

# The HYDRODYNAMICS Group

*studies in mass and energy transport in the earth*

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## JOHN D. BREDEHOEFT *PhD, NAE*

*Contaminant Transport  
Numerical Models of Groundwater Flow and Transport  
Water Resources Development  
Contaminant Clean-Up including Nuclear Waste Disposal*

### EDUCATION

1955 **BSE**            **GEOLOGICAL ENGINEERING**, Princeton University (Cum Laude)  
1957 **MS**            **GEOLOGY**, University of Illinois  
1962 **Ph.D.**        **GEOLOGY**, University of Illinois (minor in Civil Engineering—Soil Mechanics);  
Thesis: *The Hydrogeology of the Lower Humboldt River Basin, Nevada.*

### EXPERIENCE

In 1995 John Bredehoeft established the consulting firm—The HydroDynamics Group. He devoted the previous 32 years to public service at the U.S. Geological Survey (USGS). His expertise is in water resources, especially groundwater; he has worked on many aspects of water related problems. During his years at the USGS, he held both scientific research and high-level management positions. In 1994, Bredehoeft retired as a senior research geologist from the Water Resources Division of the USGS.

While at the USGS Bredehoeft testified before Congress on such diverse topics as: the USGS study of the Potomac Estuary, National Policy on the geologic disposal of nuclear wastes, water in the western United States, the use of numerical models in management decisions. He was a member of the National Academy of Sciences/National Research Council (NAS/NRC) Committee on the Waste Isolation Pilot Plant (WIPP), and a member of the NAS/NRC Panel that reviewed groundwater concerns for the Yucca Mountain Nuclear Repository.

Bredehoeft was George Pinder's Ph.D. advisor at the University of Illinois in 1967-68. Together they 1) developed and published the first widely utilized numerical groundwater flow model (for which they received the Horton Award of the American Geophysical Union), and 2) the first widely used contaminant transport model (for which they received the Meinzer Award of the Geological Society of America). During his career in research Bredehoeft worked on a variety of other topics: 1) analytical methods for the field determination of aquifer parameters, 2) geophysical experiments for both the prediction and control of earthquakes. He spent two years at Resources for the Future (RFF) where he engaged in analytical studies of the economics of groundwater management. He engaged in experiments utilizing water wells as strain meters at Parkfield, CA, and in studies of the hydrodynamics of deep sedimentary basins. In recent years he has also worked on studies of contaminant movement and nuclear waste disposal.

In the tradition of the USGS, Bredehoeft held positions in both research and high-level management. For five years in the 1970s, he managed the USGS National Water Research Program. In the early 1980s, he was the Regional Hydrologist, Western Region, where he supervised the Survey's water activities in the eight western states—Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, and Washington.

Bredehoeft taught one year as a visiting professor at the University of Illinois; and was a consulting professor at Stanford for 8 years, and at the University of California—Santa Cruz, and San Francisco State University for several years. He served on numerous national advisory committees for the National Research Council, the National Science Foundation, and the Department of Energy.

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He received numerous awards: member of the U.S. National Academy of Engineering; Editor of the scientific journal, **Ground Water** (1991-95); received both the Horton Medal of the American Geophysical Union (the highest award given to a hydrologist), the Penrose Medal of the Geological Society of America (the highest award given to a geologist), and made a life-member of the National Ground Water Association (their highest award).

## EXPERIENCE

1994	<b>Consultant/Principal</b> —The HYDRODYNAMICS Group, Sausalito, CA
1985-94	<b>Research Geologist</b> —U.S. Geological Survey (USGS), Menlo Park, CA (Supergrade)
1989-91	<b>Consulting Professor</b> —Applied Earth Sciences Department, Stanford University
1980-85	<b>Regional Hydrogeologist</b> —USGS, Region Manager (8 states west), Menlo Park, CA
1974-79	<b>Deputy Chief Hydrologist for Research</b> —USGS, Reston, VA
1968-70	<b>Resources for the Future</b> —USGS (cooperative studies), Washington DC
1967-68	<b>Visiting Associate Professor</b> —Geology Department, University of Illinois, IL
1962-67	<b>Research Geologist</b> —USGS, Water Resources Division, Arlington, Virginia
1961-62	<b>Groundwater Hydrologist</b> —Nevada Department of Conservation and Natural Resources and the Desert Research Institute, University of Nevada, Reno, NV
1957-59	<b>Exploration Geologist</b> —Humble Oil, Vernal, UT

## BIBLIOGRAPHY

Bredehoeft is the author of more than 100 scientific papers in the referred scientific literature.

## SCIENTIFIC COMMITTEES

1995-98	<b>Council International Exchange of Scholars (Fulbright Scholars)</b> —Advisory Board
1996-98	<b>Lawrence Livermore National Laboratory</b> —Advisory Committee for Environmental Programs
1992-96	<b>Association of Ground Water Scientists and Engineers</b> , National Ground Water Association—Board of Directors
1992-95	<b>Editor</b> — <b>GROUND WATER</b> , Journal of the Association of Ground Water Scientists and Engineers, National Ground Water Association.
1984-94	<b>National Research Council</b> —Member, Committee on the Waste Isolation Pilot Plant (WIPP)
1990-93	<b>National Science Foundation</b> —Member, Advisory Committee for Earth Science
1990-92	<b>National Research Council</b> —Member, HYTEC Panel for the Yucca Mountain Nuclear Repository (Chair, Modeling Subcommittee)
1970-92	numerous other Advisory Committees, including NAS/NRC, US-DOE, UNESCO, etc.

## SCIENTIFIC SOCIETIES

**American Association of Petroleum Geologists**  
**Geological Society of America**  
**American Geophysical Union**  
**Association of Ground Water Scientists and Engineers**  
**Russian Academy of Natural Sciences**  
**U.S. National Academy of Engineering**

## MEDALS and AWARDS

1969	<b>HORTON AWARD</b> —American Geophysical Union (G. F. Pinder & J.D. Bredehoeft)
1974	<b>INTERDISCIPLINARY AWARD</b> —U.S. Committee for Rock Mechanics (C.B. Raleigh, J. Healy, & J.D. Bredehoeft)
1975	<b>O.E. MEINZER AWARD</b> —Geological Society of America (J.D. Bredehoeft & G.F. Pinder)
1978	<b>MERITORIOUS SERVICE AWARD</b> —Department of Interior
1981	<b>DISTINGUISHED SERVICE AWARD</b> —Department of Interior
1984	<b>BOGESS AWARD</b> —American Water Resources Association (E. Reichard & J. Bredehoeft)
1991	<b>FOREIGN ASSOCIATE, RUSSIAN ACADEMY OF NATURAL SCIENCES</b>
1991	<b>M. KING HUBBERT AWARD</b> —National Ground Water Association
1994	<b>MEMBER, U.S. NATIONAL ACADEMY OF ENGINEERING</b>

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1997	<b>HORTON MEDAL</b> —American Geophysical Union
1997	<b>PENROSE MEDAL</b> —Geological Society of America
1997	<b>LIFE MEMBER</b> —National Ground Water Association
1999	<b>LANGBEIN DISTINGUISHED LECTURER</b> —American Geophysical Union
2001	<b>HALBOUTY DISTINGUISH LECTURE in RESOURCES</b> —Geological Society of America
2003	<b>DISTINGUISHED SERVICE AWARD</b> —Hydrogeology Division, Geological Society America
2004	<b>LIFETIME ACHIEVEMENT AWARD</b> —Ground Water Resources Association

## **SIGNIFICANT PROJECTS--USGS:**

### **FLOW & CONTAMINANT TRANSPORT MODELS**

Bredehoeft, with George Pinder, developed the first widely used numerical models for flow and transport. He taught training courses and consulted on numerous model applications within the U.S. Geological Survey—California, Colorado, Georgia, Idaho, New Jersey, Virginia, Washington, etc. He received the Horton Award of the American Geophysical Union (AGU) for the work on flow models, and the Meinzer Award of the Geological Society of America (GSA) for the contaminant transport model (MOC) that is widely used. Recently, he developed flow and transport models for PCs.

### **ECONOMIC STUDIES—CONJUNCTIVE USE**

Bredehoeft participated in investigations of the economics of groundwater development at Resources of the Future (RFF) with R.A. Young. They studied both groundwater and conjunctive groundwater and surface water development. They were the first to use distributed parameter, numerical groundwater models for the economic analysis of optimal groundwater development. Their analysis involved maximizing net economic benefits rather than the traditional engineering approach of minimizing costs to meet demand.

### **EARTHQUAKE CONTROL**

Bredehoeft did the reservoir engineering for the USGS earthquake control experiments at Rangely Colorado. Working with Raleigh and Healy, they controlled earthquakes at Rangely. The experiment entailed two cycles: 1) turned earthquakes off, 2) turned them on again, and 3) finally off. This is the only field scale experiment to demonstrate the Hubber/Rubey hypothesis of effective stress in controlling earthquakes.

### **OIL-SHALE**

Bredehoeft and Wolff did a field investigation in the Piceance basin Colorado to determine the quantity of groundwater to be pumped in mining oil shale. They conducted state of the art hydrofracing to determine the state of in-situ stress. This was the first study of its kind with measurements of in-situ stress at a regional scale.

### **WATER WELLS as STRAIN METERS**

Bredehoeft's work in 1968 on the response of wells to earth tides demonstrated sensitivity to tectonic strain--1/100,000,000. Starting in 1980 he installed a strain monitoring water well network at Parkfield, CA as part of the USGS experiment in earthquake prediction. These wells sense tectonic strain at Parkfield, especially creep events on the San Andreas fault.

### **NUCLEAR WASTE**

Bredehoeft co-authored a USGS Circular that was critical of DOE's handling of geologic disposal. He proposed an alternative for disposal in crystalline rocks below a blanket of sediment. He was a 10 year member of the NAS/NRC advisory committee on the WIPP facility, 1984-1994. He published a paper suggesting that bedded salt at the Waste Isolation Pilot Plant (WIPP), New Mexico is not dry as previously supposed—it contains 1-3 percent interstitial brine. Bredehoeft was also a member of the NAS/NRC Committee that reviewed groundwater conditions at Yucca Mountain, Nevada (1990-92). He made a 3D model of response to an earthquake. He was a consultant to Inyo County, GA and Esmeralda County, NV on impacts of the Yucca Mountain repository. Currently he is a consultant to the New Mexico Attorney General on WIPP

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## **HYDRODYNAMICS of DEEP SEDIMENTARY BASINS**

Bredehoeft conducted a series of investigations of the hydrodynamics of fluid movements in the deep subsurface. Among these were: 1) a model investigation of the Dakota Sandstone and associated aquifers in South Dakota; 2) a study of the Denver Basin; 3) analytical models of flow in the Caspian Basin; 4) a study of the Big Horn Basin, Wyoming; and 5) an analysis of the Uinta Basin, Utah where the active generation of oil is creating pore pressure in the Altamont field.

## **MAJOR CONSULTING PROJECTS—1995-07:**

### **BECHTEL**

Bredehoeft provided a major review of model analyses involving a dispute over the allocation between principal responsible parties (PRPS). He met with Bechtel, the PRPs, and their consultants in settlement negotiations.

### **YUCCA MOUNTAIN NUCLEAR REPOSITORY—Inyo County**

The HydroDynamics Group is responsible for providing oversight for the Counties on the potential impact of the proposed Yucca Mountain repository. One potential pathway to the biosphere is through a carbonate aquifer that underlies the repository at depth. This aquifer is believed to have its ultimate discharge point in springs, approximately 50 km south, in Death Valley National Park in Inyo County. Oversight involves reviewing regional groundwater computer models, performing hydrologic studies, representing the County's interest in numerous technical meetings. Oversight started in 1996 and is continuing in 2008. In the past several years we supervised a deep drilling program into the Carbonate Aquifer near Death Valley, both in the Amagosa Valley to the north, and in the vicinity of the Furnace Creek spring complex in Death Valley.

### **SAVANNAH RIVER SITE—Remediation of the F and H Area Disposal Ponds**

The F and H ponds received nuclear wastes for almost 40 years. Wastes were deliberately allowed to infiltrate the underlying aquifer. DOE is obligated to remediate the aquifer in the vicinity of the ponds. A Citizens Advisory Board for the Savannah River Site recommended an outside review by a panel of experts. Bredehoeft served on this panel and was responsible for analyzing groundwater remediation.

### **WASTE ISOLATION PILOT PLANT (WIPP)—New Mexico Attorney General**

EPA is to certify the WIPP facility. Bredehoeft was hired by New Mexico Attorney General to provide technical oversight on the work of DOE and its contractors, especially regarding Performance Assessment (PA). Of special concern is exploratory drilling in and near the repository and the associated injection of brine into the subsurface. Hydraulic fractures created by leaking high-pressure injection wells have the potential to transport radionuclides out of WIPP. In addition, drilling with air has the potential to increase the radionuclide releases from WIPP.

### **SAN FRANCISCO ZOO**

Bredehoeft did a model analysis of the Westside Groundwater basin to show the impacts of pumping at the San Francisco Zoo.

### **PLATTE RIVER GROUNDWATER IMPACTS—Wyoming vs Nebraska (Wyoming Attorney General)**

Bredehoeft was a consultant to the State of Wyoming Attorney General on the depletion in stream flow in the North Platte River caused by groundwater developments in the drainage basin. The lawsuit was settled in 2001.

### **SANTA YNEZ RIVER BASIN—Santa Barbara County, California**

The Hydrodynamics Group was the work plan manager, hired to bring consensus between the competing models of the Lompoc Plane conjunctive groundwater/surface-water system. The Hydrodynamics Group worked for a local consortium of water agencies. A confidential report was completed in 1999.

### **FALL RIVER SPRINGS: IMPACT of GEOTHERMAL DEVELOPMENT—Northern California**

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There is concern of landowners along the Fall River that geothermal development at Medicine Mountain will impact the springs adversely. Bredehoeft did a flow and contaminant transport model of the area to show the potential impact from the Fourmile Hill geothermal development.

## **CONJUNCTIVE USE, San Pedro Riparian Area, Arizona/Mexico—CEC**

The Tri-Lateral Commission for Environmental Cooperation (CEC—Canada, Mexico, United State) investigated alternatives strategies to preserve an important area of riparian vegetation along the upper San Pedro River in Arizona and Sonora that is threatened by groundwater development. Bredehoeft did the hydrogeologic investigation.

## **CLEAN-UP—Guadalupe Oil Field, California**

The Hydrodynamics Group was the technical consultant in mediation between Unocal and the California Water Quality Control Board. Cleanup at Guadalupe has been a difficult and litigious process between the State and Unocal. Bringing a mediator with technical assistance has greatly facilitated the process and eased the tension between the State and Unocal. Bredehoeft's participation was completed in 1999.

## **GROUNDWATER in MEXICO—World Bank**

The World Bank is supporting a project in Mexico to review the utilization of groundwater throughout the country. Bredehoeft is the expert in geohydrology for the World Bank. Bredehoeft prepared a model of the Hermosillo area where groundwater is threatened by seawater intrusion. Working with Dr. Robert Young, Economist of Colorado State University, the groundwater model was linked to an economic model for the area. Together, Bredehoeft and Young explored policy options for further development at Hermosillo. The Hermosillo Plain is being used as one of five demonstration studies that typify groundwater development in Mexico. Bredehoeft and Young completed their report for the Bank in 1999.

## **TCE/PCE CONTAMINANT SPILL—U.S. Department of Justice**

Bredehoeft is the groundwater hydrology expert for the Justice Department in a dispute over DNAPL contamination at a Post Office in California. The case was settled in 2000.

## **TCE/PCE CONTAMINANT SPILL, Phoenix, Arizona—U.S. EPA**

The Hydrodynamics Group is a consultant to EPA in an evaluation of contaminant movement from the Motorola 52nd Street facility and the Allied Signal facilities at Sky Harbor airport. At issue is the effectiveness of Operating Unit 2; it is designed to pump and treat groundwater contamination downstream from the facilities. Each company has a different view of groundwater movement in vicinity of Operating Unit 2.

## **MTBE CONTAMINATION, California—Major Oil Company**

Bredehoeft is a consultant to a major oil company on the potential groundwater transport of MTBE from a gas station in southern California.

## **HYDROGEOLOGICAL IMPACTS OF MINING, Summitville, Colorado—Robert M. Friedland**

Bredehoeft is an expert to R.M. Friedland (defendant) in a Civil Lawsuit brought by the U.S. EPA over CERCLA response activities at the Summitville Mine in Colorado. Bredehoeft evaluated the impact of both the mining and the reclamation on the hydrogeology and hydrology of the site. The lawsuit with the U.S. settled in 2001. WATER

## **SUPPLY—SOUTH DENVER METROPILTAN AREA—Douglas County, Colorado**

A study of the feasibility of conjunctive use of groundwater and surface water is underway for Douglas County, Colorado. Douglas County is just south of Denver; it is a growing part of the metropolitan area. Water users are largely dependent upon pumping groundwater from the Denver Basin aquifers that underlie the county; groundwater in this area is a nonrenewable resource. In 1999-2000 Bredehoeft served on a peer review committee for a groundwater model that is an integral part of the economic feasibility investigation.

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## **CADIZ STORAGE & SUPPLY PROJECT—San Bernardino, County, California**

The Cadiz project is proposed: 1) to store water from the Colorado River Aqueduct in aquifers in Cadiz Valley, 2) pump both stored and native groundwater during periods of shortage. The project is proposed to pump and store 1.1 million acre-feet during a 50-year life; it is proposed to pump 1.7 million acre-feet of native groundwater. Bredehoeft, working for the Western Environmental Law Center, showed that the pumping greatly exceeds the recharge; the project will mine more than 1 million acre-feet of groundwater. Bredehoeft's analysis demonstrated that adverse impacts of the project will be felt well beyond 100 years—well beyond the 50-year life of the project. The project was ultimately dropped.

## **SE-NEVADA CARBONATE GROUNDWATER—Nevada Power Co.**

Groundwater from the Arrow Canyon Cell of the southern Nevada Carbonate Aquifer discharges in a series of springs that create the Muddy River. Water in the river is fully allocated. Bredehoeft and Phil Hall (1996) did a groundwater model of the system for the purpose of assessing increased groundwater development from the Carbonate Aquifer and its subsequent impact on the Muddy River. The carbonate aquifer is so permeable that water levels in the aquifer are not sensitive to increased development; one has to monitor flow in the Muddy River to detect the impacts. Bredehoeft testified at a water supply hearing before the Nevada State Engineer in 2001.

## **EXPLORATORY DRILLING DEEP CARBONATE AQUIFER, DEATH VALLEY—Inyo County, CA**

The Hydrodynamics Group, on behalf of Inyo County, received funding from DOE for an unsolicited proposal to drill a series of 3000-foot exploratory, observation wells to the Deep Carbonate Aquifer on the northeastern side of the Funeral Mountains in Death Valley National Park. The Deep Carbonate Aquifer underlies the proposed Nuclear Repository at Yucca Mountain. The ultimate discharge from the aquifer is thought to be a series of large springs near Furnace Creek on the east side of Death Valley. The drilling will further confirm or refute the hypothesis that the springs are feed from the Deep Carbonate Aquifer. Drilling began in 2004, and continues in 2007.

## **CONTAMINATION AT LOS ALAMOS NATIONAL LABORATORY—New Mexico Attorney General**

Bredehoeft is providing hydrogeologic advice to the New Mexico Attorney General's Office about closure plans for waste disposal sites at the Los Alamos National Laboratory. There are concerns about the ability of the transport models to adequately predict potential contaminant movement through the geologic media at the site both above the water table in the unsaturated zone and below the water table in the saturated zone.

## **CONRAD LANDSLIDE, BRITISH COLUMBIA—CN Rail**

A landslide occurred in the Fraser River Canyon, British Columbia, that took out the CN mainline and a siding. A train subsequently was derailed at the landslide; two trainmen lost their lives in the derailment. Bredehoeft did an analysis that showed that the cause of the landslide was a groundwater buildup in highway fill associated with the TransCanada Highway that was placed above the railroad fill.

## **POWDER RIVER BASIN: COAL-BED METHANE—Environmental Coalition**

Bredehoeft reviewed the Bureau of Land Management Final Environmental Impact Statement (FEIS) on the development of coal-bed methane on the lands with Federal mineral rights in the Powder River Basin of Wyoming and Montana on behalf of an environmental coalition. The coal beds in this area are some of the best aquifers. The development of coal-bed methane will impact several thousand water wells in the area that are completed in the Fort Union coal measures. Many of these wells will have to be abandoned. While there are alternative aquifers the permeability is not as good as that of the coal beds and the water quality is not nearly as good. The impacts on the water wells were not adequately addressed in the FEIS.

## **FEASIBILITY OF GAS STORAGE—Georgia (Country)**

The Hydrodynamics Group was retained by the Georgian International Oil Company to investigate the feasibility for gas storage in the country of Georgia. The storage facility will operate in conjunction with a gas pipeline being built from Azerbaijan to Turkey through Georgia. The top three candidate sites were selected from approximately 25 potential sites. A reservoir performance analysis was performed for the top two candidate sites.

## **WALKER LAKE, NEVADA—Environmental Coalition**

Walker Lake, a remnant of Pleistocene Lake Lahontan, declined from a volume of 8,600,000 ac-ft in 1882 to less than 2,000,00 ac-ft today. The decline was caused by irrigation in the Walker River Basin diverting water that originally flowed to the lake. As the lake declined in volume, the total dissolved solids in the lake water rose from 2,500 to 16,000 mg/l. The environmental community is attempting to save the ecosystem in the lake that includes Lahontan Cutthroat Trout. This is a classic western water problem in which irrigators, Indians, and environmentalist are competing for the available water. Bredehoeft was the hydrologic consultant to the Western Environmental Law Center, whose clients are trying to save the lake and its ecology.

## **FOUR CORNERS GROUNDWATER, Montana—Trout Unlimited, Montana Department Conservation**

Groundwater is being pumped to support a development in the Four Corners area, near Bozman, Montana. Pumping groundwater impacts the nearby Gallatin River. A deal was struck, in 2006, in which surface water was recharged to the aquifer to fully offset the impact of the pumping on the river. This was the first time in Montana that the impacts of groundwater pumping on a stream were recognized, and fully offset. Bredehoeft did the groundwater analysis.

## **PUMPING GROUNDWATER FOR LAS VEGAS—Environmental Coalition**

The Southern Nevada Water Authority in attempting to pump 150,000 acre-feet/year of groundwater in an area near Ely, NV that will be piped to Las Vegas for water supply. Much of the groundwater will come from the regional Paleozoic Carbonate Aquifer that underlies the area. Environmental consequences will result from the groundwater pumping. Bredehoeft testified in opposition to the project at the initial Nevada State Engineer hearing that granted permits for the project.

## **DECOMMISSIONING NUCLEAR FACILITIES, WEST VALLEY, New York—NYSERDA & DOE**

Nuclear fuel rods were reprocessed at a facility at West Valley, NY. On the facility grounds are nuclear burial sites that are supervised by both the State of New York and DOE. The U.S. Congress instructed DOE to cleanup the site. Bredehoeft participated on a committee that reviewed the decommissioning plan of DOE for the major facilities at the site.

## **PINE COVE WATER DISTRICT, California—Environmental Coalition**

There was a dispute between the local water company and the environmental community over how much groundwater should be pumped from a newly purchased well field. Bredehoeft proposed a compromise between the groups that was accepted.

## **DICKSON COUNTY LANDFILL, Kentucky—Environmental Defense Fund**

The landfill creates TCE contamination in an underlying carbonate aquifer. Bredehoeft reviewed the thesitation for EDF.

## **OWENS LAKE DUST CONTROL, CITY OF LOS ANGELES—MWH**

Bredehoeft was a member of a 5-member expert panel that advised the project on the availability of groundwater for dust abatement of the lake.

## **MOUNTAIN SPRING, YELLOWSTONE NATIONAL PARK—Federal Highway Administration**

There was a problem with sediment in a spring associated with a gravel mine in the park. Bredehoeft advised on the source of the sediment in the spring.

## John D. Bredehoeft—Significant Papers

- BREDEHOEFT, J.D., BLYTH, C.R., WHITE, W.A., and MAXEY, G.B., 1963, *A possible mechanism for the concentration of brines in subsurface formations*: American Association Petroleum Geologists Bulletin, v. 47, p. 257-269.
- BREDEHOEFT, J.D., WHITE, W.A., and MAXEY, G.B., 1963, *A possible mechanism for the concentration of brines in subsurface formations: reply to a discussion by Gordon Rittenhouse*, American Association Petroleum Geologists Bulletin, v. 48, p. 236-238
- BREDEHOEFT, J.D., and FARVOLDEN, R.N., 1963, *Disposition of aquifers in intermontane basins in northern Nevada*: International Association Scientific Hydrologists, Publication no. 64, p. 197-212.
- BREDEHOEFT, J.D., 1963, *Hydrogeology of the Lower Humboldt River Basin, Nevada*: Desert Research Institute, University of Nevada, Technical Report no. 3, 50 p.
- BREDEHOEFT, J.D., 1964, *Variation of permeability in Tensleep Sandstone, interpreted from core analyses and geophysical logs*: U.S. Geological Survey Professional Paper 501-D, p. D166-D170.
- BREDEHOEFT, J.D., and PAPADOPULOS, S.S., 1965, *Rates of vertical ground-water movement estimated from the earth's thermal profile*: Water Resources Research, v. 1, p. 325-328.
- BREDEHOEFT, J.D., 1965, *The drill-stem test: The petroleum industry's deep-well pumping test*: Ground Water, v. 3, p. 31-36.
- COOPER, H.H., Jr., BREDEHOEFT, J.D., PAPADOPULOS, S.S., and BENNETT, R.R., 1965, *The response of well-aquifer systems to seismic waves*: Journal of Geophysical Research, v. 70, no. 16, p. 3915-3926.
- BREDEHOEFT, J.D., COOPER, H.H., Jr., PAPADOPULOS, S.S., and BENNETT, R.R., 1965, *Seismic fluctuations in an open artesian well*: U.S. Geological Survey Professional Paper 525-C, p. C51-C57.
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- COOPER, H.H., Jr., BREDEHOEFT, J.D., and PAPADOPULOS, S.S., 1967, *Response of a finite-diameter well to an instantaneous charge of water*: Water Resources Research, v. 3, p. 263-269.
- BREDEHOEFT, J.D., 1967, *The response of well-aquifer systems to earth tides*: Journal of Geophysical Research, v. 72, p. 3057-3087.
- BREDEHOEFT, J.D., and HANSHAW, B.B., 1968, *On the maintenance of anomalous fluid pressures: I. Thick sedimentary sequences*: Geological Society of America Bulletin, v. 79, p. 1097-1106.

- HANSHAW, B.B., and BREDEHOEFT, J.D., 1968, *On maintenance of anomalous fluid pressures: II. Fluid source at depth*: Geological Society of America Bulletin, v. 79, p. 1107-1122.
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