State Will Request $4 Million for Tar Creek Pollution Cleanup

Price tags seldom go down in these times, but rather grow to accommodate inflation. Not so on the proposed cleanup in the Tar Creek-Picher Mining District of northeastern Oklahoma. That price tag dropped a whopping $30 million as a result of careful, well thought-out studies sponsored by the Tar Creek Task Force. Estimates made in 1981, when “Tar Creek” was whispered in the same hush as “Love Canal” and ranked at the top of the nation’s 114 hazardous waste sites, suggested cleanup costs of $35 million or more.

On January 9, Gov. Nigh, members of the Tar Creek Task Force and the press heard Technical Subcommittee Chairman Ron Jarman describe a five-point remedy which effectively would abate pollution of area waters. The plan would cost about $3.9 million — 90 percent of that to be borne by the EPA Superfund and 10 percent by the state. The Superfund administered by the Environmental Protection Agency was created specifically to finance cleanup of the nation’s hazardous waste sites. It was suggested that the state’s share could be paid from the water development fund administered by the Oklahoma Water Resources Board, a source of cost-sharing funds for state-approved, federally funded water projects.

“Careful studies provided the information to make the recommendations,” said Jarman. “Had the Task Force sought a ‘quick-fix’ for the Tar Creek pollution, the people and the environment of the area might have suffered irreparable harm, or the state could have spent huge sums on ‘cures’ that would not have protected the people.”

The recommendations were based on studies conducted by three subcommittees within the Task Force — one evaluating health effects; another environmental effects; and the third, the Technical Subcommittee, measuring the impacts on area water supplies. A fourth committee evaluated potential economic effects.

The first and most important determination was that the pollution can be contained so that it will not endanger the lives of area residents. The acid mine water can be dealt with and the problem solved at a cost figure a fraction of early estimates.

The Task Force, co-chaired by Jarman, Ed Pugh of the governor’s staff and Ron Coke of a Miami citizens’...
group, concluded that the abandoned lead and zinc mines contain about 76,000 acre-feet of water — roughly the equivalent to the water in Lake Hefner in central Oklahoma or Lake Eucha in the northeast. Jarman pointed out that if the polluted water were left to natural processes, it would take 60 to 100 years for the mines to flush out — that is, for somewhat clean water to replace the heavily contaminated mine water.

A slide show prepared by the water resources board set out the five points the Technical Subcommittee recommends as remedies to the pollution:

— plugging and sealing deep wells
— diverting surface inflows
— monitoring Roubidoux wells
— treating reduced mine flows
— developing water supply alternatives

The first recommendation calls for plugging 66 abandoned water wells — 40 in Oklahoma and 26 in Kansas. The abandoned wells drilled into the Roubidoux formation — many with ruptured casings — potentially offer passage of contaminated mine water and surface flows directly into the aquifer that is a major source of drinking water for northeastern Oklahoma.

Total cost of the well-plugging strategy is $1,951,000 with 10 percent, or $195,190, to be provided by the state.

The second recommendation calls for the diversion of surface runoff away from mine shafts and subsidences which carry it into the mine workings. Eighteen such in-flows were located by water resources board staff. Two sites in Kansas were identified as contributing more than 70 percent of the total inflow. Findings of the Technical Subcommittee of the Task Force also concluded that each of the remaining inflow sites contributes less than one percent.

Diking and diversion structures would cost $2 million, with a state contribution of $200,000.

A sampling program would continue to monitor water quality in the Roubidoux wells, checking for traces of contamination. Meanwhile, the OWRB and the U.S. Army Corps of Engineers will have developed plans for alternate water supplies, in the event that wells in the Roubidoux show signs of pollution sometime in the future.

Jarman also proposed as part of a much longer-range plan the construction of a treatment plant, in the event that well plugging and diversion strategies fail to reduce significantly the amount of acid mine water. This might be years down the line — perhaps never — but the Task Force will have a contingency plan ready. A small package treatment plant would pump the remaining mine waters to the surface, purify them, then discharge the harmless water into area streams.

The Health Effects Subcommittee, concluded that:

— there are no adverse health effects as long as mine water is not consumed,
— properly treated waters of the Neosho River, Spring River and Grand Lake are safe to drink,
— the air in the mining region is safe to breathe,

— water supplies currently provided to cities, towns and rural water districts by wells in the Roubidoux aquifer are safe to drink.

The Environmental Effects Committee studied the effects of the mine water discharges on the environment of the Grand Lake System and reached these conclusions:

— the aquatic life in much of Tar Creek has been destroyed,
— however, the effects on the fish community diminish greatly, once the waters enter the Neosho River,
— only a small portion of the heavy metals discharge is taken up by the fish in the Grand Lake System. The fish show no effects, nor do their tissues tend to accumulate heavy metals,
— the sediments provide an effective, long-term sink for the heavy metals in the streams and should remove them from further processes.

**Miami Resident Recalls Brighter Days in Tri-State Mining Area**

**EDITOR’S NOTE**— The information presented here is drawn largely from the files of Frank J. Cuddesback, longtime resident of the Miami area and Eagle-Picher employee whose dedication to the industry caused him to preserve a written and pictorial account of the Tri-State Mining District. It is with the gracious consent of Mr. Cuddesback that Oklahoma Water News is able to share this history with its readers.

Lead and zinc mining, a blessing that spanned a half-century, became the bane of the region in 1979 when the huge catacombs belched their acidic waters to the surface. Like ghosts captive underground since the miners and their machines departed late in the 60’s, the ominous acid water spilled from the mines to haunt the Tar Creek Basin.

Major mining began in about 1880 — first in Missouri, then around Galena, Kansas, and after 1905, in the Oklahoma-Kansas area centered around Picher. Of the 500 million tons of ore that would come from this Tri-State field, 300 million tons of it would come from the Picher-Baxter Springs area.

The ore-bearing formations lay 150 feet below the surface in the southeastern part of the field, and more than 350 feet deep in the northwest. All lay within the Boone Formation — water-bearing strata that would have flooded the working mines, had the pumps not operated day and night.

The lead and zinc occurred in flint rock so hard that diamond drills could not cut it, but brittle enough that the up-and-down action of the chisel bit on a churn drill could break it up. Such churn drills, which made virtually all the discoveries, raised and dropped a string of tools weighing a ton or more.

Once promising deposits were located, contractors sunk a 5’ x 7’ or 6’ x 6’ shaft, then men dug out horizontal chambers, or drifts. Earliest hand tools were drill steel and hammer, later compressed air drills, and finally drills with threaded tungsten carbide bits. Dynamite blasted
At the peak of activity in the Tri-State Mining District, Eagle-Picher’s Central Mill processed up to 15,000 tons of ore a day. The chat, or “tailings,” a by-product of the milling process, was sold for highway and railroad bed (ballast) and still is used in construction.

Sectional ladders up to 100 feet tall provided the men access to mine ceilings for recovering ore or trimming the roof for safety. Three pairs of men held supporting guy ropes. Later, tall telescoping cranes with a pair of automatic drills mounted on Caterpillars replaced the tall ladders.

Continued on page 4
Rules and regulations of the Board spell out "emergency" as "a situation where the life, health or property of the persons served by the entity is endangered."

Brighter Days, continued from page 2

The ore was milled on the premises or nearby by many small 40 or 50-ton-per-hour mills, until the Central Mill was completed in 1932. At its peak, the capacity of the Central Mill was 15,000 tons a day, making it the largest lead-zinc concentrator in the world. By its closing in 1970, the mill had processed 66 million tons of ore.

A by-product of the milling was coarse flint chert, or tailings, which accumulated in large piles, one reaching 12 million tons at the Central Mill. It was the Central Mill that breathed new life into the Picher field, permitting small miners, or "gougers," to go back into the old mines, and with little investment recover the remaining ore for shipment to the Central Mill.

The Central Mill was sold at auction in September, 1973. Life finally drained from the Picher field with the closing of the Lawyer Mine southeast of Picher and abandonment of the Last Frontier Mill at Lincolnville in 1976, where the last underground ore was milled.

The huge caverns were left open to invasion by surface runoff and ground waters of the Boone Formation. The iron sulfide minerals left exposed by mining had oxidized in the oxygen-rich atmosphere of the working mines. As the waters seeped in, these oxidized sulfides dissolved readily, forming an acid mine water caustic enough to dissolve normally insoluble lead and zinc concentrates.

Finally, in 1979, like ghosts revisiting a favorite place, the acid mine waters spilled from the shafts and boreholes near Commerce, Oklahoma.
Low Interest Bid at Bond Sale Enhances Board Loan Program

The exceptional interest rate bid on the Board's $50 million offering of revenue bonds January 31 will enable the OWRB financial assistance program to make loans to qualified applicants at a rate of approximately 9.5 percent. Prudential-Bache securities won the bid from a field of four financial institutions vying for the bond package.

"We are extremely pleased with the response and the interest rate," said Executive Director James R. Barnett. "This is the first time in the nation such a program has been offered in the financing of water resources. We can offer Oklahoma cities, towns and rural water or sewer districts loans at an affordable interest rate in improving water and sewer facilities."

The Board's loan program is the type referred to in the financial community as a "pass through plan," in which the OWRB will use the proceeds to purchase water and sewer revenue bonds issued by the municipalities. The bond package was a "blind pool" offering, which means that the entities receiving the loans are yet unknown.

Rick Smith, coordinator of the OWRB financial assistance program, said the blind pool concept allows smaller communities and rural water districts to receive loans and interest rates they might be denied under conventional programs.

The sale was undoubtedly enhanced by the AAA rating given the issue by Standard & Poor's, a firm that assigns ratings to bond issues according to the security of the investment. Smith said the rating was remarkable. "This is the first state water financing program with enough security provisions to achieve this high a rating."

Contributing also to its security is the $25 million water development fund, which will be used as collateral on the bonds sold by the OWRB on behalf of qualified applicants.

The Board currently has 60 applications awaiting approval on loans totaling $43 million. Barnett projects statewide water development and sewer facility needs over the next two years to be more than $247 million, and he said the Board will consider additional bond offerings as necessary.

There is a limit of $12.5 million on the loan amount for any single project, and applicants must qualify under Oklahoma Statutes and water board rules and regulations in order to obtain loan assistance. Revenues earned by the completed water or sewer project or local taxes will be pledged as security.

A Small OWRB Section Tackles a Giant—Bathymetric Mapping

Determining the volume of water in an 8-inch square pan two inches deep is much simpler than calculating the amount of water in a lake, although a somewhat similar mathematical formula applies. More difficult still is mapping the lake bottom, indicating depths at one-foot intervals across the lake. Nevertheless, these were the assignments given OWRB drafters James Leewright, Gladys Haywood and Mike McEachern, who were asked to provide bathymetric maps of Lakes Atoka, Overholser and Lawtonka.

Such data were required by the Clean Lakes program in which the OWRB Water Quality Division participates with...
Bathymetric mapping, continued from page 1

the Environmental Protection Agency in developing strategies for the cleanup of certain Oklahoma lakes. Atoka, Overholser and Lawtonka met the EPA guidelines for inclusion in the program by being publicly owned lakes within a 25-mile radius of a city and having their recreational benefits limited by pollution.

One task required in the diagnostic studies which lay the groundwork for restoration is determining to what extent the capacity of the lake had been diminished by sedimentation. It is by comparison of the bathymetric map to earlier maps or design data on the lake which shows the effects of sedimentation over the lake's lifetime. Although the volume was tallied accurately in all three cases, each lake presented a challenge of a different nature in the data gathering phase.

Much simplified, the procedure consists of establishing transects across the lake, then crossing the lake along the route of each transect in a boat equipped with a sonar depth-sounding device. The sonar translates continuous depth readings onto a profile print of bottom features. The course of the boat along the transect is confirmed by another person viewing through a transit on the shore who remains in constant radio contact with the boat.

Environmental specialists who were collecting the information at the lake collaborated with the drafters throughout the field investigations to be sure their data could be plotted accurately to the map on the drawing board in Oklahoma City.

Data from the field — the sonar's printed profiles of the lake bottom — were translated into depth readings by the drafters. They made vertical projections at one-foot intervals from points along the bottom profile to the line representing the water surface. From the point of intersection, a foreshortened or extended line was further projected onto a representative transect line on a scaled map of the lake. This placed the depth readings at their respective points along the transect — precisely as if the hundreds of depths plotted along any single transect had been measured by hand.

Although Lakes Atoka and Overholser fell within bathymetric mapping procedures considered ordinary, Lake Lawtonka presented a unique situation. The lake's geographic location and configuration made establishing those 60 transects a one-in-a-million situation, according to James Leewright, chief draftsman.

"The lake is flanked on the west-southwest by Mount Scott, rising 1,064 feet above the lake surface and providing an overview of the entire body of water. The lake curves around the north and east sides of the mountain in an arc with a radius consistent throughout its length," said Leewright.

Jim Grimshaw and Gary Shapiro, environmental specialists assigned the field work, and Leewright, overseeing the mapping in the office, devised a radiating transect method using a transit stationed on top of Mount Scott. "We established 60 transects, with the first at zero degrees north and rotating clockwise, setting transects every two degrees throughout the length of the lake."

At the Lawtonka site, the sonar-equipped boat crossed the lake 60 times, once along each transect, and at each time the man in the boat steered the course directed by radio by the man at the transit on Mount Scott. Back at the drawing board, it was the job of the drafters to translate the sonar reading into a contour map.

Contouring consists of drawing a line connecting all points of equal elevation, so one can detect shallows and depths at a glance. With the contours inked in, the drafters began the task of computing the capacity of the lake.

According to Leewright, this is accomplished most accurately by determining stratigraphic volumes — that is the amount of water in any single "layer" at any selected contour. Measuring the stratum is not unlike calculating the amount of water in an 8-inch pan, two inches deep. The areas of any two adjacent depth contours are added together, then multiplied by four feet — the depth the drafters assigned to each layer. These areas are determined by using an electronic measuring device that makes allowances for graded banks, irregular boundaries and bottom features.

"The total volume is the sum of all these strata," Leewright points out.

These figures are compared to those of the original design to measure to what extent sedimentation has taken its toll. In the case of Lawtonka, built in 1905, sediment had displaced 6500 acre-feet of water supply.

Not only was the assignment a giant for three drafters, the size of their products was giant. Atoka, the largest of the lakes, produced a map more than nine feet across — covering Mike McGaugh's 6-foot drawing board, then overhanging like a tablecloth. The Overholser and Lawtonka maps were of more manageable size, approximately three feet by four.

New SYMAP Computer Program Targets Water Quality Problems

The Oklahoma Water Resources Board is using a new technology to solve an old problem. The problem is showing at a glance information gathered over many square miles. The old solution was information in number form which is tedious to compile and interpret.

The new solution, called "SYMAP" or symbiotic mapping, was first used at the water board by Jim Gopal, senior water resources engineer of the Board's Water Quality division. He and Laura McMahon, an environmental specialist, have been the prime users of the technique earlier used elsewhere in the nation for air pollution and demographic studies.

SYMAP uses the computer to translate pollution concentration data gathered from field water samples within an area to show where the pollution is least and most concentrated.

Gopal has successfully used SYMAP to show the spread of nitrate waste spilled into an aquifer, as well as to locate the source of the spill.

In Woodward County 56 water wells, used as
reference wells, were tested for nitrate concentrations in an area encompassing 312 square miles. The area was used by Gopal in March of 1982 to test SYMAP's applicability to enforcement activities of the OWRB.

Results of water quality analyses done periodically over an eight-month span and translated via SYMAP showed how concentrations of nitrates spread within the aquifer and how the concentrations eventually diffused into the aquifer or were pumped out during heavy irrigation periods. The OWRB and the Environmental Protection Agency evaluated the results and declared it valid for scientific documentation of where pollution entered an aquifer and how it spreads.

SYMAP was used in evaluating the effects of agricultural fertilizer inflow on algae growth in Lake Lawtonka, near Lawton. Concentration patterns were gathered in numerical form using a device called a fluorometer, which takes continuous readings from its probes set at four depth levels. It measures the amount of activity, called fluorescence, recorded when a special light in the probe shines on the water.

The numbers recorded by the fluorometer are then fed into an OWRB computer program with SYMAP generating information. The resulting chronological SYMAPs showed where algae concentrations are highest and lowest throughout the lake at a given time.

Algae concentrations were found to be highest in lake areas that received the most runoff from farmland around Lawtonka. The SYMAP information also showed Lawton city water treatment plant workers where to withdraw water with the least algae, which often requires less treatment.

Jim Gopal, senior water resources engineer, instructs Laura McMahon, environmental specialist, in translating information gathered by field study into SYMAP form. The numerical data entered in the computer will generate a SYMAP, an overview of the study waters showing pollution concentrations.

Annual Well Measurement in Progress

Members of the OWRB Ground Water Division continue to carry out the Board’s annual well measurement program which began January 9 in the Panhandle coun-

ties. More than 1000 wells will provide information on ground water levels throughout Oklahoma, amount of ground water in storage and trends which affect water availability.

The annual program, conducted in cooperation with the U.S. Geological Survey, will be completed in late March, then data collected in the survey will be published in long-term continuous records.
Water Awareness Day at Capitol March 20

Gov. George Nigh has proclaimed the third annual Water Awareness Day be held on Tuesday, March 20 from 10 a.m. to 3 p.m. on the fourth floor rotunda of the State Capitol. This year the event was scheduled to occur within “National Wildlife Week” March 18-24, which has “water” as its 1984 theme.

The event, which will feature an opening address by Governor Nigh at 10:45 a.m., is a forum for those interested in water conservation to come together to explore water conservation ideas, new water-saving devices and everyday practices that save our limited supply of water. State agencies, businesses, and manufacturers will offer displays and exhibits showing water conservation technology.

If your organization is interested in participating in Water Awareness Day, please call Art Cotton, Water Awareness Day coordinator, at (405) 271-2599.

OWWA to Meet in Elk City February 15-17

Roy Burson, president of the Oklahoma Water Well Association, announced the association’s annual meeting to be held at the Holiday Inn in Elk City February 15-17.

Activities open on Wednesday with registration and an opportunity to visit exhibits. Thursday’s agenda includes a luncheon address by OWRB Executive Director James R. Barnett, four workshops, board of directors meeting, general session and banquet.

On Thursday representatives of the Ground Water Division of the OWRB will test applicants for Oklahoma water well drillers licenses from 9 a.m. to 5 p.m. State law requires that all drillers who are paid for their work—commercial drillers—be licensed by the state.

A board of directors meeting on Friday morning closes out convention activities.

Board Grants to Boswell, Billings, PCPWA

At the special Board meeting January 31, three more Oklahoma communities were awarded grants from the OWRB financial assistance program. Billings, in Noble County received $19,455 for a new well, pumps, mains, booster pump station and surge tank. The $60,000 grant to Boswell in Choctaw County will finance a water treatment facility and partial costs of a water storage tank and sewage lagoon. The Pittsburg County Public Works Authority received $100,000 for expansion of water treatment and pumping facilities.

To qualify, the entity must demonstrate that the life, health or property of its citizens is endangered.

Tourism Conference Set February 26-28

Gov. George Nigh has issued an invitation to the public and members of the tourism and recreation industry to attend the 12th Annual Conference on Tourism and Recreation to be held February 26-28 at Oklahoma City’s Lincoln Plaza. This year’s theme is “Tourism—Get Your Fair Share!”

Conference registration for two days of workshops and one Governor’s Luncheon is $30, with tickets to the Legislative Reception/Dinner available at $25. Student registration (two days, one lunch) costs $10.

For more information, call Joyce Campbell at the Tourism and Recreation Department (405) 521-3411.
Board, OCC Cooperate to Protect Rush Springs Sandstone's Water

An 18-month effort by the OWRB culminating in the issue of an order by the Oklahoma Corporation Commission will protect the fresh underground water of thousands of Oklahomans, most of whom will be aware of their champions. A request by the Board to the OCC for a special field order concerning the Rush Springs Sandstone Ground Water Basin underlying parts of Dewey, Caddo, Custer, Washita, Blaine, Comanche, Grady and Stephens Counties will prevent the construction of waste disposal pits over an aquifer which is the sole source of fresh water for the area.

The OCC, which has jurisdiction over all oil and gas production activities in the state—including the disposal of oilfield wastes—made the order retroactive to May 20, 1983, the date of the oral order followed up in writing January 16, 1984. As well as denying permits for new construction of lined, earthen pits over the ground water basin, the OCC is ordering abandoned, leaking or improperly designed or operated pits drained and cleaned up as an additional safeguard.

Construction of an offsite waste disposal pit must be approved by the OCC, which first assesses the possibility of the pit's contents leaking and infiltrating the aquifer, based on geologic studies of the formations which separate the pit and the aquifer. Existing maps pinpoint the areas least likely to allow such downward migration.

Often the OWRB and the OCC cooperate in reviewing the applications received by the OCC to make sure the areas under consideration for permits do not overlook vulnerable aquifers.

However, the disposal sites and the operations which generate the wastes may lie some distance apart, in which case the companies must hire transportation to a suitable permitted site. Usually, the company that owns and operates the offsite disposal pit is not the same which hauls waste, nor do oil and gas producers generally involve themselves in building or operating offsite waste disposal pits. Oil companies count the costs of removing the wastes in their production costs and contract to have them hauled from the rig site.

The only other legal alternative is injection into a specially prepared, extremely deep, permitted disposal well separated from the water-bearing strata above by solid, almost impermeable rock.

Unfortunately, the same black gold that brought the state welfare and well-being produces wastes that can tarnish the landscape and pollute the waters above and below the surface, if the wastes are not handled responsibly. Complaints concerning illegal dumps of deleterious by-products which may affect the state's waters grow in direct proportion to the increase in drilling activity.

Oil and gas drillers use a drilling fluid called "mud" to cool, lubricate and flush the rotary drill bit as it bores through layers of earth and rocks to the oil-bearing formation. Throughout the drilling process, this fluid is forced down the drill pipe and over the bit, washing away the cuttings between the outside of the pipe and the inside of the hole, then back to the surface. Before this circulation begins, additives are blended with the mud to "tailor" it to that particular operation; that is, to

Continued on page 2

Marble City, Two Rural Water Districts Receive Assistance

The rural water users of Marble City, Sequoyah County, Rural Water District #6 in Mayes County, and RWD #5 in LeFlore County were approved for Oklahoma Water Resources Board grants totaling $239,808 last month. The announcement was made by James R. Barnett, executive director of the OWRB which administers the state financial assistance program.

Marble City, a community of 294 people, was granted $100,000 to partially pay for construction of a new sewage treatment facility. The new sewage treatment plant was necessary after the Health Department traced recent outbreaks of hepatitis and intestinal parasites to unsanitary conditions produced when area septic tanks stopped functioning.

RWD #6 in Mayes County in northeast Oklahoma will use the $100,000 granted last month to replace a corroded and partially obstructed four-inch water main with a six-inch PVC main that will more adequately serve the need of the 82 families in an area south of Wolf Creek.

Continued on page 3
thicken, to thicken, to control acidity or alkalinity or to build-in certain properties. The basic ingredient of the mud is bentonite, a chemically neutral volcanic ash which sets up as clay with the addition of water. It is certain additives which prove caustic, and the mud may acquire still other deleterious substances as it circulates and recirculates the hole from top to bottom. By the time of its final circulation, it is likely that the mud has acquired varying amounts of sodium, arsenic, barium, chlorides, crude oil, chromium and lead.

Once the drilling is completed and production begins, approximately 25,000 to 40,000 gallons of used mud is discarded in a plastic lined reserve pit at the rig site until it can be trucked to a permitted site prepared to receive it. In areas where ground water is considered extremely vulnerable, a municipality, rural water or master conservancy district or an entity with local jurisdiction can require the mud to be mixed, maintained and retained in four 8 x 8 x 28-foot above-ground tanks called "working pits." Upon completion, the contents are siphoned into tank trucks for removal to a permanent waste disposal site. Use of such closed tank systems to handle drilling fluids and other by-products of the oil patch is becoming more common as concern increases for ground water quality. Containment also eliminates the practice of spraying and/or spreading the contents of the earthen reserve pit over the land surrounding the rig, once production begins and need for the materials is past. Although this practice is somewhat controversial, farmers often agree to the dispersal of nitrogen-rich contents over their croplands.

It is construction of the huge terminal pits by commercial waste disposal companies which is specifically forbidden in areas overlying the Rush Springs Sandstone by the Oklahoma Corporation Commission special field order.

John Roles, senior ground water geologist of the OWRB’s Ground Water Division, said the special field rule is the result of a year-and-a-half of intensive effort by the Board, and is only the second such exemption so far allowed. The first special field order that forbade construction of offsite waste disposal pits was issued on February 16, 1972, on lands overlying certain portions of the Garber-Wellington Ground Water basin in central Oklahoma.

Since ground water supplies more than 60 percent of the total water used in Oklahoma, Roles said he hopes residents of areas relying on ground water as the sole source will be diligent in reporting illegal dumps and activities which could pollute these vital water sources.

"With the help of Oklahomans, the OCC and the Board perhaps will be able to expand the safety net drawn over these two vulnerable aquifers," Roles concluded.

Perhaps most significant in the figure at right is the time in residence of ground water which indicates how long contamination of ground water might last. Note the contrast with contamination of surface water, which, unless it settles to the bottom as insoluble material, will clear the stream in a matter of weeks. (In figuring volume, 1 km$^3$ x 10$^6$ = 240,000 cubic miles).
RWD #5, LeFlore County was approved for a grant of $39,808 to be used to upgrade the water distribution system which serves the community of Howe. The grant money will raise and refurbish an abandoned water storage tank.

The three grants were made from interest accrued on the $25 million water development fund.

Board Executive Director Barnett said that to qualify for grant assistance, the applicant must demonstrate that an emergency exists.

"Emergency is defined in the regulations governing the program as a situation where the life, health or property of the persons served by the entity is endangered," Barnett explained.

Four other communities—Prue, in Osage County; Bernice, in Delaware County; Piedmont, in Canadian County; and Krebs, in Pittsburg County—were denied grants on the basis of their needs not constituting an emergency, as required by program guidelines.

Sen. Gilmer Capps, center, and Jerry Frick of the National Water Well Association (seated behind Capps) addressed members and guests of the Oklahoma Water Well Association at the banquet held February 16, during the annual meeting of the OWWA February 15-17 in Elk City. Seated left to right: Mrs. Roy Burson, Roy Burson, OWWA president; Rep. Willie Rogers and Ken Masters, OWWA secretary.

The banquet also was the occasion for an award presented by OWWA to Duane Smith, Chief of the Board's Ground Water Division, recognizing Smith's professional contributions to the well drillers' organization.

Earlier in the day, OWRB Executive Director James R. Barnett had commended the organization's support of the Board's regulatory and licensing activities and invited continued dialogue between the drillers and the Board.

High Plains Study Report is Ready

The report analyzes the potential impacts of depleting water and energy supplies on the 6,300 square miles of northwestern Oklahoma underlain by the Ogallala Ground Water Aquifer. State-level studies projecting water availability to the year 2020 were completed by the Board's Planning and Development Division. Agricultural impacts research was subcontracted by the OWRB to OSU, and energy production investigations assigned to OU.

"State-Level Research Results for the Six-State High Plains Ogallala Aquifer Area Study" is available without charge by writing the Board at P.O. Box 33585, Oklahoma City, 73152, or by calling (405) 271-2555.
Come to Water Awareness Day March 20

The Third Annual Water Awareness Day sponsored by the Oklahoma Water Resources Board will attract 15 or more exhibitors to the Fourth Floor Rotunda of the State Capitol March 20. Legislators, students and the public are invited to visit the exhibits on water conservation between 10:30 a.m. and 3 p.m. and to be present for Gov. George Nigh's address at 10:45 a.m.

Organizations and state agencies preparing exhibits include the OSU Water Research Institute, OSU Extension Service, Mid-West Irrigation and Foundation, Smith's Farm and Garden Center, Oklahoma Rural Water Association, U.S. Army Corps of Engineers, Bureau of Reclamation, Oklahoma Water Well Association, Department of Tourism and Recreation; Oklahoma Conservation Commission, Department of Wildlife Conservation, Oklahoma Wildlife Federation, Moore High School Projects Research, Oklahoma State Department of Health and the Oklahoma Water Resources Board.

OWRB, FEMA Sponsor Dam Workshop

The Engineering Division of the Board and the Federal Emergency Management Agency will sponsor a workshop entitled “Risk-Based Approach to Dam Safety Assessment” April 24-25 at Rose State College's Tom Steed Center in Oklahoma City.

The lectures and problem-solving sessions will be conducted by Stanford University personnel who will introduce engineers and dam safety managers to risk-based methods of dam safety assessment. Since enrollment is limited, advance registration is required. The $50 fee includes printed materials, continental breakfasts, breaks and lunches on both meeting days. For more information, call Cecil Bearden at (405) 271-2535 or write to R.O. Box 53585, Oklahoma City, 73152.

Looking for Oil? Call Us First

The Oklahoma Ground Water Law calls it “Temporary Provisional” and the Stream Water Law calls it “Provisional Temporary,” but whether “temporary” comes first or last, it would appear that those permits for short-term water use rate among the best-kept secrets in Oklahoma. The vast disparity between the number of oil and gas drilling rigs in the state and the number of permits issued suggests that many oilmen remain unaware of the two state laws—one requiring a permit for ground water use, the other mandating a permit for stream water use.

If the oil or gas driller intends to use water from a well he drills at the rig site, he must first obtain a “Temporary Provisional” permit from the OWRB Ground Water Division which will allow him water use up to 60 days. Other options include contracting with the landowner for water use from his permitted well, hauling water or using water from a stream water source.

If the operator intends to use water from a stream, lake or pond, he must obtain a “Provisional Temporary” permit from the Stream Water Division for water use up to 90 days—unless he is using or buying water from an individual or a municipality that holds a valid permit. (Often cities and towns will allow tank trucks to fill and refill at city taps for a fee.)

In either case, the permit is non-renewable, the application form brief, and the procedure simple.

For information on “temporary provisional” or vice versa permits, or to obtain applications for 90-day stream water use or 60-day ground water use, call the OWRB Offices in Oklahoma City (405) 271-2555, Tulsa (918) 581-2925 or Lawton (405) 248-7762.

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Permit No. 310
RWDs Face 3 to 5-Year Waits, High Costs and Funding Problems

The turn of the tap that brings a flow of fresh water is a heendless act taken for granted a dozen times a day by the city dweller. Not so, out in the country. Often this same act elicits a flood of appreciation from the rural resident who has endured years of birthing and growing pains that “come with the territory” in founding a rural water district. And his numbers are legion.

Bill Secrest, OWRB member and manager of Wagoner County RWD #4, says the wait for making piped-in water a reality is typically three to five years. The time is spent signing up potential customers, working with engineers in the design, arranging financing, seeing copious paperwork through the system and overseeing the actual construction. It can be longer, much longer, for some he concedes — 19 years from start to finish for Nowata RWD #7.

“The shortest time to completion, if all the parts come together in record time, could be a year,” he said, “although I don’t know of any that have finished so fast.”

Sometimes the sheer size of a rural water district can slow its completion. Rogers County #3 serves 3000 customers in a compact 110-square mile area, while Caddo County RWD #3’s 1450 taps are scattered along a distribution network 900 miles long. In contrast, Kay County RWD #2 serves 18 customers on two miles of line.

Every day, two-thirds of a million Oklahomans turn their taps to receive water provided by some 475 rural water districts.

Only those who have endured bad-tasting water or a supply so scant that a single tub of laundry could use up the entire day’s ration, or who have doled out water hauled in drums can appreciate its worth. Unlike the urbanite who often gets a great bargain on water subsidized by the city, the resident living beyond the reach of city lines pays a water bill that reflects the real cost of developing and delivering the water.

According to Gene Whatley, executive director of the Oklahoma Rural Water Association, rural water customers can expect a bill half again to double that of city dwellers. Relatively “cheap” water is available in eastern Oklahoma where supplies are abundant, while western Oklahomans may pay a minimum bill as high as $30 to $45 for the first 1000 gallons, then two dollars or more per thousand for the rest.

The minimum bill reflects the district’s indebtedness, explained Whatley. The RWD borrows money from the FmHA or another source on behalf of the water users, then every user assumes an equal share of the debt. In these times of high interest rates (FmHA’s has doubled in recent years) and higher construction and maintenance costs, each customer’s share generally is $3500 to $4000. The share could be even more costly if the water source is a lake, in which case, costs must cover the construction of a treatment plant.

Water hauled in barrels and tank trucks is harsh reality for a rural family with a poor well or no water supply at all. Such a scene is repeated daily in both western Oklahoma, where water supplies are scarce and eastern Oklahoma, where lack of treatment and distribution systems plague many homeowners, even though they may literally live at lake’s edge.

Then add in the “tap fee” — an up-front, one-time assessment ranging from a hundred to several hundred dollars to bring the water to the house from the nearest line. In divvying up the costs, RWD organizers also take into consideration expenses accrued in wages to district employees, insurance costs and a reserve fund for future expansion. A sharp pencil must be put to figuring costs, a task made touchier by state laws which limit a RWD to breaking even on the costs of supplying water to its customers.

Continued on page 2
Rural Water Districts, continued from page 1

Because the rural water purse strings are tight, Whatley says the Oklahoma Rural Water Association spends a great deal of time and effort in educating member districts in efficient day-to-day operation and maintenance and emphasizes water conservation.

The most common source of water for the rural water district is a nearby municipality which welcomes the additional income gleaned from the sale of water surplus to its needs. Some 43 percent of the districts purchase water, 36 percent develop their own wells and 21 percent tap a surface source.

Once a potential water supply is secured, RWD organizers must shop for affordable financing. The most common source remains the FmHA, since 1961 the federal backer of 90 percent of the state's rural water districts. Oklahoma, recipient of $300 million over the past 20 years, is among three states in the nation with the greatest investment of FmHA funds. The first FmHA financing in Oklahoma was $65,760 loaned to Nowata Rural Water District #3 in 1963 at an interest rate of 3.8 percent. Early rates available through the Farmers Home Administration rose slowly, holding at five percent until October, 1981.

Today, Oklahoma rural water districts vie for FmHA funds reduced by 65 percent and loaned at an interest rate of 9.625 percent. Likewise, FmHA grants are doled out sparingly, funding only 20 to 25 percent of any rural water system. So sparse is the federal money now that rare is the case indeed in which FmHA will participate with a 50 percent grant contribution.

Bill Secrest, OWRB and OWRA Board member, says local banks usually are not interested in underwriting a rural water system with fewer than 1000 customers, considering it high-risk with too few assets. Secrest, himself a resident of a suburb served rural water and manager of a large, bank-financed district, is quick to point out that not a single rural water system in Oklahoma has failed. The migration of 50,000 to 60,000 new rural water customers to the country and the suburbs every year is giving rise to some districts of 3000 or more customers, and local banks are quick to bid on such loan business.

If the rural water district is too small to pursue bank financing, Housing and Urban Development (HUD) funds, another program under the budget knife, offer some assistance through the Department of Economic and Community Affairs.

Held in abeyance by a State Supreme Court ruling last month is the OWRB program which would have offered affordable loans to cities, towns and rural water districts for construction or improvement of water and sewer facilities. The court's interpretation was that the terms of the program's bond sale violated the constitution by making the state liable for the debts of local entities loaned money from the statewide water development fund. To assure the program's integrity, the Legislature late in April approved a joint resolution calling for a constitutional amendment to let the $25 million fund be used to assist local water projects. A statewide election scheduled for the August 28 primary will give Oklahomans an opportunity to vote on the issue.

In the meanwhile, Secrest and Whatley both lament the delay in the loan program that was conceived to relieve funding problems caused by big federal cuts.

But regardless of the obstacles — long periods in organization, high costs, short money — both men see a secure future for rural water. And for whatever reasons the new-generation country-dwellers turn to the land, they will always have a need for good water. One of the solutions, according to Whatley and Secrest, may lie in the formation of rural water co-ops to develop the water supply, build the treatment plant, lay the distribution lines, keep the books and mail the bills.

One such organization already in existence is the Poteau Valley Improvement District in LeFlore County, a co-op formed by the merger of seven rural water districts and five towns to share the waters of Lake Wister.

Co-ops will succeed, Whatley believes. Two-thirds of a million people strung along thousands of miles of water line in 475 rural water systems are living proof that the cooperative spirit is alive and well in Oklahoma.

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Board Awards Grants to Five Communities

At its regularly scheduled meeting April 10, the Oklahoma Water Resources Board presented grants to five communities, judged by the Board to have emergency needs for improvements to water and sewer systems. Grant funds are generated by interest accrued on the $25 million water development fund.

Communities awarded grants were Colcord in Delaware County, $95,816; Picher in Ottawa County, $97,900; Oiltan in Creek County, $28,420; Muldrow in Sequoyah County, $77,200; and Rural Water District #7 in Muskogee County, $90,000.

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Here's an Update on Arcadia Construction

This aerial view looking south at construction at the Lake Arcadia site near Edmond shows an earthen dam approximately 42 percent complete. The embankment is shown as a diagonal in the photo, between the outlet structure on the left and the intake tower on the right. Impoundment of the lake is scheduled for March 1986, with formal opening ceremonies in September 1987.
Stream Water Division Sets Permit Hearings

Stream water rights in Stream Systems 2-9-3, 2-9-4, 2-10 and 2-11 are being reviewed as part of a continuing OWRB program to make unused water available to the public.

The program, initiated in 1976, set up a rotation of stream systems wherein the allocation and actual usage are compared to determine whether the water has been put to beneficial use as required by Oklahoma Law. If a water right holder has failed to use the full allocation at least once in any continuous 7-year period, or failed to use amounts in accordance with a schedule of use approved by the Board, the amount of water authorized must be reduced or the permit cancelled.

Notices of hearings were mailed April 30, with hearings to be held June 14, 19 and 20. When a permit holder receives notice, the water use history should be reviewed, corrected if necessary, signed before a notary and returned to the Board before the hearing, or appear at the hearing to present evidence of use for Board consideration, says J.A. Wood, Stream Water Division chief.

If the water right holder agrees with the proposed reduction or cancellation, the form should be signed, notarized and returned to the Board prior to the hearing.

Board Lowers Allowable Chlordane Standard

In mid-April the Oklahoma Water Resources Board approved a revised chlordane limit as an amendment to the 1982 Water Quality Standards. The change came in response to a recommendation by the Environmental Protection Agency. The previous limit of 20.0 micrograms per liter is lowered to 0.02 micrograms per liter with the amended standard. Since the OSDH lab which processes the samples has a detection limit of 0.1 micrograms for chlordane, any detectable amount would be in violation of the new standard.

Water Quality Division Chief Ron Jarman points out that the pesticide may be legally used only "or termite control, and exterminators are licensed by the state. The problem, Jarman believes, is not with the licensed exterminators, but with unauthorized users. Recent reports of chlordane traces throughout the state make it more of a widespread problem than the earlier concern over PCB's, he said.

Synar to Keynote Lone Chimney Dedication

Lake Lone Chimney, the 2050th watershed lake to be built in Oklahoma, will be dedicated in June 1 ceremonies featuring Congressman Mike Synar as keynote speaker. The event will get underway at the site five miles south of Pawnee with a viewing of the project at 9:00 a.m., a program featuring parachutists at 10:30, the welcome and address by Rep. Synar at 11 a.m. and lunch at noon.

Reservations are necessary and may be made through local Conservation District Offices or by calling the Oklahoma City Office at (405) 521-2384 by May 15.

AWRA Symposium Slated in June in Seattle


The program will feature technical sessions such as "Incorporation of Forecasts in Water Resource System Operation," "Advances in Short-Term Runoff Forecasting," "Forecasting Water Demand," "Advances in Instrumentation, Data Transmission and Data Handling," and "Accuracy and Worth Forecasting." A complete program and registration information is available by writing Kenneth D. Reid, executive director, American Water Resources Association, 5410 Grosvenor Lane, Suite 220, Bethesda, MD, 20814.
If You’ve Ever Installed a Well Pump...

you will appreciate these Murphy’s Laws reprinted with the permission of Water Well Journal.

1. After a factory training course, a serviceman can destroy a cannonball by performing routine maintenance.
2. After six people have absolutely verified the proper rotation of a 3-phase motor, it will be found to be running backwards.
3. The owner of any pump that is delivering less than its advertised performance will be either a lawyer or a retired engineer.
4. A factory expert with whom you need to talk will be out of town.
5. The pump owner will not feel it is important to tell you that (a) the house is located on a hill 100 feet above the well or (b) he has added 3000 feet of irrigation pipe and 40 sprinklers to his 10-gallon-per-minute system.
6. A pump that is performing perfectly will be struck by lightning. Conversely, any pump that is a real headache will never be struck by lightning.
7. Good decisions are made either on the basis of good information or dumb luck.
8. Sometimes God is just plain annoyed with this installation.

Photo: Right:

Discussing the manual that served as text for the Stanford Workshop on Risk-Based Approach to Dam Safety Assessment are lecturers Edward Kavazanjian, Jr., Joseph B. Franzini and Martin W. McCann, Jr. of the Civil Engineering staff of Stanford University and Mike Mathis and Cecil Bearden of the OWRB Engineering Division. The Board’s Engineering Division hosted the workshop held April 24 and 25 in Oklahoma City. The workshop was sponsored by the Federal Emergency Management Agency to instruct engineers and dam safety managers in methods of prioritizing dams for remedial action.

APRIL CROP AND WEATHER SUMMARY

Favorable temperatures and rains boosted the growth and development of wheat and other small grains. Wheat, oats and barley remained in good condition, and wheat advanced to 75 percent jointing. Eastern counties began grain sorghum planting; corn is up-to-stand in southern areas; alfalfa harvesting began in southern Oklahoma. Pastures and ranges are greening rapidly.

Temperatures ranged below normal, with the coolest 24 degrees reported in the Panhandle during the week ending April 22. All areas received greater than normal rainfall, the week’s totals ranging from .04 inch in the Panhandle to 1.31 inches in the northeast and 1.22 inches in the southeast.

Courtesy Oklahoma Crop and Livestock Reporting Service

MARY E. WHITLOW, Editor
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OKLAHOMA WATER NEWS

Oklahoma Water Resources Board
1000 N.E. Tenth, P.O. Box 53585
Oklahoma City, Okla. 73152

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Permit No. 310
Hometown to Salute Red Males on July 7 “Appreciation Day”

On Saturday, July 4, L.L. Males’ hometown of Cheyenne will turn out to celebrate “Red Males Day,” their salute to an outstanding Oklahoman who has spent most of his life championing soil and water conservation. Expected to join the citizens of Cheyenne at the day-long celebration will be hundreds of guests from throughout the state.

Males, senior member of the Oklahoma Water Resources Board with 27 years continuous service, is the lone active member of the original Board created in 1957.

The industrious farmer-banker who has spent most of his life in Roger Mills County says, “As a young man in the early thirties, I could look out the window of the Strong City bank and see the fertility of our farms floating down the streams and our soil being carried away on the wings of the wind. It didn’t take much imagination to see our schools, churches, homes and the bank going the same the way.”

Males says he thought first only of soil conservation, but learned quickly that water conservation must be a partner in any effort to protect the land. He witnessed the devastation of repeated floods on the Washita River and the poverty and desperation of the Dust Bowl, and he was inspired to write a letter to the Oklahoma Farmer Stockman. In a letter written in 1934, he asked the rural newspaper how he and the bank could work in abating the wastes of soil and water wrought by nature.

In 1935, the bank was moved from Strong City to Cheyenne and Males was named its president, a title he holds today. It was about this time that upstream flood control caught the imagination of the young banker. A spring storm had unleashed 11 inches of rain in the watershed and neighboring tributaries that caused the loss of 17 lives near Hammon.

“That gave us the impetus for the program,” says Males. “Scores of homes were washed away, hundreds of livestock drowned and all the roads and railroad

Water Question to be on August Ballot; Back it with Your Yes

It is official!

The Oklahoma Legislature approved a joint resolution to let Oklahomans vote on adding a new section to the State Constitution. The addition of Section 39 to Article X would authorize use of the Statewide Water Development Revolving Fund and the Water Resources Fund to implement a financial assistance program for water and sewer improvements.

The measure recommending the water question be brought before the people in the August primary election was supported so strongly that the vote was unanimous in the House and just three short of unanimous in the Senate. Additionally, it was lauded by Gov. Nigh and Senate and House leadership.

Voters’ “Yes” to the State Water Question (yet to be assigned a number) on August 28 would allow the Oklahoma Water Resources Board to use the Statewide Water Development Revolving Fund and Water

Continued on page 2

Continued on page 4
bridges were gone. Yet the greatest loss to our river valley was the loss of the soil.”

With the aid of the U.S. Department of Agriculture, Males and his neighbors initiated the Sandstone Creek Upstream Flood Control Project, the first of its kind in the nation. Upon its completion, visitors from every nation in the world came to see it, and Males traveled hundreds of thousands of miles speaking to people on their watersheds. “I took slides with me and spoke to all who would listen. I went to Kansas enough to be a voter up there!”

For his dedication in ramrodding the Sandstone Creek Project, the National Watershed Congress selected him the recipient of its first Watershed Man of the Year Award in 1959. Males has served as advisor to presidents and governors, has won every honor in soil and water conservation and has been recognized by his peers in state and national banking associations.

A cherished award is a plaque given by his friends and neighbors in Cheyenne, engraved “Presented to L.L. ‘Red’ Males in recognition of unselfish devotion to the City of Cheyenne, Roger Mills County, the State of Oklahoma, and to his Nation, in initiating the World’s First Upstream Flood Prevention Project — Sandstone Creek — and in building a better tomorrow.”

Males says, “Our community is so proud of the Sandstone Creek Project we put up a sign. We claim we are the first in the world and nobody disputes it, so we go ahead claiming it.”

If Red Males’ energy and dry sense of humor set him apart, there is another in the matched set — his wife Lorena. Pianist, performer, music teacher and advocate for the arts, Lorena has made enormous contributions to the culture of western Oklahoma. She met and married Males early on in their careers in Strong City, then made the move to Cheyenne. While Mrs. Males taught in the Cheyenne school system, her students won award-after-award in state music competitions, and performances of the homefolks found Lorena at the piano “showing off her kids,” as she says. Teaching, encouraging, working with children, she assembled touring casts of plays and musical programs.

And the beat goes on. Today, she gives piano lessons to dozens of children each week, many of whom are the children of earlier students. Music and the children are her delight. Lorena is fond of saying, “When I leave this old world, I hope I am with a student sitting on the piano bench. It will probably scare the poor child, but that is how I want to go!”

She is the organist at the United Methodist Church in Cheyenne, director of Security State Bank, member of a touring cast of entertainers called “The Oklahoma Skit,” civic leader and grandmother of five.

Red Males Appreciation Day is just about the only honor that had not yet been bestowed upon the Maleses, and organizers are quick to point out that their tribute is directed to both Lorena and Red. To round out the day, the citizens of Cheyenne will rename Main Street. Beginning with a ribbon-cutting ceremony July 7, On July 7, a new sign will declare that Cheyenne’s Main Street is now L.L. Males Avenue.

the street that runs through the heart of Cheyenne and right outside the window of Males’ bank, will be called L.L. Males Avenue.

According to Judge K.C. Perryman, who is coordinating the event, the celebration will include a “shirttail” parade; a noon barbecue for 2500 at the fairgrounds; open houses at the bank, library and museum; speeches, street music, drawings for prizes, playday rodeo, a dance that evening and a special edition of the Cheyenne Star newspaper.

More information on Red Males Appreciation Day is available by calling Judge Perryman in at (405) 397-3359.

USGS Gages Guide Board in Planning, Allocating Water

How much water is “a lot of water under the bridge”? Chances are, the U.S. Geological Survey can tell you. This information and much more is available from the USGS, proprietors of the network of 204 gages which has furnished streamflow data since 1899. The recorcs, complete for most of the 85-year period, detail for scientists and permit writers the flow characteristics of any monitored stream.

The Oklahoma Water Resources Board bases allocations of stream water on such information, specifying to each permit holder just how much of the stream’s contents he may use and for what term. Without such historical background, fair appropriation would be an unmanageable task, according to J.A. Wood, Stream Water Division chief.
USGS data is also critical to the fair division of waters shared by two or more states in interstate stream compacts. Federal construction agencies such as the Corps of Engineers and Bureau of Reclamation consider sedimentation information from the gages in planning reservoirs and projecting their lifespan. The Corps of Engineers operates its own system of water quality, sediment, flow and flood control gages. Verl Parney of the Corps’ Tulsa Office, says their major interest is flood control.

The OWRB also uses USGS gaging data in monitoring water quality, planning new water supplies, projecting quality of proposed reservoirs and determining areas of safe development along streams, based on historical records of flood flows.

Some of the data is collected using a “real time” system, in which the USGS computer requests information via a satellite in a fixed orbit. The satellite sends an electronic signal to a selected gaging station, which relays the information back to the satellite, then down to the computer. Data gathered in this manner is only seconds old, hence the term, “real time.”

L.D. Hauth, USGS section chief who oversees the program in the state, says other information is harvested from the gages by hand by 15 field technicians who also maintain the gages. The technicians make their rounds monthly, more often if vandalism disables a gage.

Information from the stream gaging network is now available to the OWRB by telephone within two hours, although a new computer system soon will allow instant access.

### New Study Compares Tulsa, OKC Water Use

A 3-month study comparing water use in Tulsa and Oklahoma City and the factors that influence water use will soon be available in printed form, according to Richard Cochran, OWRB Tulsa Branch manager, who accomplished the study with Planning Specialist Art Cotton.

The purpose of the study is to give city planners a reliable tool in predicting how much water treatment capability will be needed to keep up with expanding populations. The factors thought to affect water use were rainfall, temperature, cost per 1000 gallons, individual income and population density.

A computer analysis of data collected in the survey shows that environmental factors (temperature and rainfall) have little effect on consumption of treated water; water use rises with per capita income; water use decreases as population density increases; and as cost of water increases, use decreases in Oklahoma City but increases in Tulsa.

Cochran says a surprising statistic generated by the study showed that in terms of 1961 dollars, cost of water per 1000 gallons has decreased in Oklahoma City from 56 cents in 1961 to 27 cents today and in Tulsa from 38 cents in 1961 to 16 cents in 1984.

### 1983 Annual Report Ready for Distribution

The Report of 1983 Activities of the Oklahoma Water Resources Board is completed and available for distribution to citizens interested in the Board’s operations, Executive Director James R. Barnett announced.
Mainstream, continued from page 3

The report is available without charge by writing OWRB offices at PO. Box 53585, Oklahoma City, 73152, or by calling the Oklahoma City office at (405) 271-2555.

Moffitt to Serve Again as Commissioner

Governor George Nigh recently announced the reappointment of John Moffitt of Ft. Gibson to a 4-year term as one of three commissioners representing Oklahoma interests on the Oklahoma-Arkansas Arkansas River Compact Commission. James R. Barnett, OWBR executive director, is designated by state law as a commissioner, with Dr. Lloyd Church of Wilburton completing the state's representation.

The Oklahoma-Arkansas Arkansas River Compact Commission is an agreement between the neighboring states of Oklahoma and Arkansas which apportions interstate waters, defining precisely how much water can be used by each state.

What Happens When a Lake “Turns Over”?

If you live in a city, you are signaled the change from winter to spring by warm temperatures and the greening of plants. Residents of rural or lakeside areas, however, witness yet another phenomenon of the new season—the “turning over” of lakes and ponds. And as surely as the birds fly south in the winter, this same circulation recurs in the fall, twice each year bringing to the waters a distinct murkiness, flavor and odor.

When the sun warms the surface waters to about 39.2°F, the lake takes a deep breath, mixing the waters that have been stratified by temperature all winter. The oxygen-rich top water, made heavier by warming to 39.2°F, sinks to the bottom. Winds on the surface, convection currents set up by night cooling and evaporation also contribute some energy to circulating the entire column of water. After this spring circulation, the waters restrate, the upper stratum (epilimnion) composed of warm, fairly turbulent water; the bottommost layer of cold, undisturbed water; and the two separated by a zone of steep temperature gradient called the thermocline.

In the fall, with the onset of cooler weather, the temperature of the surface waters drops until it is the same as that of the bottommost waters (hypolimnion). Then the water of the entire lake begins circulating and oxygen is returned to the depths.

State Question, continued from page 1

Resources Fund as the legislature originally intended—to help cities, towns and rural water and sewer districts build or improve facilities by making loans available to those entities at affordable interest rates.

“Yes” would put to rest all questions concerning validity of the program mandated by the legislature in 1982 and funded with a one-time appropriation of $25 million. Without costing the citizens of Oklahoma a dime, it would put back on track the means of solving problems caused by enormous cutbacks in federal funding. The “Yes” vote to adding Section 39 to the Constitution would limit the state’s liability in the loan program to money reserved specifically for such purposes in the Statewide Water Development Revolving Fund.

It would create for all time the sound and responsible means for the Oklahoma Water Resources Board to address the problems of Oklahoma’s cities, towns and rural water and sewer districts.

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OKLAHOMA WATER NEWS
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Water, Sewer Financing Hopes Lie in SQ 581 August 28

"Nothing survives without water," said Gov. George Nigh when he added his support to that of the Oklahoma Legislature endorsing State Question 581 to come before the voters August 28. If approved, this measure would change the Oklahoma Constitution, allowing the state to offer low-interest loans to cities, towns, and rural water districts for constructing and improving water and sewer systems.

"No further legislative appropriations will be required as the state already has the money set aside for this purpose," said James R. Barnett, executive director of the Oklahoma Water Resources Board, which is given the responsibility to manage the program. Local and state taxes won't change as a result of this much needed financial assistance program. The state's liability is limited to the Statewide Water Development Revolving Fund which was established by a $25 million legislative appropriation in 1982. The Revolving Fund will be used as collateral on bonds sold by the Board.

Often, the Board is the only source of financing available to small communities which have been unable to afford or qualify for conventional forms of financing. High interest rates and the inability of small communities to sell bonds have hindered water development and growth. Federal financing sources for water and sewer projects have become increasingly scarce or eliminated in recent years with the sharp cutbacks in such government programs as Farmers Home Administration, Economic Development Administration and Environmental Protection Agency. For example, FHA at this time has grant requests totaling eight times the amount of funds available.

In addition to the loan program, OWRB already has in place a successful emergency grant program which has assisted some 31 communities statewide with $1,739,880 in emergency relief. Grant funds for the program are generated from interest accumulated by investment of the Revolving fund. New grant funds accure regularly and would continue to be used only for emergency situations.

Emergency conditions range from repairing tornado ravaged water tanks and supply systems to drilling new water wells after the collapse of existing wells.

A qualified city, town or rural water/sewer district that needs to construct, expand or improve its water or sewer facilities could finance the project at an affordable interest rate through the OWRB program allowed by the Constitutional Amendment.

As a community grows, so must its water and sewer facilities. Approval of State Question 581 on August 28 would allow the OWRB to fully implement the loan portion of the Financial Assistance Program.

A YES vote would put reliable supplies of good quality water and adequate sewer facilities within the reach of thousands of Oklahomans who are presently deprived of such services, and it would do so with money already appropriated and specifically reserved for the purposes.

State Question 581 will be worded in approximately this manner on the primary election ballot:

"Shall a constitutional amendment adding a new Section 39 to Article X of the Constitution of the State of Oklahoma which would authorize a water resource and sewage treatment program and provide for the use of the Statewide Water Development Revolving Fund and the Water Resources Fund for financing the program through furnishing of financial assistance to municipalities, political subdivisions and certain other public entities of the state, and which would limit any state liability to monies reserved in the Statewide Water Development Revolving Fund for such purposes be approved by the people?"
Cheyenne Honors Longtime OWRB Man

It was clearly a love affair between a western Oklahoma community and a family. The whole town of Cheyenne turned out, and more came from the surrounding little towns and Roger Mills County, from the state capital, from all across Oklahoma and other states. They all came for a single reason — to express their love and admiration for L.L. "Red" and Lorena Males.

They paid tribute in every way they knew — in warm hugs and long handshakes, in vases spilling over with red roses, in a special "day" brimming with honors, in speeches, songs and readings; in gifts purchased and handmade, and in new street signs running the length of town proclaiming "L.L. ‘Red’ Males Avenue."


Their fans pressed on them plaques, scrapbooks, trophies and countless mementos recognizing the Maleses’ 50 years of service to the community. Males’ employees at Security State Bank had commissioned a handmade patchwork quilt for the occasion, the squares embroidered with their names and the center stitched with a likeness of the bronze sculpture in the bank courtyard.

Males Appreciation Day began at nine with a reception in the bank, where visitors and friends dropped by for punch and cookies and a souvenir wooden nickel. Across town, a softball tournament was underway. At eleven, the Maleses cut the red streamer that officially named the street "L.L. ‘Red’ Males Avenue," and the parade began.

It was 104 degrees. A sea of straw hats shaded faces along the parade route and little gymnasts made quick spins of their cartwheels as they balanced on the blistering pavement. Cub scouts marched with flags; antique vehicles chugged; huge farm behemoths rolled on silent tread; riders passed on prancing horses; carriages, buggies and covered wagons creaked and jingled; a bright float bloomed with "Our Little Miss" winners, and a brigade of youngsters on training wheels and motorcross bikes whizzed by.

After the parade, the festivities moved to the fairgrounds where 1000 pounds of barbecued beef, brown beans and slaw were served to 750 people. Then, a “This is Your Life” program recounted Red and Lorena’s lives, and Lorena took her favorite seat on the piano bench to play and sing with the kids.

At six, the playday rodeo began outside, and every youngster rode who owned a horse. Some little fellows without mounts ran the barrel races on "broomstick" horses. The sun began to slip. As the country and western band tuned up for the street dance downtown at nine, the thermostat on the bank still lighted 94 degrees. But the folks continued to come — more than 300 of them two-
ember L.L. "Red" Males and Wife Lorena
Prior Rights Hearings Set in 11 Counties

Duane Smith, 0WRB Ground Water Division chief, announced that work sessions and public hearings have been scheduled through August 9 in 11 counties for applicants and claimants for prior rights to beneficial use of ground water.

He pointed out that any person who used ground water under the requirements of the existing laws prior to July 1, 1973 (the effective date of the present Oklahoma Ground Water Law) is given the opportunity to establish a prior right. Exempt from the permitting requirements are those who use the water solely for domestic purposes, watering livestock under normal grazing capacity of the land, or watering domestic gardens and orchards less than three acres.

OWRB staff members will be available in the following locations to assist prior rights applicants and conduct hearings: Woods County, Alva City Council Chambers, July 24, 8:30 a.m. to 5:30 p.m.; Alfalfa County, Library Community Room, Cherokee, July 25, 8:30 a.m. to 4:30 p.m.; Grant County, City Hall Reading Room, Medford, July 26, 8:30 a.m. to 12 noon; Kay County, Commissioners (Court) Room, Newkirk, July 26, 1:30 to 4:30 p.m.; Eastern Tillman County, Light and Power Office Conference Room, Frederick, August 6, 1 to 5 p.m.; Comanche County, 0WRB Branch Office, Lawton, August 7, 8:30 a.m. to 4:30 p.m.; Cotton County, City Hall Council Chambers, Walters, August 8, 8:30 a.m. to 12 noon; Stephens County, City Hall Municipal Court Room, Duncan, August 8, 1:30 to 5 p.m.; Jefferson County, City Hall Court Room, Waurika, August 9, 8:30 a.m. to 12 noon; Love County, Marietta Public Works Authority Conference Room, August 9, 2 to 5 p.m.

Board Names Lawton Branch Manager

James R. Barnett, 0WRB executive director, announced that David O. Dillon Jr., has accepted the position of manager of the Board’s Lawton Branch Office, effective June 25.

Dillon, who has a bachelor’s degree in biology and environmental science from East Central State University in Ada, was previously employed by the Oklahoma Department of Pollution Control in Oklahoma City and the Robert S. Kerr EPA Water Quality Lab in Ada.

This monthly newsletter, printed by the Central Printing Division of the Office of Public Affairs, Oklahoma City, Oklahoma, is published by the Oklahoma Water Resources Board as authorized by James R. Barnett, executive director. Ten thousand copies are printed and distributed monthly at an approximate cost of 20 cents each.

MARY E. WHITLOW, Editor

BARRY FOGERTY, Writer

MIKE McGAUGH, Layout

OKLAHOMA WATER NEWS

Oklahoma Water Resources Board
1000 N.E. Tenth, P.O. Box 53585
Oklahoma City, Okla. 73152
SQ 581 Offers Affordable Loans to Cities, Towns, RWDs

This article, reprinted in its entirety from the newsletter of the Department of Agricultural Economics at Oklahoma State University, is reproduced as a non-biased appraisal of the Financial Assistance Program which would be sanctioned by passage of SQ 581.

The OWRB reprints the article as a public service, although the Board does not necessarily concur in all respects with the views expressed by the authors. Oklahoma Water News expresses appreciation to authors James R. Nelson, Professor of Agricultural Economics; Kent W. Olson, Professor of Economics; and Rick A. Smith, former chief of the OWRB Planning and Development Division for their permission to reprint the following.

On August 28, 1984, Oklahoma voters will be asked, via State Question 581 (SQ 581), to decide whether the Oklahoma Water Resources Board (Water Board) will play a more active role in financing water and sewer projects of local units of government. This referendum proposes the addition of Section 39 to Article X of the Oklahoma Constitution, which would allow the Water Board to use monies in the Statewide Water Development Revolving Fund as security and collateral for investment certificates issued to raise funds for local government (city, town, and rural water district) water and sewer projects. The purposes of this newsletter are to explain the origins of this referendum and to examine some of the economic implications of

Continued on page 2

SQ 581 at a Glance

WHAT IS SQ 581?
It proposes a constitutional amendment to allow state funds to be used to help cities, towns, small communities and rural water and sewer districts finance construction and improvements to water and sewage treatment facilities, distribution lines, reservoirs and water wells.

WHEN IS THE VOTE ON SQ 581?
SQ 581 will be one of three state questions on the primary election ballot August 28.

WHY DOES OKLAHOMA NEED IT?
The Federal Government has drastically reduced assistance to communities for both sewer and water improvements. It is necessary for state and local entities to shoulder more responsibility.

In 1982, more than 400 cities, towns and rural water districts in Oklahoma were not able to meet local water demands. Today, several rural communities have no public water supply. They need help NOW. Communities in Oklahoma need more than $500 million for water and wastewater improvements.

WHAT SQ 581 DOES NOT DO:
It proposes no new taxes. The money to back the program already exists in the $25 million water development revolving fund. Approval of the State Question would allow the fund to be used as collateral for state revenue bonds so communities can obtain long-term loans at affordable interest rates for improvements to water and wastewater systems.

SQ 581 does not propose water transfer. Rather, it encourages local improvements. It would help Oklahoma communities become self-sufficient and better serve their residents and rural water customers with improved water and sewer facilities.
the investment program that it would sanction.

Traditionally, local governments in Oklahoma have had to rely upon their own resources, or those of the Federal government, to finance water projects. However, a series of actions taken by the State Legislature in 1979, 1980, and 1982, greatly expanded the potential role of the state in the quest for funds at the local level.

In 1979 the Legislature passed SB 215 which authorized the creation of a Water Resources Fund (Water Fund) in the State Treasury. Although no money was appropriated for the Water Fund, this legislation granted the Water Board authority to issue investment certificates as a means of acquiring money for this fund and to use this money to make loans to local governments for a wide variety of water projects.

In 1980 the Legislature passed HB 1710 which amended SB 215 by adding sewer treatment facilities to the list of eligible projects and permitted the Water Board to award small grants (up to $50,000) from the Water Fund to needy communities. However, the Legislature once again did not appropriate any money for the grant portion of the program.

In 1982, the Legislature passed SB 145, which established the Statewide Water Development Revolving Fund (Revolving Fund) and also appropriated $25 million to the Revolving Fund from that year's surplus balances in the General Revenue Fund. According to SB 145 the monies in the revolving fund can be used for three principal purposes: 1) to produce interest earnings, part of which would be deposited in the Water Fund to finance the small grants program (now up to a $100,000 limit), 2) to serve as collateral for the investment certificates issued to finance loans to local governments, and 3) to make expenditures, subject to Legislative approval, for the planning and development of State water projects.

Although SB 145 gives the Water Board a great deal of authority, the Board's interest is in the use of the Revolving Fund as collateral for investment certificates. From the beginning, however, there was the possibility that this feature constituted a violation of Article X of the State Constitution which prohibits the lending of the State's credit to any other political unit in the state. To help clear up this question, the Legislature requested the public to approve this practice via SQ 558—put to vote, and narrowly defeated by the voters in November, 1982. Finally, in 1984 the State Supreme Court declared the use of the fund for collateral as unconstitutional, and the money in the Revolving Fund remains largely unspent.

SQ 581, scheduled for a vote August 28, 1984, is another attempt for the Water Board to use State monies to provide guarantees for state revenue bonds, the proceeds from which will be loaned to local governments for water and sewer projects. If this question is approved, key provisions of a new law, SB 156, will become effective. These provisions authorize the Water Board to use money in the Revolving Fund for the purposes outlined in SB 145. SB 156 provides further that any state liability arising from the investment certificate program will be limited to monies in the Revolving Fund, and that a share of the loans financed by each issuance of investment certificates must go to small cities, towns, and rural water districts in proportion to their share of total need.

Thus, if SQ 581 passes, the Water Board will be able to use state appropriated funds to back revenue bonds to generate funds for lending to local governmental units. The Board will retire the bonds from loan payments received from these units. In event of default at the local level funds in the Revolving Fund would be used to retire the State's investment certificates. However, since the probability of default is quite low, the Water Board should be able to borrow an amount far in excess of the $25 million originally appropriated for the Revolving Fund—up to $250 million, according to some accounts.

There are several relevant issues which should be considered by the citizens of Oklahoma as they decide whether to vote for or against SQ 581. Some of these issues are discussed below.

Anytime money is borrowed by any entity there is some risk that the money will not be repaid. So there exists some likelihood of default on the part of local units of government which might borrow money based on the bonds which will be allowed if SQ 581 is passed.

There is evidence, however, that such likelihood of default is quite low. The local units of government with the least documentable ability to pay back borrowings are small communities and rural water districts. These types of governments would be eligible to borrow funds provided by the sale of bonds which would be made legal by the passage of SQ 581. Farmers Home Administration (FmHA) in the United States Department of Agriculture has for many years been the primary lender to such small units of government for purposes of water and sewer system development. FmHA has a national default rate on water and sewer loans of considerably less than 1 percent. FmHA has never had a water or sewer loan default in Oklahoma.

If defaults should occur, what are the limits of State liability? This question is specifically answered in SB 156 which states, "Any State liability...shall be limited to..."
those monies in the Statewide Water Development Revolving Fund which have been reserved as backing for the outstanding investment certificates."

There would be some costs to the state to administer and operate a program of major water and sewer loans to local governments. This program administration and operation would be carried out by the Water Board. If the loan program goes into effect, Water Board staff will almost certainly find it necessary to become involved in providing management advice and assistance to borrowers. Budgetary support for such personnel could come from state general fund budget appropriations or in the form of increased bond insurance costs ultimately repaid by the borrowers.

Local units of government and their constituents from throughout Oklahoma will be the prime beneficiaries if SQ 581 is passed in August. These benefits will come from cost savings in the financing of water and sewer system developments and from the availability of funds to local governments in situations where there were no funds available before.

Cost savings which will accrue to local units of government which finance water and sewer projects with bonds guaranteed by the Revolving Fund will include interest savings and bond underwriting and marketing cost savings. If $250 million in bonds is backed by the Revolving Fund and thus receives a AAA bond rating rather than a B bond rating the annual interest savings will be about $3.5 million per year. Over an assumed 30-year time stream and assuming a 10 percent discount rate, this equates to an interest savings over the thirty years equal to 33 million in today’s dollars.

Researchers estimate that savings in the costs of bond underwriting and marketing are about 50 percent of first years savings in bond interest costs. Thus, total savings to local units of government which finance water and sewer projects with bonds backed by Revolving Fund would also include about $1.75 million in underwriting and marketing cost savings to yield a total 30 year savings of 34.75 million in today’s dollars.

Thanks to a fast-growing population out in the country and rural water districts working hard to stretch their water lifelines to new customers, scenes like this abandoned land are hard to find. However, the FmHA loan money that financed rural water development in the past has been drastically cut back by the feds. RWDs must now look to the state and other sources for financing.

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STATE TOTALS: 11,456,122² 93.1³

1. In initial fillling stage
2. Temporarily lowered for maintenance
3. Conservation storage for Lake Optima not included in state total

Data courtesy of U.S. Army Corps of Engineers, Bureau of Reclamation, Oklahoma City Water Resources Department, and City of Tulsa Water Superintendent's Office.

Most local units of government in Oklahoma which are involved with development of water and sewer projects (town and rural water districts) can, in some manner, issue revenue bonds. However such bonds issued by most small towns and rural districts are generally not marketable. So revenue bond financing is typically not an option for these small units of government. The benefits which would accrue to small units of government in Oklahoma from

Continued on page 4
passage of SQ 581 are not measured solely in the estimate of cost savings presented above. Rather, such units of government would benefit by having a valuable financing opportunity (bond borrowing) made available to them which for all practical purposes, is currently unavailable.

The overriding question of concern to citizens of Oklahoma concerning the vote on SQ 581 on August 28 is, "Does helping local communities finance water and sewer projects represent the 'best use' of $25 million in State funds?". Although these funds would not be spent, they would be used as collateral for bonds, and therefore could not be used for any other purposes. Most of the interest from the $25 million would be used to make assistance grants to especially needy local governments with water and sewer system problems.

There are documentable needs for water and sewer system development funds in Oklahoma. Small towns and rural water districts generally cannot go to the bond market to generate water and sewer system development funds, since their bonds generally are not marketable. FmHA has traditionally been the primary funding source for such system development. Due to federal budget cutbacks, there has been about a 70 percent decrease in the last 5 years in the FmHA funds available for water and sewer system development in Oklahoma. For the current fiscal year, FmHA in Oklahoma has available about $4 million in loan funds and about $2 million in grant funds. They have applications for about $23 million for loans and about $2 million in grant funds. Applicants come to FmHA for funding because credit is unavailable to them from other sources.

Larger cities and towns in Oklahoma also have substantial need for funds to improve water and sewer systems. A report prepared by Peat, Marwick, Mitchell and Co. in 1983, for the Water Board identified 131 communities, with total capital needs of $250 million, interested in participating in the state program. Although these entities usually have the capability to issue their own bonds, it is likely that they could obtain a more favorable rate from the State-backed program. The report demonstrated the largest portion of needs exists in central and northeastern Oklahoma. However, numerous needs were documented throughout the state.

The governor of Oklahoma, decision makers with the Oklahoma Water Resources Board and many State legislators believe that the use of the Statewide Water Development Fund as collateral for bonds to help local communities finance water and sewer projects is an appropriate use for State Funds.
Read it All in the Water Atlas Facts, Figures and Maps Galore

There are more than enough facts and figures in the new OWRB Oklahoma’s Water Atlas to design a special “water” version of “Trivial Pursuit.” For instance, did you know that Oklahoma has 207,865 farm ponds? Of the 77 counties, Ottawa County has the most with 6242 ponds; Pottawatomie is second with 5635; and Pontotoc County, third with 5115. The county with the fewest farm ponds is Texas County in the Panhandle with 150.

All but two of Oklahoma’s major lakes were built by the federal construction agencies — 22 by the U.S. Army Corps of Engineers; seven by the Bureau of Reclamation. The two exceptions are Lake Hudson and Grand Lake, which were projects of the Grand River Dam Authority.

There are four more big lakes under construction — Skiatook and Candy Lake in Osage County, Arcadia in Oklahoma County and McGee Creek Reservoir in Atoka County. All are Corps of Engineer projects except McGee Creek, which is a construction project of the Bureau of Reclamation. When those four reservoirs are finished, the state’s 35 major lakes will contain 13,399,209 acre-feet of conservation storage. (An acre-foot equals 325,851 gallons of water.)

But the Water Atlas doesn’t stop there! It considers municipal, industrial, recreational, private and SCS lakes of many other sizes. Oklahoma has 16 additional lakes of 16,500 acre-feet or more that add a combined 1,079,342 acre-feet of storage to the total. Then there are 29 more lakes in the class of 5000-16,499 acre-feet that together contain 270,442 acre-feet of water. Seventy-five lakes in

Continued on page 2

Board Adopts Formula to Grade Priority of Grant Requests

The Board has adopted a new formula for assessing the priority of the grant requests it receives.

The priority system, in mathematical format, awards up to 100 points to a community based on several different indicators of need.

The formula is \[ P = E + WR + I + L + MFI + FP \]

\( P \) is Priority Ranking, or how a community’s needs measure up against other communities.

\( E \) is Emergency Ranking which ranges from total loss of water supply due to natural or unforeseen disaster (50 points) to improvements which add to the existing water lines to provide supplemental fire protection (10 points).

\( WR \) is Water and sewer rate structure giving more points for higher rates which encourage water conservation; $24 per 5000 gallons earns 10 points, while $7 or less per 5000 gallons earns no points.

\( I \) is existing indebtedness which considers the ability of the community to assume additional debt and thereby pay for the project out of higher water rates. Communities where the utility debt is $2,000 per person earn 10 points, while communities with indebtedness of less than $400 per person earn no points.

\( L \) is local participation and indicates what percentage of the total project cost the community is willing to undertake; 75-100 percent gets 5 points, while 0 percent gets 0 points.

\( MFI \) is Median Family Income and measures the community’s ability to afford a rate increase, and thereby undertake a larger part of the project’s total cost. If income is less than $10,000 per family, the community is awarded 5 points; $15,000 or more earns 0 points.

Continued on page 3
the next-smaller category of 1000-4999 acre-feet provide additional conservation storage of 171,072 acre-feet. Included in these totals are 28 SCS lakes of more than 1000 acre-feet. If you're still thirsty, count in 2833 private lakes and 1956 SCS lakes of less than 1000 acre-feet with total conservation storage of 537,828 acre-feet.

Oklahoma has 6500 miles of shoreline along those lakes of 1000 acre-feet or more. Approximately 991,000 acres are covered with water — or 2.2 percent of the state's total land surface. That ranks Oklahoma 14th in total water area among the 50 states.

If your head is swimming with all those numbers, the Atlas has hundreds and hundreds of other facts in its narrative portions. Among the most interesting, that the crippled, mixed-breed Cherokee genius named Sequoyah (George Guess) was himself an illiterate silversmith. Sequoyah spent more than a dozen years producing for his people the first written Indian syllabary of 86 characters. As a term of the removal treaty, the Cherokees were given a printing press and type.

Did you know that many Indians of the Five Civilized Tribes came to Indian Territory by river steamers on the Arkansas and Red Rivers? When the Choctaw removals began, many of the Indians assembled at Vicksburg, Mississippi, to make the trip all the way to the river landings in the Choctaw Nation, if the waters were high enough on the Arkansas. If the water was low, as it was most of the time, the immigrants came as far as Little Rock, then traveled overland. On the Red River, they came as far as Camden, Arkansas, then by overland trail to Fort Towsen.

The first steamboat on the Arkansas was the Comet which served the lower river towns and Fort Smith on a regular route beginning in 1822. In 1828, the Facility, a boat of lighter draft, arrived at Fort Gibson landing on Grand River with two keelboats in tow carrying 300 Immigrating Creek Indians.

If you have wondered why Oklahoma has colorful and unique ethnic "pockets," the railroads probably deserve credit. The railroads, with fewer passengers and little freight in Indian Territory, sought to increase revenues with natural resource tonnages. The companies sent agents as far as Europe to recruit coal miners to man the mines in the Choctaw Nation. The Choctaws were not interested in going into the pits, so the railroad agents scoured Europe, recruiting miners from almost every country.

In the Chickasaw Nation, certain streams and springs glazed with green slicks of oil were treasured for their therapeutic qualities in treating rheumatism and other maladies.

Another tidbit that may be new to you is that settlement was not accomplished entirely by land runs. In fact, the runs became so disorderly that lands were later divvied out by lottery.

The first water laws were set out in 1905 by the Eighth Legislative Assembly of Oklahoma Territory, among them, procedures for acquiring water rights. Did you know the oldest right for the use of stream water (and today a valid right) was issued to a farm family near Boise City? Their claim to water use beginning in 1899 entitled them to a prior right to 52 acre-feet a year from Marcelus Canyon Creek for the irrigation of 26 acres of land. The oldest ground water permit is held by the City of Norman, claiming a prior right to 12 acre-feet of water a year for municipal use from the Garber-Wellington Formation dating back to 1894.

Accounts of the Dust Bowl are numerous, but did you know that the voracious "dusters" swept an estimated 300 million tons of soil from the Great Plains in a single day in 1934?

Oklahoma also has a "first" — the first upstream flood control project in the nation, completed in 1953 on Sandstone Creek. Under the leadership of L.L. Males, longtime OWRB member and Cheyenne banker, some 4.9 million acres in the Washita River watershed are protected as a result of the project.

If you have an eye for graphics, there are 81 maps in the Water Atlas, 51 of them full-page lake maps that hold special appeal for fishermen and recreationists. More than a dozen old photos gleaned from the Oklahoma Historical Society illustrate the state's water history section, and five graphs summarize various data. There are discussions of water quality, a section on Oklahoma's ground water resources, a summary of university-sponsored water research and a glossary. There are dozens and dozens of tables to tell you everything you've wanted to know about water but were afraid to ask.

It will all be there — facts and figures galore — when Oklahoma's Water Atlas comes off the press in October. The publication will be available without charge by writing the Oklahoma Water Resources Board, P.O. Box 53588, Oklahoma City, 73152, or by calling (405) 271-2555.
FP is the ability of the community to finance the project with loans, grants or assistance from other sources. Can the community raise the water/sewer rates to repay such a loan? If the community would raise rates by $10, it earns 15 points; unwillingness to raise rates less than 75 cents earns 0 points.

Due to the nature of the various parameters in the formula and current financial uncertainties, the Board anticipates reviewing and updating the ranking parameters periodically.

**Board Sponsors Dam Safety Workshop**

Participants in the OWRB Third Annual Dam Safety Evaluation Workshop on October 16 will have an opportunity to see slides of the site where the world’s largest dam will be built at Three Gorges on China’s Yangtze River. Those slides will be part of the presentation by Jim Cook, director of Operation and Maintenance of the Bureau of Reclamation, Washington, D.C.

Other speakers will include Bruce Tschann of the University of Tennessee who directs FEMA’s Dam Safety Office; Dr. Amos Eddy of the Oklahoma Climatological Survey; Tom Lester, Tulsa Civil Defense Director; and representatives of Holland Research Labs who have completed a computerized flood alert system for the City of Tulsa.

The workshop will be held at the Tom Steed Center of Rose State College, Midwest City, from 8:30 a.m. to 4 p.m. Registration, which includes lunch, is $25 and may be accomplished by returning this form by October 1, 1984.

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**Stream Water Division Sets Hearings**

Stream water rights in Stream System 1-8-1 are now under review, and hearings are scheduled October 10 and 11 at OWRB offices. Stream System 1-8-1 is the Washita River from the Red River to USGS stream gage 07328500 west of Pauls Valley.

Stream water rights hearings in Stream System 2-17 (the Illinois River from the Arkansas line to Webbers Falls, Oklahoma) will be held September 13 and 18.

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**ACTIVE CONSERVATION STORAGE IN SELECTED OKLAHOMA LAKES AND RESERVOIRS AS OF AUGUST 29, 1984**

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**STATE TOTALS**

10,745,352 87.3%

1. In initial filling stage
2. Temporarily lowered for maintenance
3. Conservation storage for Lake Optima not included in state total

Data courtesy of U.S. Army Corps of Engineers, Bureau of Reclamation, Oklahoma City Water Resources Department, and City of Tulsa Water Superintendent’s Office.

Allocation and actual usage are compared to determine whether the water has been put to beneficial use as required by Oklahoma law. If a water right holder has failed to use the full allocation at least once in a continuous 7-year period or in accordance with a schedule of use approved by the Board, the amount of water authorized must be reduced or the permit cancelled.
Is it a Drought or a Dry Spell?

Is Oklahoma now in a drought or just a dry spell? According to the National Weather Service, which looks to the Glossary of Meteorology as its "bible," "drought is a period of abnormally dry weather sufficiently prolonged for the lack of water to cause a serious hydrological imbalance (i.e. crop damage, water supply shortages, etc.) in the affected area. Drought severity depends upon the degree of moisture deficiency; the duration and, to a lesser extent, the size of the affected area. In general, the term should be reserved for periods of moisture deficiency that are relatively extensive in both space and time."

The Glossary defines dry spell as "loosely, a period of abnormally dry weather. The term should be reserved for a less extensive, and therefore less severe, condition than a drought. In the U.S., the term has been applied to a period lasting not less than two weeks, during which no measurable precipitation is recorded."

Meteorologists tell us that in the last 80 years Oklahoma has endured nine episodes of five to 10-year duration in which rainfall was significantly below normal.

Tar Creek Cleanup Ahead of Schedule

Cleanup activities planned in the Tar Creek area will get underway in mid-September, says Ron Jarman, co-chairman of Governor Nigh's Tar Creek Task Force.

According to Jarman, Hilyard Drilling Company, El Dorado, Arkansas, and McDaniels Drilling Company, Chickasha, have been selected to complete the sealing and plugging of abandoned water wells, bore and test holes. The IT Corporation, an engineering firm from Baton Rouge, Louisiana, has been selected to supervise the plugging and sealing operations. The Task Force is seeking an engineering firm to design and oversee the installation of structures to divert surface flows away from shafts, boreholes, and subidences that offer access to the mines.

Gopal to Present Research Paper to NWWA

The OWRB Water Quality Division received a national level compliment through the work of Senior Water Resources Engineer Jim Gopal.

Gopal was selected from a list of hundreds for presentation of a paper to the National Water Well Association meeting to be held in Orlando, Florida, October 29-31.

Gopal’s paper pertains to an innovative use of SYMAP, a computer-generated map which uses coded densities of type characters to define areas of pollution concentrations and trace their movement within an aquifer. Gopal says SYMAP is invaluable in tracing pollution back to its source, as well as graphically indicating the speed and direction of its spread.

Watching Meters for Leaks Saves Water

With water utility rates increasing steadily and hot weather exerting pressure on Oklahoma’s water supplies, water conservation makes good sense. Water leaks are big wasters and can be discovered easily by checking your meter.

The simplest way to check for a household plumbing leak is to record the number indicated by the meter before leaving on a 2-day trip. If the pointer is between two numbers, record the lower number. Read the meter again upon your return, then compare them. If they are not identical, you may have a leak — a dripping faucet, a running toilet or a leaky pipe fitting.

Even a small leak can waste a lot of water!

OKLAHOMA WATER NEWS

Oklahoma Water Resources Board
1000 N.E. Tenth, P.O. Box 53585
Oklahoma City, Okla. 73152
Board and City of Alva Unite in Protecting Cimarron Terrace

The short-term gain or possible long-term pain is the issue before the Oklahoma Corporation Commission in a case involving the City of Alva versus the Oklahoma City-based Magic Circle Energy Corporation. The Oklahoma Water Resources Board is involved as a champion of the community of 6,400 in its cause for clean water only because of its statutory responsibility to manage and protect all the waters of the state. Alva's interest lies close-to-home — in protecting the area nearest the wells that furnish the town's water supply. The Board is dedicated to protecting the water quality for Alva, the entire Cimarron Terrace Basin, the second largest in the state, and the integrity of all other aquifers in Oklahoma.

The City seeks a special field order from the OCC which would require any companies drilling in the area to use a closed system for the handling of their drilling muds and fluids. In the area the OCC order would protect, deleterious liquids discharged on the ground include chlorides, common waste products of the drilling process. In March, a leak from a pit occurred in an area adjacent to the City of Alva's water well field. Concerned citizens petitioned the city to prevent possible pollution of the city's only water supply. Because the aquifer lies only 60 feet from the surface and is composed of stream-laid deposits of permeable sedimentary material, the Cimarron Terrace is extremely vulnerable to pollution. It is more sensitive to pollution from surface sources than deeper aquifers confined by harder, less permeable materials.

The closed system the city favors employs a series of above-ground tanks from which the mud mixture is pumped down the drill pipe, out the drill bit, then up through the well. A suction device draws the used mud into another tank series where the suspended solids are separated from the liquids, which are remixed, or if their useful life is done, are trucked off to an OCC-permitted disposal site.

Continued on page 2

Oklahoma Sun and Wind Studied as Alternate Energy Sources

If there are two things you can bank on in Oklahoma, they are that the wind will blow and the sun will shine. It's precisely these factors that prompted the Board and the Bureau of Reclamation to cooperate in a study of the economics of pumping water with solar and wind energy.

The OWRB requested assistance from the Bureau under a program providing "technical assistance to the states," says Dan Rubenthaler, Bureau planning study manager and regional research coordinator, who supervised the projects.

The solar model, a small sun-powered water pumping system, was located near Cleo Springs, where the City of Enid was drilling new water supply wells in the Cimarron Terrace ground water basin. That application of the technology was chosen because north central Oklahoma offers the extended periods of cloudless weather necessary for solar power generation. Additionally, it was a prime test site because the installation of power lines to a well so remote would have proven costly.

Included in the proposed strategy was an array of photovoltaic cells calculated to produce enough energy to run a 3.5-horsepower permanent magnet, DC motor.

Continued on page 2
The fact that drilling fluids can seep through soil, sands and gravels to contaminate ground water was supplied at the hearing by John Roles, OWRB senior ground water geologist. Roles was one of three water board staff members who participated in the hearing.

A recent report by the U.S. Geological Survey confirms that oil and gas drilling activities can contaminate water supplies, said Roles. He pointed out that the USGS study linked oil and gas activities in central Oklahoma underlain by the Vamoosa-Ada aquifer and the salt water contamination of the well water at Sasekwa.

Fred Heitman, OWRB environmental specialist supervisor, stated that the rubber, plastic or bentonite liners of oil field reserve pits can rupture or deteriorate with time. Once through the lining of the pit, the deleterious substances can seep into the aquifer.

Explaining the Board’s legal position at the hearing was OWRB Attorney Marion Jowaisans.

As well as preventing pollution of the ground water, the closed system has the further advantage of economy, affirmed Robert D. McDowell, vice-president of Alexander Energy Corporation of Oklahoma City.

McDowell said his company’s operations lie in areas where a closed system is required by local ordinance.

“We’ve been able to save on mud costs, land usage, hauling fluids and the building and filling of reserve pits,” he asserted. “The closed system requires a smaller amount of fluid, thereby minimizing the possibility of pollution due to overflow.”

Other positives were expressed by Robert Brown, mud engineer and president of Monument Drilling Fluids, Inc., who said that the closed system uses one-fifth the water, expedites drilling and requires significantly less chemicals to manipulate the specific gravity of the drilling fluids. Brown said there are only about 20 rigs in Oklahoma currently using the systems, although they are the rule rather than the exception in many other states. Resistance to new technology, even a cost-effective system like these which have been in use since the 1960s, is the reason he offers for the industry’s reluctance in accepting the systems for wider use in Oklahoma.

According to John Auten, Brown’s employer and vice-president of Retliff Drilling and Exploration Company, the company soon will adopt the closed system for all its drilling activities. The company has monitored the economics of operating open pits versus closed systems and found cost savings up to 25 percent. “That edge on the competitors who haven’t yet begun to use the system is valuable. I believe the economics of the system, combined with its lower pollution potential, eventually will force acceptance,” he said.

The closed system is applicable to almost all normal drilling activities, ruled out only in situations involving wells drilled beyond 13,000 feet or wells with circulation problems, he concluded.

If the citizens of Alva and the Board are successful in obtaining a protective field order, the fresh waters of the Cimarron Terrace in that area will be protected against pollution from oil and gas activities. Roles and Heitman are quick to point out, however, that the Corporation Commission’s ruling would apply only to the 12-section area specified. Other communities which rely on water supplies from vulnerable aquifers will be next up to bat, they agreed.

A favorable ruling for Alva would give legal precedent to other communities facing similar situations, said Jowaisans.

According to Rubenthaler’s model, the motor would drive a vertical turbine pump to raise about 100 gallons of water a minute from the Cimarron Terrace. A sun-tracking device would keep the cells oriented to the sun to maximize its output. The simplicity of the system almost eliminates maintenance, and weather damage to the fragile photovoltaic cells was prevented by an automatic device to turn the cells away from wind and precipitation as soon as the light level drops below a useful level.

The Bureau-backed study proved the system is workable although its cost of 30 cents per 1000 gallons (excluding operation, maintenance and replacement costs over a 20-year lifespan) appear to make it infeasible on such a small project. Rubenthaler predicts that the cost of the cells will decrease with mass production, and that as technology improves their energy-output efficiency, the cells may prove a practical alternative for large-scale projects. Such a project, he points out, is being examined during a 12-month test to pump irrigation water at Alamosa, Colorado.

Another project of promise under scrutiny by the Bureau and the Board proved windpower to be more practical in Oklahoma, at least for the time being. Long-term monitoring by the Bureau showed Gage ideally suited for the generation of windpower, with winds higher than 8.5 miles per hour 69.3 percent of the time. A PROBE — Portable Remote Observations of the Environment — device installed by the Bureau collected information on wind speed, direction and constancy, as well as precipitation, barometric pressure and temperature. It confirmed what the natives had known all along — that the windpower is
greatest in the spring and lowest in the summer and fall months. A particular characteristic at Gage that enhanced the value of wind for power generation was that the strongest winds occur between 9 a.m. and 6 p.m. — the time of day when power demand is greatest. Researchers recommended that power from the wind turbine be used to replace power from expensive peaking and intermediate-load plants.

The Gage turbine produces more power than the research facility it electifies can use, so excess power is sold to the local utility company. Rubenthaler says the Gage unit, a 25-kilowatt turbine, can produce about 46,660 kilowatts of electricity annually. The total number of hours appropriate for generation during the test year was 5,403.

Following completion of the studies at Gage, the Bureau of Reclamation will continue studying the feasibility of pumping water with windpower at Beaver and Altus, where turbines will be installed.

Dry Weather Prompts Requests for Releases

Low rainfall in the weeks before late September rains prompted water users downstream from three reservoirs operated by the Corps of Engineers to ask the Board to intervene on their behalf in requesting unscheduled releases of water.

The City of Wright City asked for a release of water from Pine Creek Reservoir to flush the municipal water supply area and improve the quality of water served to city residents.

Water users below Waurika Reservoir on Beaver Creek requested a special release to supply domestic water to families downstream and for stock watering.

In the Lake Texoma area, farmers requested an unscheduled release of water from the reservoir to soften peanut fields for harvest.

J.A. Wood, OWRB Stream Water Division chief, said the Board requested the releases from water quality storage available in Pine Creek Reservoir and from inflows to Waurika and Texoma Reservoirs.

Bureau Names New State Representative

W. Brooks Gallman has recently been appointed representative for the Bureau of Reclamation for the State of Oklahoma.

Gallman will be responsible for coordination of Bureau of Reclamation policies, objectives and programs for water and related resources investigations in the state.

He has been in Bureau service 23 years, most recently serving as a planning study manager at the regional office in Amarillo, Texas.

The Oklahoma offices of the Bureau of Reclamation are located in the Alfred P. Murrah Federal Building, 200 N.W. 5th Street, Suite 922A, Oklahoma City, 73102, and can be reached by phone at (405) 231-4515.
water-bearing strata into areas where it could be recovered by pump intakes.

Total costs to recover the water amounted to about $50 an acre-foot, but modification of techniques and equipment in the future could lower costs to affordable levels for irrigators.

Air injection has raised the water level about nine feet in the test areas, a level which has held through two irrigation seasons.

ICWP, Corps Sponsor Financing Seminar

State water administrators will get a new look at water project planning and financing at a 2-day seminar to be held in Dallas/Fort Worth November 29-30. The workshop is jointly sponsored by the U.S. Army Corps of Engineers and the Interstate Conference on Water Problems.

According to sponsors, speakers will include Wall Street financiers, bond and tax counsel, academicians and regional water resource planners. Hands-on work sessions will let participants examine creative financing plans; figure benefits, revenues and debt capacities for particular projects; and compare project costs from both financial and economic points of view. Oklahoma’s program probably will be used as one of the case studies discussed on the second day of the workshop.

This Great Plains regional workshop is one of four regional programs geared to area needs and administrative structures. (Others are East Coast, Midwest and West Coast.) Registration costs $45, and lodging at the AMFAC Hotel in Dallas/Fort Worth is $59 per night. Hotel reservations and workshop registrations must be submitted by November 15. Agendas and registration forms are available by calling OWRB offices, (405) 271-2551.

Drillers’ Licensing Now Offered at Lawton

Dave Dillon, Lawton branch manager, announced recently that the Lawton office of the Oklahoma Water Resources Board now can administer tests for the licensing of water well drillers. All persons engaged in the commercial drilling or reconditioning of water wells, drilling test wells or plugging and sealing old wells are required to hold a valid license.

Dillon pointed out that the services offered in Lawton make it possible for water well drillers of southwestern Oklahoma to be licensed in Lawton instead of making a trip to Oklahoma City. In addition to a completed application and successful test, the Board requires licensees to have completed two years of supervised well drilling experience, provide a list of rigs used, pay an application fee and file a $5,000 surety or cash bond. Dillon said prospective drillers may schedule the written exam, for which a $25 fee is charged, by calling the Lawton Branch Office at (405) 248-7762.

Ceremonies late last month dedicated new water treatment facilities at the southeast Oklahoma town of Dustin. The automated 100-gpm system on the right which will serve the town of 500 was made possible by a $100,000 grant from the OWRB financial assistance program.
Board Recruits Top Speakers for Dec. 12 Water Conference

The Fifth Annual Governor’s Water Conference December 12 will bring to Oklahoma City’s Hilton Inn West a dozen or more top-flight water speakers, importing at least that many alternatives in affording water development and improvements.

Reflecting the state’s greater responsibility in financing water programs, the Conference has as its theme “Paying for Water — It’s Up to Us.” Keynoting the morning session will be Joan M. Kovalic, executive director and general counsel for the Interstate Conference on Water Problems and secretary of the National Water Alliance, who will brief Oklahomans on water issues from a Washington, D.C., vantage point.

Kovalic, a practicing attorney specializing in environmental affairs, formerly was deputy director of EPA’s Office of Water Program Operations. During that time, she directed the multi-billion-dollar construction grants program and developed water legislation including the Clean Water Act Amendments of 1981.

Co-featured with Kovalic in the keynote segment is James R. Nelson, PhD, professor of agricultural economics at Oklahoma State University, who will describe Oklahoma’s water situation. Nelson has authored more than 100 papers on the development of land and water resources and the economics of rural community services.

Also speaking on the morning agenda will be U.S. Sen. Don Nickles and U.S. Rep. Wes Watkins, who will provide further insight to national water affairs.

Oklahoma Attorney General Mike Turpen and OWRB General Counsel Tom Lay will recap for conferences several interesting and often troublesome interstate water issues.

Gerald E. Borelli, OWRB chairman, will introduce the luncheon speakers, Governor George Nigh and Acting Commissioner of Reclamation Robert A. Olson. Before being named Acting Commissioner, Olson had served as Assistant Commissioner of Planning and Operations. He directed the power activities in the southwest for the Western Area Power Administration, including the marketing of power from Hoover, Davis, Parker and Glen Canyon Dams.

The first afternoon panel discussion, moderated by Oklahoma League of Women Voters President JoAnn Puckett, is entitled “Planning and Paying for Water.” Cecil Wildman, PE, longtime state engineer with the Farmers Home Administration presently associated with Settle and Spear Engineers, Inc., will discuss the use of hydraulic analyses in planning and expanding municipal and rural water systems. Then, James R. Barnett, OWRB executive director, will tell conferences how the state’s loan and grant program can assist communities in financing water development and sewer and water improvements.

Claudia Peck, PhD, OSU assistant professor of home economics, will address water utility costs in a speech entitled “Realism in Rate Setting.” Rural water costs will be discussed by Marie Dunn, CPA, board member of the Oklahoma Rural Water Association.

A second afternoon panel, “Water to Grow On — Water for Commerce and Industry,” will include a discussion of the costs and benefits of conservation by Francis M. Epplin, PhD, OSU assistant professor of agricultural economics;
Governor's Water Conference, continued from page 1
then remarks on conservation practices and their impact on water quality by John Hassell, director of water quality programs for the Oklahoma Conservation Commission. On the same panel, Port Director Robert W. Portiss of the Port of Catoosa will describe Oklahoma's waterway as "the giant awakening." Following Portiss on the panel will be a discussion entitled "How Much Regulation for Industry's Water."

Following the panels, conferees will adjourn to the Hilton Inn West's Gazebo for a "Cracker Barrel Session," at which time they will have opportunities to ask questions of the panelists in the informal atmosphere "around the cracker barrel."

Registration for the Fifth Annual Governor's Water Conference is open to all interested persons and costs $15 in advance or $20 on Conference Day, December 12. Further information is available by calling Mary Whittlow, OWRB conference coordinator, at (405) 271-2581.

REGISTRATION
Please clip and mail to:

Governor's Water Conference,
Oklahoma Water Resources Board
Post Office Box 53585, Oklahoma City, Okla. 73152

Name ____________________________
Address __________________________
City __________ State_________ Zip______

I have enclosed my check for $____

☐ I will attend the December 11 Early Bird Reception
Conference registration costs $15 if paid in advance.
$20 on the day of the Conference. Please make check or money order payable to the Governor's Water Conference.

Legal Description Important Part of Filing Water Right at OWRB
SE1/4 SE1/4 SW1/4 SE1/4 Sec. 4 T3N R3E is not macaroni dredged from a bowl of alphabet soup, but rather, to the trained eye of the Oklahoma Water Resources Board, a description of rural land almost as precise as a street address in town.

Such legal descriptions are used in pinpointing on a plat included with any application for ground water or stream water use, the location of a well or diversion structure. Oklahoma has the original federal surveyors of Indian Territory in 1870 to thank for a system of identification so precise. General Land Office surveyors who originated the U.S. Land Survey System established as beginning reference, a point eight miles west of Davis and one mile south of Fort Arbuckle. They surveyed from this point a center north-south line which they named the Principal or Indian Meridian.

Next, they established a line perpendicular to that meridian and called it the Base Line. Lines surveyed parallel to the Base and Meridian were identified as Congressional Townships containing 36 square miles or 36 sections. Townships were numbered north or south of the Base Line, such as T1N or T1S, then the parcels of land were assigned numbers locating them east or west of the Principal or Indian Meridian, such as R1E or R2E. Surveyors numbered sections within each township. A system of quartering sections, then sub-quartering those parcels allows accurate location of a plot as small as an acre-and-a-quarter.

The Panhandle, added as a "no man's land" at the time of statehood, has its own unique system. It extends north and south from a Base Line which lies nearly parallel to, and as much as 300 feet north of the southern border, causing Township One South to be only a narrow strip of land along the north side of Sections One through Six of each range. The Panhandle's system extends east from the Cimarron Meridian, the western border of the Panhandle.

The map on the right, reproduced from the Board's newest publication, Oklahoma's Water Atlas, shows at a glance the system of meridians and base lines first laid out by federal surveyors with the General Land Office in 1870. In center, the square representing a section of land illustrates the method of determining a legal description of parcels of land in the section. Left, a marker stands in Logan County, a silent sentry on the Indian (or Principal) Meridian, a north-south line established in the survey of Indian Territory.
High Plains Farmer Recommends Conservation Tillage for Savings

“You just can’t wake up one morning and decide you’re going to do all conservation tillage. It takes a lot of nerve to sit there and know that the field has to be planted and that you haven’t done anything to it,” states Royce McFadden who practices conservation tillage on his land near Olton, Texas. “It’s just a way of life to get out there and plow it, walk it, and cultivate it to the point of planting. And it’s real hard to just let it lay there.”

But, no-till technology, as McFadden has discovered, offers agricultural producers one of the best ways to maintain income and yields while cutting production costs. “Last year we grew a corn crop on less than $50 per acre. We monitored the water fairly close and pumped approximately 16 inches through our sprinkler. I’m proud of that.” By comparison, McFadden says regularly tilled corn in his area requires 28 to 36 inches of water either through rainfall or irrigation.

According to McFadden, conservation tillage saves 55 to 100 percent of the water, or between $25 to $45 per acre in water costs.

“If I could, I’d do all my farming this way. We started three or four years ago following wheat. Then we tried it with some soybeans and then some maize. We began to wonder how it would work on other things. We also began to see the advantages of leaving the residue on top of the ground.”

McFadden questions himself, “Why did we do it? Water was the number one reason. We’ve just got to save water or we’re not going to have any, plus we can’t afford to pump it. I guess the main reason I started looking at conservation tillage was that I had too many overhead expenses. The writing was on the wall. I was going to have to quit irrigating as much. Also, when you change over to conservation tillage you cut out a lot of labor. You can do a better job of planning your work, as well. You don’t have interruptions like having to go out and run a sand fighter. We don’t have any trouble with sand at all.”

The other differences McFadden sees in conservation tillage are “When you get ready to harvest, you learn to take care of how you leave the residue. In other words, if we’re cutting wheat, we’d like to cut it as high as possible. The number one goal is to try to get all the grain when we harvest the crop, yet leave the wheat stubble as tall as possible.”

McFadden, like all farmers, is concerned about weeds. “I’ve found out that any time I’ve stirred up the soil, I bring up a whole new generation of weeds. That’s why my commitment is more to no-till. It just takes a little more management to control your weeds. But, if you’re particular enough and hit it right, you can have a weed-free field. They’re not an economic loss, they just hurt your pride. I’ve had clean fields under regular tillage and weedy fields under regular tillage. It’s going to be the same thing under minimum tillage.”

McFadden also sees that his soil retains moisture better as a result of his conservation tillage farming. “I really haven’t had a big rain in the past two years, but I just know that water is captured a lot better. Also, to me whenever you make a furrow, you are exposing the maximum amount of soil possible to the sun. Plus, if you’ve got residue laying on flat ground, it’s pretty well protected from the wind.

Continued on page 4
High Plains farmer, continued from page 3

"The only drawback I see to conservation tillage is that it's hard to keep my government allotments together and get my rotations going like I want to. The number of acres that you have to set aside is the problem. If you had everything exactly one-third wheat, a third corn and a third cotton, and had all that proportioned with your set-aside, then you could move that all around any way you wanted. But they change the programs and then you don't have enough wheat stubble to put corn back into."

A common complaint McFadden hears from other farmers is, "How do you get a planter through all that trash?" His answer is simple, "To my knowledge, we've never had to stop because of a plug-up of straw. The no-tillage or minimum tillage tools are just built to handle it."

"The biggest drawback is that I spent $25 to $30 per acre on chemicals when I could have done it on $6 per acre using Atrazine. But, then I couldn't have my rotation the way I wanted it. I can plant onions, carrots, or any kind of seed and it will grow. There's no chemicals here that will hurt as far as planting anything else. The newer chemicals are just more selective. They don't work on as broad a spectrum of weeds or crops, but some of them let you do anything with your rotation program."

"I think wheat is a good way to get started on minimum tillage. I think you can come out of wheat into milo or into cotton or corn real well. We have followed maize with corn, and corn with corn, and all with good success."

McFadden sums it all saying, "I started farming in 1958. I guess times were rough then, but I didn't know it. Then starting in about 1979, it didn't keep clicking. I always used to look at minimum tillage and say it wouldn't ever work. But, water's the number one thing along with pumping costs. We've just got to save water. I can do that with my minimum tillage, so I've changed my mind."

Larry Hill, another area conservation farmer echoes McFadden's concerns, "We were shooting at cutting down the cost of pumping water as well as saving water. We changed to conservation tillage for one thing, it's cheaper. We still produce just about the same, certainly no less with our minimum tillage."

Hill feels, "It's cut my water use. I have low pressure, drop sprinklers and I think it has cut my water use almost in half." Hill doesn't really see any disadvantages to conservation tillage. "It cuts down on your labor, and when you've got other things to do, it makes it a lot easier. You don't have to go out there and hit the ground but maybe once or twice a year and that's all. It cost me from $5 to $6 per acre just to run a tractor across the field pulling anything. The more I can keep from running that tractor, the better I like it. It just costs too much."

Granted, there are advantages and disadvantages to conservation tillage and it won't work on every field, but conservation tillage is worth looking into.

This article is reprinted in part with the permission of The Cross Section, the newsletter of the High Plains Underground Water Conservation District #1, Lubbock, Texas.

Board Opens McAlester Branch Office

A new McAlester branch of the OWRB is open for business to better serve the needs of southeastern Oklahomans, says James R. Barnett, executive director.

The new office is located in the First National Bank Center, 235 E. Choctaw, Room 126, McAlester, 74501 and can be called at (918) 426-5435.

James Adams, former assistant division chief of the OWRB Water Quality division has been appointed office manager, with Hydrologist Tim Smith helping with the field work. Donetta Blanlott of Haileyville has accepted the position of McAlester branch office secretary.
New OSU Research Station Seeks Cash Crop for Southeast

A problem as old as the family farm is how to select a crop that is suitable to the soil, tolerant of the caprices of Oklahoma weather, and popular in the marketplace at a price that allows a respectable profit. The problem is further knotted by the necessity of having not a single crop, but a succession of such crops to keep the farm families and laborers busy through most of the year.

These are precisely the tasks before OSU's Horticulture and Agricultural Economics researchers and USDA staff, according to Dr. Ron Johnson, associate director of Agricultural Research at OSU. OSU personnel along with USDA researchers, seek suitable crops and sources of irrigation water to turn southeastern Oklahoma into the green grocer for Oklahoma City, Tulsa and Dallas and provide produce to farmers markets, area supermarkets and food processors within trucking distance.

According to Johnson, the 273-acre complex in Atoka county will site research plots and buildings to house up to 18 staff members. As crews erect the structures, horticulturists prepare the soil for plantings next February or March.

Why southeastern Oklahoma? An economy in need of stimulation, combined with the sandy, loamy soil type well suited to the irrigation techniques necessary for high quality fruits and vegetables were prime factors in choosing the site, said Johnson. An abundance of available labor and ready access to truck routes leading to major markets also figured in the selection.

Crops that will be tested include early spring and late fall green vegetables such as cauliflower, green beans and broccoli; and traditional hot weather tomatoes, okra and sweet corn. Johnson said small fruits such as strawberries, raspberries and blueberries are also under scrutiny, and although the berries require large investments before a first harvest, the long term can be extremely profitable.

Peaches, successful throughout Oklahoma, are also considered as a profitable crop for the southeastern counties.

"Ideally, income-producing crops would be under some aspect of cultivation the year around to give farm workers the consistent income required to keep them in place for times of peak labor," Johnson pointed out. Planners see full-time employment as attracting workers to the area as well as stemming the out-migration.

Still ahead for the developers of the project is locating reliable sources of irrigation water. The southern band of counties could be watered by wells in the Antlers Sandstone, but floodwater retention structures such as those developed by the Soil Conservation Service may be explored as water sources elsewhere in the region. If the area does indeed bloom and prosper under the green thumbs of OSU and USDA researchers and local farmers, Continued on page 2

Males’ Water Board Colleagues Honor His Retirement Dec. 11

The Board room murmured with the usual hum of nine men attending to the state’s water business. Little set the day apart from some three hundred other second-Tuesday-of-the-month meetings of the Oklahoma Water Resources Board. Over the 27 years since the Board’s founding, a mottled army of water problems had marched before it, but only one man of the nine had witnessed the entire procession.

That man, L.L. “Red” Males ofCheyenne, who had watched Oklahoma’s water history woven here. Outside this room, Continued on page 2

Board Chairman Gerald E. Borelli, center, holds the Resolution of Appreciation presented to L.L. “Red” Males on his retirement. Looking on are Males’ fellow board members, from left, Bill Secrest, Ralph G. McPherson, Earl Walker, Gary W. Smith, Ernest R. Tucker and Robert S. Kerr, Jr.
Males' Retirement, continued from page 1

he had rolled up his sleeves and challenged western Oklahoma's dragons of drought and flood.

This day was different. An era would end here in the hush of this room as Red Males, the only member of the original Board, would close out a term distinguished with almost every award in the field of soil and water conservation. It would mark a career honored by five Oklahoma governors, a run of presidents and leaders from all over the world.

The career of the ruddy-cheeked, sandy-haired dragon-fighter began some fifty years ago as he watched the wind lash his western Oklahoma country. As he watched the droughts suck away the water, then the floods devour the topsoil, he resolved to throw his energy into saving the land. As a banker, he made good sense to him to muster the resources of the bank behind preserving the livelihood of western Oklahoma's farmers. The bank bought terracing equipment and encouraged farmers to terrace their land.

Males recalls, "the worst floods in our history came in the Dust Bowl years, followed by more dusters because almost all the rain that fell ran off."

L.L. "Red" Males

The vengeful dragon of flood marched over the land with a record-setting 11-inch rain in April of 1934, drowning 17 people near Hammon and laying a pall of brown water over homes, livestock, bridges, roads and crops. So it was, some nine times a year from the twenties through the mid-forties, when Sandstone Creek—normally a sluggish, meandering stream—dashed their crops and drowned their dreams in a riot of floodwaters.

Males was convinced that retention of rainfall and runoff in the upper watersheds was the most feasible manner in which to protect downstream. When Congress passed the Flood Control Act of 1944, the Washita River was one of 11 selected for watershed improvement. Males and other members of the Upper Washita Soil Conservation District set out to sell the program to their neighbors and obtain easements from landowners for the construction and maintenance of the 24 dams and reservoirs which soon would speckle the watershed.

Bulldozers of the Soil Conservation Service roared over the land and the tractors of local farmers hummed as they applied the land treatment measures. By 1953, the dragon was in abeyance. The Sandstone Creek Project was finished, the first of its kind in the world. The community was so proud of it they put up a sign at the edge of town proclaiming the fact.

Males' leadership in the Sandstone Creek Project was only one effort in a life devoted to conservation; a single example of hundreds which would make his neighbors, fellow conservationists and colleagues in the banking industry proud to know him. Appreciation for the durable dragon-fighter spilled over last July 7, declared "Red Males Day" by the governor and celebrated by hundreds who came to Cheyenne to pay tribute. Cheyenne and Roger Mills County turned out, more came from the state capital, still more from all corners of Oklahoma.

His friends rejoiced with him in every way they knew—from the reception at the bank and a Main-Street parade until the last guitar note sighed over a darkened street dance. And still the day wasn't long enough to say all the thanks they wanted to.

But other days would come, and still his colleagues would seek special ways to celebrate a life of stewardship of soil and water resources. On December 11, the day was set apart from more than three hundred other such meeting days. Men long retired from the Board came back to wish him well. Gerald Borelli, chairman of the Oklahoma Water Resources Board, presented Males a Resolution of Appreciation on behalf of his Board colleagues and staff.

Among other tributes, the Resolution read, "whereas, Oklahoma's citizens and the Board's members have come to know and respect Red Males as a champion of truth, a tireless advocate of fairness and a man of perception, wit and warmth. Now, therefore, let it be resolved that his fellow members of the Oklahoma Water Resources Board, past and present, do hereby respectfully and sincerely commend L.L. "Red" Males for the invaluable service he has rendered to the People of the State of Oklahoma in protecting, conserving and developing the natural resources of this State."

Indeed, an era ended in that room on December 11 as they bade the senior member farewell.

But you never really say goodbye to a dragon-fighter. When they retire, they don't. And back home in Cheyenne, things won't change much. Males will go to Security State Bank every day, and he will walk over those hills he loves, and he will continue to keep the dragons at bay.

New OSU Research Station, continued from page 1

their success may attract the attention of federal backers for a reservoir to supply irrigation water.

Still another part of the long-range plan is that of educating the farmers in the use of new technology in the cultivation of new crops. According to Johnson, this task will be undertaken by county, area and state specialists who will work with individual farmers on their small spreads, as well as with groups of farmers in solving
common problems related to the crop shift.

"Any change of crop will cost money, and educating area bankers in the risks and benefits of backing the farmers will be the assignment of extension agricultural economists," said Johnson.

Getting the crops ready to go to market and shipping them to presold customers is a job best handled by a cooperative marketing association, he acknowledged. "The Atoka Marketing Association sold a good crop of okra to the Dallas market last summer. Preselling a crop guarantees a good return on the investment of time, materials and labor," he pointed out, "and we have something of an edge in that some facilities already are in place to process the crops and prepare them for market.

Once this horticultural project is completed and selling a profit, OSU researchers will turn their attention to further developing the area's forestry resources, forage/livestock enterprises and row crops such as soybeans and peanuts.

The agricultural Economics Department at OSU will educate local farmers in selecting, growing and marketing a succession of horticultural crops which will produce profits the year around.

Development of the small fruit and vegetable research programs will be funded primarily by the state, which contributes some $3.50 to each federal dollar in the project. However, initial start-up funds for the buildings and research program were made possible largely through the efforts of Third District Congressman Wes Watkins. Johnson emphasized that authorization for the experiment station funding is the 97-year-old Hatch Act designed to do precisely what project boosters aim for—turning the green stuff in the garden to green stuff in the cash box.

Well Measurement Begins in January

Are the state's aquifers holding their own against the demands of irrigators and Oklahoma's cities and towns? The answer will be clearer after members of the OWRB Ground Water Division complete the annual statewide well measurement survey in late March.

The study, a cooperative effort with the United States Geological Survey, will measure 1,061 wells, beginning in the Panhandle counties early in January.

Dannie Spiser, senior ground water hydrologist who oversees the program, asks landowners to allow access to OWRB and USGS personnel, most of whom will arrive in white trucks distinguished by the blue OWRB insignia. "By January, cones of depression formed by heavy pumpage have had a chance to recover and water levels are near normal," Spiser pointed out.

### ACTIVE CONSERVATION STORAGE IN SELECTED OKLAHOMA LAKES AND RESERVOIRS AS OF NOVEMBER 29, 1984

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<tr>
<th>PLANNING REGION</th>
<th>LAKE/RESERVOIR</th>
<th>CONSERVATION STORAGE (AF)</th>
<th>PERCENT OF CAPACITY</th>
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<tr>
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<td></td>
<td>Broken Bow</td>
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**STATE TOTALS**

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<td>3.</td>
<td>Conservation storage for Lake Optima not included in state total</td>
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Data courtesy of U.S. Army Corps of Engineers, Bureau of Reclamation, Oklahoma City Water Resources Department, and City of Tulsa Water Superintendent's Office.
Loans "Just Around the Corner" in Financial Assistance Program

Towns and rural water districts awaiting the first of OWRB's low-interest loans may not have to wait much longer. Qualifying applicants could be approved for funding for water and sewer development projects as soon as March, 1985, reports OWRB Assistant Division Chief of Planning, Walid Maher. The overwhelming "Yes" vote by the people on State Question 581 last August cleared legal questions hampering this portion of OWRB's Financial Assistance Plan, but more red tape prevented immediate processing of loans.

Meantime, the grant portion of the OWRB Financial Assistance Plan has in the past year provided more than $4 million to 64 communities experiencing health-threatening water and sewer-related emergencies. The loan program—the other part of the Plan—will provide low-interest loans for water resource projects. These low-interest loans play a vital role in the overall plan envisioned by the state's legislature to maintain and develop new water resources. These loans, to be offered at very desirable rates, should encourage communities to plan ahead future water and sewer system needs, and construct those projects at affordable prices.

Right now, says Maher, his office has 60 loan applicants on file for a total of nearly $45 million. Rural water districts, municipalities, public works authorities, conservancy districts and utilities authorities have requested anywhere from $13,000 for minor repairs to water treatment plants, to $3.5 million for 12-mgd-capacity municipal treatment plants. Many projects can be classified as water system improvements, which include plans to improve, expand or replace distribution lines.

There's a bit more paperwork, though, before the Board makes the first loans. The state's Office of Public Affairs has selected a financial consulting firm to handle the issuance and sale of bonds. Now, the Board must commission an update of the state's "loan demand study." Then, bonds may be issued and sold to investors. According to Maher, the bond sale will probably amount to $50 million. Proceeds from this sale will then be loaned to approved applicants at the going interest rate. If bonds can be sold early in the year, interest rates could be near 10 percent, estimates Maher, and borrowers will get very near that rate for payback.

The loans are part of a creative financing innovation in water system development funding that's attracting a lot of attention, affirms James Barnett, OWRB. "This is a new way to finance loans to small, unrated borrowers that protects the investors who buy the bonds we issue, and the state, as issuer of the bonds. The approval of State Question 581 in August amended the state constitution to let the state use a large portion of the $25 million Water Development Fund as collateral for bonds issued. The investors are assured that their investment is secure, and it allows the Board, as issuer, to enter the marketplace and obtain a high credit rating. We can then take advantage of lower market interest rates than a small town, for example, might have access to. Because the borrowers are not specified at the time of the bond issue, the concept is called a "blind pool offering."

Levels of indebtedness and ability to pay back will be crucial criteria for approval of loans, said Maher, who added that planners and engineers will also go over preliminary engineers' reports for project construction and cost. In all cases, says Maher, Planning's staff will work closely with applicants, and will provide all the information they'll need to improve their chances to obtain loans.