

# WateReuse Foundation's RESEARCH UPDATE

Advancing the science of water reuse and desalination through research

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www.WateReuse.org/Foundation

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## National Database of Water Reuse Facilities Nearing Completion

The WateReuse Foundation, with in-kind support from 26 major reuse facilities nationwide, has commissioned a Malcolm Pirnie-led team to develop an interactive Internet database of U.S. water reuse facilities and programs.

The primary objective of the National Database of Water Reuse Facilities (WRF-02-004) is to provide a comprehensive web database for professionals, regulators, educators, researchers, and interested citizens that will serve as an industry benchmark as water reuse expands in the future. The project team is working closely with utilities and regulatory bodies across the nation to develop a working database. The initial phase of the project is due to be completed January 2006.

The database structure and water reuse information fields included in the database were created with input from over 30 reuse agencies, regulatory organizations, and academics. A database questionnaire was uploaded to a project web site for completion by individual reuse utilities.

The project team surveyed state regulatory agencies and populated the database with contact information for about 1200 water reuse utilities as supplied by responding agencies. All 1200 reuse utilities were contacted and

given unique online identifications and passwords that allowed them to complete the questionnaire for their utility. About 225 reuse utilities have completed the online questionnaire.

Software to query the database is currently being beta tested by the in-kind participants, including the 30 reuse agencies that assisted with the development of the database fields. The database is segregated into key topic areas including Utility Program Management, Reuse Facilities, Reclaimed Water Uses, Rates, and Utility Contacts with the capability to query information by individual states as well as nationwide.

Topic Area	Information Within Topic Area
Utility Program Management	<ul style="list-style-type: none"> <li>Reuse Policies &amp; Management</li> <li>Utility Experience</li> <li>Identified Benefits of Reuse</li> <li>Challenges of Implementing Reuse</li> <li>Reuse Community Feedback</li> </ul>
Reuse Facilities	<ul style="list-style-type: none"> <li>Production/Treatment</li> <li>Distribution</li> </ul>
Reclaimed Water Uses	<ul style="list-style-type: none"> <li>Utility Summaries</li> <li>Volume Summaries</li> </ul>
Rates	<ul style="list-style-type: none"> <li>Query Reclaimed Water Rates</li> </ul>
Utility Contacts	<ul style="list-style-type: none"> <li>Reuse Contact</li> </ul>

The Foundation plans to release the National Database of Water Reuse Facilities for general use in the first quarter of 2006 and continues to encourage all reuse utilities to participate in the program by completing the online questionnaire.

If your utility has not entered its data, please contact Patricia Hausser at Malcolm Pirnie (phausser@pirnie.com or 602-797-4659) for an online identification and password. It typically takes about 15 to 30 minutes to complete the questionnaire and assistance is available to answer any questions. For more information about the database, contact Jack Bryck of Malcolm Pirnie at jrbryck@pirnie.com.

The screenshot shows the 'National Database of Water Reuse Facilities' website. The main content area displays a table titled 'Utility and Facility Results' with columns for State, No. of Utilities with a Record in the National Database, No. of Utilities Providing Reuse Related Data, No. of Facilities with a Record in the National Database, No. of Production Facilities Reporting Data, Reported Permitted Design Capacity of the Facilities (mgd), Reported Annual Reclaimed Water Production (Billions of gallons), No. of Distribution Facilities/Systems Reporting Data, and Reported Length of Pipe Within Reclaimed Water Distribution Facility/Systems (miles).

State	No. of Utilities with a Record in the National Database	No. of Utilities Providing Reuse Related Data	No. of Facilities with a Record in the National Database	No. of Production Facilities Reporting Data	Reported Permitted Design Capacity of the Facilities (mgd)	Reported Annual Reclaimed Water Production (Billions of gallons)	No. of Distribution Facilities/Systems Reporting Data	Reported Length of Pipe Within Reclaimed Water Distribution Facility/Systems (miles)
Alaska	0	0	0	0	-	-	0	-
Alabama	0	0	0	0	-	-	0	-
Arkansas	0	0	0	0	-	-	0	-
American Samoa	0	0	0	0	-	-	0	-
Arizona	105	20	139	25	405.07 (24**)	51.53 (21**)	26	100 (16**)
California	426	74	109	92	773.35 (89**)	99.13 (79**)	88	903.35 (42**)
Colorado	5	5	4	4	49.4 (4**)	5.19 (4**)	4	65 (4**)
Connecticut	0	0	0	0	-	-	0	-
District of Columbia	0	0	0	0	-	-	0	-
Delaware	0	0	0	0	-	-	0	-
Florida	170	41	252	52	342.68 (48**)	42.86 (46**)	48	5,057.28 (28**)

# Foundation Funds 11 New Research Projects

The Foundation's Board of Directors approved seven new solicited research projects and four unsolicited research projects during its September meeting. Solicited research projects are developed from the Foundation's research agenda, while unsolicited research projects are developed by researchers and proposed to the Foundation during an open call for pre-proposals via the WateReuse website. Request for Proposals will be released for the new solicited research projects in December 2005 and January 2006.

## Solicited Research

*WRF-05-001*

Evaluating Revenue Pricing Levels and Structures to Support Reclaimed Water Systems

*WRF-05-002*

Microbiological Quality and Biostability of Reclaimed Water Following Storage and Distribution

*WRF-05-003*

Alternative Viability/Infectivity Surrogates for Giardia for Which Cell Culture Infectivity Assays Are Not Available

*WRF-05-004*

Development of Surrogates to Determine the Efficacy of Soil Aquifer Treatment Systems for the Removal of Organic Chemicals

*WRF-05-005*

Identifying Pharmaceuticals / Personal Care Products of Most Health Concern and Persistence through Water Treatments Used for Potable Reuse

*WRF-05-006*

Evaluate Wetland Systems for Treated Wastewater Performance to Meet Competing Effluent Quality Goals

*WRF-05-007*

Selection and Testing of Tracers for Measuring Travel Times in Natural Systems Augmented with Treated Wastewater Effluent

## Unsolicited Research

*WRF-05-008*

The Effect of Salinity on the Removal of Contaminants of Concern during Biological Water Reclamation

*Principal Investigator:* Dr. Peter Fox (Arizona State University)

*WRF-05-009*

Dewatering Reverse Osmosis Concentrate from Water Reuse Applications Using Direct Osmosis

*Principal Investigator:* Dr. Samer Adham (MWH)

*WRF-05-010*

Oxidative Destruction of Organics in Membrane Concentrates

*Principal Investigator:* Dr. Paul Westerhoff (Arizona State University)

*WRF-05-011*

Assessment of the Potential Presence of Chemical Contaminants in Water Produced by Desalination Systems

*Principal Investigator:* Dr. David Sedlak (UC-Berkeley)

The mission of the WateReuse Foundation is to conduct and promote applied research on the reclamation, recycling, reuse, and desalination of water. The Foundation's research advances the science of water reuse and supports communities across the United States and abroad in their efforts to create new sources of high quality water through reclamation, recycling, reuse, and desalination while protecting public health and the environment.

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## Foundation Accepting Abstracts for Research Conference

The Foundation is accepting abstracts for technical presentations at the 10th Annual Research Conference to be held at the Hyatt Regency Hotel in Phoenix, AZ on May 15-16, 2006. The Foundation's Research Conference is dedicated to showcasing the latest results of leading-edge research on water reuse and desalination. Historically this conference has identified emerging issues and technologies years before they

have come to the attention of the water industry.

The Research Conference provides an opportunity for the water reuse and desalination communities to hear and see presentations by researchers on the latest results of ongoing research. The conference provides a forum for water reuse and desalination research professionals to interact, network,



and discuss current and future research needs and trends.

The Foundation's Conference Planning Committee, chaired by Paul Kinshella of the Phoenix Water Services Department, will select abstracts with the goal of forming a program to highlight leading-edge research on topics such as waterborne pathogens, pharmaceutical agents, endocrine disrupting compounds, membrane applications and limitations, salinity management, and indirect potable reuse.

To be considered for a slot on the program, researchers should submit an abstract and abstract submittal form by January 27, 2006 to Amy Kirson at [akirson@watereuse.org](mailto:akirson@watereuse.org). Abstracts must be 200 words or less and include the title, author(s), and subject.

The corresponding author designated on the abstract submittal form will be notified of acceptance or rejection by February 24, 2006. Acceptance is contingent on receipt of a completed paper by April 21, 2006. To download an abstract submittal form, visit the conference website at [www.watereuse.org/Foundation/2006conf](http://www.watereuse.org/Foundation/2006conf).

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## Congress Approves Funding for WateReuse Foundation

The U.S. Congress approved \$2.5 million to support the research of the WateReuse Foundation for fiscal year 2006 when the conference committee for Energy & Water Development Appropriations met on November 7 to decide funding levels for the U.S. Army Corps of Engineers, the Bureau of Reclamation, and the Department of Energy. The earmark for the Foundation is part of a \$3.7 million appropriation for the Bureau of Reclamation's Title XVI

program, which focuses on water reclamation and reuse. The conference committee also provided \$7 million for the completion of construction of the Tularosa Basin Desalination Facility in New Mexico as well as a one year authorization for Water 2025, a Department of the Interior program which will provide matching funding for projects that will conserve water, increase water use efficiency, or enhance water management.

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## Foundation Moving to New Office Space

The WateReuse Foundation and WateReuse Association are scheduled to move into new, expanded office space in January 2006. The two organizations have experienced tremendous growth in recent years and will be adding additional staff to better support the water reuse and desalination communities. The new address will be as follows:

WateReuse Foundation  
1199 North Fairfax Street, Suite 410  
Alexandria, VA 22314

Updates on the planned move will be posted on the website at [www.watereuse.org](http://www.watereuse.org).

# Desalination Workshops Generate 43 Project Descriptions

A diverse group of scientists, engineers, water managers, and government officials — including some of the foremost experts in desalination and water purification — gathered for a Water Innovation Symposium held October 17-21 in San Diego to support the Joint Water Reuse & Desalination Task Force's initial efforts



Mark Wilf of Hydranautics, Patrick Brady of Sandia National Laboratories, and Nikolay Voutchkov of Poseidon Resources Corp.

to implement the *Desalination and Water Purification Technologies Roadmap*. The results of the Symposium included 43 research project descriptions with funding recommendations totaling nearly \$25 million.

The Symposium, which included three technical workshops, was organized and sponsored by the WaterReuse Foundation and the Awwa Research Foundation on behalf of the Joint Water Reuse & Desalination Task Force (JWR&DTF). Workshops were held in the areas of Membrane Technologies, Alternative Technologies, and Concentrate Management to identify specific research projects that will help the Task Force implement the *Roadmap*, which was developed by Sandia National Laboratories and the U.S. Bureau of Reclamation to hasten the rate of technological advance and cost reduction of desalination technologies.

During each of the workshops, the invited technical experts were asked to recommend research priorities, write research project descriptions, and to recommend funding for

each project. The output of each of the workshops was as follows:

- *Membrane Technologies* — The invited technical experts wrote 16 project descriptions with funding recommendations of approximately \$11 million.
- *Alternative Technologies* — The invited technical experts wrote 11 project descriptions with funding recommendations of approximately \$6 million.
- *Concentrate Management* — The invited technical experts wrote 16 project descriptions with funding recommendations of approximately \$8 million.

The JWR&DTF is taking the lead in conducting the research on the high priority research needs identified during the workshops. The Task Force is also taking the lead in stimulating interest in the research needs by other potential funding organizations. The JWR&DTF has already secured a \$1 million grant from the California Department of Water Resources and member organizations will match the grant. The Task Force is working to secure additional funding.

The JWR&DTF is a coalition of national research organizations and federal government partners dedicated to sharing the results of research, engaging in organized planning, and collaborating on research projects focused on water reclamation, reuse, recycling, salinity management, and desalination issues. The members of the Task Force that have decided to participate fully in the *Roadmap* implementation are the Awwa Research Foundation, Sandia

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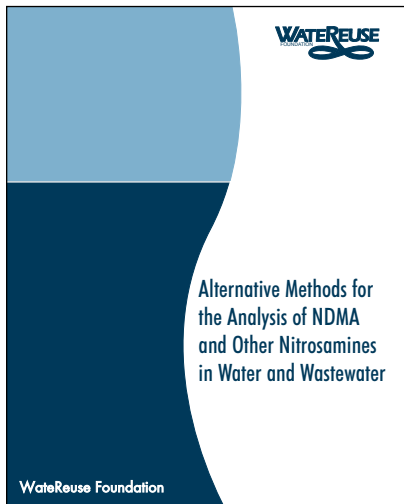
Jörg E. Drewes of the Colorado School of Mines and R. Rhodes Trussel of Trussell Technologies, Inc.



Jim Jordahl of CH2M Hill, Jose Vergara of Metropolitan Water District of Southern California, Thomas Hinkebein of Sandia National Laboratories, and Tony Rachwal of Thames Water.

# New Foundation Research Reports to be Released

The Foundation's research program is moving into a high gear with a series of new research reports being released in the coming months. The Foundation's research provides water professionals with the tools and knowledge to meet their commitment to increasing the reliability and quality of the nation's water supplies. Each new report will be available for purchase from the Foundation website once it is released at [www.watereuse.org/Foundation/research-report.htm](http://www.watereuse.org/Foundation/research-report.htm). Descriptions of the forthcoming reports are given below.



## *Alternative Methods for the Analysis of NDMA and Other Nitrosamines in Water and Wastewater (WRF-01-001)*

Principal Investigator Robert C. Cheng, Ph.D, P.E. of the Long Beach Water Department and his team have created a set of standard operating procedures to be used

for the analysis of NDMA and other Nitrosamines. Due to a lack of approved testing methods to detect NDMA, relatively few laboratories are currently performing analysis. To address this issue, the Foundation funded this study to evaluate, refine, and develop multiple methods for NDMA analysis.

## *Removal and Destruction of NDMA and NDMA Precursors during Wastewater Treatment (WRF-01-002)*

This report provides utilities practicing indirect potable reuse with a scientific framework for managing NDMA and assessing the need for additional testing, improvements to existing treatment processes, and the need for advanced treatment. The study shows which advanced treatments effectively remove NDMA and NDMA precursors and provides information on how utilities that do not have advanced treatment can reduce NDMA effluent concentrations through source control measures. The

Principal Investigators for this study are Michael C. Kavanaugh, Ph.D., P.E. of Malcolm Pirnie, Inc. and David L. Sedlak, Ph.D. of the University of California, Berkeley.

## *Rejection of Wastewater-Derived Micropollutants in High-Pressure Membrane Applications Leading to Indirect Potable Reuse: Effects of Membrane and Micropollutant Properties (WRF-02-001)*

This study develops a mechanistic understanding of the rejection of emerging organic micropollutants by high-pressure membranes, based upon an integrated framework of solute properties, membrane properties, operational conditions, and various feed water compositions. The Principal Investigator is Dr. Jörg E. Drewes of the Colorado School of Mines.

## *Investigation of N-Nitrosodimethylamine (NDMA) Fate and Transport (WRF-02-002)*

The overall objective of the project was to assess the fate and transport of NDMA and NDMA precursors in soil, groundwater, and surface waters. The study includes a review of available data from NDMA contaminated sites to identify environmental variables that influence NDMA transport and transformation. The project also includes experimental studies to assess the potential for biotransformation and field studies to assess volatilization and transport of NDMA in irrigated soil plots and soil columns. The Principal Investigator is Jennifer Bender of West Basin Municipal Water District.

## *Beneficial and Nontraditional Uses of Concentrate (WRF-02-006b)*

Disposal of concentrates from advanced water treatment processes (primarily membrane processes) poses an environmental challenge. This report provides a comprehensive review and comparison of the full range of alternative uses of concentrate and assesses the feasibility of implementation, economic considerations, and environmental safety. The report evaluates both direct uses of concentrate and the potential for recovery and marketing of individual salts separated from concentrate. The Principal Investigator is Jim Jordahl, Ph.D. of CH2M HILL, Inc.

## Foundation Testifies Before Senate Committee

The Foundation testified before the Senate Committee on Energy and Natural Resources on October 20 in support of a new bill that would create a stronger federal role in water supply research as it relates to energy production. The hearing was the first official review of



Senator Pete Domenici

the Energy-Water Efficiency Technology Research, Development, and Transfer Program Act of 2005 (S. 1860), a bill introduced by Committee Chairman Pete Domenici (R-NM). The legislation was reported out of committee on November 16 and it is now available for consideration by the full Senate

Ed Archuleta, general manager of the El Paso

Water Utilities and a member of the WateReuse Foundation Board of Directors, testified on behalf of WateReuse at the hearing. In his presentation, Archuleta emphasized that S. 1860 represents a sound approach to address the water research needs of the nation.

“In the future, the nation will depend more and more on the availability of alternative water supplies, primarily reclaimed and reused waters and the desalination of seawater and brackish groundwater,” Archuleta said. “In order for these two sources of new water to be cost-effective, research is needed to drive down the costs.”

Archuleta acknowledged the value of using the expertise of Sandia, Lawrence Livermore, and Oak Ridge National Laboratories to coordinate research programs as prescribed in the bill, but noted the importance of tapping into the resources found in organizations such as the WateReuse Foundation, which has successfully structured a research program targeting the real life needs of the public and private sectors involved in water supply delivery. Archuleta said partnerships, such as the ones the Foundation has with public and private entities, ensure meaningful results taking into account the fiscal realities of the moment.

Archuleta cited a new brackish groundwater desalination facility, jointly funded by El Paso and Fort Bliss, as an example of a successful

partnership that will bring a new source of high quality water to the region. Domenici responded that this project illustrates the value of partnerships and noted that work currently ongoing in Alamogordo would provide important advances in desalination through similar partnerships.

Addressing the Committee's concerns surrounding arsenic treatment and removal, Archuleta noted that the growing demand for water, coupled with drought, forced his community to rely on groundwater supplies. This required treatment for arsenic, which was successful. Archuleta attributed the success to the advances made in reverse osmosis.

In a series of questions, Domenici expressed concerns over the need to pursue meaningful research. The ability to conduct research for research's sake is not the objective of the bill, he said. The panel agreed that staged research that provides for constant review from researchers, product manufacturers, and the customer would ensure that commercialization of water technology is directly related to the end user's needs. Domenici said that the challenge for the public sector, including the national laboratories, is the ability to stop the research when it appears to no longer hold the promise of meeting the demands of the end user.

Domenici noted that a close nexus between water and energy exists and that it is imperative that the country have an effective research program that supports the commercialization of water technologies. Citing his commitment to the issue, Domenici said that the nation cannot afford to wait for a major crisis in the water-energy arena and emphasized that it is vital to address the issue today. He noted that the challenge will be securing the necessary funding to support research and technology commercialization.

“The federal government has let its investment in water technologies lapse, and the pressure to find more usable water for a growing nation will make that fact more apparent. We want to find cost-effective ways to conserve and reclaim water,” Domenici said.

The committee heard testimony from eight panelists regarding both S. 1860 and S. 1016, a bill that would provide federal funding for desalination facilities.

## Energy-Water Roadmap Group Begins Work

A congressionally-authorized Executive Committee has been formed to begin the process of creating a National Energy-Water Roadmap Program to assess the effectiveness of federal programs in addressing interdependent energy and water issues and to identify areas where new research, development, demonstration, and commercialization efforts are needed.

Senate Energy and Natural Resources Chairman Pete Domenici (R-NM) encouraged the Executive Committee to be innovative in its efforts to help assure adequate energy and water resources in the future. Domenici's Energy and Water Development Appropriations Subcommittee has funded the year-long Roadmap effort through Albuquerque, NM-based Sandia National Laboratories.

"Energy and water are interdependent. We cannot have sufficient energy without having sufficient water. The reverse is also true. Drinking water and wastewater treatment are dependent on having the energy to pump, move, and treat it," Domenici said. "This new Roadmap initiative will require its participants to be innovative."

The Executive Committee, which will oversee all efforts and processes, includes national

water and energy executives representing federal agencies and water and energy associations. WateReuse Foundation Executive Director G. Wade Miller has been appointed to the 20-person Executive Committee to help shape the dialogue on energy demands associated with water reuse and desalination.

The Energy-Water Roadmap process will include three regional workshops to help identify a set of regional critical issues and needs that will, in turn, be used to identify broader national issues and a scope for a future energy-water program. An advisory panel of DOE national laboratory representatives, known as the Energy-Water Nexus Group, will provide planning and guidance on the needs and prioritization workshops.

This program is one of the provisions in the massive Energy Policy Act of 2005, signed into law by President Bush on August 8. Section 979 of the law authorizes the Energy-Water Roadmap and allocates \$30 million in annual spending for federal fiscal years 2007-2009 to research and develop plans to address energy issues associated with water and to address water issues associated with energy.

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## Desalination Workshops Generate 43 Project Descriptions

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National Laboratories, U.S. Bureau of Reclamation, and the WateReuse Foundation.

The Congressionally mandated *Roadmap* was created in 2003 with an objective to map out a long-term research strategy for desalination and other water purification technologies. The Water Science and Technology Board of the National Research Council reviewed the *Roadmap* in 2003-2004 and issued a report that provided constructive recommendations. In 2004, the decision was made to implement the findings and provisions of the *Roadmap* under the auspices of the JWR&DTF.

The October workshops were preceded by a Stakeholders Workshop in November 2004 to plan the implementation process and a Source Waters Workshop in May 2005 to identify research needs by source of water (i.e., seawater, brackish groundwater, recycled water). The outcomes of the earlier workshops, along with State of the Science reports written by experts in the field, were provided to the technical experts to assist them in identifying research needs. The next step in the Roadmap implementation will be an Institutional Issues workshop, which is tentatively scheduled for late February 2006.

Erin Mackey of Carolla Engineers, Robert Krueger of FilmTec Corporation, and Anthony J. Tarquin of the University of Texas at El Paso.

