

Project #	Project Title	Principal Investigator	Project Summary/Objective	Estimated Publication Date
WRF-02-003	Filter Loading Evaluation for Water Reuse	Bahman, Sheikh & Monterey Regional Water Pollution Control Agency	This research project is designed to provide a systematic approach to determine the effect of varying filter loading rates on recycled water quality as judged by routinely monitored plant performance parameters, MS2 Phage deactivation rates, and particle counts in size ranges corresponding to those of microbial cysts. This project is expected to provide a rational basis for increasing filter loading rates significantly.	9/31/2010
WRF-02-009	Study of Innovative Treatment on Reclaimed Water	Karl Linden, UC Boulder	The objective of this project is to investigate innovative treatment methods for inactivation, removal, or destruction of biological and chemical constituents of concern that may be present in reclaimed water.	11/30/2010
WRF-04-005	Use of Recycled Water for Community Gardens	Kathleen Muller, Friends of Guadalupe River Park and Gardens	The objective of this project is to demonstrate that recycled water can be used at a community garden for growing food and ornamental crops. The project will serve as a model for other U.S. cities by addressing the feasibility and methods of implementation for recycled water use at a community garden.	12/31/2010

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WRF-04-009	Reclaimed Water Inspection and Cross Connection Control Guidebook	Stephen Davis, Malcolm Pirnie	The objective of this project is to develop a guidebook of industry-wide recommended procedures for planning and implementing on-site inspection and cross connection control programs specifically for reclaimed water systems. The procedures are intended to be suitable for adoption by state regulatory and local governmental agencies to aid in the management of cross connection risks.	12/31/2010
WRF-04-013	Improved Sample Collection and Concentration Method for Multiple Pathogen Detection	Christine Moe, Emory University	This aim of this study is to explore ultrafiltration as a technique for efficiently concentrating the large-volume samples that are needed in order to measure relatively low pathogen concentrations that may be in reclaimed water.	3/15/2010
WRF-04-017	Reaction Rates and Mechanisms of AOP Technologies for Water Reuse	Bill Cooper, University of California Irvine	The objective of this project is to examine the water based free-radical chemistry in the destruction of organic microconstituents by determining reaction rates of 30 - 50 target chemicals with hydroxyl radicals and elucidating destruction mechanisms for five selected target compounds that will be representative of broader classes of organic microconstituents.	3/1/2010

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WRF-05-004	Development of Surrogates to Determine the Efficacy of Soil Aquifer Treatment Systems for the Removal of Organic Chemicals	Jörg Drewes, Colorado School of Mines	The main objective of this project is to determine appropriate organic surrogates for groundwater recharge projects that use reclaimed water. The technical approach includes tasks to identify an appropriate surrogate or group of surrogates for recharge projects where biodegradation is the major removal mechanism, and to identify an appropriate surrogate or group of surrogates for direct injection projects where membrane treatment before injection is the major removal process.	10/1/2010
WRF-05-005	Identifying Hormonally Active Compounds, Pharmaceutical Ingredients, and Personal Care Product Ingredients of Most Health Concern From Their Potential Presence in Water Intended for Indirect Potable Reuse	Shane Snyder, Southern Nevada Water Authority	The major objective of this study is to develop methodologies for assessing pharmaceutical active ingredients, hormonally active compounds, and personal care product ingredients that are sufficiently toxic to be considered potential hazards to human health, and that may persist through treatments intended to render wastewater suitable for indirect potable reuse.	6/1/2010
WRF-05-006	Evaluate Wetland Systems for Treated Wastewater Performance to Meet Competing Effluent Quality Goals	Betty Jordan, Alan Plummer Associates, Inc.	The objective of this project is to develop a design and performance matrix for water quality parameters in surface and sub-surface wetland systems.	7/1/2010

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WRF-05-010	Oxidative Destruction of Organics in Membrane Concentrates	Paul Westerhoff, Arizona State University	The goal of this project is to develop a post-treatment oxidation process for removing organics in membrane concentrates.	3/1/2010
WRF-06-003	The Occurrence of Infectious Cryptosporidium Oocysts in Raw, Treated, and Disinfected Wastewater	Zia Bukhari, American Water	Employ a cell culture assay to determine the occurrence and concentration of infectious Cryptosporidium oocysts in a variety of secondary and tertiary effluents and effluents disinfected by UV, chlorine, and ozone. Organize and present the results of the investigation to enable health professionals to assess the risk of Cryptosporidiosis for planned and un-planned potable reuse and recreational water bodies impacted by treated recycled water.	6/1/2011
WRF-06-004	Identifying Health Effects Concerns of Water Reuse Industry and Prioritizing Research Needs for Nomination of Chemicals for Research to Appropriate National and International Agencies	Joseph Cotruvo, Joseph Cotruvo and Associates, L.L.C.	The objective of this project is to develop an approach for agencies to perform health effects studies on contaminants of interest to the water reuse community, such as: contaminants known to occur, but for which there is limited health effects information; or mode of action studies on chemicals whose regulation might result in changes to utilization of the chemical or changes in water reuse treatment. The project will produce a ranking in order to give attention to subjects of immediate concern.	9/15/2010

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WRF-06-006	Comparisons of Chemical Composition of Recycled and Conventional Waters	Shane Snyder, Southern Nevada Water Authority	The objective of this project is to develop a data set that compares the quality of water and the chemical composition of water produced by planned water reuse projects with the quality and chemical composition of conventional water produced from surface and ground sources that are impacted by waste discharges.	9/15/2010
WRF-06-007	Investigation of Membrane Bioreactor Effluent Water Quality and Technology	Joan Oppenheimer, MWH Global	The goal is to prepare a comprehensive desktop study of existing membrane bioreactor (MBR) installations in order to create a better understanding of using MBR technology in the treatment of municipal-type wastewater by characterizing MBR effluent water quality and identifying the strengths and weaknesses of MBR technology through operational histories.	8/1/2010
WRF-06-008	Low Cost Treatment Technologies for Satellite Water Reclamation Plants	Andrew Salveson, Carollo Engineers	The overall goals of this project are to identify and evaluate established and innovative treatment technologies that will meet the following criteria: provide economic treatment processes that can be used in small-scale water reclamation plants; maximize automation to minimize labor requirements; increase treatment efficiency without sacrificing water quality; increase simplicity of operation; and increase the potential to export new treatment technologies to developing countries.	5/1/2010

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WRF-06-009	Predictive Models to Aid in Design of Membrane Systems for Organic Micropollutants Removal	Colorado School of Mines	This project will improve and expand on one or more recently developed preliminary modeling techniques to predict the rejection of bioactive pharmaceuticals and specific disinfection byproducts (DBPs) by RO membranes. Development of such models will ultimately eliminate the need for extensive chemical analyses and costly field trials using pilot-scale or full-scale RO systems.	11/30/2011
WRF-06-010A	State of the Science Review of Membrane Fouling: Organic, Inorganic and Biological	HDR Engineering	The goal of this project is to summarize the current state of activity in the area of membrane fouling, including biological, organic, and inorganic causes. The goal is to create new concept ideas in fouling understanding and management.	9/1/2010
WRF-06-010B	Feasibility study of Offshore Desalination Plants	HDR Engineering	This project will perform a comprehensive literature review in order to study the technical and economic feasibility of offshore desalination plants and make recommendations on the most favorable avenues of research.	9/15/2010

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WRF-06-010D	Consideration for the Co-Siting of Desalination Facilities with Municipal and Industrial Facilities	Val Fenkel, Kennedy/Jenks Consultants	The goal of this project is to identify and document economic, environmental, water supply, water quality, or other advantages in co-siting new desalination facilities with municipal or industrial operations.	1/1/2011
WRF-06-010E	Development of Selective Recovery Methods for Desalination Concentrate Salts	Kerry Howe, University of New Mexico	The goal of this project is to develop selective recovery and purification methods for common desalination concentrate salts and identify potential regional markets for beneficial reuse.	2/1/2012
WRF-06-011	Enhanced Disinfection of Adenoviruses with UV Irradiation	Karl Linden, UC Boulder	The objectives of this research are to investigate the use of polychromatic medium pressure and pulsed UV sources for inactivation of a number of adenovirus types, and compare the results of the conventional cell culture assays to those using an animal infectivity method.	11/1/2010

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WRF-06-012	Optimization of Advanced Oxidation Processes (AOP) for Water Reuse	Fernando Rosario-Ortiz, Southern Nevada Water Authority	The main objective of this project is to provide parameters for the optimization of AOP for water reuse applications by creating target guidelines for the application of hydrogen peroxide based on the oxidative capacity of the waters and system hydroxyl radical production.	4/1/2010
WRF-06-013	Investigating the Feasibility of a Membrane Biofilm Reactor (MBfR) to Achieve Low Nitrogen Levels for Water Reclamation and Reuse	Shane Trussell, Trussell Technologies Inc.	The principle objective is to evaluate the membrane biofilm reactor (MBfR) process for meeting strict nutrient requirements in advanced wastewater treatment for water reuse or reclamation. The MBfR will be evaluated and compared with a conventional biological denitrification filter with methanol addition for process footprint, economics, sludge production, and most important effluent water quality with a focus on nitrogen.	8/1/2010
WRF-06-014	Characterization of US Seawaters and Development of Standardized Protocols for Evaluation of Foulants in Seawater Reverse Osmosis Desalination	MWH	This project addresses the emerging issue of seawater desalination for water scarce coastal regions by providing a novel approach to understanding flux decline during seawater reverse osmosis (SWRO). Validated experimental data will be combined with seawater characterization in order to determine causes and to quantify the extent of SWRO fouling by utilizing innovative bench scale testing protocols, analytical techniques and membrane autopsy procedures. Standardized testing protocols will be developed and applicable analytical techniques will be recommended.	8/1/2010

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WRF-06-015	Sequential UV and Chlorination for Reclaimed Water Disinfection	Chi-Chung Tang, Los Angeles County Sanitation District	The overall objectives of this project are to identify reclaimed water disinfection alternatives consisting of various combinations of UV and chlorine and to determine their performance with respect to: pathogen inactivation, DBP minimization, cost-effectiveness, and removal of selected emerging pollutants of concern.	6/1/2010
WRF-06-016	Guidance on Links between Water Reclamation and Reuse and Regional Growth	Chris Scott, University of Arizona	The first objective is to provide background and guidance to water reclamation and reuse (WRR) managers and decision makers on connections between WRR, water supply reliability, regional economic growth, demographic growth, and quality of life impacts for current residents. The second is to improve the ability of water agency personnel to understand and respond to public concerns by providing background on questions and pronouncements frequently made about links between water supply and growth, especially as related to the role of WRR in supply reliability.	5/15/2011
WRF-06-017	Water Reuse in 2030	Karl Linden, UC Boulder	The objectives of this project are to document the current status of water reuse; project the global status of planned water reuse in the year 2030; describe the scale and scope of challenges that will shape and influence water reuse in the industrialized world over the intervening years; and provide direction on adaptive strategies and research needs based on the future challenges which will be identified and characterized.	1/1/2011

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WRF-06-018	Tools to Assess and Understand the Relative Risks of Indirect Potable Reuse and Aquifer Storage and Recovery Projects	Inland Empire Utilities Agency	The objective of this project is to find innovative ways to address existing and future health concerns of indirect potable reuse and aquifer storage and recovery projects related to compounds that are currently regulated, under consideration for regulation, or unregulated, but of emerging concern. The project will build on existing research, with the intent to provide the water reuse community with practical information that can be easily communicated to the public and regulatory agencies, and to find new information on the types of compounds that should be evaluated in the future for possible health concern.	8/28/2011
WRF-06-019	Monitoring for Microcontaminants in an AWT Facility and Modeling Discharge of Reclaimed Water to Surface Canals for Indirect Potable Use	South Florida Water Management District	This project has the following goals: identify the microcontaminants present in the influent and the effluent of the AWT system; determine the microcontaminant removal efficiencies of various best available AWT processes; evaluate the toxicity of reclaimed water discharges, allowing for a comparison between levels of microcontaminants and effluent water toxicity; and predict post-operational hydrodynamics and water quality impacts in surface canals after discharge of reclaimed water.	4/30/2010
WRF-06-020	Attenuation of Emerging Contaminants in Streams Augmented with Recycled Water	Santa Clara Valley Water District	The objective of this project is to assess the potential impact of large-scale augmentation, and to monitor and qualify the removal by natural attenuation of wastewater-derived contaminants. The major goals of the proposed study are to: develop insight into attenuating mechanisms; extend the range of contaminants to include NDMA and perfluorochemicals; and investigate the usefulness of rhodamine WT for predicting the attenuation of wastewater-derived organic contaminants with river transport.	5/31/2010

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WRF-06-021	Interagency Partnerships to Facilitate Water Reuse	City of San Jose Environmental Services Department	The objective of this project is to review previous interagency agreements and assess their effectiveness and survey attitudes of decision makers in the San Francisco Bay area towards partnerships designed to implement water reuse, as well as obtain detailed information about agency motivations and sensitivities through a facilitated workshop.	11/28/2010
WRF 07-01	Validation of Microbiological Methods for Use with Reclaimed Waters	Mark LeChevallier, American Water	The goal of this project is to identify microbiological agents and methods useful for evaluating reclaimed waters. In addition, the project aims to develop a framework that can be turned into full protocols in order to create validation studies of assessing methods for priority microbiological agents. These goals will be achieved by conducting a thorough literature review of present microbiological methods and through convening a workshop to identify organisms of high priority health significance in reclaimed water.	1/9/2011
WRF-07-02	Development of Information Clearinghouse on Concentrate and Salt Management Processes – Phase I	Mike Mickley, Mickley & Associates	This project is designed to create a comprehensive information clearinghouse on concentrate and salt management practices. The project will be split into two phases. The first phase will involve the development of the information clearinghouse by extensive literature and methodology review in addition to a regional focus workshop. The second phase will deal with the development of guidelines for concentrate management and disposal in water reuse and desalting projects.	1/9/2011

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WRF-07-03	Talking About Water: Vocabulary and Images that Support Informed Decisions About Water Recycling	Linda MacPhearson, CH2M Hill	The goal of this project is to provide stakeholders an appropriate common vocabulary to create a greater degree of understanding about water reuse and desalination. This project will identify words and images and develop a lexicon that enhances effective communication and open consideration of water reuse and desalination.	9/30/2010
WRF 07-04	Evaluation of Impact of Nanoparticle Pollutants on Water Reclamation	Ganesh Rajagopalan, Kennedy/Jenks Consultants	Due to the increased use of nanomaterials in industrial and commercial products, there is a possibility of an increased presence of these materials in reclaimed water. The objective of this project is to study the impact of manufactured nanomaterials in both activated sludge and media filtration water reclamation processes. Nano zinc oxide and nano silver will be used to assess the impact on the reclaimed water process.	3/15/2011
WRF-07-05	Membrane Distillation for Water Reuse using Nanostructured Ceramic Membranes	Mark Wiesner, Duke University	The objective of this project is to develop and characterize ceramic membranes that possesses the structural stability, pore size, hydrophobicity and modified surface chemistries for use in direct contact membrane distillation; to integrate these membranes into a bench scale unit; and to evaluate the performance of these membranes for water reuse applications at bench scale in conditions representing wastewater RO concentrate treatment.	9/1/2010

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WRF-07-06	Recycled Water Use in Zoo and Wildlife Facility Settings and Potential Effects of Animal Health and Well Being	Cheryl Munoz (San Francisco Public Utilities Commission) and Derrick Wong (Metcalf & Eddy)	The objectives of this project are to: research existing data on the use of recycled water in zoo and wildlife facility settings and evaluate to assess the feasibility of using recycled water in zoos and wildlife facilities, identify data gaps, and determine barriers or obstacles preventing recycled water use in these settings; identify water quality requirements for long-term animal health of specified animals and compare these requirements with tertiary and advanced treated recycled water quality to determine suitability; and to develop recommendations for successful zoo and wildlife facility recycled water projects.	7/2/2010
WRF-08-01	Developing Standards/Criteria for Various End Uses of Recycled Water	Margie Nellor, Nellor Environmental Associates	The goal of this project is to assess the rationale and alternatives for developing general criteria or standards for water reuse. It will explore alternatives ranging from national regulations to voluntary consensus industry standards, water reuse criteria, or guidelines.	11/15/2010
WRF-08-02	Attenuation of PPCP/EDCs through Golf Courses using Reuse Water	Mike McCullough, Northern California Golf Association	The intent of this research program is to examine the fate and transport of PPCP/EDCs in turf systems, when reuse water is used as the sole source of irrigation. This will be accomplished by reviewing and identifying the most prevalent PPCP/EDCs in reuse water, developing reliable sampling and analytical methods, and carrying out laboratory, plot-scale, and field studies.	12/1/2010

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WRF-08-03	Investigation of Social, Environmental, Natural and other Informational Factors that Influence Judgments and Decisions about Water Reuse	TBD	This project will build from other work done by the Foundation on the theme of public perception, but will move further toward advancing understanding about how knowledge and images, marked by positive or negative affective feelings, guide public judgment and decision making. The result of the work is intended to be an extensive, comprehensive document that combines insight into theories about public resistance/outrage with the practical aspects of success.	TBD
WRF-08-04	Approaches to Maintain Consistently High Quality Reclaimed Water in Storage and Distribution Systems	Tim Thomure, HDR	This project builds on WRF-05-002 which preliminary results showed treatment processes that significantly remove TOC, AOC, and BDOC tend to have less bacterial regrowth, especially when chlorine residual can be maintained. This project will further investigate the origins of recycled water quality degradation during storage and distribution so that the utility for non potable reuse applications can be maximized and reliability maintained.	12/15/2011
WRF-08-05	Use of Ozone in Water Reclamation for Contaminant Oxidation	Shane Snyder, SNWA	This project evaluates the potential of ozone for contaminant oxidation in a variety of reclaimed water qualities. A key component of this study will be the evaluation of ozonation in combination with a variety water of treatment processes.	12/1/2012

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WRF-08-06	Evaluation of Alternatives to Domestic Ion Exchange Water Softeners	Wontae Lee (HDR), Peter Fox (ASU)	Municipal water reuse is being limited in communities where domestic ion exchange water softeners are prevalent. This project looks at alternative technologies that have the potential for providing the needs to these communities. This project will assess the effectiveness of alternative domestic water treatment devices to alleviate the negative impacts associated with hard water and compare the energy, chemical consumption and water use of alternative domestic water treatment devices with existing ion exchange water softeners.	10/1/2011
WRF-08-07	Disinfection Guidelines for Satellite Water Recycling Facilities	Joe Jacangelo, MWH Americas, Inc.	The objective of this project is to produce a set of disinfection guidelines for satellite water recycling facilities that provide uniform public health protection and, yet take advantage of superior treatment and reliability where it is available, therefore giving an alternative to the currently chlorine disinfection regulations (California's Title 22) that treat all effluents from biological treatment facilities the same way.	10/1/2012
WRF-08-08	Pilot-Scale Oxidative Technologies for Reducing Fouling Potential in Water Reuse and Drinking Water Treatment membrane Systems	Ben Stanford, Southern Nevada Water Authority	This project will investigate the potential for pilot-scale oxidative technologies placed upstream of membrane treatment to reduce the organic fouling of NF and RO membranes during drinking water treatment, reuse, and desalting applications. Additionally, mechanisms associated with organic fouling with and without oxidative pre-treatment will be investigated along with relative energy costs and carbon footprints associated with each technology.	10/19/2011

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WRF-08-09	Value of Water Supply Reliability in Residential Sector	Bob Raucher, Stratus Consulting, Inc.	To more accurately characterize the value of changes in water supply reliability to residential users through the application of relevant economic valuation techniques, relying on advanced statistical analysis of residential stated preference data collected via state-of-the-art survey methods. This assessment would address a variety of factors that may affect willingness to pay for reliability and update currently outdated empirical information.	12/27/2011
WRF-08-10	Maximizing Recovery of Recycled Water for Groundwater Recharge Employing an Integrated Membrane System	Christopher Yu, PSOMAS	The main objective is to determine if nanofiltration and a new generation of low pressure reverse osmosis membranes can be operated at higher recovery and permeate flux resulting in lower overall operating costs while maintaining a product quality comparable to conventional reverse osmosis (RO) membranes. A secondary objective will determine if RO brine can be minimized with nanofiltration.	1/19/2011
WRF-08-11	Process Optimization, Monitoring and Control Strategies, and Carbon and Energy Footprint Evaluation in Water Reuse: Full-Scale Microfiltration, Reverse Osmosis and UV/H ₂ O ₂	Ken Ishida, OCWD	This project will look at ways to minimize energy utilization and maximize treatment efficiency in a hydrogen peroxide based advanced oxidation process by trying to understand several parameters in the chemical system and then optimize the system. Detailed chemical characterization of foulants and overall AOP system optimization will be studied.	8/16/2013

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WRF-08-12	Assess Water Use Requirements and Establish Water Quality Criteria needed for Application of Reclaimed Waters and Water Reuse in Energy, Power, and Biofuels Production.	Dave Smith, Merritt Smith Consulting	The objective is to determine the application potential, requirements, and water quality criteria for using reclaimed and other non-conventional waters in the different aspects of energy, power, and biofuels production, including the production of electrical power, energy, and biofuels biomass feedstock production and pre-processing.	3/1/2012
WRF-08-13	Renewable Energy, Peak Power management, and Optimization of Advanced Treatment Technologies to Reduce Greenhouse Gases at Water Reuse and Desalination and Wastewater Membrane Treatment Plants	Joe Jacangelo, MWH Americas, Inc.	The objective of this project is to increase the use of renewable energy sources, develop management strategies to reduce peak power use and optimize advanced treatment technologies to reduce CO ₂ emissions to meet the State of California's goal to increase it's renewable energy portfolio and it's commitment to reducing greenhouse gas emissions to Kyoto Protocol standards.	2/11/2012
WRF-08-14	Evaluation and Optimization of Existing and Emerging Energy Recovery Devices for Desalination and Wastewater Membrane Treatment Plants	TBD	Energy recovery devices, including pressure exchangers and turbines, are used in order to lower overall energy consumption associated with membrane systems. This project will assess the different types of currently available and emerging energy recovery devices, their applications, and their performance. A guidance manual will be produced to help utilities using membranes for desalination and wastewater treatment processes to select an appropriate energy recovery device.	TBD

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WRF-08-15	Evaluating Emergency Planning Under Climate Change Scenarios to Better Assess the Role of Water Reuse.	Robert Raucher, Stratus Consulting, Inc.	This project aims to better understand the role of water reclamation and reuse under climate change scenarios by developing a methodology for assessing climate change-related risk to water utilities and demonstrate this methodology using real data.	12/30/2011
WRF-08-16	Implications of Future Water Supply Sources on Energy Demands	Heather Cooley, Pacific Institute	To provide a projection in energy demand changes resulting from shifts in future water supply sources, population increases, and increased water conservation efforts by quantifying the impacts on energy requirements associated with three parameters. This project will put into perspective, with respect to energy use, tapping alternative water sources, the net environmental benefits and drawbacks of these sources, and how to connect these sources with tomorrow's energy requirements.	12/15/2011
WRF-08-17	Reclaimed Water Desalination Technologies: A Full-Scale Performance and Cost Comparison between EDR and MF/RO	Shane Trussell, Trussell Technologies, Inc.	This project will compare the two most commonly applied desalination technologies for tertiary wastewater treatment: microfiltration/reverse osmosis (MF/RO) and electrodialysis reversal (EDR) by assessing the actual performance, along with operational and capital costs to improve the industry's understanding of these technologies.	9/19/2010

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WRF-08-18	Potential Infectivity Assay for Giardia Lamblia Cysts	Giovanni Widmer, Tufts University	The goal of this project is to develop a molecular assay for discriminating between infectious and dead cysts of the protozoan <i>Giardia lamblia</i> . Although <i>G. lamblia</i> cysts are easy to detect with immunofluorescence, such tests do not differentiate between infectious and dead cysts. There is considerable interest in finding molecular surrogates for the positive identification of infectious cysts.	7/10/2011
WRF-08-19	Investigation of Desalination Membrane Biofouling	Sunny Jiang, University of California Irvine	This project will identify and quantify water quality constituents and environmental factors that trigger accelerated biofouling of seawater desalination reverse osmosis membranes and will determine key species of marine microorganisms involved in biofilm formation. This project also aims to define the thresholds of easy to measure seawater parameters which could be used as precursor indicators of accelerated biofouling.	12/2/2011
WRF-09-01	The Effect of Prior Knowledge of 'Unplanned' Potable Reuse on Acceptance of 'Planned' Potable Reuse	TBD	The main objective of this project is to investigate and determine if community knowledge and awareness of 'unplanned' effluent discharges into the raw water supply improves acceptance of 'planned' discharges. This will be accomplished by testing communication techniques, determining whether discharge influences community acceptance, and advancing knowledge regarding how drinking water treatment influences community acceptance of recycled water.	TBD

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WRF-09-02	When to Use indirect Potable Reuse Systems vs. Dual Pipe Systems (With or Without Point of Use Treatment)	TBD	This project will create a planning framework with a toolkit that considers both indirect potable reuse (IPR) and dual pipe reclaimed water distribution systems that can include point of use treatment requirements, enabling utilities to make an informed decision in the investment of reuse options. The project will address issues, advantages, and obstacles in the implementation of an IPR program, dual pipe reuse system, or combinations therein to enable utilities to objectively plan projects against triple bottom line objectives.	TBD
WRF-09-03	Utilization of HACCP Approach for Evaluating Integrity of Treatment Barriers for Reuse	TBD	This project seeks to develop an alternative approach for evaluating microbial water quality of recycled water effluent through the HACCP process. It will document the applicability of HACCP for monitoring and control of reclaimed water processes.	TBD
WRF-09-04	The Value of Water Supply Reliability in the CII Sector	TBD	The objective of this project is to determine more accurately the value of water to key components of the CII sector through the application of relevant economic valuation techniques. It will provide improved empirical information on the value of the reliability of water supply.	TBD
WRF-09-05	Case Studies of Seasonal Storage of Reclaimed Water for Discharge into Surface Waters	Alan Rimer, Black & Veatch	This proposed investigation aims to provide an overview of "lessons learned" from existing case histories where treated wastewater and/or stormwater has been discharged into surface waters and then subsequently withdrawn after various time periods.	7/2/2011
WRF-09-06a	New Techniques for Real-Time Monitoring of Membrane	TBD	To develop new instruments or methods that facilitate real-time detection of viruses and determination of their removal for compliance	TBD

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WRF-09-06b	Monitoring of Membrane Integrity for Virus Removal	TBD	purposes. The study will also assess the compliance of the method with the requirements for virus removal.	TBD
WRF-09-07	Risk Assessment Study of PPCPs in Recycled Water to Support Public Review	Laura Kennedy, Kennedy/Jenks Consultants	The objective of this research is to provide quantitative human health risk assessment results for pharmaceuticals and personal care products (PPCPs) in recycled water for a representative set of treatment and non-potable use cases. The proposed effort will develop communication strategies and messages to advance the public understanding of relative risks associated with recycled water use.	12/17/2011
WRF-09-08	Evaluation of Potential Nutrient Impacts Related to Florida's Water Reuse Program	Joe Jacangelo, MWH Americas, Inc.	The objective of this study is to provide a better understanding of the contribution of nutrient loading from storm water runoff and reclaimed water irrigation by performing a set of bench and field experiments in conjunction with analysis of a suite of appropriate marker compounds to trace phosphorous and nitrogen loads back to their sources of origin.	3/1/2012
WRF-09-09	Pilot Testing Pre-Formed Chloramines as a Means of Controlling Biofouling in Seawater Desalination	Shane Trussell, Trussell Technologies, Inc.	This project will test if pre-formed chloramines will not adversely affect seawater membranes; develop and confirm the proposed method for manufacturing chloramines onsite; and confirm by testing that pre-formed chloramines are successful in reducing biofouling in seawater reverse osmosis.	6/31/11

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WRF-09-10	Use of UV and Fluorescence Spectra as Surrogate Measures for Contaminant Oxidation and Disinfection in the Ozone/H ₂ O ₂ Advanced Oxidation Process	TBD	The proposed research will facilitate use of the ozone/peroxide process for wastewater treatment by developing inexpensive yet precise online measurements of UV and fluorescence spectra as surrogates for contaminant oxidation and disinfection efficacy. In addition to providing significant cost savings, reduced DBP formation, and lower energy requirements for AOPs, the proposed research will develop the concept of chlorine, chloramine and ozone CT values for potential endocrine disrupting compounds (EDCs) and will provide an EDC _T for total estrogenic activity.	TBD
WRF-09-12	Continuous Flow Seawater RO System for Recovery of Silica-Saturated RO Concentrate	John Balliew, Mike Fahy (EPWU)	This project will use a seawater RO system in a continuous-flow mode to investigate the extent to which water can be recovered from the concentrate (with concomitant volume reduction) without fouling the membranes with the goal of having greater recovery of water from the brackish groundwater feed while at the same time rendering the super concentrate more amenable to by-product recovery and/or final disposal by evaporation.	11/1/2011

*TBD = To Be Determined