experiment the movement of chloride and tritiated water was measured in a field plot at the Plant Science Farm at New Mexico State University. In most cases there was agreement between observed and calculated chloride distributions, if anion exclusion, caused by the interaction of the chloride with the clay, was taken into account. Tritium was retarded by the soil. Therefore, tritium would not be a good tracer for following water movement in soils as indicated by these results. The soil at the experimental site was very layered with 65 centimeters of clay on the sandy subsoil. This layering of the soil introduced difficulties in sampling the soil solution, especially in the heavy clay layer above the sand. From this data it appears that section cups are not always adequate for sampling the soil solution in a soil profile.

B. Publications

van Genuchten, M. Th., J. M. Davidson and P. J. Wierenga. 1973. An evaluation of kinetic and equilibrium equations for the prediction of pesticide movement through porous media. Soil Sci. Soc. Amer. Proc. 38:29-35.

Cassel, D. K., M. Th. van Genuchten and P. J. Wierenga. 1974. Simulation of nitrate and chloride movement through gardenia very fine sandy loam. Proceedings Summer Computer Simulation Conference, Houston, July 9-11, 1974.

Wierenga, P. J., M. J. Shafer and S. P. Gomez. 1973 Salinity distributions in large soil columns. Agron. Abst.

C. Project Status

Project will be completed December, 1974.

D. Application of Research Results

Interest in movement of solutes through soil as measured in this experiment, was expressed by the Environmental Improvement Agency in Santa Fe, New Mexico. The project will be completed within the 1975 budget year. Testing on a larger scale will be necessary.

ANNUAL REPORT --- TITLE I PROJECT

OWRR Project No. _____
 NMSU Project No. 3109-146
 Agreement No. 14-31-0001-
 FCST-COWRR Research Category: _____

STREAM ORGANICS TO EVALUATE LAND MANAGEMENT

Name and Location of University Where Project is Being Carried Out:

University of New Mexico Albuquerque, New Mexico

Proj. Began--Month: July ; Year: 1973 || To Be Completed--Month: Sept. ; Year: 1974

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
James R. Gosz	Ph. D.	Forest Ecology
Mary Barr	Ph. D.	Plant Biochemistry

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Stewart Bergman	M. S.	Organic Chemistry

A. Research Project Accomplishments

A study of stream organics in surface waters of the Tesuque Watershed is being made in order to evaluate the quantity and quality of organics from different vegetation types and to evaluate any changes in surface water organics as a result of watershed management procedures.

Biweekly stream samples have been collected and analyzed for total nitrogen and total, particulate and soluble organics. The soluble organics have been fractionated and analysis for total phenals made on representative fractions. Specific organic analysis have been made on low molecular weight fractions.

B. Publications

None

C. Project Status

The project will continue through December 31, 1974 to allow for data collection through the entire year and adequate analysis.

D. Application for Research Results

Studies of this type are rare, hence this study will provide useful information for other researchers in similar fields. Both the U. S. Forest Service and the U. S. Geological Survey have indicated an interest in this work. Water quality can be a valuable tool in evaluating land management activities.

E. Work Remaining

The data collected before May is in the computer phase. Collection will continue through July and then be analyzed. Conclusions can then be drawn.

ANNUAL REPORT -- TITLE I PROJECT

OWRR Project No. _____
 NMSU Project No. 3109-147
 Agreement No. 14-31-0001-
 FCST-COWRR Research Category: _____

SOURCES OF GROUNDWATER CONTAMINATION IN THE
 OGALLALA AQUIFER IN EASTERN NEW MEXICO

Name and Location of University Where Project is Being Carried Out:

• Eastern New Mexico University, Portales, New Mexico

Proj. Began--Month: _____; Year: _____ || To Be Completed--Month: _____; Year: _____

<u>Principal Investigators</u>	<u>Degree</u>	<u>Discipline</u>
Robert G. Taylor	Ph. D.	Chemistry
Thomas W. Russell	Ph. D.	Chemistry

<u>Student Assistants 1/</u>	<u>Degree Held (if any)</u>	<u>Discipline or Academic Background</u>
Edith Kimbrell		
Steward Lacey		
Edward Bigler		
Alice Cone		Pre-Veterinary
Terry Pressley		Water Resources
David Augustine		
Geoffrey Browne	M.S.	Chemistry

A. Research Project Accomplishments

The physical characteristics of the Portales Valley Water Basin were examined. Drawdown characteristics, channeling existence, and vertical constant head permeability values were measured. The results from the physical parameters yielded insight into the movements of various chemical and biological contaminants, in addition to giving explanations to the observed changes in trends of concentrations of the various measured parameters. Vertical constant head permeability values demonstrated that downward movement of water was sufficiently rapid to account for aquifer contamination by return flow in most of the soil associations examined. Subsurface strata composition indicated ion exchange, both cation and anion, played little, if any, role in affecting contaminant percolation.

Water quality of the aquifer was monitored by both chemical and biological parameters. Eighteen chemical and biological parameters were examined routinely on seventeen wells throughout the Portales Valley Water Basin. Water under agricultural industries was monitored where the individual industries were isolated from synergistic effects. Lack of any appreciable rainfall during the fall and winter - post cultivation - months has resulted in base line fluctuations but a conspicuous absence of any trends. Minor trends were manifested as general decreases in measured parameters during the post irrigation season, and paralleled the previous study of 1971 (Project Number 3109-45 A-034 New Mexico). The absence of any winter moisture during the study period has created a repetition of environmental conditions which existed just prior to the 1971 study. As pre-planting ground preparation has required application of irrigation moisture to the soil, the terminal months of the study have produced a trend of increasing nitrate contamination in the groundwater. If the trend continues at the indicated rate, nitrate values of the same or higher levels than observed in 1971 can be expected.

The physical characteristics of the Water Basin, when considered with land use activities, permitted interpretation of the various parameters of water contaminants monitored. Comparisons indicated the relationship of sub-surface chloride concentration to animal density on land, as reported by Jones (1973), was paralleled in the Portales Valley Water Basin. The existence of high numbers of fecal and total coliforms in the water of the Valley apparently negated the observation of the fluctuations in nitrate concentrations reported by Jones (1973). (Fecal and total coliforms are capable of reducing nitrate to the more insidious nitrite ion.) Nitrite was commonly found to exist in the range of 5 to 15 ppb in the Valley's aquifer water. However, levels of nitrate concentrations have been observed as high as 5000 ppb. Attempts to identify the sources of the observed pulses of high nitrite concentrations have not been successful. The pulses were traceable in movement with the general movement of water within the aquifer. The movement of nitrite pulses were at the same rates determined by other physical measurements of watertable movement rates.

Water movement within the aquifer was measured by use of fluorescein dye marker. The rate of movement was calculated to be over six miles per year. Channeling was not evident in the wells monitored by this method. Calculations using Darcy's law indicated (on the basis of State Engineer-provided coefficient of permeability) that the expected-to-observed time for observation of the tracer material were equal.

Core sampling in the various soil associations, and subsequent chemical analyses at various intervals, has indicated that zones of concentrations exist. These zones would be expected to move downward with available moisture during the past irrigation season. The dry season, which has followed the irrigation season, has prevented results from this hypothesis.

B. Publications

None

C. Project Status

Completed, Technical Completion Report submitted to WRRI.

ANNUAL REPORT - TRAINING AND EDUCATION ASPECTS
OF THE WATER RESEARCH PROGRAM UNDER P.L. 88379

Name of University: Information is for New Mexico State University where the Institute
(or College) is located unless other wise indicated. University of New Mexico =
UNM, New Mexico Institute of Mining and Technology=NMIMT *

Submit the information specified below for the University at which the Water Resources Research Institute or Center approved under P.L. 88-379 is located, and for other universities with which the Institute or Center is cooperating. Keep the statistics on enrollments, number of students graduating, employment status of graduates, new courses, etc., separate for each University. It is recognized certain of the requested data on students may not be readily available. If so, provide best estimate figures. In OW9, data on students are required only for those students who received employment as research project or program assistants through the P.L. 88-379 program. If extra space is needed, add pages and number each continuation item in the order shown below.

A. During period since last annual report was submitted provide information on:
(See footnote 1/ below.)

- (1) New water resources related courses developed. (Give title, state whether interdisciplinary, and give brief description of course. Please indicate if any of these were outgrowths of P.O. 88-379 program activities.)

None

- (2) Water resources related staff members added to fill new positions. (List highest degree obtained and scientific discipline. Indicate which ones received any salary from P.L. 88-379 funds. Do not list staff replacements.)

None

1/ Our intent here is to obtain information on improved academic capability for water resources research and training. Indicate for each position, research facility or other item, whether support was provided in whole or in part through P.L. 88-379 funds, or from other sources; however, also list improvements supported by State or other funds.

* New Mexico Highlands University = NMHU

A. (Continued)

- (3) Water resources related staff members employed to replace those who retired, died, or moved. (List highest degree obtained and scientific discipline. Indicate which ones received any salary from P.L. 88-379 funds.)

Ms. Kathleen E. Hain (B. S., Microbiology) replaced Mr. Bobby J. Creel as assistant to the director of the Institute.

- (4) New water resources research and training facilities other than research equipment items. (Include only major facilities such as new laboratories, buildings, etc.)

None

- (5) Interdepartmental interuniversity or regional agreements consummated with respect to improved research and training capabilities. (To be answered only by institutes under P.L. 88-379. If copies of such institute-related agreements have not been provided OWRR, please provide.

Interdepartmental, interuniversity agreement between New Mexico State University, University of New Mexico and New Mexico Institute of Mining and Technology, OWRR Project No. A-045-NMEX, "Analysis of Alternative Water Use Futures for the Rio Grande Region in New Mexico."

Interdepartmental, interuniversity agreement between Texas A & M University, New Mexico State University and University of New Mexico, OWRR Project No. B-046-NMEX, "Regional Water Management with Full Consumptive Use."

Interdepartmental, interuniversity agreement between New Mexico State University and New Mexico Institute of Mining and Technology, OWRR Project No. B-037, "An Interdisciplinary Analysis of the Water Resources of the High Plains of New Mexico."

Interdepartmental, Interuniversity agreement between New Mexico State University, University of New Mexico, OWRR Project No. B-032, "Analysis of Water Characteristics of Manufacturing Industries and their Adaptability to Semi-Arid Regions."

Regional Agreement between Texas A & M University, Texas Water Resources Institute, and New Mexico State University, Water Resources Institute, OWRR Project No. X-134, "Systematic Analysis of Priority Water Resources Problems to Develop Comprehensive Research Program for the Southern Plains River Basins Region."

Regional Agreement between Colorado State University, Environmental Resources Center, and New Mexico State University, Water Resources Research Institute, OWRR Project No. X-138, "Development of a Colorado River - Great Basin Regional Framework for Water Research."

Interdisciplinary, interuniversity, interagency Proposal submitted by New Mexico Water Resources Research Institute with Los Alamos Scientific Laboratory to Board of Educational Finance, State of New Mexico, WRRRI Proposal No. 023, "Feasibility Study for Establishment of Energy - Water Complex in the Tularosa Basin."

Interdisciplinary, interuniversity, interagency Proposal submitted by the New Mexico Water Resources Research Institute and New Mexico Environmental Institute to The Pan American Health Organization for final review, WRRRI Proposal No. 008, "Rio Grande Regional Environmental Project (A Preliminary Proposal for the Preparation of a Research Design that will Lead to the Development and Implementation of a Model Environmental Management Plan for an Interstate - International Region). "

B. Number of students receiving employment as research project or program assistants through the P.L. 88-379 program. (Include only those students both continuing and graduating, paid wholly or in part with P.L. 88-379 funds during the past fiscal year.)

<u>Category of Students</u>	<u>No. by Scientific Discipline or Major Field of Study (Engineering, Biology, Economics, etc. 2/</u>	
	<u>Scientific Discipline of Student</u>	<u>Number</u>
(1) <u>Undergraduates</u>	Agricultural Engineering	1
	Biology - UNM	1
	Biology/Chemistry - NMHU	1
	Civil Engineering	1
	Geology - NMIMT	2
	Range Science	1
(2) <u>Master's Students</u>	Biology	1
	Chemical Engineering	5
	Chemistry - NMHU	1
	Economics - UNM	3
	Education	1
	History	1
	Hydrology - NMIMT	2
	Industrial Engineering	1
	Political Science - UNM	1

B. (Continued)

Category of
Students

No. by Scientific Discipline or
Major Field of Study (Engineering,
Biology, Economics, etc.)

(3) Doctoral Students

	Number
Botany	1
City Planning - U. N. M.	1
Civil Engineering	1
Geochemistry - N.M.I.M.T.	1
Geology - N.M.I.M.T.	1
Horticulture	1
Hydrology - N.M.I.M.T.	1
Irrigation and Drainage	1
Soil Chemistry	1

(4) Postdoctoral Students

C. Employment status of majors in water-related fields who graduated during the school year ending about June and who receive P.L. 88-379 support.

EMPLOYMENT STATUS	CATEGORY OF SCHOOL YEAR GRADUATE BY DEGREE OBTAINED			
	Bachelor's Degree	Master's Degree	Doctoral Degree	Total
1. No. employed in water related positions in: Total-----				
Federal Agencies-----	()	()	()	()
State & Local Agencies-----	()	()	(1)	()
University or College-----	(1)	()	()	()
Other -- Including private enterprise-----	(1)	()	(1)	()
2. No. graduates returning to school for advanced degree -	1	1		
3. No. going into military service-----				
4. No. unemployed or working in other fields-----		1		
5. No. status unknown-----	2			
6. Totals-----	5	2	2	

C. Employment status of majors in water-related fields who graduated during the school year ending about June and who received P.L. 88-379 support.

Number of Graduates Engaged in Water-Related Work In:	CATEGORY OF SCHOOL YEAR GRADUATE BY DEGREE OBTAINED			
	Bachelor's Degree	Master's Degree	Doctoral Degree	Total
1A. Federal Agencies:				
a. Primarily Research-----				
b. Primarily Planning-----				
c. Primarily Development-----				
d. Primarily Operations-----				
e. Primarily Management-----				
f. Other or not known-----				
1B. State and Local Agencies:				
a. Primarily Research-----			1	
b. Primarily Planning-----				
c. Primarily Development-----				
d. Primarily Operations-----				
e. Primarily Management-----				
f. Other or not known-----				
1C. University or College: 3/				
a. Primarily Teaching-----				
b. Primarily Research-----	1			
c. Primarily Research & Teaching---				
d. Other or not known-----				
1D. Other - Including Private Enterprise:				
a. Primarily Research-----			1	
b. Primarily Planning-----				
c. Primarily Development-----				
d. Primarily Operations-----				
e. Primarily Management-----				
f. Other or not known-----	1			
TOTALS-----	2		2	

Selected summary of above data -- from the "Total" column:

Research (1Aa, 1Ba, 1Cb, 1Cc & 1Da)-----	3
Planning (1Ab, 1Bb & 1Db)-----	
Development (1Ac, 1Bc & 1Dc)-----	
Operations (1Ad, 1Bd & 1Dd)-----	
Management (1Ae, 1Be, & 1De)-----	

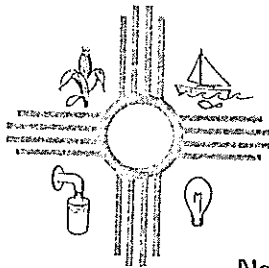
3/ Do not include here students working as research assistants and receiving course credits.

- E. Identify by name and discipline and briefly describe instances, if any, in which the institute program, in the past year, has resulted in individuals, other than students, doing research or teaching in the water resources field, who, previously, were not involved in water work.

None

- F. Cite any instances you know of, in which individuals who previously served as student research assistants on P.L. 88-379 projects, are now serving as professional investigators of P.L. 88-379 projects following graduation. Do not include individuals reported in this category last year or before.

None



New Mexico Water Resources Research Institute

New Mexico State University • Telephone (505) 646-4337 • Box 3167, Las Cruces, New Mexico 88003

July 26, 1974

Dr. Warren A. Hall
Acting Director
Office of Water Resources Research
Department of Interior
Washington, D. C. 20240


RE: TENTH ANNUAL REPORT

Dear Dr. Hall:

We are enclosing herewith eight copies of the Tenth Annual Report of the New Mexico Water Resources Research Institute, narrative portion only.

The financial information will be mailed before September 1.

Sincerely,


John W. Clark
Director

lk
encl.

NEW MEXICO WATER RESOURCES RESEARCH INSTITUTE

NEW MEXICO STATE UNIVERSITY

TENTH ANNUAL FINANCIAL REPORT

ANNUAL ALLOTMENT PROJECTS

and

MATCHING GRANT PROJECTS

FOR THE PERIOD

July 1, 1973 - June 30, 1974

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FY 1974 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

OWRR Project No. A- 043-NMEX
 NMSU Project No. 3109-054
 Annual Allotment Agreement
 No. 14-31-0001- 4031

Project Title:
 PREDICTING CONSUMPTIVE WATER WITH
 CLIMATOLOGICAL DATA

Principal Investigator(s)
 E. J. Gregory
 Eldon G. Hanson

Project Began--Month: July Yr: 19 73

Scheduled Completion--Month: June Yr: 19 75

Cost Categories to Which FY 1974 Federal Sec. 100 Funds Applied	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	10,700	10,604.67
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.10</u>	(2,300)	(2,304.00)
Other Prof. Staff - - - - - No. <u>1</u> Man-yrs <u>.35</u>	()	(2,964.00)
Grad. Student Assistants- - - - No. <u> </u> Man-yrs <u> </u> (Includes Student Technicians)	(4,200)	()
Undergrad. Student Assistants - No. <u>6</u> Man-yrs <u>.83</u> (Includes Student Technicians)	()	(3,398.62)
Technicians & Others- - - - - No. <u>6</u> Man-yrs <u>.58</u> (Non-Students)	(4,200)	(1,938.05)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -	600	637.60
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- -	1,000	1,030.70
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- -	3,870	3,897.03
Travel	(600)	(595.05)
Maintenance of Equipment	(375)	(379.58)
Duplication	(100)	(123.10)
Computer	(500)	(500.00)
Publication & Information Dissemination	(1,470.00)	(1,470.00)
Employee Benefits	(825)	(829.30)
E. TOTALS:- - - - -	16,170.00	16,170.00

FY 1974 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

OWRR Project No. A- 044-NMEX
 NMSU Project No. 3109-55
 Annual Allotment Agreement
 No. 14-31-0001- 4031

Project Title:
 EXPERIMENTAL CALIBRATION AND FIELD TEST OF
 THERMAL PROBE FOR IN-SITU GROUND WATER FLOW
 MEASUREMENTS
Principal Investigator(s)
 Marshall Reiter
 Allan Sanford

Project Began--Month: July Yr: 19 73

Scheduled Completion--Month: Dec. Yr: 19 74

Cost Categories to Which FY 1974 Federal Sec. 100 Funds Applied	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	6460.00	6460.00
Prin. Investigator - - - - - No. <u>2</u> Man-yrs <u>.13</u>	(2460.00)	(2460.00)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(4000.00)	()
Grad. Student Assistants- - - - - No. <u>1</u> Man-yrs <u>.85</u> (Includes Student Technicians)	()	(3313.27)
Undergrad. Student Assistants - No. <u>1</u> Man-yrs <u>.01</u> (Includes Student Technicians)	()	(70.88)
Technicians & Others- - - - - No. <u>2</u> Man-yrs <u>.11</u> (Non-Students)	()	(615.85)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -	650.00	650.00
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL- - -	450.00	450.00
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL- - -	3011.00	3011.00
<u>Travel</u>	(500.00)	(500.00)
<u>Machine Shop Charges</u>	(750.00)	(750.00)
<u>Publication and Information Dissemination</u>	(961.00)	(961.00)
<u>Employee Benefits</u>	(800.00)	(800.00)
_____	()	()
E. TOTALS: - - - - -	10,571.00	10,571.00

FY 1974 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

OWRR Project No. <u>A-045-NMEX</u> NMSU Project No. <u>3109-56</u> Annual Allotment Agreement No. <u>14-31-0001-4031</u>	Project Title: ANALYSIS OF ALTERNATIVE WATER USE FUTURES FOR THE RIO GRANDE REGION IN NEW MEXICO.. Principal Investigator(s) Robert R. Lansford, Shaul Ben-David, Thomas G. Gebhard, Jr., Lynn Gelhar, Bobby J. Creel
Project Began--Month: <u>July</u> Yr: 19 <u>73</u>	Scheduled Completion--Month: <u>Sept.</u> Yr: 19 <u>74</u>

<u>Cost Categories to Which FY 1974 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1974</u>	<u>Actual Expenditures FY 1974</u>
A. SALARIES & WAGES: TOTAL - - - - -	<u>6,250.00</u>	<u>6,250.00</u>
Prin. Investigator - - - - - No. <u>3</u> Man-yrs <u>.24</u>	(<u>5,700.00</u>)	(<u>4,545.00</u>)
Other Prof. Staff - - - - - No. <u>1</u> Man-yrs <u>.02</u>	()	(<u>300.44</u>)
Grad. Student Assistants- - - - - No. <u>1</u> Man-yrs <u>.12</u> (Includes Student Technicians)	()	(<u>447.00</u>)
Undergrad. Student Assistants - - - - - No. <u>1</u> Man-yrs <u>.10</u> (Includes Student Technicians)	()	(<u>294.95</u>)
Technicians & Others- - - - - No. <u>2</u> Man-yrs <u>.30</u> (Non-Students)	(<u>550.00</u>)	(<u>662.61</u>)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL- -	<u>700.00</u>	<u>645.26</u>
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL- -	<u>3,456.00</u>	<u>3,510.74</u>
<u>Travel</u>	(<u>1,500.00</u>)	(<u>1,500.00</u>)
<u>Manuscript Preparation and Duplication</u>	(<u>250.00</u>)	(<u>346.05</u>)
<u>Publication and Information Dissimination</u>	(<u>946.00</u>)	(<u>946.00</u>)
<u>Employee Benefits</u>	(<u>760.00</u>)	(<u>718.69</u>)
	()	()
E. TOTALS: - - - - -	<u>10,406.00</u>	<u>10,406.00</u>

FY 1974 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

OWRR Project No. A- <u>046-NMEX</u> NMSU Project No. <u>3109-57</u> Annual Allotment Agreement No. 14-31-0001- <u>4031</u>	<u>Project Title:</u> THE DETERMINATION OF CONTENT AND ORIGIN OF LEAD IN SURFACE AND GROUND WATERS IN NORTHEASTERN NEW MEXICO <u>Principal Investigator(s)</u> Anthony F. Gallegos Sigfredo Maestas
Project Began--Month: <u>July</u> Yr: 19 <u>73</u>	Scheduled Completion--Month: <u>Sept.</u> Yr: 19 <u>74</u>

Cost Categories to Which FY 1974 Federal Sec. 100 Funds Applied	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	6,832.00	7,245.83
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.25</u>	(4,000.00)	(3,069.00)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants- - - - - No. <u>1</u> Man-yrs <u>1.0</u> (Includes Student Technicians)	(2,832.00)	(4,079.03)
Undergrad. Student Assistants - No. <u>1</u> Man-yrs <u>.05</u> (Includes Student Technicians)	(_____)	(97.80)
Technicians & Others- - - - - No. _____ Man-yrs _____ (Non-Students)	(_____)	(_____)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -	500.00	100.00
C. EXPENDABLE PROPERTY:(Supplies,Materials, etc.)TOTAL- -	800.00	722.47
D. OTHER COSTS (SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL- -	1,968.00	2,031.70
Travel	(600.00)	(682.90)
Publication and Information Dissemination	(918.00)	(918.00)
Employee Benefits	(450.00)	(430.80)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. TOTALS:- - - - -	10,100.00	10,100.00

FY 1974 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

OWRR Project No. A- 047-NMEX
 NMSU Project No. 3109-58
 Annual Allotment Agreement
 No. 14-31-0001- 4031

Project Title:
 IMPROVED WASTEWATER TREATMENT IN ARID AREA

Principal Investigator(s)
 William Barkley

Project Began--Month: July Yr: 19 73

Scheduled Completion--Month: Dec. Yr: 19 74

<u>Cost Categories to Which FY 1974 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1974</u>	<u>Actual Expenditure FY 1974</u>
A. SALARIES & WAGES: TOTAL - - - - -	8,640.00	8,640.00
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.42</u>	(6,600.00)	(6,600.00)
Other Prof. Staff - - - - - No. <u>1</u> Man-yrs <u>.20</u>	()	(1,670.45)
Grad. Student Assistants- - - - - (Includes Student Technicians) No. <u> </u> Man-yrs <u> </u>	(2,040.00)	()
Undergrad. Student Assistants - (Includes Student Technicians) No. <u>1</u> Man-yrs <u>.04</u>	()	(369.55)
Technicians & Others- - - - - (Non-Students) No. <u> </u> Man-yrs <u> </u>	()	()
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL- -	500.00	497.90
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL- -	2,535.00	2,537.10
Travel	(500.00)	(500.00)
Computer	(50.00)	(50.00)
Publication and Information Dissimination	(1,061.00)	(1,061.00)
Employee Benefits	(924.00)	(924.00)
Duplication	()	(2.10)
E. TOTALS: - - - - -	11,675.00	11,675.00

FY 1974 ANNUAL REPORT -- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

OMRR Project No. A- 048-NMEX
 NMSU Project No. 3109-59
 Annual Allotment Agreement
 No. 14-31-0001- 4031

Project Title:
 CALCIUM CARBONATE EQUILIBRIA IN SOILS AND
 IRRIGATION WATERS

Principal Investigator(s)
 George O'Connor

Project Began--Month: July Yr: 19 73

Scheduled Completion--Month: June Yr: 1974

Cost Categories to Which FY 1974 Federal Sec. 100 Funds Applied	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	2,302.00	2,833.40
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.08</u>	(1,046.00)	(1,582.68)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(1,116.00)	(_____)
Grad. Student Assistants- - - - (Includes Student Technicians) No. <u>1</u> Man-yrs <u>.40</u>	(_____)	(1,137.44)
Undergrad. Student Assistants - (Includes Student Technicians) No. _____ Man-yrs _____	(_____)	(_____)
Technicians & Others- - - - - (Non-Students) No. <u>1</u> Man-yrs <u>.05</u>	(140.00)	(113.28)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL- -	279.00	41.90
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL- -	1,013.00	718.70
Travel	(98.00)	(185.30)
Computer	(279.00)	(_____)
Publication and Information Dissemination	(326.00)	(326.00)
Employee Benefits	(310.00)	(207.40)
_____	(_____)	(_____)
E. TOTALS: - - - - -	3,594.00	3,594.00

FY 1974 ANNUAL REPORT --- ANNUAL ALLOTMENT (Sec. 100) PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

OWRR Project No. A-052-NMEX
 NMSU Project No. 3109-063
 Annual Allotment Agreement
 No. 14-31-0001-4031

Project Title:
 SURVIVAL OF VIRUSES AND BACTERIA IN POLLUTED
 AND TURBID WATER
Principal Investigator(s)
 Robert T. O'Brien .

Project Began--Month: June Yr: 19 74

Scheduled Completion--Month: May Yr: 1975

Cost Categories to Which FY 1974 Federal Sec. 100 Funds Applied	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	6,798.00	6,798.00
Prin. Investigator - - - - - No. <u>1</u> Man-yrs <u>.13</u>	(3,390.00)	(3,390.00)
Other Prof. Staff - - - - - No. <u>1</u> Man-yrs <u>.02</u>	(428.00)	(428.00)
Grad. Student Assistants- - - - - No. <u>1</u> Man-yrs <u>.62</u> (Includes Student Technicians)	(2,980.00)	(2,980.00)
Undergrad. Student Assistants - No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Technicians & Others- - - - - No. _____ Man-yrs _____ (Non-Students)	(_____)	(_____)
B. NON-EXPENDABLE PROPERTY: TOTAL- - - - -		
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL- -	1,340.00	1,340.00
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL- -	1,862.00	1,862.00
<u>Employee Benefits</u>	(556.00)	(556.00)
<u>Travel</u>	(502.00)	(502.00)
<u>Publication and Information Dissemination</u>	(804.00)	(804.00)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. TOTALS: - - - - -	10,000.00	10,000.00

FY 1974 ANNUAL REPORT -- FOR THE INSTITUTE DIRECTOR'S OFFICE

State where institute is located: New Mexico Report as of June 30, 1974

Director's Name:

John W. Clark

Annual Allotment Agreement No. 14-31-0001- 4031

<u>Cost Categories to Which FY 1974 Federal Sec. 100 Funds Applied</u>	<u>Amount Budgeted FY 1974</u>	<u>Actual Expenditures FY 1974</u>
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	<u>27,243.00</u>	<u>27,757.80</u>
Institute Director: - - - - - Man-yrs: <u>.70</u>	<u>(18,927.00)</u>	<u>(19,399.80)</u>
Other Prof. Staff: - - - - - No. _____ - Man-yrs: _____	<u>(_____)</u>	<u>(_____)</u>
Graduate Student Assistants: - - No. _____ - Man-yrs: _____ (Includes Student Technicians)	<u>(_____)</u>	<u>(_____)</u>
Undergrad. Student Assistants: - No. _____ - Man-yrs: _____ (Includes Student Technicians)	<u>(_____)</u>	<u>(_____)</u>
Technicians & Others: - - - - - No. <u>1</u> - Man-yrs: <u>1.00</u> (Non-Students)	<u>(8,316.00)</u>	<u>(8,358.00)</u>
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u> - -	<u>1,400</u>	<u>218.83</u>
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u> - -	<u>8,841</u>	<u>9,507.37</u>
<u>Travel</u> - -	<u>(2,200)</u>	<u>(2,305.18)</u>
<u>Communications</u> - -	<u>(1,600)</u>	<u>(2,000.46)</u>
<u>Maintenance</u> - -	<u>(200)</u>	<u>(147.92)</u>
<u>Information Dissemination</u> - -	<u>(1,950)</u>	<u>(1,950.00)</u>
<u>Employee Benefits</u> - -	<u>(2,891)</u>	<u>(2,874.28)</u>
<u>Printing and Duplicating</u> - -	<u>(_____)</u>	<u>(60.32)</u>
<u>Membership Periodicals</u> - -	<u>(_____)</u>	<u>(169.21)</u>
E. <u>TOTALS: - - - - -</u>	<u>37,484</u>	<u>37,484.00</u>

FY 1974 ANNUAL REPORT -- FOR THE INSTITUTE DIRECTOR'S OFFICE

Estimated Functional Distribution of FY 1974 Allotment (Sec. 100) Funds
Expended for Operation of the Office of the Institute Director

1. Research program (P.L. 88-379) planning and development, including review and analysis of research project proposals - - -	\$ <u>14,000.00</u>
2. Coordinating the approved Institute P.L. 88-379 research and related training activities, including evaluation of progress, coordination with State agencies, etc. - - - - -	\$ <u>10,000.00</u>
3. Water research and training program symposia relating to current or projected P.L. 88-379 activity but not directly associated with (or included in) the budgets of specific projects - - - - -	\$ <u>1,000.00</u>
4. Information Dissemination	8,000.00
5. Research Conferences	1,000.00
6.	
7.	
8. Administrative expenses, including such housekeeping activities as the preparation of Institute time and attendance reports, requisitioning miscellaneous office supplies and equipment, operating Institute mails and files systems, general Institute record keeping, etc. - - - - -	\$ <u>3,484.00</u> ^{1/}
TOTAL Expenses for the Institute Director's Office - - - - -	\$ <u>37,484.00</u> ^{2/}

^{1/} If a cost of the Institute Director's Office can be attributed to a research program activity, such as described in items 1, 2, and 3 above, then that cost should be included in that program activity and not as "administrative expenses". For example, that portion of the Institute Director's salary cost, as well as related stenographic-clerical costs, that are attributable to program planning and development activity of the Office of the Institute Director should be included in item 1 above rather than in item 8 above.

^{2/} This dollar figure should be equal to the total "actual expenditures FY 1974 as shown in line "E" of Form OW-3, FY 1974 Annual Report--For the Institute Director's Office.

SUMMARY SHEET FOR FY 1974 ANNUAL ALLOTMENT PROGRAM (SEC. 100) EXPENDITURES

Summary of information from forms OW-2 and OW-3 covering Institute Director's Office and annual allotment program projects utilizing FY 1974 allotment program (Sec. 100) funds

State: New Mexico Total no. of allotment projects underway, FY 1974: 7
 Of these, indicate no. completed during year, if any: 1 1/

Annual Allotment Agreement No. (FY1974): 14-31-0001

Cost Categories to Which FY1974 Federal Sec. 100 Funds Applied	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	75,225.00	76,589.70
Institute Director - - - - - Man-yrs <u>.70</u> - (<u>18,927.00</u>)	(18,927.00)	(19,399.80)
Principal Investigators - - - - - No. <u>10</u> Man-yrs <u>1.35</u> - (<u>25,496.00</u>)	(25,496.00)	(23,950.68)
Other Professional Staff - - - - - No. <u>4</u> Man-yrs <u>.59</u> - (<u>5,544.00</u>)	(5,544.00)	(5,362.89)
Graduate Student Assistants - - - - - No. <u>5</u> Man-yrs <u>2.99</u> - (<u>12,052.00</u>)	(12,052.00)	(11,956.74)
(Includes Student Technicians)		
Undergrad. Student Assistants: - - - - - No. <u>10</u> Man-yrs <u>1.03</u> - ()	()	(4,231.80)
(Includes Student Technicians)		
Technicians & Others - - - - - No. <u>12</u> Man-yrs <u>2.04</u> - (<u>13,206.00</u>)	(13,206.00)	(11,687.79)
(Non-students)		
B. NON-EXPENDABLE PROPERTY: TOTAL - - - - -	1,750.00	1,387.60
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.)-TOTAL - -	6,469.00	4,947.06
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.)-TOTAL - -	26,556.00	27,075.64
Travel - - - - - (<u>6,500.00</u>)	(6,500.00)	(6,770.43)
Maintenance of equipment - - - - - 575.00	575.00	527.50
Duplication, Manuscript preparation - - - - - (<u>350.00</u>)	(350.00)	(531.57)
Computer - - - - - 829.00	829.00	550.00
Communication - - - - - (<u>1,600.00</u>)	(1,600.00)	(2,000.46)
Membership Periodicals - - - - - (<u>750.00</u>)	(750.00)	(169.21)
Machine Shop Charge - - - - - (<u>750.00</u>)	(750.00)	(750.00)
Publication and Information Dissemination - - - - - (<u>8,436.00</u>)	(8,436.00)	(8,436.00)
Employee Benefits - - - - - (<u>7,516.00</u>)	(7,516.00)	(7,340.47)
E. TOTALS 2/ - - - - -	110,000.00	110,000.00

1/ The OWRR Project numbers for completed annual allotment projects are as follows:
 A-048-NMEX

2/ Ordinarily, the Total of "Amount Budgeted FY 1974" should equal the total FY allotment.

FY 1974 ANNUAL REPORT -- ESTIMATE OF NON-FEDERAL CONTRIBUTIONS
(Relating to Annual Allotment Program)

State: New Mexico

Report covering FY 1974

The legislative history leading to passage of the Water Resources Research Act of 1964 emphasizes the importance of State-Federal cooperation in the conduct of the program and indicates that there will be substantial amounts of non-Federal cost participation in the FY 1974 research and training activities carried out pursuant to your institute's FY 1974 annual allotment, Sec. 100, program.

The following types of non-Federal cost participation items are suggested for your consideration. Use these, or others, as you deem appropriate.

1.	Estimate non-Federal contributions to salaries and wages of professional staff who participated in the FY 1974 annual allotment, Sec. 100, program: - - - - -	\$ 50,000.00
2.	Estimated non-Federal contribution to indirect costs and employee fringe benefits relating to the FY 1974 annual allotment, Sec. 100, program: - - - - -	\$ 30,000.00
3.	Estimated FY 1974 fair-use value non-Federal contribution relating to equipment, facilities, etc., used in the FY 1974 annual allotment, Sec. 100, program: - - - - -	\$ 85,000.00
4.	State Appropriation to WRRI in Addition to the above amounts	118,000.00
5.		
6.		
7.		
	<u>TOTAL</u> - - - - -	\$ 283,000.00

FY 1974 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1974

OWRR Proj. No. B- <u>029-NMEX</u>	Project Title: UTILIZATION OF WATER IN A SEMI-ARID REGION
NMSU Proj. No. <u>3109-132</u>	
Matching Grant Agreement Number 14-31-0001- <u>3619</u>	
Total Federal Amount of the M.G.A. -- \$ <u>14,686.00</u>	

Principal Investigator(s): H. Dale Fuehring

Proj. Began-Mo: July ;Yr: 1971 ; Actual or Scheduled Completion--Mo: June ;Yr: 1975

Cost Categories Man-Year Information FY 1974 ^{1/}	Expenditures in FY 1974		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	4,208.00	918.03	5,126.03
Principal Investigator(s) - - - - -	(3,480.00)	()	(3,480.00)
No: <u>1</u> Man-Years: <u>.20</u>			
Other Professional Staff: - - - - -	()	()	()
No: _____ Man-Years: _____			
Graduate Student Assistants: - - - - -	()	()	()
(Includes Student Technicians)			
No: _____ Man-Years: _____			
Undergrad. Student Assistants - - - - -	()	()	()
(Includes Student Technicians)			
No: _____ Man-Years: _____			
Technicians & Others - - - - -	(728.00)	(918.03)	(1,646.03)
(Non-students)			
No: <u>2</u> Man-Years: <u>.17</u>			
B. NON-EXPENDABLE PROPERTY - - - - -		715.00	715.00
C. EXPENDABLE PROPERTY: - - - - -			
(Supplies, Materials)		723.37	723.37
D. OTHER COSTS (SPECIFY): TOTAL - - - - -			
(Travel, Indirect costs, Etc.)		2,845.01	2,845.01
Computer - - - - -	()	(17.62)	(17.62)
Travel - - - - -	()	(150.00)	(150.00)
Indirect Costs - 41% of 5,126.03 - - - - -	()	(2,101.67)	(2,101.67)
Employee Benefits - - - - -	()	(575.72)	(575.72)
E. TOTALS FOR FY 1974 - - - - -	4,208.00	5,201.41	9,409.41

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1974 - - Federal-\$ 12,624.00 Non-Fed.\$ 15,477.92

1/ Man-Years relate to time paid from Federal funds only.

FY 1974 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1974

OWRR Proj. No. B- <u>032-NMEX</u>	Project Title: ANALYSIS OF THE CHARACTERISTICS OF MANUFACTURING INDUSTRIES AND THERE ADAPTABILITY TO SEMI-ARID REGIONS
NMSU Proj. No. <u>3109-139</u>	
Matching Grant Agreement Number <u>14-31-0001-</u> <u>3620</u>	
Total Federal Amount of the M.G.A. -- \$ <u>20,000.00</u>	

Principal Investigator(s): Harry G. Folster, Shaul Ben-David

Proj. Began-Mo: July ;Yr:19 71; Actual or Scheduled Completion--Mo: June ;Yr:19 74

Cost Categories Man-Year Information FY 1974 ^{1/}	Expenditures in FY 1974		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	2,834.17	858.08	3,692.25
Principal Investigator(s)- - - - -	(955.50)	()	(955.50)
No: <u>1</u> Man-Years: <u>.05</u>			
Other Professional Staff:- - - - -	(1,230.00)	()	(1,230.00)
No: <u>2</u> Man-Years: <u>.16</u>			
Graduate Student Assistants: - - - - -	(648.67)	(858.08)	(1,506.75)
(Includes Student Technicians)			
No: <u>3</u> Man-Years: <u>.24</u>			
Undergrad. Student Assistants- - - - -	()	()	()
(Includes Student Technicians)			
No: _____ Man-Years: _____			
Technicians & Others - - - - -	()	()	()
(Non-students)			
No: _____ Man-Years: _____			
B. NON-EXPENDABLE PROPERTY- - - - -			
C. EXPENDABLE PROPERTY: - - - - -			
(Supplies, Materials)		266.94	266.94
D. OTHER COSTS (SPECIFY): TOTAL - - - - -			
(Travel, Indirect costs, Etc.)		2,132.11	2,132.11
Duplication - - - - -	()	(38.65)	(38.65)
Travel - - - - -	()	(214.00)	(214.00)
Indirect Costs - 41% X 3,692.25 - - - - -	()	(1,513.82)	(1,513.82)
Employee Benefits - - - - -	()	(175.64)	(175.64)
Manuscript Preparation - - - - -	()	(190.00)	(190.00)
E. TOTALS FOR FY 1974 - - - - -	2,834.17	3,257.13	6,091.30

F. Cumulative Total Project Expenditures from Start of Project to June 30, 1974 - - Federal-\$ 20,000.00 Non-Fed.\$ 20,423.05

1/ Man-Years relate to time paid from Federal funds only.

FY 1974 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1974

OWRR Proj. No. B- <u>038-NMEX</u>	Project Title: AQUIFER PARAMETERS BY A CHEMICAL TRACER TECHNIQUE
NMSU Proj. No. <u>3109-140</u>	
Matching Grant Agreement Number 14-31-0001- <u>3914</u>	
Total Federal Amount: of the M.C.A. -- \$ <u>17,445.00</u>	

Principal Investigator(s): Vernon LeFebre, Gale Billings, G. W. Gross

Proj. Began-Mo: July; Yr: 1972; Actual or Scheduled Completion--Mo: Dec.; Yr: 1974

Cost Categories Man-Year Information FY 1974 ^{1/}	Expenditures in FY 1974		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	3,339.73	1,175.89	4,515.62
Principal Investigator(s) - - - - -	(1,633.31)	()	(1,633.31)
No: <u>1</u> Man-Years: <u>.10</u>	()	()	()
Other Professional Staff: - - - - -	()	()	()
No: <u> </u> Man-Years: <u> </u>	()	()	()
Graduate Student Assistants: - - - - -	(1,706.42)	(826.89)	(2,533.31)
(Includes Student Technicians)			
No: <u>3</u> Man-Years: <u>.55</u>	()	(349.00)	(349.00)
Undergrad. Student Assistants- - - - -	()	()	()
(Includes Student Technicians)			
No: <u> </u> Man-Years: <u> </u>	()	()	()
Technicians & Others - - - - -	()	()	()
(Non-students)			
No: <u> </u> Man-Years: <u> </u>			
B. NON-EXPENDABLE PROPERTY- - - - -			
C. EXPENDABLE PROPERTY: - - - - -		371.96	371.96
(Supplies, Materials)			
D. OTHER COSTS (SPECIFY): TOTAL - - - - -		2,218.22	2,218.22
(Travel, Indirect costs, Etc.)			
Employee Benefits - - - - -	()	(211.82)	(211.82)
Indirect Costs - 41% of 4,515.62 - - - - -	()	(1,851.40)	(1,851.40)
Travel - - - - -	()	(155.00)	(155.00)
- - - - -	()	()	()
E. TOTALS FOR FY 1974 - - - - -	3,339.73	3,766.07	7,105.80

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1974 - - Federal-\$ 11,594.65 Non-Fed.\$ 12,020.98

1/ Man-Years relate to time paid from Federal funds only.

FY 1974 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1974

OWER Proj. No. B- 037-NMEX	Project Title: A INTERDISCIPLINARY ANALYSIS OF THE WATER RESOURCE THE HIGH PLAINS OF NEW MEXICO
NMSU Proj. No. 3109-142	
Matching Grant Agreement Number 14-31-0001- 3921	
Total Federal Amount of the M.G.A. -- \$ <u>26,500.00</u>	

Principal Investigator(s): Robert R. Lansford, Bobby J. Creel, Willem Brutsaert

Proj. Began-No: July ;Yr:19 72; Actual or Scheduled Completion--No: Dec. ;Yr:1974

Cost Categories	Expenditures in FY 1974		
	Federal \$	Non-Fed.\$	Total \$
Man-Year Information FY 1974 <u>1/</u>			
A. SALARIES & WAGES: TOTAL - - - - -	2,570.22	329.75	2,899.97
Principal Investigator(s)- - - - -	()	()	()
No: _____ Man-Years: _____			
Other Professional Staff:- - - - -	()	()	()
No: _____ Man-Years: _____			
Graduate Student Assistants: - - - -	(2,040.52)	()	(2,040.52)
(Includes Student Technicians)			
No: <u>2</u> Man-Years: <u>.50</u>			
Undergrad. Student Assistants- - - -	(252.45)	()	(252.45)
(Includes Student Technicians)			
No: <u>2</u> Man-Years: <u>.05</u>			
Technicians & Others - - - - -	(277.25)	(329.75)	(607.00)
(Non-students)			
No: _____ Man-Years: _____			
B. NON-EXPENDABLE PROPERTY- - - - -			
C. EXPENDABLE PROPERTY: - - - - -			
(Supplies, Materials)		20.34	20.34
D. OTHER COSTS (SPECIFY): TOTAL - - - -			
(Travel, Indirect costs,Etc.)		2,220.14	2,220.14
Travel	()	(889.39)	(889.39)
Indirect Costs 41% of 2,899.97	()	(1,188.98)	(1,188.98)
Employee Benefits	()	(38.09)	(38.09)
Computer	()	(103.68)	(103.68)
E. TOTALS FOR FY 1974 - - - - -	2,570.22	2,570.23	5,140.45

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1974 - - Federal-\$ 24,946.55 Non-Fed.\$ 25,792.39

1/ Non-Years relate to time paid from Federal funds only.

FY 1974 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1974

OWRR Proj. No. B- <u>040-NMEX</u>	Project Title: WATER USE AND URBAN DEVELOPMENT IN THE ALBUQUERQUE, NEW MEXICO, S.M.A.: A STUDY OF USER PRACTICES, ATTITUDES AND PRIORITIES
NMSU Proj. No. <u>3109-148</u>	
Matching Grant Agreement Number <u>14-31-0001-4106</u>	
Total Federal Amount of the M.G.A. -- \$ <u>16,226.00</u>	

Principal Investigator(s):
Peter Lupsha

Proj. Began-Mo: July ;Yr: 1973 ; Actual or Scheduled Completion--Mo: June ;Yr: 1975

Cost Categories	Expenditures in FY 1974		
	Federal \$	Non-Fed.\$	Total \$
Man-Year Information FY 1974 <u>1/</u>			
A. SALARIES & WAGES: TOTAL - - - - -	7,988.00	862.00	8,850.00
Principal Investigator(s) - - - - -	(6,044.45)	()	(6,044.45)
No: <u>1</u> Man-Years: <u>.33</u>			
Other Professional Staff: - - - - -	()	()	()
No: _____ Man-Years: _____			
Graduate Student Assistants: - - - - -	(1,943.55)	(862.00)	(2,805.55)
(Includes Student Technicians)			
No: <u>1</u> Man-Years: <u>1.0</u>			
Undergrad. Student Assistants- - - - -	()	()	()
(Includes Student Technicians)			
No: _____ Man-Years: _____			
Technicians & Others - - - - -	()	()	()
(Non-students)			
No: _____ Man-Years: _____			
B. NON-EXPENDABLE PROPERTY- - - - -			
C. EXPENDABLE PROPERTY: - - - - -			
(Supplies, Materials)		861.00	861.00
D. OTHER COSTS (SPECIFY): TOTAL - - - - -			
(Travel, Indirect costs, Etc.)		6,270.00	6,270.00
Manuscript Preparation		250.00	250.00
Travel	()	(5.00)	(5.00)
Computer		800.00	800.00
Indirect Cost - 41% of 8,850.00 -	()	(3,629.00)	(3,629.00)
Employee Benefits	()	(1,086.00)	(1,086.00)
Publication & Information Dissemination	()	(500.00)	(500.00)
E. TOTALS FOR FY 1974 - - - - -	7,988.00	7,993.00	15,981.00

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1974 - - Federal-\$ 7,988.00 Non-Fed.\$ 7993.00

1/ Man-Years relate to time paid from Federal funds only.

FY 1974 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1974

OWRR Proj. No. B- <u>041-NMEX</u>	Project Title: APPLICATION OF ENVIRONMENTAL TRITIUM IN THE MEASUREMENT OF RECHARGE AND AQUIFER PARAMETERS IN A SEMI-ARID LIMESTONE TERRAIN
NMSU Proj. No. <u>3109-149</u>	
Matching Grant Agreement Number 14-31-0001- <u>4107</u>	
Total Federal Amount of the M.G.A. -- \$ <u>19,276.00</u>	

Principal Investigator(s): G. W. Gross, D. D. Rabinowitz

Proj. Began-Mo: July ;Yr: 1973 ; Actual or Scheduled Completion--Mo: June ;Yr: 1975

Cost Categories	Expenditures in FY 1974		
	Federal \$	Non-Fed.\$	Total \$
Man-Year Information FY 1974 <u>1/</u>			
A. SALARIES & WAGES: TOTAL - - - - -	5,529.44	165.50	5,694.94
Principal Investigator(s) - - - - -	(4,579.19)	()	(4,579.19)
No: <u>1</u> Man-Years: <u>.35</u>			
Other Professional Staff: - - - - -	(380.90)	()	(380.90)
No: <u>1</u> Man-Years: <u>.10</u>			
Graduate Student Assistants: - - - - -	(569.35)	(58.85)	(628.20)
(Includes Student Technicians)			
No: <u>1</u> Man-Years: <u>.30</u>			
Undergrad. Student Assistants - - - - -	()	(106.65)	(106.65)
(Includes Student Technicians)			
No: _____ Man-Years: _____			
Technicians & Others - - - - -	()	()	()
(Non-students)			
No: _____ Man-Years: _____			
B. NON-EXPENDABLE PROPERTY - - - - -			
C. EXPENDABLE PROPERTY: - - - - -			
(Supplies, Materials)		1,332.97	1,332.97
D. OTHER COSTS (SPECIFY): TOTAL - - - - -			
(Travel, Indirect costs, Etc.)		4,030.96	4,030.96
Travel - - - - -	()	(100.00)	(100.00)
Publication & Information Dissemination - - - - -	()	(1,000.00)	(1,000.00)
Employee Benefits - - - - -	()	(596.04)	(596.04)
Indirect Costs 41% of 5,694.94 - - - - -	()	(2,334.92)	(2,334.92)
E. TOTALS FOR FY 1974 - - - - -	5,529.44	5,529.43	11,058.87

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1974 - Federal-\$ 5,529.44 Non-Fed.\$ 5,529.43

1/ Man-Years relate to time paid from Federal funds only.

FY 1974 ANNUAL REPORT - MATCHING GRANT (SEC. 101) PROJECT

State where institute located: New Mexico Report as of June 30, 1974

OEER Proj. No. B- <u>046-NMEX</u>	Project Title: REGIONAL WATER MANAGEMENT WITH FULL COMSUPTIVE USE
NMSU Proj. No. <u>3109-154</u>	
Matching Grant Agreement Number 14-31-0001- <u>4164</u>	
Total Federal Amount of the M.G.A. -- \$ <u>50,000.00</u>	

Principal Investigator(s): Robert R. Lansford, John W. Adams, Shaul Ben-David, Donald L. Reddell

Proj. Began-No: Jan.; Yr: 1974; Actual or Scheduled Completion--Mo: Dec.; Yr: 1975

Cost Categories Man-Year Information FY 1974 <u>1/</u>	Expenditures in FY 1974		
	Federal \$	Non-Fed.\$	Total \$
A. SALARIES & WAGES: TOTAL - - - - -	3,254.68	112.17	3366.85
Principal Investigator(s) - - - - -	(3,000.00)	()	(3000.00)
No: <u>1</u> Man-Years: <u>.30</u>			
Other Professional Staff: - - - - -	()	()	()
No: _____ Man-Years: _____			
Graduate Student Assistants: - - - - -	(254.68)	(106.57)	(361.25)
(Includes Student Technicians)			
No: <u>1</u> Man-Years: <u>10</u>			
Undergrad. Student Assistants - - - - -	()	(5.60)	(5.60)
(Includes Student Technicians)			
No: _____ Man-Years: _____			
Technicians & Others - - - - -	()	()	()
(Non-students)			
No: _____ Man-Years: _____			
B. <u>NON-EXPENDABLE PROPERTY</u> - - - - -			
C. <u>EXPENDABLE PROPERTY</u> : - - - - - (Supplies, Materials)			
D. <u>OTHER COSTS (SPECIFY): TOTAL</u> - - - - - (Travel, Indirect costs, Etc.)	3,000.00	1,904.35	4,904.35
* Federal Funds - Texas A & M	(3,000.00)	(3.71)	(3,000.00)
Communications			
Travel	()	(143.00)	(143.00)
Employee Benefits	()	(377.23)	(377.23)
Indirect Costs 41% of 3,366.85	()	(1,380.41)	(1,380.41)
E. TOTALS FOR FY 1974 - - - - -	6,254.68	2,016.52	8,271.20

F. Cumulative Total Project Expenditures from
Start of Project to June 30, 1974 - - Federal-\$ 6,254.68 Non-Fed.\$ 2,016.52

1/ Man-Years relate to time paid from Federal funds only.

* Payment of Federal Funds to Texas A&M in accordance with project contract. 1974

SUMMARY SHEET FOR MATCHING GRANT (Sec. 101) PROGRAM ACTIVITIES - FY 1974

This sheet provides summary information covering all Sec. 101 projects in progress during FY 1974 using FY 1974 or prior years Sec. 101 funds. Hence, it is a summarization of information set forth on the separate project report forms OW-7

State: New Mexico Total No. of Sec. 101 Projects in Progress During FY 1974 _____

Cost Categories
Man-Year Information FY 1974

Expenditures in FY-1974		
Federal	Non-Fed.	Total
29,724.24	4,421.42	34,145.66
(19,692.45)	()	(19,692.45)
(1,610.90)	()	(1,610.90)
(7,163.19)	(2,712.39)	(9,875.58)
(252.45)	(461.25)	(713.70)
1,005.25	1,247.78	2,253.03
	715.00	715.00
	3,576.58	3,576.58
3,000.00	21,620.79	24,620.79
()	(1,656.39)	(1,656.39)
(// // // // //)	(14,000.20)	(14,000.20)
(// // // // //)	(3,060.54)	(3,060.54)
()	(921.30)	(921.30)
()	(38.65)	(38.65)
()	(440.00)	(440.00)
()	(1,500.00)	(1,500.00)
()	(3.71)	(3.71)
(3,000.00)	()	(3,000.00)
()	()	()
32,724.24	30,333.79	63,058.03

- A. SALARIES & WAGES: TOTAL - - - - -
- Principal Investigator(s) - - - - -
- No. 6 Man-Years: 1.33
- Other Professional Staff: - - - - -
- No. 3 Man-Years: .26
- Graduate Student Assistants: - - - - -
- Includes Student Technicians
- No. 8 Man-Years: 2.69
- Undergrad. Student Assistants: - - - - -
- Includes student technicians
- No. 2 Man-Years: .05
- Technicians & Others: - - - - -
- Non-students
- No. 3 Man-Years: .27

B. NON-EXPENDABLE PROPERTY: - - - - -

C. EXPENDABLE PROPERTY: - - - - -

D. OTHER COSTS (SPECIFY): TOTAL, - - - - -

- Travel - - - - -
- Indirect (overhead) - - - - -
- Employee benefits - - - - -
- Computer - - - - -
- Duplication - - - - -
- Manuscript Preparation - - - - -
- Publication & Information Dissemination - - - - -
- Communication - - - - -
- * Federal Funds - Texas A&M - - - - -
- Other Miscellaneous Costs: - - - - -

E. TOTALS FOR FY 1974: - - - - -

F. Cumulative Total Sec. 101 Expenditures from Start of Projects to June 30, 1974: -Federal--\$ _____; Non-Fed-\$ _____

* Payment of Federal Funds to Texas A&M in accordance with project contract.

Annual Report - Title II Project

Grant Project Number: <u>C-4060</u>	Funding Agreement Number: <u>14-31-0001-9012</u>	Report as of: <u>June 30, 1974</u>
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Name of Performing Organization: Water Resources Research Institute New Mexico State University Box 3167 Las Cruces, New Mexico 88003	Title of Project: REDUCTION OF PEAK WATER CONSUMPTION IN URBAN AREAS
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Status of Project as of Reporting Date: Completed : In Progress

Total Est. Proj. Cost: Fed. Funds: \$82,467.00 ; Non-Fed. Funds (if any): \$ 9,034.00

Project Cost Information (7/1/73 through 6/30/74)^{1/}

<u>Cost Categories</u> ^{2/}	<u>Supported From:</u>	
	<u>Federal Funds</u>	<u>Non-Fed. Funds</u> ^{3/}
Direct Salaries and Wages - - - - -	\$ 23,022.36	\$ 2,845.37
Employee Benefits (if not included elsewhere) - - -	1,887.44	233.20
Use, Rental or Depreciation Costs Included as Direct Charges - - - - -		
Non-Expendable Equipment - - - - -		
Expendable Equipment, Material & Supplies - - - - -	919.17	113.60
Travel Costs Included as Direct Charges - - - - -	144.10	17.80
Other Direct Charges (Specify):		
Freight on Probe sent for repairs - - - - -	17.14	2.11
Computer Use - - - - -	176.80	21.85
Publication and Information Dissemination - - -	178.00	22.00
Indirect Costs - - - - -	9,438.41	1,166.54
Other Costs (Specify):		
TOTALS - - - - -	35,783.42	4,422.47

1/ If necessary, project costs may be estimated.
 2/ Whenever possible, provide costs for categories listed. If cost categories other than those shown above are used, provide concise explanations as may be deemed necessary to insure proper understanding of the content of such costs.
 3/ Estimates for "Non-Fed. Funds" (\$ value of non-Federal contributions) should be provided if non-Federal contributions were contemplated by the funding agreement.

Comments:

ANNUAL REPORT - TITLE II PROJECT

OWRR Project Number: C- 4060	Funding Agreement Number: 14-31 -0001-9012	Date of Report: August 12, 1974
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Name of Performing Organization: Water Resources Research Institute New Mexico State University Box 3167 Las Cruces, New Mexico 88003	Title of Project: REDUCTION OF PEAK WATER CONSUMPTION IN URBAN AREAS
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Project Personnel and Student Training Information

<u>Surnames of:</u> <u>Principal Investigator(s):</u>	<u>Degree</u> <u>(If Any)</u>	<u>Scientific Discipline</u> <u>or Academic Background</u>
Cotter	Ph. D.	Vegetable Physiology
Professional Associates:		
Clark	C. E.	Civil Engineering
Croft	Ph. D.	Research and Design
Reeves	M. S.	Horticulture
Student Assistants (if any): 1/		
Hughes	M. S.	Botany
Craves	B. S.	Biology
Winkles	B. S.	Education

1/ Includes research assistants who are currently registered as university or college students. State research institutes participating in the Title I program should include (incorporate) Title II student information in Form OW-9 used for Title I reporting.

Training of Water Resource Scientists and Engineers. In the space below, and as may be appropriate, provide statements of the extent to which currently registered college and university students participated as research assistants on the project. Objective is to indicate how the P.L. 88-379 program is contributing to the training of water resource scientists and engineers -- a principal objective of the Act.

ANNUAL REPORT - TITLE II PROJECT

Name of Reporting Official: <u>John W. Clark</u>	Date of Report: <u>August 12, 1974</u>
Name of Performing Organization: <u>Water Resources Research Institute New Mexico State University Box 3167 Las Cruces, New Mexico 88003</u>	OWRR Project Number: <u>C- 4060</u> Funding Agreement Number: <u>14-31 -0001-9012</u> FCST Research Category as Shown on NRP: <u>III D</u>

Title of Project: REDUCTION OF PEAK WATER CONSUMPTION IN URBAN AREAS

Principal Investigator(s): Dr. Donald J. Cotter

- A. RESEARCH PERFORMANCE AND APPLICATION OF RESULTS. In the space below, using additional sheets as necessary, provide information relating to the three items listed below. Normally, 500 or less words should be adequate. Lay language preferred.
- (1) Research Accomplished. Describe research accomplished and the findings, results and conclusions relating thereto.
 - (2) Application of Results. Provide examples of application of research results, when possible, or statements as to how the findings may be useful in water management or conservation.
 - (3) Work Remaining. Provide statements of work remaining to be accomplished.
(Note: If the project was completed during the fiscal year ending June 30, 1973 and a final report has been submitted, please make reference to this fact but complete items A-(1), A-(2), and C of this form OW-28 and also forms OW-26 and OW-27 to assist OWRR in compiling annual report information.)

A (1) Research accomplished

The major thrust of activities for the project during 1973-74 has centered about testing and refinement, and subsequent application of the residential landscape description questionnaire (RLDQ) to urban residential landscapes. Water usage data was available for most of the landscapes evaluated. The instrument met semantic and statistical criteria and had a very high reliability. Results now show that the RLDQ can be used in identifying attributes of a landscape which contribute to its overall beauty and those which lead to less water to maintain the landscape. The following four areas are measured by RLDQ: harmony, composition, accent and uniqueness. Uniqueness correlated negatively with landscape water use per square foot. Composition negatively correlated with total gallons applied to a landscape.

The progress on obtaining definitive data on the knowledge about water usage by urban dwellers is currently under way. Two completed preliminary studies show consumers do not have sufficient knowledge of how to use water wisely. For example, luxuriant water users consider themselves to be good stewards of water, that is, those consumers who felt they could not conserve water in their landscapes used twice as much water on their landscapes as those who felt they could conserve water. Programs for the conservation of water on New Mexico State University Campus has been developed and implemented. To date, water savings of 37% on fescue and 11% on hybrid bermuda have been achieved on campus.

Cooperative arrangements with Las Cruces Municipal Water and Utilities Department are under way for the purpose of counseling with high water users and encouraging adaption of conservation measures.

A (2) Application of Results

The results obtained to date suggest that a means of reducing urban water usage lies in the area of consumer education. Application of RLDQ would identify specific landscape attributes which conserve water.

A (3) Work Remaining

1. The analysis of data currently under way, is nearing completion.
2. Completion of final report.

ANNUAL REPORT -- TITLE II PROJECT (Cont'd)

OWRR Research Project Number: C- 4060

Date of Report: August 12, 1974

Title of Project:

REDUCTION OF PEAK WATER CONSUMPTION IN URBAN AREAS

B. Project-Related Publications. In the space below, provide a listing by title, author, volume, page number, etc., of project-related publications or reports issued, and papers prepared. (Complete & accurate citations will be greatly appreciated.) Do not include unpublished progress reports submitted to OWRR pursuant to provisions of the funding agreement.

Cotter, D. J. and Fabian Chavez. Factors affecting water application rates and urban landscapes, Journal ASHS, accepted for publication April, 1974.

FY 1974 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico

Report as of June 30, 1974

Project Title:

CROPLAND USES AND AGRICULTURAL WATER DEPLETIONS
IN NEW MEXICO

Principal Investigator(s)

R. R. Lansford

NMSU Project No. - - 3109-134

Project Began--Month: July Yr: 1972

Scheduled Completion--Month: Dec. Yr: 1974

	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	3,055.00	3,043.13
Prin. Investigators- - - - -No. <u>1</u> Man-yrs <u>.03</u>	(1,819.00)	(1,845.00)
Other Prof. Staff - - - - -No. <u>1</u> Man-yrs <u>.06</u>	(1,236.00)	(751.13)
Grad. Student Assistants - - - -No. <u>1</u> Man-yrs <u>.12</u> (Includes Student Technicians)		447.00
Undergrad. Student Assistants- - -No. <u> </u> Man-yrs <u> </u> (Includes Student Technicians)	(<u> </u>)	(<u> </u>)
Technicians & Others - - - - -No. <u> </u> Man-yrs <u> </u> (Non-students)	(<u> </u>)	(<u> </u>)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	1,021.00	866.06
<u>Travel</u>	(200.00)	(218.00)
<u>Computer</u>	(100.00)	(<u> </u>)
<u>Publication and Information Dissemination</u>	(371.00)	(371.00)
<u>Employee Benefits</u>	(350.00)	(277.06)
<u> </u>	(<u> </u>)	(<u> </u>)
E. <u>TOTALS:</u> - - - - -	(4,076.00)	(3,909.19)

FY 1974 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

Project Title:

NMSU Project No. - - 3109-135

THE DETERMINATION AND ORIGIN OF LEAD IN SURFACE AND
GROUND WATERS OF NORTHERN NEW MEXICO

Principal Investigator(s)

Sigfredo Maestas
Antonio Gallegos

Project Began--Month: July Yr:19 72 Scheduled Completion--Month: Dec. Yr:19 74

	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	4,116.65	531.47
Prin. Investigators - - - - - No. _____ Man-yrs _____	(349.17)	(_____)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants - - - - - No. <u>1</u> Man-yrs <u>.15</u> (Includes Student Technicians)	3,767.48	531.47
Undergrad. Student Assistants - - - - - No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Technicians & Others - - - - - No. _____ Man-yrs _____ (Non-students)	(_____)	(_____)
B. NON-EXPENDABLE PROPERTY: TOTAL - - - - -		
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL		
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL		
	(_____)	(_____)
Employee Benefits	(280.17)	(_____)
	(_____)	(_____)
	(_____)	(_____)
	(_____)	(_____)
E. TOTALS: - - - - -	(4,396.82)	(531.47)

FY 1974 ANNUAL REPORT --- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

Project Title:

PREDICTING THE QUALITY OF IRRIGATION RETURN FLOW

Principal Investigator(s)

P. J. Wierenga

RMSU Project No. - - 3109-136

Project Began--Month: July Yr: 19 72 Scheduled Completion--Month: Dec. Yr: 1974

	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	13,250.00	11,770.74
Prin. Investigators- - - - -No. <u>1</u> Man-yrs <u>.25</u>	(5,250.00)	(4,247.00)
Other Prof. Staff - - - - -No. <u>2</u> Man-yrs <u>.40</u>	()	(3,864.61)
Grad. Student Assistants - - - -No. <u>1</u> Man-yrs <u>1.00</u> (Includes Student Technicians)	4,100.00	3,630.25
Undergrad. Student Assistants- - -No. <u>1</u> Man-yrs <u>.01</u> (Includes Student Technicians)	()	(28.88)
Technicians & Others - - - - -No. <u> </u> Man-yrs <u> </u> (Non-students)	(3,900.00)	()
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		100.00
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	1,000.00	180.80
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	4,303.00	3,205.32
<u>Travel</u>	(500.00)	(17.00)
<u>Computer</u>	(1,000.00)	(356.25)
<u>Publication & Information Dissemination</u>	(1,687.00)	(1,687.00)
<u>Employee Benefits</u>	(1,116.00)	(1,017.77)
<u>Duplication</u>	()	(127.30)
E. <u>TOTALS: - - - - -</u>	(18,553.00)	(15,256.86)

FY 1974 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico

Report as of June 30, 1974

Project Title:

CALCIUM CARBONATE EQUILIBRIA IN SOILS AND IRRIGATION WATER

NMSU Project No. - - 3109-144

Principal Investigator(s)

George O'Connor

Project Began--Month: July Yr: 19 73

Scheduled Completion--Month: June Yr: 19 75

			Amount Budgeted FY 1974	Actual Expenditures FY 1974
A.	<u>SALARIES & WAGES:</u>	<u>TOTAL</u> - - - - -	5,948.00	3,386.87
	Prin. Investigators- - - - -	No. <u>1</u> Man-yrs <u>.25</u>	(2,704.00)	(2,221.32)
	Other Prof. Staff - - - - -	No. <u> </u> Man-yrs <u> </u>	(2,884.00)	(<u> </u>)
	Cred. Student Assistants - - - - - (Includes Student Technicians)	No. <u>1</u> Man-yrs <u>.20</u>		674.85
	Undergrad. Student Assistants- - - - - (Includes Student Technicians)	No. <u>1</u> Man-yrs <u>.01</u>	(<u> </u>)	(95.00)
	Technicians & Others - - - - - (Non-students)	No. <u>1</u> Man-yrs <u>.08</u>	(360.00)	(395.70)
B.	<u>NON-EXPENDABLE PROPERTY:</u>	<u>TOTAL</u> - - - - -		
C.	<u>EXPENDABLE PROPERTY:</u> (Supplies, Materials, etc.)	<u>TOTAL</u>	721.00	
D.	<u>OTHER COSTS (SPECIFY):</u> (Travel, ADP Svcs., etc.)	<u>TOTAL</u>	2,621.00	1,310.77
	Travel		(252.00)	(76.47)
	Computer		(721.00)	(<u> </u>)
	Publication & Information Dissemination		(845.00)	(845.00)
	Employee Benefits		(803.00)	(298.40)
	Duplication		(<u> </u>)	(90.90)
E.	<u>TOTALS:</u> - - - - -		(9,290.00)	(4,697.64)

FY 1974 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

Project Title:

THE IMPACT OF WATER QUALITY STANDARDS
ON WATER UTILIZATION IN THE RIO GRANDE BASIN OF
NEW MEXICO

NMSU Project No. - - 3109-145

Principal Investigator(s)

Shaul Ben-David, William Schulze, Willem Brutsaert

Project Began--Month: July Yr: 1973 Scheduled Completion--Month: Dec. Yr: 1974

	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	<u>10,050.00</u>	<u>9,984.02</u>
Prin. Investigators - - - - - No. <u>2</u> Man-yrs <u>.50</u>	(<u>4,500.00</u>)	(<u>3,083.50</u>)
Other Prof. Staff - - - - - No. <u> </u> Man-yrs <u> </u>	(<u> </u>)	(<u> </u>)
Grad. Student Assistants - - - - - No. <u>3</u> Man-yrs <u>1.60</u> (Includes Student Technicians)	<u>5,000.00</u>	<u>4,894.02</u>
Undergrad. Student Assistants - - - - - No. <u> </u> Man-yrs <u> </u> (Includes Student Technicians)	(<u> </u>)	(<u> </u>)
Technicians & Others - - - - - No. <u>3</u> Man-yrs <u>.35</u> (Non-students)	(<u>550.00</u>)	(<u>2,006.50</u>)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	<u>300.00</u>	<u>200.00</u>
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	<u>2,477.00</u>	<u>2,233.42</u>
Travel	(<u>300.00</u>)	(<u>223.92</u>)
Computer	(<u>300.00</u>)	(<u>200.00</u>)
Publication and Information Dissemination	(<u>1,166.00</u>)	(<u>1,166.00</u>)
Employee Benefits	(<u>711.00</u>)	(<u>643.50</u>)
	(<u> </u>)	(<u> </u>)
E. <u>TOTALS: - - - - -</u>	(<u>12,827.00</u>)	(<u>12,417.44</u>)

FY 1974 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

Project Title:

STREAM ORGANICS TO EVALUATE LAND MANAGEMENT

NMSU Project No. - - 3109-146

Principal Investigator(s)

James R. Gosz, Mary L. Barr

Project Began--Month: July Yr:1973 Scheduled Completion--Month: Dec. Yr:1974

	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	9,600.00	9,587.41
Prin. Investigators- - - - -No. _____ Man-yrs _____	()	()
Other Prof. Staff - - - - -No. _____ Man-yrs _____	()	()
Grad. Student Assistants - - - - -No. <u>3</u> Man-yrs <u>2.25</u> (Includes Student Technicians)	9,600.00	9,566.62
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	()	()
Technicians & Others - - - - -No. <u>1</u> Man-yrs <u>.01</u> (Non-students)	()	(20.79)
B. NON-EXPENDABLE PROPERTY: TOTAL - - - - -	390.00	
C. EXPENDABLE PROPERTY:(Supplies,Materials,etc.) TOTAL	800.00	800.00
D. OTHER COSTS(SPECIFY):(Travel,ADP Svcs.,etc.) TOTAL	1,629.00	2,031.59
Travel	(500.00)	(500.00)
Publication and Information Dissemination	(1,129.00)	(1,129.00)
Employee Benefits	()	(402.59)
	()	()
	()	()
E. TOTALS: - - - - -	(12,419.00)	(12,419.00)

FY 1974 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

Project Title:

SOURCE OF GROUNDWATER CONTAMINATION IN THE OGALLALA
AQUIFER OF EASTERN NEW MEXICO

Principal Investigator(s)
Robert G. Taylor

NMSU Project No. - - 3109-147

Project Began--Month: July Yr: 19 73 Scheduled Completion--Month: June Yr: 19 74

	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	13,940.00	14,090.00
Prin. Investigators- - - - -No. <u>2</u> Man-yrs <u>.50</u>	(8,000.00)	(8,000.00)
Other Prof. Staff - - - - -No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants - - - - -No. <u>10</u> Man-yrs <u>2.0</u> (Includes Student Technicians)	5,940.00	6,090.00
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Technicians & Others - - - - -No. _____ Man-yrs _____ (Non-students)	(_____)	(_____)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>	600.00	600.01
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	3,081.00	2,930.99
Travel	(448.00)	(298.00)
Publication and Information Dissimination	(1,600.00)	(1,643.23)
Employee Benefits	(1,033.00)	(989.76)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. <u>TOTALS: - - - - -</u>	(17,621.00)	(17,621.00)

FY 1974 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

Project Title:

CONTRIBUTION OF NATURAL TRITIUM STUDIES TO WATER
RESOURCE MANAGEMENT IN THE ROSWELL BASIN, NEW MEXICO

Principal Investigator(s)

D. D. Rabinowitz

NMSU Project No. - - 3109-150

Project Began--Month: July Yr: 19 73 Scheduled Completion--Month: December Yr: 19 74

	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. <u>SALARIES & WAGES: TOTAL</u> - - - - -	3,000.00	1,749.99
Prin. Investigators- - - - -No. <u>1</u> Man-yrs <u>.15</u>	(3,000.00)	(1,749.99)
Other Prof. Staff - - - - -No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants - - - - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Undergrad. Student Assistants- - -No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Technicians & Others - - - - -No. _____ Man-yrs _____ (Non-students)	(_____)	(_____)
B. <u>NON-EXPENDABLE PROPERTY: TOTAL</u> - - - - -		
C. <u>EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL</u>		
D. <u>OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL</u>	407.50	226.91
Employee Benefits	(407.50)	(226.91)
_____	(_____)	(_____)
_____	(_____)	(_____)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. <u>TOTALS: - - - - -</u>	(3,407.50)	(1,976.90)

FY 1974 ANNUAL REPORT -- STATE FINANCED PROJECT

State where institute is located: New Mexico Report as of June 30, 1974

Project Title: <u>LOS ALAMOS COOPERATIVE STUDY</u>	NMSU Project No. - - <u>3109-153</u>
Principal Investigator(s) <u>R. R. Lansford</u>	

Project Began--Month: July Yr: 1973 Scheduled Completion--Month: August Yr: 1973

	Amount Budgeted FY 1974	Actual Expenditures FY 1974
A. SALARIES & WAGES: TOTAL - - - - -	2,271.00	2,406.00
Prin. Investigators - - - - - No. <u>1</u> Man-yrs <u>.13</u>	(2,271.00)	(2,406.00)
Other Prof. Staff - - - - - No. _____ Man-yrs _____	(_____)	(_____)
Grad. Student Assistants - - - - - No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Undergrad. Student Assistants - - - - - No. _____ Man-yrs _____ (Includes Student Technicians)	(_____)	(_____)
Technicians & Others - - - - - No. _____ Man-yrs _____ (Non-students)	(_____)	(_____)
B. NON-EXPENDABLE PROPERTY: TOTAL - - - - -		
C. EXPENDABLE PROPERTY: (Supplies, Materials, etc.) TOTAL	581.76	446.76
D. OTHER COSTS (SPECIFY): (Travel, ADP Svcs., etc.) TOTAL		
Employee Benefits	(240.00)	(249.44)
Travel	(341.76)	(193.86)
Duplication	(_____)	(3.46)
_____	(_____)	(_____)
_____	(_____)	(_____)
E. TOTALS: - - - - -	(2,852.76)	(2,852.76)