OKLAHOMA, A SUMMARY OF ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, IN FISCAL YEARS 1988–90

Compiled by
John S. Havens

U.S. GEOLOGICAL SURVEY
Open-File Report 91–492

Oklahoma City, Oklahoma
1991

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OKLAHOMA, A SUMMARY OF ACTIVITIES OF THE U.S. GEOLOGICAL SURVEY, WATER RESOURCES DIVISION, IN FISCAL YEARS 1988-90

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ABSTRACT

This report summarizes the activities of the Oklahoma District, Water Resources Division, U.S. Geological Survey, for fiscal years 1988-90. Included are summary statements of current and recently completed projects, an updated bibliography of reports dealing with Oklahoma hydrology, a table of ground-water sites included in the mass-measurement network, and a listing of continuous and partial-record ground-water sites.

A MESSAGE FROM THE DISTRICT CHIEF

The U.S. Geological Survey historically has worked to fulfill its principal mission of appraising the nation's water resources through scientifically designed data-collection and investigative programs managed at the District level. This provides ready access by State and local governments to valuable information on national water issues, but also allows Districts to concentrate on relevant State and local needs.

Past reports on topics such as ground water in the High Plains, flood frequency of Oklahoma streams, water quality of the Garber-Wellington aquifer, and potential water supplies from the alluvial and terrace aquifers of the North Canadian River have provided information beneficial both to the Nation and residents of Oklahoma. The focus of water-resources studies has changed as awareness of the vulnerability of water resources to contamination has joined long-standing concerns,such as long-term water supplies for all needs and prediction of and protection from catastrophic flooding.

Data-collection activities and investigative projects will enable the Oklahoma District of the U.S. Geological Survey to meet the challenge and opportunity of providing needed water-resources information in the future.

Kathy D. Peter
District Chief
U.S. Geological Survey
Oklahoma City, Okla.

U.S. GEOLOGICAL SURVEY ORIGIN

The U.S. Geological Survey was established by an act of Congress on March 3, 1879 to provide a permanent Federal agency to conduct the systematic and scientific "classification of the public land, and examination of the geological structure, mineral resources, and products of national domain." An integral part of that original mission includes publishing and dissemination the earth-science information needed to understand, to plan the use of, and to manage the Nation's energy, land, mineral, and water resources.

Since 1879, the research and fact-finding role of the USGS has grown and been modified to meet the changing needs of the Nation it serves. As part of that evolution, the USGS has become the Federal Government's largest earth-science research agency, the Nation's largest civilian map-making agency, the primary source of data on the Nation's surface- and ground-water resources, and the employer of the largest number of professional earth scientists. Today's programs serve a diversity of needs and users. Programs include:

- Conducting detailed assessments of the energy and mineral potential of the Nation's land and offshore areas.
- Investigating and issuing warning of earthquakes, volcanic eruptions, landslides, and other geologic and hydrologic hazards.
- Conducting research on the geologic structure of the Nation.
- Studying the geologic features, structure, processes, and history of the other planets of our solar system.
- Conducting topographic surveys of the Nation and preparing topographic and thematic maps and related cartographic products.
- Developing and producing digital cartographic data bases and products.
- Collecting data on a routine basis to determining the quantity, quality, and use of surface and ground water.
- Conducting water-resource appraisals in order to describe the consequences of alternative plans for developing land and water resources.
- Conducting research in hydraulics and hydrology, and coordinating all Federal water-data acquisition.
- Using remotely sensed data to develop new cartographic, geologic, and hydrologic research techniques for natural resources planning and management.
- Providing earth-science information through an extensive publications program and a network of public access points.

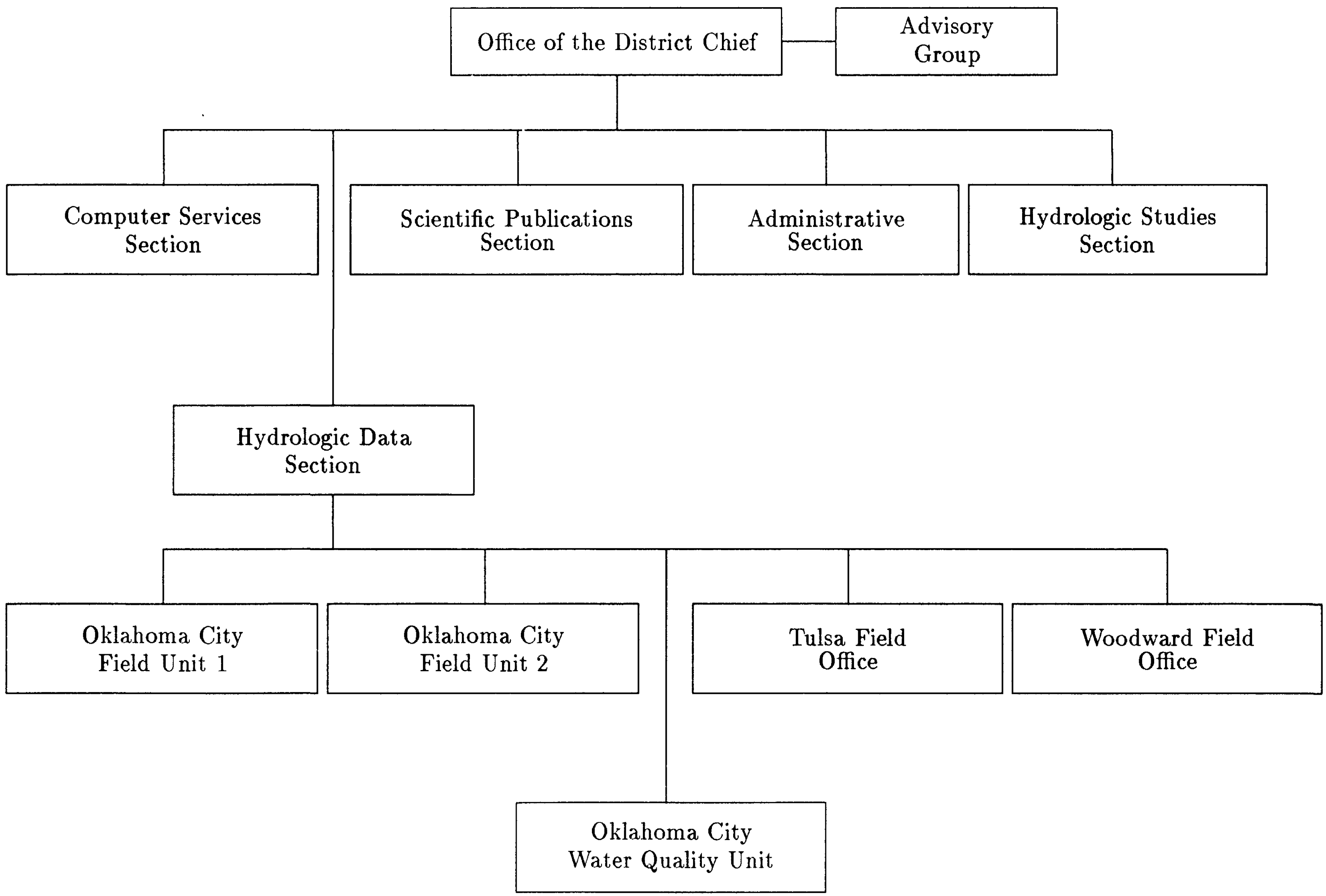
Along with its continuing commitment to meet the growing and changing earth-science needs of the Nation, the USGS remains dedicated to its original mission to collect, analyze, interpret, publish, and disseminate information about the natural resources of the Nation—providing "Earth Science in the Public Service."

WATER RESOURCES MISSION OF THE U.S. GEOLOGICAL SURVEY

The water resources mission of the U.S. Geological Survey is to provide the hydrologic information needed by others to help manage the Nation's water resources. To accomplish its mission, the Survey, in cooperation with State and local governments and other Federal agencies:

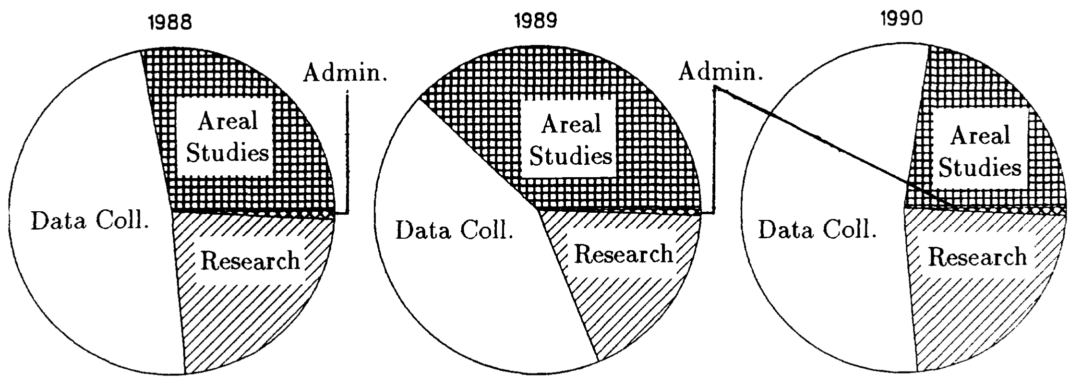
- Collects data on a systematic basis to determine the quantity, quality, and use of surface and ground water, and the quality of precipitation.
- Conducts water-resources investigations and assessments at national, State, and local scales, characterizes water-resources conditions, and provides the capability to predict the impact on the resource of managerial actions, proposed development plans, and natural phenomena.
- Conducts basic and problem-oriented hydrologic and water-related research that is likely to produce knowledge useful for the resolution of water-resources problems facing the State, regions, and Nation.
- Acquires information useful in predicting and delineating water-related natural hazards from flooding, volcanoes, mudflows, and land subsidence.
- Coordinates the activities of all Federal agencies in the acquisition of water data, and operates water information centers.
- Disseminates data and the results of investigations through reports, maps, and other forms of public release.
- Provides scientific and technical assistance in hydrology to other Federal agencies, to State and local agencies, to licensees of the Federal Energy Regulatory Commission, and, on behalf of the U.S. Department of State, to international agencies.
- Administers the provisions of the Water Resources Research Act of 1984, which include the State Water Resources Research Institute Program (Section 104) and the Water Resources Research Grant Program (Section 105).

OKLAHOMA DISTRICT ORGANIZATION CHART

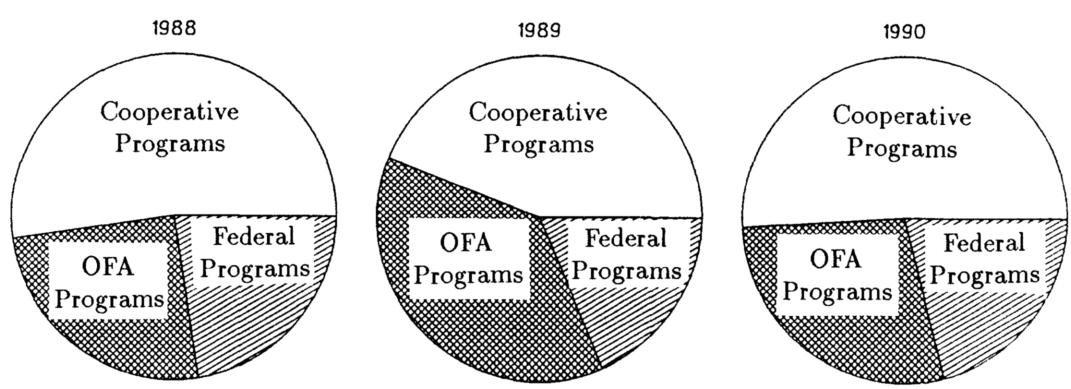


TYPES OF INVESTIGATIONS AND SOURCES OF FUNDING FOR OKLAHOMA IN 1988-90

Four broad categories of investigations are conducted in Oklahoma to obtain the information needed by managers and planners for the solution or alleviation of water problems in the State. These categories are: (1) Areal studies involving the appraisal of ground-water resources and river basins, (2) hydrologic data collection involving the statewide surface-water, ground-water, and quality-of-water monitoring programs, (3) research involving special studies that improve our understanding of hydrology, and (4) administration of programs involving the collection of data for national programs. The diagrams below show these investigations, expressed as a percentage of the District's total work for fiscal years 1988-90.



The investigations shown above are supported by services and funds from three basic programs: (1) Cooperative programs with 50 percent of the funds provided by State and local agencies and the remaining 50 percent by Federal funds, (2) Federal programs with funds appropriated directly to the U.S. Geological Survey, and (3) other Federal agency programs (OFA) supported entirely by other Federal agencies. In fiscal year 1988, the financial support for these three programs in Oklahoma was about $4,141,000; in 1989, about $4,917,000; and in 1990, about $4,220,000. The distribution is shown below.



LIST OF COOPERATORS

The following table lists State, local, and other Federal agencies that supported water-resources investigations in cooperation with the U.S. Geological Survey during fiscal years 1988–90:

State Agencies

Oklahoma Conservation Commission
Oklahoma Department of Transportation
Oklahoma Geological Survey
Oklahoma Pollution Control Coordinating Board
Oklahoma State Department of Health
Oklahoma Water Resources Board

Local Agencies

Association of Central Oklahoma Governments
City of Ada
City of Altus
City of Edmond
City of Lawton
City of Norman
City of Oklahoma City
City of Tulsa
Central Oklahoma Master Conservancy District
Ft. Cobb Reservoir Master Conservancy District
Foss Reservoir Master Conservancy District
Grand River Dam Authority
Lugert-Altus Irrigation District
Mountain Park Master Conservancy District
Oklahoma Gas and Electric Company
Town of Wellston

Federal Agencies

Bureau of Indian Affairs
Federal Emergency Management Agency
National Park Service
U.S. Air Force
U.S. Army Corps of Engineers
U.S. Bureau of Reclamation

WATER CONDITIONS IN OKLAHOMA

Large variations in streamflow characterize hydrologic conditions in Oklahoma. In the extreme southeastern part of the State, mean annual precipitation exceeds 52 inches and mean annual runoff exceeds 20 inches. In the southeast, stream channels are deeply incised in mountainous terrain and streamflow generally is perennial. In the extreme northwestern part of the Panhandle, mean annual precipitation is less than 16 inches and mean annual runoff is less than 0.1 inch. In northwestern Oklahoma, streams generally have shallow, ill-defined channels and ephemeral flow.

Water Year 1988

Precipitation data from monthly reports of the National Weather Service, averaged over the State, indicate that monthly precipitation was greater-than-normal during November, December, January, March, April, July, and September of water year 1988. Precipitation was less than normal during February, May, June, and August

In spite of the greater-than-normal streamflow for the year, drought conditions existed during some months. Streamflow was much less than normal in all streams during May and June, except in south-central Oklahoma. Streamflow continued to be below normal during July and August, with near-normal flow in September in the north-central and northeast; in the southwest September stream flow was much greater than normal. In the southeast, streamflow was less than normal in July and September but greater than normal in August. In the far southeast, stream flow was greater than normal in July and August, and less than normal in September.

Water Year 1989

Precipitation data from monthly reports of the National Weather Service, averaged over the State, indicate that monthly precipitation was above normal during November, January, February, March, May, June, August, and September of water year 1989. Precipitation for June was much greater than normal; total rainfall in Oklahoma City for June was 14.47 inches, the most since record keeping began in Oklahoma City in 1890. Monthly precipitation was well below normal during October and April; April was the driest in 98 years. Precipitation in December and July was about average.

Streamflow in eastern Oklahoma was far below normal in all streams during October and April. Streamflow was above normal the remainder of the year. In central Oklahoma, streamflow was below normal during mid-April through mid-May and normal in February, March, and June through September. In western Oklahoma, streamflow generally was above normal from mid-May through September. Selected sites statewide show above normal streamflow from June through September. In spite of the month-to-month variation, streamflow on an annual basis was about normal, with all annual peak flow in the medium flow range. However, some flooding occurred during June in central Oklahoma.

Water Year 1990

Precipitation data from monthly reports of the Oklahoma Climatological Servey, averaged over the State, indicate that monthly precipitation was below normal during October through December, June, and August, normal during July, and above normal during

September of water year 1990. However, precipitation for January through May was much greater than normal; since record keeping began throughout the State in 1892, the statewide average accumulation of 25.75 inches for January through May 1990 was exceeded only by 25.94 inches in 1957. In some parts of the southeast, the total accumulation was 34 inches above the long-term mean. It was the wettest January-April on record. The extremely wet late winter and early spring made it the seventh wettest year on record.

Streamflow in central, eastern, southcentral, and southeastern Oklahoma was above normal in all streams during January, February, and September. During March, April, and May, streamflow was far above normal, with many streams attaining record or near-record peak flows at the end of April and beginning of May. Severe flooding in these areas equalled or exceeded the serious flooding of April-June 1957. Streamflow was about normal the remainder of the water year except in the southeast and east, where it was below normal from October through December. Annual streamflow was far above normal in these areas of Oklahoma, setting a record for annual flow at many sites.

In southwestern Oklahoma streamflow was above normal in January through May and in September, and normal the rest of the year. In northcentral Oklahoma, streamflow was above normal in October, January, March, and April; normal during November, December, and February; and below normal the rest of the year. In northwestern Oklahoma, streamflow generally was above normal from October through May and below normal the remainder of the year. Annual streamflow was about normal in these areas of Oklahoma.

Storage in all major reservoirs in the State, with a combined conservation storage capacity of over 13 million acre-feet, averaged over 99 percent at the end of May. The flood-crest elevation was at or above the elevation of the 100 percent flood-control pool in many reservoirs.

SUMMARY OF PROJECTS

Title: SURFACE-WATER STATIONS
Leader: Blazs, Robert L.
Number: OK001

Problem: Surface-water information is needed for purposes of surveillance, planning, design, hazard warning, operation, and management, in water-related fields such as water supply, hydroelectric power, flood control, irrigation, bridge and culvert design, wildlife management, pollution abatement, flood-plain management, and water resources development. To provide this information an appropriate data base is necessary.

Objective: A. To collect surface-water data for: 1) Assessment of water resources, 2) operation of reservoirs or industries, 3) forecasting, 4) disposal of wastes and pollution controls, 5) discharge data to accompany water-quality measurements, 6) compact and legal requirements, and 7) research or special studies. B. To collect data for analytical studies of the statistical properties of, and trends in, the occurrence of surface water.

Progress: Surface-water data were collected at 188 active sites (fig. 4 and 5): 139 stream-gaging stations (continuous-discharge records), 32 lake and reservoir gages, 6 dual-digital gages (synchronous stage-rainfall with discharge hydrograph data only), 5 continuous stage-only gages, 2 continuous stage with high-flow discharge data only, and 1 miscellaneous discharge data site. In addition, continuous records of discharge were computed and published from 3 gaging stations operated and maintained by the U.S. Army Corps of Engineers.

Cooperating Agencies: Local, State, and Federal agencies in Oklahoma.

Title: GROUND-WATER STATIONS
Leader: Goemaat, Robert L.
Number: OK002

Problem: Long-term water-level records are needed to evaluate the effects of climatic variations on the recharge to and discharge from the ground-water systems, to provide a data base from which to measure the effects of development, and to provide data for management of the resource.

Objective: A. To collect water-level data to provide long-term records of the general response of the hydrologic system to natural climatic variations and induced stresses. B. To provide a data base against which the short-term records acquired in areal studies can be analyzed.

Progress: During the 1988-89 fiscal years, water levels were measured in 1,058 wells; continuous water levels were monitored at 29 sites; and yearly, monthly, or quarterly measurements were made at 1,029 other sites. During the 1990 fiscal year, water levels were measured in 33 wells; continuous water levels were monitored at 29 sites and yearly, monthly, or quarterly measurements were made at 4 other sites (fig. 8).

Cooperating Agency: Oklahoma Water Resources Board

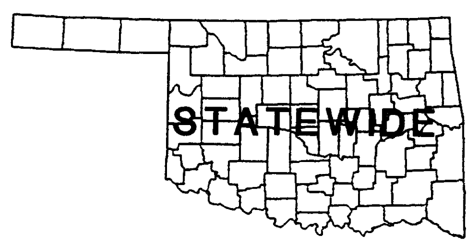
Title: WATER-QUALITY STATIONS
Leader: Kurklin, Joanne K.
Number: OK003

Problem: Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. For intelligent planning and realistic assessment of the water resource, the chemical and physical quality of the rivers and streams must be defined and monitored.

Objective: To provide a national bank of water-quality data for broad federal planning and action programs and to provide data for federal management of interstate waters.

Progress: Water-quality data were collected at 46 active sites; of these, 12 were equipped with minimonitors for collection of continuous data. The sites locations are shown on figure 6.

Cooperating Agencies: Oklahoma Water Resources Board, Oklahoma State Department of Health.



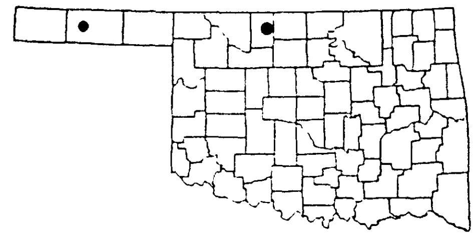
Title: SEDIMENT STATIONS
Leader: Kurklin, Joanne K.
Number: OK004

Problem: Water-resource planning and water-quality assessment require a nationwide base level of relatively standardized information. For intelligent planning and realistic assessment of water resources, sediment concentrations and discharges in rivers and streams must be defined and monitored.

Objective: To provide a national bank of sediment data for use in broad federal and state planning and action programs and to provide data for federal management of interstate and international waters.

Progress: Sediment data are collected presently at 34 sites. Figure 7 shows the location of each site.

Cooperating Agencies: Local, State, and Federal agencies in Oklahoma.

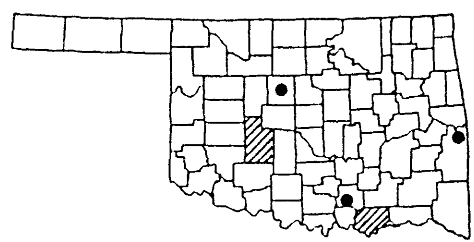


Title: NATIONAL TRENDS NETWORK FOR MONITORING
Leader: Kurklin, Joanne K.
Number: OK005

Problem: To establish long-term monitoring stations to detect and measure levels of atmospheric deposition.

Objective: To determine variations in atmospheric depositions that occur on a week-to-week basis. To collect wet and dry deposition products for analysis of elements and compounds that can contribute to chemical composition of surface waters.

Progress: Two active continuous sites are maintained.

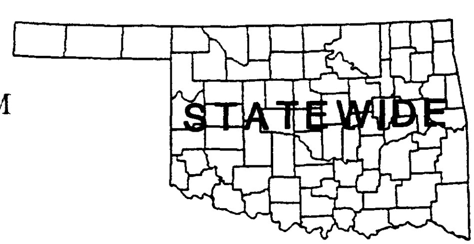


Title: FEMA FLOOD INSURANCE STUDIES BY LIMITED DETAIL METHODOLOGIES
Leader: Tortorelli, Robert L
Number: OK006

Problem: The 100-year recurrence-interval flood potential needs to be determined for the purposes of the National Flood Insurance Program in many populated areas. Because of limited funding, alternative ways of determining the 100-year profile and boundaries are being used—limited detail methodologies.

Objective: The 100-year recurrence-interval flood will be published as inundation maps and flood profiles for: Bryan and Caddo Counties, and the towns of Dover, Pocola, and Tishomingo, Okla., by use of limited detail study (LDS) methods.

Progress: The Less Detailed Study/Flood Insurance Study (LDS/FIS) for Dover and Caddo County has been completed. Project is Completed.



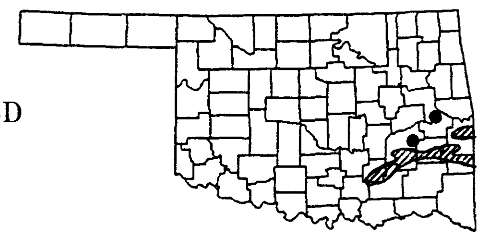
Title: OKLAHOMA WATER-USE DATA SYSTEM
Leader: May, Jayne E.
Number: OK007

Problem: Water-use data that have been collected for the State of Oklahoma are presently distributed throughout many Federal, State, and local agencies. The data are in different formats and contain different bits of information that may make the data from one agency unusable by another agency. Future data collection is presently based on various agency needs that can render the data to be collected by one agency incompatible with another agency's needs.

Objective: To develop a comprehensive point-source water-use collection and management system for the State of Oklahoma.

Progress: We have begun populating the New Site-Specific Water-Use Data System with data collected from public suppliers. A paper was presented at the American Water Resources Association meeting in Tampa, Fla., entitled "Development of a withdrawal-point water-use data base in Oklahoma." We will continue to try to find funding for a full interpretive study using this information. Water-use data were collected and analyzed for two other District projects.

Cooperating Agency: Oklahoma Water Resources Board

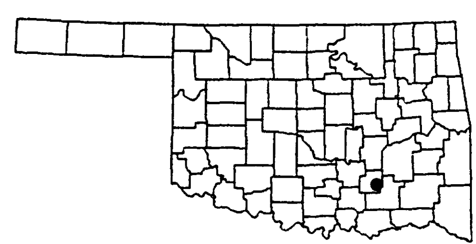


Title: WATER-RESOURCES MONITORING IN THE EASTERN OKLAHOMA COAL FIELD
Leader: Blumer, Stephen P.
Number: OK044

Problem: Strip mining coal in eastern Oklahoma may have adverse effects on the area's water resources. The principal adverse effect may be degradation by solution of minerals exposed by mining and increased sediment loads of streams. Mine dewatering, changes in land use, disposal of wastes, stream-channel realignment, and increased water use may significantly alter the existing hydrologic system on a regional basis, limit available supplies, and cause local and overall deterioration of the available water.

Objective: The objective of the program is to determine the characteristics of the regional hydrologic system and to detect and document changes in the system that may occur as the result of coal mining.

Progress: The project is completed. A data report containing all project data has been approved for release as Open-File Report (OFR 86-319). Interpretive report (Water-Resources Investigations Report) is in review.

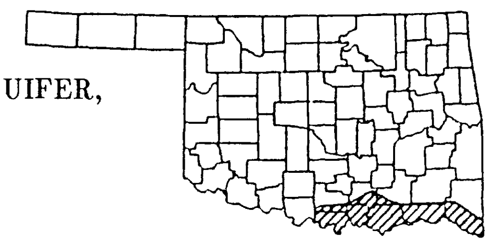


Title: COAL CREEK BASIN, OK
Leader: Blumer, Stephen P.
Number: OK049

Problem: Coal underlying about 375,000 acres in the eastern Oklahoma coal field is Federally owned. The Bureau of Land Management is charged with the responsibility of assessing probable water-resource effects and reclamation capabilities of any area under Federal jurisdiction in which surface mining for coal might occur. None of the studies so far underway in Oklahoma's coal fields specifically addresses the problem of predicting effects on water resources of extracting coal by surface mining techniques. A study by the U.S. Geological Survey, in cooperation with the Bureau of Land Management, is underway.

Objective: The study's primary objective is to collect and interpret sufficient hydrologic data to predict and assess the effects of surface mining for coal and subsequent reclamation efforts on hydrologic characteristics. A secondary objective is collection of sufficient hydrologic data so that baseline hydrologic conditions can be defined and possible changes occurring after mining takes place can be documented.

Progress: Project is complete except report.



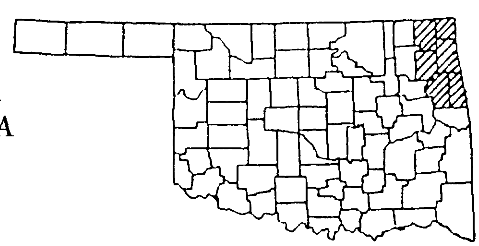
Title: DIGITAL MODEL OF THE ANTLERS AQUIFER, SOUTHEASTERN OKLAHOMA
Leader: Morton, Robert B.
Number: OK057

Problem: The future economy of southeastern Oklahoma is dependent largely upon wise utilization and management of the regions's water resources. A major source of water in this area is the Antlers aquifer, which underlies 4,400 square miles and contains about 31,600,000 acre-feet of water having less than 1,000 mg/l dissolved solids. However, proper utilization and management of this resource cannot be achieved with the present knowledge of the hydrologic system.

Objective: To develop a more complete understanding of the hydrologic system than is presently known, to predict the effect of future withdrawals from the aquifer, and to aid in the management and utilization of the aquifer. These objectives will be achieved by the use of a digital flow model of the aquifer.

Progress: Final report has been written and is awaiting final approval.

Cooperating Agency: Oklahoma Geological Survey



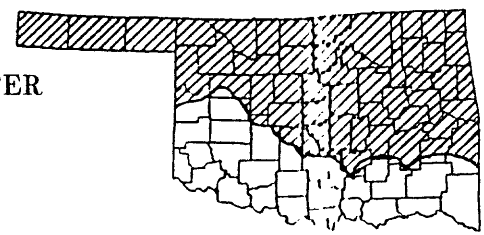
Title: GEOHYDROLOGY OF THE ROUBIDOUX AQUIFER, NORTHEASTERN OKLAHOMA
Leader: Christenson, Scott C.
Number: OK058

Problem: Maximum and orderly development of ground water from the Roubidoux aquifer requires an accurate knowledge of the quantity and quality of water available and the functioning of the hydrologic system; such information is not available now. Specific problems include: (1) Potential over-development of the aquifer in the vicinity of the City of Miami, (2) potential contamination of the aquifer by toxic waters from the abandoned zinc mines a few hundred feet above the aquifer, and (3) excessive amounts of naturally-occurring radium in water from the aquifer in some areas.

Objective: To provide information on: (1) Availability of water from the aquifer and its suitability for municipal, domestic, and industrial supply, (2) extent of over-development and project the possible consequences of increasing stresses on the aquifer, (3) the hydrologic relationship between water in the aquifer and toxic waters in the abandoned zinc mines, and (4) extent and amount of radium in the water and its probable source.

Progress: The project is completed. A final report combining this project and project OK070 has been approved and released as Open-File Report 90-570 pending publication by the cooperator.

Cooperating Agency: Oklahoma Geological Survey

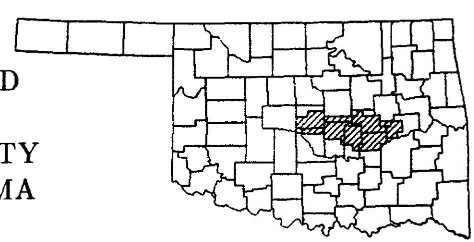


Title: CENTRAL MIDWEST REGIONAL AQUIFER SYSTEM ANALYSIS IN OKLAHOMA
Leader: Christenson, Scott C.
Number: OK062

Problem: Mesozoic and Paleozoic formations are major sources of water supplies in some parts of Oklahoma. In other parts of the State these formations contain slightly saline to saturated brines. Some of those formations are oil and gas reservoirs and, at other locations, are storage reservoirs for industrial waste. A knowledge of the geohydrologic system is essential to determine the availability of ground water and to plan maximum and orderly development of this vital resource.

Objective: (1) Describe the hydrologic system, including aquifer designation, hydraulic characteristics, and quality of the water within the regional aquifers. (2) Create a data base including water use, water levels, lithologic logs, geophysical logs, and chemical analyses of water samples. (3) Describe historic, present, and future problems associated with use of water. (4) Evaluate aquifer system responses to future conditions.

Progress: No progress has been made on this project during the current fiscal year.



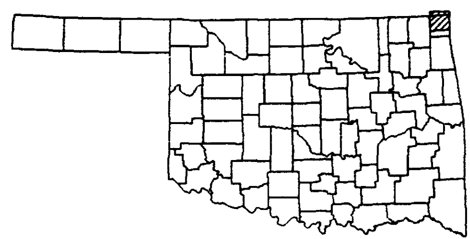
Title: GEOHYDROLOGY OF THE ALLUVIAL AND TERRACE DEPOSITS OF THE NORTH CANADIAN RIVER FROM OKLAHOMA CITY TO EUFAULA LAKE, CENTRAL OKLAHOMA
Leader: Havens, John S.
Number: OK065

Problem: Ground water in the alluvial and terrace deposits of the North Canadian River is used extensively for irrigation, municipal, stock, and domestic supplies. Increasing demand has made it necessary for the State to formulate a plan to manage this resource. Quantitative knowledge of the hydrologic system is necessary for proper management.

Objective: The project is an investigation designed to provide quantitative knowledge of the hydrologic system necessary to manage the aquifer effectively. The specific objectives of the project are: (1) To describe the geologic setting of the alluvial and terrace deposits of the North Canadian River, (2) to provide a quantitative description of the hydrologic system, and (3) to compute the maximum annual yield from the aquifer based on a minimum twenty-year life span.

Progress: The final report has been published. The project is complete.

Cooperating Agency: Oklahoma Water Resources Board



Title: GEOCHEMISTRY OF THE TAR CREEK LEAD-ZINC AREA IN OKLAHOMA
Leader: Parkhurst, David L.
Number: OK068

Problem: High concentrations of zinc, lead, and cadmium are found in the water filling abandoned zinc mines of northeastern Oklahoma. The water is draining into Tar Creek and the Grand Lake O' the Cherokees. The potential exists for downward migration of contaminants from the mines to the Roubidoux aquifer, the important water source for the area.

Objective: (1) To critically evaluate the thermodynamic data necessary to apply geochemical models to the zinc-cadmium-lead system, (2) to determine the geochemical reactions occurring with these metals in the abandoned mines and in the surface water, and (3) to model the chemical reaction of mine water mixing with ground water of the Roubidoux aquifer.

Progress: Data collection and field work on the project are complete. The final report is being written.

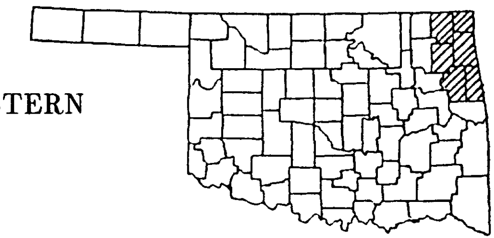
Title: AN INVENTORY OF OKLAHOMA SPRINGS
Leader: Funkhouser, Ron A.
Number: OK069

Problem: The flow in many of Oklahoma's streams is augmented in part by springflow. State agencies, and the public, interested in water rights, ground-water contribution to base flow, or streamflow accountability require knowledge of the location, quality, and quantity of flow—particularly in areas where large springflows occur. An annotated state-wide springs report does not exist.

Objective: (1) Review historical data for known springs; (2) do a physical inventory of Oklahoma springs; measure the discharge, pH, temperature, and specific conductance; and (3) collect water samples for laboratory analyses.

Progress: The project was reactivated in the 1990 fiscal year.

Cooperating Agency: Oklahoma Geological Survey



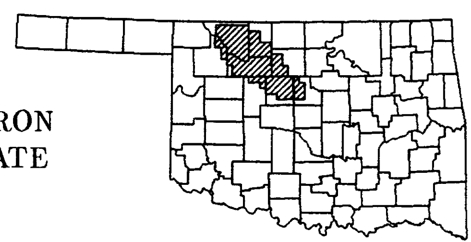
Title: DIGITAL MODEL ANALYSIS OF THE ROUBIDOUX AQUIFER IN NORTHEASTERN OKLAHOMA
Leader: Christenson, Scott C.
Number: OK070

Problem: Water from the Roubidoux aquifer is used for public supplies and industrial purposes. Water users in the area are concerned about declining water levels as a result of withdrawal of water from the aquifer and the possibility of contamination of the water supply from abandoned lead and zinc mines in the northern part of the area. The possibility exists for downward migration of toxic mine water through existing or abandoned leaky well casings or through fractures in rocks that overlie the Roubidoux aquifer.

Objective: The hydraulic properties of the formations above and below the Roubidoux aquifer are unknown. Information about the hydraulic properties of the rocks in the deep formations is needed for a better understanding of the direction and rates of ground-water flow in the Roubidoux aquifer and overlying geologic units.

Progress: The project is completed. A final report combining this project and project OK058 has been approved and released as an Open-File Report 90-570 pending publication by the cooperator.

Cooperating Agency: Oklahoma Geological Survey



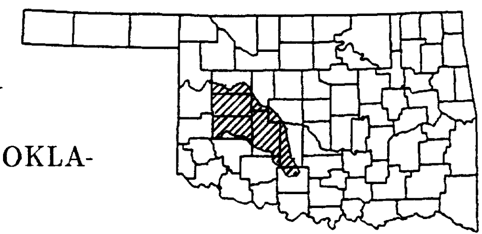
Title: GEOHYDROLOGY OF ALLUVIAL AND TERRACE DEPOSITS OF THE CIMARRON RIVER FROM NEAR THE KANSAS STATE LINE TO GUTHRIE, OKLAHOMA
Leader: Adams, Gregory P.
Number: OK072

Problem: Ground water in the alluvial and terrace deposits along the Cimarron River in northwestern Oklahoma is used extensively for irrigation, municipal, stock, and domestic supplies. Increasing demands for water within the State makes it necessary to have a quantitative knowledge of the hydrologic system for formulation of effective management plans. The area of study extends about 115 miles from near Freedom, Okla., to Guthrie, Okla.. This area includes the Cimarron Terrace and associated aquifers.

Objective: (1) To describe the geologic setting of the alluvial and terrace deposits along the Cimarron River from Freedom, Okla. to Guthrie, Okla.; (2) to estimate the approximate quantity of water in storage and the approximate annual recharge and discharge from the alluvium and terrace deposits to the Cimarron River; (3) to provide estimates of the effects of future withdrawals from the aquifer by means of a digital model of the aquifer-river system; and (4) to identify sources of existing and potential natural saline pollution.

Progress: A data report, "Hydrologic data for the terrace and alluvial aquifer of the Cimarron River from Freedom to Guthrie, Okla.," has been completed and is in review. Steady-state and transient modeling of the aquifer is in progress. The final report, "Geohydrology of the terrace and alluvial deposits of the Cimarron river from Freedon to Guthrie, Okla.," is being prepared.

Cooperating Agency: Oklahoma Geological Survey



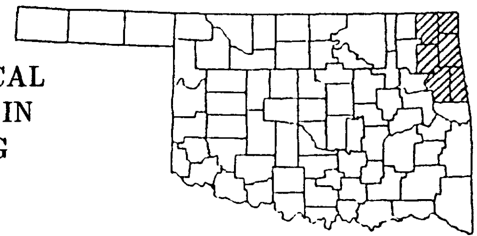
Title: NUMERICAL SIMULATION AND WATER-QUALITY ASSESSMENT OF THE RUSH SPRINGS AQUIFER, SOUTHWESTERN OKLAHOMA
Leader: Becker, Mark F.
Number: OK073

Problem: Communities, along with agriculture and industry, within and surrounding the study area are dependent upon the Rush Springs aquifer to sustain the current and future economy of the region. Current agricultural and industrial use of irrigation and supply wells could stress the aquifer significantly, reducing the amount of water in storage. Agricultural, industrial, and petroleum exploration activities may have contributed to a decline in water quality.

Objective: The study will obtain water-quality information that will represent current water quality with the study area. By use of the modular ground-water flow model, stresses and changes within aquifer may be simulated, leading to a better understanding of the hydrology of the aquifer.

Progress: In 1989, 34 ground-water samples were collected for water-quality analysis, including 20 pesticide/herbicide samples. During the winter of 1989, base-flow measurements were made at 36 sites. A network of observation wells has been established and monthly measurements have been made from 1988 through the present. Measurements are made by the Oklahoma Water Resources Board. Starting in the fall of 1989 and ending in the fall of 1990, 11 additional wells were drilled. Of the 11 wells, 6 were cored continuously from land surface to the bottom of the well. All 11 wells were completed as observation wells and added to the observation-well network.

Cooperating Agency: Oklahoma Geological Survey, Oklahoma Water Resources Board



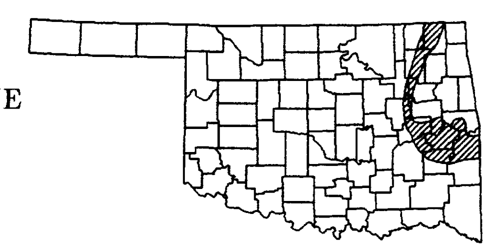
Title: HYDROGEOLOGICAL AND GEOCHEMICAL STUDY OF THE ROUBIDOUX AQUIFER IN THE VICINITY OF THE PICHER MINING FIELD, NORTHEASTERN OKLAHOMA
Leader: Christenson, Scott C.
Number: OK074

Problem: Most of the water supply for extreme northeastern Oklahoma is obtained from fractured sandstone and dolomite units in the Roubidoux and associated formations of Cambrian and Ordovician ages. It is anticipated that the demand for water from the principal aquifer, the Roubidoux, will increase in proportion to the population growth of the area. There is concern that the Roubidoux, which averages 150 feet thick and lies between 800 and 1,000 feet below land surface, may be subject to contamination from abandoned mines of the Picher field. Water in the underground lead-zinc mines contains high concentrations of iron, zinc, cadmium, and lead. The contaminated water may migrate from the mines to the Roubidoux via abandoned water wells. A multi-agency effort to locate and plug all such wells began in late 1984. Participation in this effort will provide information in support of other ongoing investigations of the hydrogeology of the Roubidoux aquifer and of the geochemical mechanisms involved in the contamination of surface and ground waters in the vicinity of the Picher mining field.

Objective: To determine the geologic, hydraulic, and chemical characteristics of the Roubidoux Formation and of the overlying formations that separate the Roubidoux from the mined interval. Specific objectives are to: (1) Obtain a suite of geophysical logs for each well prior to plugging; (2) Construct a production well and several observation wells within the abandoned wells; (3) Perform aquifer tests to determine the hydraulic properties and leakage characteristics of the Roubidoux; and (4) Collect chemical and isotope samples to determine the geochemical evolution and age of water in the Roubidoux.

Progress: The project is completed. The final data report is in review.

Cooperating Agency: Oklahoma Water Resources Board



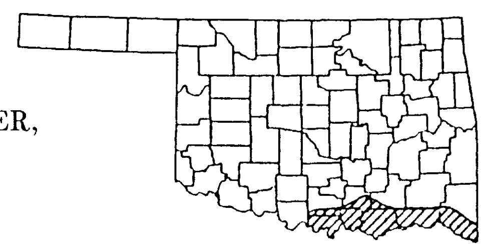
Title: LIMNOLOGY OF SELECTED COAL-MINE PONDS IN THE COAL-MINING REGION OF EASTERN OKLAHOMA
Leader: Parkhurst, Renee S.
Number: OK075

Problem: There is no information on the limnological characteristics of mine ponds and non-mine ponds in the coal-mining region of eastern Oklahoma. Limnological information is needed to manage this water resource created by strip mining, and to further understand the limnological processes occurring in mine ponds.

Objective: (1) Describe the limnological characteristics of the strip-mine ponds and other ponds in the area not associated with coal mining, (2) determine if the limnological characteristics of strip-mine ponds are significantly different from those of other ponds, (3) determine if the limnological characteristics of strip-mine ponds are significantly different among (a) those associated with different coal seams, (b) those associated with different mining and reclamation practices and (c) those of different ages and (4) intensively study selected strip-mine ponds and non strip-mine ponds to develop an understanding of hydrologic, chemical, and biological processes occurring within the ponds as well as the interrelationships among these processes.

Progress: Data collection and fieldwork on the project are complete. A data report is in review. The final report is being written.

Cooperating Agency: Oklahoma Geological Survey



Title: SIMULATED EFFECTS OF PROJECTED WATER USE ON THE ANTLERS AQUIFER, SOUTHEASTERN OKLAHOMA
Leader: Morton, Robert B.
Number: OK076

Problem: The Antlers Sandstone of Lower Cretaceous age underlies an area of about 4,400 square miles in southeastern Oklahoma. In terms of volume of water in storage, the Antlers is one of the State's most important sources of fresh water. Current pumpage from the aquifer is relatively minor, but withdrawals are expected to increase as population and industrial growth occur. As ground-water supplies in other parts of the State become fully appropriated or become unsuitable for use, the impetus for interbasin transfer of Antlers water will mount. The U.S. Army Corps of Engineers has made water-use projections for the area spanning several decades. As the next step in the process of areal water-resource planning, the Corps has asked the U.S. Geological Survey to simulate the effects of projected water use on the Antlers aquifer.

Objective: Simulate the effects of projected water use on the Antlers aquifer and present the results for use by water-management agencies. The specific objectives are to: (1) Complete the data base from earlier studies by incorporating new stratigraphic and hydrologic data; (2) adapt previous data matrices, with appropriate changes in boundary conditions and parameters for use with the modular ground-water model; (3) perform model simulations using projected withdrawal rates provided by the Corps; and (4) present the results of the simulations as maps and tables that depict hydrologic information for each decennial year from 1990 to 2040.

Progress: The final report has been approved and is awaiting final drafting and publication.

Cooperating Agency: U.S. Army Corps of Engineers

Title: STREAMFLOW STATISTICS FOR OKLAHOMA STREAMS
Leader: Tortorelli, Robert L.
Number: OK079

Problem: Most statistical data on streams in Oklahoma have not been published using the common period of record. For some statistics, there has been 10 years of additional data collected since last publication. There is a need to use more current information in statistics needed in design problems.

Objective: Compute streamflow statistics using most current data and publish in one publication.

Progress: Project is completed and final report published.

Cooperating Agency: Oklahoma Water Resources Board

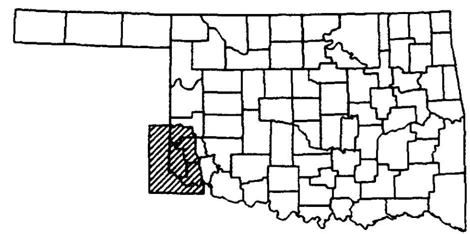
Title: HYDROGEOLOGIC CHARACTERISTICS OF SHALEY FORMATIONS IN OKLAHOMA, AND THEIR SUITABILITY FOR HAZARDOUS WASTE CONTAINMENT
Leader: Hanson, Ronald L.
Number: OK080

Problem: American industry produces millions of tons of potentially hazardous waste each year. In Oklahoma, industrial wastes are disposed of by near-surface burial and subsurface injection. Only one burial site currently is licensed in Oklahoma, but pressure is mounting for the selection and approval of other sites. A reconnaissance of geologic formations in Oklahoma suitable for the disposal of hazardous wastes indicates that thick shales would be most favorable for near-surface burial of wastes. Few data are available, however, on the hydraulic properties and ground-water flow systems of shales.

Objective: (1) Conduct a literature search on the hydrology of shales; (2) determine which physical properties of shale may be used as an index of permeability and fracture tendency; (3) select four representative shales for study, map the outcrop areas, drill test holes, and describe the detailed geology at the test sites; (4) evaluate the hydraulic and selected physical properties of the shales; (5) Evaluate the fracture tendency of shales and the resulting effect on ground-water flow; and (6) suggest hydrogeologic and physical criteria or guidelines for use in evaluating the suitability of shales for waste disposal.

Progress: All field data collection has been completed and selected core samples have been evaluated. Resignation of the project chief early in 1990 necessitated putting the project temporarily on hold. Preparation of a report describing the results of the field testing is scheduled to start again during 1991.

Cooperating Agency: Oklahoma Geological Survey



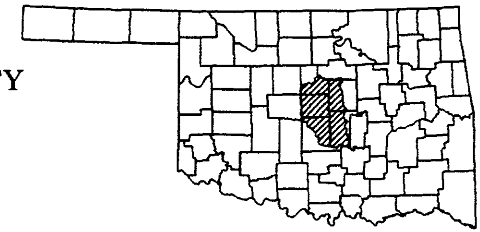
Title: HYDROGEOLOGY OF THE BLAINE AQUIFER AND ASSOCIATED UNITS IN SOUTHWESTERN OKLAHOMA
Leader: Runkle, Donna L.
Number: OK081

Problem: The Blaine aquifer consists of cavernous gypsum and dolomite beds interlayered with shales in the Permian Blaine Formation in Harmon, Jackson, and Greer Counties in southwestern Oklahoma. Ground water from the Blaine supports a local agriculture based mainly on irrigated cotton, corn, and wheat. Declining water levels in parts of the Blaine aquifer are evidence that water is being withdrawn at rates greater than it is being replenished. Although the aquifer has been artificially recharged since about 1961, much of the effort was abandoned after 1975. Water in the Blaine aquifer is not used for human consumption because of the large dissolved-solids concentrations. The calcium sulfate-type water in the Blaine is acceptable for irrigation of salt-tolerant crops.

Objective: (1) Evaluate and map the stratigraphy and structure of all geologic units in the study area adjacent to the Blaine Formation; (2) evaluate the hydrology of the Blaine and adjacent units; (3) determine the distribution of major and selected trace and organic (agriculturally applied) chemical constituents in the aquifers; (4) analyze the effects that extensive irrigation and artificial recharge have had on the aquifers to determine what effect they have had on the quantity and quality of water in the aquifer; and (5) determine if opportunities exist for additional artificial recharge.

Progress: A data report has been completed and is in review. An analytical report is in preparation and will be completed following development and application of a ground-water digital flow model of the aquifer scheduled for 1991.

Cooperating Agency: Oklahoma Water Resources Board, Oklahoma Geological Survey



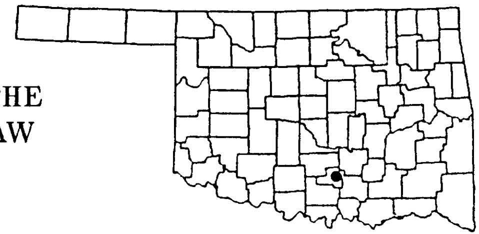
Title: HYDROGEOLOGY AND WATER QUALITY OF THE GARBER-WELLINGTON AND ASSOCIATED AQUIFERS, CENTRAL OKLAHOMA
Leader: Christenson, Scott C.
Number: OK082

Problem: The Central Oklahoma aquifer, which includes in descending order the Garber Sandstone and Wellington Formation, the Chase Group, the Council Grove Group, the Admire Group, and overlying alluvium and terrace deposits, underlies about 3,000 square miles of central Oklahoma and is used extensively for municipal, industrial, commercial, and domestic water supplies. The aquifer was selected for study by the National Water Quality Assessment (NAWQA) program because it is a major source for water supplies in central Oklahoma and because it has several known or suspected water-quality problems. Known problems include concentrations of sulfate, chloride, selenium, chromium, and gross-alpha activity that exceed drinking-water standards. Suspected problems include possible contamination of the aquifer by oil-field brines and drilling fluids, pesticides, industrial chemicals, septic-tank effluent, fertilizers, and leakage from sewage systems and underground tanks used for storage of hydrocarbons.

Objective: There are four major objectives of the Central Oklahoma aquifer project. The first objective is the collection and analysis of existing information, including chemical, hydrologic, and land-use data. The second objective is the geohydrologic and geochemical investigations of the aquifer flow system. The third objective is the sampling for a wide variety of inorganic, organic, and radioactive constituents as part of a regional survey that will produce a consistent set of data among all ground-water pilot projects. These data can be used to: (1) Define regional ground-water quality within the Central Oklahoma aquifer, and (2) compare water quality in the Central Oklahoma aquifer to the water quality in the other ground-water study units of the NAWQA program. The fourth objective is topical studies that will address, in more detail, some of the major water-quality issues pertaining to the aquifer.

Progress: Work is continuing on the project. A total of six reports have been published, including "Hydrogelogic maps of the Central Oklahoma aquifer, Oklahoma," by S.C. Christenson, R.B. Morton, and B.A. Mesander. Numerous other reports are in progress and have been planned. Water-quality sampling is complete.

Title: PRELIMINARY INVESTIGATION OF THE HYDROGEOLOGY OF THE CHICKASAW NATIONAL RECREATION AREA



Leader: Hanson, Ronald L.
Number: OK084

Problem: The Chickasaw National Recreational Area (CNRA) is located in south-central Oklahoma in Murray County near Sulphur, Okla.. Initially, the CNRA (originally established as Platt National Park in 1902) contained about 33 flowing freshwater and mineralized springs. Numerous flowing wells were drilled in the general vicinity of the CNRA during the 1920's and 1930's. Over the years, the mineral springs have dried up and discharge from some of the freshwater springs and flowing wells has significantly declined. At present, only about five springs flow intermittently.

Objective: To review the hydrologic and geologic data presently available in the general region of the CNRA and evaluate all hydrologic data collected to date. A detailed study plan will be prepared outlining the study approach necessary to obtain a full understanding of the hydrologic system and the analysis required to explain the depletion of flow from the springs and flowing wells.

Progress: All published reports related to the study area have been reviewed. The existing climatic, geologic, and hydrologic data, including precipitation, wells logs, streamflow data, ground-water levels, flowing well discharges, ground-water pumpage, and water-quality data have been entered into computer data files. A report describing the relation of this information to historic spring and well discharge has been prepared and is in review. Four project proposals–each outlining different levels of work to obtain a better understanding of the hydrologic system–have been prepared.

Cooperating Agency: National Park Service

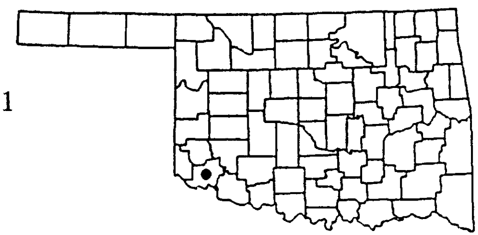
Title: FACILITATING THE ANALYSIS OF GROUND-WATER SYSTEMS USING A GEOGRAPHIC INFORMATION SYSTEM

Leader: Scott, Jonathon C.
Number: OK085

Problem: Ground-water hydrologists need sophisticated computer software to aid them in the analysis of ground-water systems. Geographic Information Systems (GIS) provide powerful map making and analysis capability, however, system integration programming is needed to transform this software into a productive tool.

Objective: (1) Develop software to transport water-quality and ground-water site inventory data into the Geographic Information System (GIS), (2) develop software to randomly choose a set of areally distributed sampling locations from a stratified set of polygons describing the study area, (3) develop software to assist with visualizing the results of finite-difference numerical simulations performed with the Modular Ground-water Flow Model, and (4) develop software to aid in the establishment of relationships between land use and ground-water quality using statistical methods.

Progress: The software has been written and tested. Four reports have been published in the Water-Resources Investigations Reports series. Project is completed.



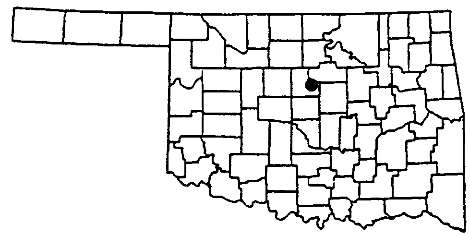
Title: ALTUS AFB IRP STUDY: RI/FS STAGE 1
Leader: Stoner, Jerry D.
Number: OK086

Problem: Altus Air Force Base (AFB) was established as a flight training facility in 1942. An investigation of historical waste-disposal practices on the 2,525-acre Base identified nine former disposal sites that may pose a continued hazard to humans and the environment. The sites include fire protection training areas, landfills, and washracks. A gas station presumed to have a leaking tank is the tenth site that will be investigated as part of the Altus Installation Restoration Program (IRP) Study. No major aquifers underlie the area.

Objective: For each of the ten sites the study objectives are: (1) Determine the public health and environmental requirements to develop data quality objectives and evaluate the threat of the contaminants to the public health and welfare; (2) collect sufficient hydrologic and chemical data to support the needs of this phase of the IRP study; (3) using these data, determine the potential risk to human health and welfare or to the environment from the contaminants identified at each site; and (4) develop preliminary alternative remedial actions for each site except for those sites for which no significant effect is found and a No Further Action Decision Document can be prepared.

Progress: All field work has been completed. A total of 44 monitoring wells and 26 boreholes were installed on Altus Air Force Base. Soil samples were collected from the boreholes and from selected monitoring wells during the installation phase. One round of water samples was collected from the monitoring wells and the surface drainages on Altus Air Force Base. The Informal Technical Information Report containing the basic analytical data was prepared and delivered to the U.S. Air Force. The technical report for this RI/FS Stage 1 study was completed and is under review by the U.S. Air Force.

Cooperating Agency: U.S. Air Force

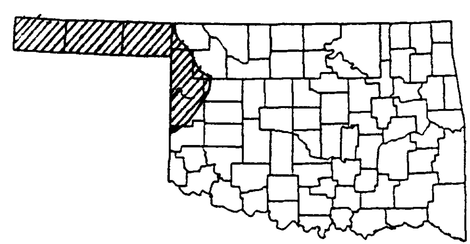


Title: CURRICULUM DEVELOPMENT IN THE COMPUTER SCIENCES AT LANGSTON UNIVERSITY
Leader: Scott, Jonathon C.
Number: OK089

Problem: Langston University, a Historically Black University located in central Oklahoma, is trying to develop a curriculum in the computer sciences. The University already has a good curriculum for business applications of computer technology, and is expanding its curriculum in the use of computing technology in scientific investigations.

Objectives: To help expand the computer science curriculum at Langston University. Secondary objectives are to improve employment opportunities in the sciences for Blacks, and to provide the U.S. Geological Survey with well trained, employable computer scientists.

Progress: Preliminary plans were made for a visiting-guest-lecture series. One guest lecture by Jonathon Scott was presented on the history of computing technology. A workstation was installed in the Earth Sciences Computer Laboratory. The workstation is connected to 11 terminals, a laser printer, an optical disk drive, 2 magnetic disk drives, and a local-area network. An Open-File Report describing cooperative activities of the U.S. Geological Survey with Historically Black Colleges and Universities has been published.



Title: WATER-LEVEL MONITORING IN THE HIGH PLAINS AQUIFER
Leader: May, Jayne E.
Number: OK090

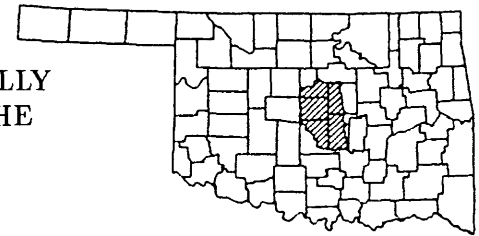
Problem: Most of the land surface overlying the High Plains aquifer is intensively developed for agriculture. Because the High Plains region is semiarid and subject to frequent droughts, the water demands are met largely with irrigation water drawn from the High Plains aquifer. Extensive long-term pumpage from the aquifer has resulted in large water-level declines and depletion of storage in many areas.

Objective: To evaluate the current water-level monitoring network and to make additions and deletions of annually measured observation wells and recorder wells as needed to improve its cost and informational effectiveness.

Progress: The location of all existing wells has been reviewed; these sites have been plotted on 1:100,000 planimetric maps. Two reports, "Water-level changes in the High

Plains aquifer underlying parts of South Dakota, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Oklahoma, and Texas—Predevelopment through nonirrigation season 1987–88," and for the following year, 1988–90, have been published as U.S. Geological Survey Water-Resources Investigations Report 89–4073 and 90–4153.

Cooperating Agency: Oklahoma Water Resources Board



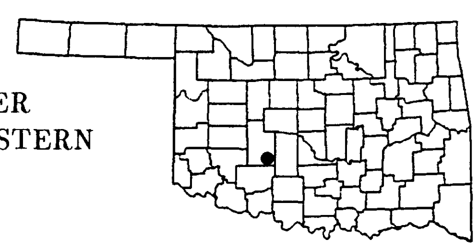
Title: SOURCE AND MOVEMENT OF NATURALLY OCCURRING TOXIC SUBSTANCES IN THE CENTRAL OKLAHOMA AQUIFER
Leader: Schlottmann, Jamie L.
Number: OK091

Problem: Ground water in some wells in the Central Oklahoma aquifer contains arsenic, chromium, residual alpha-particle activities, and selenium in amounts that exceed the U.S. Environmental Protection Agency's primary drinking-water standards. Uranium concentrations are commonly greater that 10 pCi/L.

Objective: Determine (1) The distribution of the substances in ground water of the aquifer; (2) the solid phase sources of the substances; and (3) the processes mobilizing the substances into the ground water.

Progress: Two deep test holes were drilled and sampled. Three data reports were written containing the results of (1) Rock chemical analyses, (2) mineralogic and petrographic analyses, and (3) chemical analyses of water and geophysical logs. The first report is published and the other two are in review. A report describing the results of the project is in progress. Two abstracts on the project were published.

Cooperating Agency: Association of Central Oklahoma Governments



Title: EVALUATION OF THE IMPACT OF OIL REFINERY PRODUCTS AND WASTES ON THE GROUND- AND SURFACE-WATER RESOURCES NEAR CYRIL IN SOUTHEASTERN CADDO COUNTY, OKLAHOMA
Leader: Stoner, Jerry D.
Number: OK092

Problem: Water from the Rush Springs Sandstone, a major aquifer in southwestern Oklahoma, is used for irrigation, public, domestic, and livestock supplies. Since the early 1920's, crude oil has refined in this area near Cyril, Okla. in Caddo County. Even though refinery operations have now been suspended, the past operations are potential sources of contamination of the water in the Rush Springs aquifer and in the local surface-water drainages.

Four potential sources of contamination of the water resources of the area, resulting from past refinery operations at Cyril have been identified and are: (1) Spillage and leakage of crude petroleum and finished products, (2) acid sludges buried on site, (3) buried lime and caustic waste sites, (4) the API Separator and soil farm.

Objective: To evaluate the effects of oil-refinery products and wastes on the ground- and surface-water quality in southeastern Caddo County near Cyril, Okla.

Progress: A surface-water gaging station has been located on Gladys Creek downstream from the old refinery. Water-quality samples have been collected at this site and at a site on Gladys Creek upstream from the refinery. A review of the literature was made and the available data from any past investigations in the area have been obtained. A Superfund RI/FS investigation by another agency is in progress at the refinery and the data resulting from that investigation are being obtained as they become available. A ground-water well inventory was made and water levels were measured in selected wells. Preparation of a water-level map using all available data is under way.

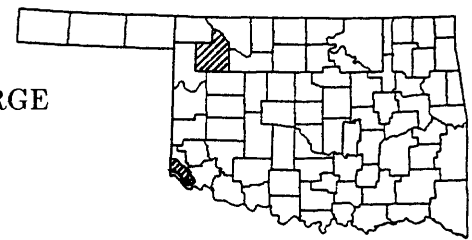
Cooperating Agency: Oklahoma Geological Survey

Title: AUTOMATED QUALITY ASSURANCE (AQUA)
Leader: Scott, Jonathon C.
Number: OK093

Problem: Errors have been incorporated into computerized data bases from a number of sources. Some errors are simple typographic mistakes that occurred when data were transcribed from paper into digital form. Other errors occurred because the personnel preparing the data for entry into the computer lacked proper training (map-reading skills or hydrologic expertise). Because the Survey's hydrologic data have been migrated through several data-management systems some subtle, systematic errors have been introduced into the computerized data bases. For example, ground-water data have been moved from the ABC system, to System 2000 Ground-Water Site Inventory (GWSI), to the National Water Information System (NWIS) GWSI. Errors have resulted from unforeseen or undetected modifications that were made to data during the conversion process from one data management system to another. When Survey hydrologists begin new projects, one of the initial phases is to compile and analyze existing data for the study area. Normally, a significant amount of time and expertise is needed to correct errors in the data. When new projects require the use of data from other organizations, the time needed for quality-control is increased. Data quality control commonly is the largest single task, in terms of manpower expense, that must be performed for ground-water projects.

Objective: The Survey needs to develop automated methods for detecting errors in hydrologic data. The purpose of the project is to develop computer software to assist hydrologists with the problem of detecting these errors. By developing the computer software, the Survey will have a system which can be employed by any of its offices for the detection of errors in hydrologic data.

Progress: Development of the software is partially complete.



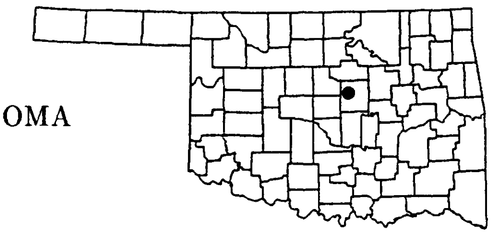
Title: BLAINE GYPSUM AQUIFER AND WOODWARD GROUND-WATER RECHARGE DEMONSTRATION PROJECTS
Leader: Hanson, Ronald L.
Number: OK094

Problem: The Blaine Gypsum aquifer and Woodward ground-water recharge projects are two of several U.S. Bureau of Reclamation projects selected for study under the High Plains States Groundwater Demonstration Program Act of 1983. The purpose of these studies is to advance the state of the art of artificial ground-water recharge.

Objective: The Blaine Gypsum project objectives are to evaluate the recharge potential of the Blaine aquifer. The project area presently diverts surface runoff from precipitation and irrigation tailwater to recharge wells completed in fracture or solution zones of the aquifer. The surface water will be impounded by two diversion structures and additional recharge and monitoring wells will be established within the impoundment area. The Woodward Ground-Water Project objectives are to evaluate ground-water flow characteristics resulting from placement of a subsurface dam in the ground-water flow path between a Woodward municipal water-supply well and the North Canadian River and to determine the potential effects that this dam may have on the river and spring discharge at nearby Boiling Springs State Park. The Woodward study will be conducted in two phases, a feasibility study and (assuming feasibility) an actual implementation of the project by installing a grout dam in the terrace deposits down gradient from the well. The U.S. Geological Survey will provide technical support and review of these projects as they relate to planning, surface- and ground-water monitoring, and report preparation.

Progress: The sponsoring agency for these studies is the Oklahoma Water Resources Board. They have completed development, monitoring, and mitigation plans for the Blaine project, and these plans have been reviewed and approved by the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S. Geological Survey. The Woodward feasibility study is being conducted by the Oklahoma Water Resources Board, utilizing a three-dimensional finite-difference ground-water flow model to simulate ground-water conditions at the study site with selected subsurface dam configurations placed in the flow path.

Cooperating Agencies: Oklahoma Water Resources Board, U.S. Bureau of Reclamation, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and U.S. Geological Survey



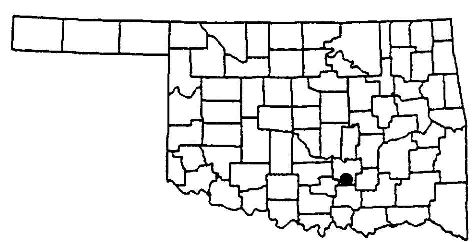
Title: GROUND WATER, WELLSTON, OKLAHOMA
Leader: Schlottmann, Jamie L.
Number: OK095

Problem: Ground water in some wells in the Wellston area contain residual alpha-particle activities that exceed the U.S. Environmental Protection Agency's primary drinking-water standards. Uranium concentrations are commonly greater than 10 pCi/L.

Objective: (1) Test theories developed as part of the Naturally Occurring Toxic Substances (NOTS) project pertaining to water chemistry associated with the substances, (2) determine vertical distribution of radioactive substances in the ground water, and (3) determine whether a test hole drilled in the area could intercept sand layers that would produce adequate quantities of water for a production well containing acceptable drinking water.

Progress: The well inventory was completed and test hole was drilled. Water samples were collected and aquifer tests were completed. Sandstone layers were found that would supply adequate quantities of water for a production well, but the water produced from the sands contained large amounts of radioactivity. The water chemistry associated with the radioactivity agreed with that found by the NOTS project. An oral report of the results of the study was presented to the Town of Wellston. Project was completed.

Cooperating Agency: Association of Central Oklahoma Governments



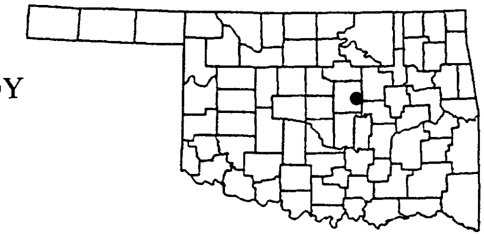
Title: HYDROLOGY OF BYRDS MILL SPRING
Leader: Savoca, Mark E.
Number: OK096

Problem: A 1987 Oklahoma Supreme Court ruling threatens to change a management policy that allowed Oklahoma communities to legally transfer appropriated water from one stream basin to another. The City of Ada may lose its right to withdraw water from Byrds Mill Spring and three nearby city wells, particularly if it can be shown that withdrawals from the Arbuckle aquifer significantly affect local ground-water levels or spring flows.

Objective: (1) Establish a monitoring program to measure the water diverted from Byrds Mill Spring to the City of Ada; (2) measure the amount of water pumped by the city from the three city wells; and (3) evaluate the effect of these withdrawals on local ground-water levels and spring flow.

Progress: Monitoring equipment has been installed on Byrds Mill Spring to measure the spring flow and water diverted to Ada; a monitoring system has been installed to measure the amount of water pumped from the city wells. A report containing available data is in preparation.

Cooperating Agency: Oklahoma Water Resources Board



Title: SAC AND FOX GROUND-WATER STUDY
Leader: Abbott, Marvin M.
Number: OK097

Problem: Tribal Reserve Lands of the Sac and Fox Nation of Oklahoma are located in Lincoln County, Okla.. Oil production began in this area in the 1930's and water injection for secondary recovery and salt-water disposal began in the 1950's. Studies indicate that extensive degradation of surface and ground water in the area may exist as a result of these oil-production activities.

Objective: (1) Determine the water-table surface and gradient, and ground-water quality and quantity in the 960-acre Tribal Reserve; (2) locate a source of water capable of supplying present and future needs of the Tribe; and (3) assess the potential for contamination of the water supply.

Progress: A field survey of regional ground-water levels and ground-water quality has been completed and surface resistivity measurements have been obtained describing the thickness of fresh water underlying the Tribal lands. Full funding for this study did not materialize and work required to meet all objectives was not accomplished. A letter describing the results of the investigation to date has been submitted to the Bureau of Indian Affairs.

Cooperating Agencies: Bureau of Indian Affairs

OTHER DISTRICT ACTIVITIES IN SUPPORT OF THE STATE'S WATER PROGRAMS

As part of the Geological Survey's responsibility to provide hydrologic information to all water users, the Survey participates in numerous other activities in addition to the regular Federal and State cooperative programs of hydrologic data collection and analysis. These other activities include involvement in various water-related committees and task forces, the review of technical reports on hydrology prepared by other agencies and universities, answering requests for hydrologic data and related information, and presenting information to schools, civic groups, and other interested groups on the water resources of Oklahoma and the Nation. Some of the current special activities are:

Committee Activities—Members of the Oklahoma District staff participate in various technical committees and task forces dealing with water problems. Included are: (1) The Governor's Coordinating Committee on Water Resources Research; (2) a ground-water committee to develop water-quality standards for Oklahoma's major aquifers; (3) a water-quality advisory board that reviews the State's ambient surface-water quality monitoring network, and selects stream- and lake-sampling frequency; (4) four interstate river compact commissions; (5) a Rural Abandoned Mine Programs (RAMP) committee, which selects for reclamation abandoned surface mines based on their hazard to life and health; and (6) an American Society of Civil Engineers' task committee on water requirements of native vegetation.

Special Activities—Beginning in 1984, the Geological Survey published the first of an annual series of Water-Supply Papers, "National Water Summary", describing the conditions, trends, availability, quality, and use of the Nations's water resources. Each of these reports contains chapter devoted to Oklahoma. In addition to yearly hydrologic events, the reports address: Water issues (1983), selected water-quality trends and ground-water resources (1984), surface-water resources (1985), ground-water quality (1986), water supply and demand (1987), hydrologic events and floods and droughts (1988-89, unpublished), stream water quality (1990-91, unpublished).

The Oklahoma Data Section completed the renovation of 17 gaging stations in Oklahoma and one in Texas. The work was requested by the Corps of Engineers and consisted of replacing gaging stations and installing multiple orifice systems to insure continuous gage operation above the Maximum Probable Flood.

The Corps also asked the District to assume the operation and maintenance responsibilities of 15 Corps-operated lake, reservoir, river, stage, DCP, and precipitation sites due to a reorganization after a reduction in personnel.

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Compiled by John S. Havens

[Revision of U.S. Geological Survey Open-File Report 89–33, with the addition of reports printed since publication of that report. Reports published or added from 1988 through September 1990 are marked with a pointing hand in the left margin.]

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1936	817	1949	1159
1937	840	1950	1168
1938	845	1951	1194
1939	886	1952	1244
1940	909	1953	1268
1941	939	1954	1324
1942	947	1955	1407
1943	989	1956–59	1549
1944	1019	1960–64	1824
1945	1026	1965–69	1979
1946	1074	1970–74	2172
1947	1099		

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Water Year	Water-Supply Paper	Water Year	Water-Supply Paper
1899	37	1932	732
1900	50	1933	747
1901	65, 66, 75	1934	762
1902	83, 84	1935	787
1903	98, 99	1936	807
1904	128, 131	1937	827
1905	169, 173	1938	857
1906	205, 209	1939	877
1907–08	247	1940	897
1909	267	1941	927
1910	287	1942	957
1911	307	1943	977
1912	327	1944	1077
1913	357	1945	1037
1914	387	1946	1057
1915	407	1947	1087
1916	437	1948	1117
1917	457	1949	1147
1918	477	1950	1177
1919–20	507	1951	1211
1921	527	1952	1241
1922	547	1953	1281
1923	567	1954	1341
1924	587	1955	1391
1925	607	1956	1441
1926	627	1957	1511
1927	647	1958	1561
1928	667	1959	1631
1929	687	1960	1711
1930	702	1961–65	1921
1931	717	1966–70	2121

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Water Year	Water-Supply Paper	Water Year	Water-Supply Paper
1941	942	1957	1522
1942	950	1958	1573
1943	970	1959	1644
1944	1022	1960	1744
1945	1030	1961	1884
1946	1050	1962	1944
1947	1102	1963	1950
1948	1133	1964	1957
1949	1163	1965	1964
1950	1188	1966	1994
1951	1199	1967	2014
1952	1252	1968	2096
1953	1292	1969	2146
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The Oklahoma District also manages the following data information services that provide water-resources data in an easy-to-use and readily available from:

NAWDEX (NATIONAL WATER DATA EXCHANGE) provides information on the location and types of data available on water and related subjects. (District contact for this information is Lionel D. Mize.)

WATSTORE (WATER DATA STORAGE AND RETRIEVAL SYSTEM) provides the following types of information:

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2. Current discharge and quality-of-water data from about 150 streams, lakes, and springs in Oklahoma.
3. Current peak-flow data from about 40 partial-record stations in Oklahoma.

(District contacts for this information are Joanne K. Kurklin and Jayne May.)

GENERAL INFORMATION ON OKLAHOMA WATER RESOURCES AND PUBLICATIONS:

For general information on water resources and availability of publications dealing with Oklahoma, contact:

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Table 1.—*Ground-water sites included in the mass measurement network*
[Aquifer codes are listed inside back cover.]

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
355914094340001	17N-26E-05 BAA 1	Adair	331BOON	—	—	9001	1979–
355742094331201	17N-26W-09 CCA 1	Adair	331PTKN	—	140	9000	1979–
360000094353501	18N-25E-36 ADD 1	Adair	331BOON	—	42.0	9002	1977–
360006094340001	18N-26E-32 BAA 1	Adair	331BOON	—	100	9003	1982–
362953098245401	23N-11W-06 BBB 1	Alfalfa	110CMTA	6	25.8	9004	1950–
363823098233701	25N-11W-16 CCD 1	Alfalfa	110CMTA	—	86.0	9005	1975–
365028098104001	27N-09W-09 BBA 1	Alfalfa	112TRRCH	—	31.0	9008	1975–
364909098210301	27N-11W-14 DBB 1	Alfalfa	112TRRCH	—	37.0	9007	1975–
364837098205501	27N-11W-23 ABD 1	Alfalfa	112TRRCH	—	41.0	9006	1975–
365916098125001	29N-09W-18 CDD 1	Alfalfa	112TRRCH	—	35	9009	1975–
341938096090001	03S-11E-04 ACA 1	Atoka	218ALRS	—	73.0	9010	1976–
363035100490201	01N-21E-32 ABC 1	Beaver	121OGLL	—	430	9015	1964–
363411100384701	01N-22E-12 BCB 1	Beaver	121OGLL	—	—	9024	1967–
363136100430001	01N-22E-29 BBD 1	Beaver	121OGLL	6.6	245	9017	1980–
363011100410601	01N-22E-33 DDD 1	Beaver	121OGLL	2	365	9012	1970–
363006100404201	01N-22E-34 CDC 1	Beaver	121OGLL	16	343	9011	1967–
363342100360801	01N-23E-08 DCB 1	Beaver	121OGLL	2	512	9022	1970–
363233100324001	01N-23E-23 AAB 1	Beaver	121OGLL	—	176	9019	1968–
363138100332701	01N-23E-26 BBB 1	Beaver	121OGLL	6	440	9018	1967–
363136100363701	01N-23E-29 BBC 1	Beaver	121OGLL	16	560	9016	1967–
363514100251801	01N-24E-01 ABB 1	Beaver	121OGLL	16	330	107	1967–
363017100250501	01N-24E-36 DAC 1	Beaver	121OGLL	6.6	250	9013	1980–
363424100192501	01N-25E-01 CCC 1	Beaver	121OGLL	5	240	9025	1980–
363356100241801	01N-25E-07 CAA 1	Beaver	121OGLL	4	111	9023	1968–
363319100142401	01N-26E-15 ABD 2	Beaver	121OGLL	16	120	9021	1980–
363028100124101	01N-26E-36 BDC 1	Beaver	121OGLL	—	—	9014	1967–
363451100111801	01N-27E-06 ACB 1	Beaver	121OGLL	2	122	9026	1970–
363235100093301	01N-27E-21 BBA 1	Beaver	121OGLL	—	186	9020	1967–
363600100144701	01N-27E-35 DAC 1	Beaver	121OGLL	—	168	9031	1967–
363503100010001	01N-28E-02 BCA 1	Beaver	121OGLL	16	256	9027	1968–
364015100505401	02N-20E-01 AAA 1	Beaver	121OGLL	6	81.0	9043	1968–
363847100460601	02N-21E-11 CDD 1	Beaver	121OGLL	16	301	9039	1967–
363759100391901	02N-22E-14 DCC 1	Beaver	121OGLL	—	379	9036	1967–
363816100321901	02N-23E-13 BCC 1	Beaver	121OGLL	14	53.0	9037	1967–
364018100283001	02N-24E-04 ABD 1	Beaver	121OGLL	5	40.0	9044	1980–
363853100311001	02N-24E-07 CCD 1	Beaver	121OGLL	6	95	9040	1946–
364036100240301	02N-25E-06 AAB 1	Beaver	121OGLL	5	234	9047	1980–
363925100202501	02N-25E-11 BBD 1	Beaver	121OGLL	5	160	9041	1980–
363740100235001	02N-25E-19 ADD 2	Beaver	121OGLL	16	205	9035	1967–
363720100185301	02N-25E-24 DBB 1	Beaver	121OGLL	5	245	9034	1980–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
363558100221001	02N-25E-33 ACA 1	Beaver	121OGLL	2	353	9030	1971–
364026100134901	02N-26E-02 BBA 1	Beaver	121OGLL	—	154	9045	1967–
364008100063901	02N-27E-02 AAD 2	Beaver	110ALVM	16	82.0	9042	1967–
363831100082301	02N-27E-15 BCB 1	Beaver	110ALVM	18	70.0	9038	1967–
363705100093101	02N-27E-21 CDB 2	Beaver	110ALVM	16	87.5	9033	1968–
363613100100601	02N-27E-29 DCD 3	Beaver	110ALVM	18	57	9032	1967–
363527100105501	02N-27E-31 DDA 1	Beaver	110ALVM	—	87.0	338	1967–
364228100341701	03N-23E-22 CAC 1	Beaver	121OGLL	5	180	9051	1980–
364110100374501	03N-23E-31 BBC 1	Beaver	121OGLL	5	280	9048	1980–
364348100305101	03N-24E-18 BAA 1	Beaver	121OGLL	6	—	9052	1968–
364036100202601	03N-25E-35 CCA 1	Beaver	121OGLL	6	220	9046	1980–
364500100181201	03N-26E-06 CCC 1	Beaver	121OGLL	6	96.0	9054	1968–
364445100142401	03N-26E-10 AAB 1	Beaver	121OGLL	6	44.0	9053	1967–
364226100085901	03N-27E-21 DBD	Beaver	121OGLL	5	138	9050	1980–
364206100030901	03N-28E-28 BAB 1	Beaver	112TRRCH	5	59.0	9049	1978–
364728100533101	04N-20E-22 CAD 1	Beaver	121OGLL	16	330	9058	1967–
364901100381901	04N-22E-13 ABB 1	Beaver	110ALVM	16	60.0	9062	1967–
364807100400601	04N-22E-22 AAD 1	Beaver	121OGLL	5	300	9061	1980–
364734100254501	04N-24E-24 CCC 1	Beaver	110ALVM	4	34.0	9059	1967–
364719100223501	04N-25E-28 BBB 1	Beaver	121OGLL	6	63.0	9057	1968–
364626100242601	04N-25E-31 ABC 1	Beaver	121OGLL	5	132	9056	1968–
365014100070901	04N-27E-02 CDC 1	Beaver	121OGLL	5	140	9063	1980–
364551100064401	04N-27E-35 DDB 1	Beaver	121OGLL	5	40.0	9055	1980–
365045100002501	04N-28E-02 AAC 1	Beaver	121OGLL	5	160	9065	1981–
365038100043301	04N-28E-06 ADA 1	Beaver	121OGLL	—	77.0	9064	1967–
365507100515301	05N-20E-02 DCC 1	Beaver	121OGLL	16	575	9079	1968–
365141100542101	05N-20E-28 CCC 1	Beaver	121OGLL	16	503	572	1968–
365450100475501	05N-21E-09 BBC 1	Beaver	121OGLL	2	438	9078	1970–
365419100472001	05N-21E-09 DCD 1	Beaver	121OGLL	16	525	9077	1967–
365418100465001	05N-21E-10 CAA 1	Beaver	121OGLL	16	560	9076	1967–
365343100483001	05N-21E-17 DBB 1	Beaver	121OGLL	16	458	613	1967–
365206100422901	05N-22E-29 CBA 1	Beaver	121OGLL	—	180	9069	1967–
365316100335201	05N-23E-22 BBB 1	Beaver	121OGLL	6	135	9071	1967–
365323100303101	05N-24E-19 BBD 1	Beaver	121OGLL	—	102	9073	1980–
365553100214301	05N-25E-04 BAC 1	Beaver	121OGLL	—	200	9081	1967–
365138100203201	05N-25E-34 BAD 1	Beaver	121OGLL	5	191	9066	1980–
365331100135801	05N-26E-15 CDD 1	Beaver	121OGLL	2	465	9074	1970–
365524100063401	05N-27E-02 CDB 1	Beaver	121OGLL	5	180	9080	1980–
365321100013201	05N-28E-22 ABA 1	Beaver	121OGLL	—	250	9072	1968–
365214100021201	05N-28E-27 BCD 1	Beaver	121OGLL	16	91.0	9070	1967–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
365600100515101	06N-20E-35 DCC 1	Beaver	121OGLL	16	560	710	1967–
365748100371901	06N-22E-24 DDD 1	Beaver	121OGLL	5	128	9085	1967–
365632100423701	06N-22E-32 CBB 1	Beaver	121OGLL	16	500	9083	1980–
365701100272001	06N-24E-27 CCC 1	Beaver	121OGLL	5	192	9084	1967–
365947100241101	06N-25E-07 CCB 1	Beaver	121OGLL	5	88.0	9087	1980–
365757100221001	06N-25E-20 DDD 1	Beaver	110ALVM	—	164	9086	1980–
350727099274901	08N-21W-31 CBB 1	Beckham	112TRRCH	—	76.0	9088	1980–
351215099292401	08N-22W-02 ABB 1	Beckham	313RSPG	—	210	9094	1981–
350839099303001	08N-22W-27 AAD 1	Beckham	—	—	50.0	9089	1980–
351030099385401	08N-23W-17 AAB 1	Beckham	313RSPG	—	80.0	9090	1980–
351129099415601	08N-24W-02 DCD 1	Beckham	—	—	—	9093	1986–
351122099435501	08N-24W-09 AAB 1	Beckham	112TRRCH	—	142	9092	1980–
351119099494101	08N-25W-10 BAA 1	Beckham	313DGCK	14	82.0	9091	1980–
351347099324101	09N-22W-29 AAD 1	Beckham	112TRRCH	—	64.0	9103	1980–
351334099344001	09N-22W-30 BCC 1	Beckham	112TRRCH	—	67.0	9102	1980–
351301099323301	09N-22W-33 BBB 1	Beckham	112TRRCH	—	74.0	9098	1980–
351518099375901	09N-23W-16 ADD 1	Beckham	112TRRCH	—	—	9115	1981–
351426099372701	09N-23W-22 BDD 1	Beckham	112TRRCH	—	—	9109	1980–
351446099362401	09N-23W-23 BAA 1	Beckham	112TRRCH	—	113	9111	1980–
351308099353601	09N-23W-25 CCD 1	Beckham	112TRRCH	—	—	9100	1980–
351353099383101	09N-23W-28 BAA 1	Beckham	112TRRCH	—	80.0	9104	1980–
351222099395801	09N-23W-32 CCB 1	Beckham	112TRRCH	—	—	9096	1980–
351512099411001	09N-24W-13 DAA 1	Beckham	—	—	30.0	9113	1980–
351512099472401	09N-24W-18 CBB 1	Beckham	112TRRCH	—	120	9114	1980–
351413099451601	09N-24W-21 CBC 1	Beckham	112TRRCH	—	59.0	9108	1980–
351242099420601	09N-24W-36 BCC 1	Beckham	112TRRCH	—	123	9097	1980–
351637099521001	09N-25W-05 DCC 1	Beckham	112TRRCH	—	—	9120	1980–
351557099522601	09N-25W-08 CAC 1	Beckham	112TRRCH	—	160	9117	1980–
351617099482701	09N-25W-12 BCB 1	Beckham	112TRRCH	—	130	9118	1980–
351452099494701	09N-25W-15 DDC 1	Beckham	112TRRCH	—	73.0	9112	1980–
351402099533501	09N-25W-19 CCC 1	Beckham	112DUNE	6	36.0	9107	1980–
351353099482701	09N-25W-25 BBB 1	Beckham	112TRRCH	—	100	9105	1980–
351400099533501	09N-25W-31 BCB 1	Beckham	112TRRCH	6	34.8	9106	1980–
351216099483501	09N-25W-35 DDD 1	Beckham	112TRRCH	—	86.0	9095	1980–
351617099590301	09N-26W-08 BCB 1	Beckham	112TRRCH	—	63.0	9119	1980–
351525099560801	09N-26W-15 ADB 1	Beckham	112TRRCH	—	150	9116	1980–
351433099544101	09N-26W-24 BCA 1	Beckham	112TRRCH	—	219	9110	1980–
351327099595901	09N-26W-30 CBA 1	Beckham	112TRRCH	—	70.0	9101	1980–
351306099515501	09N-26W-33 BBB 1	Beckham	112TRRCH	6	32.8	9099	1980–
351755099563201	10N-26W-34 BDD 1	Beckham	112TRRCH	—	—	9121	1980–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
352426099572801	11N-26W-21 DCC 1	Beckham	121OGLL	—	90.0	9123	1980–
352328099560001	11N-26W-34 AAA 1	Beckham	112TRRCH	—	32.0	9122	1980–
353616098334601	13N-13W-15 ADA 1	Blaine	313RSPG	6	275	9204	1982–
355151098215101	16N-11W-15 BCC 1	Blaine	112TRRCH	—	76.0	9125	1981–
355045098243101	16N-11W-19 DBC 1	Blaine	112TRRCH	—	50.0	5131	1976–
355724098283501	17N-12W-09 DDD 1	Blaine	112TRRCH	—	80.0	9127	1977–
360927098354701	19N-13W-04 BBA 1	Blaine	112TRRCH	—	48.0	9130	1976–
360631098331501	19N-13W-23 ACC 1	Blaine	112TRRCH	—	72.0	9129	1976–
360600098324701	19N-13W-25 BBB 1	Blaine	112TRRCH	12	54.0	9128	1978–
340135096013601	06S- 12E -23 BBB 1	Bryan	—	—	—	9131	1977–
350902098235501	08N-11W-19 CAC	Caddo	313RSPG	14	287	9133	1955–
350832098282101	08N-12W-28 BDB 1	Caddo	313RSPG	16	245	9132	1955–
350930098352501	08N-13W-20 ABA 1	Caddo	313RSPG	16	300	9134	1974–
351459098260201	09N-12W-14 DDB 1	Caddo	313RSPG	—	294	9138	1974–
351439098263401	09N-12W-23 BAC 1	Caddo	313RSPG	—	235	9137	1974–
351623098312001	09N-13W-12 AAC 1	Caddo	313RSPG	—	285	3899	1974–
351302098351501	09N-13W-33 BBB 1	Caddo	313RSPG	—	—	9135	1974–
352225098274001	10N-12W-03 BBD 1	Caddo	313RSPG	16	335	9151	1974–
352229098300901	10N-12W-06 AAD 1	Caddo	313RSPG	—	306	9152	1974–
352107098273801	10N-12W-10 CCA 1	Caddo	313RSPG	21	340	4017	1974–
352015098253001	10N-12W-13 CCA 1	Caddo	313RSPG	16	355	9147	1956–
352017098263301	10N-12W-14 CBD 1	Caddo	313RSPG	18	320	9148	1974–
352046098285901	10N-12W-17 AAD 1	Caddo	313RSPG	14	328	4039	1977–
351923098291301	10N-12W-20 DAC 1	Caddo	313RSPG	16	340	9144	1974–
351950098263601	10N-12W-23 BBD 1	Caddo	313RSPG	16	288	9145	1955–
351730098300301	10N-12W-31 DDB 2	Caddo	313RSPG	16	307	9140	1982–
351805098281201	10N-12W-33 ABD 1	Caddo	313RSPG	—	290	4093	1975–
351755098265801	10N-12W-34 ADD 1	Caddo	313RSPG	—	268	9142	1973–
351748098264201	10N-12W-35 CBA 1	Caddo	313RSPG	—	230	9141	1974–
351952098332801	10N-13W-22 AAC 1	Caddo	313RSPG	16	328	9146	1975–
352715098234901	11N-11W-06 DAC 1	Caddo	313RSPG	14	285	9158	1983–
352514098223501	11N-11W-21 BBB 1	Caddo	313RSPG	18	120	9075	1988–
352316098284101	11N-12W-04 CAC 1	Caddo	313RSPG	16	309	9154	1956–
352515098263001	11N-12W-14 CDC 1	Caddo	313RSPG	18	320	9156	1974–
352306098282401	11N-12W-33 ACC 1	Caddo	313RSPG	6	275	9067	1988–
352551098343901	11N-13W-16 ACA 1	Caddo	313RSPG	16	353	9157	1956–
352922098225801	12N-11W-29 ACA 1	Caddo	313RSPG	14	260	9159	1981–
353137098265801	12N-12W-10 DAD 1	Caddo	313RSPG	—	—	9162	1974–
353119098273501	12N-12W-15 BAB 1	Caddo	313RSPG	6	238	9029	1989–
352924098335601	12N-13W-27 BAC 1	Caddo	313RSPG	18	300	9160	1974–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
353130097415501	12N-05W-11 CDA 1	Canadian	110ALVM	—	43.0	9164	1977–
353105097454001	12N-05W-18 ADA 1	Canadian	110ALVM	12	45.0	9163	1977–
353210097485601	12N-06W-10 AAB 1	Canadian	110ALVM	—	55.0	9165	1978–
353236097551801	12N-07W-03 DAB 1	Canadian	110ALVM	—	50.0	9166	1978–
353315097521001	13N-06W-31 DDA 1	Canadian	110ALVM	—	45.0	9167	1977–
353446098033701	13N-08W-28 BBA 1	Canadian	110ALVM	—	—	9168	1977–
354058098101601	14N-09W-17 DDD 1	Canadian	110TRRCL	—	77.0	9169	1977–
341526097165101	03S-01W-35 BBC 1	Carter	318WCHT	—	—	9170	1976–
355407094593701	17N-22E-32 CDC 1	Cherokee	—	—	54.00	9171	1985–
355920095111001	18N-20E-33 CDD 1	Cherokee	325SVNN	—	65.0	9172	1979–
360151094594501	18N-22E-17 CCA 1	Cherokee	—	—	155	9173	1981–
340201095531501	06S-14E-18 CBB 1	Choctaw	—	—	—	9174	1976–
340326095171901	06S-19E-02 CDD 1	Choctaw	—	—	—	9175	1981–
340326095175101	06S-19E-03 DDD 2	Choctaw	218ALRS	—	320	9176	1981–
363410102560001	01N-01E-10 AAD 1	Cimarron	221EXTR	2	662	9205	1970–
363240102560001	01N-01E-15 BBB 1	Cimarron	121OGLL	18	412	1988	1967–
363120102545001	01N-01E-25 CBB 1	Cimarron	217CYNN	16	400	1996	1967–
363030102571001	01N-01E-33 ACD 1	Cimarron	121OGLL	16	316	9181	1966–
363050102551001	01N-01E-35 ABC 1	Cimarron	121OGLL	18	243	2001	1967–
363410102513001	01N-02E-09 BCB 1	Cimarron	121OGLL	16	170	2008	1967–
363430102474001	01N-02E-12 ABB 1	Cimarron	121OGLL	16	290	9206	1967–
363330102482001	01N-02E-13 BBC 1	Cimarron	121OGLL	16	340	9200	1967–
363310102511001	01N-02E-16 BDC 1	Cimarron	217CYNN	16	448	9199	1967–
363220102482001	01N-02E-24 CBB 1	Cimarron	217CYNN	16	401	2019	1967–
363120102502001	01N-02E-27 BCC 1	Cimarron	121OGLL	—	102	9190	1966–
363150102522001	01N-02E-29 BBA 1	Cimarron	121OGLL	2	454	9195	1970–
363130102534001	01N-02E-30 BCC 1	Cimarron	217CYNN	16	227	2022	1967–
363410102452001	01N-03E-08 ADB 1	Cimarron	—	16	703	9203	1967–
363254102460701	01N-03E-17 CBC 1	Cimarron	217CYNN	—	252	9198	1968–
363150102414001	01N-03E-25 BBB 1	Cimarron	217CYNN	—	425	2038	1966–
363110102461001	01N-03E-29 CCB 1	Cimarron	221MRSN	16	444	2041	1967–
363014102443001	01N-03E-33 DCC 1	Cimarron	121OGLL	—	62.0	9178	1938–
363030102423001	01N-03E-35 CCA 1	Cimarron	121OGLL	16	120	9180	1967–
363120102354001	01N-04E-26 ADC 1	Cimarron	121OGLL	16	295	9189	1967–
363120102301001	01N-05E-27 DBD 1	Cimarron	121OGLL	16	190	9188	1967–
363100102330001	01N-05E-32 BBA 1	Cimarron	121OGLL	16	223	9183	1966–
363010102303001	01N-05E-34 CDD 1	Cimarron	121OGLL	—	250	9177	1967–
363030102292001	01N-05E-35 DBC 1	Cimarron	121OGLL	16	210	2052	1967–
363517102262701	01N-06E-05 BBA 1	Cimarron	121OGLL	5	126	9208	1967–
363110102230001	01N-06E-26 CCC 1	Cimarron	121OGLL	16	172	9186	1967–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
363130102184001	01N-07E-28 BAD 1	Cimarron	121OGLL	—	221	9192	1968–
363440102115001	01N-08E-04 DDB 1	Cimarron	121OGLL	16	465	9207	1967–
363351102050701	01N-09E-10 CBC 1	Cimarron	121OGLL	2	423	9202	1970–
363348102035201	01N-09E-11 CBD 1	Cimarron	121OGLL	16	415	9201	1969–
363110102040001	01N-09E-27 DDA 1	Cimarron	121OGLL	—	401	9184	1967–
363110102064001	01N-09E-29 DCB 1	Cimarron	121OGLL	16	420	2074	1967–
363620102541001	02N-01E-27 CAD 1	Cimarron	—	—	—	9210	1966–
364020102473001	02N-02E-01 ADB 1	Cimarron	211DKCN	16	243	9222	1966–
363820102510001	02N-02E-16 CAA 1	Cimarron	—	16	515	2081	1967–
363660102476001	02N-02E-25 BAD 1	Cimarron	217CYNN	16	249	9213	1967–
364030102253001	02N-06E-04 BBB 1	Cimarron	121OGLL	—	—	9223	1967–
363920102184001	02N-07E-09 ACC 1	Cimarron	121OGLL	16	220	2117	1967–
363800102150001	02N-07E-13 DDD 1	Cimarron	121OGLL	16	393	5600	1967–
363650102161001	02N-07E-26 AAC 1	Cimarron	121OGLL	16	375	2127	1967–
363850102134001	02N-08E-17 BBA 1	Cimarron	121OGLL	16	407	9219	1967–
363730102142001	02N-08E-19 DBB 1	Cimarron	121OGLL	16	320	2137	1967–
363750102110001	02N-08E-22 ABC 1	Cimarron	121OGLL	16	400	9215	1967–
363700102100001	02N-08E-26 ABB 1	Cimarron	121OGLL	16	373	2146	1967–
364008102032601	02N-09E-02 ACC 1	Cimarron	121OGLL	5	135	9221	1938–
363844102060101	02N-09E-16 BBA 1	Cimarron	—	5	240	9218	1981–
363610102054001	02N-09E-33 ABB 1	Cimarron	121OGLL	—	382	2158	1967–
364130102512001	03N-02E-28 CCC 1	Cimarron	121OGLL	5	149	9227	1967–
364420102361001	03N-04E-11 CAC 1	Cimarron	121OGLL	16	261	2172	1978–
364150102401001	03N-04E-30 BDD 1	Cimarron	121OGLL	16	365	2183	1967–
364100102383001	03N-04E-33 BCC 1	Cimarron	121OGLL	16	415	2186	1967–
364520102321001	03N-05E-05 DAA 1	Cimarron	121OGLL	16	277	9237	1962–
364440102282001	03N-05E-12 ACC 1	Cimarron	121OGLL	16	250	2208	1967–
364340102231301	03N-05E-16 DBA 1	Cimarron	—	—	—	9231	1967–
364539102214601	03N-06E-01 ABC 1	Cimarron	121OGLL	16	152	2231	1967–
364440102253001	03N-06E-09 BCC 1	Cimarron	121OGLL	—	260	2243	1967–
364400102225001	03N-06E-14 ABB 1	Cimarron	121OGLL	—	255	9233	1967–
364320102235001	03N-06E-15 DCA 1	Cimarron	121OGLL	16	278	9349	1968–
364330102253001	03N-06E-16 CBB 1	Cimarron	121OGLL	16	216	9230	1967–
364130102195001	03N-07E-32 BBA 1	Cimarron	121OGLL	16	189	2275	1967–
364040102182001	03N-07E-33 DDC 1	Cimarron	121OGLL	16	190	9224	1967–
364400102022001	03N-09E-13 ABB 1	Cimarron	231DCKM	16	375	9232	1967–
364918102415201	04N-03E-11 DDD 1	Cimarron	121OGLL	16	247	2285	1980–
364720102362001	04N-04E-26 BCB 1	Cimarron	221MRSN	16	—	9245	1967–
364630102343001	04N-04E-36 AAC 1	Cimarron	121OGLL	16	220	2288	1967–
364910102305501	04N-05E-15 BBB 1	Cimarron	217CYNN	—	215	9251	1967–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
364550102340001	04N-05E-31 CCD 1	Cimarron	121OGLL	16	242	9239	1967–
364640102321001	04N-05E-32 AAA 1	Cimarron	121OGLL	12	228	9242	1967–
364620102282001	04N-05E-36 ACB 1	Cimarron	121OGLL	16	285	2300	1967–
364950102250001	04N-06E-09 ACB 1	Cimarron	121OGLL	8	288	2305	1967–
364830102262001	04N-06E-17 CDC 1	Cimarron	121OGLL	16	282	2313	1967–
364800102243001	04N-06E-22 CBB 1	Cimarron	121OGLL	16	283	2319	1967–
364820102231001	04N-06E-23 BAB 1	Cimarron	121OGLL	16	227	9247	1966–
364720102222001	04N-06E-25 BBC 1	Cimarron	121OGLL	12	193	2325	1967–
364650102232001	04N-06E-26 CBC 1	Cimarron	121OGLL	16	207	2326	1966–
365030102175001	04N-07E-03 CBA 1	Cimarron	121OGLL	—	265	9256	1967–
365010102204001	04N-07E-07 ABB 1	Cimarron	121OGLL	18	253	9255	1967–
364850102184001	04N-07E-16 ACC 1	Cimarron	121OGLL	16	204	2353	1967–
364850102212001	04N-07E-18 CBB 1	Cimarron	121OGLL	16	229	2354	1967–
365100102125001	04N-08E-05 AAB 1	Cimarron	121OGLL	16	334	2358	1967–
364950102031001	04N-09E-11 ADD 1	Cimarron	231DCKM	—	268	9253	1967–
365110102024001	05N-09E-36 CBC 1	Cimarron	231DCKM	16	316	9258	1967–
365730102132001	06N-08E-29 BDC 1	Cimarron	121OGLL	16	325	9348	1967–
365740102054901	06N-09E-28 BCA 1	Cimarron	121OGLL	5	300	9259	1980–
365934102014401	06N-10E-18 BBB 1	Cimarron	121OGLL	2	272	9800	1970–
365710102013901	06N-10E-30 CCC 1	Cimarron	121OGLL	16	365	9789	1966–
350430097175501	07N-01W-15 CCC 1	Cleveland	317GBWG	—	220	9262	1981–
350338097180301	07N-01W-21 DDD 1	Cleveland	317GBWG	—	585	9260	1984–
350351097165201	07N-01W-23 CBC 1	Cleveland	—	—	166	9261	1981–
350812097180301	07N-01W-28 ADD 1	Cleveland	—	—	220	9264	1981–
350628097230401	07N-02W-02 CBD 1	Cleveland	—	—	84.0	9263	1981–
351149097210501	08N-01W-06 CBB 1	Cleveland	—	—	—	9267	1983–
350845097181101	08N-01W-28 AAB 1	Cleveland	—	5	260	9265	1984–
350845097214501	08N-02W-25 BAA 1	Cleveland	317GBWG	—	480	9266	1979–
351512097292801	09N-03W-14 CBA 1	Cleveland	—	6	700	9268	1984–
351531097331801	09N-03W-18 ABC 1	Cleveland	—	—	141	9269	1984–
352137097165201	10N-01W-11 BBC 1	Cleveland	—	—	100	9271	1979–
351913097262501	10N-02W-20 CCC 1	Cleveland	—	—	210	9270	1980–
343634096204901	02N-09E-27 CDD 1	Coal	325SVNN	—	23.0	9272	1981–
342911098374701	01S-14W-12 BCC 1	Comanche	—	—	—	9273	1981–
344630098095901	04N-09W-32 DBB 1	Comanche	—	—	—	9275	1983–
344630098083201	04N-09W-33 DAA 1	Comanche	—	—	—	9274	1983–
342232098281901	02S-12W-21 BBB 1	Cotton	—	—	—	9277	1983–
341625098170201	03S-10W-30 AAB 1	Cotton	—	—	—	9276	1979–
363220095132701	24N-20E-30 BCA 1	Craig	331BOON	—	—	9278	1979–
364438095043501	26N-21E-08 DDD 1	Craig	325SVNN	—	—	9279	1977–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
360717096202801	19N-09E-15 CCA 1	Creek	—	—	—	9281	1980–
352749098422001	11N-14W-05 BAA 1	Custer	313RSPG	—	—	9847	1979–
352834098415201	12N-14W-32 AAC 1	Custer	313RSPG	6	320	9246	1989–
352804098401801	12N-14W-34 CCA 1	Custer	313RSPG	6.63	440	9244	1989–
353241098500201	12N-15W-06 BCC 1	Custer	313RSPG	6	340	9243	1989–
352948098443101	12N-15W-24 CDB 1	Custer	313RSPG	6	400	9241	1989–
353019098501801	12N-16W-24 AAB 1	Custer	313RSPG	6	300	9240	1989–
353033099014801	12N-17W-18 DDD 1	Custer	313RSPG	7	520	9238	1989–
353645098440401	13N-14W-07 CCA 1	Custer	313RSPG	6	300	9235	1989–
353319098393401	13N-14W-35 CAD 1	Custer	313RSPG	6.63	285	9234	1989–
353436098464201	13N-15W-27 ACA 1	Custer	313RSPG	9.875	360	9225	1990–
353504099003201	13N-17W-21 DBD 1	Custer	313RSPG	6.625	362	9220	1989–
353346098582301	13N-17W-35 AAC 1	Custer	313RSPG	6	470	9217	1989–
353613099065601	13N-18W-16 ACD 1	Custer	313RSPG	6.625	500	9216	1989–
354109098431501	14N-14W-18 DADD 1	Custer	313RSPG	4	148	9214	1990–
354015098423001	14N-14W-20 DCA 1	Custer	313RSPG	6	225	9212	1989–
353926098505801	14N-16W-25 DBD 1	Custer	313RSPG	6	400	9211	1990–
354238099094801	14N-18W-07 BBBB 1	Custer	313RSPG	4	186	9209	1990–
354545098514101	15N-16W-24 BCC 1	Custer	313RSPG	6.625	305	9248	1989–
354555098593001	15N-17W-22 ACA 1	Custer	313RSPG	6	360	9249	1990–
362554094580201	23N-22E-33 ACC 1	Delaware	—	—	—	9287	1979–
355352098391401	16N-14W-02 ABA 1	Dewey	—	4	253.00	9310	1988–
355114099011101	16N-17W-21 BBD 1	Dewey	313RSPG	6	400	9309	1989–
354949099062101	16N-18W-27 CDB 1	Dewey	313RSPG	6	405	9308	1990–
355816098432401	17N-14W-05 CCC 1	Dewey	313RSPG	—	350	9288	1976–
360316098442001	18N-14W-07 BBD 1	Dewey	313RSPG	—	400	9289	1979–
360015098573601	18N-17W-25 DBD 1	Dewey	313RSPG	—	—	9252	1989–
360539098402001	19N-14W-27 ADD 1	Dewey	313RSPG	—	190	9291	1979–
360850099141001	19N-19W-04 CCA 1	Dewey	121OGLL	—	85	9294	1981–
360759099195601	19N-20W-09 DDB 1	Dewey	121OGLL	5	—	9293	1980–
360113099501601	18N-25W-23 CAA 1	Ellis	121OGLL	14	91	2923	1980–
360137099490801	18N-25W-24 BAA 1	Ellis	121OGLL	—	—	9297	1980–
360916099391001	19N-23W-04 ADB 1	Ellis	—	—	—	2964	1980–
360922099413401	19N-23W-06 ABC 1	Ellis	121OGLL	16	380	9317	1980–
360756099401901	19N-23W-08 DDD 1	Ellis	121OGLL	—	—	9383	1980–
360758099382201	19N-23W-10 DCB 1	Ellis	121OGLL	16	480	2970	1980–
360929099455901	19N-24W-04 BAA 1	Ellis	121OGLL	16	273	2989	1980–
360804099475001	19N-24W-07 DBC 1	Ellis	121OGLL	6.52	170	9311	1980–
360753099460901	19N-24W-09 CBD 4	Ellis	121OGLL	—	280	2990	1980–
360758099451001	19N-24W-10 CCA 1	Ellis	121OGLL	16	366	2997	1975–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
360604099483101	19N-24W-19 CCC 1	Ellis	121OGLL	16	174	9303	1980–
360613099422801	19N-24W-23 DCA 1	Ellis	121OGLL	5	325	9306	1980–
360827099485001	19N-25W-12 AAC 1	Ellis	121OGLL	—	—	9315	1980–
360736099483901	19N-25W-13 AAD 1	Ellis	121OGLL	16	203	9307	1980–
360606099514501	19N-25W-22 CCC 2	Ellis	121OGLL	—	—	9304	1980–
360612099500101	19N-25W-23 DCA 1	Ellis	121OGLL	5	125	3012	1980–
360558099522601	19N-25W-28 ABB 1	Ellis	121OGLL	—	—	9302	1980–
360825099582701	19N-26W-04 DAC 1	Ellis	121OGLL	—	—	9314	1980–
360822099552201	19N-26W-12 ACA 1	Ellis	121OGLL	—	520	9313	1980–
360520099562601	19N-26W-26 DCA 1	Ellis	121OGLL	6.63	65.0	9300	1980–
360520099583401	19N-26W-28 DCA 1	Ellis	121OGLL	6.63	455	9301	1980–
360427099572801	19N-26W-34 DCA 1	Ellis	121OGLL	6.63	215	9299	1980–
360420099560001	19N-26W-36 CCC 1	Ellis	121OGLL	—	—	9298	1980–
360936099332901	20N-22W-32 DCA 1	Ellis	121OGLL	16	420	3025	1980–
361420099411001	20N-23W-06 ADD 1	Ellis	121OGLL	—	—	9329	1980–
361154099415801	20N-23W-19 BCA 1	Ellis	121OGLL	—	—	9323	1980–
361127099374301	20N-23W-23 CCA 1	Ellis	121OGLL	—	—	9322	1980–
361405099443301	20N-24W-03 DDB 1	Ellis	121OGLL	6.63	180	4315	1980–
361335099475301	20N-24W-07 ACA 1	Ellis	121OGLL	6.63	240	3043	1980–
361300099453801	20N-24W-16 BAA 2	Ellis	121OGLL	—	—	9382	1980–
360958099432901	20N-24W-35 ADC 1	Ellis	121OGLL	16	283	3054	1975–
361429099503501	20N-25W-02 BCA 1	Ellis	121OGLL	6	300	9330	1980–
361431099523801	20N-25W-04 BCA 1	Ellis	121OGLL	10	—	9332	1980–
361403099533301	20N-25W-05 CAC 1	Ellis	121OGLL	12	—	9327	1980–
361429099544001	20N-25W-06 BDB 1	Ellis	121OGLL	12	232	9331	1981–
361256099534501	20N-25W-17 BBA 1	Ellis	121OGLL	—	75.0	9376	1981–
361156099504001	20N-25W-23 BBC 1	Ellis	121OGLL	—	—	9324	1981–
361211099573801	20N-26W-15 DCC 1	Ellis	121OGLL	16	380	3071	1976–
361007099572201	20N-26W-34 ADB 1	Ellis	121OGLL	5	325	9321	1981–
360822099551301	20N-26W-36 DDB 1	Ellis	121OGLL	—	—	9312	1981–
361852099412801	21N-23W-08 BCA 1	Ellis	121OGLL	—	193	9353	1980–
361545099361601	21N-23W-25 DDA 1	Ellis	121OGLL	—	230	9367	1980–
361629099424301	21N-23W-30 BBB 1	Ellis	121OGLL	5	170	3097	1980–
361924099430701	21N-24W-01 DBD 2	Ellis	121OGLL	6	180	9356	1980–
362017099455101	21N-24W-03 BBB 2	Ellis	121OGLL	8	78.0	9359	1980–
361911099481901	21N-24W-06 DCD 2	Ellis	121OGLL	8	167	9355	1980–
361817099461301	21N-24W-09 DDC 1	Ellis	121OGLL	16	217	9351	1980–
361905099455801	21N-24W-10 BBB 1	Ellis	121OGLL	10	60.0	3109	1980–
361815099444201	21N-24W-11 CCC 1	Ellis	112TRRCH	—	—	9366	1979–
361648099442601	21N-24W-23 CAD 1	Ellis	110TRRCL	—	—	9347	1980–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
361646099434301	21N-24W-24 CBC 1	Ellis	121OGLL	6.62	202	9345	1980–
361552099475201	21N-24W-29 CAC 1	Ellis	121OGLL	6.62	210	9338	1980–
361455099490201	21N-24W-31 CCA 1	Ellis	121OGLL	5	230	9333	1980–
361735099513501	21N-25W-15 DDB 1	Ellis	110ALVM	16	225	3134	1980–
361737099531301	21N-25W-16 CCA 1	Ellis	110ALVM	—	240	3136	1980–
361635099543101	21N-25W-20 CCC 1	Ellis	110TRRCL	—	—	9343	1980–
361641099513801	21N-25W-22 DDB 1	Ellis	121OGLL	16	215	3141	1970–
361634099501301	21N-25W-24 CCC 1	Ellis	121OGLL	16	240	3143	1976–
361550099530801	21N-25W-28 CDB 1	Ellis	121OGLL	—	—	9337	1980–
361558099524101	21N-25W-28 DBD 1	Ellis	121OGLL	—	318	9339	1979–
361622099552601	21N-25W-30 BBD 4	Ellis	121OGLL	16	297	9340	1980–
361456099542401	21N-25W-32 CCA 1	Ellis	121OGLL	16	200	9334	1980–
361501099521201	21N-25W-34 CBD 1	Ellis	121OGLL	16	238	3153	1980–
361534099501401	21N-25W-36 BBB 1	Ellis	121OGLL	—	105	9336	1980–
361831099590901	21N-26W-09 DAC 3	Ellis	121OGLL	—	380	3161	1980–
361720099590201	21N-26W-21 AAA 1	Ellis	121OGLL	—	324	3171	1980–
361647099554901	21N-26W-24 DDB 1	Ellis	110ALVM	14	50.0	9346	1980–
362451099372701	22N-23W-02 ADD 1	Ellis	121OGLL	—	112	9379	1980–
362450099383101	22N-23W-03 ADD 1	Ellis	121OGLL	—	115	9378	1980–
362415099393901	22N-23W-09 AAB 1	Ellis	121OGLL	—	210	9377	1980–
362340099373501	22N-23W-11 DDB 1	Ellis	121OGLL	—	140	9374	1980–
362254099364001	22N-23W-13 DBD 1	Ellis	121OGLL	16	123	9373	1980–
362249099405701	22N-23W-17 DBD 1	Ellis	121OGLL	—	—	9357	1980–
362201099415501	22N-23W-19 DAC 3	Ellis	121OGLL	16	175	9368	1980–
362221099383801	22N-23W-22 ADB 1	Ellis	110ALVM	—	123	9369	1980–
362150099370401	22N-23W-24 CCA 3	Ellis	121OGLL	—	110	9354	1980–
362056099382001	22N-23W-26 DCC 1	Ellis	121OGLL	—	—	9364	1980–
362052099410901	22N-23W-32 ABB 1	Ellis	121OGLL	—	—	9363	1980–
362003099365501	22N-23W-36 CDD 2	Ellis	121OGLL	5	200	3214	1980–
362349099443501	22N-24W-11 CBB 1	Ellis	121OGLL	5	295	9375	1980–
362225099470601	22N-24W-20 ADA 1	Ellis	112TRRCH —	—	—	9370	1980–
362129099424901	22N-24W-25 ADA 8	Ellis	121OGLL	—	—	9365	1980–
362143099473501	22N-24W-29 ABB 1	Ellis	121OGLL	16	239	3221	1980–
362050099475601	22N-24W-32 BBA 1	Ellis	121OGLL	16	310	9362	1980–
362017099450801	22N-24W-34 DAC 1	Ellis	121OGLL	4	139	9358	1980–
362226099544201	22N-25W-19 AAC 1	Ellis	121OGLL	4.5	470	9371	1980–
362236099494001	22N-25W-24 ABB 1	Ellis	121OGLL	—	—	9372	1980–
362049099524601	22N-25W-33 ABB 1	Ellis	121OGLL	6	500	3244	1980–
362042099495901	22N-25W-36 BBD 1	Ellis	121OGLL	6.62	320	9360	1980–
362410099594601	22N-26W-09 BBD 1	Ellis	121OGLL	—	400	3251	1980–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
362148099594301	22N-26W-21 CCD 1	Ellis	121OGLL	16	383	3257	1980–
362847099410401	23N-23W-08 DCC 1	Ellis	121OGLL	16	207	3266	1980–
362750099392701	23N-23W-22 BBB	Ellis	121OGLL	5	260	3270	1980–
362518099421801	23N-23W-31 CDD 1	Ellis	121OGLL	16	280	9380	1980–
362536099400901	23N-23W-33 CAA 1	Ellis	121OGLL	—	184	9381	1980–
363020099432901	23N-24W-01 BAC 1	Ellis	121OGLL	—	342	9352	1980–
362912099461801	23N-24W-09 ACD 1	Ellis	121OGLL	—	—	9392	1980–
362906099450601	23N-24W-10 DAB 1	Ellis	121OGLL	—	—	9391	1980–
362933099440101	23N-24W-11 AAB 1	Ellis	121OGLL	—	—	9393	1980–
362800099434001	23N-24W-13 CCA 1	Ellis	121OGLL	—	—	9387	1980–
362833099485901	23N-24W-18 BBD 1	Ellis	121OGLL	—	—	9389	1980–
362957099514501	23N-25W-03 DDA 1	Ellis	121OGLL	5	320	9395	1980–
362939099525401	23N-25W-04 DCC 1	Ellis	121OGLL	5	345	3296	1980–
362800099524601	23N-25W-16 DCA 1	Ellis	121OGLL	—	359	9388	1980–
362736099510801	23N-25W-23 BCA 1	Ellis	121OGLL	6	335	9384	1980–
362654099544601	23N-25W-30 AAB 1	Ellis	121OGLL	16	480	3302	1980–
362740099563001	23N-26W-24 BBD	Ellis	121OGLL	—	280	3307	1980–
362647099554901	23N-26W-25 AAC 1	Ellis	121OGLL	6.62	290	9350	1980–
362621099574601	23N-26W-26 CBC 1	Ellis	—	—	—	3309	1980–
363203099381401	24N-23W-26 BBD 1	Ellis	121OGLL	—	—	9401	1980–
363124099403201	24N-23W-28 CCC 1	Ellis	121OGLL	—	—	9398	1980–
363325099481101	24N-24W-18 DAA 1	Ellis	121OGLL	—	—	9407	1980–
363215099471301	24N-24W-20 DDC 1	Ellis	121OGLL	—	—	9404	1980–
363159099471801	24N-24W-29 ACA 1	Ellis	121OGLL	5	180	9400	1981–
363448099521801	24N-25W-03 CCC 1	Ellis	121OGLL	—	—	9409	1980–
363511099532601	24N-25W-04 CBB 1	Ellis	121OGLL	—	216	9411	1980–
363316099552501	24N-25W-18 CCA 1	Ellis	121OGLL	12	180	3327	1981–
363254099513201	24N-25W-22 AAC 1	Ellis	121OGLL	—	—	9405	1980–
363145099515201	24N-25W-27 DBB 1	Ellis	121OGLL	5	260	9399	1981–
363036099510801	24N-25W-35 CCA 1	Ellis	121OGLL	—	—	9396	1980–
363501099594201	24N-26W-04 CCA 1	Ellis	121OGLL	5	180	9410	1980–
363407099580101	24N-26W-10 DDB 2	Ellis	121OGLL	—	200	3339	1980–
363211099573401	24N-26W-26 BBA 1	Ellis	121OGLL	—	147	9402	1980–
363211099580201	24N-26W-27 AAB 1	Ellis	121OGLL	16	160	3346	1980–
363118099595701	24N-26W-33 BBB 1	Ellis	121OGLL	6	240	3348	1980–
361907097573601	21N-07W-04 CCC 1	Garfield	318CDHL	—	165	9414	1977–
361725098052001	21N-08W-18 DCD 1	Garfield	110CMTA	36	12.9	9413	1950–
361651098061001	21N-08W-19 CBB 1	Garfield	110CMTA	12	56	9412	1954–
362736097563901	23N-07W-21 AAD 1	Garfield	112TRRCH	—	—	9422	1975–
362736097573601	23N-07W-21 BBC 1	Garfield	112TRRCH	—	—	9423	1975–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
362650097543901	23N-07W-26 AAB 1	Garfield	—	—	—	9416	1975–
362650097551901	23N-07W-26 BBA 1	Garfield	112TRRCH	—	—	9417	1975–
362650097555101	23N-07W-27 ABA 1	Garfield	112TRRCH	—	70.0	9418	1950–
362650097562301	23N-07W-27 BBA 1	Garfield	112TRRCH	—	—	9419	1975–
362637097563101	23N-07W-27 BCB 2	Garfield	112TRRCH	—	60.0	9415	1950–
362650097565501	23N-07W-28 ABA 1	Garfield	112TRRCH	—	—	9420	1975–
362655097572101	23N-07W-28 BAB 2	Garfield	112TRRCH	—	66.8	9421	1975–
345054096580501	04N-03E-03 ADD 1	Garvin	—	—	—	9425	1975–
344844096575701	04N-03E-14 CCC 1	Garvin	—	—	—	9424	1975–
344222098030101	03N-08W-28 BCA 1	Grady	—	—	—	4686	1979–
345409097445101	05N-05W-17 DCB 1	Grady	—	—	65.0	9429	1983–
345304097421301	05N-05W-26 BBB 1	Grady	—	—	—	9428	1983–
351907097510401	10N-06W-29 AAB 1	Grady	—	—	—	9430	1979–
364133097460901	26N-05W-31 ADA 1	Grant	112TRRCH	—	51.0	9431	1975–
364244097471401	26N-06W-24 DDD 1	Grant	112TRRCH	—	53.0	9433	1975–
364514097592101	26N-07W-07 ABA 1	Grant	112TRRCH	—	48.0	9434	1975–
364238098025201	26N-08W-27 BAA 1	Grant	112TRRCH	—	26.0	9432	1975–
364935097594601	27N-07W-18 BAB 1	Grant	112TRRCH	—	67.0	9435	1975–
344630099370201	04N-23W-33 DAB 1	Greer	313VVCR	16	155	9436	1949–
345541099193001	05N-20W-08 AAA 1	Greer	112TRRCH	—	57.0	9445	1980–
345403099202501	05N-20W-17 CCC 1	Greer	112TRRCH	—	58.0	9440	1980–
345356099212801	05N-20W-19 BBB 1	Greer	112TRRCH	—	49.0	9438	1980–
345528099255801	05N-21W-08 ADB 1	Greer	112TRRCH	—	52.0	9444	1980–
345514099240701	05N-21W-10 DBB 1	Greer	313BLIN	—	66.0	9443	1983–
345409099220801	05N-21W-13 CDA 1	Greer	112TRRCH	—	50.0	9441	1980–
345356099224001	05N-21W-23 AAA 1	Greer	112TRRCH	—	50.0	9439	1980–
345547099302701	05N-22W-03 DCC 1	Greer	110ALVM	—	28.0	9446	1980–
345554099313001	05N-22W-04 DCB 1	Greer	110ALVM	—	24.0	9447	1980–
345554099281201	05N-22W-12 DCD 1	Greer	110EFRT	—	46	9442	1980–
345251099363101	05N-23W-27 ACA 1	Greer	313BLIN	16	109	9437	1956–
350055099204901	06N-20W-07 ABA 1	Greer	112TRRCH	—	52.0	9450	1980–
350121099232701	06N-21W-02 CBA 1	Greer	112TRRCH	—	75.0	9451	1980–
345758099345601	06N-23W-25 BDC 1	Greer	110ALVM	—	47.0	9448	1980–
345818099413701	06N-24W-25 BBB 1	Greer	—	—	24.0	9449	1980–
350615099242301	07N-21W-03 CDC 1	Greer	110ALVM	—	49.0	9460	1980–
350641099274901	07N-21W-06 BCC 1	Greer	112TRRCH	—	—	9461	1980–
350529099255801	07N-21W-08 DDB 1	Greer	112TRRCH	—	70.0	9459	1980–
350516099243901	07N-21W-15 BBB 1	Greer	112TRRCH	—	—	9456	1980–
350457099254201	07N-21W-16 CCB 1	Greer	—	—	71.0	9454	1980–
350457099271701	07N-21W-18 ACC 1	Greer	313BLIN	—	102	9455	1980–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
350411099274101	07N-21W-19 BCA 1	Greer	112TRRCH	—	67.0	9453	1981–
350239099265301	07N-21W-31 AAA 1	Greer	112TRRCH	—	68.0	9452	1980–
350701099302701	07N-22W-03 ABB 1	Greer	112TRRCH	—	113	9462	1980–
350516099282801	07N-22W-13 BAA 1	Greer	112TRRCH	—	78.0	9457	1980–
343020099422001	01N-24W-34 DCC 1	Harmon	313VVCR	16	94	9463	1956–
343419099462201	01N-25W-12 DABA 1	Harmon	313BLIN	—	212	9465	1976–
343042099474701	01N-25W-35 DDBA 1	Harmon	313VVCR	16	72	9464	1976–
343820099593001	02N-17W-16 DCC 1	Harmon	—	—	55.5	9533	1989–
343814099481501	02N-25W-23 ABB 1	Harmon	313DGCK	12	130	9467	1956–
343512099574701	02N-26W-05 BCCC 1	Harmon	313BLIN	16	149	9470	1950–
343855099544501	02N-26W-15 AADD 1	Harmon	313BLIN	16	130	9468	1956–
343559099534901	02N-26W-31 CBCD 1	Harmon	313BLIN	16	150	9466	1950–
344015099594501	02N-27W-01 CCBB 1	Harmon	313BLIN	16	150	9469	1952–
344220099441601	03N-24W-29 AAA 2	Harmon	313BLIN	—	169	9472	1954–
344145099512501	03N-25W-32 BBBD 1	Harmon	313BLIN	16	160	9471	1956–
363749099364301	25N-22W-19 BDD 1	Harper	110ALVM	6	130	9476	1978–
363844099442301	25N-24W-13 BDC 1	Harper	110ALVM	6	52.0	9478	1978–
363827099485001	25N-24W-17 CC 1	Harper	112TRRCH	18	40.0	9477	1977–
363957099540201	25N-25W-09 BAA 1	Harper	110ALVM	—	—	9480	1977–
363602099550601	25N-25W-32 BDD 1	Harper	110ALVM	16	175	9474	1981–
363714099564301	25N-26W-25 AAD 1	Harper	121OGLL	5	135	9475	1975–
363538099575301	25N-26W-35 DDD 1	Harper	121OGLL	—	270	9473	1980–
364118099444701	26N-24W-35 ADD 1	Harper	110ALVM	4	27.0	9482	1978–
364336099542001	26N-25W-17 DC 1	Harper	112TRRCH	16	—	9484	1972–
364102099554601	26N-25W-31 DDA 1	Harper	112TRRCH	4	46.0	9481	1978–
364255099581301	26N-26W-23 DBC 1	Harper	121OGLL	—	110	9483	1980–
364825099494701	27N-24W-19 BDB 1	Harper	110ALVM	4	119	9485	1978–
364842099554001	27N-25W-19 AAA 1	Harper	121OGLL	—	50.0	9486	1979–
364953099564001	27N-26W-12 DAD 1	Harper	121OGLL	—	85	9488	1980–
364923099570301	27N-26W-13 ABD 1	Harper	110ALVM	6	33.0	9487	1978–
344929096053501	04N-11E-13 AAA 1	Hughes	325TRMN	—	—	9490	1976–
350945096240401	08N-09E-18 CDA 1	Hughes	—	3	29.7	9491	1982–
351029096162701	08N-19E-11 CDC 1	Hughes	325BGGY	—	66.0	9489	1978–
351538096113401	09N-11E-18 BBB 1	Hughes	—	3	15.0	9493	1982–
343020099404501	01S-24W-02 ABB 1	Jackson	313BLIN	6	55.5	9495	1957–
342744099460701	01S-25W-13 CCCA 1	Jackson	313BLIN	16	130	9494	1953–
343913099313901	02N-22W-08 DDA 1	Jackson	313BLIN	—	75	9497	1953–
343945099342501	02N-23W-12 BBDD 1	Jackson	313BLIN	16	200	9498	1948–
343810099365701	02N-23W-21 AAA 1	Jackson	313BLIN	—	89	9496	1953–
344114099323701	03N-22W-32 CBB 2	Jackson	313BLIN	14	182	9500	1949–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
344220099355501	03N-23W-27 ADAA 1	Jackson	313BLIN	16	127	9501	1948–
344032098390201	03N-23W-30 DAA 1	Jackson	313BLIN	16	90	9499	1952–
344637099152801	04N-20W-36 BDC 1	Jackson	110ALVM	—	97.0	9502	1977–
340827097593301	05S-08W-12 BAD 1	Jefferson	—	—	—	9503	1979–
342236096262701	02S-08E-14 CCC 1	Johnston	—	—	—	9505	1979–
341243096534501	04S-04E-16 BBC 1	Johnston	218ALRS	—	—	9504	1977–
364001097200001	25N-01W-08 BBA 1	Kay	—	—	—	9506	1976–
364222097025601	26N-02E-25 BBC 1	Kay	—	—	—	9508	1975–
364210097025401	26N-02E-26 BDD 1	Kay	110ALVM	—	38.0	9507	1977–
365824097272901	29N-02W-19 CDC 1	Kay	—	—	—	9509	1975–
355724097430301	17N-05W-10 DCC 1	Kingfisher	110CMTA	—	45	9512	1974–
355632097464801	17N-05W-18 CCC 1	Kingfisher	110CMTA	—	30	9510	1974–
355724097480001	17N-06W-11 DDD 1	Kingfisher	110CMTA	—	60	9513	1974–
355810097465601	17N-06W-12 AAA 1	Kingfisher	110CMTA	—	80	9517	1974–
355658097531201	17N-06W-18 BCC 1	Kingfisher	110CMTA	—	30	9511	1974–
355743097544001	17N-07W-11 DBA 1	Kingfisher	110CMTA	4.5	40	9516	1973–
355724097544001	17N-07W-11 DCD 2	Kingfisher	110CMTA	4.5	33	9514	1974–
355743097532001	17N-07W-12 DAA 1	Kingfisher	110CMTA	—	30	9515	1975–
355823097020901	17N-08W-03 DCA 1	Kingfisher	112TRRCH	—	—	9518	1981–
360342097495201	18N-06W-03 CBD 1	Kingfisher	110CMTA	—	45	9527	1974–
360316097522401	18N-06W-07 AAC 1	Kingfisher	110CMTA	—	34	9526	1974–
360230097512001	18N-06W-17 AAB 1	Kingfisher	110CMTA	—	58	9524	1974–
355954097524801	18N-06W-31 BAA 1	Kingfisher	110CMTA	—	56	9521	1974–
355908097521601	18N-06W-31 DDD 2	Kingfisher	110CMTA	—	36	9519	1974–
355954097514401	18N-06W-32 BAA 1	Kingfisher	110CMTA	—	70	9520	1974–
360052097564801	18N-07W-21 DCD 1	Kingfisher	110CMTA	5	63	9522	1950–
360230098004101	18N-08W-13 BBB 1	Kingfisher	110CMTA	—	—	9525	1975–
361045097590501	19N-07W-30 DCD 1	Kingfisher	110CMTA	16	92	9528	1950–
360922098021401	19N-08W-03 AAB 1	Kingfisher	110CMTA	5	48	9532	1950–
360657098041701	19N-08W-17 DCD 1	Kingfisher	110CMTA	—	74	9530	1974–
360526098020101	19N-08W-27 DAC 1	Kingfisher	110CMTA	16	67	9529	1950–
360750098084901	19N-09W-10 CDD 1	Kingfisher	110CMTA	—	32	9531	1974–
344005098591001	02N-17W-04 DDC 1	Kiowa	112TRRCH	—	44.0	9538	1981–
343913098592601	02N-17W-09 DCC 1	Kiowa	112TRRCH	—	49.0	9537	1981–
343913098564801	02N-17W-12 CCC 1	Kiowa	112TRRCH	—	48.0	9536	1978–
343903098580001	02N-17W-15 AAA 1	Kiowa	112TRRCH	—	45.0	9535	1985–
343846099000501	02N-17W-17 ADD 1	Kiowa	112TRRCH	—	40.0	9534	1979–
344235098541801	03N-16W-29 BAA 1	Kiowa	112TRRCH	—	35.0	9541	1978–
344149098582301	03N-17W-27 DCC 1	Kiowa	112TRRCH	—	60.0	9539	1978–
344210098593501	03N-17W-28 CA 1	Kiowa	112TRRCH	—	40.0	9540	1976–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
344821099082201	04N-18W-19 BCC 1	Kiowa	112TRRCH	—	23.0	9544	1979–
344745099083001	04N-19W-25 AAA 1	Kiowa	110ALVM	—	33.0	9543	1978–
344637099085401	04N-19W-36 ACC 1	Kiowa	112TRRCH	—	19.0	9542	1981–
345857099193001	06N-20W-20 ADA 2	Kiowa	112TRRCH	—	68.0	9553	1976–
345844099193001	06N-20W-20 DAA 1	Kiowa	112TRRCH	—	64.0	9552	1976–
345831099191401	06N-20W-21 CCA 1	Kiowa	112TRRCH	—	66.0	9551	1976–
345824099185001	06N-20W-21 DCC 2	Kiowa	112TRRCH	—	42.0	9550	1976–
345824099165901	06N-20W-23 CDC 1	Kiowa	112TRRCH	—	38.0	9549	1976–
345732099181801	06N-20W-27 CCC 1	Kiowa	112TRRCH	—	38.0	9546	1976–
345751099185801	06N-20W-28 CAA 1	Kiowa	112TRRCH	—	57.0	9547	1979–
345818099193001	06N-20W-29 AAA 1	Kiowa	112TRRCH	—	51.0	9548	1979–
345659099162001	06N-20W-35 DAA 1	Kiowa	112TRRCH	—	—	9545	1976–
350457098453401	07N-15W-14 BCC 1	Kiowa	112TRRCH	—	46	9555	1956–
350226099074501	07N-18W-32 BCB 1	Kiowa	313DGCK	—	—	9554	1976–
345509095184901	05N-19E-09 CBB 1	Latimer	—	—	—	9556	1976–
345021094320801	04N-26E-11 AAA 1	Le Flore	—	—	—	9557	1980–
352907096411001	12N-06E-29 DAB 1	Lincoln	—	—	—	9558	1980–
354205096530801	14N-04E-09 CAB 1	Lincoln	—	—	—	9559	1980–
355540097054901	17N-02E-21 CDD 1	Lincoln	322VMOS	—	80.0	9560	1977–
354328097234801	14N-02W-03 ABB 1	Logan	—	—	110	9624	1976–
355315097390701	16N-04W-05 CCA 1	Logan	110CMTA	—	75	9561	1983–
355717097252601	17N-02W-16 BBB 1	Logan	—	—	34.0	9568	1984–
355632097365501	17N-04W-15 CDC 1	Logan	110CMTA	—	—	9567	1974–
355606097392701	17N-04W-19 ADD 1	Logan	110CMTA	—	—	9566	1974–
355447097365501	17N-04W-27 CDC 1	Logan	110CMTA	—	—	9565	1975–
355355097402301	17N-04W-31 CCC 1	Logan	110CMTA	4	52.20	9562	1974–
355441097363901	17N-04W-34 ABB 1	Logan	110CMTA	—	—	9564	1974–
355402097371101	17N-04W-34 CCB 1	Logan	110CMTA	—	57	9563	1974–
335106097244901	08S-02W-21 BAA 1	Love	112TRRCH	—	51.0	9569	1980–
345646097160401	06N-01W-35 DDB 1	McClain	110ALVM	—	—	9591	1976–
351043097294001	08N-03W-10 DDA 1	McClain	323IOLA	—	—	9593	1976–
350957097274901	08N-03W-13 CBC 1	McClain	—	—	—	9592	1980–
342812094382601	01S-25E-14 DAA 1	McCurtain	—	—	300	9596	1984–
340042095051801	06S-21E-27 AAA 1	McCurtain	218ALRS	—	—	9595	1956–
335904094444001	06S-24E-36 DCD 1	McCurtain	—	—	62.0	9594	1984–
351206095504201	08N-14E-05 AAB 1	McIntosh	112TRRCH	—	—	9597	1981–
352420095472601	11N-14E-26 ABB 1	McIntosh	—	3	32.2	9598	1982–
361442098092801	20N-09W-04 AAA 1	Major	110CMTA	6	60	9575	1965–
361355098112101	20N-09W-05 CCC 1	Major	110CMTA	—	53	9574	1949–
361302098130601	20N-10W-12 CDD 1	Major	110CMTA	—	54	9573	1978–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
361155098360801	20N-13W-20 ADA 1	Major	112TRRCH	5	61.0	9571	1978–
361117098543101	20N-16W-21 DCD 1	Major	110TRRCL	6	41.0	9570	1978–
361907098123501	21N-09W-06 CCC 1	Major	110CMTA	—	40.0	9580	1976–
361631098103501	21N-09W-20 DDD 1	Major	110CMTA	24	49.5	9577	1950–
361624098120301	21N-09W-30 AB 1	Major	110CMTA	1.25	21	9576	1950–
361723098164401	21N-10W-16 CC 1	Major	110CMTA	10	39	9579	1951–
361631098155601	21N-10W-21 DDD 1	Major	110CMTA	24	40	9578	1950–
362045098183101	22N-10W-31 BAA 1	Major	110CMTA	—	51	9581	1974–
362506098210101	22N-11W-02 BBA 1	Major	110CMTA	—	75	9585	1983–
362427098211701	22N-11W-03 DDA 1	Major	110CMTA	—	—	9584	1983–
362210098201301	22N-11W-23 ADD 1	Major	110CMTA	—	75	9583	1974–
362716098243001	23N-11W-19 DAA 1	Major	110CMTA	—	55	9587	1974–
362650098191701	23N-11W-25 AAB 1	Major	110CMTA	—	—	9586	1983–
335621096380301	07S- 06E-24 BBA 1	095	—	—	—	9588	1978–
361132095130901	20N- 20E-19 CCD 1	Mayes	—	—	—	9589	1979–
361547095151901	21N- 19E-35 BAB 1	Mayes	—	—	—	9590	1977–
343208096494101	01N- 04E-25 AAA 1	Murray	—	—	—	9599	1976–
352143095131301	10N- 20E-07 AAA 1	Muskogee	110ALVM	—	—	9600	1981–
365439095270101	28N- 17E-14 ADD 1	Nowata	121OGLL	—	—	9602	1979–
365321095282901	28N- 17E-22 DCC 1	Nowata	121OGLL	—	—	9601	1979–
365903095390001	29N- 15E-23 ABB 1	Nowata	—	—	—	9603	1979–
352213096210801	10N- 09E-15 BBB 1	Okfuskee	—	3	20.8	9605	1982–
352000096110401	10N- 11E-18 DCC 1	Okfuskee	—	3	24.7	9604	1982–
352752096344701	11N- 07E-33 CCD 1	Okfuskee	—	3	37.2	9607	1982–
352659096252301	11N- 08E-12 BBB 1	Okfuskee	—	3	20.0	9606	1982–
352637097253701	11N-02W-08 ADC 1	Oklahoma	318GRBR	—	743	9608	1975–
352726097294301	11N-03W-03 ADD 1	Oklahoma	—	3	19.5	9610	1982–
352700097384101	11N-04W-05 CDD 1	Oklahoma	—	3	17.5	9609	1982–
352940097225001	12N-02W-23 CDD 1	Oklahoma	—	—	180	9611	1979–
353236097332601	12N-03W-06 CAA 1	Oklahoma	—	—	762	9612	1976–
353749097243601	13N-02W-04 DAB 1	Oklahoma	—	—	130	9618	1981–
353729097253201	13N-02W-05 DDD 1	Oklahoma	318GRBR	—	260.00	9617	1986–
353354097301201	13N-03W-34 ABB 1	Oklahoma	318GRBR	—	200	9614	1984–
354231097140501	14N- 01E-07 ABA 1	Oklahoma	318GRBR	6	87.0	9622	1974–
353948097112501	14N- 01E-27 BAB 1	Oklahoma	310WLNG	8	200	9620	1973–
354025097200501	14N-01W-20 CBB 1	Oklahoma	—	—	43.0	9621	1956–
354243097300401	14N-03W-03 DCD 1	Oklahoma	—	—	410	9623	1976–
353914097325901	14N-03W-30 DDD 1	Oklahoma	—	6	134	9619	1973–
354302096102101	14N- 11E-06 DAA 1	Okmulgee	323CFVL	—	—	9625	1981–
361526096084201	21N- 11E-32 ABC 1	Osage	323IOLA	—	—	9626	1979–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
365745094580101	29N-22E-30 AAC 1	Ottawa	331BOON	—	—	9627	1979–
361631096301901	21N-07E-24 CDD 1	Pawnee	323IOLA	—	—	9628	1979–
363058096440101	24N-05E-35 ACA 1	Pawnee	112TRRCH	—	—	9629	1978–
355810097134101	17N-01E-08 BBB 1	Payne	—	—	65.0	9630	1983–
355908097030101	18N-02E-36 CCC 1	Payne	112TRRCH	—	—	9633	1979–
355908096554101	18N-03E-36 DDD 1	Payne	—	—	56.0	9632	1983–
360329096450101	18N-05E-03 DDD 1	Payne	—	—	42.0	9634	1983–
355908096442101	18N-05E-35 DCC 1	Payne	322VMOS	—	—	9631	1977–
360927097211001	19N-01W-06 BBB 1	Payne	310WLNG	—	—	9636	1977–
360725096521501	19N-04E-15 CBB 1	Payne	310PRMN	6	—	9635	1977–
345128095441501	05N-15E-32 DDA 1	Pittsburg	325SVNN	—	—	9637	1976–
343523096410901	01N-06E-04 BCB 1	Pontotoc	371ABCKL	—	—	9638	1977–
350035097031801	06N-02E-11 ADA 1	Pottawatomie	112TRRCH	—	—	9639	1978–
352748097055201	11N-02E-04 BAA 1	Pottawatomie	—	3	21.5	9643	1982–
352519096545501	11N-04E-18 DDC 1	Pottawatomie	—	—	—	9642	1981–
352519096544701	11N-04E-18 DDD 1	Pottawatomie	112TRRCH	—	—	9641	1981–
352420096463601	11N-05E-21 DCD 1	Pottawatomie	—	3	16.7	9670	1982–
352509096420601	11N-06E-19 AAA 1	Pottawatomie	—	3	17.1	9640	1982–
341435095350801	04S-16E-02 AAA 1	Pushmataha	218ALRS	—	—	9645	1976–
341344095373801	04S-16E-09 ABB 1	Pushmataha	—	—	—	9644	1980–
352750099530001	11N-25W-06 ABB 1	Roger Mills	121OGLL	14	130	2447	1979–
353206099422201	12N-24W-11 ABC 1	Roger Mills	121OGLL	—	—	9649	1980–
353100099460801	12N-24W-17 BCC 1	Roger Mills	121OGLL	—	90.0	9648	1980–
353242099471801	12N-25W-01 ADD 1	Roger Mills	121OGLL	—	105	9650	1980–
353044099492601	12N-25W-15 DDA 1	Roger Mills	121OGLL	—	46.0	9647	1980–
352834099533701	12N-25W-31 BBD 1	Roger Mills	121OGLL	—	—	9335	1979–
353722099400801	13N-23W-08 ABB 1	Roger Mills	—	—	—	9328	1976–
353648099521601	13N-25W-09 CBC 1	Roger Mills	121OGLL	—	125	9653	1981–
353440099534001	13N-25W-30 AAC 1	Roger Mills	121OGLL	—	80	9651	1980–
353338099533401	13N-25W-31 ADA 1	Roger Mills	110ALVM	5	50.0	9326	1979–
353712099582001	13N-26W-09 BDB 1	Roger Mills	121OGLL	6.62	156	2632	1980–
353440099575601	13N-26W-28 AAC 1	Roger Mills	121OGLL	6.62	205	2644	1980–
353854099402401	14N-23W-32 BDD 1	Roger Mills	110ALVM	12	86.0	2687	1976–
353924099492801	14N-25W-26 DCA 1	Roger Mills	121OGLL	5	120	9657	1980–
353904099542201	14N-25W-31 BBC 1	Roger Mills	121OGLL	6.62	80.0	9656	1980–
354702099465501	15N-24W-08 CCC 1	Roger Mills	121OGLL	—	111	9663	1980–
354651099434101	15N-24W-14 BBC 1	Roger Mills	121OGLL	—	—	9661	1980–
354519099465901	15N-24W-19 DDD 1	Roger Mills	121OGLL	—	68	9660	1980–
354340099422501	15N-24W-36 CAC 1	Roger Mills	—	—	—	9658	1976–
354704099563201	15N-26W-11 CCC 1	Roger Mills	121OGLL	—	45.7	9664	1980–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
354700099552901	15N-26W-13 BBB 1	Roger Mills	121OGLL	—	81.0	9662	1980–
354344099593601	15N-26W-32 CCA 1	Roger Mills	121OGLL	—	167	9659	1981–
355047099540501	16N-25W-19 CAC 1	Roger Mills	121OGLL	—	220	9665	1980–
355219099574501	16N-26W-09 DDD 1	Roger Mills	121OGLL	—	—	9666	1980–
355122099551601	16N-26W-24 BBA 1	Roger Mills	121OGLL	—	80.0	9341	1985–
355429099502801	17N-25W-35 BCA 1	Roger Mills	121OGLL	—	—	9667	1981–
362305095420301	22N-15E-15 CBD 1	Rogers	121OGLL	—	—	9668	1979–
363306095242201	24N-18E-20 AAC 1	Rogers	325SNOR	—	—	9669	1979–
352558096271701	11N-08E-16 AAD 1	Seminole	322VMOS	—	—	9671	1976–
353117095065201	12N-21E-18 AAA 1	Sequoyah	110ALVM	—	—	9672	1977–
353624094585601	13N-22E-16 BAD 1	Sequoyah	326ATCK	—	—	9673	1979–
344050097553101	02N-07W-03 BAB 1	Stephens	313RSPG	—	186	9674	1976–
363346101594001	01N-10E-09 CBC 1	Texas	121OGLL	16	360	800	1966–
363336101554701	01N-10E-12 DCD 1	Texas	121OGLL	16	352	9691	1966–
363318101583801	01N-10E-15 BCB 1	Texas	121OGLL	16	382	803	1965–
363037102004100	01N-10E-32 CBA 1	Texas	121OGLL	—	414	9676	1966–
363451101542001	01N-11E-05 CBB 1	Texas	121OGLL	16	309	812	1966–
363118101511001	01N-11E-22 DDC 1	Texas	121OGLL	4	122	9682	1966–
363118101510001	01N-11E-26 CBB 1	Texas	121OGLL	—	316	818	1963–
363336101470901	01N-12E-08 DCD 1	Texas	121OGLL	5	104	9690	1966–
363459101370001	01N-13E-01 BCB 2	Texas	121OGLL	16	310	840	1964–
363405101390401	01N-13E-10 BCB 1	Texas	121OGLL	16	402	9695	1964–
363118101373101	01N-13E-26 DBB 1	Texas	121OGLL	5	324	9680	1966–
363359101321201	01N-14E-10 BDD 1	Texas	121OGLL	5	211	9694	1966–
363032101355101	01N-14E-31 CBB 1	Texas	121OGLL	—	—	9385	1966–
363314101242901	01N-15E-14 ACA 1	Texas	121OGLL	6.63	181	868	1980–
363238101292801	01N-15E-19 BBB 1	Texas	121OGLL	16	321	871	1965–
363209101283201	01N-15E-19 DAA 1	Texas	121OGLL	16	365	9684	1964–
363107101261501	01N-15E-27 CCB 1	Texas	121OGLL	6	133	9678	1966–
363027101282301	01N-15E-32 CBB 1	Texas	121OGLL	16	333	9675	1966–
363512101203801	01N-16E-04 BAB 1	Texas	121OGLL	16	260	9699	1980–
363202101213301	01N-16E-20 CAD 1	Texas	121OGLL	16	400	9683	1980–
363439101110701	01N-17E-01 CBC 1	Texas	121OGLL	16	475	911	1966–
363338101131801	01N-17E-10 CCC 1	Texas	121OGLL	4	180	9692	1966–
363211101161101	01N-17E-19 CCC 1	Texas	121OGLL	16	365	9685	1966–
363115101160001	01N-17E-30 DBB 1	Texas	121OGLL	2	363	9679	1970–
363242101042301	01N-18E-13 CDC 1	Texas	110ALVM	20	27.0	9687	1966–
363048101064601	01N-18E-34 BBA 1	Texas	121OGLL	5	80.0	9677	1966–
362958101220201	01S-16E-06 AAA 1	Texas	121OGLL	—	—	9386	1966–
363742102002301	02N-10E-20 BBD 1	Texas	121OGLL	16	300	9710	1967–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
363648101584901	02N-10E-28 BCB 1	Texas	121OGLL	6	204	9706	1966–
363534101521001	02N-11E-34 CCB 1	Texas	121OGLL	16	300	949	1966–
363632101423901	02N-12E-25 DBB 1	Texas	121OGLL	16	332	953	1955–
363604101462601	02N-12E-33 BAB 1	Texas	110ALVM	16	60.0	9702	1955–
363819101363001	02N-13E-13 CAA 1	Texas	121OGLL	16	300	9713	1966–
363843101401201	02N-13E-16 BBB 1	Texas	121OGLL	16	320	9715	1958–
363520101411701	02N-13E-32 CCC 1	Texas	121OGLL	16	384	988	1963–
363909101312301	02N-14E-11 CBA 1	Texas	121OGLL	16	342	9719	1966–
363718101313001	02N-14E-23 CBB 2	Texas	121OGLL	2	287	9708	1970–
363716101303101	02N-14E-24 CBC 1	Texas	121OGLL	16	360	9707	1980–
363911101271401	02N-15E-09 BCB 1	Texas	121OGLL	16	408	9720	1955–
363843101254501	02N-15E-15 BAA 1	Texas	121OGLL	2	410	9714	1970–
364003101201901	02N-16E-04 DBA 1	Texas	121OGLL	16	435	9725	1964–
363927101225701	02N-16E-07 BBB 1	Texas	121OGLL	16	480	1106	1964–
363929101210701	02N-16E-08 AAA 1	Texas	121OGLL	—	—	1111	1966–
363816101184201	02N-16E-14 CBB 1	Texas	121OGLL	16	455	1120	1964–
363848101163101	02N-17E-07 CCC 1	Texas	121OGLL	16	473	1135	1965–
363932101064401	02N-18E-03 BDC 1	Texas	110ALVM	6	33.0	9723	1967–
363938101090101	02N-18E-08 BAD 1	Texas	121OGLL	6	117	9724	1968–
363907101051001	02N-18E-11 DBB 1	Texas	121OGLL	—	94.0	9718	1966–
363758101051301	02N-18E-14 DCD 1	Texas	121OGLL	16	312	9711	1960–
363727101044101	02N-18E-24 BCC 1	Texas	121OGLL	2	321	9709	1969–
363636101064801	02N-18E-27 BCC 1	Texas	121OGLL	16	293	1156	1959–
363629101100401	02N-18E-30 CBB 1	Texas	121OGLL	16	482	9703	1956–
363904101031501	02N-19E-07 CAA 1	Texas	121OGLL	—	88.0	9717	1966–
364447101573301	03N-10E-11 BBB 2	Texas	231DCKM	6	194	9733	1966–
364220102014101	03N-10E-19 CDC 1	Texas	231DCKM	16	270	1175	1966–
364305101562401	03N-10E-24 BBB 1	Texas	121OGLL	16	220	1178	1956–
364325101552501	03N-11E-18 CBC 1	Texas	121OGLL	16	200	9730	1956–
364459101373601	03N-13E-02 CDD 1	Texas	121OGLL	3	73.0	9734	1966–
364301101175401	03N-16E-23 AAB 1	Texas	121OGLL	6	122	9728	1966–
364202101195501	03N-16E-28 AAD 1	Texas	121OGLL	4	148	9726	1966–
364334101111101	03N-17E-13 CBB 1	Texas	121OGLL	6	—	9732	1966–
365033101524702	04N-11E-04 DBD 1	Texas	231DCKM	—	386	9754	1982–
365006101520801	04N-11E-10 BBB 1	Texas	231DCKM	—	—	9750	1966–
365026101321102	04N-14E-03 DBB 1	Texas	121OGLL	16	350	1316	1980–
365046101345101	04N-14E-05 BBC 1	Texas	121OGLL	5	167.50	9755	1966–
364851101303901	04N-14E-14 ADD 1	Texas	121OGLL	16	273	9746	1966–
364939101262101	04N-15E-09 ADD 1	Texas	121OGLL	16	540	1335	1966–
364945101244101	04N-15E-11 BDA 1	Texas	121OGLL	16	381	1337	1966–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
364844101255801	04N-15E-15 CAB 1	Texas	121OGLL	16	440	1340	1966–
364703101233501	04N-15E-25 DBB 1	Texas	121OGLL	16	468	1354	1966–
364705101264701	04N-15E-28 ACC 1	Texas	121OGLL	16	510	1356	1966–
365028101215901	04N-16E-05 CCB 1	Texas	121OGLL	16	627	1362	1966–
364858101213301	04N-16E-17 BAD 1	Texas	121OGLL	16	497	9747	1966–
364740101190501	04N-16E-22 DCB 1	Texas	121OGLL	16	264	1375	1966–
364724101215601	04N-16E-29 BBB 1	Texas	121OGLL	16	495	1383	1966–
365015101132301	04N-17E-03 CBC 1	Texas	121OGLL	—	486	1387	1966–
364822101121101	04N-17E-14 CCD 1	Texas	121OGLL	16	402	9744	1966–
364817101133101	04N-17E-21 AAA 1	Texas	121OGLL	16	515	1408	1964–
364810101112501	04N-17E-23 AAA 1	Texas	121OGLL	16	567	1412	1966–
364614101133001	04N-17E-33 ADD 1	Texas	121OGLL	16	491	1421	1966–
364658101044301	04N-18E-25 CBB 1	Texas	121OGLL	16	355	9736	1966–
364716101053601	04N-18E-26 BCA 1	Texas	121OGLL	16	350	1434	1966–
364734100571301	04N-20E-19 CBB 1	Texas	121OGLL	5	120	9060	1968–
365407101530001	05N-11E-16 BCB 1	Texas	121OGLL	16	334	9767	1966–
365607101481101	05N-12E-06 BAA 1	Texas	121OGLL	—	320	1531	1968–
365422101462601	05N-12E-16 BBB 1	Texas	121OGLL	16	350	1536	1966–
365325101454001	05N-12E-21 AAB 1	Texas	121OGLL	16	253	1540	1966–
365313101451801	05N-12E-22 CBB 1	Texas	121OGLL	16	272	1541	1982–
365546101363301	05N-13E-01 CBA 1	Texas	121OGLL	16	380	9779	1966–
365509101405501	05N-13E-08 BBB 1	Texas	121OGLL	16	300	1554	1966–
365358101371201	05N-13E-14 DBB 1	Texas	121OGLL	16	350	9766	1966–
365335101294001	05N-14E-01 ABB 1	Texas	121OGLL	—	—	9762	1966–
365451101321901	05N-14E-10 CBB 1	Texas	121OGLL	16	485	1573	1966–
365130101350001	05N-14E-31 ACC 1	Texas	121OGLL	16	367	1584	1964–
365428101273901	05N-15E-08 CDD 1	Texas	121OGLL	16	446	9771	1954–
365354101244401	05N-15E-14 CBA 1	Texas	121OGLL	16	501	1604	1964–
365300101271001	05N-15E-20 DAB 1	Texas	121OGLL	—	365	9759	1966–
365336101214701	05N-16E-18 DDC 2	Texas	121OGLL	7	197	9763	1966–
365552101094901	05N-17E-01 ADA 1	Texas	121OGLL	—	116	9780	1966–
365437101130301	05N-17E-09 DDA 1	Texas	121OGLL	4	125	9772	1966–
365427101111501	05N-17E-11 DCC 1	Texas	121OGLL	6	153	9770	1966–
365358101145301	05N-17E-17 CBA 1	Texas	121OGLL	16	515	1675	1966–
365234101122001	05N-17E-27 ABC 1	Texas	121OGLL	18	343	1679	1966–
365541101044901	05N-18E-02 DBB 1	Texas	121OGLL	—	—	9777	1966–
365539101002301	05N-19E-04 DBA 1	Texas	121OGLL	—	510	1705	1966–
365513101023601	05N-19E-07 ABB 1	Texas	—	16	595	9774	1980–
365421100571201	05N-19E-13 ABB 1	Texas	—	16	536	1713	1980–
365208101010601	05N-19E-29 DAA 1	Texas	121OGLL	2	567	9757	1970–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
365636101554301	06N-10E-36 DBB 1	Texas	121OGLL	16	400	1745	1966–
365903101540201	06N-11E-17 CBC 1	Texas	121OGLL	—	357	9799	1967–
365739101504801	06N-11E-26 BCB 2	Texas	121OGLL	16	423	1771	1966–
365810101400201	06N-13E-20 DDA 1	Texas	121OGLL	16	440	1826	1966–
365730101420601	06N-13E-30 CBB 1	Texas	121OGLL	16	434	1838	1966–
365825101330001	06N-14E-21 ACB 1	Texas	121OGLL	—	542	1855	1966–
365633101311501	06N-14E-35 CBB 1	Texas	121OGLL	16	379	1874	1966–
365735101283501	06N-15E-30 ACB 1	Texas	121OGLL	—	—	9792	1966–
365649101270001	06N-15E-33 BBC 1	Texas	121OGLL	16	395	9786	1980–
365750101195501	06N-16E-27 ACC 1	Texas	121OGLL	2	605	9794	1970–
365606101112001	06N-17E-14 DBB 1	Texas	121OGLL	16	435	1895	1966–
365809101114701	06N-17E-23 CBC 1	Texas	121OGLL	—	145	9795	1966–
365706101134001	06N-17E-28 CCD 1	Texas	121OGLL	5	149	9788	1966–
365616101115701	06N-17E-34 DDD 1	Texas	121OGLL	—	118	9783	1966–
365704101070301	06N-18E-28 CDD 1	Texas	121OGLL	6	133	9787	1966–
365730101084101	06N-18E-30 ADD 1	Texas	121OGLL	—	125	9790	1966–
365857100595601	06N-19E-15 CCC 1	Texas	121OGLL	16	437	9798	1966–
343122099013201	01N-17W-30 DCC 1	Tillman	112TRRCH	—	28.0	9829	1974–
343511099025101	01N-18W-01 CAB 1	Tillman	112TRRCH	—	42.0	9834	1953–
343419099041001	01N-18W-11 CBB 1	Tillman	—	—	—	9833	1977–
343313099052901	01N-18W-16 DDB 1	Tillman	112TRRCH	—	—	9832	1974–
343122099062401	01N-18W-29 DDD 1	Tillman	—	—	—	9830	1947–
343300099083801	01N-19W-24 AAB 1	Tillman	112TRRCH	—	54.0	9831	1975–
342957099015701	01S-17W-06 DBB 1	Tillman	—	—	58.0	9827	1984–
342938099053001	01S-18W-04 DCD 1	Tillman	112TRRCH	—	46.0	9826	1970–
342845099043501	01S-18W-10 DCC 1	Tillman	112TRRCH	—	58.0	9824	1974–
342727099072101	01S-18W-19 ADD 1	Tillman	112TRRCH	—	50.0	9822	1970–
342700099040301	01S-18W-23 CCC 1	Tillman	112TRRCH	—	58.0	9821	1974–
342654099054601	01S-18W-28 BAA 1	Tillman	—	—	—	9819	1977–
342615099072101	01S-18W-30 DDA 1	Tillman	112TRRCH	—	50.0	9817	1981–
342601099051401	01S-18W-33 AAA 1	Tillman	112TRRCH	—	50.0	9816	1968–
342542099030001	01S-18W-36 BCC 1	Tillman	—	—	—	9815	1974–
343017099103001	01S-19W-03 AAD 1	Tillman	112TRRCH	—	46.0	9828	1969–
342931099122001	01S-19W-09 BBA 1	Tillman	112TRRCH	—	38.0	9825	1974–
342806099092701	01S-19W-14 DAD 1	Tillman	112TRRCH	—	43.0	9823	1974–
342628099082401	01S-19W-25 DAA 1	Tillman	—	—	—	9818	1944–
342654099105301	01S-19W-27 ABB 1	Tillman	112TRRCH	—	47.0	9820	1975–
342535099091901	01S-19W-36 CBB 1	Tillman	112TRRCH	—	54.0	9814	1969–
343735099010801	02N-17W-19 DDA 1	Tillman	112TRRCH	—	47.0	9835	1977–
342430099053801	02S-18W-04 DCB 2	Tillman	112TRRCH	—	65.0	9812	1975–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
342245099050701	02S-18W-15 CCB 1	Tillman	112TRRCH	—	62.0	9810	1970–
342443099134701	02S-19W-06 DAB 1	Tillman	110ALVM	—	—	9813	1974–
342309099085501	02S-19W-13 BC 1	Tillman	112TRRCH	14	70.0	9811	1974–
341718099102201	02S-19W-23 BBB 1	Tillman	—	—	—	9806	1984–
342001099083201	02S-19W-36 DBC 1	Tillman	—	—	—	9809	1984–
341559099003901	03S-17W-29 CAB 1	Tillman	—	—	18.0	9805	1970–
341539099015701	03S-17W-30 CCC 1	Tillman	—	—	32.0	9804	1983–
341955099051401	03S-18W-04 AAA 1	Tillman	—	—	—	9808	1974–
341723099052401	03S-18W-21 BA 1	Tillman	112TRRCH	16	46.0	9807	1974–
341447099062501	03S-18W-32 DDC 2	Tillman	112TRRCH	—	70.0	9803	1969–
341342099030001	04S-18W-12 BBC 1	Tillman	112TRRCH	—	64.0	9801	1981–
341441099084701	04S-19W-01 ABB 1	Tillman	112TRRCH	—	—	9802	1981–
355914095534701	17N-13E-02 BAB 1	Tulsa	110TRRCL	—	37.00	9837	1988–
355210095224401	16N-18E-15 AAA 1	Wagoner	110ALVM	—	—	9838	1976–
363819095523901	25N-13E-23 DAA 1	Washington	110ALVM	—	—	9839	1979–
364919095523101	27N-13E-13 CBB 1	Washington	323DEWY	—	—	9840	1977–
365557095521501	28N-13E-01 CDC 1	Washington	323WANN	—	—	9841	1979–
351630098432401	09N-14W-07 BAA 1	Washita	—	6	52.2	9843	1957–
351308098395701	09N-14W-27 DCD 1	Washita	313RSPG	14	312	9842	1955–
352238098384301	10N-14W-02 AAB	Washita	313RSPG	18	395	9194	1989–
352229098384601	10N-14W-02 AAC 1	Washita	313RSPG	—	352	9846	1979–
351939098394101	10N-14W-22 ADD 1	Washita	313RSPG	—	—	9844	1979–
352203098472201	10N-15W-04 DBD 1	Washita	—	—	—	9845	1980–
362933098350501	23N-13W-03 CCC 1	Woods	110CMTA	—	73	9849	1983–
362755098371301	23N-13W-17 CCB 1	Woods	110CMTA	—	70	9848	1975–
363446098334401	24N-13W-02 CDC 1	Woods	110CMTA	6	55	9853	1983–
363446098352901	24N-13W-04 DCD 1	Woods	110CMTA	6	32	9854	1983–
363209098402601	24N-14W-23 CCC 1	Woods	110CMTA	4.5	60	9852	1974–
363150098444301	24N-14W-30 BCB 1	Woods	110CMTA	5	59	9851	1983–
363045098403401	24N-14W-34 DAA 1	Woods	110CMTA	5	75	9850	1979–
363446098514101	24N-16W-01 DCC 1	Woods	110CMTA	—	80	9855	1983–
363916098353601	25N-13W-10 CCC 1	Woods	110CMTA	—	35	9859	1983–
363751098395501	25N-14W-24 CBB 1	Woods	110CMTA	—	14	9858	1983–
363658098502601	25N-15W-29 CAB 1	Woods	110CMTA	—	82	9857	1975–
363547098505001	25N-15W-31 DDD 1	Woods	110CMTA	5	68	9856	1983–
364422098374601	26N-13W-17 BBB 1	Woods	110CMTA	—	76	9861	1983–
364330098401901	26N-14W-23 ABA 1	Woods	110CMTA	—	44	9860	1983–
364613098391401	27N-14W-36 DCD 1	Woods	110CMTA	—	48	9862	1983–
361447099105501	20N-19W-01 BAA 1	Woodward	—	—	—	9390	1977–
361221099182601	20N-20W-14 CCA 1	Woodward	121OGLL	5	180	5275	1980–

Table 1.—*Ground-water sites included in the mass measurement network*—Continued

Site-ID	Local well number	County	Aquifer code	Diameter of casing (in.)	Depth of well (ft)	OWRB identifier	Period of record
361128099210601	20N-20W-20 DCA 1	Woodward	121OGLL	5	85	9864	1980–
361340099252201	20N-21W-10 ACA 1	Woodward	121OGLL	5	310	9867	1980–
361432099301001	20N-22W-01 BCA 1	Woodward	121OGLL	5	285	9869	1980–
361146099395001	20N-22W-19 ADD 1	Wooodward	121OGLL	—	144	9865	1980–
361006099293201	20N-22W-36 ADD 1	Woodward	121PLCN	1	402	9863	1957–
361737099024301	21N-17W-17 CDB 1	Woodward	112TRRCH	5	82.0	9872	1978–
361610099070901	21N-18W-27 BCB 1	Woodward	110ALVM	6	54.0	9871	1977–
361856099112401	21N-19W-12 BBD 1	Woodward	110ALVM	16	30.0	9876	1956–
361949099192601	21N-20W-03 ABD 1	Woodward	121OGLL	—	134	9877	1980–
361833099192201	21N-20W-10 DBD 1	Woodward	121OGLL	5	58	5385	1980–
361605099253201	21N-21W-27 DAA 1	Woodward	121OGLL	—	—	9870	1980–
361748099334101	21N-22W-16 CAA 1	Woodward	121OGLL	—	—	9873	1980–
362325099091901	22N-18W-17 BBB 1	Woodward	112TRRCH	6	41.0	9884	1978–
362002099081801	22N-18W-33 CCC 1	Woodward	—	.75	62	9878	1977–
362144099174101	22N-20W-25 BBA 1	Woodward	313RSPG	5	10.0	9880	1952–
362147099224701	22N-21W-24 CCD 1	Woodward	121OGLL	3	125	9881	1980–
362101099264701	22N-21W-28 DDB 1	Woodward	121OGLL	5	240	5467	1980–
362429099301101	22N-22W-01 DCA 1	Woodward	121OGLL	—	346	9886	1982–
362502099311401	22N-22W-02 ABA 1	Woodward	121PLCN	12	69.0	9887	1978–
362350099341501	22N-22W-08 DAD 1	Woodward	121OGLL	12	204	9885	1980–
362149099361501	22N-22W-19 CCC 1	Woodward	—	—	77.0	9882	1956–
362229099295801	22N-22W-24 AAB 1	Woodward	—	—	—	9883	1983–
362818099103001	23N-19W-13 ADD 1	Woodward	112TRRCH	12	100	5514	1978–
362748099134401	23N-19W-21 AAA 1	Woodward	112TRRCH	12	80.0	5523	1978–
362737099125101	23N-19W-22 AAC 1	Woodward	—	16	80.0	5524	1977–
363020099220201	23N-20W-05 BBA 1	Woodward	—	6	40.0	9896	1977–
362728099220201	23N-20W-20 BCA 1	Woodward	112TRRCH	5	39.0	9891	1978–
362650099254401	23N-21W-27 AAB 1	Woodward	121OGLL	—	62	9888	1980–
362942099320301	23N-22W-03 DDA 1	Woodward	110ALVM	—	45.9	9895	1980–
362659099322201	23N-22W-22 DCD 1	Woodward	121OGLL	12	41.0	9890	1978–
362658099321801	23N-22W-22 DDB 1	Woodward	121OGLL	—	51.0	5552	1980–
362534099344501	23N-22W-32 DBD 1	Woodward	110ALVM	—	76	5558	1981–
363300099232001	24N-20W-18 CCC 1	Woodward	—	—	51.2	9898	1978–
363023099231901	24N-20W-31 CCC 1	Woodward	112TRRCH	—	70.0	9897	1978–
363308099245801	24N-21W-14 CDA 1	Woodward	112TRRCH	—	44.0	9899	1978–
363534099331101	24N-22W-04 AAA 1	Woodward	121OGLL	—	72.0	9900	1980–

Table 2.—*Continuous and partial-record ground-water sites*
[Aquifer codes are listed inside back cover.]

Site-ID	Local number	Station name	County	Aquifer code	Depth of well (ft)	Period of record
365342098175301	28N-11W-27 DAD 1	BURLINGTON GW WELL	Alfalfa	112TRRCH	36	1967–83, 88–89
341501096145401	03S-10E-34 CBB 1	CANEY GW WELL 1	Atoka	218ALRS	150	1983
341455096145401	03S-10E-34 CBC 1	CANEY GW WELL 2	Atoka	218ALRS	73.2	1984–89
363853100311001	02N-24E-07 CCD 1	ELMWOOD QUARTERLY GW WELL	Beaver	121OGLL	95	1946–90
354412098172701	15N-10W-32 BAC 1	GREENFIELD GW WELL	Blaine	112TRRCH	51.6	1986–90
351308098341601	09N-13W-28 DDD 1	ALFALFA GW WELL	Caddo	313RSPG	335	1948–81, 89–Present
352423098341701	11N-13W-21 DDD 1	EAKLY GW WELL	Caddo	313RSPG	210	1965–81, 89–Present
353107097453701	12N-05W-18 ADA 1	YUKON GW WELL	Canadian	110TRRCL	47.2	1986–87, 89–Present
364450102190001	03N-07E-09 BBB 1	KEYS QUARTERLY GW WELL	Cimarron	121OGLL	61	1938, 43–89
350816097233101	08N-02W-27 ACD 1	NOBLE GW WELL	Cleveland	318GRBR	461	1943–89
342619096144201	01S-10E-27 BAB 1	LEHIGH GW WELL	Coal	325MCAL	34	1983–88
343540098342001	01N-13W-04 BAA 1	CACHE GW WELL	Comanche	371ABCKL	997	1972–Present
364705095135302	27N-19E-25 CBB 2	MOONEY GW, PYRAMID CORNERS	Craig	—	102	1979
354112098430601	14N-14W-17 CBD 1	THOMAS GW WELL	Custer	313RSPG	320	1972–73, 75–81, 85–Present
361415094452501	20N-24E-04 DCA 1	KANSAS GW WELL	Delaware	338KKUK	—	1976–86, 89–Present
355850098522701	17N-16W-02 ACB 1	TALOGA GW WELL	Dewey	313RSPG	240	1980, 89–Present
361536099464601	21N-24W-33 BBB 1	GAGE GW WELL	Ellis	121OGLL	205	1977–Present
363235099592801	24N-26W-21 CAA 1	CATESBY QUARTERLY GW WELL	Ellis	121OGLL	120	1930, 72–81, 85–89
363224099584601	24N-26W-22 CCB 1	CATESBY RECORDER GW WELL	Ellis	121OGLL	94	1985–Present
344656098031401	04N-08W-33 BBB 1	RUSH SPRINGS GW WELL	Grady	313RSPG	254	1948–81, 88–Present
344143099560601	03N-26W-33 ABA 1	HOLLIS GW WELL	Harmon	313BLIN	237	1988–Present
352006095080101	10N-20E-13 DDD 1	STIGLER GW WELL	Haskell	325MCAL	148	1985–89
341243096534501	04S-04E-16 BBC 1	MANNSVILLE GW WELL	Johnston	218ALRS	—	1977–Present
345908095013001	06N-22E-18 DCC 1	RED OAK GW WELL	Latimer	325MCAL	138	1986–89
351122094403901	08N-25E-04 CDC 1	PANAMA GW WELL	Le Flore	325HRSR	110	1987–89
351002094314401	08N-26E-14 ACC 1	WILLIAMS GW WELL	Le Flore	326ATCK	277	1980–87
354442096400801	15N-06E-29 AAA 1	STROUD GW WELL	Lincoln	322VMOS	339	1976–81, 85–Present
354525097242201	15N-02W-22 CCB 1	WATERLOO GW WELL	Logan	318GRBR	146	1988–Present
335337094451101	08S-24E-01 BBD 1	IDABEL GW WELL	McCurtain	218ALRS	66	1983–Present
361442098092801	20N-09W-04 AAA 1	AMES GW WELL	Major	110CMTA	60	1965–84,88-Present

Table 2.—*Continuous and partial-record ground-water sites*—Continued

Site-ID	Local number	Station name	County	Aquifer code	Depth of well (ft)	Period of record
343017096561501	01S-03E-01 ABA 1	SULPHUR EAST GW WELL	Murray	364SMPS	96	1973–89
343022096565701	01S-03E-01 BBB 1	SULPHUR WEST GW WELL	Murray	364SMPS	70	1973–Present
351833095155401	11N-19E-35 BBB 1	PORUM GW WELL	Muskogee	325MCAL	25.1	1985–86
352750097223001	11N-02W-02 ABA 1	MIDWEST CTY GW WELL NO. 50	Oklahoma	318GRBR	751	1976–82,84–89
352725097224701	11N-02W-02 BDD 1	MIDWEST CTY GW WELL NO. 49	Oklahoma	318GRBR	765	1976–80, 85–89
352705097281201	11N-03W-01 CDD 1	OKC GW WELL ON SE 15TH	Oklahoma	318GRBR	354	1976–84, 86–90
352449097293201	11N-03W-23 BCD 1	OKC GW WELL ON SE 51ST	Oklahoma	318GRBR	261	1975–85, 86–Present
352910097232001	12N-02W-26 BCC 1	MIDWEST CTY GW WELL NO. 51	Oklahoma	318GRBR	748	1976–89
362935096291501	23N-09E-10 AAD 1	WYNONA GW WELL	Osage	322VMOS	55.0	1971–81, 90–Present
365229094520201	28N-23E-30 DBC 1	MIAMI GW WELL	Ottawa	367RBDX	1490	1907, 37, 44, 56–62, 65–70, 72–81, 85–Present
365732094513201	29N-23E-30 CDD 1	BLUEGOOSE GW WELL, PICHER	Ottawa	367RBDX	289	1980, 86–Present
350241095341101	07N-16E-25 CDC 1	BLOCKER GW WELL	Pittsburg	325BGGY	140	1981–89
343457096404501	01N-06E-04 CAD 1	FITTSTOWN GW WELL	Pontotoc	367ABCKU	396	1959–Present
354527099470501	15N-24W-19 DDA 1	ROLL GW WELL	Roger Mills	121OGLL	122	1971–75, 77–81, 86–Present
352419094270401	11N-27E-21 CDD 1	MOFFETT GW WELL	Sequoyah	110ALVM	—	1961–64, 67–81, 85–86, 88–89
363033101440701	01N-12E-35 BDD 1	TEXHOMA GW WELL	Texas	121OGLL	386	1956–Present
352142099122501	10N-19W-10 BBB 1	BURNS FLAT GW WELL	Washita	312ELKC	107	1979–81, 86–Present
365143098404201	28N-14W-35 BCC 1	ALVA GW WELL	Woods	318CDHL	54	1972–Present
361256099102101	20N-19W-13 ABB 1	MUTUAL GW WELL	Woodward	313RSPG	40	1972–90
361714099315101	21N-22W-23 BBB 1	SHARON GW WELL	Woodward	121OGLL	322	1957–63, 65–Present

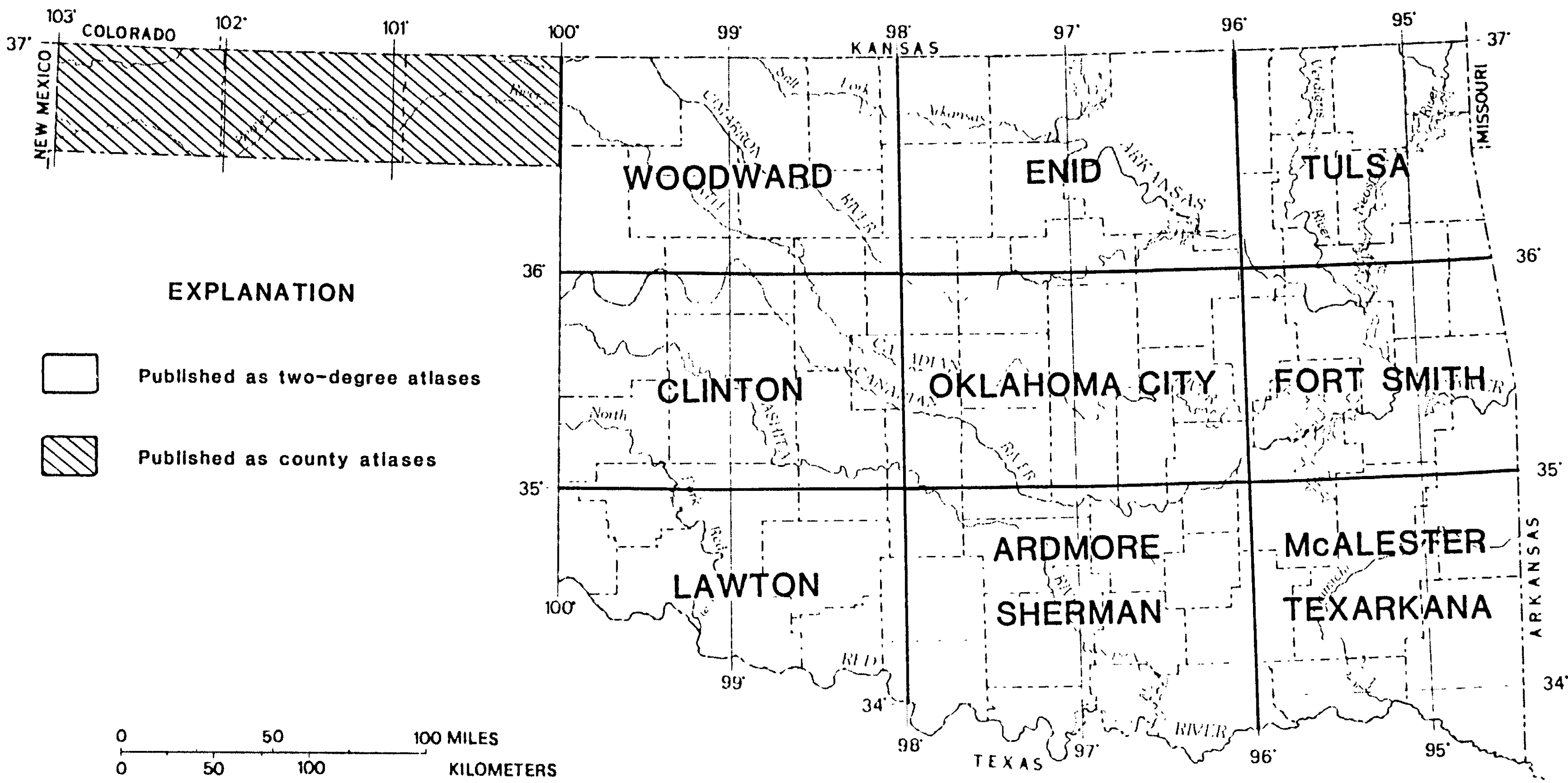
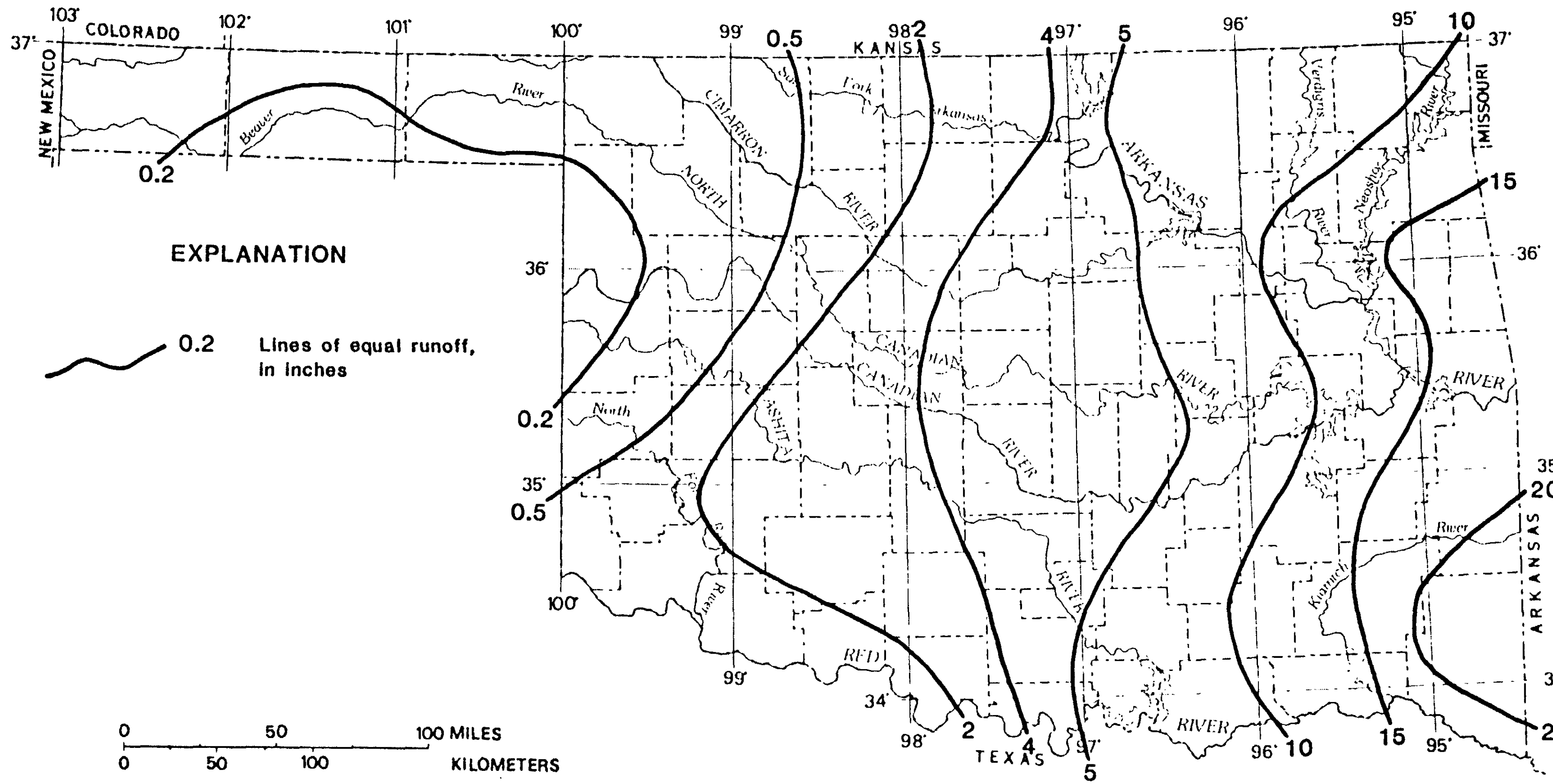


Figure 1. Areas for which reconnaissance hydrologic studies have been made (For references, see page 37 for Panhandle counties and pages 60–61 for main body of State.)



From Pettyjohn, W. A., and others, 1983,
Water Atlas of Oklahoma:
University Center for Water Research,
Oklahoma State University,
Stillwater, Oklahoma, 72 p.

Figure 2. Average annual runoff in Oklahoma for 1970-79

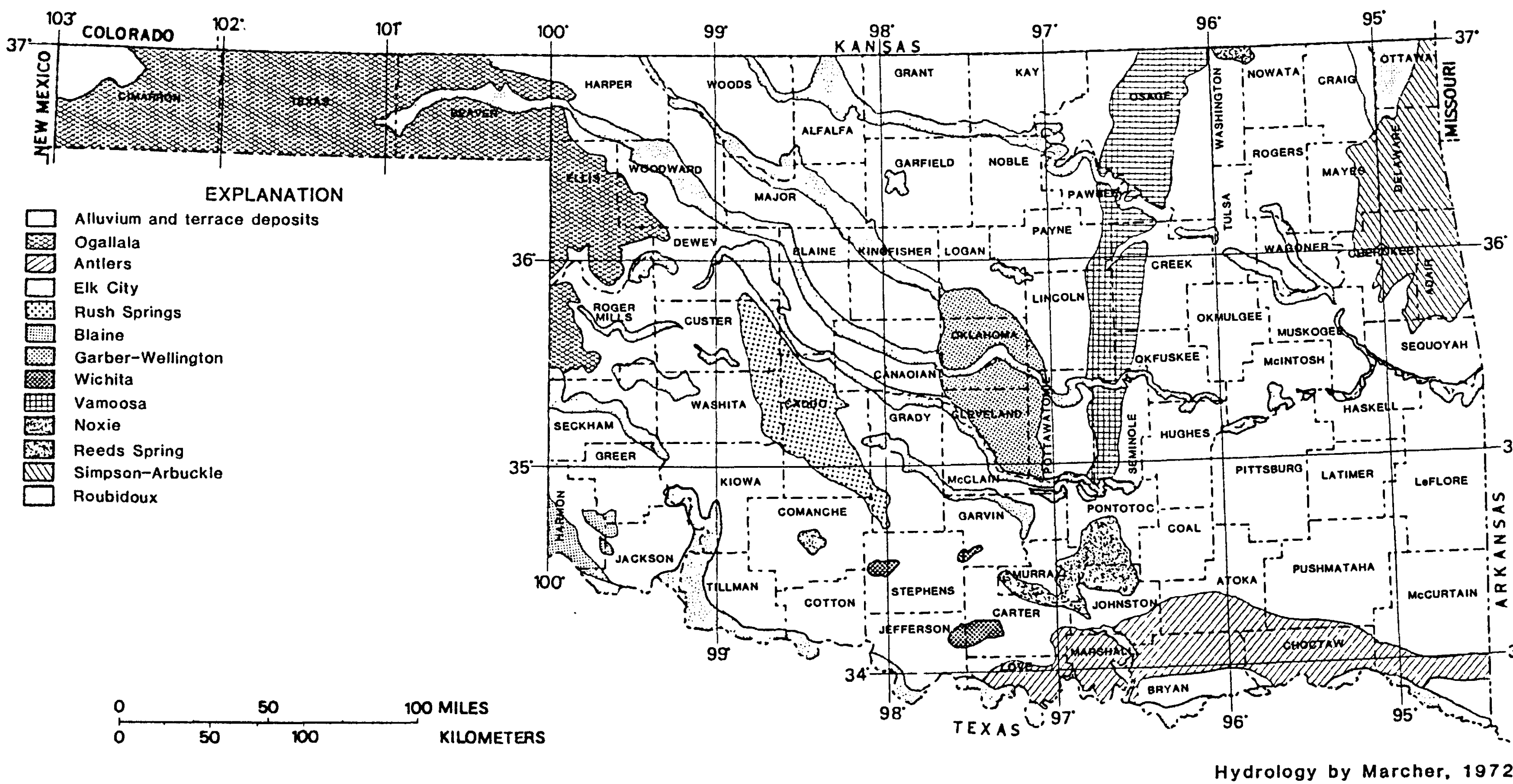


Figure 3. Location of principal aquifers in Oklahoma

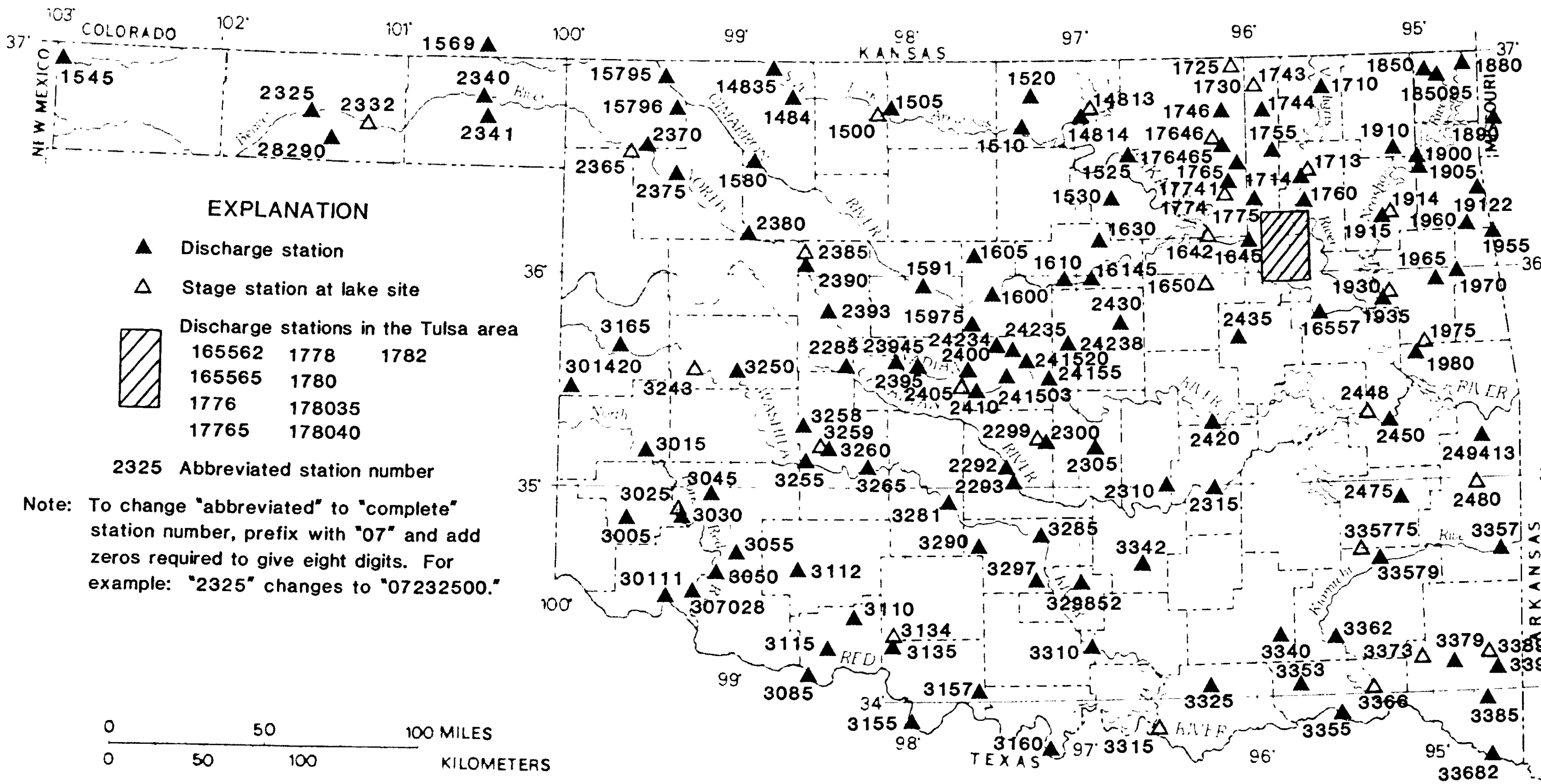


Figure 4. Location of continuous-record surface-water stations, water year 1990

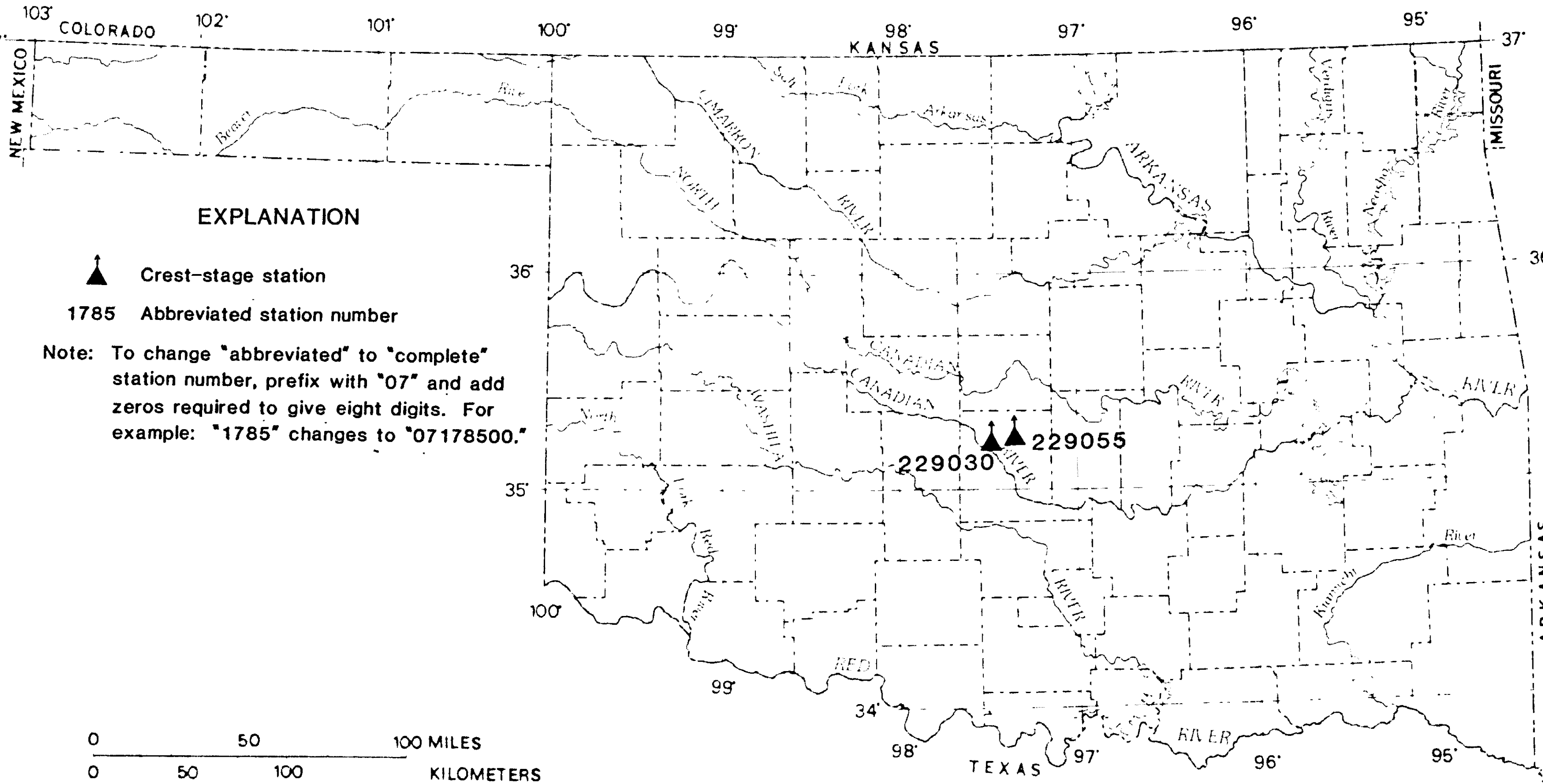


Figure 5. Location of partial-record surface-water stations, water year 1990

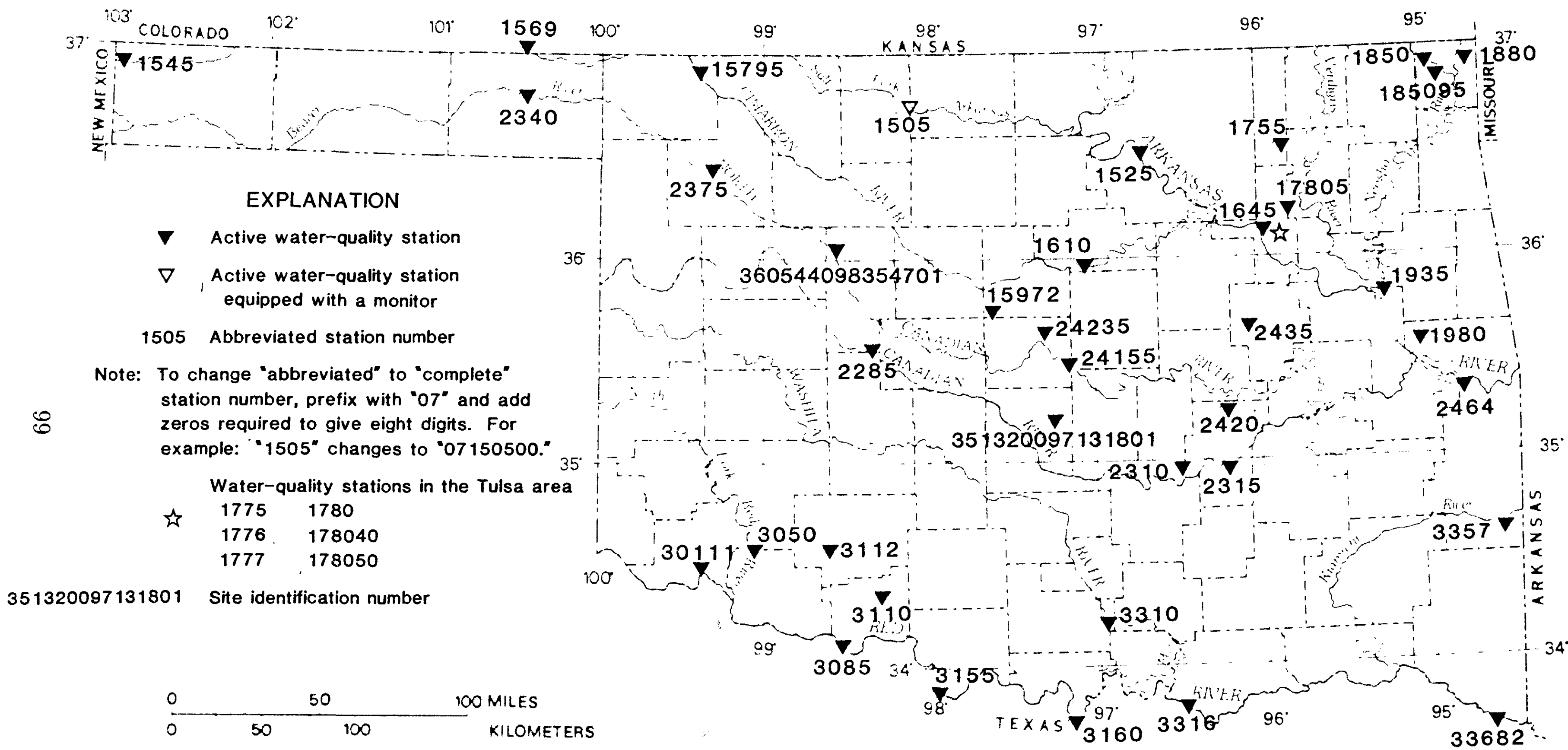


Figure 6. Location of water-quality stations, water year 1990

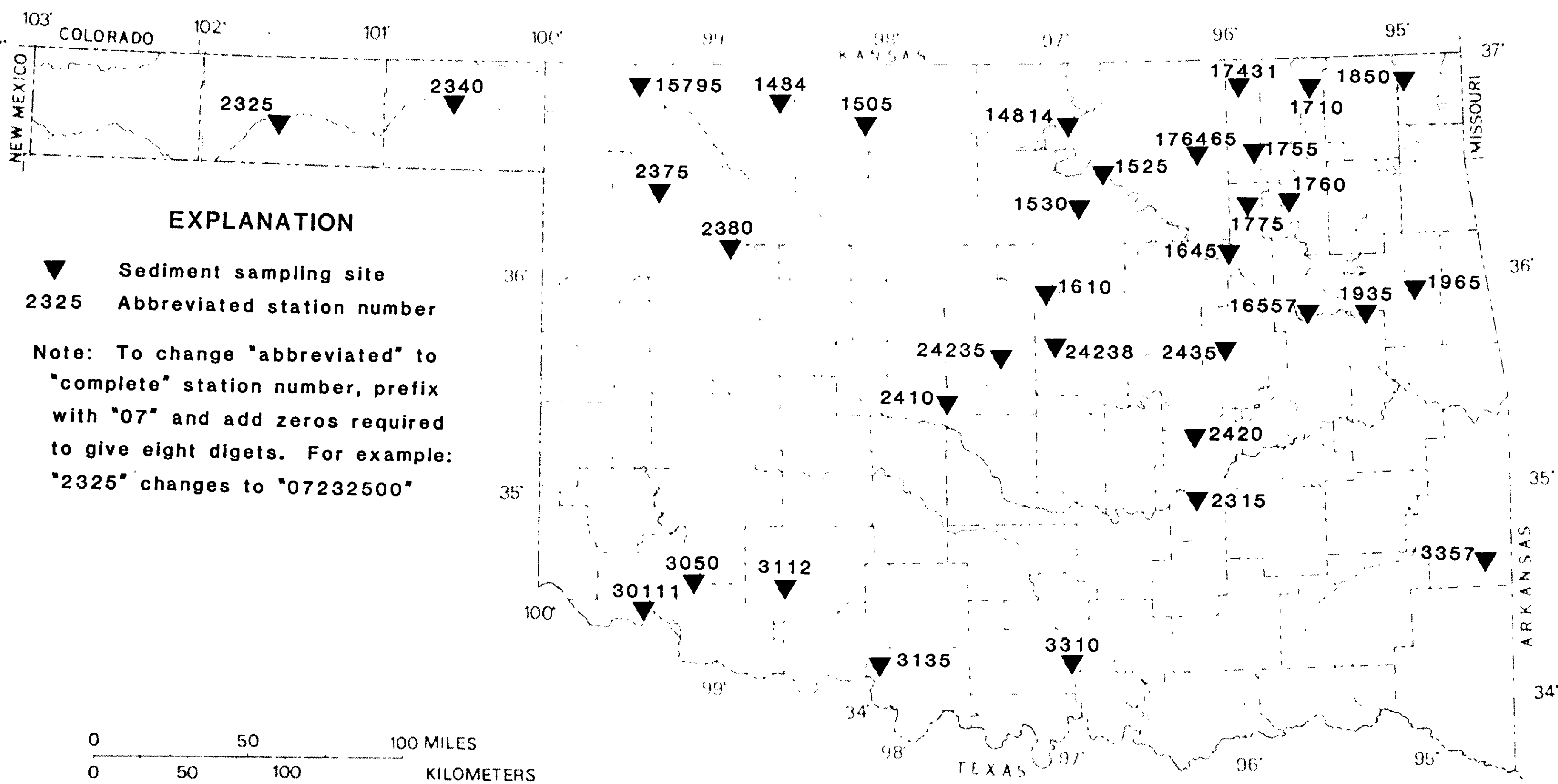


Figure 7. Locations of sediment sampling sites

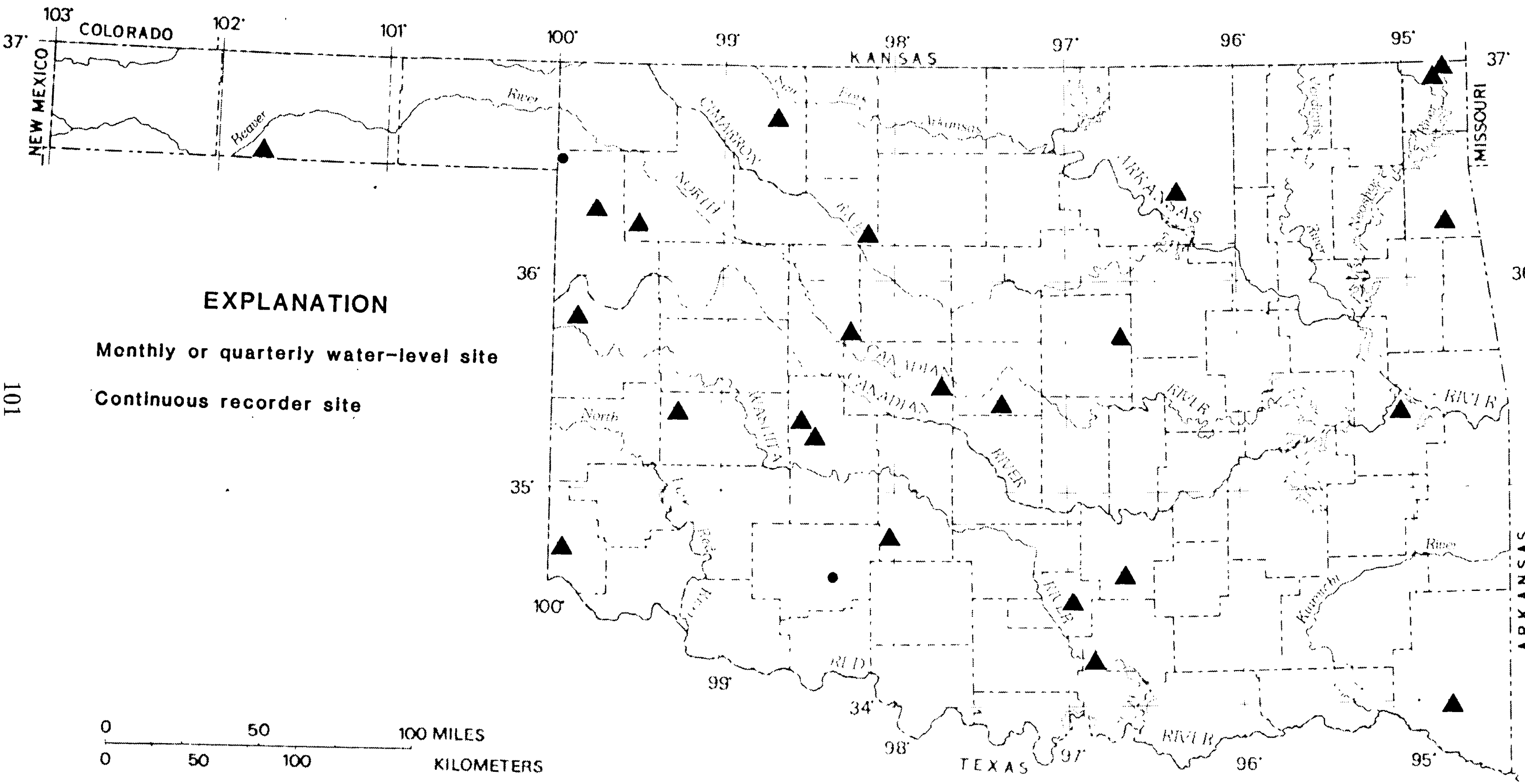


Figure 8. Locations of water wells measured continuously, monthly, or quarterly

OKLAHOMA AQUIFER CODES

110ALVM — Quaternary alluvium
110CMTA — Cimarron terrace and alluvial aquifer
110EFRT — Elm Fork-Red River terrace aquifer
110TRRCL — Terrace deposits, low
112DUNE — Dune sand
112TRRCH — Terrace deposits, high
121OGLL — Ogallala Formation
121PLCN — Pliocene series
211DKCN — Dakota Formation-Cheyenne Sandstone
217CYNN — Cheyenne Sandstone
218ALRS — Antlers Sandstone
221EXTR — Exeter Sandstone
221MRSN — Morrison Formation
231DCKM — Dockum Group
310PRMN — Permian series
310WLNG — Wellington Formation
312ELKC — Elk City Member of Quartermaster Formation
313BLIN — Blaine Gypsum
313DGCK — Dog Creek Shale
313RSPG — Rush Springs Formation
313VVCR — Van Vactor Member of Blaine Formation
317GBWG — Garber-Wellington aquifer
318CDHL — Cedar Hills Sandstone Member
318GRBR — Garber Sandstone
318WCHT — Wichita Group
322VMOS — Vamoosa Formation
323CFVL — Coffeyville Formation
323DEWY — Dewey Limestone
323IOLA — Iola Limestone
323WANN — Wann Formation
325BGGY — Boggy Shale
325HRSR — Hartshorne Sandstone
325MCAL — McAlester Shale
325SNOR — Senora Formation
325SVNN — Savanna Sandstone
325TRMN — Thurman Sandstone
326ATCK — Atoka Formation
331BOON — Boone Formation
331PTKN — Pitkin Limestone
338KKUK — Keokuk Limestone
364SMPS — Simpson Group
367ABCKU — Arbuckle Limestone, upper
367RBDX — Roubidoux Formation
371ABCKL — Arbuckle Limestone, lower