



Arizona Corporation Commission

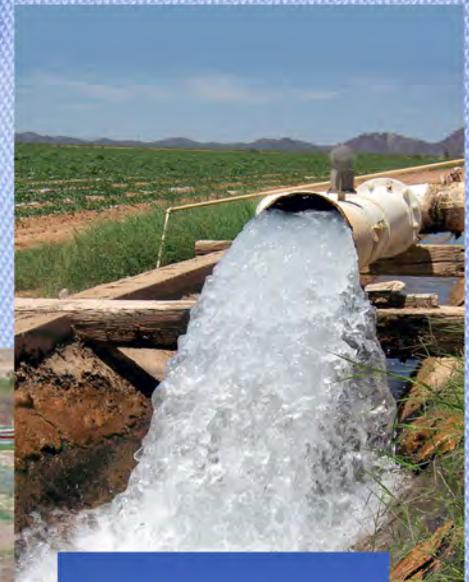


Arizona
Department of
Water Resources

Blue Ribbon Panel on Water Sustainability

Final Report

November 30, 2010



Arizona
Department of
Environmental
Quality



Arizona
Department
of Water
Resources



Arizona
Corporation
Commission



November 30, 2010

The Honorable Janice K. Brewer
Governor of Arizona
1700 West Washington
Phoenix, Arizona 85007

Re: Final Report of the Governor's Blue Ribbon Panel on Water Sustainability

Dear Governor Brewer,

Upon your announcement of the formation of the Blue Ribbon Panel (BRP) on Water Sustainability, we appointed 40 individuals representing diverse water interests in Arizona and asked them to collaborate and work toward a goal of improving statewide water sustainability through increased recycling and conservation.

Over the past year, panelists and interested stakeholders representing large and small cities, counties, agriculture, industry, Indian Tribes, environmental interests, Arizona universities, legislative leaders, and other experts in Arizona water issues were challenged to identify and overcome obstacles to increased water sustainability, a matter vital to the future of Arizona.

Under our direction, the BRP worked to provide advice to the Department of Environmental Quality, Department of Water Resources and to the Corporation Commission on the technical, legal and policy means of promoting water conservation and recycling of all sources of water.

We are pleased to provide you this report of the findings of the BRP which includes specific recommendations for action to advance the water sustainability goals. We feel that our continued collaboration with stakeholders to implement these recommendations will lead to real and measurable advancement in the sustainability of Arizona's precious water resources.

Sincerely,

Handwritten signature of Benjamin H. Grumbles in blue ink.

Benjamin H. Grumbles
ADEQ Director

Handwritten signature of Herbert R. Guenther in blue ink.

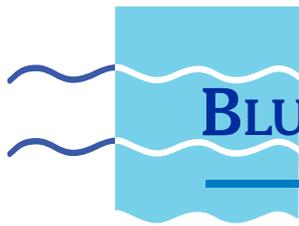
Herbert R. Guenther
AWDR Director

Handwritten signature of Kristin K. Mayes in blue ink.

Kristin K. Mayes
ACC Chairman

cc: The Honorable Robert Burns
The Honorable Kirk Adams
Blue Ribbon Panel Members
The Honorable Gary Pierce
The Honorable Russell Pearce

The Honorable Paul Newman
The Honorable Sandra D. Kennedy
The Honorable Bob Stump
The Honorable Brenda Burns



BLUE RIBBON PANEL MEMBERS

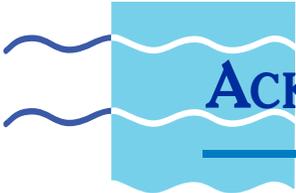
Member	Organization
Kristin Mayes, Chair	ACC
Benjamin Grumbles, Director	ADEQ
Herbert Guenther, Director	ADWR
Chris Udall, Executive Director	Agri-Business Council of AZ
Edward Gowan, Executive Director	Arizona Golf Association
John Gall, Development Consultant	Arizona Land Quest, LLC
Ken Strobeck, Executive Director	Arizona League of Cities and Towns
Steve Olson, Executive Director	Arizona Municipal Water Users Association
Bob Lotts	Arizona Public Service
Senator John Nelson	Arizona State Legislature
Representative Lucy Mason	Arizona State Legislature
Representative Ray Barnes	Arizona State Legislature
Paul Townsley, President	Arizona-American Water
Ron Doba, Past President	AZ WaterReuse Association
David Modeer, General Manager	Central Arizona Project
Brad Hill, Water Resources Mgr	City of Flagstaff
Tom Buschatzke, Water Policy Advisor	City of Phoenix
John Kmiec, Environmental and Regulatory	Compliance Supervisor, City of Tucson
Mary Alexander	DMB Developments
Ron Rayner	Farming and Irrigation
Lyn White	Freeport-McMoRan
Trevor Hill, President	Global Water
Kevin Kinsall, Governor's Policy Advisor on Natural Resources	Governor's Office
Gayl Shingoitewa-Honanie, Director, Hopi Environmental Protection Office	Hopi Nation
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John R. Lewis, Executive Director	Inter-Tribal Council of AZ
Warren Tenney	Metro DWID - Tucson
Guy Carpenter	National WaterReuse Association
Stephen B. Etsitty, Director, Navajo Nation EPA	Navajo Nation
Steve Brophy	Page land & Cattle Company
Kathy Chavez, Water Policy Manager	Pima County Regional Wastewater
Supervisor David Snider	Pinal County

Member	Organization
John Sullivan, Associate General Manager	Salt River Project
Bonnie O'Connor, President	Southwestern Utility Management, Inc.
Brenda Burman	The Nature Conservancy
Paul Bonavia, President	Tucson Electric Power
Sharon Megdal, Director	University of Arizona Water Resources Research Center
Mike Rutherford, Chairman	Upper San Pedro Water District
Randy Chandler	US Bureau of Reclamation
Tom Davis	Yuma County Water Users Association

FORMER MEMBERS

Michael Anable – Former Governor's Policy Advisor on Natural Resources

Carol Erwin – US Bureau of Reclamation



ACKNOWLEDGEMENTS

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Chuck Graf, ADEQ	Steve Olea, ACC
Monica Hart, ADEQ	Sheila Stoeller, ACC

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Craig Kafura, ADEQ	Lisa Williams, ADWR
David Lelsz, Ph.D., ADEQ	Carrolette Winstead, ADEQ
Wendy LeStarge, ADEQ	

Working Group Chairs/Co-Chairs

Guy Carpenter, Chair – Infrastructure/Retrofit	Graham Symmonds, Co-Chair - Infrastructure/Retrofit
Kathy Chavez, Chair – Public Perception/Acceptance	Karen Dotson, Co-Chair - Public Perception/Acceptance
Ron Doba, Chair – Regulations/Permitting	Tom Buschatzke, Co-Chair - Regulations/Permitting
Steve Olson, Chair – Conservation/Recycling/Efficiency/Energy-Water Nexus	Bob Lotts, Co-Chair - Conservation/Recycling/Efficiency/Energy-Water Nexus
David Snider, Chair – Economic/Funding	Bonnie O'Connor, Co-Chair - Economic/Funding

All the Dedicated Individuals who participated in the numerous Working Group Meetings (See Appendix I)

BRP Meeting Presenters

May 7th Meeting

- Melaney Seacat, Senior Program Manager, Pima County Regional Wastewater Reclamation Dept.
- Nicole Ewing-Gavin, Assistant to City Manager, City of Tucson
- Trevor Hill, President and CEO, Global Water

March 5th Meeting

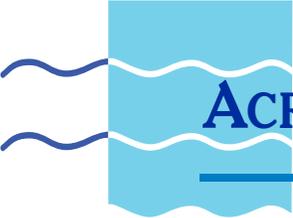
- Michele Robertson, Groundwater Section Manager, ADEQ
- Charles G. Graf, R.G., Senior Hydrologist, Water Quality Division, ADEQ
- Robert A. Lotts, Water Resources Manager, Arizona Public Service Co.
- Karen Collins, Water Sustainability Analyst, Salt River Project
- Sandra Fabritz, Assistant Director, Water Management Division, ADWR

February 5th Meeting

- Guy Carpenter, WaterReuse Association
- Dr. Channah Rock, Assistant Professor, Water Quality Specialist, University of Arizona

January 8th Meeting

- Linda Stitzer, Regional Planner, ADWR



ACRONYMS

AAWS	Assured & Adequate Water Supply Program
ACC	Arizona Corporation Commission
ADEQ	Arizona Department of Environmental Quality
ADES	Arizona Department of Economic Services
ADHS	Arizona Department of Health Services
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Management
AMA	Active Management Area
APP	Aquifer Protection Permit
AZPDES	Arizona Pollutant Discharge Elimination System
BADCT	Best Available Demonstrated Control Technologies
BMP	Best Management Practice
CAGR	Central Arizona Groundwater Replenishment District
CAP	Central Arizona Project
CC&N	Certificate of Convenience & Necessity
CGP	Construction General Permit
DAWS	Designation of Assured Water Supply
DSM	Demand Side Management
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GAC	Granular Activated Carbon
GIU	General Industrial Use
GMA	Groundwater Management Act
GPCD	Gallons per Capita per Day
GSF	Groundwater Savings Facility
IGFR	Irrigation Grandfathered Right
IMS	Irrigation Management Service
IPR	Indirect Potable Reuse
IT	Information Technology
KERP	Kino Environmental Restoration Project
MNPCCP	Modified Non-Per Capita Conservation Program
MSGP	Multi-Sector General Permit
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
PWS	Public Water System
RO	Reverse Osmosis
SIC	Standard Industrial Classification
USF	Underground Storage Facility
WCMP	Water Conservation Management Program
WET	Whole Effluent Toxicity



EXECUTIVE SUMMARY

It is a common understanding that water is crucial to our existence and all living things. Without abundant fresh water supplies life as we know it would not be possible. This is especially true in the arid southwest. However, through extensive commitments to developing, conserving, and protecting fresh water supplies for more than a century, Arizona has flourished in an otherwise inhospitable environment. Early Arizonans made significant contributions to developing water supplies for agricultural, industrial and domestic purposes and set the stage for Arizona to be a recognized leader in sustainable water supply planning and development. Because water is fundamental to economic development and ecosystem health, Arizona leaders maintain their commitment to the sustainability of our water supplies to ensure future economic prosperity and enhanced quality of life for current and future generations of Arizonans.

In consideration of Arizona's water supply portfolio and the demands that development increasingly puts on these resources, finding new untapped water supplies is becoming a challenge; however, water planners recognize opportunities for the increased use of all types of recycled water (reclaimed water, gray water, storm water, etc.) to help meet these challenges. Recycling some of these sources of water has been practiced by some Arizona communities and industries (including agriculture) for decades. However, a perception that these sources are "wastes" inhibits the ability to take full advantage of resources available right in our own backyard.

On August 28, 2009, Governor Brewer, continuing Arizona's long leadership tradition in water resource planning, announced the formation of the Blue Ribbon Panel on Water Sustainability (Panel). Governor Brewer's announcement highlighted water conservation and recycling as a priority to improve water sustainability and increase its visibility in Arizona. Recognizing that collaboration is essential in planning for Arizona's water future, Governor Brewer announced joint chairmanship of the Panel by Arizona Department of Water Resources (ADWR) Director Herb Guenther, Arizona Department of Environmental Quality (ADEQ) Director Ben Grumbles, and Arizona Corporation Commission (ACC) Chairman Kris Mayes (collectively the Executive).

Forty members representing diverse water interests in Arizona - large and small cities, counties, agriculture, industry, Indian Tribes, environmental interests, Arizona universities, legislative leaders, and other experts in Arizona water issues - were appointed to the Panel. A list of Panel members is provided in the *Panel Members & Acknowledgements* section preceding this Executive Summary.

The Panel held its first meeting on January 8, 2010, and was challenged to identify and overcome obstacles to increased water sustainability. The Panel was instructed to provide advice to ADWR, ADEQ and the ACC on the technical, legal, and policy means of promoting water conservation and recycling of reclaimed water, gray water, storm water, and other waters. Soon after, the Panel set out its purpose:

To advance water sustainability statewide by increasing reuse, recycling, and conservation to protect Arizona's water supplies and natural environment while supporting continued economic development and to do so in an effective, efficient and equitable manner.

In meeting this purpose, Panel members agreed to the goal of providing recommendations on statute, rule, and policy changes that, by the year 2020 in Arizona, would significantly:

1. Increase the volume of reclaimed water reused for beneficial purposes in place of raw or potable water,
2. Advance water conservation, increase the efficiency of water use by existing users, and increase the use of recycled water for beneficial purposes in place of raw or potable water,
3. Reduce the amount of energy needed to produce, deliver, treat, and reclaim and recycle water by the municipal, industrial, and agricultural sectors,
4. Reduce the amount of water required to produce and provide energy by Arizona power generators, and
5. Increase public awareness and acceptance of reclaimed and recycled water uses and the need to work toward water sustainability.

The Panel established five Working Groups, each chaired by a Panel member and open to the public to facilitate discussion of issues and involve the broadest spectrum of stakeholders and technical experts. The five Working Groups and their respective chairs and purposes are as follows:

- **Public Perception/Acceptance**

Chair: Kathleen Chavez, Water Policy Manager, Pima County Regional Wastewater Reclamation

Purpose: Make recommendations for enhancing public acceptance of the use of reclaimed and recycled waters through public education, outreach, and other strategies.

- **Regulations and Permitting**

Chair: Ron Doba, President, Arizona WateReuse Association

Purpose: Identify regulatory impediments and make recommendations to streamline the reuse of reclaimed water.

- **Infrastructure/Retrofit**

Chair: Guy Carpenter, Board of Directors, National WateReuse Association

Purpose: Recommend measures that will facilitate the design, construction, operation and maintenance of new and retrofitted reclaimed and recycled water systems.

- **Conservation/Recycling/Efficiency/Energy Nexus**

Chair: Steve Olsen, Executive Director, Arizona Municipal Water Users Association

Purpose: Make recommendations regarding statutes, rules, policies, and strategies for increasing water conservation in the agricultural, industrial, and municipal sectors; increasing the recycling of water that is not considered reclaimed water; and reducing the water cost of energy and the energy cost of water.

- **Economic/Funding**

Chair: David Snider, Supervisor, Pinal County

Purpose: Make recommendations on incentives, approaches to funding, and other mechanisms that will accelerate the reuse of reclaimed and recycled waters.

The chairs and Working Group participants accomplished a stunning amount of work in the few months that followed formation of the Working Groups. Cumulatively, 58 Working Group meetings were held, involving some 320 individuals. The Working Groups identified an abundance of issues, which were summarized in the Interim Report of the Panel, dated July 1, 2010. These coalesced into 40 separate issues (Appendix II), which were presented at the Panel meeting of August 16, 2010.

The Panel further condensed these 40 issues into 26 priority issues (Appendix III) and directed the applicable Working Groups to develop “white papers” analyzing the issues and provide recommendations based on the analyses. The 26 priority issues addressed public perception, public education, research needs, regulatory impediments, efficient use of water supplies, expanded use of rainwater and stormwater, the interface between water and energy, funding and incentives, and more.

A summary of each white paper was prepared. At its meeting of November 5, 2010, the Panel reviewed the white papers and summaries and consolidated them into 18 sets of recommendations in five categories, as follows:

- Education/Outreach
- Standards
- Information Development and Research Agenda
- Regulatory Improvements
- Incentives.

The 18 sets of recommendations actually encompass a total of 63 separate sub-recommendations. As this number of recommendations is too great to provide an abbreviated digest in this Executive Summary, the reader is referred to Chapter 4 for a full description of the recommendations and Appendix VI for a summary table.

Chapters 2 and 3 of this Final Report aid in understanding the context of the Panel’s recommendations. Chapter 2 provides descriptions of the legal framework in Arizona for regulating reclaimed water, gray water, rainwater harvesting and stormwater, conservation measures, and energy/water nexus relationship. Applicable regulatory programs for ADEQ, ADWR, and ACC are described.

Chapter 3 addresses the current status and potential opportunities to advance water sustainability in these same areas of interest. Discussions include the use of reclaimed and gray water, the extent of rainwater harvesting and stormwater utilization, the considerable impact of conservation measures already implemented, and the emerging area of energy/water nexus opportunities.

All of the recommendations of the Panel now move forward for consideration by Governor Brewer, the Legislature, ADEQ, ADWR, and the ACC. A large proportion of the recommendations involve implementation by ADEQ and ADWR, which will challenge the two agencies in light of budget cuts that have reduced staff levels.

Importantly, the Panel recommends no new regulatory programs or major reconstruction of existing programs. Instead, the Panel’s recommendations include improvements to Arizona’s existing toolbox

of water management, education, and research capabilities. In the Panel's opinion, the current programs administered by ADWR, ADEQ, and the ACC constitute an exceptional framework within which water sustainability can be pursued, and improvements to that framework will move Arizona further toward a secure water supply future.

Although implementation will take time because of the large number of recommendations provided by the Panel, a path forward now exists. As the agencies begin work with stakeholders to implement the Panel recommendations, resulting

advancements in water conservation and increased use of recycled water will benefit all the citizens of Arizona and stand as a tribute to the dedication and intellect of the participants who contributed long hours to the Panel process.

The Final Report of the Governor's Blue Ribbon Panel on Water Sustainability, in its entirety, can be accessed at:

www.azwater.gov/AzDWR/waterManagement/BlueRibbonPanel.htm.

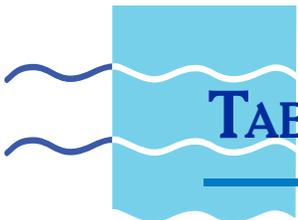
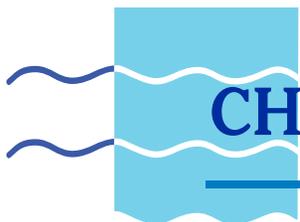


TABLE OF CONTENTS

Chapter 1 - Introduction	1
Chapter 2 - Legal and Regulatory Framework for Water Sustainability	5
Chapter 3 - Current Status and Potential Opportunities to Advance Water Sustainability in Arizona	15
Chapter 4 - Recommendations of the Blue Ribbon Panel on Water Sustainability	21
A. EDUCATION/OUTREACH	21
A.1 – Increasing Public Awareness	21
A.2 – Pharmaceuticals & PCPs	23
B. STANDARDS	24
B.1 – Matching Alternative Water Supplies to Appropriate End Uses	24
B.2 – Developing Comprehensive Reclaimed Water Infrastructure Standards	24
B.3 – Facilitating Indirect Potable Reuse	26
B.4 – Operator Certification for Reclaimed Water Distribution Systems	27
B.5 – Water/Energy Standards	28
B.6 – Permitting Inconsistencies	28
C. INFORMATION DEVELOPMENT & RESEARCH AGENDA	29
C.1 – Coordinating & Streamlining Data Submission	29
C.2 – Promote research on Human Health Effects	29
C.3 – Water/Energy Nexus	30
C.4 – Rainwater Harvesting & Stormwater Research	31
D. REGULATORY IMPROVEMENTS	33
D.1 – Encourage the Use of Alternative Water Supplies	33
D.2 – Eliminate Duplicate Regulations & Fees	33
D.3 – Update Reclaimed Water Quality Standards	34
D.4 – Establish Ratemaking Guidelines	34
D.5 – Address Unique Situations in Recharge, Reuse and AZPDES Permits	35
E. INCENTIVES	37
E.1 – Develop, Expand and Promote Tax Credits for Use of Alternative Water Supplies ..	37
Appendix I – Working Group Membership	38
Appendix II – Working Group Issues (40 Issues)	43
Appendix III – BRP Priority Issues (Top 26)	46
Appendix IV – Municipal Conservation BMPs	49
Appendix V – Working Group White Paper Analyses	51
Appendix VI – Summary of Recommendations	134



CHAPTER 1 - INTRODUCTION

It is a common understanding that water is crucial to our existence and all living things. Without abundant fresh water supplies life as we know it would not be possible. This is especially true in the arid southwest. However, through extensive commitments to developing, conserving, and protecting fresh water supplies, Arizona has flourished in an otherwise inhospitable environment. Early Arizonans made significant contributions to developing water supplies for agricultural, industrial and domestic purposes and set the stage for Arizona to be a recognized leader in sustainable water supply planning and development. As Arizona continues to enhance its economic development, Arizona leaders maintain their commitment to the sustainability of our water supplies to ensure future economic prosperity and enhanced quality of life for current and future generations of Arizonans.

Three State Agencies in Arizona have regulatory and planning authority over water supplies. The Arizona Department of Water Resources (ADWR) is the primary agency responsible for water planning and water rights administration. The Arizona Department of Environmental Quality's (ADEQ) role is to protect and enhance public health and the environment by ensuring safe drinking water and reducing the impact of pollutants discharged to surface and groundwater. The Arizona Corporation Commission (ACC) has jurisdiction over the quality of service and rates of public corporations offering water and wastewater utility service as well as energy policy matters with a nexus to water.

Since 1980, with passage of the Groundwater Management Act (GMA) and establishment of ADWR, Arizona has aggressively managed water supplies in the Active Management Areas (AMA) – requiring utilization of renewable water supplies in lieu of diminishing groundwater supplies for new growth; prohibiting new agricultural lands developed on groundwater supplies; requiring increased efficiency in the use of all water supplies by the largest water-using sectors (municipal, agricultural, and industrial); and encouraging the use of recycled water to meet the increasing water demands for Arizona's communities. The AMA communities have made significant investments to develop

renewable supplies such as the Central Arizona Project (CAP), other surface water supplies and reclaimed water as well as developing conservation programs aimed at stretching these supplies into the future. Outside of the AMAs, including areas along the Colorado River, individual water users and communities have also taken significant steps to improve their water sustainability. However some areas of the state still have limited access to renewable water supplies and reliance predominantly on groundwater continues.

Even with the recent economic downturn, Arizona is still one of the fastest growing states. While the slowdown in the housing boom reflects that fewer people will move to the area in the next few years, Arizona's population is still expected to grow, and with a 26.7 percent increase in population from 2000 to 2008, Arizona ranks second highest in the country¹. In 1980, Arizona's population was 2,716,546 (ADES, 2008). Between 1980 and 2000, Arizona grew at a rate of just over four percent per year to a population of 5,130,632 (ADES, 2008). Between 2000 and 2008 Arizona continued its high growth rate to a population of just over 6.5 million people. Population growth is expected to continue in Arizona with projections in 2025 and 2055 of 9,588,745 and 13,340,646 people, respectively. While total water use in the State has increased, the percentage increase in total water use has not increased at the same rate as population. Between 1980 and 2009 population increased more than 140 percent yet the estimated statewide water use in 2006 is approximately the same as it was during the period from 1975 and 1980, about 7.5 million acre-feet (ADWR, 1994; ADWR, 2009). This reflects the continued focus on conservation of Arizona's most important resource and a conversion from agricultural to urban demands, primarily in the AMAs. However, if the growth that is expected for Arizona is realized, water managers must find additional resources to supply these increasing demands while protecting the natural resources and environment of this State that are of equal importance to the quality of life in Arizona.

As we look at Arizona's water supply portfolio (*Overview of Arizona Water Atlas & Water Use Data,*

¹ Forbes.com: www.forbes.com/2008/12/22/fastest-growing-states-forbeslife-cx_ls_1222realestate.html

January 8, 2010, Panel meeting) and the demands that Arizona’s growing population increasingly puts on these resources, finding new untapped water supplies is a challenge. However, water planners recognize opportunities for the increased and efficient use of all types of recycled water (reclaimed water, gray water, rain water, storm water, etc.) to help meet these challenges. Water recycling has long been practiced in some Arizona communities and by Arizona industries (including agriculture), but the perception that this water is “waste” inhibits the ability to take full advantage of a resource that is right here in our own backyard. Current water supply utilization in Arizona is illustrated in Figure 1, below.

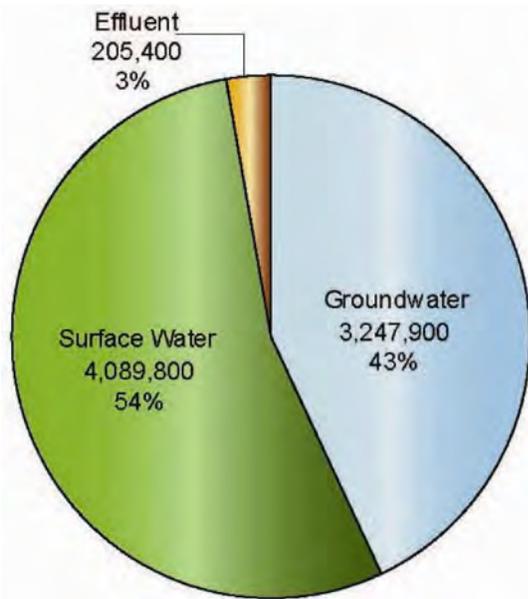


Figure 1 - Arizona Average Water Use by Source 2001 – 2005 (ADWR – Water Atlas Volume I, 2010)

As illustrated, the direct and indirect² use of reclaimed water (includes only water that has not been discharged or artificially recharged but is put to a reported beneficial use) represents approximately three percent of the total water use Arizona, approximately 205,000 acre-feet³. This has increased from 1990 when reclaimed water use accounted for less than two percent of the total water supply portfolio. While a significant portion of the reclaimed water is discharged in an unmanaged way into the beds of rivers and streams, benefiting the environment by providing habitat for wildlife and adding aesthetic and economic value to Arizona’s landscape, there may be additional opportunities to more fully utilize these supplies to

replace existing uses of limited water supplies. An Arizona Supreme Court Decision in 1989, *Arizona Pub. Serv. Co. v. Long*, 160 Ariz. 429, 773 P.2d 988 (1989), confirmed that treated effluent (reclaimed water) is owned by the entity that produces it. The Court ruled that until reclaimed water is returned to the ground as surface water or groundwater, reclaimed water is neither surface water nor groundwater, and therefore a city that produces reclaimed water is free to use it without regard to the laws governing surface water and groundwater. This ruling creates a strong incentive for reuse by allowing those who generate reclaimed water to maintain the right to reuse or sell that water.

Currently, Arizona, along with California, Florida, and Texas, lead the nation in utilization of reclaimed water⁴. Increased utilization of reclaimed water is challenging, however. For example, although ADEQ administers a comprehensive regulatory program governing the safe use of reclaimed water, public perception of water quality limitations still remains the largest obstacle that water managers face. Developing a strong recycled water program must address concerns of public health and safety, significant infrastructure and capital costs, and must confront the “ick” factor associated with reusing water long thought of and referred to as “waste” by both water managers and the public. In order to provide a long-term sustainable water supply for the citizens of this State, water managers must address these long-held perceptions and remove regulatory barriers to ensure Arizona’s continued economic and environmental viability into the future.

Purpose and Goal of Blue Ribbon Panel on Water Sustainability

In recognition of Governor Jan Brewer’s and the Arizona Corporation Commission’s commitment to collaboration on water resource issues, ADWR Director Herb Guenther, ACC Chairman Kris Mayes, and ADEQ Director Ben Grumbles (collectively the Executive) initiated a statewide effort in January, 2010, to improve the long term sustainability of Arizona’s water supplies to meet the challenge of increasing demands through enhanced conservation and recycling.

The Blue Ribbon Panel on Water Sustainability (Panel) was formed to identify and overcome obstacles to increased water sustainability. The Panel has been challenged to provide advice to ADWR, ADEQ, and the ACC on the technical, legal, and

² Indirect use refers to the recovery of reclaimed water storage credits

³ There are other significant uses of reclaimed water occurring in Arizona that is either not reported or permitted.

⁴ Water and Wastes Digest: www.wwdmag.com/EPA-Releases-Updated-Version-of-Guidelines-for-Water-Reuse-article6636

policy aspects of promoting recycling of reclaimed water, gray water, industrial process water, and storm water. While there are many opportunities to increase water conservation and recycling, an early priority of the Panel has been a focus on reuse of reclaimed water through detailed examinations of water quality, regulatory impediments, infrastructure requirements, and public perception challenges that limit the increased efficient use of this important water supply.

The Panel was established to facilitate discussions between Arizona stakeholders to identify regulatory impediments, draft new strategies to advance water conservation and increase the use of recycled water. In December, 2009, the Executive identified and invited experts to participate in this effort based on their knowledge and leadership in Arizona water issues. The Panel membership is composed of 40 members representing large and small cities, counties, agriculture, industry, Indian Tribes, environmental interests, Arizona universities, legislative leaders, and other leaders in Arizona water issues.

At its inception, the Panel met to build a common understanding of the issues facing Arizona and the challenges of developing recycled water strategies and increasing water conservation efforts across the State. The Panel worked collaboratively to identify a clear Purpose Statement in order to convey a common understanding to all Panel members and the public on the scope of this effort:

The Purpose of the Blue Ribbon Panel on Water Sustainability is to advance water sustainability statewide by increasing reuse, recycling, and conservation to protect Arizona's water supplies and natural environment while supporting continued economic development and to do so in an effective, efficient and equitable manner.

To achieve this Purpose, the Panel also identified a goal specifically aimed at guiding the work of the Panel towards increased sustainability of Arizona's water supplies. The Goal of the Panel is to provide recommendations to the Executive on statute, rule, and policy changes that, by the year 2020 in Arizona, will significantly:

1. Increase the volume of reclaimed water reused for beneficial purposes in place of raw or potable water;
2. Advance water conservation, increase the efficiency of water use by existing users, and increase the use of recycled water for beneficial purposes in place of raw or potable water;

3. Reduce the amount of energy needed to produce, deliver, treat, reclaim, and recycle water by the municipal, industrial, and agricultural sectors;
4. Reduce the amount of water required to produce and provide energy by Arizona power generators; and
5. Increase public awareness and acceptance of reclaimed and recycled water uses and the need to work toward water sustainability.

Working Groups

The Panel created five Working Groups to facilitate discussion of issues and development of recommendations with a broader spectrum of stakeholders and technical experts (See Appendix I for a listing of Working Group membership). The Working Groups held 58 meetings since February, 2010, and worked to first identify specific issues for the Panel to prioritize for further research and recommendation development. The five Working Groups and their purpose are identified below.

1. Public Perception/Acceptance – make recommendations for enhancing public acceptance of the use of reclaimed and recycled waters through public education, outreach, and other strategies.
2. Regulations/Permitting – identify regulatory impediments and make recommendations to streamline the reuse of reclaimed water.
3. Infrastructure/Retrofit – recommend measures that will facilitate the design, construction, operation and maintenance of new and retrofitted reclaimed and recycled water systems
4. Conservation/Recycling/Efficiency/Energy Nexus – make recommendations regarding statutes, rules, policies, and strategies for increasing water conservation in the agricultural, industrial, and municipal sectors; increasing the recycling of water that is not considered reclaimed water; and reducing the water cost of energy and the energy cost of water.
5. Economic/Funding – make recommendations on incentives, approaches to funding, and other mechanisms that will accelerate the reuse of reclaimed and recycled waters.

The Working Groups developed Issue Papers identifying approximately 40 issues (See Appendix II), compiled in the Interim Report dated July 1, 2010. Upon consideration of the initial 40 issues, the Panel directed the Working Groups to further research and provide recommendations on 26 issues, including (but not limited to) issues related

to public perception, regulatory impediments, efficient use of water supplies, exploring opportunities for effectively utilizing storm water, and evaluating the water/energy nexus. These 26 issues are identified in Appendix III.

The Working Groups developed White Paper Recommendations of each of the 26 issues for the

Panel to discuss. Summaries of the White Papers also were prepared for each of the 26 issues. After review of the White Papers and Summaries, the Panel decided which Recommendations to move forward for consideration by the Governor, the Legislature, the ACC and the Executive. The White Papers are included as Appendix V in this Report.



CHAPTER 2 - LEGAL AND REGULATORY FRAMEWORK FOR WATER SUSTAINABILITY

Reclaimed Water

Recycling of treated sewage effluent, out of necessity, long preceded any administrative framework in Arizona. In 1926, an activated sludge sewage treatment plant was built at Grand Canyon Village expressly to provide reclaimed water for nonpotable needs. The sole water supply for the community since 1901 had arrived in tank cars on the Atchison, Topeka & Santa Fe Railroad - at a cost of \$3.09 per 1000 gallons (Fleming, 1980). Upon completion of the treatment plant, reclaimed water was used for toilet flushing at El Tovar Hotel boiler feed, cooling water for the power plant at Grand Canyon Village, and makeup water for the steam locomotives. With a design capacity of 130,000 gallons per day, the plant greatly reduced the demand for potable water. The facility has the distinction of being the first operational water reclamation plant in the United States (Metcalf & Eddy, 2007).

Arizona's first rules regarding reuse of reclaimed water were promulgated much later, in 1972, by the Arizona Department of Health Services (ADHS). These rules established effluent quality requirements for various irrigation uses and industrial reuse and monitoring requirements for reclaimed water. Guidance published in that period by ADHS (1978) stated:

Reuse of treated sewage effluents is encouraged. However, the potential public hazard caused by reusing effluents must be weighed carefully in the study of reuse methods. Additional treatment of the effluent may be required prior to reuse.

At that time, the published bacterial limits were lax compared to today's standards, reflecting the state of the industry then for sewage treatment plants (i.e., secondary treatment).

After the Environmental Quality Act of 1986 created ADEQ, administrative responsibility for the reuse rules (which had been revised in 1985) was transferred to ADEQ. During this time reuse of reclaimed water continued to grow. In its 1997 report to the Governor and Legislature, ADEQ identified about 175 wastewater treatment plants in Arizona that were producing effluent for reuse. Under those rules, ADEQ issued reuse permits with a duration of five years to end users for reclaimed water. ADEQ

reported that 43 such permits were issued in FY 1997, the greatest number ever issued in a single year (ADEQ, 1997) up to that time.

In the summer of 1997, ADEQ initiated a stakeholder process to rewrite its water quality permitting rules, including its reuse rules. This effort culminated in the promulgation of transformative rules for the Aquifer Protection Permit (APP) and reclaimed water programs. These rules became effective in January, 2001. In connection with this stakeholder and rulemaking effort, the Legislature explicitly clarified ADEQ's authority over reclaimed water, stating that the ADEQ director shall:

Adopt, by rule, technical standards for conveyances of reclaimed water and a permit program for the direct reuse of reclaimed water. [A.R.S. 49-203(A)(6), effective January 1, 2001]

The reclaimed water rules adopted in 2001 are still in effect today. This rule framework provides a comprehensive approach to regulating the reuse of reclaimed water in Arizona, including permitting requirements, reclaimed water quality standards, allowable end uses, and technical standards for conveyances of reclaimed water. The 2001 rules were written to ensure the safe use of reclaimed water while removing impediments from the previous rules to facilitate more widespread reuse. However, there are opportunities to modify the 2001 rules in recognition of almost 10 years of experience with the program and 10 years of advances in the science and technology of reclaimed water reuse. Looking for these opportunities is the primary objective of the Regulations/Permitting and Infrastructure/Retrofit Working Groups established by the Panel.

The 2001 reclaimed water rules consist of three sets of rules, each addressing a critical component of Arizona's reclaimed water program. A fourth component, central to modernizing Arizona's approach to sewage treatment and incentivizing further use of reclaimed water, is the BADCT (Best Available Demonstrated Control Technology) part of the APP rule, applicable to sewage treatment plants. The BADCT provisions were developed in concert with the three reclaimed water rule packages to provide a unified approach to regulating the treat-

ment and reuse of domestic reclaimed water. A thoroughly revised APP rule, which included the sewage treatment plant BADCT provisions, was also adopted by ADEQ in January, 2001. Together, these four components comprise Arizona's framework for regulating reclaimed water. Each is briefly described below.

Reclaimed water conveyances [A.A.C. Title 18, Ch. 9, Art. 6, R18-9-601 through 603]

These provisions consist of a basic set of technical criteria for the design and construction of reclaimed water distribution systems. The provisions:

- address pipeline and open water conveyances,
- apply to conveyances transporting reclaimed water from the treatment plant to "the point of land application or end use,"
- prescribe a few overall performance standards, and
- address aspects of pressure and pressure testing, minimum separation distance from water and sewer pipes, pipe identification and marking, and signage.

The rule prescribes compliance with the criteria, but ADEQ requires no notification of proposed construction, performs no review of design plans, and issues no permit relating to construction activity. ADEQ receives no information on the extent to which reclaimed water distribution system projects constructed by utilities comply with the technical criteria in rule.

Reclaimed water quality standards [A.A.C. Title 18, Ch. 11, Art. 3, R18-9-301 through 309]

This article established five classes of reclaimed water based on protection of public health and groundwater quality (A+, A, B+, B, and C). Allowable end uses are listed corresponding with the water quality class designations.

- Class A reclaimed water is:
 - o reserved for open access uses (access to the reclaimed water by the general public is uncontrolled)
 - o considered essentially pathogen free based on meeting a limit of no detectable fecal coliform organisms
 - o filtered to meet a 24-hour average turbidity limit of two NTU (nephelometric turbidity unit)
 - o acceptable for irrigation of food crops, residential and school ground landscape irrigation, toilet and urinal flushing, recreational impoundments, snowmaking, and other uses requiring highly treated water

- o upgraded to the A+ designation if the water is further treated to remove total nitrogen to below 10 mg/l (that is the drinking water standard for total nitrogen)
- o also acceptable for all Class B and C uses.
- Class B reclaimed water is:
 - o allowable for restricted access uses (access to the reclaimed water by the general public is restricted)
 - o must meet a limit for fecal coliform organisms of 200 colony forming units per 100 ml (substantially equivalent to the ADEQ Surface Water Quality Standard for full-body contact)
 - o acceptable for irrigation of golf courses, orchards, vineyards, and other restricted access irrigation; landscape impoundments; livestock watering (dairy animals); concrete mixing; and similar designated uses
 - o upgraded to the B+ designation if the water is further treated to remove total nitrogen to below 10 mg/l (that is the drinking water standard for total nitrogen)
 - o also acceptable for all Class C uses.
- Class C reclaimed water:
 - o must meet a fecal coliform limit of 1000 colony forming units per 100 ml
 - o is acceptable for certain restricted uses including irrigation of sod farms and fiber, seed, and forage crops; livestock watering (non-dairy animals); and silviculture.

Under this article, ADEQ may also set reclaimed water quality requirements for industrial reuse on a case-by-case basis.

Direct reuse of reclaimed water [A.A.C. Title 18, Ch.9, Art. 7, R18-9-701 through 720]

This article governs ADEQ's system for reclaimed water permitting. In 2001, ADEQ completely overhauled its permitting approach for reclaimed water. Before 2001, end users were required to apply for an individual reclaimed water permit. This permit required monitoring and reporting of the quality of reclaimed water reused by the end user. This was a major burden for end users and an impediment to the advancement of reuse in the state. In 2001, ADEQ changed the permitting approach to rely heavily on simplified general permits for end users. General permits were established for end users of the five classes of reclaimed water (A+, A, B+, B, and C) designated in the reclaimed water quality standards rule. Responsibility for monitoring and maintaining the quality of reclaimed water was shifted to the sewage treatment plant owner/operator under provisions of the APP issued to the plant.

In other words, the generator of the reclaimed water, i.e., the entity with control over treatment, became responsible for complying with the reclaimed water quality standards. Thus, from the end user's perspective, ADEQ could craft simple general permits with provisions relating to operation, maintenance, and reporting of volumes of reclaimed water used. The simplest end use general permits are for use of Class A+ and B+ reclaimed water, as the low nitrogen content in these two "plus" classes of water minimizes concerns that over application during irrigation will cause a violation of the Aquifer Water Quality Standard for total nitrogen.

In the same rule, ADEQ established a general permit for a reclaimed water agent [A.A.C. R18-9-718]. This permit allows an entity like a homeowners association, for example, to take responsibility for the delivery of reclaimed water, operation and maintenance, and report filing for multiple end users, eliminating the need for each end user to obtain a separate general permit.

The rule also established a general permit for a reclaimed water blending facility [A.A.C. R18-9-717]. This general permit allows a facility to blend reclaimed water with other water, except industrial wastewater or reclaimed water from an industrial wastewater treatment plant. The permittee specifies the class of reclaimed water that is to be produced by the blending and must monitor the blended water to ensure that the water quality standards for the applicable class of reclaimed water are met.

Finally, the ADEQ rule allows an end user to apply for an individual permit if none of the general permits are applicable.

BADCT for sewage treatment facilities [A.A.C. Title 18, Ch. 9, Art. 2, Part B, R18-9-B201 through B206]

In 2001, and revised by modifications in 2005, ADEQ adopted a Best Available Demonstrated Control Technology (BADCT) standard for sewage treatment plants under its APP program that requires tertiary treatment in all new or significantly expanding wastewater treatment plants. Under this standard, high quality denitrified, disinfected reclaimed water must be produced.

- For plants with a design capacity of less than 250,000 gallons per day, limits are set for fecal coliform and *E. coli* bacteria that allow the treated reclaimed water to meet the Class B reclaimed water quality standard (actually Class B+ because nitrogen removal is also required under BADCT).
- For larger sewage treatment plants, disinfection is required so that no fecal coliform and *E. coli*

bacteria are detected. If filtration is added to the treatment process to meet a turbidity limit of two NTU, the treated reclaimed water meets the Class A reclaimed water quality standard (actually Class A+ because nitrogen removal is also required under BADCT).

Because BADCT requires advanced treatment for new and expanding facilities, ADEQ was able to adopt the previously-described simplified general permit program for end users of the high-quality reclaimed water generated by this treatment. This regulatory scheme has boosted the reuse of reclaimed water, turning what was once a "waste" into a valuable renewable resource.

Recharge of Reclaimed Water

For artificial recharge of reclaimed water to underground storage facilities, as defined by ADWR, ADEQ writes APPs to ensure that the underlying groundwater is protected. For such facilities, the regulatory responsibilities of ADWR include the provisions of the Underground Water Storage, Savings and Replenishment Act.

Underground storage and recovery is a means of artificially storing water supplies, including CAP water, reclaimed water and other surface waters, so that they may be recovered for later use. Storage of water supplies, including reclaimed water, is an increasingly important tool in the management of Arizona's water supplies, particularly in meeting the goals of the 1980 GMA. Storing water underground to ensure an adequate supply for the purpose of satisfying current and future needs is both a practical and cost-effective alternative to direct use of renewable supplies.

In 1986, the Arizona Legislature established the Underground Water Storage and Recovery program to allow persons with surplus supplies of water to store that water underground and recover it in another location in the same groundwater basin either in the same calendar year or at a later date. In 1994, the Legislature enacted the Underground Water Storage, Savings, and Replenishment Act, which further refined the Recharge Program.

A person who wishes to store, save, replenish, or recover water through the Recharge Program must apply for permits through ADWR. Depending on what the applicant intends to accomplish, different types of permits may be required.

An **Underground Storage Facility (USF) Permit** allows the permit holder to operate a facility that stores water in the aquifer. A Constructed USF Permit allows for water to be stored in an aquifer by using some type of constructed device, such as an

injection well or percolation basin. A Managed USF Permit allows for water to be discharged to a naturally water-transmissive area such as a streambed that allows the water to percolate into the aquifer without the assistance of a constructed device.

A Groundwater Savings Facility (GSF) Permit allows renewable water supplies, owned by the water storer, to be delivered to a separate recipient who agrees to curtail groundwater pumping on a gallon-for-gallon basis, thus creating a groundwater savings.

A Water Storage Permit allows the permit holder to store water at a USF or GSF. In order to store water, the applicant must provide to ADWR evidence of its legal right to the source water proposed for recharge. Water storage must occur at a permitted USF or GSF, as described above.

A Recovery Well Permit allows the permit holder to recover long-term storage credits or to recover stored water annually. Recovery can occur inside the area of impact of the stored water (the area where the water artificially recharged into the aquifer actually occurs) or outside the impact area of the stored water; however, recovery must occur in the same groundwater basin where the water was stored.

The Recharge Program provides incentives for storing reclaimed water. For storage of water supplies other than reclaimed water, ADWR includes a cut-to-the-aquifer of five percent. Storage of reclaimed does not include this cut-to-the-aquifer, unless the water is stored at a Managed USF where the cut-to-the-aquifer is calculated at 50 percent.

Assured Water Supply

ADWR's Assured and Adequate Water Supply (AAWS) Programs were created to address the problem of limited groundwater supplies in Arizona. The Assured Water Supply Program functions to protect and preserve limited groundwater supplies within Arizona's five AMAs. AMAs are those areas of the state where significant groundwater depletion has occurred in the past and include portions of Maricopa, Pinal, Pima, Santa Cruz and Yavapai Counties. A key element of the Assured Water Supply Program within the AMAs is the requirement for future development to reduce its reliance on mined groundwater supplies through utilization of renewable water supplies (CAP and surface water) or through the use of reclaimed water. The use of reclaimed water has become increasingly utilized for non-potable purposes in new developments (e.g., golf courses and other landscaping needs) to meet the Assured Water Supply requirements.

Outside the AMAs, the Adequate Water Supply Program, while not as protective as the Assured Water Supply Program, acts as a consumer advisory program, ensuring that potential real estate buyers are informed about any water supply limitations.

Gray water

Gray water reuse is regulated by ADEQ under rules for the direct use of reclaimed water, A.A.C. Title 18, Chapter 9, Article 7. As described earlier, this article also governs end user permits for the reuse of reclaimed water from a sewage treatment plant. Gray water is defined in statute as "wastewater that has been collected separately from a sewage flow and that originates from a clothes washer or a bathroom tub, shower, or sink but that does not include wastewater from a kitchen sink, dishwasher or toilet [A.R.S. 49-201(18)]."

Prior to 2001, gray water reuse was regulated through individual permits. This approach had proved ineffective because nearly all residential gray water users ignored the permitting requirement. In 2001, ADEQ replaced the individual permit requirement with a simple general permit for residential use of gray water [A.A.C. R18-9-711]. Under the general permit, a residential reuser of gray water is deemed permitted to use gray water as long as the person complies with 13 best management practices (BMP). No application or notification to ADEQ is required, and ADEQ does not issue any permit document. This approach, which emphasizes education, recognized the impediments created by the earlier "hard" permitting requirements that were ignored by nearly everyone. This new approach has been highly successful in adding gray water to the recycled water supply and has been copied by other states.

In the 2001 rule, ADEQ also established a general permit for more voluminous residential and non-residential uses of gray water up to 3000 gallons per day [A.A.C. R18-9-719]. This general permit requires submittal of design plans to and approval by ADEQ, and conformance with technical criteria in rule.

With respect to the residential gray water general permit allowed under A.A.C. R18-9-711, the ADEQ rule explicitly granted towns, cities, or counties the authority to further limit the use of gray water by rule or ordinance [A.A.C. R18-9-711(C)]. This authority was removed through legislation in 2006 [A.R.S. 49-204], which prohibited a town, city, or county from limiting the use of gray water in rule or ordinance, with one exception. In an initially designated AMA that does not contain part of the CAP aqueduct but has a safe yield goal dependent on

utilization of reclaimed water as part of an Assured Water Supply determination (only the Prescott AMA satisfies this definition), towns, cities, or counties may limit the use of gray water by rule or ordinance as long as the volume of effluent available to meet the Assured Water Supply requirements is not reduced.

In 2006, the Legislature enacted legislation requiring ADWR to amend its Assured Water Supply rules to provide for a reduction in water demand for an application for an Assured Water Supply Designation (DAWS) or Certificate of Assured Water Supply (CAWS) if a gray water reuse system will be installed that meets the requirements of rules adopted by ADEQ for gray water systems. The legislation provides that the rules shall allow for such a reduction in water demand for CAWS only if the land to which the Certificate is sought qualifies as member land in the Central Arizona Groundwater Replenishment District (CAGRD). The legislation defines gray water consistent with A.R.S. § 49-201(18). Although the current AAWS rules do not explicitly provide for the reuse of gray water to reduce demands because the rulemaking was delayed for unrelated reasons, the ADWR has previously considered such rule language and the gray water reuse changes are mandated by statute. Therefore, ADWR will allow for a reduction in water demand based on gray water reuse before the AAWS rules are amended to include such a requirement. The ADWR draft gray water rule language included the following:

- *Two amendments to A.A.C. R12-15-704 to allow for a reduction in the estimated water demand for a subdivision enrolled as a member land in the CAGRD if gray water reuse systems will be installed in the subdivision.*
 - *Language would be added to subsection (B) to require an applicant for a CAWS to provide "sufficient information for the ADWR Director to determine the appropriate reduction in demand" if the subdivision is enrolled as a member land in the CAGRD and the applicant proposes to install gray water reuse systems.*
 - *Language would be added to subsection (E) to provide that if the subdivision is enrolled in the CAGRD and gray water reuse systems will be installed in the subdivision, the ADWR Director shall reduce the estimated water demand by a volume that is likely to be saved through the gray water reuse system.*
- *Two amendments to A.A.C. R12-15-710 regarding application for DAWS to allow a reduction in the estimated water demand if the applicant will serve one or more customers that will use a gray water reuse system.*

- *Subsection (A) would provide that an applicant for a DAWS that is seeking a reduction in the estimated water demand because one or more customers will use a gray water reuse system must include in its application sufficient information to allow the director to determine the appropriate reduction in demand.*
- *Subsection (D) would provide that if the applicant demonstrates that it will serve one or more customers that will use a gray water reuse system, the ADWR director shall reduce the estimated water demand by the volume the director determines is likely to be saved through the gray water reuse system. Unlike an applicant for CAWS, it is not a requirement that the DAWS applicant show membership in the CAGRD in order for demand to be reduced because of the gray water reuse system.*
- *Amendments to A.A.C. R12-15-714 (applications for Designation of Adequate Water Supply) would mirror the amendments to A.A.C. R12-15-710, above, relating to the use of gray water reuse systems and the ability of an applicant to reduce its estimated water demand by an appropriate volume of water that will likely be saved by the utilization of a gray water reuse system by one or more of the applicant's customers.*

Finally, if the City of Tucson is any indication, ordinances to encourage gray water use, rather than limiting use, may become the trend. The City of Tucson adopted its gray water ordinance, effective June 1, 2010, requiring plans for all new single family homes and duplexes to include plumbing for future gray water distribution. The plans must show either a separate multiple pipe outlet or diverter valve and an outside "stub-out" installation on clothes washing machine hook-ups. The plans also must show a building drain or drains for lavatories, showers, and bathtubs, separate from all other plumbing fixtures. In other words, the Tucson ordinance prepares new single family homes and duplexes for easy use of gray water upon occupation by the new residents.

Rainwater Harvesting/Stormwater

Rainwater harvesting

Rainwater harvesting is the process by which rainwater is accumulated and stored after collection from the roofs of houses, buildings, other structures, and specially prepared areas of ground. Most definitions of rainwater harvesting highlight the concepts of onsite or within-the-property capture, collection where rainwater falls before it can drain away, and use of the captured water for non-potable purposes.

ADEQ statutes and rules contain no definitions or citations relating to rainwater harvesting. Neither the Arizona Pollutant Discharge Elimination System (AZPDES) permit program nor the APP program require permits for this activity. As described more fully in the next section on stormwater, the AZPDES program regulates discharges to waters of the United States, which are essentially surface waters. The term “precipitation runoff” is used once in AZPDES rules governing permitting of discharges to surface waters [A.A.C. R18-9-A902(G)(7)]. This is in connection with an exclusion from permitting for mining and oil and gas operations if precipitation runoff is collected into a conveyance and prevented from coming into contact with “any overburden, raw material, intermediate products, finished product, byproduct, or waste product located on the site of the operations.” Except in this extreme situation, which most practitioners would not regard as a rainwater harvesting activity anyway, the AZPDES program does not contemplate a requirement for permitting.

APP statutes and rules also contain no language that applies directly to rainwater harvesting. Statutory exemptions from APP permitting exist for “household and domestic activities” and “household gardening, lawn watering, lawn care, landscape maintenance and related activities” [A.R.S. 49-250(B)(1) and (B)(2), respectively]. ADEQ law is silent on similar non-household activities. An exemption from permitting exists for “surface impoundments used solely to contain storm runoff, except for surface impoundments regulated by the federal clean water act” [A.R.S. 49-250(B)(10)]. Although it is doubtful this exemption was written with rainwater harvesting in mind as this practice is now understood, it would nevertheless apply to impoundments constructed to harvest locally-derived rainwater.

In summary, ADEQ statutes and rules do not address rainwater harvesting, using that terminology, and only vaguely address activities that might fall into the definition of rainwater harvesting as described in the first paragraph of this section. What can be said with certainty is that no ADEQ permit is required to practice rainwater harvesting in this context.

ADWR has no specific requirements for the use of rainwater harvesting, however the use of this practice is one possible BMP that can be used in the Modified Non-Per Capita Conservation Program (MNPCCP) by municipal water providers (described in Chapter 3 under Conservation).

In contrast, the City of Tucson recently adopted a rainwater harvesting ordinance that may be the first

of its type in the nation. Tucson’s ordinance requires water harvesting from new commercial buildings for landscape irrigation. According to the City of Tucson, integrating rainwater harvesting into new building construction adds minimal cost to a project while allowing a significant portion (50 percent or more) of outdoor landscaping water needs to be met. Under the Tucson ordinance, facilities subject to the ordinance must meet 50 percent of their landscape demand using harvested rainwater, prepare a site water harvesting plan and water budget, meter outdoor water use and use irrigation controls that respond to soil moisture conditions at the site. Facilities have three years to establish plants before the 50 percent requirement must be met, and the requirement is waived during periods of drought. Both passive water harvesting systems (systems that passively infiltrate rainwater into soil or porous pavement for use by vegetation), and active systems (systems that store water in tanks for future distribution to beneficial uses) are addressed in the ordinance. The City cites other benefits of this program including stormwater pollution prevention, attenuation of peak runoff from hardscaped surfaces, and public education opportunities. Following Tucson’s lead, other Arizona communities are exploring rainwater harvesting ordinances – such as Oro Valley and Flagstaff.

Stormwater

Stormwater discharges are regulated under the federal Clean Water Act through National Pollutant Discharge Elimination System (NPDES) permits. The purpose of these permits is to regulate impact of pollutant discharges to the nation’s surface waters. In Arizona, these permits are called AZPDES permits and are issued by ADEQ under a grant of primacy from the United States Environmental Protection Agency (EPA).

ADEQ has established both individual and general AZPDES permits. An individual permit is required for many point source discharges such as wastewater treatment plants and other “end-of-pipe” discharges. In this type of permit, the regulated facility must limit levels of pollutants in its discharge so as to meet technology-based and water quality-based effluent limits. Water quality-based limits are derived from Surface Water Quality Standards that are set for the designated uses of the watercourse into which the facility is discharging. These permits usually require regular monitoring and reporting of a suite of pollutants.

Stormwater discharges also are regulated as point sources under the Clean Water Act. According to the EPA, about 30 percent of known pollution to

our nation's surface waters is attributable to stormwater runoff. Discharges from these sources are regulated under individual permits for large municipal storm sewer systems and general permits for other types of facilities. Although the permits for stormwater rely heavily on implementation of BMP to control pollutants, there is expanding emphasis within this program on routine water quality monitoring and compliance with Surface Water Quality Standards at outfalls. AZPDES stormwater permits are applicable to the following categories of facilities:

Large storm sewer systems. The Medium and Large Municipal Separate Storm Sewer System (Large MS4) Permit is an individual permit that authorizes stormwater discharges from concentrated development in large urban areas. Currently, eight permittees operate under Large MS4 permits: Phoenix, Glendale, Mesa, Scottsdale, Tempe, Tucson, Pima County, and the Arizona Department of Transportation (ADOT).

Small storm sewer systems. The Small Municipal Separate Storm Sewer Systems (Small MS4) General Permit authorizes discharges of stormwater from smaller urbanized areas. Based on EPA criteria for eligibility, 41 such areas in Arizona operate under this general permit in regard to their stormwater discharges. This list includes 28 cities and counties, but also involves some non-traditional MS4s comprised of eight college campuses, two military bases, Arizona Dept of Corrections, Arizona State Hospital, and two Veteran's Administration medical centers.

Construction activities. The Construction General Permit (CGP) authorizes stormwater discharges from sites of construction-related activities where the discharges have a potential to enter waters of the United States or a storm drain system.

Industrial activities. The Multi-sector General Permit (MSGP) authorizes discharges of stormwater associated with industrial activities that are of a non-construction nature. A list of standard industrial classification (SIC) codes is available indicating which industries must obtain coverage under this general permit. Regardless of SIC code, MSGP coverage applies if the facility meets certain narrative criteria.

AZPDES stormwater permits are designed to reduce the discharge of pollutants into surface waters to the maximum extent practicable. Many BMPs used for stormwater utilize detention or retention. However, AZPDES stormwater provisions do not regulate the use of retained stormwater, nor do they address downstream appropriation of runoff for beneficial use.

An AZPDES individual permit is required for projects designed to beneficially use stormwater

where it is mixed with reclaimed water, remediated water, or other types of water and the site of use is within a water of the United States. Such projects have been proposed for environmental restoration and multi-benefit enhancement purposes. For this type of project, the water quality standards and testing requirements of the different programs likely will conflict. This obstacle has constrained the design or hindered full development of such projects. AZPDES does provide for alternative approaches such as Net Ecological Benefit and lake management plans. More complete guidance on these alternative approaches would probably stimulate innovative ideas for multi-benefit projects.

Conservation

Arizona Department of Water Resources

Because of Arizona's arid climate, the availability of secure water supplies has always been a blessing rather than a certainty. Though Arizona is in fact blessed with many sources of available water supplies, the reliability of those supplies has been highly dependent on annual variability. Not until the development of dams, storage reservoirs and delivery infrastructure was this variability "tamed", albeit for as long as the climate allowed. Additional progress for accessing water, on a large scale, from below the land surface has added to the reliability of water supplies in Arizona. However, Arizonans have long known that the water supply upon which it has become so reliant is finite and that the only way to stretch this finite supply is to efficiently utilize all sources of water.

The most significant step that Arizona has taken to improve on-going water use efficiency was the adoption of the 1980 GMA. The state Legislature created the GMA to address groundwater depletion in the state's most populous areas and created ADWR to implement it. The goal of the GMA is twofold:

- 1) to control severe groundwater depletion, and
- 2) to provide the means for allocating Arizona's limited groundwater resources to most effectively meet the state's changing water needs.

This effort to manage Arizona's groundwater resources was so progressive that in 1986 the GMA was named one of the ten most innovative programs in state and local government by the Ford Foundation and Harvard University. When granting the award, it was noted that no other state had attempted to manage its water resources so comprehensively. Accordingly, Arizona built consensus around its policy and then followed through to make it work in practice.

Groundwater basins where groundwater depletion is most severe are designated as AMAs. There are five AMAs – Phoenix, Pinal, Prescott, Santa Cruz and Tucson. These areas are subject to regulation pursuant to the GMA. Each AMA has a statutory management goal. In the Phoenix, Prescott, and Tucson AMAs, the primary management goal is to achieve safe yield by the year 2025. In the Pinal AMA, where the economy is primarily agricultural, the management goal is to preserve that economy for as long as feasible, while considering the need to preserve groundwater for future non-irrigation uses. Recognizing that the Santa Cruz AMA is currently at the safe-yield status, the management goal of the Santa Cruz AMA is to maintain safe yield and prevent local water tables from experiencing long-term decline. Each AMA carries out its programs in a manner consistent with these goals while considering and incorporating the unique character of each AMA and its water users. Another important component of the GMA is the requirement for ADWR to develop and implement conservation requirements within AMAs for the agricultural, municipal, and industrial water use sectors. The conservation requirements change in each subsequent management period⁵, generally requiring increasing water use efficiency in each management period for each of the water-using sectors. Management Plans, corresponding to each management period for the five AMAs contain specific water allocation formulas and conservation requirements for each sector.

ADWR Agricultural Conservation Requirements. Holders of an Irrigation Grandfathered Right (IGFR), a right to withdraw groundwater in an AMA on farmland of two or more acres for crops for human or animal consumption who withdraw water from a non-exempt well are subject to the Agricultural Conservation Program. The foundation of the program includes conservation requirements based on water duties and maximum annual groundwater allotments or through BMPs. A key component of the GMA prohibits the establishment of new IGFRs—eliminating new acres from being put into agricultural production.

ADWR Municipal Conservation Requirements. Under the Municipal Conservation Program, municipal water providers (cities, towns or private water companies) are required to meet conservation requirements based on reductions in total per capita use or through implementation of specific BMPs (see Appendix IV) identified for their service

area characteristics. Additionally, municipal providers are required to limit the amount of lost and unaccounted for water in their delivery system. Private water companies regulated by the ACC located inside or outside of an AMA are also required to implement BMPs for their service area as identified by the ACC.

ADWR Industrial Conservation Requirements. Industrial water users who do not receive water from a municipal provider and have their own well (non-irrigation groundwater rights inside of AMAs) are subject to the Industrial Conservation Program. Conservation requirements are based on the best available technology for the end use and range, based on the permit or right type, from BMPs to specific groundwater allotments for water users such as turf facilities. Requirements for industrial water users are specific to the industry including mining and metallurgical processing, electric power facilities, sand and gravel facilities, dairies, feedlots, turf-related facilities (schools, parks, golf courses, and home owner association greenbelts) and other large landscape users.

Statewide Conservation Requirements. While specific conservation requirements are limited to the major water using sectors (agricultural, municipal, and industrial) located within the AMAs, the statutes require all water providers to develop a water conservation plan to be submitted to ADWR and updated every five years. Significant water conservation efforts have been implemented across Arizona, many of which can be found by accessing the ADWR Web site at www.azwater.gov.

ADWR is not the only entity that requires conservation of water supplies in Arizona and is not the only reason why entities implement conservation in their communities. Water users who enter into sub-contracts for CAP water have requirements to develop and implement conservation measures. Many Indian communities in Arizona, who are not regulated under state requirements, voluntarily implement many of the provisions of the GMA for water use in their agricultural, industrial and municipal systems. Additionally, the ACC has developed their own requirements that increase water use efficiency for their regulated utilities described in more detail below.

Arizona Corporation Commission

For many years, the ACC has promoted the efficient use of groundwater and renewable surface

⁵ The first management period was 1980 through 1990; the second management period was 1990 through 2000; the third management period was 2000 through 2010; the fourth management period is 2010 through 2020; and the fifth management period is 2020 through 2025.

water by instituting inclining block rates (also referred to as “tiered rates”) for all water companies that have filed rate cases since the late 1990s. Prior to that time, most water companies’ rates were set at a flat rate per 1,000 gallons with up to 5,000 gallons of water included as part of the monthly minimum charge. In fact, it was not uncommon for a water system to have declining block rates (i.e., the more water a customer used, the lower the cost per 1,000 gallons).

The most common form of rate design used by the ACC today is a 3-tiered rate for residential use. An example of this rate structure would be:

- Tier 1 - \$2.00 per 1,000 gallons for the first 3,000 gallons
- Tier 2 - \$4.00 per 1,000 gallons for the next 7,000 gallons
- Tier 3 - \$6.00 per 1,000 gallons for all usage over 10,000 gallons.

In addition, the monthly minimum is set at zero gallons, which means that a customer pays the minimum regardless of water use, plus the applicable rate for every gallon of water used above zero.

Assuming a customer uses 12,000 gallons in a month with the above rate design and a monthly minimum charge of \$20.00, the customer’s bill would be \$66.00 (\$20 minimum plus \$46 for commodity). A customer using half that amount (6,000 gallons) would have a bill of \$38.00 (\$20 minimum plus \$18 for commodity). As can be seen, the price for the commodity billed to the customer using 12,000 gallon per month is not twice that of the customer using 6,000 gallon per month, but more than 2.5 times. Likewise, a customer using 18,000 gallons would pay greater than 4.5 times more for the commodity portion than a customer using 6,000 gallons, rather than just 3 times more.

The 3-tiered rate design described above gives a customer control over his or her water bill by providing an incentive to use less water, since the cost increases significantly with each tier. The tiered rate structure does allow a customer who wishes to use more water to do so, but at an increasingly higher cost per unit of commodity, unlike flat or declining block rate structures.

There have been a few cases recently where the ACC has approved tiered rates with more than three tiers. The ACC has approved rate designs with as many as six tiers. With more tiers in an inclining block rate design, the customer has more control over his or her bill, but the tradeoff is that customers must be better informed by the water company as to exactly how this type rate design operates and affects them.

In the last couple of years the ACC also has been requiring water utilities that come before it to adopt and implement BMPs for water conservation. These BMPs are the same ones that the ADWR requires within the designated AMAs. The ACC has applied these BMPs both within and outside of the AMAs. The ACC typically has required a water utility to adopt more BMPs than the number required by ADWR.

The manner in which the ACC has allowed water systems to implement the BMPs is through the adoption of tariffs. These tariffs not only require the water systems to meet BMP requirements, but also require customers to abide by these BMPs in order to receive initial service and maintain service from the water system. An example of such a BMP tariff is a low water use landscaping tariff. Under this tariff, a water system would be required to provide new customers with information regarding low water use landscaping. The tariff could also impose a requirement that would allow only a percentage of the customer’s landscaping to be turf. If after initiating service to a customer, the water system becomes aware that the customer’s landscaping of turf has risen above the set percentage, the water system notifies the customer in writing that the customer has violated the terms of the tariff. The customer is given a reasonable amount of time to comply with the tariff. If the customer does not comply within the timeframe, the water system initiates a disconnection process per ACC rules.

In addition, in the last few years, the ACC has added a condition to a new Certificate of Convenience and Necessity (CC&N) or an extension of an existing CC&N for a water provider that prohibits the provider from selling groundwater for irrigation of golf courses or for other water intensive features such as ponds and fountains. This condition further promotes the ACC’s policy of conserving groundwater.

Energy/Water Nexus

In recent years the term “energy/water nexus” has become very familiar to all in both the energy and water industries. The typical forms of energy production cannot exist without consumption of water and water cannot be treated or moved from point A to point B without consumption of some type of energy. To use a very simple example of this, a water-saving showerhead should also be considered an energy-saving device and an energy-saving light bulb should also be considered a water-saving device.

The ACC presently has an open docket to gather information on dry- versus wet-cooling for power plants. While dry-cooling or some form of hybrid-

cooling could save significant quantities of water in the production of electricity, there are accompanying efficiency and cost tradeoffs that serve as disincentives to their use.

Furthermore, electric power plants located within AMAs are required by ADWR to implement the Industrial Conservation Requirements specific to their industry. Facilities that were in existence after 1984 (the first year in which the conservation requirements took effect) must comply with an annual average of 15 cycles of concentration (seven cycles of concentration for facilities constructed and operational in and prior to 1984), must blow down water on a continuous basis, and must divert the maximum amount of water feasible to the cooling processes. In other words, water used to cool the power plant must be re-circulated through the cooling tower so that only one-fifteenth (or one-seventh, if applicable) of its original volume is left, the rest being lost as steam. At the same time, there must be continuous removal of the water to control salt buildup and minimize corrosion and scaling. To incentivize use of reclaimed water, the cycles of concentration do not apply to any facility for the first 12 consecutive months in which 50 percent or more of the water supplied to the cooling towers is reclaimed water.

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CHAPTER 3 - CURRENT STATUS AND POTENTIAL OPPORTUNITIES TO ADVANCE WATER SUSTAINABILITY IN ARIZONA

Reclaimed water

As a percentage of the total Arizona water supply, reliance on reclaimed water resources has grown. Current estimates of use of reclaimed water in Arizona for an allowed beneficial purpose total over three percent of statewide water use based on information reported to ADWR. Additional volumes of reclaimed water are artificially recharged for use in later years. The use of reclaimed water is greater in the AMAs, accounting for over six percent of total AMA water use, where groundwater use restrictions, incentives for the use of renewable water supplies, and the availability and investments in infrastructure have moved water users toward non-groundwater supplies, including reclaimed water for non-potable uses.

In Arizona, ADEQ is the primary agency regulating production and use of reclaimed water, with ADWR maintaining authorities over recharge of reclaimed water, long-range water supply planning and water conservation requirements that depend on

reclaimed water. ADEQ has a broad regulatory program for reclaimed water encompassing permitting, water quality standards, allowable end uses, and BADCT for sewage treatment plants. This regulatory framework ensures that most reclaimed water now generated for reuse is of high quality, nearly meeting EPA Drinking Water Standards (although ADEQ's rule prohibits direct reuse for drinking). ADEQ's regulatory program thus assists in meeting the State's water supply and conservation goals while protecting public health and the environment.

ADEQ's program creates an incentive to construct modern, high-performance tertiary sewage treatment facilities in accordance with the BADCT requirements. This incentive results because the BADCT requirements are offset by an uncomplicated, yet protective, regulatory framework for reclaimed water, which relies largely on simple end user permits. This overall regulatory approach, within which

Table 1: Arizona Wastewater Treatment Plants Authorized to Reuse

County	Number of Permitted Plants	Number Authorized to Reuse	Percentage Authorized to Reuse
Apache	7	3	43
Cochise	15	8	53
Coconino	27	17	63
Gila	10	3	30
Graham	5	4	80
Greenlee	2	1	50
La Paz	6	2	33
Maricopa	64	50	78
Mohave	33	12	36
Navajo	14	7	50
Pima	19	14	74
Pinal	45	32	71
Santa Cruz	6	1	17
Yavapai	33	19	58
Yuma	23	8	35
All Counties	309	181	59

treatment plant and reclaimed water permitting requirements dovetail, also has created appealing collateral environmental benefits. For reclaimed water discharges that are not otherwise reused, pollutant loading to waters of the United States under NPDES permits is reduced. Natural and constructed wetlands become more sustainable through greater availability of high-quality treated reclaimed water. Increased reuse results in a reduced probability of activation of state- and federally-mandated contingency plans by public drinking water systems (PWS) burdened by inherently scarce supplies or during drought. Finally, the high level of treatment now required under BADCT and to meet Class A+ reclaimed water standards results in substantially decreased levels of emerging contaminants in reclaimed water, including pharmaceuticals and personal care products (PPCP), compared to older lower-performance facilities.

Proof of the effectiveness of Arizona’s regulatory program for reuse of reclaimed water is found in the fact that 59 percent of wastewater treatment plants in the state now distribute reclaimed water for reuse, 181 of the 309 permitted facilities. Reuse occurs in every county (see Table 1).

Notable are the large percentage of plants authorized for reuse in counties comprising the most populous AMAs: Maricopa (78%), Pima (74%), and Pinal (71%). Even counties located outside of AMAs have significant percentages of sewage treatment plants authorized for reuse, for example, Coconino County (63%), Cochise County (53%), and Mohave County (36%).

The number of sewage treatment plants producing high quality reclaimed water is significant, too, as Table 2 shows. One-quarter of the plants in Arizona now produce Class A+ or A reclaimed water, that is, reclaimed water that has been treated to an essentially pathogen free level. Thirty-nine percent of the plants in the state produce reclaimed water in “plus” classifications, which is water that has

undergone treatment to remove excess nitrogen. The treatment processes to remove nitrogen also have the additional benefit of increased PPCP removal.

On the user side, ADEQ has issued 389 end use permits to date for the reuse of reclaimed water. The vast majority of the permits, 72 percent, are for reuse of Class A+ reclaimed water, with the remaining permits for the older sub-Class A+ treatment facilities still in operation. More than 40 end use permits have been issued to reclaimed water agents, accounting for hundreds of additional end users.

In summary, Arizona’s reclaimed water program has resulted in construction and upgrading of scores of high-performance sewage treatment plants in Arizona so that safe supplies of reclaimed water are available for reuse. Reclaimed water is distributed for a myriad of uses to many hundreds of end users. Reclaimed water distribution systems have been built, some with over 100 miles of distribution mains, to supply recharge facilities throughout the state; irrigation of a significant number of Arizona’s golf courses; outside landscape and turf irrigation service to hundreds of residences; irrigation of many parks and schoolyards; and critical supplies for agricultural, industrial, and power generation needs. Ultimately, this investment in infrastructure has extended Arizona’s water supply and contributed to long-term water sustainability.

Although much reclaimed water is already used in Arizona as the tables show, significant potential still exists. Even though a large number of plants are classified and authorized to supply reclaimed water, not all that capacity is being used, and in some cases, reuse has not yet started. As the Table 1 shows, considerable opportunity for reuse still exists outside the AMAs. Both inside and outside the AMAs, a historical limiting factor has been that reclaimed water is usually produced at the lowest, downstream edge of a community, making it costly, particularly in retrofit situations, to convey it to high

Table 2: Classification of Wastewater Treatment Plants for Reuse

Classification of Plant for Reclaimed Water Reuse	Number of Plants	Percentage of Total Plants in Arizona	Percentage Among Plants Authorized for Reuse
A+	74	24	41
A	7	2	4
B+	46	15	25
B	32	10	18
C	22	7	12
Totals	181	59	100

value reusers within the community. For this reason, opportunity exists for developing incentives or for better matching the availability of reclaimed water with potential uses. For example, it might be possible to locate solar thermal electrical generation plants adjacent to wastewater treatment plants where reclaimed water is not being fully utilized. Also, communities are investigating decentralized wastewater treatment options, where smaller high-performance, odor free plants are located within the communities, allowing a variety of high-value uses with lower infrastructure costs. In any case, when planning for reuse, diurnal and seasonal variations in effluent production and variations in the end use demand must be taken into account. As indicated in the recommendations of Working Groups, many other opportunities for fuller use of reclaimed water exist.

Gray water

Prior to 2001, ADEQ required applications from and issuance of individual permits to any person wishing to legally use gray water for residential use. The requirements were so onerous that ADEQ had issued only two known permits for such use. During the stakeholder process preceding the 2001 rule update, a major study of gray water use in the greater Tucson area was completed by the Water Conservation Alliance of Southern Arizona (Water CASA). The Water CASA surveyed a large number of Pima County residents with a detailed questionnaire (just under 2000 survey forms mailed out with some 600 usable responses returned). The study garnered a wealth of information about the extent and use of gray water in Pima County.

Of immediate interest at that time was the result that 13 percent of occupied single-family residences and manufactured homes did some type of gray water reuse. This corresponded roughly to between 20,000 and 30,000 residences in Pima County and 50,000 to 80,000 persons. Extrapolating to the rest of the state, it was clear that citizens in well over 100,000 residences in Arizona already reused gray water in some way, ignoring the legal requirement for obtaining a permit. It also was clear that a “hard” permitting approach would never work, either aimed at existing “illegal” reusers or at persons wishing to begin using gray water. The survey results strongly supported ADEQ’s BMP approach to residential gray water use as embodied in the current rule.

The Water CASA study found that the largest source of gray water, by far, was clothes washing machines, accounting for 66 percent of all gray water sources. Bathroom tubs and showers accounted for another 15 percent. The study also

found that irrigation of shade or ornamental trees accounted for 32 percent of reported uses, followed by shrub irrigation at 19 percent, and grass irrigation at 14 percent. Many gray water reusers appeared to have simply directed clothes washing machine drainage water to vegetation with a hose.

The study suggested that the following factors may increase the likelihood of gray water reuse:

- older homes
- lower value homes
- manufactured housing
- lower income levels
- septic tanks

The study concluded that residents of manufactured homes may be particularly likely to reuse gray water because of the easier access to wastewater plumbing, and that septic tank preservation probably was a significant factor motivating much gray water reuse.

Even though the Water CASA study is 10 years old and was limited to the greater Tucson area, it probably represents the current situation on a statewide basis with considerable accuracy. In communities like Tucson, where gray water use is encouraged and an ordinance became effective in 2010, requiring all new residences to be built with gray water capabilities, a new survey might show some increased gray water reuse since 2000. The Tucson ordinance likely represents a model for all of Arizona in increasing the use of gray water and thus reducing potable supply demand.

Rainwater Harvesting/Stormwater

Rainwater harvesting has long been practiced in Arizona on a small-scale basis mostly by individual homeowners. Harvesting rainwater for landscape watering allows homeowners to conserve potable water supplies and to reduce their water bills. There are no requirements for rainwater harvesting on individual residential lots and the practice is largely unregulated but highly encouraged by local water conservation groups. Because of Arizona’s arid climate, the volume of rainwater available for harvesting may be a limiting factor, but still may provide a lower cost alternative to potable water supplies.

Implementation of large-scale rainwater harvesting and stormwater control projects is also possible. For example, the University of Arizona developed a project on its campus that provides multiple benefits. Landscaping is being maintained with harvested rather than potable water, and some troublesome areas of flooding following rains have been mitigated. The project also provides educational benefits and hand-on experience to a large number of future water experts.

The ADEQ headquarters in Phoenix is an example of harvesting a non-traditional source of water. This LEED Silver certified office building has drastically reduced its landscape irrigation water needs through use of xerophytic plants and harvesting and reuse of cooling tower blowdown from heating, venting and air conditioning. Similar opportunities exist in other commercial, institutional, and educational settings.

Opportunity also exists, enhanced once a number of obstacles identified in the recommendations are removed, for developing multi-source, multi-purpose projects that might combine harvested rainwater, captured stormwater, reclaimed water, remediated water and other types of water. One example of a project along these lines is the Kino Environmental Restoration Project in Tucson. This project, which combines captured stormwater and reclaimed water, turned what was essentially a 50-acre unattractive stormwater retention basin into 141 acres of riparian and open water wetlands, grassland, mesquite bosque, marsh, and upland vegetation with surrounding recreational paths. The facility still serves its fundamental stormwater control purpose while providing a popular environmental amenity for use by its citizens. Other such opportunities can be envisioned across the state if recommendations of this Panel are implemented.

Conservation

Water is an essential resource in our lives and economy. Using water more efficiently is a responsibility of all Arizonans and a critical element in Arizona's long-range plan for securing sufficient water supplies. By supporting a "culture of conservation" in Arizona, ADWR is helping citizens, businesses, and communities become better water stewards. Within the AMAs, municipal water providers are required to comply with either a gallons per capita per day (GPCD) requirement or to implement BMPs that reflect the water use characteristics of their service area. Under the GPCD program, water providers are given a numeric target for each management plan and are expected to implement conservation measures aimed at reducing per capita use. ADWR does not require specific conservation measures under this program but allows the water provider to identify the appropriate measures for their community.

The MNPCCP) was developed in conjunction with stakeholders from all AMAs. The MNPCCP became effective in May 2008, and is described in the Second Modification to Chapter 5 of the Third Management Plan (ADWR, 2008). Participation in the program is required for all large municipal water

providers that do not have a DAWS and that are not regulated as a large untreated water provider or an institutional provider. Participation in the MNPCCP is optional for large municipal providers (a city, town, or private water company that serves more than 250 acre-feet of water per year) that have a DAWS. DAWS providers that do not opt for MNPCCP are regulated by the GPCD program. To date, 55 out of 76 large municipal providers in the five AMAs are regulated under the program. The MNPCCP requires participating providers to implement BMPs that yield greater water use efficiency in their service areas. A water provider regulated under the program must implement a required basic public education program and choose one or more additional BMPs based on its size as defined by its combined total of residential and non-residential water service connections:

- Tier 1 – up to 5,000 service area connections:
one additional BMP
- Tier 2 – 5,001 - 30,000 service area connections:
five additional BMPs
- Tier 3 – more than 30,000 service area connections:
ten additional BMPs

The 53 BMPs described in the program are divided into seven categories (see Appendix IV for complete list of BMPs):

1. Public Awareness/Public Relations
2. Conservation Education and Training
3. Outreach Services
4. Physical System Evaluation and Improvements
5. Ordinances, Conditions of Service, Tariffs
6. Rebates/Incentives
7. Research/Innovation Program

Encouraging water-wise agricultural practices is also consistent with the goal of the AMAs. Many agricultural water users in the AMAs have been proactive in implementing on-the-ground conservation measures such as land leveling, ditch lining, sprinkler systems, and drip irrigation systems. ADWR regulates agricultural water use through its Agricultural Conservation Programs detailed in the AMA Management Plans. The Agricultural Conservation Program contains three conservation programs for IGFR owners:

1. the Base Program,
2. the Historic Cropping Program, and
3. the BMP Program.

For the third management plan period Base Agricultural Program, ADWR calculated the maximum annual groundwater allotment for each IGFR

by dividing the total irrigation requirement per acre of the crops historically grown between 1975 and 1980 on a farm unit by an irrigation efficiency of 80 percent. Lower irrigation efficiencies may be used for a farm unit or portion of a farm unit determined by ADWR to have limiting soils or excessive slopes and for a farm unit where orchard crops were historically grown and continue to be grown. Alternatively, the owner of the IGFR may opt to enroll in one of the two alternative conservation programs if certain requirements are met. The BMP program is the only alternative program that has been utilized by farmers in the AMAs. Of the 4,012 active IGFRs (representing a total of 477,411 acres) in the AMAs, 148 right holders (37,195 acres) participate in the BMP program. The remaining IGFR holders continue to be regulated under the Base Agricultural Program.

ADWR also has consistently provided conservation assistance funds to reduce agricultural water use in the AMAs. One important example is the Irrigation Management Service (IMS) in the Pinal AMA and Water Conservation Management Program (WCMP) in the Phoenix AMA. The IMS and WCMP are cooperative programs with local Natural Resources Conservation Districts, the U.S. Natural Resources Conservation Service, ADWR, and more recently the U.S. Bureau of Reclamation. The programs provide irrigation scheduling, application rate information and water management education services to numerous farmers. In addition, programs such as the AMA Crop Survey help identify the impacts of agriculture in the AMAs, and help assess the effects of crop markets on water use. This tool has been used in the past by ADWR hydrologists and water resource specialists, in consultation with Irrigation Districts, and provides a relatively inexpensive way to assess water use and conservation potential in the AMAs. The Crop Survey also could be used as an educational and

outreach tool to demonstrate the contribution of agriculture to the local economy.

Industrial conservation is also a key component of the regulatory conservation program in the AMAs. This program is aimed at industrial water users who have their own well and do not receive water from a municipal water provider. Conservation measures employed by industrial facilities are either allotment-based, dependent on number of acres or animals, or rely on the use of industry-specific BMPs. There are several industrial sub-sectors included in this program. Table 3 below identifies the types and numbers of industrial facilities regulated within the AMAs.

Outside of the AMAs, water efficiency decisions are made by individual water users and communities. ADWR requires all water providers statewide to develop and submit a water conservation plan every five years. This is part of ADWR's effort to develop a culture of conservation throughout Arizona. ADWR has provided assistance to communities developing conservation programs outside of AMAs by hosting a website that provides the most up to date conservation technologies available for all water users: www.azwater.gov/AzDWR/StatewidePlanning/Conservation2/default.htm. The Web site includes "how to" fact sheets and information on successful implementation of these measures in Arizona and other parts of the United States.

Arizona communities and water users have long been implementing conservation programs to stretch our limited water supplies. Opportunities exist in providing the non-AMA communities with the tools and experiences of the AMA communities in developing strong conservation programs to enhance what has already been implemented. Sharing information on programs that have been successfully implemented in Arizona allows communities to better address their unique water supply limitations.

Table 3: Regulated Industrial Facilities in AMAs

User Category	Facilities
Large Scale Metal Mines	7
Turf-Related Facilities	281
Sand and Gravel Facilities	85
Other Industrial	743
Large-Scale Power Plants	12
Dairies	107
Total	1,235

Water/Energy Nexus

Water and energy are interdependent. It takes water to produce energy. Water is needed to produce steam to drive the electric generators, but more visibly and in greater volume for cooling the steam to convert it back to liquid. The primary forms of electrical generation in Arizona - coal, natural gas, and nuclear - are still thermal processes that require large volumes of water. The demand for water at these facilities varies significantly with nuclear being the most water dependent, needing about 785 gallons to generate a megawatt hour of power, followed by coal at 510 gallons per megawatt hour and natural gas at 415 gallons per megawatt hour (Pasqualetti and Kelly, 2008). Currently, Arizona power facilities account for approximately 45 percent of the total industrial water use in the state.

Conversely, significant amounts of energy are required to produce water. Energy is needed to extract water from wells or to divert from rivers. The CAP, which pumps water from Lake Havasu on the Colorado River into an aqueduct supplying the Phoenix and Tucson metropolitan areas, is the largest single energy user in Arizona. Conveying that water further to homes, farms and other uses requires varying amounts of energy depending on the terrain and location and types of end uses. Water treatment facilities require energy for producing safe drinking water and to move it to end uses. Energy is used in our homes and places of work to heat water, another significant energy requirement. A study by the Salt River Project, which was summarized for the Panel at the March 5, 2010 meeting, found that more than 80 percent of the electricity use for potable water supplies is attributable to residential water heating (see Figure 2).

Once the water is used, energy is required to convey wastewater to treatment facilities and, most significantly, for the treatment processes. For many communities, the cost of treating wastewater is the single biggest component of their power bill. If the reclaimed water is reused, electricity is again needed to pump the water to end uses.

The use of solar energy has been explored and continues to be studied because of the consistent availability of sunshine in Arizona.

While solar energy produces significantly less carbon emissions than conventional energy production techniques, the type of cooling for solar energy can have impacts on water supplies. Wet cooling is the lowest cost alternative for solar energy production, requiring less land area and producing the highest net generation, but it uses the most water. It is estimated that wet-cooled thermal solar facilities can use from 700 to 1,000 gallons per megawatt hour. Dry cooling is an alternative to wet cooling. Dry cooling can use very little water (estimated at below 100 gallons per megawatt hour), however it requires more land area to compensate for lower power production and it works better in cool, humid climates. This is a significant disadvantage in Arizona. Hybrid wet/dry cooling is an alternative solution that is being studied that may be able to accentuate the advantages of both dry and wet cooling while minimizing the disadvantages.

Because water and energy are so interrelated, conservation of one conserves the other. Opportunities exist in educating Arizonans on this interdependency and promoting simultaneous conservation of water and energy. As Arizona explores renewable energies such as solar power, investigating the practical application of wet, dry, or hybrid cooling facilities will enhance the goal of Arizona to be water and energy efficient. Identifying alternative cooling water sources by linking impaired

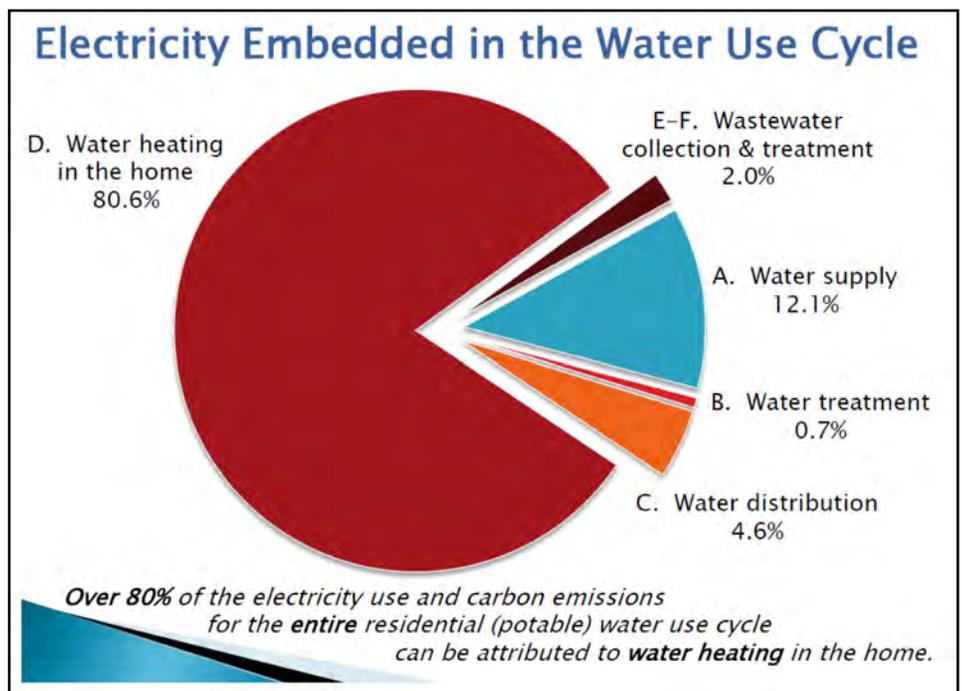


Figure 2: Electricity Embedded in Water

From the presentation, "The Electricity Embedded in Water: Two Sides of the Same Coin."

Salt River Project, accessed at: www.azwater.gov/azdwr/waterManagement/documents/EmbeddedElectricityBlueRibbonCommittee030510.pdf.

waters to the appropriate uses and conserving higher quality waters for potable uses will also stretch the available water supplies. And finally, encouraging water and energy planners to collaborate on plant locations and water supply availability will better ensure that appropriate water sources are used at the lowest cost to the facility and ultimately energy consumers.

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CHAPTER 4 - RECOMMENDATIONS OF THE BLUE RIBBON PANEL ON WATER SUSTAINABILITY

This chapter presents the final recommendations of the Panel. Some of these recommendations may require modifications to rules and policies. Most of the recommendations advocate action outside of the Panel process, including further research and public awareness/education campaigns or processes. The process used to get to the recommendation phase included development and prioritization of issues identified by the Working Groups. The Working Groups identified over 40 issues for consideration by the Panel (see Appendix II), which were then prioritized and reduced to 26 issues (see Appendix III). Next, the Panel directed the Working Groups to develop White Paper analyses and proposed recommendations for the 26 issues. The full text of these White Papers can be found in Appendix V. The Panel has reviewed the recommendations and by general consensus, adopted the recommendations within this chapter. A summary of the Issues and Recommendations is included in Appendix VI. Panel members with significant concerns about a recommendation were invited to file minority reports. No minority reports have been submitted to the Panel.

The Panel recommends no new regulatory programs or major reconstruction of existing programs. Instead, the Panel's recommendations include improvements to Arizona's existing toolbox of water management, education, and research capabilities. In the Panel's opinion, the current programs administered by ADWR, ADEQ, and the ACC constitute an exceptional framework within which water sustainability can be pursued and improvements to that framework will move Arizona further toward a secure water supply future. The issues and recommendations that were approved by the Panel were combined and categorized into five categories:

- A. Education/Outreach;
- B. Standards;
- C. Information Development and Research Agenda;
- D. Regulatory Improvements; and
- E. Incentives

A. Education/Outreach

Water issues are inherently complex, and the long-term sustainability of water supplies in Arizona and the role of reclaimed water in the water supply port-

folio is no exception. Discussions in the working groups identified a general lack of understanding and miscommunication affecting public awareness regarding the relationship among water availability, water resource management, water quality, economic development, environmental needs, and quality of life.

To further exacerbate the issue of miscommunication, definitions for reclaimed water and associated terminology vary among entities statewide. The professional water community uses technological terms and the bulk of the communication regarding reclaimed water comes from the professional water community. Conflicting definitions, complex terminology and negative campaigns (inherited from other states) foster public mistrust, misinformation, and confusion.

Additionally, a lack of awareness of the availability of water reuse and water resource-related information (including technologies and financial information) continues to surface in numerous forums as a critical issue for water conservation, water reuse, and water management efforts. Because Arizona has limited water resources, it is clear that a well-informed public is necessary to move Arizona forward with planning and financing the infrastructure and programs needed to achieve sustainability.

Education/Outreach issues identified in this category emphasize the need for coordinated information to be disseminated to the general public as well as community and business leaders in order to encourage efficient use of our water supplies and to improve public confidence in the use of reclaimed water. The Panel recommends the development of a coalition to formulate positive and easily understandable terminology as a means to improve public perceptions. The Panel also recommends the creation of an information portal to centralize the information necessary to develop a common understanding of Arizona's water supplies and conduct a coordinated education campaign aimed at improving the public's understanding and confidence in use of reclaimed water.

A.1. Increasing Public Awareness

Issue (White Papers #17 #18, #20, #5, #6, #3)

The Panel believes there is a need for consistent use of common and positive terminology to convey

effective messages about water sustainability. Additionally, there is a need for better public understanding of and confidence in the overall water picture and the role of reclaimed water in the water cycle. Support for programs that protect and enhance the sustainability of Arizona water supplies through a firmly-grounded and fact-based awareness of the relationship of water availability, conservation, the economy, the environment and desired quality of life is necessary. In order to establish the role of water efficiency and demand curtailment programs in addressing growth and drought, the relationship of water resource availability and development costs must be incorporated in water resource planning at all levels of government and private enterprise.

Recommendations

1. ADWR and ADEQ should create a coalition to engage industry experts and enlist professional assistance to translate industry terminology into an acceptable lexicon for statewide use. Water professionals should be educated on the use of the new terminology and the benefit to their industry for employing the terminology. The coalition should also focus on a unified message about the importance and appropriate uses of reclaimed water as part of Arizona's water portfolio and a plan to continuously and widely (at the state, county, and local levels) disseminate the message. Coalition members could include representatives from state, county and local jurisdictions, agricultural experts, industry experts, Arizona Universities, University of Arizona (U of A) Cooperative Extension, the AMAs, the Water Resources Research Center, the AZ Water Association, the Arizona section of the WaterReuse Association, interested members of the public and other parties (state, county, local). The coalition should be commissioned to formulate a strong, positive message that can be utilized on the state, county, and local level and that is appropriate to a variety of audience segments (agriculture, commercial, municipal, and consumer for example). ADWR and ADEQ should seek outside voluntary funding from federal, state, local, and private institutions to manage and administer the coalition, to acquire professional assistance, and to undertake a public awareness campaign. Information from the coalition should be reported regularly, using state and local jurisdiction websites and the media as well as encouraging stakeholder groups to keep their members informed.
2. ADWR should create a state-hosted, and easily accessible, information portal (with links to

ADEQ, ACC, Universities and other relevant information) with researched-based information on water pricing, water supply, water quality, water management, and water conservation and efficiency programs (including reuse and water efficient technologies), and water harvesting. The portal should also include available information regarding education, training, rebates, and ordinances as well as a section on funding options with links to possible organizations that could provide funding and case studies showing solutions to various reuse programs. Emphasis should be placed on detailed information regarding actual practices that have been analyzed for benefits and costs so that a provider or a district staff member can assess the information and make a tangible determination of the plausibility of the information for their own entity. To improve the information available through the portal, ADWR, ADEQ, and ACC should improve the collection and dissemination of information about water supplies and demand and should promote electronic, real-time information sharing and discussion through on-line forums, e-mail groups, etc. This information should be promoted to all stakeholders, including water resource planners, industry and trade groups, agricultural interests, economic development staff, and business prospects. It could be utilized to educate economic development leaders, industry, and trade association groups (state, regional, and local) regarding the impact of new business and water demand upon one another.

3. A more robust approach, or a second-tier of the web-based portal, could be modeled after the U of A Cooperative Extension Service, where staff would be available to provide direct assistance ranging from reconnaissance level feasibility assessment to helping with applications for funding. Staff would apply a common evaluation framework to the unique circumstances of the individual, business, or community seeking assistance.
4. Public and private water and/or wastewater agencies should be encouraged to evaluate their ability to implement a reuse program within the next two years and to submit this evaluation to ADWR and ADEQ. Those entities that make the greatest efforts should be rewarded through public recognition of their efforts.
5. ADWR should develop, in cooperation with ADEQ, ACC, Universities, and stakeholders, a series of out-of-session legislative meetings with stakeholders and legislators to discuss various aspects of water sources and the programs that protect and enhance water sustainability.

6. ADWR should expand the existing statewide awareness campaign to help encourage a culture of conservation that would make the public more receptive to local efforts. This campaign could ensure consistency of message, the greatest visibility, and the most efficient use of resources. This campaign should generate the umbrella awareness of the need for conservation as efficiently as possible, priming the public for more specific messages and allowing more funding on a local level to be concentrated on delivering targeted information to customers.
7. ADWR and ADEQ should request the Governor to proclaim an auspicious date as Water Reuse day for Arizona. The Agencies should also engage with academics, local celebrities, and business partners as official spokespeople for reclaimed water and should conduct an outreach campaign to potential users of reclaimed water.
8. Arizona should continue to rely on the combined expertise of Arizona's water managers in conjunction with the resources of the three universities as a means of expanding collaboration to support water resources management and technology development in real-world applications. The Universities serve as the hub of research, community assistance and analytical support to ensure clean and sustainable water resources and opportunities should be explored for strengthening links with Arizona's water managers.

A.2. Pharmaceuticals and PCPs

Issue (White Paper #16)

Many man-made compounds have made our lives safer, healthier and more convenient. However, when released into the environment, even in trace concentrations, some of these substances may cause water quality, health, and safety concerns. Their presence can also result in a public perception that use of reclaimed or recycled water is not safe. Because of the many compounds in use today and because we have a better understanding of their potential to impact human health and the environment, the process of setting water quality standards and regulations has grown increasingly important and complex. The Panel believes there is a need for the public, community leaders, water treatment professionals, businesses and industry to understand and be aware of water quality issues and how their actions, may impede the use of reclaimed water.

Recommendations

By focusing an effort on coordinated education and outreach, funding and legislative attention in the

area of PPCPs, the Panel believes that the following recommendations can increase public awareness and confidence in the use of reclaimed or recycled water.

1. Education and Outreach

- Work with national and other statewide programs to develop a consistent program nomenclature. For example, entities have different names for pharmacy take-back programs including Unwanted Medicine Return Program, Dispose-A-Med and No Drugs Down the Drain
- Expand pharmaceutical take-back programs: participate at the state and national level in efforts to facilitate programs and offer them at no cost to the public
- Urge ADEQ to implement a non-regulatory outreach/education/facilitation approach, that cuts through some of the barriers
- Be proactive with the media
- Media outreach should include:
 - o Linkage between water supplies and water quality
 - o Description of how contaminants are regulated
 - o Consistent messages regarding safety of reclaimed water for its intended uses
 - o What the public can do to protect clean and safe water
- Use experts, universities, professional industry organizations, subject matter experts, law enforcement, and social media to educate the public on water quality issues

2. Funding

- Fund a statewide education and outreach campaign
- Implement incentive programs for pharmacy and health departments
- Fund drug take-back programs. Some programs charge a fee and others require proof of residency. These requirements are impediments to successful programs and discourage the public from using them.
- Support funding for research in the following areas:
 - o Evaluate the effects of trace organics in stream systems receiving reclaimed water
 - o Evaluate the fate of trace organics in reclaimed water discharge to surface water or infiltrated for groundwater replenishment
 - o Explore the linkages, if any, between residual trace organic compounds in reclaimed water and human health effects
 - o Evaluate the environmental fate of PPCPs in Arizona settings where effluent is used for reuse, recharge, and environmental enhancement

- o See also Issue C.2 in this chapter for discussion of a strategic research plan related to emerging contaminants.

3. *Legislation*

- State laws specify the information that must be provided in prescriptions. One strategy is to advocate for an amendment to state law ARS 36, Chapters 27 and 28 to require pharmacies to post information about how to dispose of medications and personal care products and where to find take-back programs.
- Legislation to support proper disposal of pharmaceuticals and personal care products should be administered by the Arizona Department of Health Services (ADHS) and the Arizona State Board of Pharmacy.

B. Standards

Issues in this category are focused on the need for new or improved standards or related regulations and permit requirements to assist water users to increase their ability to utilize reclaimed water or other types of recycled water. Recommendations focus on matching recycled water supplies with appropriate end uses and removing uncertainties by coordinating regulations and planning efforts. Specific recommendations are proposed for developing standards for reclaimed water distribution system operations and design and for facilitating approval for projects aimed at coupling advanced treated reclaimed water with potable water sources, such as an aquifer.

B.1. Matching Alternative Water Supplies To Appropriate End Uses

Issue (White Paper #12)

Some recycled water supplies such as reclaimed water, remediated water, and brackish groundwater may not be utilized to the fullest extent throughout Arizona. Recognizing that not all recycled waters are appropriate for all classes of user, the Panel believes that efforts should be made to manage water supplies to optimize the matching of water quality to intended uses.

Recommendations

Recognizing that a “one size fits all” policy with respect to the use of lower quality water is unlikely to represent the best approach for Arizona, uniform model standards can be developed and may be useful; however, they must take into account site-specific conditions or provide for exceptions. To develop a comprehensive approach to matching water supplies to appropriate uses the Panel makes the following recommendations:

1. ADEQ, ADWR, and the ACC should initiate a stakeholder’s process to review and amend regulations as necessary that will improve, enhance or encourage use, storage and exchange of lower quality water supplies. A focus should be made to encourage agricultural water users to use reclaimed or remediated water, where appropriate. Recognizing that funding for improvements to infrastructure is needed; changes or amendments may be needed to policies and regulations that impede utility providers and governing agencies from pursuing alternate water sources and exchanges.
2. ADWR and ADEQ should evaluate the potential for incentives that encourage use of lower quality water supplies (see also the Incentives section at the end of this chapter).

3. Public and private water utilities should be encouraged to invest in treatment technology research aimed at improving efficiency, cost reduction and quality improvement.
4. ADEQ, ADWR, and the ACC should encourage research in water reuse. It may be less costly and alleviate concerns about possible emerging contaminants in reclaimed water to use this water for non-potable (agricultural or industrial) purposes.

B.2. Developing Comprehensive Reclaimed Water Infrastructure Standards

Issue (White Paper #21)

ADEQ statutes and rules provide a framework for the reuse of reclaimed water in Arizona. In 2001, ADEQ adopted in rule a relatively limited set of technical criteria for the design and construction of reclaimed water distribution systems, including criteria for both pipeline conveyances and open water conveyances. These criteria apply to conveyances transporting reclaimed water from the treatment plant to “the point of land application or end use.” Retrofit situations are not addressed, including conversions of drinking water system piping to reclaimed water use or vice versa. Other significant issues not addressed include cross connection control, meters and other appurtenances, augmentation of the system with other sources of water, and infrastructure abandonment. For reclaimed water infrastructure and distribution at the end use or “onsite,” i.e., following delivery of the reclaimed water from the conveyance to the end use (typically viewed as downstream of the reclaimed water meter) ADEQ rules provide very few technical criteria as part of end use permits. Lack of comprehensive, standardized technical criteria at the State level is seen by many as a key impediment to increasing the reuse of reclaimed water and decreasing the cost of reclaimed water infrastructure. It also has spawned multiple standards-generating efforts at local levels that some regard as duplicative.

Recommendations

The Panel recommends compiling a matrix of state, regional and local specifications and infrastructure standards to identify similarities, inconsistencies, and gaps and develop recommendations on a suite of standards that will provide a common foundation of safety and good engineering practices for reclaimed water distribution systems. The Panel believes that this would reduce uncertainties over appropriate standards, reduce costs due to uncertainties, and would be further protective of public health and safety.

To facilitate the development of the matrix the

Panel recommends ADEQ establish a Reclaimed Water Infrastructure Advisory Panel of state, county, local, and private experts. The Advisory Panel would review and enhance the matrix of State, regional, and local infrastructure specifications and standards developed by the Blue Ribbon Panel Infrastructure/Retrofit Working Group. Based on the matrix, the Advisory Panel would review and make recommendations regarding minimum design and construction criteria appropriate for statewide use and local conditions, while balancing the need for communities and utilities to maintain the ability to adopt local standards to enable an increased use of reclaimed water. The Advisory Panel would devise processes for timely updating of standards and for ensuring that local conditions can be accommodated. The Advisory Panel would recommend whether specifications and standards should be adopted as ADEQ rule, or embodied in a guidance manual of BMPs, or accomplished as a combination of the two. The Advisory Panel would consider and recommend an appropriate administrative mechanism to ensure that the infrastructure specifications and standards are used throughout the state with minimum additional administrative burden and cost.

Due to time limitations, Working Group members were not able to complete a full analysis of Priority Issue #24, which called for developing a menu of BMPs for operation and maintenance of reclaimed water systems. Working Group members had agreed, however, that a menu of operation and maintenance BMPs would be valuable to owners/operators of reclaimed water systems and would provide a baseline for consistent operation state-wide. Since development of a menu of BMPs easily could be incorporated into the work of the Reclaimed Water Infrastructure Advisory Panel, it is recommended that the Advisory Panel consider adding this task to its program of work.

B.3. Facilitating Indirect Potable Reuse

Issue (White Paper #10)

Some recycled water supplies such as reclaimed water, remediated water, and brackish groundwater may not be utilized to the fullest extent throughout Arizona. Recognizing that not all recycled waters are appropriate for all classes of user, the Panel believes that efforts should be made to manage water supplies to optimize the matching of water quality to intended uses.

Recommendations

The Panel believes that there is a need to develop definitions and guidance for Indirect Potable Reuse (IPR) to clarify and facilitate drinking water source

approval and local and state agency permitting requirements. IPR is defined as the injection of advanced treated reclaimed water into the saturated zone of a potable source water aquifer. Fundamentally, IPR is the intentional close coupling of advanced treated reclaimed water with a potable water source (i.e., aquifers) – see Figure 3, below.

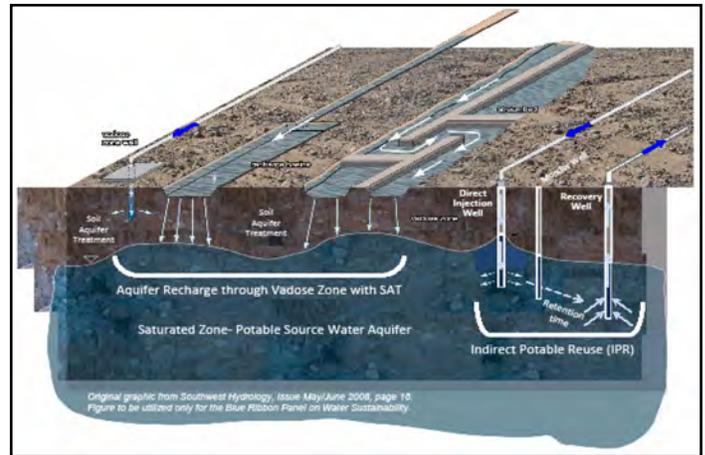


Figure 3: Cross-sectional graphic depicting the differences between IPR and Quifer Recharge through Vadose Zone.

It is believed that IPR guidance would facilitate a standardized and efficient approach to design, permitting and operation of such projects. The intent for a unified IPR policy is to maximize the efficient use of secured water supplies for future growth and to augment surface and groundwater supplies during system outages or drought.

Currently, APP program administered by ADEQ allows for the recharge of aquifers with reclaimed water. However, the regulatory requirements for obtaining a New Source Approval to allow the recovery of groundwater augmented by reclaimed water to be connected to a Public Water System are indeterminate at this time. Without an adequate regulatory framework for New Source Approval for IPR projects such investments cannot be made, thereby inhibiting the full utilization of reclaimed water supplies. It has therefore been suggested that IPR regulations be established to address water quality standards (regulated and unregulated constituents), differing hydrogeological circumstances of recharge and recovery, and multiple/engineered barriers of protection necessary to obtain a New Source Approval.

For the current State and County permit programs there are multiple layers of overlap and confusion related to the design, construction and operations of the facilities (e.g., implementation of new technologies to prevent operational injection clogging), hydrogeologic characterization of the area (e.g., address A.A.C. R18-5-502 and R12-15-818, both

having a “100-foot separation rule”), monitor well design and location, water quality sampling/reporting requirements, water quality impacts (i.e., obtaining New Source Approval for IPR programs), groundwater level impacts, technical and financial capabilities of the applicant, and land ownership and land zoning issues. Permitting of such a facility could be most effectively addressed by all agencies cooperating and accepting a single, unified, and well defined review and approval framework which covers all issues of concern without duplication and inconsistencies.

Recommendations

IPR uses the latest technology to indirectly store and recover reclaimed water for supplementing potable water supplies. The Panel believes that the current regulatory framework of multiple agency rules and regulations should be streamlined for IPR projects by the following recommendations:

1. Create an IPR Multi-Agency Steering Committee. The Steering Committee shall be comprised of the Directors or their designees of ADEQ, ADWR, and County agencies. The Steering Committee’s mission is to further advance IPR’s use by streamlining agency reviews, incorporating new technologies, and directing the IPR Advisory Panel. The Steering Committee’s first priority should be the development of a state-wide unified policy on IPR. The policy should define the objectives of IPR; clarify how recharged reclaimed water can be source water acceptable for potable purposes; and define the process for issuing New Source Approvals for IPR facilities.
2. Create an IPR Advisory Panel to focus on the effectiveness and implementation of new technologies and field studies (e.g., tracer studies).
 - a. The advisory panel should report to the IPR Multi-Agency Steering Committee.
 - b. The advisory panel should include technical agency representatives, researchers, practitioners, and a citizen representative.
 - c. The advisory panel could address streamlining current and future multi-agency rules, technical issues, and public concerns as they arise.
 - d. Convene a citizens/industrial panel to determine if there is public acceptance for IPR and work with the regulatory agencies in identifying potential regulatory controls to be implemented.
3. ADEQ should open a public rule making process and develop the regulatory framework for IPR.
4. Implement the above recommendations in a manner that has no detrimental effect on USF projects or APP discharges of reclaimed water that are already permitted and functioning.

B.4. Operator Certification For Reclaimed Water Distribution Systems

Issue (White Paper #15)

A.A.C. R18-5-101 through 116 provides rules for classifications of water and wastewater facilities and certification of operators. The level of training and certification required depends upon the classification of water and wastewater facilities, based mainly upon their complexity and population served. However, this code does not include reclaimed water distribution systems operated by utilities. The Panel believes that without a state-recognized and approved training and certification program for operation of reclaimed water distribution systems, there is a risk to the entire water reuse industry in Arizona should there be an operator error in any one system that leads or directly contributes to harm or perception of harm to public health or the environment. Legal or press media scrutiny of such an error could result in public distrust and fear that operators of reclaimed water distribution systems are not qualified to do so (even though they very well may be).

Recommendations

The Panel recommends that ADEQ facilitate the development of a reclaimed water distribution system operator training program and associated certification. The “certification” would actually be a reclaimed water operator “rider” that would be added to existing certifications that may be required for a utility. It is proposed that the AZ Water Association and WateReuse Arizona work together to develop and administer the program as a best practice, and refine the program over a year or two until it can be adopted into code by the State and be managed by ADEQ. As part of a future rule modification to include the reclaimed water operator rider program, it should be made a requirement that each reclaimed water utility designate an operator in direct responsible charge and that the operator in direct responsible charge must possess the reclaimed water operator rider. The program development and refinement process should include the ADEQ Operator Certification Committee. The white paper analysis on Priority Issue #15 (in Appendix V) provides the outline for a suggested training program.

It is proposed that this be an optional program jointly developed and administered by the AZ Water Association and WateReuse Arizona. Once the program is developed and implemented, modifications can be made as deemed necessary and appropriate over a 12 to 24 month period of time. Ultimately, it is suggested that the program be

administered by ADEQ as part of the existing operator certification program, which would require a modification to the existing rule. Incorporating the reclaimed water distribution system operator certification program into rule is consistent with what is currently in place for water and wastewater operator certifications, formalizes the responsibilities of a reclaimed water distribution system operator within a legal framework, and facilitates the designation of an 'operator in direct responsible charge' by utilities.

B.5. Water/Energy Standards

Issue (White Paper #7)

Water utilities need electricity to support the treatment, distribution, collection, and reclamation of water. Electric utilities need water for power plant cooling purposes. While a linkage between water and electric service provision is evident, at the present time in Arizona and, in some cases, water service providers develop long range forecasts and plans without significant regard for electric service issues, and electric service providers develop long range forecasts and plans without significant regard for water service issues. One example of existing water - electric collaboration occurs under the general provisions of Arizona's Power Plant and Transmission Line Siting statute (A.R.S. § 40-360-06), where water resource impacts are addressed during the siting process.

Recommendations

Acknowledging that independent conservation efforts are being advanced within the water and electric service provision areas, more collaborative planning aimed at saving both water and electricity can be conducted. For a future in which water and electric service provision may be constrained, the Panel makes the following recommendations to facilitate collaboration between water and energy planners to ensure the most efficient use of water and energy:

1. As an initial step toward supporting increased collaboration between water and electric service providers, the ACC, ADWR, and ADEQ should facilitate a workshop aimed at promoting discussion among stakeholders regarding coordinated utility planning activities. Arizona's electric and water industry regulatory agencies could take the lead in developing and moderating the proposed workshop. Participation in the forum or workshop would be voluntary; however results of the workshop may include best practice recommendations and/or the identification of guiding principles.
2. While the Panel recognizes some collaboration that occurs under the general provisions of

Arizona's Power Plant and Transmission Line Siting statute (A.R.S. § 40-360-06), as identified above, collaboration may be increased by amending the statute for the sole purpose of specifying that the water resource impacts of a proposed generation facility should be considered in issuing a Certificate of Environmental Compatibility. The ACC should take the lead in this effort.

B.6. Permitting Inconsistencies

Issue (White Paper #9)

The Panel believes that there may be inconsistencies between the AZPDES Permit Program, Surface Water Quality Standards, Reclaimed Water Quality Standards, and Aquifer Protection Permits. It is unclear if there are significant inconsistencies between these programs that are an impediment to reclaimed water use. However, there is a perception that redundancies exist in permit reporting requirements causing frustration and unnecessary expenditures of resources on the part of the permittees. This uncertainty illustrates that there is a need for a greater understanding of the programs by the regulated community. What is allowed by one program may be inadvertently prohibited by another. The regulatory maze may be a disincentive, especially for small providers.

Recommendations

The Panel recommends that ADEQ lead an effort, in cooperation with ADWR, ACC, and stakeholders to identify any inconsistencies or conflicts among the different agency programs (embodied in statutes, rules or policies). Reconciling inconsistency should have the impact of removing impediments to reuse and recharge where what is allowed by one program may currently be inadvertently blocked by another. To facilitate this review, the Panel recommends the development of a flowchart to identify what each program covers and where one program ends and the next program starts. Development of this matrix should be an effort of ADEQ, ADWR, ACC, and stakeholders. The regulating agencies should follow through on the results of the matrix to amend rules as necessary to resolve conflicts.

The Panel recognizes that this could easily turn into a big project at a time when agencies have scarce resources and further recommends that the agencies consider contracting with a third party to facilitate the process.

C. Information Development and Research Agenda

Accurate information is one of the most important elements of water sustainability. Good data promotes a common understanding of Arizona's water supplies. Development of rational regulations and standards that encourage reuse while protecting public health and safety, and increased public confidence in the use of reclaimed water, remediated water, gray water, and stormwater also rely on timely and accurate data. Issues in this section focus on the need for accurate information regarding the amount of reclaimed water available in Arizona, a better understanding of the relationship of water and energy and streamlined coordination of data collection among the state's water agencies and water users. This section also contains recommendation to research technologies that can improve water and energy efficiency. In addition, a strategic research plan is proposed to alleviate barriers and water quality concerns, as well as to provide incentives, for BMPs related to stormwater and rainwater harvesting.

C.1. Coordinating and Streamlining Data Submission

Issue (White Paper #4)

Permit data submission by reclaimed water permittees is commonly done manually and is a time consuming process that typically involves more than one permit or application. Sometimes data has already been submitted for a report to an agency and it is required again for another agency or report. Paper reporting causes an inefficient submittal process. Good reuse and water management policies require current and accurate information. Some agencies/utilities may shy away from implementing a reuse program due to the real and perceived additional administrative requirements and costs to implement such a program. The Panel believes that streamlining data submission using current technology would reduce the administrative burden and improve data quality for regulatory agencies, permittees and public.

Recommendations

The Panel recommends that ADEQ and ADWR initiate a process to review and revise permit and non-permit data submittal requirements for necessary frequency, consistency, and the applicability of monitoring requirements. Data should be submitted electronically to avoid inefficient data submittal and the agencies should develop a standard for an electronic data management system that would be common and available to all regulators, permittees, contractors and the public. The agencies should

utilize a stakeholder participation process to develop the system utilizing the expertise of information technology (IT) professionals, the expertise and capabilities developed by the regulated community to electronically report and manage data and to allow for electronic signatures. Regulators could work together with an IT firm to develop a common database that meets their needs as well as the needs of the permittees and public. The development of the data management system could be administered through an Intergovernmental Agreement between the regulatory agencies that require the data. The cost of developing the data management system should be shared by agencies that need the data.

The Panel also recommends that the ACC utilize common data from ADEQ and ADWR database to support application processes such as environmental quality compliance, water use data and wastewater flows.

After development of the system, the Panel recommends that ADEQ conduct outreach to ADHS certified laboratories to develop standardized electronic data submittals.

C.2. Promote Research On Human Health Effects Issue (White Paper #13)

The ability to measure extremely small levels of contaminants in water and recent media attention has increased the concern about emerging contaminants. There currently are no water quality standards and limited human health effect studies for many of these constituents. This situation has raised concern of whether or not the health of the population is threatened by the presence of these compounds. In response, limited research has been conducted by various groups, suggesting that additional coordinated research is needed. Doubt about public health impacts may impede the use of reclaimed water, and it elicits further concern regarding future possibilities for direct potable reuse of reclaimed water. The Panel believes that a strategic research plan is needed that supports new direction in policy and rule development in emerging contaminants, direct potable and full body contact reuse.

Recommendations

The Panel supports research on human health impacts in a traditional reuse setting (e.g. turf irrigation), separate from research into impacts on potable water and traditional in-stream discharge. This includes examination of exposure and risks associated with emerging contaminants (e.g. pharmaceutically active compounds, endocrine disruptors, personal care products) as well as from

pathogens (e.g. protozoa). This information could be used to evaluate and possibly improve existing monitoring requirements and water quality standards. To implement this research the Panel recommends the following:

1. Arizona, California, Texas, Colorado, and Florida are national leaders in developing water reuse programs. These states could form a coalition, along with the WaterReuse Association, WaterReuse Research Foundation, EPA and other state and national institutions to develop a strategic research plan to answer questions regarding the development of new and expanded uses of reclaimed water and gray water. ADEQ should contact the WaterReuse Research Foundation and present them with a proposal to take the lead in bringing the states and EPA together to formulate a strategic research plan that addresses the issues described here.
2. ADEQ should convene a group of stakeholders to engage in a process that could eventually develop standards for emerging contaminants, direct potable reuse, and full body contact. This process would include identifying standards and monitoring requirements driven by the type of end use, (such as for drinking water, i.e. adopting drinking water standards), and would include associated health effects research and the development of indicator parameters appropriate to the end use. These standards should be technology based, employ a suite of treatments such as Granular Activated Carbon (GAC), high ozone, Reverse Osmosis (RO), etc., to address the broad spectrum of potential contaminants.

C.3. Water/Energy Nexus

Issue (White Papers #2, #22, #25)

Population projections continue to predict strong, long-term growth in Arizona. Water and energy needs are critical elements to consider when planning for growth. A better understanding is needed of the evolving relationship between future water and energy demands. Growing needs for water and energy are going to require a balancing of competing demands, and knowing how those needs change is essential.

Using less water requires less energy, which results in even more water savings at the power plant (as well as fewer carbon emissions). Therefore, pursuing water-energy nexus efficiency opportunities, evaluation of technologic feasibility thresholds, operational consequences, water and electric cost impacts, as well as site-specific considerations is necessary. In the electric business arena, some renewable resources (wind and solar photo-

voltaic) offer water use advantages. Consideration of dry cooling, or hybrid (wet and dry) cooling is one method of pursuing efficiency in the water-energy nexus. However, to date, no dry or hybrid cooling systems have been built in Arizona due to actual or perceived impediments including, but not limited to, loss of generation capacity during the hottest months of the year (when power needs are at their highest), large land requirements to make up for losses in generating efficiencies, and the added capital costs for construction and the cost to produce power resulting in increased costs to ratepayers.

Additional efficiency improvements exist in the juncture of the water/energy nexus, presenting opportunities for joint ventures in technology transfer that will take advantage of economies of scale in both areas. Consumer oriented products that improve efficiency do not impede reuse or recycling per se, but a failure to optimize the use of water and energy saving technologies is an impediment to water and energy sustainability. In order to increase the availability of efficient fixtures, appliances, and technologies, there needs to be additional research and development for these water and energy saving items. Cooperation between the government, water providers, and industry is necessary to achieve this. These partnerships are critical to achieving water and energy savings, communicating the benefits of these technologies, and expediting the acceptance and adoption of them.

In addition to the water/energy nexus, additional efficiency improvements can be developed for all types of end uses. Information and research on the latest available technologies will assist water users in developing conservation measures that can address the unique characteristics of their communities and water use patterns.

The Panel believes that to address these issues there is a need for Arizona-specific information about how much water is embedded in energy production and how much energy is embedded in water production. Furthermore, the Panel agrees that Arizona must look at opportunities for efficiency in water use and the water and energy nexus including water-less solar facilities and dry cooling towers and increasing the availability of efficient fixtures, appliances, and technologies.

Recommendations

To gain a better understanding of the energy needs of producing water and the water needs of energy production, as well as providing continuous updated information on appropriate cooling technologies to promote water-efficient energy production, the Panel recommends the following:

1. ADWR and the ACC should cooperatively facilitate an Arizona-specific study that identifies the amount of water in energy and the amount of energy in water and an evaluation of the technologic feasibility, operational consequences, water use impacts and electric cost impacts of dry / hybrid cooling systems. (This may be more than one study, i.e. the cooling technology study may be performed separately with the higher level synopsis included in an overall report).
2. Legislation would not be needed to perform such a study. However, while oversight would come from ADWR and the ACC, adequate funding would need to be secured and could come in the form of grants or from the electric and water utilities within Arizona. The study should include support and feedback from a stakeholder group so that a thorough understanding of benefits and drawbacks are well understood prior to adoption of a new rule or policy. Uniform standards can be developed as a result of this study however it should be recognized that a “one size fits all” policy with respect to the use of dry or hybrid cooling is unlikely to represent the best approach for Arizona and must take into account site-specific conditions or provide for exceptions. Additional studies should be initiated to analyze the cost of FERC licensing that may be prohibitive to development of low-head hydro generation. The State should support evaluation of impediments to small (1.5 MW) low-head hydro generation in existing conduits resulting from FERC regulation.
3. ADWR should create a State-hosted information clearinghouse to store data (this could be done in conjunction with the information portal proposed on page in the Education/Outreach section of this chapter, Issue A.1, Recommendation 2). If creation of a State-hosted information clearinghouse is infeasible due to the current state of the Arizona budget, then ADWR should look for other possible partners such as the State universities to house the data. Stakeholder input should be used to streamline the data-gathering process, using data already being reported to governmental agencies when possible. Once this is accomplished, the agency should work toward staffing of analytical support within a State agency as future budgets allow to provide feedback of current experiences and technologies.
4. ADWR and the ACC should support regional and national research that will encourage the development of innovative and groundbreaking products that will increase water use efficiency for all types of end uses and energy efficiency. The agencies should encourage federal funding for

these research areas. It is important to note that research should not be limited solely to efficiency technology, but should also include a broad array of scientific studies. For example, plant research leading to the development of salt-tolerant varieties appropriate for reclaimed water use would prove fruitful, as would research on salt mitigation and reduction. The State should provide leadership for partnering in and supporting federal efforts. Individual jurisdictions could provide incentives for use of technology as their abilities and interests dictate.

C.4. Rainwater Harvesting and Stormwater Research

Issue (White Paper #26)

Utilization of stormwater and rainwater at the regional, community and individual property owner levels is fairly new in the scheme of development. There is an opportunity for creative thinking that is technically oriented and based on sound engineering practices to be adopted in current regulations or guidance documents and made available for use. The Panel believes that further research is needed regarding regulatory barriers, cost and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and homeowner/property owner level. Additionally, the Panel believes that there is a need to provide incentives for emphasizing water harvesting as a preferred BMP for stormwater management.

Recommendations

The Panel recommends that ADWR approach the Arizona Floodplain Management Association or the National Association of Floodplain and Stormwater Management Agencies to “champion” the development of a strategic research plan to identify regulatory barriers, costs and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and individual property owner level. It is further recommended that a dialog be established with organizations such as the American Rainwater Catchment Systems Association and stakeholders to determine the extent of current research available and what research would be helpful in promoting more use of stormwater and rainwater.

Examples of questions that research should address include:

1. How much unused stormwater and rainwater can be reused?
2. What are the best uses for stormwater and rainwater?

3. What rules are currently in place that impedes development of new applications for reuse in the areas of stormwater and rainwater?
4. Is technology available that is not being utilized? Why not?
5. What are the cost barriers to more reuse of stormwater and rainwater and how can they be reduced?

The significant efforts and progress made by Australia and Tucson in this area should be reviewed by ADWR and ADEQ for possible implementation statewide in Arizona.

D. Regulatory Improvements

While regulations are aimed at protecting public health and safety and providing consistent application of statutes, there are concerns that some regulations inhibit the increased utilization of reclaimed water, remediated water, gray water and stormwater. Practical interpretation and implementation of rules by regulatory agencies is needed to promote increased utilization of these alternative water supplies. The issues in this category identify some of these limitations and make recommendations for improving consistency and coordination among the regulatory agencies and various regulatory programs.

D.1. Encourage The Use Of Alternative Water Supplies

Issue (White Paper #8)

Although traditional sources of water are becoming fully utilized in Arizona, potential applications of reclaimed water, reuse of gray water, stormwater and remediated water exist and are not being fully realized. Reasons include cost, effort, and current rules that should be amended as needed to keep up with current technology. Remediated water cannot currently be comingled with reclaimed water under a reclaimed water general permit; an individual permit must be processed by the ADEQ. Beneficial use of rainwater harvesting and stormwater management is not fully developed. Backflow and cross connection prevention to protect public drinking water systems and reuse sites from contamination is important to maintain public support for use of reclaimed water, gray water and other alternate water sources. The public needs assurance that health concerns regarding protection of drinking water supplies are adequately addressed, or they may oppose alternative water sources. Greater public education and outreach is needed regarding rainwater harvesting and stormwater opportunities.

The Panel believes that policy and rule changes are needed to encourage use of new water sources (reclaimed water, gray water, rainwater, stormwater and remediated water).

Recommendations

To encourage use of new water sources, the Panel recommends the following:

1. ADEQ and ADWR should review the rules that address comingling of remediated and reclaimed waters using a stakeholder process to identify changes. ADEQ rule in conjunction with ADWR policy needs to clearly address comingling of remediated waters with reclaimed water. ADEQ should review the rules to evaluate circum-

stances whereby a General Permit may be considered for comingling of remediated water and reclaimed water.

2. ADEQ's Stormwater BMPs need to encourage "green" infrastructure development such as rainwater harvesting and reclaimed water use, preservation of riparian corridors and groundwater recharge. Local agencies should be encouraged to adopt applicable BMPs and educational programs that promote "green" infrastructure development.
3. ADEQ should add an additional provision to the reclaimed water conveyance rules that refer to backflow requirements in A.A.C. R18-4-215 (ADEQ drinking water rule governing backflow provisions). Water providers would be responsible for enforcing backflow requirements.
4. ADEQ should amend R18-4-215 to specifically identify reclaimed water as an alternate water supply that would necessitate protection of the potable water service.
5. ADEQ should consider incorporating cross connection control requirements into rules administered by ADEQ.

D.2. Eliminate Duplicate Regulations and Fees

Issue (White Paper #1)

A concern exists among stakeholders that definitions of terms in rules and statutes are inconsistent. After much general discussion at the working group level, the Panel chose not to recommend changing any of the definitions. Instead the Panel recommends practical interpretation and implementation of rules by the regulatory agencies on a case-by-case basis that will promote increased utilization of reclaimed water.

One example of duplication has been identified in Maricopa County where the county is taking an active role in permitting reuse sites in a manner similar to ADEQ, although ADEQ has not delegated its reclaimed water program to any county. While Maricopa County believes it is providing additional service, duplication of requirements creates additional work, inefficient work flow and increased transactional costs for regulatory agencies, reclaimed water providers and end users that are operating with scarce resources. The issue causes confusion for the permittee regarding reporting requirements and possible liability regarding enforcement responsibilities for the regulatory agency. Furthermore, confusion regarding reuse authority creates negative public perception about the safety of reclaimed water.

Recommendations

The Panel believes that jurisdictional/duplication issues that exist between ADEQ, ADWR, ACC, counties should be identified and addressed. To address this issue, terms should be standardized; reporting requirements and fees should be examined for duplication among entities.

1. The ACC, ADEQ, ADWR, and the counties should review statutes for inconsistencies in definitions and duplication of fees.
2. ADEQ should review rules that apply to reclaimed water users for inconsistencies in definitions and duplication of fees.
3. ADEQ should initiate corrective action through their rulemaking process to fix the inconsistencies in A.A.C. R18-9 and R18-11 where references are made to the wrong location in A.R.S. 49-201 for the definitions of "Reclaimed water" and "On-site wastewater treatment facility."
4. ADEQ should determine if counties are duplicating programs and charging fees for programs that are also being conducted by the State. Specifically, Maricopa County should consider amending its Health Code to be consistent with ADEQ Rules for permitted uses of reclaimed water to avoid confusion and facilitate the use of reclaimed water.

D.3. Update Reclaimed Water Quality Standards

Issue (White Paper #11)

The Panel believes that Title 18, Chapter 11, Article 3 Reclaimed Water Quality Standards should be reviewed and updated to take into account the experience and knowledge learned from reclaimed water use in Arizona. Cumbersome permitting processes may cause potential uses to be avoided. Specific standards to be addressed include:

- New candidates for general permits
- Type 3 gray water system design standards
- New gray water uses
- Definitions, amendments and signage requirements
- Review of outstanding issues
- Coliform monitoring issues (e.g. e-coli v. fecal coliform)
- Gray water usage limitations (quantity)
- Accommodate de minimus uses of alternate water sources
- Type 3 gray water system design standards review

Recommendations

The Panel specifically recommends that ADEQ take the following actions:

1. Develop a new general permit for commercial and municipal gray water users;
2. Revise standards for Type 3 gray water systems (R18-9-719);
3. Redefine permissive uses of gray water (R18-9-711. A.3);
4. Possible revisions to R18-9-101 (definitions) and R18-9-704 (signage);
5. Revise the fecal coliform rule (R18-11-303-307) so E coli may be used as the indicator organism for pathogen removal similar to the BADCT rule (R18-9-B204) and revise the coliform monitoring frequency requirement for Class A+, A, B+, and B reclaimed water in R18-11-303 to R18-11-306 to match the BADCT frequency in R18-9-B204;
6. Revise gray water permits to address size of application area and type of water demand (R18-9-711); and
7. Address de minimus uses under gray water permit requirements.

D.4. Establish Ratemaking Guidelines

Issue (White Paper #23)

Public service corporations that provide water, wastewater and reclaimed water service regulated by the ACC lack the financial and ratemaking incentives, regulatory certainty and regulatory programs necessary to:

1. facilitate and promote the implementation of demand side management and conservation programs;
2. acquire and deploy renewable (sustainable) supplies;
3. plan and construct infrastructure on a regional scale, all of which are necessary to promote sustainability; and
4. invest in large-scale regionally planned facilities or the acquisition of future renewable resources due, in part, to the regulatory concept of used and useful which generally holds that investment in facilities cannot be considered for recovery in rates until it is deemed to be providing service to current customers.

Recommendations

The Panel suggests that the ACC establish financial and rate-making guidelines for the ACC regulated water utilities that mirror the programs currently in effect for power utilities. Specifically, the Panel recommends that the ACC consider the following:

1. Establishment of a demand side management (DSM) and conservation program framework through a stakeholder or workshop process at the ACC with establishment of rules that include cost

- recovery method established for all future utility rate cases as part of rate case application;
2. Establish and promote effective revenue decoupling⁶ to remove revenue impediments to achievement of use reductions through stakeholder or workshop process at the ACC with establishment of rules that establish appropriate decoupling mechanisms;
 3. Establish a consistent policy that promotes acquisition of renewable supplies in advance of supply needs. Establish appropriate funding mechanisms, needed to acquire such supplies and modify the “used and useful” standard or determine by ACC policy or rule that demonstration of sustainable and/or renewable supplies to offset current use of non-sustainable supplies is good public policy and is deemed to be “used and useful” for those supplies;
 4. Establish by rule, a process where rate recovery of large capital-intensive infrastructure can begin before these facilities are placed in service. Allowing recovery as construction is on-going with step increases will provide utilities with a funding mechanism and help shield rate payers from rate shock;
 5. Through stakeholder workshop process with the ACC, develop alternative funding methodologies that can provide funding for regionally-scaled reclaimed and renewable water facilities;
 6. Insure that no existing policies, rules, legislation, or guidance, unnecessarily interfere with or make more difficult the potential to use private funding options for larger capital intensive projects;
 7. Partner with large water users to fund reclaimed water facilities and distribution systems; and
 8. Seek private sector funding for large-scale water infrastructure projects, where appropriate.

D.5. Address Unique Situations In Recharge, Reuse and AZPDES Permits

Issue (White Paper #14)

The Panel finds that Recharge, Reuse and AZPDES permits do not adequately address unique situations. The permit process may prohibit the use of reclaimed water for an environmental benefit because it is based on rigid standards that make the environmental use infeasible due to treatment costs. Regulation and permitting could better facilitate multiple benefits which recognize unique situations. Individual permits are expensive and time consuming. More General AZPDES Permits

may be an incentive to use reclaimed water on sites that could benefit from the use of reclaimed water. This could allow improved compatibility with reuse permits. Rules are narrowly interpreted, resulting in policies that may impede utilization of reclaimed water. Whole Effluent Toxicity (WET) testing may be inappropriate for permitting some environmental restoration and multi-benefit projects, which are significant future uses of reclaimed water.

Recommendations

To allow for more flexibility so that reclaimed water use opportunities can be taken advantage of (while carefully considering the discharges from metal mines), and recognizing that EPA approval may be required in some cases, the Panel recommends that ADEQ implement the following modifications:

1. AZPDES general permits should be more widely offered for riparian areas, urban lakes, and wetlands. There is a general APP (R18-9-D305) for wetlands discharge of A+ reclaimed water to natural wetlands, waters of the U.S., waters of the State, and riparian areas. ADEQ and stakeholders should develop a similar AZPDES general permit, if appropriate.
2. ADEQ should improve the interface between its various permitting program requirements where reclaimed water is incorporated as a resource to support a public project that involves overlapping programs with equally beneficial goals such as reuse, recharge of multiple water sources, stormwater management, stormwater harvesting, public amenities, wildlife benefits, etc.
3. To accommodate use of reclaimed water for environmental purposes (habitat restoration, riparian preservation, environmental and ecosystem enhancement projects, etc.) flexibility should be added to ADEQ’s standards and permitting for surface water and reuse programs. Stakeholders and ADEQ should consider adopting one or more of the options or approaches included in White Paper on Priority Issue # 14 (Appendix V) in order to better facilitate environmental enhancement with reclaimed water.
4. ADEQ should develop a flexible approach that only applies WET in settings where aquatic wildlife impacts are likely. There should be additional research into alternative appropriate protections for AZPDES discharge in upland/ephemeral settings that are distinct from

⁶ Revenue decoupling is generally defined as a ratemaking mechanism designed to eliminate or reduce the dependence of a utility’s revenues on sales. It is adopted with the intent of removing the disincentive a utility has to administer and promote customer efforts to reduce water consumption and demand.

wet-water environments. In these settings, criteria for impact on terrestrial wildlife could be developed and applied.

5. Expand the application and provide guidance on implementation of Net Ecological Benefit NEB in individual AZPDES permits.

E. Incentives

Improvements in regulations and standards may not fully facilitate the increased use of reclaimed water. However, incentives will provide additional benefits in moving Arizona closer to water sustainability.

E.1. Develop, Expand and Promote Tax Credits/Exemptions For Use of Alternative Water Supplies

Issue (White Paper #19)

Currently, Arizona statute provides for a tax credit incentive for water conservation systems (A.R.S. §43-1090-01). The statute defines water conservation systems as systems capable of storing rainwater or gray water for reuse on a residential property. However, the tax credit will expire in tax year 2011. Less than half of the available tax credits were used during 2009 which could indicate that the availability of the tax credit is not widely known. Developers and rural property owners may not want to pursue gray water system installations or may not be encouraged to implement rainwater harvesting if the tax credit incentive expires and/or they are not aware of it due to the lack of publicity.

Adoption of A.R.S §49-204 removed the ability of some local governments to control gray water systems that was previously allowed by rule R18-9-711.C. The Statute states a city, town or county may not limit the use of gray water unless it is located in an initial Active Management Area, has a ground-water goal of safe yield, the area does not contain part of the CAP aqueduct and the effluent has been included in an assured water supply that permits towns, cities or counties to limit gray water systems. This means that water providers in some areas, where these conditions do not apply, cannot prohibit gray water systems, even if they have contractual commitments to reclaimed water customers. Local control of gray water outside these areas was allowed by rule before adoption of A.R.S §49-204. The price of water competes with the price of reclaimed water. A customer is likely to select the type of water that is most economically feasible for their project. The best use of reclaimed water could be aquifer recharge, industrial use or other types of large scale use in lieu of permitting gray water systems that might reduce the availability of reclaimed

water to meet these uses. In this case it may be in the community's best interest to prohibit gray water systems so they are able to receive the return flow as reclaimed water.

The Panel believes that the current statutes have created jurisdictional issues with regards to control of gray water systems and because there are currently only limited financial and regulatory incentives for using reclaimed water, there is a need to provide incentives (or continue current incentives) for continued/expanded use of alternative sources of supply.

Recommendations

To provide the needed incentives to continue and/or expand the use of alternative water supplies, the Panel recommends the following:

1. A.R.S. §43-1090-01 should be extended by the Legislature and an effort should be made to publicize that it is available for tax credits (using the information portal recommended under Education/Outreach). ADWR and ADEQ should cooperate on facilitating this amendment. Administration of the tax credit would be the responsibility of the Arizona Department of Revenue.
2. A bill that expands the tax exemption for reclaimed water infrastructure capital investment should be created. ADEQ and ADWR should assemble a work group tasked with considering how such a bill would look and try to find a sponsor for the bill.
3. A.R.S. §49-204 should be amended by the Legislature to allow for local control of gray water systems. ADEQ should take the lead on facilitating this amendment. Administration of the tax credit would be the responsibility of the Arizona Department of Revenue. Local governments would have clear authority to administer whether gray water systems are permitted or not by local ordinance.
4. ADWR should consider other policy changes that would provide incentives to encourage converting existing water uses to using alternative water supplies (see recommendations under Issue B.1 of this chapter).

APPENDIX I - WORKING GROUP MEMBERSHIP

A. PUBLIC PERCEPTION/ACCEPTANCE WORKING GROUP MEMBERS

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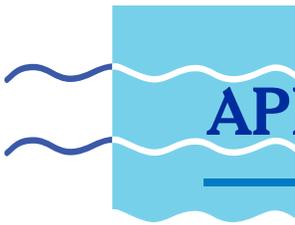
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Eric P. Thor	Arizona State University	Scott Mussi	Home Builders Association of Central Arizona
Evan Canfield	Pima County Regional Flood Control District	Taylor D. Shipman	Montgomery & Associates
Grant Ward	Maricopa Stanfield Irrigation and Drainage District	Teresa Bourne	Tucson Water
Greg Carlson	Greg Carlson Engineering	Tim Walls	Rural Water Association of Arizona
Janeen Rohovit	Salt River Project	Tony Mardam	HDR
		Wendy LeStarge	ADEQ

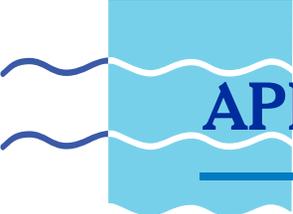


APPENDIX II - WORKING GROUP ISSUES

<i>Public Perceptions/Acceptance Working Group</i>
The need for consistency in the use of common and positive terminology to convey effective messages about water sustainability (PPA)
The need for a better public understanding of the overall water picture and the role of reclaimed water in the water cycle (PPA)
The need for the public, community leaders, water treatment professionals, businesses and industry to understand and be aware of water quality issues and how their actions, including disposal of pharmaceuticals and personal care products, can influence water quality (PPA)
The need to create and expand public confidence that reclaimed water is safe for reuse through an understanding of how the water is treated and the types of potential uses for reclaimed water (PPA)
The need to build a constituency for increased use and acceptance of reclaimed and recycled waters for beneficial purposes through education, outreach and other strategies (PPA)
<i>Conservation/Recycling/ Efficiency/Energy Nexus Working Group</i>
Guiding Principles - Recommendations must reflect that each area of the state has unique circumstances (CREEN)
Guiding Principles - There is need for better awareness and education campaigns that target groups such as the public, decision makers and policy makers in all areas of discussion (CREEN)
Guiding Principles - There is a need for improved data, research and better definition of terms in all areas of discussion (CREEN)
Guiding Principles - Efforts should be made to manage water supplies to optimize the matching of water quality to intended uses (CREEN)
Guiding Principles - The cost and benefits of all recommendations must be considered (CREEN)
Stormwater Management - Further research is needed regarding regulatory barriers, costs and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and homeowner/property owner level. (CREEN)
Stormwater Management - Identify what is needed to further encourage use of stormwater (CREEN)
Water Energy Nexus - Ways to facilitate collaboration between water and energy planners should be developed to ensure the most efficient use of water and energy
Water Energy Nexus - Arizona-specific information is needed about how much water is embedded in energy and how much energy is embedded in water (CREEN)
Conservation - Water resource availability and associated development costs establish the role of water efficiency and demand curtailment programs in addressing growth and drought. This interrelationship must be incorporated in water resource planning at all levels (CREEN)
Conservation - It is important to consider a continuing role for research and incentives which will transition worthy technologies into mainstream markets (CREEN)
Conservation - To develop support for programs that protect and enhance sustainability of Arizona water supplies, a firmly-grounded and fact-based awareness of the relationship of water availability, conservation, the economy, the environment and desired quality of life among the public, business community and governmental leaders is necessary (CREEN)
<i>Infrastructure/Retrofit Working Group</i>
Compile a matrix of State, regional, and local specifications and infrastructure standards and use it to identify similarities, inconsistencies, and gaps. Use the matrix to develop recommendations to the BRP on a suite of standards that will provide a common foundation of safety and good engineering practice for reclaimed water distribution systems (IR)
Compile a matrix of O&M best management practices (BMPs) that are applicable to reclaimed water distribution.

Use the matrix to develop recommendations to the BRP on a menu of BMPs appropriate for use in Arizona (IR)
Develop definitions and guidance for Indirect Potable Reuse (IPR) in aquifers in association with drinking water source approval and local and state agency permitting requirements to facilitate a standardized and efficient approach to design, permitting, and operation of such projects (IR)
Coordinate with the Regulations/Permitting Working Group to analyze an array of approaches needed to implement the recommendations of Issues 1, 2, and 3 above in a manner that will eliminate current impediments (IR)
Identify issues and develop approaches to operator training/certification for reclaimed water utility distribution systems to ensure consistent and safe management of this resource and its associated infrastructure. Based upon the analysis, develop recommendations on operator certification for the BRP (IR)
<i>Regulations/Permitting Working Group</i>
Data collection needs to be streamlined to reduce the administrative burden on reclaimed water providers. ADEQ and ADWR should initiate a review process of data collection requirements, monitoring requirements, and reporting requirements for permit and non-permit information. <ul style="list-style-type: none"> • Data should be collected in an efficient manner, avoid redundancies, where possible and reflect a comprehensive picture of reclaimed water use • Permit requirements should be reviewed for frequency, consistency, and applicability of monitoring • Consider the expertise/capabilities developed by the regulated community to electronically report and manage data; and accept electronic signatures (RP)
Recharge, Reuse, and AZPDES permits do not adequately address unique situations. More flexibility is needed so that reclaimed water use opportunities can be taken advantage of. <ul style="list-style-type: none"> • De-chlorination requirements for riparian and recharge projects should be case by case • Lake management plans could substitute for narrative nutrient standards • Permits need to be consistent (APP BADCT/Reclaimed Water Quality Standards) • General permits should be more widely offered (RP)
Policy and rule changes are needed to encourage use of new water sources (reclaimed water, gray water, rainwater, stormwater, and remediated water). <ul style="list-style-type: none"> • ADWR policy should clearly address comingling of remediated waters with reclaimed water • BMPs need to encourage “green” infrastructure development such as rainwater harvesting • Aquifer Protection Permit and Reclaimed Water Permit Rules should emphasize protection of public drinking water sources from contamination to maintain public support for use of reclaimed water, gray water and other alternate water sources (RP)
Jurisdictional/duplication issues exist between ADEQ, ADWR, ACC, counties, and other entities. <ul style="list-style-type: none"> • Terms should be standardized • Reporting requirements should be examined for duplication • Fees should be examined for duplication between entities (RP)
Education and outreach need to be stronger components of regulatory programs. Regulations need to encompass these issues so the public better understands the benefits and safety of the use of alternate sources of water supply. <ul style="list-style-type: none"> • Design guidelines are needed for persons considering and installing gray water systems • Reclaimed water use can offset and help conserve potable water sources (RP)
A strategic research plan is needed that supports new directions in policy and rule development (emerging contaminants, direct potable and full body contact reuse). <ul style="list-style-type: none"> • Direct potable reuse • Research efforts coordinated similar to those under the prior Arizona Water Institute • Technology based standards development process • Human health impacts for existing, traditional reuse applications • Human health impacts of PCPs in gray water (RP)
Title 18, Chapter 11, Article 3 Reclaimed Water Quality Standards need review and updating to take into account experience and knowledge learned from reclaimed water use in Arizona. <ul style="list-style-type: none"> • New candidates for general permits • Type 3 gray water system design standards based on on-site treatment • New gray water uses • Definitions, amendments, signage requirements

<ul style="list-style-type: none"> • Review of outstanding issues • Coliform monitoring issue (e.g. E. coli vs fecal coliforms) • Gray water usage limitations (quantity) • Accommodate de minimus uses of alternate water sources • Type 3 gray water system design standards review (RP)
<p>Current state statutes have created a jurisdictional issue with regards to control of gray water systems and need to provide incentives for continued/expanded use of alternate sources of water supply.</p> <ul style="list-style-type: none"> • Tax credits for gray water systems • Provide financial and regulatory incentives for conversions • Local control of gray water systems (RP)
<p>Items identified that should remain on the radar for future consideration, but currently work well.</p> <ul style="list-style-type: none"> • Enhance education efforts to promote reuse that currently already have standards and framework in place by statute and rule • Local control of salinity requirements • Local control of water softeners • The definition of effluent (RP)
<p>Interactions and inconsistencies between the AZPDES Permit Program, Surface Water Quality Standards, Reclaimed Water Quality Standards and Aquifer Protection Permits need to be resolved.</p> <ul style="list-style-type: none"> • A flowchart/matrix will assist in clarification. This should have the impact of removing impediments to reuse and recharge where what is allowed by one program might be inadvertently blocked by another. The flowchart should identify what each program covers and where one program ends and the next program starts. The working group believes it is beyond their scope to develop this matrix and it should be an effort of ADEQ (RP)
<p><i>Economic/Financing Working Group</i></p>
<p>Provide technical support and a Clearinghouse for assistance to Arizona communities. (EF)</p>
<p>Establish financial and rate-making guidelines for the ACC regulated water utilities that mirror the programs currently in effect for the power utilities. (EF)</p>
<p>Continue and expand WIFA grant and loan programs targeted to Green Infrastructure such as aquifer recharge, and stormwater capture/rainwater harvesting. (EF)</p>
<p>Incentivize Green Infrastructure by introducing simplified ADWR and ADEQ regulatory and permitting programs which save time and effort for smaller communities. (EF)</p>
<p>Refine Arizona policies and regulations governing the accrual of groundwater credits to provide incentives for conversion to reclaimed water from groundwater pumping for groundwater turf users proximate to reclaimed lines. (EF)</p>
<p>Provide incentives for emphasizing water harvesting as a preferred Best Management Practice (BMP) for stormwater management. (EF)</p>
<p>Make changes to state statutes to grant full recharge credit to the Secretary of the Interior for effluent used to sustain the flows in riparian corridors. (EF)</p>
<p>Look at opportunities for efficiency in the water and energy nexus including water-less solar facilities and dry cooling towers (EF)</p>
<p>Gray water incentives should be provided to the commercial and municipal sector. (EF)</p>



APPENDIX III - BRP PRIORITY ISSUES

BRP ISSUE PRIORITIZATION DRAFT Recommendation Approach

October 29, 2010

EDUCATION/OUTREACH

- *(Priority Issue #17)* Need for consistency in the use of common and positive terminology to convey effective messages about water sustainability;
- *(Priority Issue #20)* Need for better public understanding of the overall water picture and the role of reclaimed water in the water cycle;
- *(Priority Issue #16)* Need for the public, community leaders, water treatment professionals, businesses and industry to understand and be aware of water quality issues and how their actions including disposal of pharmaceuticals and personal care products can influence water quality;
- *(Priority Issue #5)* Need to create and expand public confidence that reclaimed water is safe for reuse through an understanding of how the water is treated and the types of potential uses for reclaimed water and the need to build a constituency for increased use and acceptance of reclaimed and recycled waters for beneficial purposes through education, outreach and other strategies;
- *(Priority Issue #6)* To develop support for programs that protect and enhance sustainability of Arizona water supplies; a firmly-grounded and fact-based awareness of the relationship of water availability, conservation, the economy, the environment and desired quality of life among the public, business community and government leaders is necessary;
- *(Priority Issue #3)* Water resource availability and associated development costs establish the role of water efficiency and demand curtailment programs in addressing growth and drought. This interrelationship must be incorporated in water resource planning at all levels.

STANDARDS

- *(Priority Issue #12)* Efforts should be made to manage water supplies to optimize the matching of water quality to intended uses (Can also be a part of regulatory rationalization and education/outreach);
- *(Priority Issue #21)* Compile a matrix of state, regional and local specifications and infrastructure standards and use it to identify similarities, inconsistencies and gaps. Use the matrix to develop recommendations on a suite of standards that will provide a common foundation of safety and good engineering practice for reclaimed water distribution systems;
- *(Priority Issue #24)* Compile a matrix of O&M best management practices (BMPs) that are applicable to reclaimed water distribution. Use the matrix to develop recommendations to the BRP on a menu of BMPs appropriate for use in Arizona;
- *(Priority Issue #10)* Develop definitions and guidance for Indirect Potable Reuse (IPR) in aquifers in association with drinking water source approval and local and state agency permitting requirements to facilitate a standardized and efficient approach to design, permitting and operation of such projects;
- *(Priority Issue #15)* Identify issues and develop approaches to operator training/certification for reclaimed water utility distribution systems to ensure consistent and safe management of this resource and its associated infrastructure. Based upon the analysis, develop recommendations on operator certifications for the BRP;

- (Priority Issue #7) Facilitate collaboration between water and energy planners should be developed to ensure the most efficient use of water and energy;
- (Priority Issue #9) Interactions and inconsistencies between the AZPDES Permit Program, Surface Water Quality Standards, Reclaimed Water Quality Standards and Aquifer Protection Permits need to be resolved.
 - o A flowchart/matrix will assist in clarification. This should have the impact of removing impediments to reuse and recharge where what is allowed by one program might be inadvertently blocked by another. The flowchart should identify what each program covers and where one program ends and the next program starts. The working group believes it is beyond their scope to develop this matrix and it should be an effort of ADEQ.

INFORMATION DEVELOPMENT & RESEARCH AGENDA

- (Priority Issue #4) Data collection needs to be streamlined to reduce the administrative burden on reclaimed water providers. ADEQ and ADWR should initiate a review process of data collection requirements, monitoring requirements and reporting requirements for permit and non-permit information.
 - o Data should be collected in an efficient manner, avoid redundancies where possible and reflect a comprehensive picture of reclaimed water use;
 - o Permit requirements should be reviewed for frequency, consistency and applicability of monitoring;
 - o Consider the expertise/capabilities developed by the regulated community to electronically report and manage data; and accept electronic signatures.
- (Priority Issue #13) A strategic research plan is needed that supports new direction in policy and rule development (emerging contaminants, direct potable and full body contact reuse)
 - o Direct potable use;
 - o Research efforts coordinated similar to those under the prior Arizona Water Institute;
 - o Technology based standards development process;
 - o Human health impacts for existing, traditional reuse applications;
 - o Human health impacts of PCPs in gray water.
- (Priority Issue #2) Arizona-specific information is needed about how much water is embedded in energy and how much energy is embedded in water;
- (Priority Issue #25) Look at opportunities for efficiency in the water and energy nexus including water-less solar facilities and dry cooling towers;
- (Priority Issue #22) It is important to consider a continuing role for research and incentives which will transition worthy technologies into mainstream markets.
- (Priority Issue #26) Further research is needed regarding regulatory barriers, cost and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and homeowner/property owner level. Provide incentives for emphasizing water harvesting as a preferred Best Management Practice (BMP) for stormwater management.

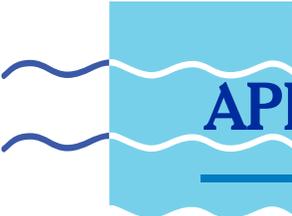
REGULATORY IMPROVEMENTS

- (Priority Issue #8) Policy and rule changes are needed to encourage use of new water sources (reclaimed water, gray water, rainwater, Stormwater and remediated water). (Can also be under Incentives)
 - o ADWR policy should clearly address commingling of remediated waters with reclaimed water;
 - o BMPs need to encourage “green” infrastructure development such as rainwater harvesting;
 - o Aquifer Protection Permit and Reclaimed Water Permit Rules should emphasize protection of public drinking water sources from contamination to maintain public support for use of reclaimed water, gray water and other alternative water sources (Can also be part of Education/Outreach)

- o Refine Arizona policies and regulations governing the accrual of groundwater credits to provide incentives for conversion to reclaimed water from groundwater pumping for groundwater turf and irrigation users – proximate to reclaimed lines;
- *(Priority Issue #1)* Jurisdictional/duplication issues exist between ADEQ, ADWR, ACC, counties and other entities –terms should be standardized, reporting requirements should be examined for duplication and fees should be examined for supplication between entities;
- *(Priority Issue #11)* Title 18, Chapter 11, Article 3 Reclaimed Water Quality Standards need review and updating to take into account experience and knowledge learned from reclaimed water use in AZ (Can also be under Standards):
 - o New candidates for general permits
 - o Type 3 gray water system design standards
 - o New gray water uses
 - o Definitions, amendments and signage requirements
 - o Review of outstanding issues
 - o Coliform monitoring issues (e.g. e-coli v. fecal coliform)
 - o Gray water usage limitations (quantity)
 - o Accommodate de minimus uses of alternate water sources
 - o Type 3 gray water system design standards review
- *(Priority Issue #23)* Establish financial and rate-making guidelines for the ACC regulated water utilities (and public utilities) that mirror the programs currently in effect for power utilities;
- *(Priority Issue #14)* Recharge, Reuse and AZPDES permits do not adequately address unique situations. More flexibility is needed so that reclaimed water use opportunities can be taken advantage of.
 - o De-Chlorination requirements for riparian and recharge projects should be case-by-case;
 - o Lake management plans should substitute for narrative nutrient standards;
 - o Permits need to be consistent (APP BADCT/Reclaimed Water Quality Standards)
 - o General Permits should be more widely offered.

INCENTIVES

- *(Priority Issue #19)* Current state statutes have created a jurisdictional issue with regards to control of gray water systems and need to provide incentives for continued/expanded use of alternative sources of water supply:
 - o Tax credits for gray water systems;
 - o Provide financial and regulatory incentives for conversions;
 - o Local control of gray water systems.
- *(Priority Issue #18)* Provide technical support and serve as a clearinghouse for AZ communities in determining needs for water resource requirements relative to reclaimed water and to provide assistance with eligibility for grants and financial assistance and continue and expand WIFA grant and loan programs targeted to Green Infrastructure such as aquifer recharge and stormwater capture/rainwater harvesting.



APPENDIX IV - MUNICIPAL CONSERVATION BMPs

Category 1: Public Awareness/Public Relations

- 1.1 Local and/or regional messaging program
- 1.2 Special events/programs and community presentations
- 1.3 Market surveys to identify information needs/assess success of messages

Category 2: Conservation Education and Training

- 2.1 Adult education and training programs
- 2.2 Youth conservation education program
- 2.3 New homeowner landscape information
- 2.4 Xeriscape demonstration garden
- 2.5 Distribution plan for water conservation materials

Category 3: Outreach Services

- 3.1 Residential audit program
- 3.2 Landscape consultations (residential and/or non-residential)
- 3.3 Water budgeting program (non-residential)
- 3.4 Residential interior retrofit programs
- 3.5 Non-residential interior retrofit programs
- 3.6 Customer high water use inquiry resolution
- 3.7 Customer high water use notification
- 3.8 Water waste investigations and information

Category 4: Physical System Evaluation and Improvement

- 4.1 Leak detection program
- 4.2 Meter repair and/or replacement program
- 4.3 Comprehensive water system audit program

Category 5: Ordinances / Conditions of Service / Tariffs

- 5.1 Low water use landscaping requirements for residential, multi-family, non-residential and/or common areas
- 5.2 Water tampering/water waste ordinances
- 5.3 Plumbing code requirements if more restrictive than the 1990 Uniform Plumbing Code
- 5.4 Limitations on water features and/or water intensive landscaping and turf
- 5.5 Ordinance for model home landscapes in new residential developments
- 5.6 Required on-site gray water/water harvesting features at residences and/or businesses
- 5.7 Requirements for car wash water recycling
- 5.8 Landscape watering restrictions (time of day, etc.)
- 5.9 Requirements for hot water recirculation devices for residential, multi-family and or non residential sectors
- 5.10 Retrofit on resale
- 5.11 Landscape water-use efficiency standards for non-residential users
- 5.12 Conservation tariff (private water companies)
- 5.13 Water use plan for new large non-residential users

Category 6: Rebates/Incentives

- 6.1 Toilet rebate (residential and/or multifamily homes)
- 6.2 High efficiency flush toilet rebate (residential and/or multifamily homes)
- 6.3 Toilet replacement (residential and/or multifamily homes)
- 6.4 Indoor water fixture replacement/rebate/incentive (residential and/or multifamily homes)
- 6.5 Hot water recirculating system or instant hot water system rebate (residential, multifamily, or nonresidential)
- 6.6 Water efficient appliances rebate/incentive
- 6.7 Gray water retrofit/rebate/incentive
- 6.8 Water harvesting retrofit/rebate/incentive
- 6.9 Landscape conversion rebate/incentive
- 6.10 Xeriscape installation rebate in new landscapes
- 6.11 Commercial and industrial program, e.g. audits, incentives, rebates, etc.
- 6.12 Large landscape conservation program (non-residential)
- 6.13 No/low interest loans for implementing water conservation measures (non-residential)

Category 7: Research/Innovation Program

- 7.1 Implement an emerging technology
- 7.2 Initiate or support applied research to enhance decision making
- 7.3 Evaluate new and emerging technologies and practices
- 7.4 Conduct quantitative analysis of a conservation measure (for water savings results)
- 7.5 Implement smart irrigation technology
- 7.6 Develop industry partnerships to save water
- 7.7 Support the development of new technologies and products
- 7.8 Pilot a new initiative, project or program

APPENDIX V - WORKING GROUP WHITE PAPER ANALYSES

Regulations/Permitting Working Group Blue Ribbon Panel White Paper Analysis

PRIORITY ISSUE #1 - Jurisdictional/duplication issues are believed to exist between ADEQ, ADWR, ACC, counties, and other entities. The following are concerns that were expressed by the working group:

- Definitions should be standardized
- Reporting requirements by regulators should be examined for duplication
- Fees, such as those for permits, should be examined for duplication between entities

Describe the existing situation or issue

A concern exists among stakeholders that definitions of terms in rules and statutes are inconsistent.

A similar concern, primarily in Maricopa County, has been identified that the County is taking an active role in permitting reuse sites in a manner similar to ADEQ. ADEQ has not delegated its reclaimed water program to any county; however, Maricopa County believes it is providing additional service. Permittees should not be required to duplicate work or pay extra fees to another regulatory agency for the same service.

Chapter II, Section 2, Regulation 3.b. of the Maricopa County Health Code, deals with design, operation, and maintenance of sewerage systems and refers to Engineering Bulletin No.11. Engineering Bulletin No.11 was last revised in 1978. The State no longer uses use Engineering Bulletin No.11 and has no intention of revising it because it has been superseded by rule changes.

Describe associated impediments to increased reuse

Duplication of work creates additional work, inefficient work flow and increased transactional costs for regulatory agencies, reclaimed water providers and end users that are operating with scarce resources. The issue causes confusion for the permittee regarding reporting requirements and possible liability regarding enforcement responsibilities for the regulatory agency. Furthermore, confusion regarding reuse authority creates negative public perception about the safety of reclaimed water.

The Maricopa County Health Code, Chapter II, Sewage and Wastes, Section 2, Regulation 3 prohibits the use of reclaimed water for irrigation of crops used for human consumption, watering of cattle, full body contact, or drinking purposes. Although the Regulation refers to A.A.C. Title 18, Chapter 11, Sections 301 through 309, it conflicts with the permissible uses identified in R18-11-309 Table A that allows for reclaimed water to be used for irrigation of food crops and watering of cattle. Conflicts between programs lead to erosion of public confidence for reuse programs.

The continued reference to Engineering Bulletin No.11 creates confusion for permittees by referring to an obsolete document.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

Review statutes that apply to the Arizona Corporation Commission (ACC), Arizona Department of Environmental Quality (ADEQ), Arizona Department of Water Resources (ADWR), and Counties for inconsistencies in definitions and duplication of fees.

Review rules that apply to reclaimed water users for inconsistencies in definitions and duplication of fees.

Determine if counties are duplicating programs that are also being conducted by the State. If the counties desire some level of regulatory oversight they should explain the rationale and the source of the authority.

Confusion of conflicting authorities should be resolved by the agencies involved as exemplified by the continued use of Engineering Bulletin No.11 and the perception of duplicative permitting structures.

Provide the recommendations

1. The Working Group reviewed Titles 10 (ACC), 45 (ADWR), 49 (ADEQ), 36 (Public Health and Safety), Title 18 (Environmental Quality Rules) for consistency of definitions and problems caused by wording. It became apparent to the group that though there was room for improvement in such definitions as “effluent” in Title 45, the current definition, as well as others had been made for specific purposes. While reasons could be identified for change, other reasons opposed the change. After much general discussion, the group chose not to recommend changing any of the definitions. Instead the group recommends practical interpretation and implementation of rules by the regulatory agencies on a case-by-case basis that will promote increased utilization of reclaimed water. For example, continued and flexible implementation of R18-11-113 in AZPDES permits dealing with Effluent-Dependent Waters.
2. After review of the definitions, the Working Group identified inconsistencies in R18-9-701.8 and R18-11-301 where references are made to the wrong location in A.R.S. § 49-201 for the definitions of “Reclaimed water” and “On-site wastewater treatment facility.” While these inconsistencies should be fixed, the group did not feel these were causing an impact on the use of reclaimed water in Arizona.
3. Maricopa County is currently charging fees for their reuse program (inspections, permits, etc.). Initially, this appears to be a potential overlap with State fees. This was originally identified in early meetings of the working group. Since the initial identification of these fees, Maricopa County has begun discussions with the stakeholders (cities, towns, reuse site owners), and it appears this issue is being sorted through. Other counties do not appear to be actively pursuing monitoring and inspecting reuse programs and sites.
4. The Maricopa County Health Code, Chapter II, Sewage and Wastes, Section 2, Regulation 3 should be amended by the County to conform with ADEQ permitted uses for reclaimed water unless sufficient reason exists to prohibit the uses identified in the Code. This Section also appears to contain requirements that are similar to ADEQ requirements in Regulation 3.d and 3.e. County Health Code and ADEQ rules should be consistent to avoid confusion and facilitate use of reclaimed water.
5. The group suggests that efforts of Maricopa County continue to identify concerns of reclaimed water stakeholders regarding duplication in fees and resolve any remaining issues. The first meeting was held October 7, 2010. The Working Group recommends the dialogue be continued between stakeholders to prevent duplication of responsibilities.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

The group suggests the State initiate corrective action to fix the inconsistencies in R18-9 and R18-11 through their rulemaking process.

Maricopa County should consider amending its Health Code to be consistent with ADEQ Rules for permitted uses of reclaimed water.

Describe the benefits of the recommendation

More efficient regulatory reporting will free up resources and provide a cost benefit to regulators, providers and end users. Elimination of duplicate fees or the perception of duplicate fees will provide an immediate benefit to end users.

Consistent rules make it easier for the permittee to interpret what is allowable in operating a reclaimed water system. Consistency also provides a level playing field across the state for the regulated community. Consistent rules also send a positive message to the public that the use of reclaimed water is safe.

Describe possible unintended consequences of recommendation

Reduced revenue streams to regulatory agencies through removal of duplicative fees. Possible reduced revenues to water providers due to increased use of reclaimed water.

Employment may be impacted by minimizing redundancies.

Elimination of duplication alone should not impact public health and safety. However, if the recommendation were to go beyond eliminating duplication then protection of health and safety may be reduced.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
low/med	low	low	N/A	high	

CREEN
Blue Ribbon Panel
White Paper Analysis
Revision 4 – 10/15/10

PRIORITY ISSUE #2: Arizona-specific information is needed about how much water is embedded in energy and how much energy is embedded in water.

Describe the existing situation or issue.

Electricity and water are both critically necessary for modern life in the arid Southwest. Electricity is used beneficially to treat and transport water, and water is used to efficiently produce energy. When we use water, we use energy. In California, roughly 20 percent of the State's annual electricity use supports the pumping, conveyance, end-uses of water, and treatment of water and wastewater (California Energy Commission (CEC) 2005¹). Water-related energy use also accounts for one-third of non-power plant natural gas consumption, and about 88 million gallons of diesel fuel consumption. For municipalities, approximately 80 percent of water processing and distribution costs are for electricity (Electric Power Research Institute (EPRI) 2002²). There are no comparable statistics for Arizona.

By saving water, we save energy. Population projections continue to predict strong long-term growth in Arizona; water and energy needs are critical elements to consider when planning for growth. A better understanding is needed of the evolving relationship between future water and energy demands. Arizona has different water resources, climatic environment, and electrical generation requirements than California, and a separate Arizona-specific study is warranted. The study is required to establish a benchmark for the relationship between water and power in Arizona, and to develop a baseline from which to measure efficiency gains in the future.

Together with gathering and analyzing these data, it is important to identify a public agency to lead future studies, and help with the development of benchmarks and practices for optimizing the water and energy balance. These benchmarks could help water and power providers increase efficiency by analyzing how their facilities can improve compared to best practices from other providers within the State.

Using less water requires less energy, which results in even more water savings at the power plant (as well as fewer carbon emissions). Therefore, in addition to preserving existing supplies of these two key resources, more thoughtful and efficient water and energy consumption would diminish the need for new supplies and further translate into cost savings.

Describe associated impediments to understanding the water and energy flows in Arizona.

Ideally, a State agency would be the best candidate to lead an Arizona study of the energy in water and the water in energy. The California study was completed by the CEC; a comparable agency does not exist in Arizona. Severe budget cuts and reduced revenues statewide have made funding of an Arizona study a difficult task in the short run; however, alternatives need to be identified to fund and staff the necessary research.

Describe the possible solutions (e.g. policy/rule/legislation) that could be applied to remove impediments.

One way to minimize the budget impacts in any one budget year might be to stage research for an Arizona study so all of the money is not required up front. A good starting point could be to create a low-

¹ California's Water-Energy Relationship, CEC-700-2005-011-SF, November, 2005.

² EPRI, Water and Sustainability, Vol. 4, U.S. Electricity Consumption for Water Supply and Treatment, 2002.

cost common repository for the data. Also, all stakeholders on the data side of the equation (providers of the data) should collaborate on the types of data to be used. The staffing required to regularly update the analyses would be one of the last things to be funded.

Provide the recommendations.

1. Conduct an Arizona-specific study that identifies the amount of water in energy and the amount of energy in water.

2. Create a State-hosted information clearinghouse to store data. If that option is infeasible due to the current state of the Arizona budget, then look for other possible partners such as the State universities to house the data. Use stakeholder input to streamline the data-gathering process, using data already being reported to governmental agencies when possible. Once this is accomplished, work toward staffing of analytical support within a State agency as future budgets allow.

3. Develop a data management process/mechanism to facilitate data entry and retrieval.

Describe how the policy /rule /legislation of guidance could be administered (state, county, local, etc.)

This process would need to be administered by a State government agency. The study would not need to be repeated often.

Describe the benefits of the recommendation.

Once a benchmark is established for the State, it will be possible to understand if the energy intensity of water and/or the water intensity of energy changes with future use patterns. Growing needs for water and energy are going to require a balancing of competing demands, and knowing how those needs change is essential.

An added benefit is that awareness of the quantities of water and power that are currently being used may provide an incentive to conserve both.

Describe the unintended consequences of the recommendation.

Other important functions may not be performed if money is taken away to fund this new priority.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency H/M/L	Cost to Utility H/M/L	Cost to End User H/M/L	Potential for Cost Pass- through	Benefits / Removal of Impediments	Additional Comments
M	L	L	L-M	M	

**CREEN
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White Paper Analysis**

PRIORITY ISSUE #3: Water resource availability and associated development costs establish the role of water efficiency and demand curtailment programs in addressing growth and drought. This interrelationship must be incorporated in water resource planning at all levels.

Describe the existing situation or issue

Each water provider and irrigation district has a different portfolio of water supplies to meet current and future water demand. The variability among providers and districts is high, necessitating very specific solutions for how – and when – efficiency and demand curtailment are put in place by each provider and district. If current supplies cannot meet future demands due to growth or drought/climate-induced reductions in water supplies, the development of new supplies and/or implementing underutilized supplies (including reclaimed water) to meet demand must be governed by their associated costs.

Describe associated impediments to increased reuse.

While many providers have already committed 100-percent of their reclaimed water to beneficial use, there are impediments to reuse for some water providers who do not have the expertise and planning capacity to match resource availability and associated costs.

Describe the possible solutions (e.g. policy/rule/legislation) that could be applied to remove impediments.

Improved interactions and shared knowledge between resource planners and conservation/efficiency specialists are two possible solutions to remove impediments at the statewide level.

Feasibility studies at the local level would facilitate water planning for providers wishing to increase their reuse of water.

Fostering multiparty cooperation to facilitate increased use of reclaimed water could also be considered.

Provide the recommendations.

1. Provide information on water efficiency options, including reuse and water efficient technologies, in a centrally available location. Promote it to all stakeholders, including water resource planners, industry and trade groups, economic development staff, and business prospects.
2. Create a state-hosted information clearinghouse regarding water pricing, water supply, water quality, water management, and water conservation and efficiency programs. Emphasis should be placed on detailed information regarding actual practices that have been analyzed for benefits and costs so that a provider or a district staff member can assess the information and make a tangible determination of the plausibility of the information for their own entity.
3. Promote electronic, real-time information sharing and discussion. This may be done through on-line forums, e-mail groups, etc.

Describe how the policy /rule /legislation of guidance could be administered (state, county, local, etc.)

Administration would be done by state agencies in collaboration with stakeholders.

Describe the benefits of the recommendation.

Improved water planning and water resource development will result in increased efficiency and water reuse, allowing water planners to better address growth and drought.

Describe the unintended consequences of the recommendation.

There may be possible duplication of existing efforts.

Water conservation and efficiency measures may result in a reduction of the liquid fraction of wastewater, which could limit the amount of wastewater for reuse (by agriculture, industry, or downstream users) and/or increase the cost of wastewater transportation and treatment.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency H/M/L	Cost to Utility H/M/L	Cost to End User H/M/L	Potential for Cost Pass- through	Benefits / Removal of Impediments	Additional Comments
Low	Low	Low	Low	Medium to high	

**Regulations/Permitting Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #4: In many cases, permittee data submission is done manually. Data submission needs to be streamlined using current technology to reduce the administrative burden and improve data quality for regulatory agencies, permittees and public.

Describe the existing situation or issue.

Permit data submission by reclaimed water permittees is a time consuming process that typically involves more than one permit or application. Sometimes data has already been submitted for a report to an agency and it is required again for another agency or report. Paper reporting causes an inefficient submittal process.

Describe associated impediments to increased reuse.

Good reuse and water management policies require current and accurate information. Some agencies/utilities may shy away from implementing a reuse program due to the real and perceived additional administrative requirements and costs to implement such a program.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments.

Permit requirements could be reviewed and revised for necessary frequency, consistency, and applicability of monitoring.

Expertise and capabilities developed by the regulated community should be considered to electronically report and manage data; and accept electronic signatures.

Regulators could work together with an information technology (IT) firm to develop a common database that meets their needs as well as the needs of the permittees and public.

ADEQ and ADWR should initiate a review process of data submission and monitoring requirements. Data should be submitted electronically to avoid inefficient data submittal.

ACC should be able to utilize common data from ADEQ and ADWR database to support application processes such as environmental quality compliance, water use data and wastewater flows.

Provide the recommendations.

1. Develop a standard for an electronic data management system that would be common and available to all regulators, permittees, contractors and the public. Utilize a stakeholder participation process to develop the system utilizing the expertise of IT professionals.
2. After development of the system, conduct outreach to ADHS certified laboratories to develop standardized electronic data submittals.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.).

The system can be administered through an IGA between the regulatory agencies that require the data. The cost of developing the data management system should be shared by agencies that need the data.

Describe the benefits of the recommendation.

Data will be compiled and stored more efficiently and accurately. Ready access of data can be available to all stakeholders. The system provides efficient use of resources necessary to manage data and potentially reduce paperwork.

Describe possible unintended consequences of recommendation.

- Data security could be compromised.
- A technological barrier could be created to some stakeholders.
- Training may need to be increased for personnel.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
high	medium	low	high	high	High initial cost, reduced long term cost

**Public Perceptions/Acceptance Working Group
Blue Ribbon Water Panel
Draft White Paper Analysis
December 2, 2010**

PRIORITY ISSUE #5 – The need to create and expand public confidence that reclaimed water is safe for reuse through an understanding of how the water is treated and the types of potential uses for reclaimed water AND the need to build a constituency for increased use and acceptance of reclaimed and recycled waters for beneficial purposes through education, outreach, and other strategies.

Describe the existing situation or issue.

In his paper presented at the 2005 International Conference on Integrated Concepts on Water Recycling, Troy W. Hartley³ states that since the 1970s, survey and case study research has found that the public in Arizona, California, Colorado, and Texas support the general concept of using reclaimed water and has been “somewhat supportive of non-potable reuse initiatives.”⁴

According to Dr. Hartley, acceptance of water reuse by the public in the United States is higher when the factors below exist:

- Degree of human contact is minimal
- Protection of public health is clear
- Protection of the environment is a clear benefit of the reuse
- Promotion of water conservation is a clear benefit of the reuse
- Cost of treatment and distribution technologies and systems is reasonable
- Perception of wastewater as the source of reclaimed water is minimal
- Awareness of water supply problems in the community is high
- Role of reclaimed water in overall water supply scheme is clear
- Perception of the quality of reclaimed water is high
- Confidence in local management of public utilities and technologies is high

Describe associated impediments to increased reuse.

Surveys indicate that people generally favor reuse. Yet, as specific projects are proposed in their communities and reuse moves from an abstract concept to a tangible reality that increases the likelihood of human contact, attitudes change and the support decreases.⁵

The lack of public support for reuse programs and the lack of a statewide strategy supporting reuse manifests itself in many ways ranging from the lack of political priority due to competition with other issues, lack of political support for rate increases to fund reuse programs, and lack of voter support to approve and finance reuse programs.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments.

Develop a statewide strategy to increase the public’s knowledge about the treatment and use of reclaimed water

1. Create and expand public confidence that reclaimed water is safe for allowable uses
2. Demonstrate that reclaimed water is a safe water supply source if the level of treatment is appropriate for the type of use

³ Hartley, T.W., Department of Resource Economics and Development, University of New Hampshire, Durham, NH 03824, USA, Desalination 187 (2006) 115–126.

⁴ Hartley, T.W

⁵ Hartley, T.W

3. Build a constituency for increased use and acceptance of reclaimed and recycled water for beneficial purposes

Provide the recommendations

1. Through public education and information, develop an understanding of how the water can be treated and used:
 - a. Use focus groups, professional public relations firms, and trusted university and private sector experts to provide information about reclaimed water treatment and use
 - b. Provide and/or increase funding to State universities to develop statewide programs
 - c. Use surveys to assess public perceptions and the impact of information and education campaigns
2. Expand the Cooperative Extension Service programs
3. Document savings that can result from the use of reclaimed water
4. Require public and private water and/or wastewater agencies to biannually evaluate their ability to implement a reuse program within the next two years and to submit this evaluation to ADWR and ADEQ (**NOTE:** A concern was expressed that this requirement could potential be burdensome and costly to implement)

Describe possible unintended consequences of the recommendations

The use of reclaimed water would become so popular that demand would exceed supply.

Reclaimed water use would shift from one type of user to another resulting in a reduction in the volume of potable water saved.

The public would conclude that reclaimed water is going to be used for potable purposes now.

The public would conclude that conservation is no longer necessary.

Describe the benefits of the recommendations.

Implementation of the above recommendations would, over time, increase public acceptance of reuse. This acceptance would make it easier for elected officials, policy makers, and water/wastewater agencies to implement new programs or increase reuse thereby reducing the pressure on potable water supplies. Increased reuse will result in a new water supply that may, in the long-term, be less expensive than acquiring supplies from outside of the water/wastewater providers' service area. In addition, as the volume of reuse increases, the reclaimed water provider may see the unit cost of the water decrease as economies of scale come into play.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.).

A statewide reuse information program is a necessary and more cost efficient way of ensuring the consistency of information. In conjunction with the statewide program, local programs may also be needed because of their ability to address specific local concerns.

All of the recommendations will require new funds which could come from increased fees and water and wastewater rates, grants, partnerships and coalitions. These funds would be used for additional staff at ADEQ and ADWR for review of biannual reuse evaluations and implementation of the statewide program, and by water/wastewater providers for local staff, and local program materials.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user.

Effective public information programs can be expensive and time consuming. In times of shrinking budgets, there is little incentive to undertake such programs unless there is a legislative mandate to do so, the benefits- ability to implement a reuse program with public support -, or the savings to water and/or wastewater providers and their customers resulting from a reuse program outweigh the upfront costs of a public information program.

State and local agencies charged with the responsibility of implementing public information programs will require funding that will most likely come from increased fees, grants, partnerships and coalitions.

Water/wastewater entities might get new funding from increased rates, grants, partnerships, and coalitions.

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White Paper Analysis**

PRIORITY ISSUE #6: To develop support for programs that protect and enhance sustainability of Arizona water supplies, a firmly-grounded and fact-based awareness of the relationship of water availability, conservation, the economy, the environment, and desired quality of life among the public, business community and governmental leaders is necessary.

Describe the existing situation or issue

There is a lack of understanding regarding the relationship between water availability, water resource management, and economic impacts; what the environmental impacts are of increased reuse; and how these issues affect quality of life. This lack of understanding or misunderstanding of the issues cuts across public, government, and business sectors, which impedes our power to enhance sustainability.

Informed Arizonans are more likely to make personal choices and business decisions to use water more efficiently; however, the lack of awareness of water resource-related information continues to surface in numerous forums as a critical issue for water conservation and management efforts. People frequently complain that they do not know where to find water sustainability information.

The ability to gather data, conduct research, and access information from one central location is needed to support decision-making. Resource and conservation planners, residents, and businesses benefit from having access to relevant, research-based information about water use and trends; emerging water technologies; and the evaluation of conservation programs, particularly the water savings and cost/benefit of existing conservation programs and practices.

Describe associated impediments to increased reuse.

Public education regarding how alternate water sources can supplement potable water supplies is critical. In order to supplement potable water supplies and maintain sustainability of those supplies, alternative sources must be considered. The public perception that reclaimed water is “unclean” has plagued many jurisdictions – some have been able to overcome this misunderstanding through public awareness campaigns.

Countless organizations have endeavored to collect information and promote it to Arizonans, and therein lies the challenge: a wealth of information, sometimes conflicting messages, and disparate resources each vying for the public’s attention and diluting the chance that the message will stick. This has hampered reuse.

Describe the possible solutions (e.g. policy/rule/legislation) that could be applied to remove impediments.

Increase interaction between the legislature, state agencies, and water providers on the key points of water sustainability – conservation, water quality, alternative resources, and how each of these impacts the quality of life of Arizonans.

An educational program that has a statewide theme, but is adaptable for local use, would greatly assist in raising awareness of the importance of sustainable water supplies including reuse.

Promote and disseminate water-related information, tools, and resources to the public.

Appropriate information could be developed for each water use sector that is specific to their needs and uses.

Provide the recommendations.

1. Develop a series of out-of-session legislative meetings with stakeholders to discuss various aspects of water sources and the programs that protect and enhance water sustainability.
2. Expanding an existing statewide awareness campaign would help encourage a culture of conservation that would make the public more receptive to local efforts. This one campaign will ensure consistency of message, the greatest visibility, and the most efficient use of resources. This campaign should generate the umbrella awareness of the need for conservation as efficiently as possible, priming the public for more specific messages and allowing more funding on a local level to be concentrated on delivering targeted information to customers.
3. Educate economic development leaders, industry, and trade association groups (state, regional, and local) regarding the impact of new business and water demand upon one another.
4. There is a need to create and widely promote a central comprehensive “water information portal” that houses Arizona water-related information, including education, training, rebates, ordinances, water pricing, water supply, water quality, water management issues, water harvesting, and water reuse.
5. Improve the collection and dissemination of information about water supplies and demand. Develop and centralize relevant, research-based information and ensure it is easily available to planners.

Describe how the policy /rule /legislation of guidance could be administered (state, county, local, etc.)

A state agency or organization could be considered the ideal location for the public “water information portal” and to develop and centralize research-based information for water planners, residents, and businesses.

Leadership for the research, development, and implementation of these recommendations is needed from the state level.

Describe the benefits of the recommendation.

Comprehensive understanding of water supplies and the impact on the economy of Arizona will enhance water sustainability.

Businesses that invest in efficiency will reduce the cost of doing business, improving overall returns on investment.

Describe the unintended consequences of the recommendation.

Not allowing enough flexibility in programs for awareness and education that would contour them to meet the needs of various water sectors could stifle innovative partnerships for the promotion of reuse and efficiency.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency H/M/L	Cost to Utility H/M/L	Cost to End User H/M/L	Potential for Cost Pass- through	Benefits / Removal of Impediments	Additional Comments
Medium	Low	Low	Low	High	

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Blue Ribbon Panel
White Paper Analysis
Revision 4 – 10/11/10

PRIORITY ISSUE #7: Ways to facilitate collaboration between water and energy planners should be developed to ensure the most efficient use of water and energy

Describe the existing situation or issue

Water utilities need electricity to support the treatment, distribution, collection, and reclamation of water. Electric utilities need water for power plant cooling purposes.

While a linkage between water and electric service provision is evident, at the present time in Arizona, in some cases water service providers develop long range forecasts and plans without significant regard for electric service issues, and electric service providers develop long range forecasts and plans without significant regard for water service issues.

Acknowledging that independent conservation efforts are being advanced within the water and electric service provision areas, limited collaborative planning aimed at saving both water and electricity is being conducted. For a future in which water and electric service provision may be constrained, it may become more vital to enhance coordinated utility planning activities.

Describe associated impediments

Impediments to collaboration between water and electric service providers include:

- Differing regulatory requirements. Water utilities and electric utilities seek to comply with the various requirements of differing laws, oversight agencies and reporting requirements.
- Differing entity types. The requirements, business planning cycles, fiscal year definitions and internal planning processes of publicly and privately held utilities, as well as governmental utilities, are distinct.
- Proprietary, confidential and competitive information. Promoting collaboration among entities that requires a divulging of proprietary and confidential information, or requires information sharing among diverse entities that may be competing for the same resources, may be problematic.

Describe the possible solutions (e.g. policy/rule/legislation) that could be applied to remove impediments.

See recommendations below.

Provide the recommendations.

As an initial step toward supporting increased collaboration between water and electric service providers, a workshop aimed at promoting discussion among stakeholders regarding coordinated utility planning activities is suggested.

One example of water - electric collaboration occurs within the context of existing state law. Water resource impacts are addressed during the siting process under the general provisions of Arizona's Power Plant and Transmission Line Siting statute (A.R.S. § 40-360-06). While formalizing and clarifying existing practice, collaboration may be increased by amending the statute for the sole purpose of specifying that the water resource impacts of a proposed generation facility should be considered in issuing a Certificate of Environmental Compatibility.

Describe how the policy /rule /legislation of guidance could be administered (state, county, local, etc.)

Arizona’s electric and water industry regulatory agencies could take the lead in developing and moderating the proposed workshop.

Participation in the forum or workshop would be voluntary; however results of the workshop may include best practice recommendations and/or the identification of guiding principles.

See recommendations above

Describe the benefits of the recommendation.

Discussions about barriers to and opportunities for collaboration could lead to new business relationships with potential benefits to the utilities and their customers.

A more comprehensive understanding of future issues and constraints from water and electric planning perspectives could develop. This understanding could lead to a more collaborative approach to planning for the utilities which could ultimately be beneficial to our customers and the environment.

Describe the unintended consequences of the recommendation.

Given potential for the perception that this would be “just another conference”, the event could be ignored.

In addition, some may argue that water and electric utilities may use knowledge gained in the workshop to create an advantage for their stakeholders.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency H/M/L	Cost to Utility H/M/L	Cost to End User H/M/L	Potential for Cost Pass- through	Benefits / Removal of Impediments	Additional Comments
L	L	L	L	M	

**Regulations/Permitting Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE#8: Policy and rule changes are needed to encourage use of alternative water sources (reclaimed water, gray water, rainwater, stormwater, and remediated water).

Describe the existing situation or issue

It has become apparent that although surface and groundwater are becoming scarce in Arizona, potential applications of reclaimed water, reuse of gray water, stormwater and remediated water exist and are not being fully used. Reasons include cost, effort, and current rules that should be amended as needed to keep up with current technology.

A simple way does not exist to obtain guidance documents on what may be possible or permissible. As an example, an individual or developer may have to sort through a multitude of information to determine what is needed to implement rainwater harvesting into a project.

With limited exceptions, ADWR will not give in-lieu credit as a groundwater savings facility for conversion of turf irrigation or landscape irrigation from groundwater to reclaimed water. Although nothing in statute seems to prohibit this approach, ADWR has not recognized turf or landscape irrigation as qualifying for GSF long-term storage credit.

Describe associated impediments to increased reuse

Remediated water cannot currently be comingled with reclaimed water under a reclaimed water general permit. Instead, an individual permit must be processed by the agency. This process is required even though the remedial action plan approval has already assessed the beneficial use of the water in accordance with acceptable end use standards.

Beneficial use of rainwater harvesting and stormwater management is not fully developed.

Backflow and cross connection prevention to protect public drinking water systems and reuse sites from contamination is important to maintain public support for use of reclaimed water, gray water and other alternate water sources. The public needs assurance that health concerns regarding protection of drinking water supplies are adequately addressed or they may oppose alternative water sources.

Reclaimed water system operators may have difficulty encouraging historic groundwater users to switch to reclaimed water because the cost of reclaimed water exceeds the cost to pump on-site wells.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

Amend reclaimed water rule to allow comingling to occur under a general reclaimed water permit pursuant to the Director's approval under a remediation program. Changes to R18-9-701 should be made to include a definition of "remediated water" as water produced through a corrective action or remedial action approved by ADEQ and to change the definition of "reclaimed water blending facility" to include remediated water among the water sources that may be used to blend with reclaimed water. Also, R18-9-17, the Type 3 Reclaimed Water General Permit for a Reclaimed Water Blending Facility, should be amended to require that reclaimed water blending facilities using remediated water provide a demonstration that use of the remediated water for all types of direct reuse associated with the class of reclaimed water the facility will produce is consistent with end uses and risks evaluated for the corrective action or remedial action approved by the appropriate governmental authority.

Greater public education and outreach is needed regarding rainwater harvesting and stormwater BMPs and opportunities. ACC regulated water companies are currently required by BMP 2.3 to provide a Homeowner Landscape Packet upon establishment of water service, which includes, among other things, a basic interior and exterior water savings pamphlet, xeriscape landscape information, and a rainwater harvesting pamphlet. This could be a useful tool to promote rainwater harvesting and should have a wider audience. Examples of current documents such as ADWR's *Low Water Use Drought Tolerant Plant List* and the EPA's *Managing Wet Weather with Green Infrastructure Municipal Handbook on Rainwater Harvesting Policies* and City of Tucson's *Water Harvesting Manual* provide recommendations that could be incorporated into a Homeowner Landscape Packet.

Clearly require backflow protection for sites that use reclaimed water in drinking water rules.

ADWR can, through its policy, expand the use of GSFs to include landscape and turf irrigation.

Provide the recommendations

1. ADEQ rule in conjunction with ADWR policy needs to clearly address comingling of remediated waters with reclaimed water.
2. BMPs need to encourage "green" infrastructure development such as rainwater harvesting and reclaimed water use, preservation of riparian corridors and groundwater recharge.
3. Review the rules to evaluate circumstances whereby a General Permit may be considered for comingling of remediated water and reclaimed water.
4. An additional provision should be added to the reclaimed water conveyance rules that refer to backflow requirements in R18-4-215. A similar approach might be appropriate for on-site cross connection situations.
5. R18-4-215 should be amended to specifically identify reclaimed water as an alternate water supply that would necessitate protection of the potable water service.
6. The Working Group recognized that the GSF issue needs more review but was not able to come to a consensus on broadening the use of GSFs to include landscape and turf irrigation. The group recommends this issue be addressed outside the Blue Ribbon Panel process because it has implications beyond reclaimed water use.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

ADEQ and ADWR should review the rules that address comingling of remediated waters in conjunction with a stakeholder process.

Local agencies should be encouraged to adopt applicable BMPs and educational programs that promote "green" infrastructure development.

Water providers would be responsible for enforcing backflow requirements.

Consider incorporating cross connection control requirements into rules administered by ADEQ.

With regard to the GSF issue, ADWR would administer this policy change under current provisions of A.R.S. §§ 45-802.01 & 812.01.

Describe the benefits of the recommendation

Utilizing remediated water may alleviate the need for additional treatment and allow it to be used as a source of supply for reclaimed water. This also has the potential of providing a cost savings.

Reclaimed water conveyance rules would clearly identify the need for backflow prevention on potable water systems when lots are served with reclaimed water.

Incentive is provided for converting current large-volume groundwater users to reclaimed water. New reclaimed distribution lines built to facilitate this conversion have the effect of providing conveyance of reclaimed water to many new customers.

Allowing GSF storage credits in these instances would provide some of the needed incentive to convert these groundwater users and secure them as new reclaimed customers.

Describe possible unintended consequences of recommendation

An unintended reduction in reclaimed water quality as a result of the comingling with remediated water. There may be public perception issues that arise with certain instances of use of remediated water. These will need to be addressed in the remedial action plan approval process.

Clearly identifying the need for potable water system protection from reclaimed water may negatively affect public perception. It may add to a perception that reclaimed water, regardless of the quality standard it meets, is inferior to water provided by drinking water systems.

Stored water does not permanently reduce groundwater pumping, since the stored groundwater will be removed in the future.

Additional groundwater savings facility credits may not be eligible for inclusion in AWS designations.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
Low	Low	Low	N/A	Medium	

**Regulations/Permitting Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #9 - Inconsistencies between the AZPDES Permit Program, Surface Water Quality Standards, Reclaimed Water Quality Standards, Aquifer Protection Permits and Drinking Water Rules are believed to exist and need to be resolved.

Describe the existing situation or issue

It is unclear if there are significant inconsistencies between these programs that are an impediment to reclaimed water use. But, there is a perception that this situation exists.

Describe associated impediments to increased reuse

There is a perception that redundancies exist in permit reporting requirements causing frustration and unnecessary expenditures of resources on the part of the permittees.

There is a need for a greater understanding of the programs by the regulated community.

What is allowed by one program may be inadvertently prohibited by another.

The regulatory maze may be a disincentive, especially for small providers.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

A flowchart/matrix will assist in clarification. The flowchart should identify what each program covers and where one program ends and the next program starts. Development of this matrix should be an effort of ADEQ, ADWR, ACC, and stakeholders.

Provide the recommendations

ADEQ, ADWR, ACC and stakeholders should collaborate in the development of the flowchart/matrix with follow up to make rule changes identified by the process.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

ADEQ should take the lead to bring the groups together and develop the matrix. Regulating agencies should follow through on the results of the matrix to amend rules as necessary to resolve conflicts. Another option would be to contract with a third party to facilitate the process.

Describe the benefits of the recommendation

Identification and removal of conflicting language and redundancies that may exist in the various permits would increase the potential for reuse opportunities.

Describe possible unintended consequences of recommendation

This can easily turn into a big project at a time that agencies have scarce resources.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
medium	low	low	N/A	medium	

**Infrastructure/Retrofit
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #10: Develop definitions and guidance for Indirect Potable Reuse (IPR) in aquifers in association with drinking water source approval and local and state agency permitting requirements to facilitate a standardized and efficient approach to design, permitting, and operation of such projects.

Introduction

Indirect Potable Reuse (IPR) augments potable surface and groundwater supplies. IPR is defined as the injection of advanced treated reclaimed water into the saturated zone of a potable source water aquifer (see Figure 1 and Appendix A). Fundamentally, IPR is the intentional close coupling of advanced treated reclaimed water integrated with a potable water source (i.e., aquifers) (Appendix A).

Historically, existing recharge projects in Arizona have used treated reclaimed water to recharge aquifers via recharge basins or vadose wells (see Figure 1). In these recharge programs, equivalent volumetric supplies are typically recovered from a deeper aquifer for potable use or from within the area of hydrogeologic/recharge impact for non-potable use (see Figure 1). For these types of recharge projects, treated reclaimed water passes through the unsaturated zone (vadose zone) to the saturated zone allowing for soil aquifer treatment (SAT) processes to occur (Appendix A). SAT is widely accepted as a secondary treatment process to remove some organic and biological constituents. In all cases of reclaimed water being used to augment or recharge an aquifer in Arizona, the aquifer water quality standards must be met at the discharge point, regardless of whether or not there are additional treatment benefits achieved from SAT. In Arizona, all aquifers are designated for potable supply unless specifically re-designated by the Arizona Department of Environmental Quality (ADEQ).

Currently, the aquifer protection permit (APP) program administered by ADEQ allows for the recharge of aquifers with reclaimed water. However, the regulatory requirements for obtaining a New Source Approval to allow the recovery of groundwater augmented by reclaimed water to be connected to a Public Water System are indeterminate at this time. Some water providers have determined that maximizing the future use of reclaimed water is developing recharge and recovery projects that allow recovered groundwater augmented by advanced treated reclaimed water to be connected to a Public Water System (i.e. IPR). However, without an adequate regulatory framework for New Source Approval such investments cannot be made, thereby inhibiting the full utilization of reclaimed water supplies. It has therefore been suggested that IPR regulations be established to address water quality standards (regulated and unregulated constituents), differing hydrogeological circumstances of recharge and recovery, and multiple/engineered barriers of protection necessary to obtain a New Source.

The purpose of this white paper is to identify existing impediments in implementing an IPR program and provide recommendations on how to remove these impediments and develop steps necessary towards a regulatory pathway.

Impediments to Indirect Potable Reuse

Infrastructure Issues

Arizona's Administrative Code (AAC), R18-5-502 (Minimum Design Criteria for a Public Water System), states "a public water system shall not construct or add to its system a well which is located within 100 feet of a discharge or activity which is required to obtain an Individual Aquifer Protection Permit." The R18-5-502 "100-foot" rule is an impediment to IPR wells in that it does not address the physical structure of the aquifer and the affects of IPR recharge and recovery activities. The "100-foot" rule objective should be determined on a case-by-case basis using field testing (e.g., tracer studies) to determine the aquifer's structure, treatment potential, or attenuation capability. Separation distance

requirements should be based on site specific technical data. The current regulations do not consider variable aquifer characteristics and are an impediment to IPR.

The presence of elevated concentrations of organic carbon, nitrogen, and phosphorus could support biological re-growth within the reclaimed water distribution system and could clog IPR recharge wells, resulting in reduced injection rates. For controlling re-growth, some disinfection technologies (i.e., chlorine or ozone) could create disinfection by-products in aquifers. It is important to match the disinfection technology with the advanced treated reclaimed water to reduce the formation of disinfection by-products. Disinfection technology is continually changing, and the current regulatory framework of legislation and agency promulgated rules does not allow for the consideration of new technologies.

Regulatory and Compliance Issues

To construct and operate an IPR facility, applications must be submitted to and permits obtained from the following regulatory agencies:

- EPA - Registration of Injection Wells, and Safe Drinking Water Act (SDWA)
- ADWR - Underground Storage Facility, Water Storage and Recovery Well Permits
- ADEQ - APP and Reclaimed Water Permits, and Drinking Water New Source Approval, Approval To Construct (ATC) and Approval Of Construction (AOC) for facilities not located in Maricopa or Pima County
- County - Drinking Water New Source Approval, ATC and AOC for facilities located in Maricopa or Pima County

Currently, the regulatory framework for allowing recharged reclaimed water blended with groundwater via IPR methodology to be approved as a drinking water source is not specified under the SDWA. Thus obtaining approval and permits from the State and County agencies is problematic for IPR programs. To overcome this impediment in California, Title 22 California Code of Regulation (Groundwater Recharge Reuse) was developed in August 2008 which allows the direct injection of advanced treated reclaimed water into aquifers. Perhaps an examination of the relevant components of Title 22 related to Best Available Demonstrated Control Technologies (BADCT) treatment technologies and water quality monitoring could be used and adopted in Arizona's APP program. Once the regulatory framework addressing APP and SDWA issues is in place, augmentation of aquifers with advanced treated reclaimed water through permitted IPR facilities should then be possible since specific regulatory concerns such as the requirements for obtaining a New Source Approval will be eliminated or mitigated.

These permit programs all play important roles in protecting public health and the environment, but, there are multiple layers of overlap related to the design, construction and operations of the facilities, hydrogeologic characterization of the area, monitor well design and location, water quality sampling/reporting requirements, water quality impacts, groundwater level impacts, technical and financial capabilities of the applicant, and land ownership and land zoning issues. Sometimes agencies require the same data in different formats, or place conflicting requirements upon the applicant. This overlap is an impediment to the development of IPR projects and therefore the full utilization of reclaimed water in Arizona. Permitting of such a facility could be most effectively addressed by all agencies cooperating and accepting a single, unified, and well defined review and approval framework which covers all issues of concern without duplication and inconsistencies.

Recommendations

IPR uses the latest technology to indirectly reuse reclaimed water for supplementing potable water supplies. The current regulatory framework of multiple agency rules and regulations is cumbersome, costly, and has difficulty incorporating rapidly changing technology. Three recommendations are:

1. Create an IPR Multi-Agency Steering Committee. The Steering Committee shall be comprised of the Directors or their designees of ADEQ, ADWR, and County agencies. The Steering Committee's mission is to further advance IPR's use by streamlining agency reviews, incorporating new technologies, and directing the IPR Advisory Panel. The Steering Committee's first priority should be the development of a state-wide unified policy on IPR. The policy should define the objectives of IPR; clarify how recharged reclaimed water can be source water acceptable for potable purposes; and define the process for issuing New Source Approvals for IPR facilities.
2. Creation of an IPR Advisory Panel to focus on the effectiveness and implementation of new technologies and field studies (e.g., tracer studies).
 - a. The advisory panel should report to the IPR Multi-Agency Steering Committee.
 - b. The advisory panel should include technical agency representatives, researchers, practitioners, and a citizen representative.
 - c. The advisory panel could address streamlining current and future multi-agency rules, technical issues, and public concerns as they arise.
 - d. Convene a citizens/industrial panel to determine if there is public acceptance for IPR and work with the regulatory agencies in identifying potential regulatory controls to be implemented.
3. Open up the public rule making process and develop the regulatory framework for IPR.

Unintended Consequences of Recommendations

The unintended consequences of an IPR program could include the following:

1. The recharge mound from IPR wells could potentially benefit neighboring water supply wells from nearby cities.
2. Reclaimed water supplies for irrigation use may be reduced since IPR would be developing potable supplies. Currently, the delivery of reclaimed water to irrigation customers is a cost-effective resource and, in limited cases, is a method of disposal for wastewater treatment service providers. The objective of an IPR program is mainly for water resource development and may potentially be cost-prohibitive for irrigation customers.

Benefits of the Recommendations

The benefits of these recommendations include the following:

1. Streamlining the State and County approval, permitting, monitoring, and reporting procedures would benefit both applicants and agencies.
2. An IPR program would maximize the efficient use of secured water supplies for future growth and augment surface and groundwater supplies during system outages and or droughts.
3. IPR could mitigate declining groundwater levels and potentially mitigate future land subsidence due to excessive groundwater pumping.
4. Allowing applicants to conduct IPR would further the science/technology and improve our ability to manage water resources.
5. Water qualities of some aquifers do not meet the aquifer numeric water quality standards may be improved by IPR recharge.

Appendix A- Definitions

1. **Advanced Treated Reclaimed Water-** A resource developed from the treatment of a wastewater of municipal origin, suitable for indirect potable reuse. Advanced treated reclaimed water uses new technologies and creates reclaimed water that far exceeds today's A+ water quality standards.
2. **Indirect Potable Reuse-** The injection of advanced treated reclaimed water into a saturated potable aquifer that would be used for future potable supplies.
3. **Saturated Zone-** An underground region in which all interstices in, between, and below geologic material is filled with water, with the uppermost surface of the saturated zone being the water table.
4. **Soil Aquifer Treatment-** The process of water being purified by percolating through the unsaturated zone and into an underground aquifer (saturated zone).
5. **Subsurface Application-** The controlled application (e.g., injection well) of recharge water to a saturated zone by a means other than surface application.
6. **Surface Application-** The constructed/managed application of recharge water to a spreading area (basin) or shallow vadose zone injection well resulting in recharge supplies infiltrating through the unsaturated zone to the saturated zone.
7. **Unsaturated (Vadose) Zone-** The volume between land surface and the saturated zone.



Figure 1: Cross-sectional graphic depicting the differences between IPR and Aquifer Recharge through Vadose Zone

**Regulations/Permitting Working Group
Blue Ribbon Panel
White Paper Analysis**

PRORITY ISSUE #11 - Title 18, Chapter 11, Article 3 Reclaimed Water Quality Standards needs review and updating to take into account experience and knowledge learned from reclaimed water use in Arizona. Examples of issues that should be considered are as follows:

- Commercial and municipal gray water reuse would be more attractive if general permits existed for their use. Very few commercial gray water permits exist statewide, a possible indication that the permit process is too onerous for the permittee.
- Type 3 gray water system design standards are currently based on on-site treatment design standards. Gray water systems do not have the same water quality concerns as on-site treatment systems and should therefore have design standards that are based on gray water quality. Type 3 gray water system design standards do not provide for a means to dispose of gray water when system problems and/or the temporary inability to consumptively use available gray water occur.
- Permitted uses of gray water exclude uses that meet current criteria (non-edible outer rind or shell) yet are not a nut or citrus. Fruit such as the pomegranate is currently excluded from being irrigated with gray water by existing rules yet it is similar to a citrus in that it has a rind that is not eaten. A pomegranate is classified as an exotic fruit, not a citrus fruit.
- Review of outstanding issues that have been identified to ADEQ regarding reclaimed water quality standards is needed. The last five-year review of the standards should also be considered to see if any issues were identified at that time. The goal would be to identify reuse areas that will grow over time so that permits could be standardized.
- The fecal coliform rule (R18-11-303-307) is contradictory to the BADCT rule (R18-9-B204.B.4) which allows the use of *E. coli* as an alternative.
- Existing rules permit residential gray water use without concern for lot size. In some cases, lots may not be large enough for use of 400 gallons per day (maximum allowable use) of gray water.
- Rules do not accommodate de minimus gray water use, instead requiring a Reclaimed Water Individual Permit for a small, temporary application of gray water.

Describe the existing situation or issue

Reclaimed Water Quality Standards need to be updated to take into account lessons learned from the utilization of reclaimed water.

In addition to those identified in the issue, monitoring frequency for reclaimed water classifications is different than required for BADCT. There is no reason for them not to be the same.

The Working Group identified four issues that were presented by ADEQ that it agreed should be reviewed. These included 1) Are the coliform limits set appropriately for the different classes of reclaimed water (i.e., to ensure that public health is protected for the allowed uses)? Are the daily sampling limits appropriate? The single sample maximums? 2) Is the ratio of fecal coliform to *E. coli* in the BADCT rule (1 to 0.63) set appropriately? 3) Is the filtering requirement and turbidity limit for Class A reclaimed water set appropriately (both the 24-hour average and not to exceed level)? 4) For the purpose of providing guidance for satisfactorily demonstrating alternative monitoring indicators, are there acceptable surrogate measures for microbial quality and turbidity that should be identified in rule, especially real-time measures and/or technologies?

The original issue identifies five issues that deal with gray water that are addressed in this White Paper.

Describe associated impediments to increased reuse

Cumbersome permit processes may cause potential uses to be avoided.

Type 3 gray water systems may be unnecessarily expensive or infeasible due to standards being based on on-site treatment system standards.

The listing of permitted uses for gray water could be expanded.

Unnecessary lab expenses may be incurred to test for fecal coliform bacteria.

Permissible residential gray water usage is based on customer classification which is not relevant to the actual water demand of vegetation. The residential customer classification does not address lot size or vegetation.

There is no provision in current permitting to allow for de minimus use of gray water.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

Develop a new general permit (Type 2?) for commercial and municipal gray water users that is similar to the general permit for Type 1 Reclaimed Water General Permit for Gray Water. This could be a new provision in R18-9.

Revise standards for Type 3 gray water systems (R18-9-719).

Redefine permissive uses of gray water (R18-9-711. A.3).

Revise the fecal coliform rule (R18-11-303-307) so *E coli* may be used as the indicator organism for pathogen removal similar to the BADCT rule (R18-9-B204) and revise the coliform monitoring frequency requirement for Class A+, A, B+, and B reclaimed water in R18-11-303 to R18-11-306 to match the BADCT frequency in R18-9-B204.

Revise gray water permits to address size of application area and type of water demand (R18-9-711).

Address de minimus uses under gray water permit requirements. This could be addressed by inserting a new provision under Title 18, Chapter 9.

With regard to the four issues identified by ADEQ that need review, the Working Group believes applicable data exists. The Working Group believes current data may allow for “tweaking” these limits. But, it does not have the information available or the resources to finalize a recommendation concerning these four issues.

Provide the recommendations

1. Rule changes would be required for the following:
2. New provision in R18-9 for a new commercial and municipal general gray water permit.
3. Revision to R18-9-719 standards for Type 3 gray water systems.
4. Revision to R18-9-711.A.3 permissive uses of gray water.
5. Possible revisions to R18-9-101 (definitions) and R18-9-704 (signage).
6. Revise R18-11-303-307, fecal coliform rule.
7. Revise R18-9-711 for gray water permits to address size of application area.
8. Include a new provision under Title 18, Chapter 9 to address de minimus use of gray water.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

Regulatory agency would administer in a manner consistent with current administration.

Describe the benefits of the recommendation

Increased gray water use, and slow down of WWTP expansions.

Mitigate workload of regulatory agencies and streamline permitting to the regulated community using general permits.

Provide consistency in rules, with policies that are currently being administered.

Reduction in use of potable water to the extent that the use of alternate sources of water supply are increased.

Describe possible unintended consequences of recommendation

Potential reduction of flow to WWTPs, no recharge credits, permittees not able to meet contracts for reclaimed water.

There may be loss of revenue to utilities.

Public health threats resulting from poorly maintained gray water systems.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
low	medium	medium	N/A	low	Local control is needed

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White Paper Analysis
Revision 4 – 10/11/10

PRIORITY ISSUE #12: Efforts should be made to manage water supplies to optimize the matching of water quality to intended uses.

Describe the existing situation or issue

Some lower quality water supplies such as reclaimed water, remediated water, and brackish groundwater may not be used to the fullest extent throughout Arizona. Recognizing that not all lower quality waters are appropriate for all classes of user, these valuable resources could be more fully utilized by first identifying current water users whose needs match the quality of these water supplies, and then facilitating transitions to these supplies.

For example, in a situation where direct delivery from canals or use of reclaimed water could replace potable water, utilization of these lesser quality waters could save higher quality water supplies to meet future potable water needs, potentially save energy and conserve overall water usage.

Water reuse by agriculture should be encouraged as a replacement for potable water. Not all reuse water currently utilized by agriculture is recognized or documented.

Describe associated impediments

Regulatory barriers – lower quality water supplies may face regulatory restrictions (e.g., use of reclaimed water as potable water)

Higher treatment costs – Treating lower quality water supplies to levels that allow greater use is likely to result in additional expense

Negative perceptions – use of reclaimed water or remediation site water may have negative perceptions

Location – there may be conditions such as local availability of lower quality water supplies that would preclude use (e.g. distance from the point of use is cost prohibitive)

Funding for new or increased infrastructure, water treatment facilities, and other elements of alternative water sources is limited, especially during current economic conditions. Additionally, legal issues, water rights, and a lack of understanding of, or limited ability to invest in, alternative water sources have led to an impact on use of these resources.

Describe the possible solutions (e.g. policy/rule/legislation) that could be applied to remove impediments.

See recommendations below

Provide the recommendations.

1. Review and amend regulations as necessary that will improve, enhance or encourage use, storage and exchange of lower quality water supplies. A stakeholder process could help to identify specific regulations that may require revision.
2. Evaluate potential for incentives that encourage use of lower quality water supplies.

3. Invest in treatment technology research aimed at improving efficiency, cost reduction and quality improvement
4. Develop an educational campaign designed to counter inaccurate perceptions that the public may have concerning use of alternative water supplies.
5. Funding for improvements to infrastructure is needed. Changes or amendments may be needed to policies and regulations that impede utility providers and governing agencies to pursue alternate water sources and exchanges.
6. Encourage use of reclaimed or remediation water by agriculture, where appropriate. Encourage research in water reuse. It may be less costly and alleviate concerns about possible emerging contaminants in reclaimed water to use this water for agricultural or industrial purposes.
7. Recognize that a “one size fits all” policy with respect to the use of lower quality water is unlikely to represent the best approach for Arizona. Uniform model standards can be developed and may be useful, however they must take into account site-specific conditions or provide for exceptions.

Describe how the policy /rule /legislation of guidance could be administered (state, county, local, etc.)

Water and power regulatory agencies may consider strategies to encourage use of lower quality water supplies, matching quality to use, where appropriate and cost-effective

The State could develop policy to allow exchanges and uses of alternative water sources with few impediments.

Describe the benefits of the recommendation.

Expanded use of lower quality water supplies could lessen dependence on other higher quality water supplies, improving Arizona’s water supply portfolio.

Utilization of these lesser quality waters for use in power generation, agriculture, turf irrigation, etc, not only saves higher quality water supplies to meet future potable water needs but also saves energy, conserving overall water usage.

Describe the unintended consequences of the recommendation.

Use of lower quality water supplies may be technically infeasible for some applications, or could result in added costs to water and/or power users.

Because of the complexity and diversity of the types and quantities of lesser quality water supplies, expectations may be created that this solution is a panacea for water resource constraints even when feasibility of use of some supplies in some areas may be low.

Regulatory requirements could force the utilization of lower quality water supplies that may not be in the best interest of ratepayers or could have environmental consequences, such as generating or concentrating waste products.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency H/M/L	Cost to Utility H/M/L	Cost to End User H/M/L	Potential for Cost Pass- through	Benefits / Removal of Impediments	Additional Comments
L	L-M	L-M	L-M	M-H	

**Regulations/Permitting Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #13 - A strategic research plan is needed that supports new directions in policy and rule development (emerging contaminants (i.e. pharmaceuticals), direct potable and full body contact reuse).

- Direct potable reuse
- Research efforts coordinated similar to those under the prior Arizona Water Institute
- Technology based standards development process
- Human health impacts for existing, traditional reuse applications
- Human health impacts of PCPs in gray water

Describe the existing situation or issue

The ability to measure extremely small levels of contaminants in water and recent media attention has increased the concern about emerging contaminants. There currently are no water quality standards and limited human health effect studies for many of these constituents. This situation has raised concern of whether or not the health of the population is adequately protected from these compounds that are eventually passed into the wastewater stream.

In response, research has been done by various groups (depending on their funding, resource availability and in some cases driven by specific interests) that have created the question of whether additional coordinated research is needed.

The media has identified this issue and brought it to the attention of the public. The result is a public health concern that may impede the use of reclaimed water and elicits concern regarding direct potable reuse of reclaimed water.

Describe associated impediments to increased reuse

Fear of perceived or unknown health impacts from the use of reclaimed water for existing permitted applications as well as direct potable impact may hinder the development of potential reuse projects.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

Develop a research plan to address concerns regarding reuse activities that are already allowed, prohibited, or not addressed by Federal and State Rules.

Examples of questions that research should address include:

Will standards for existing uses need to be revised as new data becomes available on contaminants of emerging concern?

What additional standards, if any, would be required to allow direct potable reuse?

What will it take for the general public to accept direct potable and full body contact reuse?

Are Personal Care Products (PCPs) a concern for gray water systems that needs to be addressed?

Provide the recommendations

Arizona, California, Texas, Colorado, and Florida are national leaders in developing water reuse programs. These states could form a coalition, along with the WateReuse Association, WateReuse Research Foundation, EPA and other state and national institutions to develop a strategic research plan to answer questions regarding the development of new and expanded uses of reclaimed water and gray water.

1. Recommend that stakeholders engage in a standards development process that would eventually allow for including direct potable, full body contact, etc. This would include lifting the prohibition on direct potable reuse. It would include identifying standards and monitoring requirements driven by the type of end use, such as for drinking water (i.e. adopting drinking water standards), associated health effects research and the development of indicator parameters appropriate to the end use. These standards should be technology based, employing a suite of treatments such as GAC, high ozone, RO, etc., to address the broad spectrum of potential contaminants.

2. Recommend that the Blue Ribbon Panel (BRP) support research on human health impacts in a traditional reuse setting (e.g. turf irrigation), separate from research into impacts on potable water and traditional in-stream discharge. This would include examination of exposure and risks associated with emerging contaminants (e.g. pharmaceutically active compounds, endocrine disruptors, personal care products) as well as from pathogens (e.g. protozoa). This information could be used to evaluate and possibly improve existing monitoring requirements and water quality standards.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

The WateReuse Research Foundation currently conducts research projects, as approved by their Board, to address research associated with reuse activities. They have accumulated a large amount of data that could assist in future efforts. They could be an entity that brings the right stakeholders together to develop a strategic research plan. ADEQ should contact the WateReuse Research Foundation and present them with a proposal to take the lead in bringing the states and EPA together to formulate a strategic research plan that addresses the issues described here.

Describe the benefits of the recommendation

A strategic research plan will direct research that will provide information to assist water policy makers in deciding whether or not to include direct potable reuse or full body contact applications to meet future water demands.

Research will aid regulatory agencies in developing standards.

Describe possible unintended consequences of recommendation

The cost of treating reclaimed water to meet any new standards could increase and actually have the effect of reducing the use of reclaimed water and/or gray water, subsequently placing additional strain on traditional water supplies.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
Medium	Medium	Medium	Medium	High	The cost of the plan will be relatively small compared to the cost of the research

**Regulations/Permitting Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #14 - Recharge, Reuse, and AZPDES permits do not adequately address unique situations. More flexibility is needed so that reclaimed water use opportunities can be taken advantage of.

Describe the existing situation or issue

The permit process may prohibit the use of reclaimed water for an environmental benefit because it is based on rigid standards that make the environmental use infeasible due to treatment costs. Regulation and permitting could better facilitate multiple benefits which recognize unique situations.

Describe associated impediments to increased reuse

Individual permits are expensive and time consuming. More General AZPDES Permits may be an incentive to use reclaimed water on sites that could benefit from the use of reclaimed water. This could allow improved compatibility with reuse permits.

Rules are narrowly interpreted, resulting in policies that may impede utilization of reclaimed water.

WET testing may be inappropriate for permitting some environmental restoration and multi-benefit projects, which are significant future uses of reclaimed water.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

Expand the application and provide guidance on implementation of Net Ecological Benefit (NEB). This is specific to individual AZPDES permits.

Provide the recommendations

1. AZPDES general permits should be more widely offered for riparian areas, urban lakes, wetlands. There is a general APP (R18-9-D305) for wetlands discharge of A+ reclaimed water to natural wetlands, waters of the U.S., waters of the State, and riparian areas. ADEQ and stakeholders should develop a similar AZPDES general permit, if appropriate.
2. ADEQ should improve the interface between its various permitting program requirements where reclaimed water is incorporated as a resource to support a public project that involves overlapping programs with equally beneficial goals such as reuse, recharge of multiple water sources, stormwater management, stormwater harvesting, public amenities, wildlife benefits, etc.
3. To accommodate use of reclaimed water for environmental purposes (habitat restoration, riparian preservation, environmental and ecosystem enhancement projects, etc.) flexibility should be added to ADEQ's standards and permitting for surface water and reuse programs. Stakeholders and ADEQ should consider adapting one or more of the following options or approaches in order to better facilitate environmental enhancement with reclaimed water:
 - Use of waivers for riparian and wetland projects (similar to what was used for the Yuma wetlands project, but in a more streamlined fashion).
 - Broader use of the Net Ecological Benefit provision of SWQSs rule.
 - Specify maximum flow duration and other operational BMPs which would allow periodic discharge of reclaimed water to ephemeral streams without creating an EDW.

- Establish an AZPDES general permit or exemption for created wetlands used to further treat reclaimed water so that discharge into such facilities is clearly not discouraged by SWQS regulation (this could work in conjunction with APP general permit for this type of facility).
 - Establish a designated use for environmental enhancement/ecosystem restoration with reclaimed water in the SWQS rule so that standards exist specific to this type of activity.
 - Develop BMPs and reuse permit coverage for reuse projects operating in and adjacent to riparian settings (within the floodplain) so that these types of projects could maintain exclusion from AZPDES.
 - De-chlorination requirements for riparian and recharge projects should be case by case and take into account the potential value of chlorine residual where public protection is necessary, such as in recreational trail and park settings. For use of reclaimed water in multi-purpose projects, the benefit of dechlorination needs to be weighed against the risk. Use of reclaimed water for environmental enhancement is often conducted in the same setting as irrigation for park and recreational use. Forcing the operator to dechlorinate may not be appropriate, considering the total picture for human health and environmental benefit. Also, consideration could be given to chlorine reaction, absorption, and dissipation achieved by site conditions. Could there be some sort of site condition BMP developed that incorporates issues such as infiltration, soil type, vegetation density, timing of application, etc?
 - Lake management plans (urban lakes) could substitute for narrative nutrient standards
4. ADEQ should develop a flexible approach that only applies WET in settings where aquatic wildlife impacts are likely. There should be additional research into alternative appropriate protections for AZPDES discharge in upland/ephemeral settings that are distinct from wet-water environments. In these settings, criteria for impact on terrestrial wildlife could be developed and applied.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)
Administration would be done on a state level. EPA approval may be required in some cases.

Describe the benefits of the recommendation

Increased environmental enhancement and/or restoration may result from the availability and application of reclaimed water.

Describe possible unintended consequences of recommendation

Possible creation of demands for reclaimed water that remains committed when conflicting demands or higher uses could occur in the future for the same water.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
low	low	low	N/A	medium	

**Infrastructure/Retrofit Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #15: Identify issues and develop approaches to operator training/certification for reclaimed water utility distribution systems to ensure consistent and safe management of this resource and its associated infrastructure. Based upon the analysis, develop recommendations on operator certification for the BRP.

Describe the existing situation or issue

Arizona Administrative Code (AAC) R18-5-101 through 116 provides rules for classifications of water and wastewater facilities and certification of operators. The level of training and certification required depends upon the classification of water and wastewater facilities, based mainly upon their complexity and population served. However, this code does not include reclaimed water distribution systems operated by utilities. At present, there is no statute or code in Arizona requiring specialized training and/or certification of reclaimed water distribution system operators, regardless of which class of reclaimed water is being distributed, the complexity of the system, or the population served. In the absence of specific reclaimed water distribution system certification at the state level, each reclaimed water utility has determined its own requirements for training and certification for its operators, which may include no specialized training or certification, or a combination of water and wastewater training and certifications.

Describe associated impediments to increased reuse

Without state-recognized and approved training and certification program, there is a risk to the entire water reuse industry in Arizona should there be an operator error in any one system that leads or directly contributes to harm or perception of harm to public health or the environment. Legal or press media scrutiny of such an error could result in public distrust and fear that operators of reclaimed water distribution systems are not qualified to do so (even though they very well may be).

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

- Consult with ADEQ and the 12 member ADEQ Operator Certification Committee
- Research other States' Programs
- Evaluate "Best Practices"
 - Solicit Stakeholder Recommendations
- Formulate Draft Arizona Water Reuse Operator Certification Program
 - Solicit Stakeholder Comments
- Develop Training Manuals/Videos
- Present Program to AZ Water Association & WateReuse Boards of Directors
- Develop a "Train-the-Trainer" Program
- Roll-out the Program as Guidance
- Make necessary modifications and then codify the program in State code

Provide the recommendations

Develop a reclaimed water distribution system operator training program and associated certification. The "certification" would actually be a reclaimed water operator "rider" that would be added to existing certifications that may be required for a utility. This implies that the utility must at least require training and certification in one of the four existing areas of operator certification for Arizona. It is proposed that the AZ Water Association and WateReuse Arizona work together to develop and administer the program as a best practice, and refine the program over a year or two until it can be adopted into code by the State and be managed by ADEQ. As part of a future rule modification to include the reclaimed water operator

rider program, it should be made a requirement that each reclaimed water utility designate an operator in direct responsible charge and that the operator in direct responsible charge must possess the reclaimed water operator rider. The program development and refinement process should include the ADEQ Operator Certification Committee.

The certification “rider” would involve reclaimed water specific coursework and an examination as follows:

- Reclaimed Water Operator (“Rider” to Existing Certifications)
 - Purpose
 - Provide specialized training
 - Enhance credibility
 - Support identity
 - Supplement job description required certifications
 - Protect the public
 - Applies to ALL existing certification classes
 - Applies to ALL existing certification grades (1,2,3,& 4)
 - Course of Study
 - Overview of SDWA and CWA
 - ADEQ rules related to reclaimed water and water reuse
 - ADWR rules
 - Permitting
 - Water quality & end uses
 - Health and case studies
 - Onsite considerations & user agreements
 - Sampling, reporting, and technical writing
 - Common best practices
 - Common treatment processes
 - Reuse demand characteristics & delivery
 - Customer agreements and relations
 - Cross connection control and backflow prevention
 - Materials, signage, utility locating
 - “Unauthorized discharge” response
 - Aquifer recharge and wetlands managed by the utility
 - Water resources & quantity (ADWR reporting)
 - Metering
 - 8 hours of training, no field work

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

It is proposed that this be an optional program jointly developed and administered by the AZ Water Association and WateReuse Arizona. Once developed and implemented, modifications can be made as deemed necessary and appropriate over a 12 to 24 month period of time. Ultimately, it is suggested that the program be administered by ADEQ as part of the existing operator certification program, which would require a modification to the existing rule. Incorporating the reclaimed water distribution system operator certification program into rule is consistent with what is currently in place for water and wastewater operator certifications, formalizes the responsibilities of a reclaimed water distribution system operator within a legal framework, and facilitates the designation of an ‘operator in direct responsible charge’ by utilities.

Describe the benefits of the recommendation

Implementation of a standardized certification program would educate operators with a common understanding of the unique issues associated with operating and maintaining a reclaimed water distribution system, provide the public with a reference point for operator qualifications, and mitigate risk to the utilities employing operators. A reclaimed water distribution system operator training and certification program would also increase the overall integrity of the water reuse industry in Arizona.

Describe possible unintended consequences of recommendation

Certified operators may request additional pay in association with higher training and certification standards. If administered by the State of Arizona, the program may require new fees to fund additional resources provided by ADEQ. Some reclaimed water utilities may be unable to afford the additional cost of training operators, or may not be able to recover costs for the training.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency	Cost to Utility	Cost to End User	Potential for Cost Pass-Through	Benefits & Removal of Impediments	Additional Comments
Low	Low for large utility; medium for small utility	Low	High	Undetermined	Preventive measure to maintain public perception and trust

**Public Perceptions/Acceptance Working Group
Blue Ribbon Water Panel
Draft White Paper Analysis
December 2, 2010**

PRIORITY ISSUE #16: The need for the public, community leaders, water treatment professionals, businesses and industry to understand and be aware of water quality issues and how their actions, including disposal of pharmaceuticals and personal care products, can influence water quality.

Existing Situation or Issue

Many man-made compounds have made our lives safer, healthier and more convenient. However when released into the environment, even in trace concentrations, some of these substances may cause water quality, health and safety concerns. They can also result in a public perception that use of reclaimed or recycled water is not safe. Because of the many compounds in use today and because we have a better understanding of their potential to impact human health and the environment, the process of setting water quality standards and regulations has grown increasingly complex.

In 2009 the New York Times reported that *Millions in U.S. Drink Contaminated Water*⁶ and *Tap Water Is Legal but May Be Unhealthy*⁷. These headlines are alarming. The public places a great deal of trust in water professionals to deliver water that is free of contaminants. Because water is a basic, life sustaining element, the public expects water to be clean and safe.

Federal Role

EPA sets National Water Programs Goals to ensure clean and safe water to protect human health, to protect and restore aquatic ecosystems and to protect and restore water quality and maintain the health of aquatic life and aquatic dependent wildlife.⁸ The Safe Drinking Water Act requires EPA to set national drinking water standards to ensure the safety of water consumed by millions in the US who receive their water from public water systems.

EPA's research strategy for safe drinking water includes understanding the human health effects of known and emerging pathogens, chemicals and suites of contaminants, improving the risk assessment process for these contaminants and reducing uncertainty in extrapolation from animals to humans and from high to low doses.

The Clean Water Act was adopted to restore and maintain the chemical, physical and biological integrity of our nation's waters. EPA's research strategy includes assessing the impact of emerging contaminants on aquatic life and establishing water quality criteria to protect them.

EPA loosely describes emerging contaminants as substances that have no regulatory standard. They may have recently been *discovered* in the environment because of improved detection methods and may cause public health or ecosystem risk. EPA now uses the term *contaminant of emerging concern* (CEC) to include subgroups of compounds including endocrine disrupting compounds, pharmaceutical and

⁶ <http://www.nytimes.com/2009/12/08/business/energy-environment/08water.html>

⁷ http://www.nytimes.com/2009/12/17/us/17water.html?_r=1

⁸ <http://water.epa.gov/scitech/swguidance/waterquality/standards/strategy/upload/strategy.pdf>

personal care products and minute quantities of organic compounds, trace metals, perchlorate, various parasites and some commonly occurring compounds such as salinity and sulfate.⁹

State Role

The mission of the Water Quality Division at Arizona Department of Environmental Quality (ADEQ) is to protect and enhance public health and the environment by ensuring safe drinking water and reducing the impact of pollutants discharged to surface and groundwater. ADEQ has been delegated the authority to administer the federal Safe Drinking Water Act and the National Pollutant Discharge Elimination System Program in Arizona.

Issues

EPA and ADEQ establish water quality criteria and implement water quality standards to protect drinking water quality and the environment from chemical, physical and biological contaminants. Research shows that many chemical and microbial constituents that were not previously considered contaminants are present in the environment.¹⁰ Compounds such as antibiotics, hormones, antidepressants, detergents and caffeine have been found in the environment. The impacts to human health and to the environment are now being evaluated by agencies such as the EPA and the US Geological Survey (USGS). USGS is conducting research to develop analytical methods to measure trace levels, to determine where and how often they occur in the environment, to determine how contaminants are released to the environment, to define and understand how contaminants are transported and to identify potential ecologic effects from exposure to these contaminants. Improved technology also enables us to detect minute concentrations alerting us to the presence of compounds that could not have been detected previously.

How do these contaminants enter our drinking water supplies and the environment? Many enter the environment as conventional toxic pollutants associated with industrial activities. Some are everyday products ingested as pharmaceuticals and excreted to the sanitary sewer system to the water cycle. Personal care products such as over-the-counter therapeutic drugs, fragrances and cosmetics that are not absorbed by our bodies are excreted or washed off into the sanitary sewer system. Agricultural or industrial contaminants can enter the environment through run off practices where they eventually enter our waterways. Still others are simply flushed into the sanitary sewer system. Disposal of grease and household hazardous waste are also practices that introduce contaminants into the water supply and environment. Any contaminant that is not removed in the wastewater treatment process remains in the discharged effluent and may impact the groundwater aquifer, affect the quality of reclaimed water or affect the environment into which it is discharged.

Many contaminants of emerging concern have probably been in our water supply and environment for years, but advances in technology now allow us to detect and quantify traces of these chemicals. We are also beginning to identify what effects these chemicals have on human health and the environment and surface water.

The public's perception that unregulated contaminants are in reclaimed water can be an impediment to their accepting it as a safe and reliable alternative to groundwater or surface water for irrigation and other non-potable uses.

Associated Impediments to Increased Reuse

⁹ Tucson/ Pima City/County Water/Wastewater Infrastructure Water Quality Technical Paper, September 2009.

¹⁰ <http://toxics.usgs.gov/regional/emc/>

Water quality and water supply are closely interrelated. Poor quality water diminishes the amount of water available for potable use and for reuse. The public may not be aware of the interdependency between water quantity and quality. They may also not fully appreciate the water cycle including the role recycled water plays.

Increased public awareness of the presence of trace amounts of pharmaceuticals and chemicals associated with personal care products may give the perception that reclaimed water is not safe for public use purposes, such as parks. Additionally, the unknown effects of these constituents, in trace amounts, may lead the public to have more concerns about the safety of reclaimed water use.

The public expects regulators to ensure that water quality standards protect the public and environment. The public may not fully understand the process for setting water quality standards and may not understand why contaminants are unregulated.

The regulatory process is complex and the number of unregulated compounds is numerous. Data is lacking on the epidemiological risk for these compounds for exposure pathways like turf irrigation or industrial use. Therefore, the unknown impacts can affect the public's perception of the safety of using reclaimed water.

The key issues for public perception can be summarized as follows:

- Are there contaminants in the water?
- At what levels or concentrations are they present?
- At what levels are they a public health concern?

Possible Solutions

In the Public Perceptions/Acceptance Working Group strategies for addressing the public's perception on awareness of water quality issues and how their actions can influence water quality were discussed. Possible strategies that were identified include public education and outreach, source control, research on the affects of contaminants of emerging concern, highlight successful programs, build partnerships and coalitions and provide funding to implement these strategies.

Public Education and Outreach

Public education on water quality issues should focus on expanding public understanding of the water cycle and the relationship between water quality and water quantity. Raising awareness that reclaimed water is safe for the purposes for which it is permitted to be used is another objective. Other strategies should include suggestions on how the public can help protect water quality and water quantity. For example:

- Buy and use only what you need
- Read and follow labels
- Store properly
- Dispose of properly or take leftover quantities to an approved drop-off site
- Use safe alternative products when possible

Outreach programs should be broad-based and reach into all segments of the community. Outreach should include support from the environmental community, health and medical community, the general public and community leaders. Written support should be solicited from all political levels.

Many venues exist for conducting outreach. Publicity pamphlets, media, utility billing inserts, water fairs and websites are some of the available venues. However, care should be taken that they convey

consistent, clear messages and effective delivery methods should be researched. Successful outreach programs employ professional public relations firms.

Another important outreach venue is our schools where water education can shift people's thinking, change behavior and nurture knowledgeable water stewards. Students often further educate their parents and other members of their families. Programs like Project WET (Water Education for Teachers) that promote responsible water stewardship through excellent and effective water education should be supported by the professional water community. Case studies performed by Project WET show that Arizonans accept water reuse when they are educated on the subject.

The WateReuse Association is a professional organization formed to advance the beneficial and efficient uses of high-quality, locally produced, sustainable water resources for the betterment of society and the environment through advocacy, education and outreach, research and membership.

Organizations such as these provide technical resources and publications to educate the public about the benefits of recycled water. WateReuse Association's Arizona section is comprised of statewide water professionals and works together to encourage and assist communities to achieve sustainable water supplies through reclamation and reuse. The technical expertise of these professional organizations should be used to advance public education and outreach.

Arizona's Department of Environmental Quality and Department of Water Resources and the Arizona Corporation Commission provide education and outreach on water quality, water resources and energy efficiency. These agencies provide support for many community outreach events.

Source Control and Multiple Barrier Approaches

Modern wastewater facilities do an excellent job of treatment and are capable of producing very high quality effluent suitable for a variety of purposes. However, no single treatment technology is capable of removing every contaminant. Furthermore, new analytical advances and continued manufacturing of new compounds will increase the number of contaminants that enter the sewerage system.¹¹ Source control programs that prevent contaminants from entering the sewerage system offer lower treatment costs and improved water quality. Many of these are described in the section that highlights successful programs.

EPA and ADEQ require public water systems to employ a multiple barrier approach to potable water protection. The multiple barrier approach consists of assessing and protecting drinking water sources, protecting wells, making sure water is treated by qualified operators, ensuring the integrity of distribution systems and making information available to the public on the quality of their drinking water. These activities include sampling for 15 secondary and 25 unregulated drinking water contaminants on a regular basis, maintaining chlorine target levels, as necessary, in the system and maintaining policies and procedures that can react to any newly developing contaminant situation in a preventive manner. Maintaining multiple barrier approaches reassures the public that effective strategies are in place to protect water quality.

Source control and multi-barrier approaches are regulatory requirements and may be addressed by the Regulations and Permitting Working Group. However, these programs should be continued and are important mechanisms that protect water quality.

Research Considerations

¹¹ Tucson/ Pima City/County Water/Wastewater Infrastructure Water Quality Technical Paper, September 2009.

A report published by the USGS in 2000 received national attention on the presence of PPCPs in our environment.¹² USGS results indicated unusually high concentrations of chemicals in both Pima and Maricopa counties, primarily due to the discharge of wastewater into surface waters with little or no dilution. This report raised many questions about the chemical risks to populations, potential contamination of groundwater, analytical validity, and compound identification and classification.

In 2004 Pima County conducted a survey of community sources of pharmaceuticals and personal care products and found most hospitals, nursing homes and pharmacies have an organized system for keeping these compounds out of the sewers.¹³ It was concluded that the primary sources are likely the result of human excretion of medication residuals to the sewers. Other potential sources were disposal of unused medication in household trash or disposal through flushing to the sewer system. Additionally, there are many natural sources of these compounds in plants, plant byproducts and even natural human and animal hormones.

Regarding trace organics the following are key considerations:

- Advances in analytical technology enable us to measure concentrations at minute levels making the presence and detection of many trace organics unavoidable
- Most organics now measured in municipal wastewater are present in concentrations that are unlikely to produce physiological response in exposed organisms. However, hormones at very low levels can disrupt organism development at critical life stages. The effects on organism development from trace organics in municipal wastewater are unclear and the effect of simultaneous exposure to multiple trace organics is unknown
- It is unlikely that source control or prohibiting certain products can greatly reduce estrogenic activity in municipal wastewater
- Conventional wastewater treatment is efficient at removing estrogenic activity from municipal wastewater. However, the roles of specific groups of organisms in breaking down important classes of trace organics have not been fully researched
- The fates of trace organics in wastewater effluent discharge to surface water or infiltrated for groundwater replenishment have not been well studied and are not completely understood
- There is no compelling evidence linking residual trace organics in wastewater effluent with human health effects

Highlight Successful Programs

Many successful programs exist to protect water quality. Among them are:

Fats, Oil and Grease Programs are mandated by the EPA to control commercial and industrial sources of pollution into the sanitary sewers. Fats, oils and grease discharges to the sewerage system are controlled because they can lead to sanitary sewer overflows, cause odors and increase the costs of repair, maintenance and replacement of sewer lines and treatment plants. Strategies to control residential discharge of fats, oil and grease include public outreach programs that urge residents to pour used liquid into a can, allow it to cool and dispose of it in the trash. Additional grease can be wiped from pots, pans and plates with a paper towel before washing them, instead of pouring it down the drain

Household Hazardous Waste Programs are operated in many communities. These programs accept small quantities of household hazardous waste, such as paint, auto batteries, solvents, lawn and garden products,

¹² *Pharmaceuticals, Hormones, and Other Organic Wastewater contaminants in U.S. Streams, 1999-200: A National Reconnaissance*, United States Geological Survey, 2000.

¹³ Tucson/Pima City/County Water/Wastewater Infrastructure Water Quality Technical Paper, September 2009.

and pool chemicals. Waste is recycled or disposed of properly instead of being poured into the sanitary sewer system or disposed of in a landfill.

Industrial Pretreatment Programs have been in place since the 1980s when amendments to the Clean Water Act required them. Industries that discharge hazardous wastes into the sewer must have industrial discharge permits. These permits protect wastewater treatment facilities, prevent pollutants from passing through the treatment process and into the environment, protect municipal sludge and prevent the exposure of workers and the public to chemical hazards.

Pharmaceutical Take-Back Programs consist of a one-day event, typically held on a Saturday at a public venue such as a shopping center. The public brings their expired, unwanted or unused pharmaceuticals and other medications for destruction. The programs are anonymous and usually at no cost to the public. Prescription and over-the-counter solid dosage medications (i.e. tablets and capsules) are usually accepted. Because of the potential presence of controlled substances, law enforcement must be present. Volunteers from local government, college of pharmacy and fire departments accept the unwanted drugs and process them for destruction.

Take-back programs have a strong interface with law enforcement because drugs that are controlled substances are heavily regulated under Federal and State Laws. Pharmacies, law enforcement and the person to which the drugs are prescribed are the only ones authorized to possess them. By law they must be properly labeled. ARS Chapters 27 and 28 address controlled substances. Examples of take-back programs are listed in Attachment A.

Partnerships and Collaboration

Partnerships with stakeholders that have a role in water quality can contribute to building and promoting public awareness of water quality issues.

The U.S. Department of Justice designated September 25, 2010 as Nationwide Prescription Drug Take-Back Day. The primary goal of this initiative was to prevent drug abuse and theft, but it also received the National Association of Clean Water Agencies' support to provide communities an opportunity to educate their residents on the importance of keeping prescriptions medications from entering the Nation's waterways. This initiative consisted of collection activities at local sites throughout the country. Partners included the White House Office of National Drug Control Policy, the Partnership for a Drug-Free America, the International Association of Chiefs of Police, the National Association of Attorneys General, the National Association of Boards of Pharmacy, the Federal State Medical Boards and the National District Attorneys Association. This one-day effort was free and anonymous for those turning in over-the-counter and prescription drugs.

**Tucson Residents Turned in
345 Pounds of Unwanted Drugs
at Recent Take-Back Day**



Potential partnerships exist among:

- Law enforcement, emergency services agencies
- Federal agencies; Food & Drug Administration, EPA, Justice Department
- State agencies; State Board of Pharmacy, ADWR, ADEQ, ADHS
- Academia/University Pharmacy Colleges
- Local government (cities, towns, counties)

- Water treatment professionals
- Pharmacies
- Drug manufacturers
- Personal care product manufacturers
- Senior organizations

Community leaders should also participate in public education and outreach should advocate for the safe disposal of contaminants and should emphasize public health and water quality. Leadership from the following sectors yields credibility to education and outreach efforts:

- Physicians and Pharmacists
- Elected officials
- Federal, State and Local leaders
- Water Treatment professionals
- Business leaders

Funding

Outreach and education programs require funding at many levels. Partnerships to share and optimize limited financial resources can minimize the impacts to any one agency. Funding of additional research as described in Section 3 under research considerations should be pursued. Finally, public participation in voluntary take-back programs will be successful if they are offered at no cost to the public.

Recommendations

The following recommendations are provided for consideration:

1. Education and Outreach

- Work with national and other statewide programs to develop a consistent program nomenclature. For example, entities have different names for pharmacy take-back programs including Unwanted Medicine Return Program, Dispose-A-Med, No Drugs Down the Drain
- Expand pharmaceutical take-back programs: participate at the state and national level efforts to facilitate programs and offer them at no cost to the public
- Urge ADEQ to implement a non-regulatory outreach/education/facilitation approach, that cuts through some of the barriers
- Be proactive with the media
- Media outreach should include
 - Linkage between water quantity and water quality
 - Description of how contaminants are regulated
 - Consistent messages regarding safety of reclaimed water for its intended uses
 - What the public can do to protect water quality
- Use experts, universities, professional industry organizations, subject matter experts, law enforcement and social media to educate the public on water quality issues

2. Funding

- Fund a statewide education and outreach campaign
- Implement incentive programs for pharmacy and health departments
- Fund drug take-back programs. Some programs charge a fee and others require proof of residency. These requirements are impediments to successful programs and discourage the public from using them
- Support funding for research in the following areas:
 - Evaluate the effects of trace organics in stream systems receiving wastewater
 - Evaluate the fate of trace organics in wastewater effluent discharge to surface water or infiltrated for groundwater replenishment

- Explore the linkages, if any, between residual trace organic compounds in wastewater effluent and human health effects
- Evaluate the environmental fate of pharmaceuticals and personal care products in Arizona settings where effluent is used for reuse, recharge, and environmental enhancement

3. Legislation

- State laws specify the information that must be provided in prescriptions. One strategy is to advocate for an amendment to state law ARS 36, Chapters 27 and 28 to require pharmacies to include information on proper disposal and where to find take-back programs. This would provide outreach to the end users
- Require pharmacies to post information about how to dispose of medications and personal care products and where to find take-back programs

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc)

At the state level education and outreach would require budgeted staff support and resources. State support for funded research efforts will also require budgetary support. The state should also take an active role in promoting drug take-back programs.

Legislation to support proper disposal of pharmaceuticals and personal care products would be administered by the Department of Health Services and the Arizona State Board of Pharmacy.

Benefits of the Recommendations

Public education and outreach provide the public the necessary tools to make informed decisions. An informed public will change their behavior and participate in voluntary source control programs to keep contaminants out of the water cycle improving water quality. Public participation in residential source control programs empowers the public to be active in protecting water quality, increasing public confidence in the safety of reclaimed water and achieving water sustainability. Agency support, including funding, will make these efforts successful. The following benefits are possible with an informed community:

- The public will be empowered to modify behaviors to protect water quality
- The public will have confidence in the safety and use of reclaimed and recycled water
- The public will support reclaimed water and recycled projects
- The public will support funding of sustainable water projects and programs
- Research will provide data to determine safe levels of emerging contaminants and their impacts to human health and the environment

Possible Unintended Consequences of Recommendation

Expanded outreach, if poorly executed or using inadequate data, might give a mixed message to the public that reuse water is not safe and that pharmaceuticals are present and their effects not fully known.

The success of public outreach and education programs may be difficult to measure. One potential success indicator could be the number of pounds of pharmaceuticals collected at take-back events. This could represent the pounds of pharmaceuticals that were averted from reaching the environment or from being abused.

Take-back programs for pharmaceuticals and personal care products only address a small percentage of the pollutant load. For personal care products, many of which result from normal consumer use and serve essential daily functions, prevention through take-back or alternative modes of discharge is not possible. Reliance on take-back programs alone to address this issue would fall short of the comprehensive goal.

Describe the associated cost/benefit of implementation, possible funding sources and estimated cost to the end user using the matrix below for each recommendation

Recommendation	Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments
Education and Outreach	Medium	Medium	Low	Low	High
Funding	Medium	Medium	Low	Low	High
Legislation	Low	Low	Low	Low	Medium

Attachment A - Example Take-Back Programs

Program	Partners
Pima County Dispose-A-Med http://www.pima.gov/wwm/programs/dispose_med/	Apothecary Shops, City of Tucson, Fry's Food Stores, Green Valley Coordinating Council, Household Hazardous Waste, Town of Marana, Northwest Fire Department, Oro Valley Policy Department, Pima Association of Governments, Town of Sahuarita, Tucson Water, University of Arizona College of Pharmacy, Walgreens
City of Scottsdale Drug Collection and Disposal http://www.scottsdaleaz.gov/News/09-21-2010-newsa.asp	Scottsdale Police Department Senior Centers, Fit City, Scottsdale Healthcare, US Department of Justice
Town of Gilbert Drug Disposal Event http://www.gilbertaz.gov/calendar/eventDetail.cfm?recordID=2283	Gilbert Policy Crime Prevention Unit US Department of Justice
Southern California No Drugs Down the Drain www.nodrugsdownthedrain.org	City of Los Angeles, City of Riverside, Orange County Sanitation District, City of San Diego, County of Los Angeles, California Pharmacists Association,
Washington State Medicine Return http://www.medicinereturn.com/	Clark County, Bartell Drugs, Group Health, Local Hazardous Waste Management Program in King County, People for Puget Sound, Science and Management of Addiction Foundation, Thurston County Solid Waste, Washington State Hospice and Palliative Care Organization Zero Waste Washington,

Public Perceptions/Acceptance Working Group
Blue Ribbon Water Panel
White Paper Analysis
December 2, 2010

PRIORITY ISSUE #17: The need for consistency in the use of common and positive terminology to convey effective messages about water sustainability.

Describe the existing situation or issue

- Water issues are inherently complex, and reclaimed water is no exception.
- Definitions for reclaimed water and associated terminology vary between entities statewide.
- The professional water community uses technical terms.
- The bulk of communication regarding reclaimed water comes from the professional water community.
- Conflicting definitions, complex terminology and negative campaigns (inherited from other states) encourage mistrust, misinformation, and confusion for the public and the media, as well as political leaders and industry professionals.
- Conflicting messages create confusion and undue concern about associated issues such as water quality and public safety.
- Conflicting messages create uncertainty about adopting reclaimed water.
- Examples of projects from other parts of the U.S., both successes and failures, are available as models and cautionary tales.

Describe associated impediments to increased reuse

- Conflicting definitions make it difficult to compare apples to apples when sharing information, developing policy, and for regulatory reporting.
- Terminology issues can contribute to difficulty in permitting, funding, regulation, and public acceptance of projects, thereby limiting implementation of new projects.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

- Create a lexicon of terminology that conveys a positive message and can be utilized as industry standard on a statewide basis.
- Implement phased educational programs and outreach campaigns appropriate to specific audiences.

Provide the recommendations

- Create a coalition to engage industry experts and enlist a public relations firm to translate industry terminology into an acceptable lexicon for statewide use and to procure funding from federal, state, local and private institutions. Coalition members could include representatives from state, county and local jurisdictions, industry experts, the Arizona Water Institute (re-established), Cooperative Extension, the AMAs, the Water Resources Research Center, the AZ Water Association, the Arizona section of the WateReuse Association, interested members of the public and other parties (state, county, local).
- Commission the coalition to formulate a strong, positive message that can be utilized on the state, county, and local level and that is appropriate to a variety of audience segments (agriculture, commercial, municipal, and consumer for example).

- Educate water professionals on the use of the new terminology and the benefit to their industry for employing the terminology.
- Conduct an outreach campaign to potential users of reclaimed water.
- Engage with academics, local celebrities, and business partners as official spokespeople for reclaimed water.
- Ask that the Governor proclaim an auspicious date as Water Reuse day for Arizona.
- Water providers fund the coalition, the public relations firm, and the awareness campaign.
- Procure written support from political leaders.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

- A statewide coalition administers the effort to determine common terminology, craft a strong, positive message, and create a plan for the awareness campaign and education program.
- The statewide coalition administers federal, state, and private grants and funding.
- The statewide coalition acts to employ and supervise a Public Relations firm.
- Local entities and providers fund an awareness campaign appropriate for local use.
- Providers and private partners administer professional education programs.

Describe the benefits of the recommendation

- Clear messaging will encourage public acceptance of the development of reuse projects, water uses and overall water pricing.
- The audience for reclaimed water projects will increase.
- Public trust of government will increase.
- Positive media coverage will increase.
- National awareness of Arizona as a leader in reuse will increase.
- Perception of other BRP issues will benefit as part of the education and awareness process.
- Reporting requirements and data collection will be standardized.
- Acceptance of future water issues and solutions will enjoy early adoption.
- Confidence in water supply, water quality, and public safety will increase.
- The need for additional water supplies and expense is lessened.
- Creating a common terminology will enable BRP efforts to be evaluated and measured.

Describe possible unintended consequences of recommendation

- Demand overtakes supply.
- A disconnect occurs between Arizona and federal standards.
- Public opines that money should be better spent elsewhere.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Implementation Costs:

Con: Any statewide effort will be expensive.

Pro: Individual providers and institutions determine their funding contribution for the coalition as well as staff effort based on their own objectives.

Pro: Reporting cost to provider is reduced due to standardized terms.

Pro: DEQ and DWR staff time is reduced due to the use of standardized terminology for reporting and evaluation.

Possible Funding Sources:

Con: Public/Private partnerships require effort and supervision.

Pro: Public/Private partnerships will assist in balancing expense.

Con: Federal grant requires administration time.

**Economic/Funding Workgroup
Blue Ribbon Water Panel
White Paper Analysis
September 23, 2010**

PRIORITY ISSUE #18: Provide Technical Support and a Clearinghouse for Assistance to Arizona Communities

Describe the existing situation or issue.

There is a general lack of technical and financial information available to help communities, utilities and individuals to determine the feasibility of developing their effluent resources or to pursue the development of additional water supplies through gray water or rain water harvesting. Furthermore, there is not a common framework for evaluating the cost-effectiveness of different water reuse strategies. This lack of readily-available information hinders the ability of Arizona communities to pursue water reuse and water supply augmentation as a viable alternative supply.

Describe associated impediments to increased reuse.

To implement water reuse requires knowledge of technology, legal constraints, and funding mechanisms. It also requires an ability to weigh the economic viability of different water augmentation strategies. In many cases, particularly for small or emerging communities (communities that were once small but have grown or are expected to grow rapidly), there is insufficient information for either the water providers or local government to begin to pursue the development of water reuse alternatives. This is further complicated by the fact that each community faces unique circumstances that may require a variety of technical solutions. There is no one commonly-accepted method to evaluate the cost effectiveness of different strategies. In addition, funding criteria are complex and difficult for communities with limited staff resources to keep up with and utilize outside funds and grants.

Describe the possible solution (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments.

The solution could take a number of forms:

- At its simplest and least costly, the recommendation would be to develop a web-based information and referral site. The site could include tools for assessing the benefits and costs of water reuse such as the Water Reuse Research Foundation model, the American Water Works Association Cost-of-Service framework for evaluating conservation strategies, or similar models. It would include a section on the capabilities and limitations of different technologies (e.g., direct use of reclaimed water vs. recharge and recovery). It would also include a section on funding options with links to the funders, and case studies showing solutions to various reuse problems. Ideally, the case studies could be statewide or nationwide.
- A more robust approach, or a second tier of the web-based approach, might be modeled after the Extension Service, where staff would be available to provide direct assistance from reconnaissance level feasibility assessment to helping with applications for funding. Staff would apply a common evaluation framework to the unique circumstances of the community seeking assistance.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.).

There are no rules or regulations required to pursue this web-based option. There are a number of options, however, where this resource could be housed:

- Within a state agency (ADWR, ADEQ, WIFA)
- At a University (Water Resource Research Center, a State Cooperative Extension Service Center or a special university group like Decisions for a Desert City)
- At a private non-profit such as the Watershed Management Group
- With industry and trade groups
- With regional councils of governments

There are also resources on the national level which could be of assistance such as the WateReuse Association and its affiliated WateReuse Research Foundation. The WateReuse Research Foundation “is an educational, nonprofit public benefit corporation that serves as a centralized organization for the water and wastewater community to advance the science of water reuse, recycling, reclamation, and desalination. The Foundation’s research covers a broad spectrum of issues, including chemical contaminants, microbiological agents, treatment technologies, salinity management, public perception, economics, and marketing.”¹⁴ The WateReuse Research Foundation is funded by its member organizations, many of which are state and federal agencies. There are also a significant number of private enterprises which subscribe. A subscription on behalf of one of the above organizations could make this information available to participating Arizona entities.

Provide the recommendations, including the associated cost of implementation and possible funding sources – cost to the end user.

The cost of implementation will depend largely on how robust the services provided are. The website would need to be hosted and supported, both from a technical perspective (website development, links etc) and a content perspective. If an extension service model were adopted, then there would be additional staffing requirements, both technical and clerical. Dependent on the range of technical assistance provided (site visits, reconnaissance level cost assessment, assistance with funding application, etc.) staffing could vary significantly. Given the size of this state, travel expenses could be significant if site visits were involved. Much of the information necessary for a reconnaissance level assessment may require site visits.

Potential funding sources include:

- A fee-based service, possibly measured on the ability to pay. However, the target audiences for this service are cash and staff poor, so including additional costs for these services may be self-defeating.
- Another approach would be to operate the service on a reimbursement basis. The service would be provided with no upfront charge, but would be invoiced when the project being evaluated is funded for design and construction. Monies would be allocated to the planning process and the technical assistance would be reimbursed from these funds.
- If the service were housed in a state agency, funding and staffing this service would be part of the normal budgeting process, either with the reallocation of existing budgets or with new funding. (The current state budget may not make this approach very feasible at this time.)
- If it were located at a university, it could be state funded (by an agency or administrative office) or the university could seek grant funding from federal agencies or private non-profits. This would also hold true for co-locating with a private non-profit.

¹⁴ *WateReuse Website, <http://www.watereuse.org/>*

Benefits

The benefits include providing a clearinghouse and information database of consistent, up to date information on options for effluent utilization for reuse/recharge, as well as a standardized means to weigh alternatives. This information would include best practices for reuse (locally, state-wide and nationally), funding alternatives, regulatory requirements, and evaluation tools to help assess feasibility of concepts and proposals. The clearinghouse and database would help put communities, utilities, and individuals in a position to make informed decisions about the development of their effluent resources and the implementation of grey water and rainwater harvesting.

Unintended consequences

None identified.

**Regulations/Permitting Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #19: Current state statutes have created a jurisdictional issue with regard to control of gray water systems and need to provide incentives for continued/expanded use of alternate sources of water supply.

- Tax credits for gray water systems
- Provide financial and regulatory incentives for conversions
- Local control of gray water systems

Describe the existing situation or issue

The existing tax credit incentive provided by *A.R.S. §43-1090-01*. Credit for water conservation systems will expire in tax year 2011. Less than half of the available tax credits were used during 2009.

There are currently only limited financial and regulatory incentives for using reclaimed water.

Adoption of *A.R.S §49-204* removed the ability of some local governments to control gray water systems that was previously allowed by rule R18-9-711.C. The Statute states a city, town or county may not limit the use of gray water unless it is located in an initial Active Management Area, has a groundwater goal of safe yield, the area does not contain part of the CAP aqueduct and the effluent has been included in an assured water supply that permits towns, cities or counties to limit gray water systems. This is saying that water providers in some areas, where these conditions do not apply, cannot prohibit gray water systems, even if they have contractual commitments to reclaimed water customers. Local control of gray water outside these areas was allowed by rule before adoption of *A.R.S §49-204*.

Describe associated impediments to increased reuse

Developers and rural property owners may not want to pursue gray water system installations if the tax credit incentive expires and/or they are not aware of it due to the lack of publicity.

The price of water competes with the price of reclaimed water. A customer is likely to select the type of water that is most economically feasible for his/her project.

The best use of reclaimed water could be aquifer recharge, industrial use or other types of large scale use in lieu of permitting gray water systems that might reduce the availability of reclaimed water to meet these uses. In this case it may be in the community's best interest to prohibit gray water systems so they are able to receive the return flow as wastewater.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

Existing tax credit incentives for gray water systems should not be allowed to expire and the public and developers should be made aware of their existence.

A monetary incentive of a tax credit, based on reclaimed water use could cause developers to be more creative and amenable to utilizing reclaimed water.

Restrictions on gray water systems should be by local control because of the different types of systems that exist and to ensure reclaimed water is available for the greatest beneficial use as determined by each jurisdiction.

Provide the recommendations

A.R.S. §43-1090-01 should be extended by the Legislature and an effort should be made to publicize that it is available for tax credits.

A bill that establishes a tax credit for reclaimed water infrastructure capital investment should be created. ADEQ and ADWR should assemble a work group tasked with considering how such a bill would look and try to find a sponsor for the bill.

A.R.S §49-204 should be amended by the Legislature to allow for local control of gray water systems.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

Any new tax credit for new reclaimed water infrastructure and the extension of the current tax credit for gray water systems should be administered by the Arizona Department of Revenue in the same manner they are currently managing the gray water credit.

Local governments would be expected to administer whether gray water systems are permitted or not by local ordinance.

Describe the benefits of the recommendation

Gray water systems are an extra “upfront cost.” The existing tax credit helps to offset that cost and may be enough to encourage the property owner or developer to construct a gray water system.

Cost/benefit analyses for projects that have the option of using reclaimed water may improve if reclaimed water is utilized due to any tax credits that could be obtained.

Local governments will be able to determine their own best use of reclaimed water by having a consistent supply of water available. This will assist in planning efforts as well.

Describe possible unintended consequences of recommendation

Tax incentives take revenue away from the state (state tax incentives). This can create a budget problem during times of a weak economy.

An unintended consequence of allowing local control of gray water systems would occur if the locality was not able to determine the best use for its wastewater. It could conceivably make a poor investment in a reclaimed water system that was neither cost effective nor environmentally effective to operate.

If more people take advantage of gray water systems, we may see an adverse impact on community wastewater treatment and conveyance systems (e.g., augmentation to those systems with other water sources, even potable water, may be necessary to ensure proper operation). Additionally, wastewater treatment and conveyance capacity would need to be available for all flows to enter the public sanitary sewage system in the event the gray water systems fail.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
Low	Low	Low	Low	High	Impact is to State revenue

Public Perceptions/Acceptance Working Group
Blue Ribbon Water Panel
White Paper Analysis
December 2, 2010

PRIORITY ISSUE #20: The need for a better public understanding of the overall water picture and the role of reclaimed water in the water cycle.

Existing Situation or Issue

While a 2008 Arizona Water Institute survey of Arizona residents¹⁵ indicated they feel it is important for their community to use reclaimed water, two-thirds of those surveyed had “concerns” about reclaimed water, especially if it would be used for replenishing groundwater, watering vegetables, cooking or drinking. However, it was determined that those concerns could be alleviated by more information about reclaimed water, better wastewater treatment, and stronger oversight of treatment plants.

Because Arizona has limited water resources, especially in rural areas, it is clear that a well-informed public is critical if Arizona is to move ahead with planning and financing the infrastructure and programs needed to achieve sustainability.

Associated Impediments to Increased Reuse

- Absence of a well-understood water supply-and-demand picture and the role reclaimed water will play in achieving sustainability
- No unified education plan for citizens about Arizona’s increasingly deficient water picture
- Conflicting information from officials, interest groups and the media about Arizona’s overall water picture, future population growth, and how they are related.
- Lack of understanding of the positive impact reclaimed water could make as an addition to Arizona’s water portfolio
- The public may not understand its role in protecting water quality (proper use and disposal of pharmaceuticals, personal care products, cleaning products, paints, etc.)
- Inadequate and incomplete information about pollutants found in sewage effluent and how they can be treated
- Inadequate and incomplete information about appropriate uses for adequately treated reclaimed water
- Lack of information about the need to adequately treat reclaimed water and what it will cost

Possible Solution

- Work toward developing and publicizing an accurate picture of projected supply and demand for each Active Management Area (AMA) and for the rural areas outside the AMAs.
- Develop and disseminate a unified message about the importance of reclaimed water as part of Arizona’s water portfolio.
- Educate the public about appropriate uses for reclaimed water.

¹⁵ Channah Rock, Kristine Uhlman, Susanna Eden, Shawn Newell, Erin Westfall, and Margaret White, “Survey of Public Perceptions Regarding Water Reuse in Arizona: Challenges and Opportunities,” in *2009 Annual Water Symposium “Managing Hydrologic Extremes”* (Arizona Hydrological Society), 4-6.

- Educate the public about its role in protecting water quality (proper use and disposal of pharmaceuticals, personal care products, cleaning products, paints, etc.)
- Make available to local jurisdictions information about resources, such as the Water Infrastructure and Finance Authority (WIFA) and Rural Water Infrastructure Committee (RWIC).

Recommendations

1. As suggested in Issue Paper #17, create a coalition to develop a unified message about the importance and appropriate uses of reclaimed water as part of our water portfolio and a plan to disseminate the message. Coalition members could include representatives from state, county and local jurisdictions, industry experts, the Arizona Water Institute, Cooperative Extension, the AMAs, the Water Resources Research Center, the AZ Water Association, the Arizona section of the WateReuse Association, and other interested parties (state, county, local).
2. Report progress regularly, using state and local jurisdiction websites and the media. Encourage stakeholder groups to keep their members informed (state, county, local).
3. Disseminate messages continuously and widely (state, county, and local).
 - Partner with environmental and other interest groups in the educational process
 - Establish speakers bureau and notify all service groups in the state about the availability of speakers
 - Hold press conferences at all levels of government to publicize plan
 - Partner with Project WET, state universities, and high schools to make using reclaimed water a part of Arizona's culture
 - Establish a Web site to post reclaimed water news, ideas, innovations, etc.
 - Use all media, depending on funding available
 - Use social media
4. Restore funding for the Arizona Water Institute (AWI). AWI combined the expertise of Arizona's water managers with the resources of the three universities to support water resources management and technology development in real-world applications. AWI served as the hub of research, community assistance and analytical support to ensure clean and sustainable water resources; AWI provided education, training, and professional capacity building to citizens and state, local, and tribal government decision makers about conserving and managing water in arid/semi-arid environments. If revived, AWI could serve as the hub for research on and information about the use of reclaimed water (state).

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc)

The overall strategy for increasing the public's understanding of the role of reclaimed water should be developed and established at the state level, with input from the county and local jurisdictions, industry experts, the Arizona Water Institute, Cooperative Extension, the AMAs, the Water Resources Research Center, the AZ Water Association, the Arizona section of the WateReuse Association, and other interested parties (state, county, local).

Describe the benefits of the recommendation

Using reclaimed water would become the norm for Arizonans, thus adding a significant new source of water to our water portfolio.

Describe possible unintended consequences of recommendation

- Without simultaneous appropriate messages about conservation, the public could perceive reclaimed water as “the answer” to our still limited water supply problems.

- “Yuck” factor could push more people to use bottled water.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

In large part, benefits will accrue in proportion to how much money is spent, especially if a media campaign is used to reach the public. Obtaining "new" water from reclaimed water will be much less expensive than most other new sources. Therefore, the investment in public education and implementation should be a good one.

Funding could come from taxes at all jurisdictional levels, water and sewer rates, impact fees, if the legislature restores them, users of the reclaimed water, grants, etc. The ideal funding plan would distribute the costs fairly, with growth paying its share, and would take advantage of a variety of funding sources.

**Infrastructure/Retrofit Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #21: Compile a matrix of State, regional, and local specifications and infrastructure standards and use it to identify similarities, inconsistencies, and gaps. Use the matrix to develop recommendations to the BRP on a suite of standards that will provide a common foundation of safety and good engineering practice for reclaimed water distribution systems.

Existing Situation

Treated wastewater from sewage treatment plants (reclaimed water) is increasingly being used in Arizona to meet water demand. In many cases, reclaimed water from treatment plants is transported to end uses through dedicated reclaimed water distribution systems. These distribution systems may comprise a significant portion of constructed water/wastewater infrastructure and capital/O&M expenditure in some communities.

ADEQ statutes and rules provide a framework for the reuse of reclaimed water in Arizona, including permitting requirements, reclaimed water quality standards, and allowable end uses. As part of this framework, Arizona statute specifically grants ADEQ the authority to “adopt, by rule, technical standards for conveyances of reclaimed water...” [Arizona Revised Statutes (A.R.S.) 49-203(A)(6)].

In 2001, ADEQ adopted in rule a relatively limited set of technical criteria for the design and construction of reclaimed water distribution systems, including criteria for both pipeline conveyances and open water conveyances. [Arizona Administrative Code (A.A.C.), Title 18, Chapter 9, Article 6, Reclaimed Water Conveyances]. These criteria apply to conveyances transporting reclaimed water from the treatment plant to “the point of land application or end use.” [A.A.C. R18-9-601(1) and 601(2)]. The criteria prescribe a few overall performance standards and address aspects of pressure and pressure testing, minimum separation distance from water and sewer pipes, pipe identification and marking, and signage. Although communities and private utilities must comply with these standards in rule, ADEQ requires no notification of proposed new construction, performs no review of design plans, and issues no permit relating to the construction activity. Thus, review and approval of engineering plans is left to the local jurisdiction. ADEQ receives no information on the extent to which reclaimed water distribution system projects comply with its technical standards in rule.

For reclaimed water infrastructure and distribution at the end use or “onsite,” i.e., following delivery of the reclaimed water from the conveyance to the end use (typically viewed as downstream of the reclaimed water meter), ADEQ rules provide very few technical criteria as part of end use permit requirements [A.A.C., Title 18, Chapter 9, Article 7, Direct Use of Reclaimed Water]. Although provisions regarding signage and reclaimed water hose bib use are included in ADEQ rule, other aspects of onsite distribution are not addressed. Retrofit situations also are not addressed, including conversions of drinking water system piping to reclaimed water use or vice versa. As a condition of the reclaimed water end use permit, permittees must comply with the end use technical standards in ADEQ rule.

Impediments to Increased Reuse

Lack of comprehensive, standardized technical criteria at the State level is seen by many as a key impediment to increasing the reuse of reclaimed water and decreasing the cost of reclaimed water infrastructure. This lack of comprehensive criteria is the primary reason for the formation of the Infrastructure/Retrofit Working Group within the Governor’s Blue Ribbon Panel.

Lack of comprehensive statewide standards has spawned or exposed issues that may be detrimental to expanding the use of reclaimed water:

1. *No criteria (or inadequate criteria) at the State level for many elements of design and construction of reclaimed water infrastructure.* These omissions include, among other things, pipe flow and sizing criteria; cross-connection control; trench criteria; valves and other appurtenances; pump stations; pipe materials; and testing and quality control. The current criteria also fail to distinguish between the significant differences and needs applicable to infrastructure constructed in new developments versus infrastructure retrofitted into existing communities. For this reason, uncertainty reigns about what is adequate and/or appropriate. This is true both on the distribution system side of the meter as well as for onsite or inside-the-building infrastructure. The cost of project design and construction may be increased and project planning and execution may be slowed while these issues are researched, evaluated, and decided upon repeatedly and unsystematically by design consultants, regulatory agency reviewers, and infrastructure owners striving to ensure that public health will be protected. Project design and construction would be enhanced through development of standards that are consistent, yet with the capability to accommodate local conditions. In addition, comprehensive statewide standards would provide communities and utilities certainty as to conformance with good engineering practice and, perhaps most importantly, raise public confidence that the public health and safety aspects of reclaimed water use are satisfactorily addressed.
2. *Multiple standards-generating efforts have developed at local levels.* The Maricopa Association of Governments (MAG), Pima County/City of Tucson, and Yavapai Association of Governments (YAG) have developed standards governing reclaimed water infrastructure, which have been adopted locally. In some cases, cities have generated further modifications. While these standards represent good technical efforts and alleviate some confusion within their areas of applicability, they still do not eliminate many of the issues noted in the previous paragraph. Gaps remain, conflicts exist between sets of standards, and human resources are wasted duplicating efforts to develop standards.

Also, two national plumbing codes are in use in Arizona, the Uniform Plumbing Code and the International Plumbing Code. Both of these codes include onsite and inside-the-building criteria applicable to reclaimed water use downstream of the reclaimed water meter. Some criteria in the two codes regarding reclaimed water use may conflict with ADEQ rule, and some experts believe these codes do not adequately reflect modern water quality standards for highly treated reclaimed water and modern end-use practices.

Possible Solutions

1. Maintain the current situation described in the previous paragraphs.
2. Publish the technical standards as BMP and encourage utilities to adopt them.
3. Develop a core of standards in rule for statewide use, perhaps in conjunction with additional published BMPs that represent good engineering practice.

Recommendations

1. Establish a Reclaimed Water Infrastructure Advisory Panel, under ADEQ auspices, of state, county, local, and private experts.
2. The Advisory Panel would review and enhance the matrix of State, regional, and local infrastructure specifications and standards developed by the Blue Ribbon Panel Infrastructure/Retrofit Working Group.
3. Based on the matrix, the Advisory Panel would review and make recommendations regarding minimum design and construction criteria appropriate for statewide use and local conditions, while balancing the need for communities and utilities to maintain the ability to adopt local standards to enable an increased use of reclaimed water.

4. The Advisory Panel would devise processes for timely updating of standards and for ensuring that local conditions can be accommodated.
5. The Advisory Panel would recommend whether specifications and standards should be adopted as ADEQ rule, or embodied in a guidance manual of BMPs, or accomplished as a combination of the two.
6. The Advisory Panel would consider and recommend an appropriate administrative mechanism to ensure that the infrastructure specifications and standards are used throughout the state with minimum additional administrative burden and cost.

Implementing the Recommendations

Using the Advisory Panel approach, the following steps to implementing the recommendations are foreseen:

1. Following completion and review of the matrix of state, regional, and local infrastructure specifications and standards, the Advisory Panel would compile a body of minimum infrastructure specifications and standards appropriate for statewide application.
2. The Advisory Panel would determine whether the specifications and standards should be elevated into ADEQ rule or incorporated into a guidance document of BMPs, or a combination of the two.
 - a. If standards are recommended for promulgation as ADEQ rule, ADEQ would open a docket announcing the rulemaking, develop a rule proposal, and follow through with the associated stakeholder process that precedes rule adoption. ADEQ would rely on the Advisory Panel for significant input during the rulemaking process.
 - b. For criteria recommended for inclusion in a BMPs document, the AzWater Association, Arizona WaterReuse Association, and similar professional associations would be approached to assess their interest in developing such a document. Stewardship of the document by well-regarded organizations would lend the BMPs the authority needed for acceptance and use by reclaimed water utilities throughout the state.
3. The Advisory Panel would consider options and make a recommendation to ADEQ for implementing the technical criteria in such a manner as to minimize administrative costs to ADEQ and reclaimed water utilities while maximizing conformance with the criteria. Several ideas have been offered for implementing an expanded code with low regulatory impact. One potential option would be similar to the “Ten States Standards” approach, wherein the criteria would be published in ADEQ rule as optional for adoption by local jurisdictions or utilities. Under this scenario, ADEQ, perhaps with assistance from the professional organizations mentioned in the previous item, would encourage adoption by local jurisdictions. Thus, the design reviews they perform would continue to be done the same way as they have in the past. Other approaches such as certification by a supervisory engineer within the local jurisdiction of compliance of distribution system plans with state-adopted standards and simplified ADEQ general permits have been suggested. In any case, standardized criteria developed at the state level would provide consistency among jurisdictions, certainty as to conformance with good engineering practice and, security in the knowledge that the criteria protect public health.

Associated Costs

Cost to agency: Estimated to be moderate. About 1.5 to 3 Full Time Equivalents, spread over several experienced staff, would be needed for about one year to chair and guide the Advisory Panel, assist in drafting the technical standards for the rule and BMPs guidance document, and draft the rule and oversee associated rulemaking responsibilities.

Cost to utility: Estimated to be low assuming that the Advisory Panel can develop a consensus approach with low regulatory impact that assures conformance with the statewide criteria while allowing for consideration of local conditions.

Cost to end user: Estimated to be low for most types of reuse, although the possibility exists that some infrastructure criteria recommended by the Advisory Panel could be significantly more complex or stringent than existing practices of local jurisdictions, which could result in costs passed on to the end user.

Possible Unintended Consequences

Potential concerns or unintended consequences of elevating a body of infrastructure specifications and standards into an ADEQ rule for statewide use include:

1. Standards may not be updated speedily if they are in rule at the State level.
2. Statewide standards in rule might hinder appropriate adjustments due to local or geographically diverse conditions.
3. Satisfactory standards already developed at the county or city level may be lost if standards are adopted at the state level.
4. Standards adopted at the state level may create a greater regulatory and enforcement profile, which might offset the value and efficiency of statewide standardization.
5. Experts at the county and local level may not have a significant and ongoing role in statewide standards development and updating.

Benefits of Recommendation

The potential benefits of adopting technical standards for reclaimed water distribution systems in statewide rule include:

1. Simplification of the design and construction process by reducing questions and uncertainties over appropriate standards from standpoints of both engineering practice and protection of public health and safety.
2. Reduction of added expense to municipalities and utilities because these providers would not need to determine appropriate standards on an essentially case-by-case basis.
3. Establishment of an agreed-upon baseline for statewide use that is deemed protective of public health and safety, thus greatly reducing the possibility of distribution system failures with potentially catastrophic consequences due to inconsistent practice or inconsistently applied standards.

APPENDIX: PRELIMINARY MATRIX OF RECLAIMED WATER SYSTEM TECHNICAL CRITERIA FOR DESIGN AND CONSTRUCTION

A. Pipeline Conveyances

	ADEQ Article 6, Conveyances	MAG Specifications	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
1. Legal Authorization	<p>The [ADEQ] director shall "adopt, by rule, technical standards for conveyances of reclaimed water and a permit program for the direct reuse of reclaimed water." <i>[A.R.S. 49-203(A)(6)]</i></p> <p>ADEQ's rule for technical standards for conveyances of reclaimed water applies to "pipeline conveyances" and "open water conveyances," both of which are defined in rule. <i>[A.A.C.R18-9-601(1) & 601(2)]</i></p>						
2. Overall performance standards	<p>Design and construct using good engineering judgment following standards of practice. <i>[A.A.C. R18-9-602(B)]</i></p> <p>Design and construct system such that:</p> <ol style="list-style-type: none"> 1. Reclaimed water does not contaminate a potable water system. 2. System structural integrity is maintained. 3. Capability for inspection, maintenance, and testing is maintained. <i>[A.A.C. R18-602(C)]</i>		<p>Reference ADEQ Requirements as outlined in A.A.C R18-9-602. <i>[C.O.T. Design Standards Section 8-14, 2.1 (A)]</i></p>	<ol style="list-style-type: none"> 1. System is designed to prevent clogging with algae. 2. Spray equipment is designed and located to minimize aerosol carry-over ... to areas beyond setback distances.... <i>[FAC 62-610.421(2)]</i> 			<p>Ensure that the recycled water service cannot be accidentally cross-connected to the drinking water supply within the property. <i>[Victoria Recycled Water Plumbing Guide (VRW), 2005, p. 2]</i></p>

	ADEQ Article 6, Conveyances	MAG Specifications	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
3. Pipe Design/ Pressure/Pressure Testing/Other Testing	1. Withstand static pressure of 50 psi above design working pressure without leakage. 2. Test for leakage per ADEQ requirements for gravity sewer lines [R18-9-E301(D)(2)(j)]. [A.A.C. R18-9-602(D)]		Reference ADEQ Requirements as outlined in A.A.C R18-9-602. [C.O.T. Design Standards Section 8-14, 2.1 (A)]		1) All pipes and fittings shall have a minimum working pressure 150 psi. Minimum test pressure 1.5 times maximum design pressure. [T.A.C. 210.25 (d)]	Min. Velocity: 7.5 ft/s based on peak day Min. Resid. Pressure: 20 psi Hazen Williams Coefficient of Friction: 110 All lines are to be looped. When possible, reclaimed line pressure in reclaimed line should be lower than adjacent potable line. [Ordinance Sect. 4-4.2.3] Valves shall be no more than 500 ft apart in residential areas, 1000 ft apart on arteries and secondary feeders. Valve shall be located so that not more than 3 valves need to be operated to shut down a line. [Ordinance Sect. 4-4.2.9] Dead ends and stub outs shall be equipped with 4-in blow off assemblies. [Ordinance Sect. 4-4.2.9]	Water pressure in the recycled main may be similar to the pressure in the drinking water main. [VRW, p. 4]
4. Thrust blocks/ Restrained joints	1. Use where needed to prevent excessive movement of pipeline.[A.A.C. R18-9-602(E)]		Reference ADEQ Requirements as outlined in A.A.C R18-9-602.[C.O.T. Design Standards Section 8-14, 2.1 (A)]				

	ADEQ Article 6, Conveyances	MAG Specifications	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
5. Minimum separation distances/Trench design	<p>1. From a drinking water well: 50 ft, unless special protection.</p> <p>2. From a potable water line: 2 ft vertically, 6 ft horizontally, unless special protection.</p> <p>3. Special protection: Encase in 6 in of concrete or mechanical joint ductile iron pipe for at least 10 feet beyond the minimum separation distances. [A.A.C. R18-9-602(F)(1) through (F)(3)]</p>	<p>1. When a reclaimed main is adjacent to or crosses a potable main, the reclaimed main shall be considered a pressure sanitary sewer.</p> <p>2. From a potable water line: 2 ft vertically, 6 ft horizontally, unless special protection. [MAG 616.3, MAG 610.5]</p>	<p>Reference ADEQ Requirements as outlined in A.A.C R18-9-602. [C.O.T. Design Standards Section 8-14, 2.1 (A)]</p>		<p>1. 9-ft horizontal separation distance from potable water piping.</p> <p>2. 3-ft horizontal separation from sewer line at or above the level of the sewer line.</p> <p>3. Reclaimed water lines may be placed in the same trench as sewer lines. [T.A.C. 210.25 (c)]</p>	<p>Potable and reclaimed lines will never be installed in the same trench. [Ordinance Sect. 4-4.2.1.1]</p> <p>Top of reclaimed line should be 4 ft below finished grade, unless otherwise approved. [Ordinance Sect. 4-4.2.4]</p> <p>Minimum horizontal separation distance of 10 feet between parallel, buried, reclaimed and potable lines, otherwise special protection required. [Ordinance Sect. 4-4.2.5]</p> <p>Buried reclaimed line must be at least 12 in below potable line at crossing, otherwise special protection required. [Ordinance Sect. 4-4.2.5]</p>	<p>Drinking water main may be located in same trench as recycled water main, but it should not be purple in color. [VRW, p. 4]</p>
6. Adding potable water to the pipeline conveyance	<p>1. Separate potable water system from the pipeline conveyance with an air gap. [A.A.C. R18-9-602(F)(4)]</p>		<p>Reference ADEQ Requirements as outlined in A.A.C R18-9-602. [C.O.T. Design Standards Section 8-14, 2.1 (A)]</p>				

	ADEQ Article 6, Conveyances	MAG Specifications	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
7. Pipe materials/ identification/ marking	1. For pipe 8 in dia. or less, a) mark in English on opposite sides of pipe: "CAUTION: RECLAIMED WATER, DO NOT DRINK" at least every 3 feet, and b) color purple or wrap in durable purple tape.2. For mechanical appurtenance, color purple or legibly mark to identify as part of the reclaimed water system and distinguish it from potable water and sewage collection systems. <i>[A.A.C. R18-9-602(G)]</i>	1. The color purple shall be used for identifying all pipes, valves, and other equipment for conveying reclaimed water.2. All below ground pipe shall be marked by identification tape, or sleeving, or integral coloring, or stenciling and shall have the words "CAUTION: RECLAIMED WATER - DO NOT DRINK" or similar wording.3. All above ground piping shall be identified by stenciling or decals. <i>[MAG 616.4.1, MAG 616.4.2]</i>	Reference ADEQ Requirements as outlined in A.A.C R18-9-602. <i>[C.O.T. Design Standards Section 8-14, 2.1 (A)]</i>		Exposed piping or piping within a building shall be purple or painted purple and stenciled in white "Non-potable water". Buried pipe shall be purple, painted purple, taped with purple metallic tape or bagged in purple. <i>[T.A.C 210.25 (g)]</i>	Ductile Iron Pipe (D.I.P.) shall be encased in 2 layers of purple 8-mil polyethylene. A 3-in minimum width purple detector tape marked "RECLAIMED WATER" in 1-1/2" letters shall be placed on the compacted fill 1 ft above and centered over the pipe.PVC pipe shall be rubber ring bell or rubber ring plain end coupling; no solvent welded joints allowed. Pipe shall be purple and installed with "RECLAIMED WATER" facing upward. Plans shall indicate locations of couplings and pipe lengths. Purple tape shall be placed as above.Copper pipe shall be silver soldered and encased in 8-mil purple polyethylene sleeve. <i>[Ordinance Sect. 4-4.2.8]</i>	Recycled water main will be purple colored, if plastic. If ductile cast iron, pipe shall be wrapped in a purple colored plastic sleeve. <i>[VRW, p. 4]</i> Recycled water main hydrants for fire fighting and standpipes must be marked "recycled water" and colored purple. <i>[VRW, p. 4]</i>

	ADEQ Article 6, Conveyances	MAG Specifications	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
8. Reclaimed Water Meters			<p>Turbo type meters shall be used unless they are not available in the required size. <i>[C.O.T. Design Standard Section 8-14, 2.7]</i></p>				<p>Meter from recycled water main to property service: a) is purple in color, b) is fitted above ground adjacent to drinking water meter, c) will have different inlet and outlet threads from drinking water meter to prevent interchange of meters, d) is installed on a copper pipe riser colored purple. <i>[VRW, p. 5]</i></p> <p>Copper pipe for recycled meter assembly and standpipe must be sheathed in purple-colored plastic. <i>[VRW, p. 10]</i></p> <p>Adjacent drinking water meter must be fitted with a dual check valve, which must be visible and situated on the horizontal section of meter assembly (dual check valve also can be inbuilt in the meter). <i>[VRW, p. 5]</i></p>

	ADEQ Article 6, Conveyances	MAG Specifications	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
9. Signage		Valve and manhole covers shall be stamped with the words or shall have raised lettering with the words "RECLAIMED WATER" [MAG 616.4.4]			1) Signs minimum 8-in by 8-in located at all reclaimed storage areas and on all hose bibs and faucets that read "Reclaimed Water, Do not Drink" or similar warning in both English and Spanish. 2) Area must be secured to prevent public access. [T.A.C. 210.25 (b)]		
10. Potable Water System Protection/ Cross Connection Control						The reclaimed water system shall be COMPLETELY SEPARATE AND INDEPENDENT from the potable water system. Cross connections between potable water and reclaimed water facilities are completely prohibited. [Ordinance Sect. 4-4.2.1] Backflow prevention is regulated through use of reduced pressure (RP) backflow prevention devices on the potable water system rather than the reclaimed water system. [Ordinance Sect. 4-4.2.9]	

B. Open Water Conveyances

	ADEQ Article 6, Conveyances	MAG Specifications	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
1. Overall performance standards	1. Maintain so as to prevent a release except as allowed by federal and state law. 2. Maintenance program shall include periodic inspections and necessary corrective actions to ensure integrity of conveyance banks and capacity of conveyance to safely carry operational flows. [A.A.C. R18-9-603(B)]						

2. Signage requirements	<p>For B+, B, and C Reclaimed Water:</p> <ol style="list-style-type: none"> 1. Signs should state: "CAUTION: RECLAIMED WATER, DO NOT DRINK," and display the international "do not drink" symbol. 2. Place signs at all points of ingress and, if the open water conveyance is operated with open access, at least every 1/4 mi along the length of the open water conveyance. 3. Signs should be visible from both sides of the conveyance. <p><i>[A.A.C. R18-9-603(C)]</i></p>						
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C. End User/Onsite/Inside Building

	ADEQ Article 7, Direct Use of Reclaimed Water	MAG Specs	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
1. Overall performance standards	<ol style="list-style-type: none"> 1. Use application methods that preclude human contact with reclaimed water. 2. Prevent reclaimed water from standing in open access areas during normal periods of use. 3. Prevent reclaimed water from coming into contact with drinking fountains, water coolers, or eating areas. <p><i>[A.A.C. R18-9-704(F)]</i></p>			<ol style="list-style-type: none"> 1. Existing systems shall be disconnected from potable systems prior to connection to a reclaimed water system. <p><i>[JEA FL 4.01]</i></p>		<p>The design of off-site facilities, including the preparation of Contract Documents, is to be prepared under the supervision of a responsible professional engineer.</p> <p><i>[Ordinance Sect. 4-4.1.4]</i></p> <p>Irrigation systems shall minimize overspray, runoff, and ponding. Drinking fountains, outdoor seating areas and similar facilities must be protected from overspray.</p> <p><i>[Ordinance Sect. 4-4.1.4]</i></p>	<p>Ensure that the recycled water service cannot be accidentally cross-connected to the drinking water supply within the property.</p> <p><i>[VRW, p. 2]</i></p>
2. Signage requirements	<p>Detailed signage requirements based on type of use and class of reclaimed water.</p> <p><i>[A.A.C. R18-9-704(H)]</i></p>		<ol style="list-style-type: none"> 1. All flanged side outlets, drain valve assemblies, blow-off valve assemblies, and combination air / vacuum release valves shall have a sign attached to provide a warning not to discharge reclaimed water. <p><i>[C.O.T. Design Standards 8-14, 2.9 (C)]</i></p>				

	ADEQ Article 7, Direct Use of Reclaimed Water	MAG Specs	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
3.Hose bibbs	<p>Each hose bibb shall be signed. [A.A.C. R18-9-704(H)]</p> <p>Hose bibbs shall be secured to prevent use by the public. [A.A.C. R18-9-704(F)(4)]</p>		<p>Not permitted. [C.O.T. Design Standards 8-14, 2.3 (B)(2)]</p>	<p>1. Hose bibbs or other hand-operated irrigation devices shall not be present on single-family residential irrigated systems connected to a reclaimed water system. [JEA FL 4.01]</p>	<p>All hose bibbs and faucets shall be painted purple and designed to prevent connection to a standard water hose. Hose bibbs shall be located in a locked, underground vault and clearly labeled "non-potable" quality. Standard hose bibbs may also be installed within an above ground, locked service box that can only be opened with a special tool so long as it is labeled "non-potable." [T.A.C. 210.25 (a)]</p>	<p>Hose bibbs on reclaimed water facilities are prohibited. [Ordinance Sect. 4-4.2.1.1]</p>	<p>1. Hose bibb shall be posted with "Do Not Drink" sign. [VRW, p. 2]</p> <p>2. Recycled water hose bibb design shall be different from normal design [VRW, p. 2].</p> <p>3. Hose bibb tap shall have removable handle. [VRW, p. 6]</p> <p>4. External tap outlets on the drinking water service connection shall be fitted with vacuum breakers. [VRW, p. 6]</p>
4. Pipe identification/ marking			<p>1. All air/vacuum relief valves, pressure reducing valves, pumps, pump control valves, meter box lids, interiors of meter boxes, and any other appurtenances to the reclaimed water system will be painted purple or have purple color integral to the material. [C.O.T. Design Standards 8-14, 2.9]</p>				<p>1. Buried recycled water pipes must have identification tape installed on top of pipe running longitudinally and fastened to the pipe at 3 meter (~10 ft) intervals. [VRW, p. 6]</p> <p>2. Tape must be at least 75 mm (~3 in) wide and state "Warning: Recycled or Reclaimed Water - Do Not Drink" continually along its length in contrasting purple lettering. [VRW, p. 6 (specifies compliance with clause 9.5.4 AS/NZS3500.1.2003)]</p>
5. Cross-connection control				<p>All irrigation systems connected to a reclaimed system will have outside controls accessible for routing Cross-Connection Inspection. [JEA FL 4.01]</p>		<p>The reclaimed water system shall be COMPLETELY SEPARATE AND INDEPENDENT from the potable water system. Cross connections between potable water and reclaimed water facilities are completely prohibited. [Ordinance Sect. 4-4.2.1]</p>	

	ADEQ Article 7, Direct Use of Reclaimed Water	MAG Specs	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
6. Testing/ Commissioning							Testing requirements are described that involve turning off drinking water supply and testing all drinking water and recycled water taps and appliances, and vice versa. <i>[VRW, p. 9]</i>
7. Installer requirements							1. Licensed plumber shall do recycled water plumbing work inside the property. <i>[VRW, p. 6]</i> 2. Plumber shall submit a Compliance Certificate to consumer at completion of work. <i>[VRW, p. 2]</i>
8. Impoundments/ Impoundment liner requirements	No liner required for Classes A+ and B+ reclaimed water. <i>[A.A.C. R18-9-712(D) & R18-9-714(C)]</i>		Liners are required for golf courses receiving reclaimed water in accordance with A.A.C. R18-9-713(C)(1). <i>[C.O.T. Design Standards 8-14, 2.5]</i>		1) Impoundments for Type I and Type II reclaimed water located in the recharge zone of the Edwards Aquifer shall be constructed to prevent contamination of groundwater. 2) Soil or synthetic liners are required in areas in TX with specific "aquifer pollution potential". Specifications for soil and synthetic liners provided in code. <i>[T.A.C. 210.23 (c)]</i>		
9. Water Trucks					Allowable with Type II Reclaimed Water (water quality restrictions apply) <i>[T.A.C. 210.32 (2) (e)]</i>		
10. Cooling Water Applications					Allowable with Type II Reclaimed Water (water quality restrictions apply) <i>[T.A.C. 210.32 (2) (f)]</i>		

	ADEQ Article 7, Direct Use of Reclaimed Water	MAG Specs	Tucson/Pima County	Florida	Texas	City of Oceanside, CA	Australia (Victoria)
11. Toilet Flushing			Allowed for non-residential buildings only. <i>[C.O.T. Design Standards 8-14, 2.3(A)(2)]</i>		Allowable with Type I Reclaimed Water (water quality restrictions apply) <i>[T.A.C. 210.32 (2) (g)]</i>		
12. Fire Protection					Allowable with Type I Reclaimed Water (water quality restrictions apply) <i>[T.A.C. 210.32 (2) (c)]</i>		
13. Agriculture					Allowable with Type I and Type II Reclaimed Water (water quality restrictions apply) <i>[T.A.C. 210.32 (2) (d), T.A.C. 210.32 (2) (b)]</i>		
14. Aesthetics/ Nuisance							
15. Forbidden Uses			Interior use within residential buildings is prohibited. <i>[C.O.T. Design Standards 8-14, 2.3(A)(1)]</i>				

**CREEN
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #22: It is important to consider a continuing role for research and incentives which will transition worthy technologies into mainstream markets.

Describe the existing situation or issue.

Current water conservation technologies focus on water use and energy savings. Increased implementation of proven technologies will yield substantial increases in water and energy efficiency. However, in order to increase the availability of efficient fixtures, appliances, and technologies, there needs to be additional research and development for these water and energy saving items. Cooperation between the government, water providers, and industry is necessary to achieve this. These partnerships are critical to achieving water and energy savings, communicating the benefits of these technologies, and expediting the acceptance and adoption of them.

The juncture of the water/energy nexus presents an opportunity for joint ventures in technology transfer that will take advantage of economies of scale in both areas.

Describe associated impediments to increased reuse.

Consumer oriented products that improve efficiency do not impede reuse or recycling per se, but a failure to optimize the use of water and energy saving technologies is an impediment to water and energy sustainability.

Describe the possible solutions (e.g. policy/rule/legislation) that could be applied to remove impediments.

Arizona's support of and participation in research and development efforts will help accelerate the availability and adoption of proven products and the efficient use of water and energy throughout the state. Two nationwide efforts of particular interest are: EPA's WaterSense program and the Smart Water Application Technologies (SWAT) initiative.

Provide the recommendations.

1. Support regional and national research that will encourage the development of innovative and groundbreaking products that will increase water and energy efficiency.
2. Endorse federal funding for these research areas. It is important to note that research should not be limited solely to efficiency technology, but should also include a broad array of scientific studies. For example, plant research leading to the development of salt-tolerant varieties appropriate for reclaimed water use would prove fruitful, as would research on salt mitigation and reduction.
3. Maximize cooperation between government, water providers, and industry.

Describe how the policy /rule /legislation of guidance could be administered (state, county, local, etc.)

The State should provide leadership for partnering in and supporting federal efforts. Individual jurisdictions could provide incentives for use of technology as their abilities and interests dictate.

Describe the benefits of the recommendation.

Support for the development of additional product specifications and testing will accelerate the availability of and adoption of water-efficient fixtures and appliances. This will accelerate the efficient use of water and energy.

Describe the unintended consequences of the recommendation.

Unfunded mandates.

Though a technology may prove to be extremely efficient, that does not necessarily mean that it will perform up to consumer expectations. In that circumstance, consumers will become frustrated and avoid the products (example: many of the early low-flow toilets and showerheads). Both efficiency and performance of products must be verified before they are promoted.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency H/M/L	Cost to Utility H/M/L	Cost to End User H/M/L	Potential for Cost Pass- through	Benefits / Removal of Impediments	Additional Comments
Medium	Medium	Low	Medium	High	

**Economic/Funding Workgroup
Blue Ribbon Water Panel
White Paper Analysis**

Priority Issue #23: Establish financial and rate-making guidelines for the ACC regulated utilities that mirror the programs currently in effect for the power utilities.

Describe the existing situation or issue

Public service corporations that provide water, wastewater, and reclaimed water service regulated by the Arizona Corporation Commission (the “ACC”), lack financial and ratemaking incentives, regulatory certainty, and regulatory programs necessary to:

- Facilitate and promote the implementation of demand side management and conservation programs;
- Acquire and deploy renewable (sustainable) supplies;
- Plan and construct infrastructure on a regional scale, all of which are necessary to promote sustainability; and
- Invest in large-scale regionally planned facilities or the acquisition of future renewable resources due, in part, to the regulatory concept of used and useful which generally holds that investment in facilities cannot be considered for recovery in rates until it is deemed to be providing service to current customers.

Describe associated impediments to increased reuse

- Lack of established demand side management (“DSM”) and conservation regulatory guidelines or framework.
- Lack of standardized funding mechanism to implement DSM and other conservation programs.
- Efforts that would achieve reductions in customer use would also reduce revenues needed to fund basic utility operations and construction.
- “Used and useful” standard applied to renewable supply acquisition would not provide funds needed for supplies in advance of need.
- Historical test year ratemaking framework does not provide incentives or revenues needed to construct reclamation plants, recharge facilities, or other capital intensive infrastructure needed for deployment of renewable supplies.
- Funding needed to plan and construct regional infrastructure in advance of full anticipated demand cannot meet the “used and useful” test because of the excess initial capacity required for future demand. Furthermore, public funding of such infrastructure may require increases in existing rates before construction is completed and before a rate case has been completed. Note that private funding, where available, would not require increases in existing rates until construction was complete.
- Conventional funding methods such as Contributions in Aid of Construction and Advances in Aid of Construction are inadequate to meet the funding needs of regional facilities.
- Large capital investments can, under certain circumstances cause significant rate impacts to users even if revenues are generated timely to fund such infrastructure. However, private funding of capital intensive infrastructure using public private partnerships (PPPs) may ameliorate this by (1) structuring repayments to more closely match gradual increases in usage, avoiding placing too much pressure on existing rate payers or overburdening new rate payers through excessive hook-up fees and

(2) using lender discipline to allow no construction change orders, resulting in more rapidly-built and lower-cost construction.¹⁶

Describe the possible solutions (e.g., policy/rule/legislation or guidance) that could be applied to remove impediments

- Establish DSM and conservation program framework through stakeholder or workshop process at ACC with establishment of rules that include cost recovery method established for all future utility rate cases as part of rate case application.
- Establish and promote effective revenue decoupling¹⁷ to remove revenue impediments to achievement of use reductions through stakeholder or workshop process at ACC with establishment of rules that establish appropriate decoupling mechanisms.
- Establish a consistent policy that promotes acquisition of renewable supplies in advance of supply needs. Establish appropriate funding mechanisms, needed to acquire such supplies and modify “used and useful” standard or determine by ACC policy or rule that demonstration of sustainable and/or renewable supplies to offset current use of non-sustainable supplies is good public policy and is deemed to be “used and useful” for those supplies.
- Establish by rule, a process where rate recovery of large capital-intensive infrastructure can begin before these facilities are placed in service. Allowing recovery as construction is on-going with step increases will provide utilities with a funding mechanism and help shield rate payers from rate shock.
- Through stakeholder workshop process with the ACC develop alternative funding methodologies that can provide funding for regionally-scaled reclaimed and renewable water facilities.
- Insure that no existing policies, rules, legislation, or guidance, unnecessarily interfere with or make more difficult the potential to use private funding options for larger capital intensive projects.
- Partner with large water users to fund reclaimed water facilities and distribution systems.
- Seek private sector funding for large-scale water infrastructure projects, where appropriate.

Provide the recommendations

- Begin stakeholder process to explore for water and wastewater utilities:
 - DSM conservation plans for water and wastewater.
 - Develop criteria to establish the need for, and identify funding needs, for new reclaimed and other renewable supplies.
 - Planning for regional infrastructure needs including development of guidelines on determining how such infrastructure should be funded, by whom, and mechanisms of funding.
- After stakeholder process, begin rulemaking to establish how DSM and conservation will be addressed in rate cases and the structure of cost recovery.
- Begin rulemaking process to establish how advance funding of capital-intensive plant that will be considered “used and useful” can be accomplished.
- Establish structure of decoupling mechanism through stakeholder process. Establish by rule how decoupling will be implemented in conjunction with DSM and other conservation programs.
- Determine outline of projects that should be considered for private funding.

¹⁶ (up to 40% less according to the Congressional Budget Office as quoted in “Trends in Local Government Expenditures on Public Water and Wastewater Services and Infrastructure: Past, Present and Future,” from the Mayors Water Council of the U.S. Conference of Mayors.)

¹⁷ Revenue decoupling is generally defined as a ratemaking mechanism designed to eliminate or reduce the dependence of a utility’s revenues on sales. It is adopted with the intent of removing the disincentive a utility has to administer and promote customer efforts to reduce water consumption and demand.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)
 The ACC will administer the policy and rules as part of its normal rate administration.

Describe the benefits of the recommendation

- Conservation of precious and limited resources.
- Move to more sustainable practices.
- Planning in advance for capital-intensive reclaimed and renewable water facilities will lower overall cost of using such supplies rather than delaying such planning until renewable supplies can be fully used.
- Large regionally-scaled facilities tend to have lower energy consumption and operating costs.
- Facilitate, encourage, and increase the use of reclaimed and renewable water.
- The use of private sector funding of large infrastructure projects using public private partnerships with private funding may (1) allow for significantly greater and more rapid building of needed projects and (2) lower the ultimate cost to the consumer of the increased use of reclaimed and other reusable water sources.

Describe possible unintended consequences of recommendation

- Decoupling mechanisms may confuse and discourage consumers from conserving as reductions in use do not lead to corresponding reductions in utility costs.
- DSM and other conservation methods may succeed in reducing water use, but without a carefully thought out method to address those impacts they may lead to more utilities at financial risk.
- Advance funding through rates may lead to unjustified risk taking and additional costs to customers.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception).

Recommendation	Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
Begin stakeholder process to explore:						
i. DSM and Conservation Funding	Med	Low	Low	High	Promote the use of these tools to promote conservation	
ii. Supply acquisition	Med	Low	Low	N/A	Provide needed renewable supplies	
iii. Regional planning and construction of reclaimed and renewable water facilities	Med	Low	Low	N/A	Potential to provide lower overall cost and more efficient use of resources	
Rulemaking to formalize output of stakeholder process	Med	Low	Low	N/A	Establish rules that utilities can rely on in developing strategies to meet growing consumer needs	
Advance funding of capital intensive infrastructure that will not be considered “used and useful”	Low	Med-High	Med-High		Potential to use private capital to significantly lower user costs for large capital-intensive projects.	The ultimate cost to the utilities and end users will depend on (1) the quality/accuracy of the estimates of the timing and level of needs which need to be closely analyzed; (2) the reality of actual growth in users and needs; and (3) the intensity and effectiveness of cost controls on the construction of systems.
Establish decoupling mechanism	Low	Low	Low			

CREEN
Blue Ribbon Panel
White Paper Analysis
Revision 4 – 10/11/10

PRIORITY ISSUE #25: Look at opportunities for efficiency in the water energy nexus including waterless solar facilities and cooling technologies that reduce the consumptive use of water

Describe the existing situation or issue

Efficiency in the water-energy nexus refers to efforts within water business activity aimed at saving electricity, efforts within electric business activity aimed at saving water, or efforts within either water or electric business activity aimed at saving both water and electricity. Thus, the pursuit of “efficiency in the water-energy nexus” refers to a wide range of possibilities.

In the water business community, a focus on managing the foremost business cost, electricity, often occurs. In the agricultural community, taking advantage of existing conduits and naturally occurring topography to pursue low head hydro generation opportunities is seen as a logical water-energy nexus consideration. In the electric business community, attention turns to the generation selection process or the type of power plant cooling that is used.

In pursuing water-energy nexus efficiency opportunities, evaluation of technologic feasibility thresholds, operational consequences, water and electric cost impacts, as well as site-specific considerations becomes an essential part of the decision-making process.

For example, in the electric business arena, some renewable resources (wind, solar photovoltaic) offer water use advantages. However, the inherent limitations of these resources are such that continued deployment of conventional generation resources in Arizona is believed to be necessary. Consequently, consideration of dry cooling, or hybrid (wet and dry) cooling is one method of pursuing efficiency in the water-energy nexus.

To date, no dry or hybrid cooling systems have been built in Arizona.

Describe associated impediments

Impediments to the development of dry or hybrid cooling methods include:

- May not be technically feasible for some power plant technologies
- Requires more land due to larger cooling tower foot-print
- Added capital cost of construction
- Loss of generation capacity during the hottest months of the year, the period when power is most needed – results in a need to install additional generation
- Added O&M cost due to parasitic loads and maintenance of additional infrastructure
- Added cost to produce power – impacts on ratepayers
- No Arizona-specific information has been developed that describes the technologic feasibility, operational consequences, water use impacts or electric cost impacts of dry / hybrid cooling system applications.,

Impediments to low-head hydro include:

- Federal licensing requirements
- Need for added security
- Added cost

Describe the possible solutions (e.g. policy/rule/legislation) that could be applied to remove impediments.

See recommendations below.

Provide the recommendations.

An Arizona-specific evaluation of the technologic feasibility, operational consequences, water use impacts and electric cost impacts of dry / hybrid cooling systems should be conducted. The study must address site-specific considerations, accounting for the distinct ambient meteorological conditions that exist in various Arizona locations.

The cost of FERC licensing may be prohibitive to development of low-head hydro generation. Support evaluation of impediments to small (1.5 MW) low-head hydro generation in existing conduits resulting from FERC regulation.

Recognize that a “one size fits all” policy with respect to the use of dry or hybrid cooling is unlikely to represent the best approach for Arizona. Uniform standards can be developed and may be useful; however they must take into account site-specific conditions or provide for exceptions.

Describe how the policy /rule /legislation of guidance could be administered (state, county, local, etc.)

Legislation would not be needed to perform such a study. However, it is likely that oversight and funding would come from a State agency. The study should include support and feedback from a stakeholders group so that a thorough understanding of benefits and drawbacks are well understood prior to adoption of a new rule or regulation.

Describe the benefits of the recommendation.

This study could provide Arizona-specific answers (different from other States, and may vary within the State, depending upon location) to the potential added costs associated with construction of dry or hybrid cooling systems at an Arizona power plant. This would be useful for multiple power plant designs (solar thermal, gas, ...) It would then be feasible to compare the potential water savings with the cost of the alternative cooling system, and make an informed decision of the best way to proceed.

Low-head hydro will result in clean energy production (no emissions) and reduced energy demand

Describe the unintended consequences of the recommendation.

Studies are often subject to second-guessing, and the study may not be performed at a level that is universally supportable, thus making it difficult to develop useful and objective conclusions.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency H/M/L	Cost to Utility H/M/L	Cost to End User H/M/L	Potential for Cost Pass- through	Benefits / Removal of Impediments	Additional Comments
L	L	L	L	M	

**Regulations/Permitting Working Group
Blue Ribbon Panel
White Paper Analysis**

PRIORITY ISSUE #26: Further research is needed regarding regulatory barriers, costs and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and homeowner/property owner level.

Describe the existing situation or issue

Utilization of stormwater and rainwater at regional, community and individual property owner levels is fairly new in the scheme of development. There is an opportunity for creative thinking that is technically oriented and based on sound engineering practices to be adopted in current regulations or guidance documents and made available for use. More research is required to move this utilization forward.

Describe associated impediments to increased reuse

Current rules and BMPs for stormwater and rainwater reuse could be revised to incorporate new technology or active and/or passive harvesting methodologies.

Describe the possible solutions (e.g. policy/rule/legislation or guidance) that could be applied to remove impediments

A strategic research plan could be developed with a goal to identify regulatory barriers, costs and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and individual property owner level.

Examples of questions that research should address include:

How much unused stormwater and rainwater can be reused that is not being utilized?

What are the best uses for stormwater and rainwater?

What rules are currently in place that impedes development of new applications for reuse in the areas of stormwater and rainwater?

Is technology available that is not being utilized? Why not?

What are the cost barriers to more reuse of stormwater and rainwater and how can they be reduced?

Provide the recommendations

1. The State and cities and towns need someone to “champion” this research effort and the funding needs to be identified. The Arizona Water Institute used to fulfill this role and should be reinstated.
2. The significant efforts and progress made by Australia and Tucson in this area should be reviewed for possible implementation statewide in Arizona.
3. The working group recommends a dialog be established with organizations such as the American Rainwater Catchment Systems Association and stakeholders to determine the extent of current research available and what research would be helpful in promoting more use of stormwater and rainwater.

Describe how the policy/rule/legislation or guidance could be administered (state, county, local, etc.)

As previously indicated, someone needs to “champion” this effort and there will need to be some resources made available to perform the research. Typically, the WateReuse Research Foundation funds research projects that have to do with reuse of reclaimed water, not stormwater or rainwater. The Water Environment Research Foundation provides independent scientific research on wastewater and stormwater issues.

It is possible the Arizona Floodplain Management Association would be willing to “champion” this project or the National Association of Floodplain and Stormwater Management Agencies.

Describe the benefits of the recommendation

It is unknown what benefit is available by maximizing reuse of stormwater and rainwater. Currently, much money is spent to control stormwater. It is anticipated that little is spent to reuse stormwater. Benefits of the recommendation include enhanced, low cost management of stormwater and conservation of potable water supplies (both surface water and groundwater) due to rainwater harvesting for home and commercial purposes.

Describe possible unintended consequences of recommendation

Research could determine that it is less costly to control the flow of stormwater than reuse it. Catchment systems managed by private property owners that are not using BMPs could lead to a vector problem, and subsequent related public health issues. People may not accept the appearance of devices and structures necessary to reuse stormwater and rainwater because they are unfamiliar.

Describe the associated cost / benefit of implementation, possible funding sources, and estimated cost to the end user using the matrix below for each recommendation (recognizing that some issues may not be able to utilize this approach – e.g., public perception):

Cost to Agency (Hi/Med/Low)	Cost to Utility (Hi/Med/Low)	Cost to End User (Hi/Med/Low)	Potential for Cost Pass-Through	Benefits/Removal of Impediments	Additional Comments
low	low	medium	medium	medium	

APPENDIX VI - SUMMARY OF RECOMMENDATIONS

ISSUE	RECOMMENDATIONS
<p>A. EDUCATION/OUTREACH</p> <p>A.1 – Increasing Public Awareness</p>	<ul style="list-style-type: none"> - Create a coalition to engage industry experts and enlist professional assistance to translate industry terminology into an acceptable lexicon for statewide use; - Create a state-hosted information portal on water pricing, water supply, water quality, water management, and water conservation and efficiency programs (including reuse and water efficient technologies), water harvesting, and education/technology information. Improve the collection and dissemination of information about water supplies and demand and promote electronic, real-time information sharing and discussion through on-line forums, e-mail groups, etc; - Encourage public and private water and/or wastewater agencies should to evaluate their ability to implement a reuse program within the next two years; - Develop a series of out-of-session legislative meetings to discuss various aspects of water sources and the programs that protect and enhance water sustainability; - Expand the existing statewide awareness campaign to help encourage a culture of conservation; - Request the Governor to proclaim a Water Reuse day for Arizona; - Continue to rely on the combined expertise of Arizona's water managers in conjunction with the resources of the three universities as a means of expanding collaboration to support water resources management and technology development in real-world applications
<p>A.2 – Pharmaceuticals & PCPs</p>	<ul style="list-style-type: none"> - Expand pharmaceutical take-back programs, develop a consistent program nomenclature, and expand media outreach; - Fund a statewide education and outreach campaign, drug take-back programs, and research on the effects of trace organics in stream systems receiving wastewater, the fate of trace organics in wastewater effluent discharge to surface water or infiltrated for groundwater replenishment, the linkages, if any, between residual trace organic compounds in wastewater effluent and human health effects, and the environmental fate of PPCPs in Arizona settings where effluent is used for reuse, recharge, and environmental enhancement; - Amend state statutes to require pharmacies to post information about how to dispose of medications and PCPs and where to find take-back programs.

ISSUE	RECOMMENDATIONS
<p>B. STANDARDS</p>	
<p>B.1 – Matching Alternative Water Supplies to Appropriate End Uses</p>	<ul style="list-style-type: none"> - Initiate a stakeholder process to review and amend regulations as necessary that will improve, enhance or encourage use, storage and exchange of recycled water supplies; - Evaluate the potential for incentives that encourage use of lower quality water supplies; - Encourage public and private water utilities to invest in treatment technology research aimed at improving efficiency, cost reduction and quality improvement; - Encourage research in water reuse.
<p>B.2 – Developing Comprehensive Reclaimed Water Infrastructure Standards</p>	<ul style="list-style-type: none"> - Compile a matrix of state, regional and local specifications and infrastructure standards to identify similarities, inconsistencies, and gaps and develop recommendations on a suite of standards that will provide a common foundation of safety and good engineering practices for reclaimed water distribution systems - establish a Reclaimed Water Infrastructure Advisory Panel of state, county, local, and private experts to facilitate development of the matrix.
<p>B.3 – Facilitating Indirect Potable Reuse</p>	<ul style="list-style-type: none"> - Create an IPR Multi-Agency Steering Committee to further advance IPR’s use by streamlining agency reviews, incorporating new technologies, and directing the IPR Advisory Panel. The Steering Committee’s first priority should be the development of a state-wide unified policy on IPR; - Create an IPR Advisory Panel to focus on the effectiveness and implementation of new technologies and field studies.
<p>B.4 – Operator Certification for Reclaimed Water Distribution Systems</p>	<ul style="list-style-type: none"> - Develop a reclaimed water distribution system operator training program and associated certification
<p>B.5 – Water/Energy Standards</p>	<ul style="list-style-type: none"> - Facilitate a voluntary workshop aimed at promoting discussion among stakeholders regarding coordinated water and energy utility planning activities - the workshop may include best practice recommendations and/or the identification of guiding principles; - Amend A.R.S. § 40-360-06 to specify that the water resource impacts of a proposed generation facility should be considered in issuing a Certificate of Environmental Compatibility.
<p>B.6 – Permitting Inconsistencies</p>	<ul style="list-style-type: none"> - Convene a stakeholder process to identify inconsistencies or conflicts among the different agency (ADWR, ADEQ and ACC) programs (embodied in statutes, rules or policies). To facilitate this review, develop a flowchart to identify what each program covers and where one program ends and the next program starts

ISSUE	RECOMMENDATIONS
<p>C. INFORMATION DEVELOPMENT & RESEARCH AGENDA</p> <p>C.1 – Coordinating & Streamlining Data Submission</p>	<ul style="list-style-type: none"> - ADEQ and ADWR initiate a stakeholder process to review and revise permit and non-permit data submittal requirements for necessary frequency, consistency, the applicability of monitoring requirements, develop a common database and develop electronic data submittal procedures; - The ACC should utilize common data from the ADEQ and ADWR database to support application processes such as environmental quality compliance, water use data and wastewater flows; - ADEQ conduct outreach to ADHS certified laboratories to develop standardized electronic data submittals.
<p>C.2 – Promote research on Human Health Effects</p>	<ul style="list-style-type: none"> - Form a coalition between Arizona, California, Texas, Colorado, and Florida (national leaders in developing water reuse programs) along with the WaterReuse Association, WaterReuse Research Foundation, EPA and other state and national institutions to develop a strategic research plan to answer questions regarding the development of new and expanded uses of reclaimed water and gray water; - Convene a group of stakeholders to engage in a process that could eventually develop standards for emerging contaminants, direct potable reuse, and full body contact.
<p>C.3 – Water/Energy Nexus</p>	<ul style="list-style-type: none"> - Facilitate an Arizona-specific study to identify the amount of water in energy and the amount of energy in water and an evaluation of the technologic feasibility, operational consequences, water use impacts and electric cost impacts of dry / hybrid cooling systems; - Create a State-hosted information clearinghouse to store water/energy nexus data ; - Support regional and national research that will encourage the development of innovative and groundbreaking products that will increase water use efficiency for all types of end uses and energy efficiency.
<p>C.4 – Rainwater Harvesting & Stormwater Research</p>	<ul style="list-style-type: none"> - Approach the Arizona Floodplain Management Association or the National Association of Floodplain and Stormwater Management Agencies to “champion” the development of a strategic research plan to identify regulatory barriers, costs and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and individual property owner level.
<p>D. REGULATORY IMPROVEMENTS</p> <p>D.1 – Encourage the Use of Alternative Water Supplies</p>	<ul style="list-style-type: none"> - Review the rules that address comingling of remediated and reclaimed waters

ISSUE	RECOMMENDATIONS
	<ul style="list-style-type: none"> • modify agency rules and/or policies to clearly address comingling of remediated waters with reclaimed water and review rules to evaluate circumstances whereby a General Permit may be considered for comingling of remediated water and reclaimed water; - Stormwater BMPs need to encourage “green” infrastructure development such as rainwater harvesting and reclaimed water use, preservation of riparian corridors and groundwater recharge. Local agencies should be encouraged to adopt applicable BMPs and educational programs that promote “green” infrastructure development; - Add an additional provision to the reclaimed water conveyance rules to refer to backflow requirements; - Amend R18-4-215 to specifically identify reclaimed water as an alternate water supply that would necessitate protection of the potable water service; - Consider incorporating cross connection control requirements into rules administered by ADEQ.
D.2 – Eliminate Duplicate Regulations & Fees	<ul style="list-style-type: none"> - Review state and county statutes for inconsistencies in definitions and duplication of fees; - Review rules that apply to reclaimed water users for inconsistencies in definitions and duplication of fees. - Initiate corrective action through the rulemaking process to fix the inconsistencies in A.A.C. R18-9 and R18-11 where references are made to the wrong location in A.R.S. 49-201 for the definitions of “Reclaimed water” and “On-site wastewater treatment facility.”; - Determine if counties are duplicating programs and charging fees for programs that are also being conducted by the State - specifically, Maricopa County should consider amending its Health Code to be consistent with state rules for permitted uses of reclaimed water.
D.3 – Update Reclaimed Water Quality Standards	<p>ADEQ should consider the following actions:</p> <ol style="list-style-type: none"> 1. Develop a new general permit for commercial and municipal gray water users; 2. Revise standards for Type 3 gray water systems (R18-9-719); 3. Redefine permissive uses of gray water (R18-9-711. A.3); 4. Possible revisions to R18-9-101 (definitions) and R18-9-704 (signage); 5. Revise the fecal coliform rule (R18-11-303-307) so E. coli may be used as the indicator organism for pathogen removal similar to the BADCT rule (R18-9-

ISSUE	RECOMMENDATIONS
<p>D.4 – Establish Ratemaking Guidelines</p>	<p>B204) and revise the coliform monitoring frequency requirement for Class A+, A, B+, and B reclaimed water in R18-11-303 to R18-11-306 to match the BADCT frequency in R18-9-B204;</p> <ol style="list-style-type: none"> 6. Revise gray water permits to address size of application area and type of water demand (R18-9-711); and 7. Address de minimus uses under gray water permit requirements. <p>The ACC should consider the following:</p> <ol style="list-style-type: none"> 1. Establishment of a demand side management (DSM) and conservation program framework with establishment of rules that include cost recovery method established for all future utility rate cases as part of rate case application; 2. Establish and promote effective revenue decoupling to remove revenue impediments to achievement of use reductions with establishment of rules that establish appropriate decoupling mechanisms; 3. Establish a consistent policy that promotes acquisition of renewable supplies in advance of supply needs. Establish appropriate funding mechanisms, needed to acquire such supplies and modify the “used and useful” standard or determine by ACC policy or rule that demonstration of sustainable and/or renewable supplies to offset current use of non-sustainable supplies is good public policy and is deemed to be “used and useful” for those supplies; 4. Establish by rule, a process where rate recovery of large capital-intensive infrastructure can begin before these facilities are placed in service; 5. Through stakeholder workshop process with the ACC, develop alternative funding methodologies that can provide funding for regionally-scaled reclaimed and renewable water facilities; 6. Insure that no existing policies, rules, legislation, or guidance, unnecessarily interfere with or make more difficult the potential to use private funding options for larger capital intensive projects; 7. Partner with large water users to fund reclaimed water facilities and distribution systems; and 8. Seek private sector funding for large-scale water infrastructure projects, where appropriate.
<p>D.5 – Address Unique Situations in Recharge, Reuse and AZPDES Permits</p>	<ul style="list-style-type: none"> - AZPDES general permits should be more widely offered for riparian areas, urban lakes, wetlands; - Improve the interface between its various permitting program requirements

ISSUE	RECOMMENDATIONS
<p>E. INCENTIVES</p> <p>E.1 – Develop, Expand and Promote Tax Credits/Exemptions for Use of Alternative Water Supplies</p>	<p>where reclaimed water is incorporated as a resource to support a public project that involves overlapping programs with equally beneficial goals such as reuse, recharge of multiple water sources, stormwater management, stormwater harvesting, public amenities, wildlife benefits, etc.</p> <ul style="list-style-type: none"> - Add flexibility to ADEQ’s standards and permitting for surface water and reuse programs to accommodate use of reclaimed water for environmental purposes; - Develop a flexible approach that only applies WET in settings where aquatic wildlife impacts are likely. There should be additional research into alternative appropriate protections for AZPDES discharge in upland/ephemeral settings that are distinct from wet-water environments. In these settings, criteria for impact on terrestrial wildlife could be developed and applied. - Expand the application and provide guidance on implementation of Net Ecological Benefit (NEB) in individual AZPDES permits. <ul style="list-style-type: none"> - Extend the tax incentive in A.R.S. §43-1090-01 and publicize that it is available for tax credits (using the information portal recommended under Education/Outreach); - Expand the tax credit for reclaimed water infrastructure capital investment through legislation; - Amend A.R.S. §49-204 to allow for local control of gray water systems; - Consider other policy changes that would provide incentives to encourage converting existing water uses to using alternative water supplies.

