

Arizona Department of Water Resources Tucson Active Management Area Irrigation Conservation Assistance Program (ICAP)



2016



**Arizona Department of Water Resources
Tucson Active Management Area
Irrigation Conservation Assistance Program (ICAP)**

For ADWR Conservation Assistance Program Grant

2016

Proposed by:

Westland Resources, Inc.



Apex Applied Technology, Inc.



and

Avra Valley Irrigation and Drainage District

TABLE OF CONTENTS

STATEMENT OF PURPOSE	4
BACKGROUND.....	4
PROGRAM OVERVIEW	5
PROGRAM GOALS AND OBJECTIVES	7
PROGRAM DESCRIPTION	7
PROJECT TEAM AND FUNDING STRUCTURE	9
METHODOLOGIES AND WORK PLAN	9
DELIVERABLES AND SCHEDULE.....	11
BUDGET AND JUSTIFICATION	11

STATEMENT OF PURPOSE

Agriculture is a major water user in Tucson Active Management Area (TAMA). Improved agricultural water efficiency will well contribute to maintaining safe-yield in the AMA. This proposal is prepared for Arizona Department of Water Resources (ADWR) to obtain a Conservation Assistance Grant to reinstate the Irrigation Conservation Assistance Program (ICAP) in TAMA. The primary goals and objectives of the proposed program are (i) providing Irrigation Water Management (IWM) technical assistance, training and monitoring to agricultural producers; (ii) improving agricultural water use efficiency; (iii) identifying irrigation water saving opportunities; (iv) quantifying groundwater savings; (v) potentially obtaining additional funding from Federal, other state agencies, and local entities to implement on-farm IWM practices and/or improve irrigation infrastructure; and (vi) eventually reducing groundwater withdrawals in the AMA.

The proposed project supports the conservation of groundwater resources in TAMA by providing technical IWM services to agricultural producers.

BACKGROUND

With the advent of shortages on the Colorado River and reduction of available excess Central Arizona Project (CAP) water, agriculture water users in the TAMA will become more dependent on groundwater resources. Many large irrigation wells in TAMA have Grandfathered Groundwater Rights. Under the ADWR Groundwater Savings Program, many agricultural producers in TAMA have been receiving CAP water for the irrigation of crops in lieu of using groundwater. Access to excess CAP water and Municipal and Industrial (M&I) CAP subcontractors have significantly reduced ground water pumping and facilitated the Groundwater Savings Program in TAMA, which has contributed to rises in groundwater levels in the Avra Valley sub-basin. However, as the access to renewable CAP water supplies diminishes, TAMA farmers will have to use groundwater for irrigation. The return to using groundwater as a primary water source for irrigation contradicts ADWR's safe yield goals. Agricultural irrigation water management and conservation with increased irrigation efficiency and reduced groundwater use becomes increasingly critical to support TAMA in maintaining its safe-yield goal.

ICAP is consistent with ADWR policies and the program and management goals of TAMA.

Flood irrigation from concrete ditches is the most commonly used irrigation mechanism in TAMA. Most of the irrigation systems still use concrete lined ditches and siphon tube technology. Although many farmers use laser land leveling tools to ensure the water is uniformly delivered to the fields, many other techniques and practices can be applied by irrigators to further improve water use efficiency. Many farm ditches are over half-century old and have been heavily patched due to deteriorated conditions contributing to unnecessary water losses and reduced irrigation efficiency. **Figure 1** shows flood irrigation using siphon tubes and an example of deteriorated farm ditches in the Avra Valley. A unique benefit of this proposed ICAP is that the Irrigation Specialist will identify farm irrigation systems that have particular needs for improvement. Then available Federal and/or other local grant funding opportunities may be identified and pursued by ICAP staff for these on-farm improvements on-behalf of interested participants.



Figure 1: Deteriorated Irrigation Ditches and Siphon Tube Irrigation

PROGRAM OVERVIEW

1. This proposal was prepared to include: (i) a statement of purposes and goals; (ii) methodology; (iii) a list of tasks and deliverables; and (iv) a detailed project budget, including salary costs and benefits, retrofit device costs, equipment/supply purchases.
2. The primary goal of the proposed ICAP in TAMA is to reduce agricultural sector groundwater withdrawals and quantify water conservation efforts. This will be achieved by providing IWM technical assistance and training to farmers for the scheduling and application of irrigation water to farm fields. Data will be collected and evaluation will be performed to quantify water savings.
3. The program is consistent with ADWR policies and programs, and the management goal of TAMA. It is proposed that ADWR Conservation Assistance Grant funds be used to reestablish ICAP in TAMA to provide agricultural water users a service that is consistent with similar programs that have been operating long-term in the Phoenix and Pinal AMAs.
4. The ICAP will benefit all water users and stakeholders in TAMA through the conservation of groundwater resources. The services will be available to irrigation water users in TAMA. The program is well supported by area farmers, agricultural landowners, and major water users (SAWUA) in TAMA. ICAP program support letters have been provided by:
 - Natural Resources Conservation Service (NRCS), Tucson Field Office
 - Avra Valley Irrigation and Drainage District (AVIDD)
 - BKW Farms
 - Private Farmers (multiple)

- Pima County, Regional Wastewater Reclamation Department
- Southern Arizona Water User Association (SAWUA) representing major water users in TAMA, such as: *Community Water Co. of Green Valley; FICO/Farmers Water Company; Flowing Wells Irrigation District; Marana Utility Department; Metro Water District; Oro Valley Water Utility; Sahuarita Water Company; Tucson Water Department*, and many Others.

Support letters are attached in **Appendix A** of this proposal.

5. Water Conservation Grant funds are required from ADWR to implement ICAP. To ensure the program goals and objectives are successfully met, both Direct Leverages (in-kind assistance) and Potential (indirect) Leverages are identified as follows:

Direct Leverage (\$19,800), In-Kind Services:

- AVIDD – \$4,000 in Program Management and admin support;
- AATech – \$8,800 in Project Management/Technical Oversight, and \$7,000 in office accommodations and supplies.

Potential Leverage, Indirect Complimenting Programs:

- Bureau of Reclamation WaterSMART Grant awarded to AVIDD for irrigation water efficiency improvement – ongoing;
 - Lower Colorado River Basin (LCRB) Agricultural Water Conservation and Drought Preparedness Partnership Program (mainly focusing on Tribal agricultural water use in Arizona) – proposed to USDA NRCS by the University of Arizona and AATech;
 - NRCS Environmental Quality Incentive Program (EQIP) and Conservation Stewardship Program (CSP) – to be developed;
 - USDA Rural Development (RD) Programs – to be developed.
6. Field monitoring is essential to establish baselines and to track conservation outcomes. Baseline conditions at each project site will be established through farmer interviews. A questionnaire will be developed and provided to each participant to understand farming methods, crop selection, irrigation system description, historic water use, and current IWM practices. The ICAP Irrigation Specialist will document baseline conditions.
 7. The TAMA ICAP was initially operated for a few years under ADWR Conservation Assistance Grant program approximately 20-years ago as a cooperative effort between local, state, and federal agencies to reduce groundwater use for the production of agricultural crops. During its operation in the mid-1990's, ICAP reported annual water savings for cotton and wheat crops specific to the fields serviced and monitored under the program. In the year 1996, ICAP reported providing assistance to 15 wheat fields and 23 cotton fields with a combined area of 2,264 acres and a measured water savings of 1,397 acre-feet. In 1997, 14 wheat fields and 17 cotton fields were monitored with a combined area of 2,151 acres and a measured water savings of 1,824 acre-feet. The ICAP reported that most farmers participating in the program were applying ICAP data to other irrigated fields making actual water savings even greater.

Reinstating ICAP in TAMA is essential to reduce agricultural groundwater pumping, lower energy costs, and help TAMA to maintain its safe-yield goal, especially when renewable water

resources become limited due to long-term drought and inadequate availability of Central Arizona Project (CAP) water supplies for the agricultural sector.

PROGRAM GOALS AND OBJECTIVES

The ICAP is consistent with ADWR policies and programs, particularly the regulatory requirements established in the Tucson AMA Agricultural Conservation Program. The ICAP would contribute to maintaining AMA safe-yield goals and compliments other water use sectors (e.g. M&I) by contributing to the reduction of groundwater withdrawals.

ICAP is a service oriented program. Conservation Assistance Program grant funds from ADWR will provide ICAP the opportunity to employ a Water Resources/IWM Expert, an Engineer, and an Irrigation Specialist to provide IWM assistance directly to farm operators in TAMA. Under direct supervision of the Engineer, the ICAP Irrigation Specialist will work one-on-one with individual farmers, irrigation foreman, and/or irrigator to provide training, technical assistance, and monitoring for specific IWM practices. The USDA NRCS's Field Office Technical Guide (FOTG) for Pima County and established ADWR agricultural Best Management Practices (BMP) provides the basis of most irrigation water conservation practices and measures for ICAP. The ICAP Irrigation Specialist will use these resources to provide educational and technical information to farm managers and irrigators.

It is the intent of ICAP to encourage and help farm managers to become self-sufficient with the implementation of IWM practices and tools, allowing the ICAP Irrigation Specialist to extend services over increased acreage.

The ICAP Irrigation Specialist will identify on-farm infrastructure improvement needs that can yield additional water savings. Examples of infrastructure improvements include land leveling, laser touch up, ditch lining, well rehabilitation, and metering. Cost-share assistance and funding opportunities to implement physical on-farm improvements will be independently pursued by the project team depending on available grant programs and participant interest.

PROGRAM DESCRIPTION

The ICAP is a service oriented program that proposes to employ a part-time Project Manager to oversee an Irrigation Specialist to provide IWM assistance to farm operators in TAMA. The program team consists of professionals with knowledge and experience in water resources, agronomy, IWM, environmental science, conservation planning, and agricultural engineering.

The ICAP Irrigation Specialist will work closely with each farmer, irrigation foreman, and/or irrigator to provide technical assistance specific to IWM practices. This service will provide recommendations to each participant specific to soil moisture monitoring, soil moisture availability for optimal plant growth, irrigation scheduling, and irrigation application rates. Resource information will include meteorological data, computer based irrigation scheduling software, smart phone applications, and traditional on-site interactions. The ICAP Irrigation Specialist will also provide educational information specific to agricultural Best Management Practices program established by ADWR.

It is the intent of ICAP to encourage farm managers to become self-sufficient with the implementation of IWM practices and tools, allowing the ICAP Irrigation Specialist to extend services over increased acreage. Participants will also be encouraged to extrapolate ICAP field data for use over larger farming areas under their management. As mentioned above, ICAP staff will identify on-farm infrastructure improvement needs and cost-share assistance funding opportunities from available grant programs.

The ICAP will maintain an electronic file for each participant that tracks all related data on the operation and effectiveness of the program. Each case file should include the participants contact information, farm location map, irrigation system description (e.g. field slope, soil types, available flow rate, delivery system, crop type, and planted acreage).

Program effectiveness will be evaluated following each growing season by analyzing collected data and reporting the incurred water savings based on these data. The ICAP project team will work closely with the farmer to quantify additional water savings based on data extrapolation to the farmer's entire operation.

The ICAP Irrigation Specialist will prepare and provide quarterly status reports to ADWR and/or to the TAMA Groundwater Users Advisory Council (GUAC). An annual report will be provided to ADWR summarizing the programs progress and accomplishments.

PROJECTED GROUNDWATER SAVINGS

Based on the ADWR Draft 4th Management Plan Agricultural Conservation Program (Chapters 3 and 4), groundwater accounted for 80,553 acre-feet (AF) of total reported use in TAMA in the year 2013. An additional 25,356 AF of in-lieu groundwater was reported, which is essentially CAP water delivered to irrigation rights as part of the ADWR Groundwater Savings Facility program. Approximately 3,400 AF from other water sources were accounted (i.e. other CAP water, Surface Water, and Reclaimed Water).

Groundwater remains a significant water resource available for agricultural irrigation and will become increasingly relied upon as renewable water supplies available to the agricultural sector become limited (i.e. CAP water). ICAP provides an opportunity to conserve precious groundwater supplies through the implementation of on-farm IWM practices and by assisting farmers to identify funding sources to cost share for on-farm infrastructure improvements.

It is projected that ICAP will concentrate its efforts for larger farming operations located primarily in Avra Valley. This includes an area east and west of the Lower Santa Cruz River from Marana to the Pinal County line. Other areas of interest include State Lease land near Red Rock.

Although one primary objective of ICAP is to quantify real time groundwater savings based on implemented IWM practices, the following water savings projection is presented as a goal. Accumulated groundwater saving over a large area will be provided, if ICAP becomes a multi-year program.

First year projections include working with 10 farms. Typically, ICAP would select one area of the farm to focus its IWM efforts. As an example, the consumptive water use of cotton is 3.5 AF/acre. Assuming that a farm is achieving 70 percent irrigation efficiency, the total water use per

acre is 5.0 AF/acre. It is an accepted projection that you can increase seasonal irrigation efficiencies up to 10 percent by applying IWM practices. For every acre of cotton produced, this is a water savings of 0.5 AF/acre. Assuming IWM practices were applied to a 40 acre farm field, 20 AF of water is saved. Applying this savings to 10 ICAP participants with a total of 4,000 acres of farm land, annual savings would approach 2,000 AF/year. This projection is consistent with the data previously collected during ICAP operations in the 1990's. These savings relate to the cost of service less than \$50 per AF.

Participants will be encouraged to implement ICAP IWM recommendations to their entire farming operations, potentially yielding significant groundwater savings. The ICAP cost of service by extrapolating these water savings over an entire farming operation is expected to be reduced proportionately. ICAP will evaluate and report projected groundwater savings based on extrapolated data for entire participant farming operations applying IWM practices. ICAP will also evaluate and report groundwater savings from implemented on-farm conservation improvements resulting from ICAP recommendations.

PROJECT TEAM AND FUNDING STRUCTURE

An Intergovernmental Agreement (IGA) is proposed between ADWR and the Avra Valley Irrigation and Drainage District. AVIDD will provide contract management for ICAP. The management of daily operations will be provided by Apex Applied Technology, Inc. (AATech), Tucson, Arizona. WestLand Resources Inc. (WestLand) will provide ICAP technical assistance for the first year start up, as a sub-consultant to AATech. AATech will be responsible for overall personnel and program management, office accommodations, outreach, field services, and administrative services/management.

AATech, independent from ICAP, will pursue alternative funding and financial assistance for farmers who are interested in implementing on-farm infrastructure improvement projects. Providing assistance to farmers to pursue available grant funding opportunities for the installation of physical on-farm water conservation improvements provides added value to ICAP with the potential to achieve significantly more groundwater savings.

The project team structure is presented in **Figure 3**.

METHODOLOGIES AND WORK PLAN

The proposed tasks and services for ICAP include the following:

Task 1: Program/Project Management

Program/project management task includes, but are not limited to, holding project meetings, communicating effectively with project teams and stakeholders, monitoring project progress, evaluating program performance, managing cost, preparing pay request, and conducting quality assurance and quality control (QA/QC) throughout the course of the project.

Project Meetings

The Irrigation Specialist will prepare quarterly status reports and provide updates to ADWR and/or the TAMA GUAC. ICAP team meetings will be held as needed for program technical

oversight, status updates, budget review, and progress reporting. The ICAP team will also meet as needed with individual farmers to review project needs alternative funding opportunities.

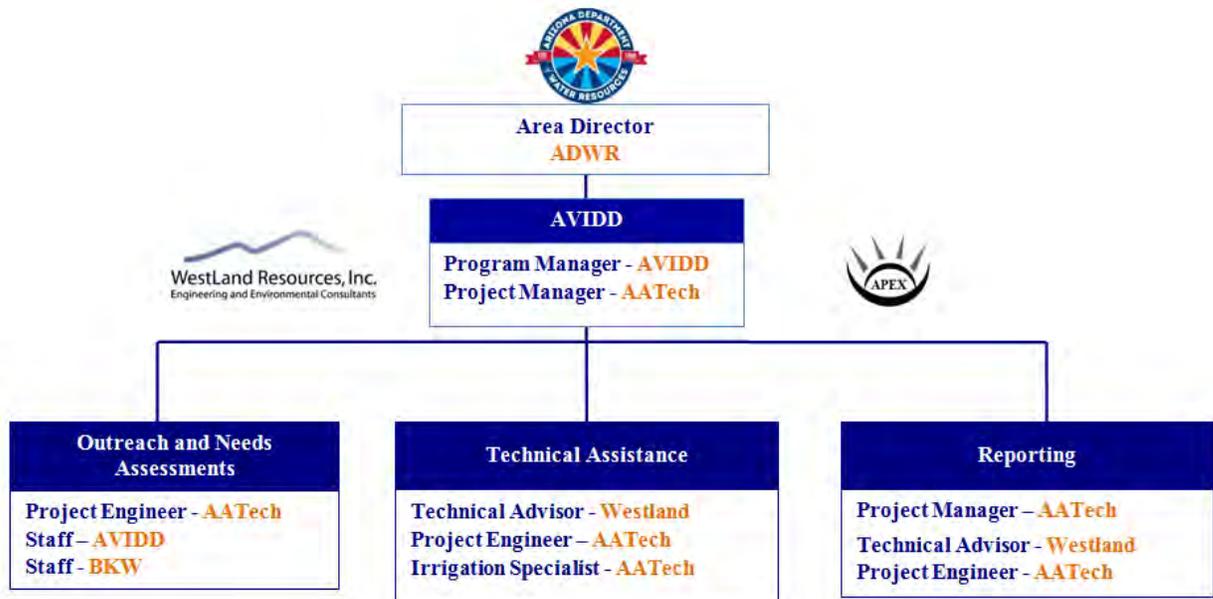


Figure 3: Project Team

Project Control, Progress Monitoring, and Effectiveness Measurement

Project Manager will communicate with project team and program participants on a regular basis to evaluate program effectiveness and monitor project progress.

Task 2: Outreach, Needs Assessment, and Participant Enrollment

Outreach is important to ICAP and therefore, it is proposed as a stand-alone task. This task includes (i) conduct irrigation water needs assessments, (ii) website development and maintenance, (ii) program promotion, and (iv) reach out to individual agricultural producers.

In the first year of the program, we expect to enroll a minimum of 10 participants to provide IWM technical assistance through irrigation scheduling, recommended application rates, and other irrigation water conservation practices. The program will target farms irrigating high water use crops such as alfalfa and summer crops (e.g. cotton) and continue technical assistance for winter crops (e.g. wheat).

Task 3: Technical Assistance

Seasonal records will be maintained that document each irrigation event, application rates, application efficiency, field and crop conditions, and other relevant information for each ICAP participant. Assessment and calculations will be made for seasonal irrigation efficiencies for all fields monitored for each ICAP participant, quantified groundwater savings, and ultimate groundwater savings based on extrapolated data for all fields applying IWM practices by each

participant. The ICAP will maintain a computer generated tracking system to record and monitor program progress.

The ICAP will provide irrigation scheduling dates as determined by actual field soil moisture monitoring and/or data generated by the University of Arizona-Arizona Meteorological weather station using the AZSCHED computer model. Participants will be provided real-time irrigation scheduling dates and recommended water application rates to replenish soil moisture for optimal plant growth and water use efficiency.

The ICAP participants will be provided with information on IWM techniques and established agricultural Best Management Practices (BMPs).

Independent from ICAP, AATech will provide technical assistance to area famers for available grant and loan applications to install on-farm improvements and infrastructure to further benefit the conservation of water resources.

Task 4: Reporting

The ICAP will provide ADWR with a quarterly report that summarizes program highlights, work activities completed, work activities in progress, budget, and planned work activities. The ICAP will compile an annual report to include: 1) a brief description of the ICAP; 2) program achievements; 3) evaluation and summary of collected field data; and 4) estimated seasonally and annual water use savings. A comprehensive annual report will be submitted to ADWR in draft format for review prior to being finalized.

DELIVERABLES AND SCHEDULE

Deliverables include:

- Data collection results
- Program website
- Outreach
- Needs assessment results and analysis
- Quarterly program reports
- Annual program report -groundwater savings will be quantified in the annual report.

Table 1: Schedule

Tasks	Mon 1	Mon 2	Mon 3	Mon 4	Mon 5	Mon 6	Mon 7	Mon 8	Mon 9	Mon 10	Mon 11	Mon 12
Task 1: Program/Project Management												
Task 2: Outreach, Needs Assessment, and Participant Enrollment												
Task 3: Technical Assistance												
Task 4: Reporting												

BUDGET AND JUSTIFICATION

The budget for ICAP is summarized in **Table 2**. Funds requested to be provided by the ADWR Conservation Assistance Grant program amounts to **\$93,184**. The annual operating budget for

ICAP is \$112,984 which includes the matching fund total of \$19,800 (in-kind services). The ADWR Conservation Assistance Grant funds are proposed to be used primarily for personnel, consultant services, and operating expenses (e.g. equipment, vehicle mileage reimbursement). Matching funds are included for AVIDD program/contract management and administrative support, and AATech project management/technical oversight and office accommodations and supplies. The breakdown is:

Local Matching (\$19,800), In-Kind Services:

- AVIDD – \$4,000 in Program Management and admin support;
- AATech – \$8,800 in Project Management/Technical Oversight, and \$7,000 in office accommodations and supplies.

Table 2: Budget Summary

Total Program	Budget
Personnel (\$12,800 in-kind)	\$89,809
Fringe Benefits	\$6,175
Office Rental and Supplies (in-kind)	\$7,000
Travel (mileage reimbursement)	\$8,000
Equipment (cell phone, computer and software, etc)	\$2,000
Total Direct Costs	\$112,984
Indirect Costs	\$0
Total Annual Program Costs	\$112,984
Local Matching (leverage)	\$19,800
ADWR Funding Request:	\$93,184

Local Matching	Budget
Program Management -AVIDD	\$4,000
Technical Oversight - AATech	\$8,800
Office Rental and Supplies	\$7,000
Total Local Matching:	\$19,800

---The End of the Proposal---



Thank You!

Appendix A – Support Letters



SOUTHERN ARIZONA WATER USERS ASSOCIATION
PO Box 35481
Tucson AZ 85740-5481

October 23, 2015

Mr. Jeff Tannler
Arizona Department of Water Resources
3550 N. Central Avenue, 2nd Floor
Phoenix, Arizona 85012-2105

MEMBERS

Ava Water Co-op

BKW Farms

*Community Water Company
of Green Valley*

FICO/Farm Water Co.

Flowing Wells Irrigation District

*Green Valley Domestic Water
Improvement District*

Kal Farms

*Town of Marana Municipal
Water System*

Metro Water District

Oro Valley Water Utility

*Pima County Regional Wastewater
Reclamation Department*

Red Rock Utilities, LLC

Sahuarita Water Company

*Town of Sahuarita Wastewater
Treatment and Reclamation Facility*

Tucson Water Department

Re: Letter of Support to Implement the Irrigation Conservation Assistance Program (ICAP) in the Tucson Active Management Area

Dear Mr. Tannler:

The Southern Arizona Water Users Association (SAWUA) is pleased to provide this Letter of Support to the Arizona Department of Water Resources (ADWR) for the development of the Irrigation Conservation Assistance Program (ICAP) in the Tucson Active Management Area (TAMA). The ICAP was historically an integral part of ADWR's overall Water Conservation Assistance Program. Providing a serviced based Irrigation Water Management (IWM) program for the agricultural sector would benefit the conservation of valuable groundwater resources.

Water conservation is an important factor in balancing our current and future water demands and supplies for all water use sectors. The ICAP objectives are well aligned with the mission to promote water conservation for our municipal water users. This program will focus on water conservation in the agricultural sector, providing individual technical assistance, and the use of innovative technologies to schedule irrigations and implement effective IWM practices. Reducing agricultural water use will become increasingly important, especially during times of Central Arizona Project (CAP) water shortages and increased dependence on groundwater.

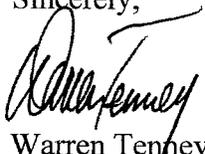
It is understood that the ADWR Conservation Grant Program has the funds to support ICAP in the TAMA which have been collected from the agricultural sector as part of the annual water use fees. SAWUA supports the use of these funds for ICAP through its endorsement of this program.

CONTACT INFORMATION

Mary Bauer, Executive Assistant
(520) 406-2229
marycbauer@gmail.com

Stuart Goodman, Capitol Lobbyist
(602) 277-0911
sgoodman@goodmanschwartz.com

Sincerely,



Warren Tenney
President

Achieving long-term quality water for Southern Arizona

www.sawua.org



United States Department of Agriculture

August 28 2015

Mr. Jeff Tannler
Arizona Department of Water Resources
3550 N. Central Avenue, 2nd Floor
Phoenix, Arizona 85012-2105

Re: Letter of Support for "Tucson AMA Irrigation Conservation Assistance Program (ICAP)"

Dear Mr. Tannler:

The USDA-Natural Resources Conservation Service (NRCS), Tucson Field Office is pleased to support to the "Tucson AMA Irrigation Conservation Assistance Program (ICAP)". As we all know that Arizona Department of Water Resources (ADWR) is committed to the conservation of water resources. The proposed program is to reduce agricultural water use in the Tucson Active Management Area (AMA), where groundwater withdrawals are most prevalent.

The ICAP historically was a cooperative program with ADWR, NRCS, and the Pima Natural Resources Conservation District. Although the NRCS cannot administer ICAP, it provides its full support for the program. The NRCS can coordinate with ICAP staff and the farming community to bridge cooperation and technical guidance. The ICAP provides irrigation scheduling and water application rate information to participating farmers. A computer program which integrates crop type, field and soil conditions, and weather conditions is used by ICAP to assist farmers to schedule irrigation events leading to the conservation of groundwater.

ICAP intends to reach out to farm managers and irrigators to provide technical information to implement Irrigation Water Management (IWM) practices. The ICP will encourage the implementation of the practices, which promote efficient agricultural water use. A significant portion of groundwater use in the Tucson AMA is used for the production of agricultural crops. NRCS believes that the agriculture sector has the potential to contribute greatly to the conservation of groundwater resources, especially in the light of limiting Central Arizona Project water supplies. Ongoing technical assistance and education is essential to maintain and enhance conservation efforts. As a direct outcome of ICAP, we expect to see more local farmers and producers who are motivated to conserve water resources, which in turns promotes the NRCS mission of "helping people to help the land".

Sincerely,

Kristen Egen, District Conservationist
USDA-NRCS, Tucson Field Office
3241 N. Romero Rd.
Tucson, AZ., 85705

Natural Resources Conservation Service
3241 N. Romero Rd, Tucson, Arizona 85705
Tel. (520)292-2999 • Fax (855) 848-4339

An Equal Opportunity Provider and Employer



PO BOX 638 • MARANA AZ 85653-0638 • 520-682-2516 • FAX 520-682-2517 • BKWFarms.com

October 21, 2015

Mr. Jeff Tannler
Arizona Department of Water Resources
3550 N. Central Avenue, 2nd Floor
Phoenix, Arizona 85012-2105

Re: Letter of Support for ADWR Water Conservation Program Grant

Dear Mr. Tannler:

BKW Farms, Inc. is an agricultural service corporation which serves irrigation water to farms in the Marana area. BKW is one of three largest agricultural water providers in the Marana region and began farming in 1939.

BKW Farms supports the goals of restoring the Irrigation Conservation Assistance Program (ICAP) in the Tucson Active Management Area. We began using CAP water for irrigation in 1993. As you know, shortages are predicted for the Colorado River which will directly impact agriculture's access to CAP water. If there are CAP water shortages for agriculture, many farmers will have to increase their use of groundwater supplies.

A Water Conservation Program grant award by the Arizona Department of Water Resources for ICAP would help farmers increase their irrigation efficiency. If the grant is awarded, BKW Farms will help the ICAP Program Manager and Irrigation Specialist meet its stated goals by helping to coordinate with the farmers that BKW serves.

Sincerely,

A handwritten signature in blue ink that reads "Brian Wong". The signature is fluid and cursive, with a long, sweeping underline that extends to the right.

Brian Wong
President

**AVRA VALLEY IRRIGATION AND DRAINAGE DISTRICT
P O BOX 2305
CORTARO, ARIZONA 85652
TEL: (520) 791-2409**

September 7th, 2015

Re: Letter of Support for the Irrigation Conservation Assistance Program in Tucson AMA Proposed by Apex Applied Technology, Inc.

Mr. Tannler,

Avra Valley Irrigation and Drainage District (AVIDD) is pleased and honored to write this Letter of Support for the establishment of Irrigation Conservation Assistance Program (ICAP) in Tucson Active Management Area proposed by Apex Applied Technology, Inc. (AATech).

AVIDD is a political subdivision located in Tucson Active Management Area, along the Santa Cruz River and west Interstate 10 in northern Pima County. The District includes over 40 square miles of agriculture and rural lands, which are generally sloped from southwest to northeast. Currently, AVIDD has over 50 privately owned/leased irrigation wells with pumping capacity in the range of 1,000 – 3,000 gallons per minute each. Each well either has its own distribution system or shares one with nearby wells. Most of the wells in the District were drilled in the 1940s and 1950s. These wells were originally equipped with natural gas driven, oil lubricated, vertical turbine well pumps. The annual irrigation water demand of the entire District can be as high as 40,000. Energy and water efficiency improvements are most needed in AVIDD.

Water is extremely important for the agriculture in Arizona. The District is actively involved in all kinds of agricultural activities in Southern Arizona. The members in AVIDD will definitely benefit from the proposed ICAP Program. The goals and objectives this program meet the best needs and interests of the agricultural producers in our District.

Dr. Jing Luo, PE with Apex Applied Technology, Inc. (AATech) has worked closely with AVIDD and successfully obtained numerous Federal grants to improve energy and water use efficiency in the District. Without her assistance and the financial support from Bureau of Reclamation, many water conservation projects would not happen. Since, 2010, AATech actively works in the rural areas in Arizona and has brought over \$2,000,000 Federal funding to these agricultural communities. They are currently working to bring another \$7 million Federal funding to the State.

AVIDD would like to express our whole-hearted support for the ICAP Program proposed by AATech and its partners. Please feel free to contact me at: (520) 990-8888 or johnkaijr@yahoo.com with any question.

Sincerely,



John Kai Jr., President
Avra Valley Irrigation and Drainage District

September 15th, 2015

Re: Letter of Support for an Irrigation Conservation Assistance Program in Tucson and Marana

To Whom It May Concern:

My name is Tom Glover. I am a lifetime cotton farmer in Marana, Arizona. I am writing this letter to support the establishment of an Irrigation Conservation Assistance Program in our area. We are very much blessed for always having sufficient groundwater for our crops for many generations in the past. However, recent years the cost to pump water has gone up significantly, which greatly impacts the economics of our operation. We are always interested in exploring opportunities to improve water and energy efficiency and reduce water costs. However, technical assistance is not always made available to small to mid-size farms like us.

Re-establishing an Irrigation Conservation Assistance Program in this region will certainly benefit all the farmers in Tucson and Marana. The program will provide the most need technology and technical assistance educating and guiding us to be more efficient in water and energy uses. I and my fellow farmers strongly support this exciting program!

Sincerely,

A handwritten signature in cursive script that reads "Tom Glover".

Tom Glover
Cotton Farmer in AVIDD

September 15th, 2015

Mr. Jeff Tannler, AMA Director
Arizona Department of Water Resources
3550 N. Central Avenue, 2nd Floor
Phoenix, Arizona 85012-2105

Re: Letter to Support the Establishment of an Irrigation Conservation Assistance Program in Tucson Active Management Area

Dear Mr. Tannler

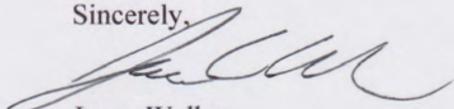
I am Jason Walker, current owner of Walker Farms in Marana. As a third generation farmer, I farm a total of 2,850 acres of agricultural land. I am just a guy who knows our world needs us to take care of it. Looking towards the future, the cost and volatility of water should be of primary concern of all the farmers in the southwest region of the Country. Our fields are irrigated through a combination of groundwater wells and CAP water, which originated from Colorado River. With extended years of drought, the Colorado River and its tributaries continue to recede at alarming rates, the irrigation cost continue to increase, leaving farming a smaller opportunity to be profitable.

It's absolutely our responsibility to conserve our finite resources. In the past four years, working with NRCS, we have not only replaced badly damaged concrete irrigation ditches but also leveled the adjoining fields. Through this effort, we are able to transition our first 175 acres field to a level basin surface irrigation system. This basin now is 20-30% more water efficient than the graded surface system. We are also going to put in the first central pivot sprinkler system in Marana.

Our experience has demonstrated that there are lots of room and opportunities to improve water and energy efficiency in our current farming practices. I am only one farm in a major farming community. Farming takes everyone. We are all in this together and we have to protect the opportunity for the future.

For that, I am whole-hearted support the establishment of the Irrigation Conservation Assistance Program in Tucson Active Management Area. Through this Program, we will see more and more farmers working together protecting our finite water resources for our future generations. I am looking forward to work with Apex Applied Technology, Inc. and other stakeholder on this exciting endeavor. Should you have any question on this letter of support, please contact me at 602-620-9003.

Sincerely,



Jason Walker

Walker Farms



PIMA COUNTY

REGIONAL WASTEWATER RECLAMATION DEPARTMENT

201 NORTH STONE AVENUE
TUCSON, ARIZONA 85701-1207

JACKSON JENKINS
DIRECTOR

PH: (520) 724-6500
FAX: (520) 724-9635

September 23th, 2015

Mr. Jeff Tannler, AMA Director
Arizona Department of Water Resources
3550 N. Central Avenue, 2nd Floor
Phoenix, Arizona 85012-2105

Re: Letter of Support to Reinstate the Irrigation Conservation Assistance Program (ICAP) in TAMA

Dear Mr. Tannler,

I am writing this letter to express Pima County Regional Wastewater Reclamation Department (PCRWRD)'s support to reinstate the Irrigation Conservation Assistance Program (ICAP) in Tucson Active Management Area (TAMA).

As one of the major wastewater management agencies in Southern Arizona, PCRWRD plays an important role of collecting, treating, and reusing water as a vital resource for the prosperity and longevity of human beings. PCRWRD is always seeking and supporting integrated activities and programs, which maximize the benefits of water resource in Pima County.

Many agricultural producers in TAMA have been receiving Central Arizona Project (CAP) water for irrigation of crops in lieu of using groundwater under the Arizona Department of Water Resources (ADWR) Groundwater Savings Program. With the advent of shortages on the Colorado River and reduction of available excess CAP water, agriculture water users in the TAMA will become more dependent on groundwater resources.

We understand the goals and objectives of the ICAP program are to provide Irrigation Water Management (IWM) education and technical assistance to agricultural producers to increase irrigation efficiencies and reduce groundwater withdrawals. The project team will also investigate available grant funding opportunities from either local or Federal sources to implement on-farm infrastructure improvements to increase irrigation efficiency.

At PCRWRD, we believe that a program like this is beneficial to the rate payers in Pima County. We would like to endorse the efforts to reinstate this timely program in TAMA.

Sincerely,

Jackson Jenkins, Director
Pima County Regional Wastewater Reclamation Department

Appendix B – Key Personnel Resumes

Project Role and Responsibilities:

Senior Project Manager

Special Expertise:

- *Groundwater Management, Policy, and Regulatory Program Compliance*
- *Recharge System Planning, Permitting, and Design*
- *Reclaimed Water Use*
- *Water Conservation Program Compliance*
- *Clean Water Act Compliance*
- *On-site Wastewater Design*
- *208 Plan Amendments*
- *Aquifer Protection/Reuse Permits*
- *Natural Resources Management*
- *Outdoor Recreation Planning*
- *Agricultural Systems Planning and Design*

Education:

- *B.S., Agriculture, University of Arizona; School of Renewable Natural Resources (December 1976)*

Professional Societies:

- *Arizona Hydrological Society (member since 1992)*
- *Soil & Water Conservation Society (member from 1980 to 1996; Arizona Chapter President in 1991)*

Background:

Mr. Caporaso has over 30 years of experience in water resources planning, regulatory water conservation program management, permitting, and agricultural planning and design. He has been employed by WestLand Resources Inc, (WestLand) for over 10 years. He joined WestLand after 15 years with the Arizona Department of Water Resources (ADWR) and seven years with the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS). Mr. Caporaso holds a Bachelor of Science degree in Agriculture from the University of Arizona's School of Renewable Natural Resources with an emphasis on natural resources management, environmental sciences, and regional park planning.

Mr. Caporaso has in-depth knowledge regarding federal and state water and wastewater regulatory requirements for municipal, industrial, and agricultural water users. He has managed multiple recharge basin design projects and studies for CAP water and effluent recharge. Mr. Caporaso has technical background in the ADWR Groundwater Management Planning process for all water use sectors, Assured and Adequate Water Supply program, utilization of renewable water resources, and groundwater hydrology. He was also active in regional recharge planning in the Tucson Active Management Area (AMA). He has completed projects in compliance with the Clean Water Act including processing multiple Section 208 Plan Amendments for wastewater treatment, disposal, and effluent reuse.

As a senior project manager for WestLand, Mr. Caporaso has managed projects that include water resource studies, water conservation, CAP water transfers, Underground Storage Facility permits, Recovery permits, recharge basin design, on-site wastewater treatment systems, reclaimed water use, farm planning, irrigation system design, Irrigation Water Management (IWM), riparian habitat development, vegetation monitoring studies, and regulatory permitting. His regulatory permitting experience included presenting technical information at public meetings and hearings to obtain approval of 208 Area Plan Amendments and Aquifer Protection Permits.

As a senior project manager for WestLand, Mr. Caporaso had a lead role in assisting the Pinal County Planning and Development Department to facilitate a 10 member Task Force appointed by the Board of Supervisors to develop Water Element criteria for a major amendment to the Pinal County Comprehensive Plan. The Task Force process included the development of technical and legal water resource related white papers by the WestLand team and a series of stakeholder meetings to develop water element recommendations. This consensus driven process led to formal Task Force recommendations that WestLand presented to the Pinal County Planning and Zoning Committee and the Board of Supervisors for implementation of the 2011 Pinal County Comprehensive Plan Amendment and Zoning Ordinance.

Also at WestLand, Mr. Caporaso completed a two-year project for the planning, layout, and design criteria for the 1,000-acre San Xavier District (SXD) Farm Rehabilitation Project, requiring coordination of entities including the Tohono O'odham Nation, SXD, San Xavier Farm Cooperative Board, Pima County Flood Control District, Bureau of Indian Affairs, and Reclamation.

Michael Caporaso

Responsibilities included managing meetings with the SXD Farm Cooperative Board and SXD tribal council to prepare technical land use reports, present design alternatives, and obtain approval. Tasks included analysis of Native American cultural and traditional values, use of CAP water to produce crops, groundwater recharge, groundwater recovery and well system analysis, subsidence, IWM, and potential SXD recreational facilities.

Other WestLand duties included developing a water conveyance and recharge study for the Upper Santa Cruz River watershed funded by an ADWR Conservation Assistance Program grant. Mr. Caporaso was the project manager for the design of effluent recharge basins and conveyance systems for the Town of Prescott Valley, City of Eloy, City of Benson (i.e. Whetstone Ranch), and Miraval Resort and Spa. He is the project manager for the first joint public-private recharge project partnership for Liberty Utilities and the Central Arizona Project. Mr. Caporaso also developed a CAP Recharge Feasibility Report for the Pinal County Water Augmentation Authority.

As a senior water resources planner for ADWR Tucson AMA, Mr. Caporaso was responsible for development of the Second and Third Management Plans Agricultural Conservation Program and Groundwater Quality Management Program. His Second Management Plan experience included conservation program development and implementation for Santa Cruz and Pima Counties. Mr. Caporaso had a lead role in the development and implementation of the Third Management Plan locally and statewide for the agricultural sector. He was the local and statewide chair for the ADWR Agricultural Technical Advisory Committees for the development and promulgation of the Agricultural Conservation Program requirements. He was project manager for multiple consultant studies that included the technical and economic evaluation of agricultural water use, effluent reuse studies, and graywater reuse risk analyses and permitting. He also developed and provided oversight for the Conservation Assistance Grant program including the Irrigation Conservation Assistance Program (ICAP). Mr. Caporaso participated in the Governor's Task Force for Central Arizona Project (CAP) water utilization and Water Management Advisory Committee. He was a staff representative for the Tucson AMA and Pinal AMA Groundwater Users Advisory Councils. He participated in consensus building processes that included the adoption Area Management Plans, Assured Water Supply rules, and groundwater recharge policy. As a Water Resources Supervisor for the Pinal AMA, Mr. Caporaso developed the Agricultural Best Management Practices program that was subsequently adopted for statewide implementation.

Mr. Caporaso was the chair for Pima Association of Government's (PAG) Water Quality/Watershed Subcommittee for eight years, PAG Environmental Planning Advisory Committee member, Davis-Monthan Air Force Base Restoration Advisory Board member, Air Force Plant 44 Remedial Task Force member, Tucson Regional Water Council member, and Tucson Water CAP Study Team member. Mr. Caporaso also served for eight years as the chair of the Oro Valley Water Utility Commission.

Mr. Caporaso was employed for five years as the IWM Team Leader for the USDA, NRCS Wellton-Mohawk Irrigation District Special Projects, Arizona. His responsibilities included the development, implementation and IWM compliance certification for 366 contractual and financial agreements with area farmers. He performed annual monitoring and analysis of Wellton-Mohawk Irrigation and Drainage District water deliveries and return flow (dewatering) for the purpose of reducing treatment loads for the Yuma Desalinization Plant. He developed IWM plans for 56,000 acres of improved irrigated farmland; managed the IWM program; and performed farm planning, soil evaluations, and agricultural system design (flood, drip, and sprinkler irrigation systems). He was also involved in habitat restoration projects along the Gila River corridor in Yuma County.

While employed for two years as a Soil Conservationist with the NRCS in Holbrook, Arizona, Mr. Caporaso's tasks included survey, design, construction, and management of water conservation measures including the construction inspection of water conveyance and delivery systems, agricultural and park irrigation systems, livestock pipelines, sewage lagoons, land leveling, regulatory water storage reservoirs, fish ponds, flood control diversion structures, and stream bank protection projects. He was the government inspector for multiple water construction projects including Little Mormon Lake to provide water storage for the Silver Creek Irrigation District and the Town of Taylor pipeline project. Mr. Caporaso assisted with range, stock ponds, and fencing projects on the Navajo, Hopi, and Apache Indian Reservations.

Jing Luo, PhD, PE

6376 N. Camino Padre Isidoro

Tucson, Arizona 85718

520-395-7781 (cell)

Email: jing.luo@aatechsolar.com

EDUCATION

Ph.D.: Major in Environmental Engineering, Minor in Material Science, the University of Arizona, December 2003

M.S.: Civil and Environmental Engineering, Tianjin University, July 1998

B.S.: Civil and Environmental Engineering, Tianjin University, July 1995

ENGINEERING REGISTRITON

- ❑ Registered **Professional Engineer (P.E.)** in the State of Arizona: #42806
- ❑ The State of Arizona Certified Operator **Grade IV (Wastewater Treatment):** #22947
- ❑ The State of Arizona Certified Operator **Grade III (Water Treatment):** #22947

GRANT MANAGEMENT:

- ❑ **USDA RD, Value-added Producer Implementation Grant** - \$250,000 for Native American Farmers COOP in Tohono O'odham Nation
- ❑ **USDA RD, Water & Waste Disposal Technical Assistance & Training Program** - \$100,000 for a charter school serving Navajo Nation
- ❑ **USDA RD, Socially Disadvantaged Groups Grant** - \$175,000 for Native American Farmers COOP in Navajo Nation
- ❑ **WERF Unsolicited Research Grant** - \$80,000 for *Sustainable Struvite Control Using Residual Gas from Digester gas Cleaning Process* research, Pima County
- ❑ **WIFA Green Project Fund** - \$35,000 for energy audit of PCRWRD's sub-regional wastewater reclamation facilities, Pima County
- ❑ **Bureau of Reclamation** - \$30,000 for local irrigation and drainage district system optimization review
- ❑ **Bureau of Reclamation, WaterSMART Program** - \$299,000 for local irrigation and drainage district efficiency improvements
- ❑ **USDA OAO** - \$296,831 for the Assistance for Socially Disadvantaged Farmers and Ranchers Program partnered with the University of Arizona
- ❑ **USDA RD, Small Socially Disadvantaged Program Grant** - \$188,129 for local farm
- ❑ **USDA RD, Value Added Producer Grant** - \$52,206 and \$26,268 for local farms
- ❑ **USDA AMS, Local Food Promotion Program** - \$320,000 for local food businesses (4 projects)

AWARDS

- ❑ The **2015 Project of the Year Award in Sustainability Practices** by American Public Works Association (APWA), Arizona Chapter

- ❑ The **2013 Women in Government Leadership Award** by Pima County and City of Tucson Women Council
- ❑ The **2014 Sisterhood in Government Award** by Pima County and City of Tucson Women Council
- ❑ 2002 Graduate College Fellowship, University of Arizona
- ❑ 2001 Graduate College Fellowship, University of Arizona
- ❑ 1997 Outstanding Paper Award, Tianjin University

EXPERIENCE

07/2010 - Present

Vice President: Apex Applied Technology, Inc. (AATech)

- ❑ AATech is a professional engineering consulting firm focusing on economic development in rural and economic development in rural and Native American communities.
- ❑ Under Dr. Luo's leadership, AATech has initiated and managed over 14 federally funded programs, mostly in Native American Tribes, and brought a total of \$2.6 million Federal funds to AZ, since 2012.
- ❑ AATech has extensive experience in agricultural business planning, value-added project development, technical grant writing, water resources planning and engineering, construction management, outreach and technical assistance to socially disadvantaged (SDA) farmers and ranchers.
- ❑ Since 2010, AATech has assisted many local farms and ranches and played a significant role in promoting sustainable agricultural practices and community/local food system.

09/2013 - 11/2015

Manager: Sustainability and Energy Management Office (SEMO), Pima County Regional Wastewater Reclamation Department (PCRWRD), Pima County, Arizona

- ❑ Initiated and Manage the award winning "**Integrated Sustainability and Energy Management Program**", which includes:
 - Reclaimed Water
 - Biosolids Beneficial Utilization
 - Biogas Utilization
 - Energy Management
 - Nutrients Recovery
 - Research and Technology
 - PCRWRD Green Team
- ❑ Responsible for a total of \$30 million budget for the Resource Recovery efforts of the Department
- ❑ Received the **2015 Project of the Year Award from APWA** in Arizona

01/2008 - 09/2013

Civil Engineering Manager: CIP Section and Treatment Division, PCRWRD, Pima County, Arizona

- ❑ CIP Management

- Responsible for the management of the Department's Regional Optimization Master Plan (ROMP) Program with total construction budget of \$605 million
- Oversaw the management of wastewater treatment CIP and O&M projects
- Wastewater Treatment Plant Engineering
 - Responsible for providing engineering and technical support to Pima County's two large metropolitan wastewater treatment plants 41 MGD and 37.5 MGD and seven smaller outlying facilities and associated infrastructure.
- Regulatory Compliance
 - PCRWRD is currently in compliance with 35 regulatory Permits including APP, AZPDES, Storm Water, Reuse, and Air Pollution
- Construction Management through Job Order Contracting (JOC)
 - Successfully delivered over sixty (60) wastewater treatment CIP and O&M projects with a total project costs of \$13 million.

08/2006-01/2008

Project Manager/Process Engineer: Stantec Consulting Ltd., Tucson, Arizona

- Wastewater Engineering
 - Managed and participated numerous water and wastewater, planning, design and construction projects; supervised junior engineering and technical staff.
- Wastewater Treatment Process Engineering
 - Southwest Infrastructure Planning project, Pima County, Arizona
 - Individual APP Permit Review for ADEQ – Pinnacle Peak Country Estate/Beazer Homes, Phoenix, Arizona
 - Individual APP Permit Review for ADEQ – Section 14 WWTP, Far West Water and Sewer, Phoenix, Arizona
 - The Ranch at White Hills Water and Wastewater Study, Mohave County, Arizona
 - Mariposa Lakes Water and Sewer System Study, Stockton, California
 - Marana WWTF BNROD Expansion, Pima County, Arizona
 - City of Nogales WWTP 14 MGD Expansion Design/Build
 - City of Winnipeg SEWPCC Wastewater Treatment Plant Expansion-26 MGD, Winnipeg, Manitoba

08/2003-08/2006

Project Manager: Planning and Engineering Division, PCRWRD

- CIP Project Management
 - Roger Road WRF Gravity Belt Thickener Design and Construction; Total construction cost of 1.5 Million
 - Roger Road WRF Biosolids Handling System Study
 - Roger Road WRF Structural Assessment
 - Roger Road WRF Trickling Filter Condition Assessment

- Treatment Processes Simulation for INA Road WWPCF, Roger Road WRF and Randolph Park WTF
- Pima County Regional Optimization Master Planning. Total Consulting cost of \$2.0 Million
- Avra Valley WWTF Oxidation Ditch Expansion

01/1999-08/2003

Research Associate: Chemical and Environmental Engineering Department, University of Arizona, Tucson, Arizona

- ❑ Led the research project sponsored by U.S. Environmental Protection Agency (EPA) through Grant R-825223-01-0
- ❑ Supervised the research group composed of both graduate and undergraduate students
- ❑ Led a research project sponsored by National Science Foundation (Grant CTS-9624724)
- ❑ Designed and performed the laboratory experiment and molecular modeling to investigate the adsorption mechanisms of hydrophobic organic compounds in mineral microporous

Teaching Associate: Chemical and Environmental Engineering Department, University of Arizona, Tucson, Arizona

- ❑ Assisted 50-student undergraduate class in water supply and wastewater systems
- ❑ Lecturing, holding office hour and grading papers.

08/1998-01/1999

Research Associate: Biological Lab, Department of Civil Engineering and Environmental Science, University of Oklahoma, Norman, OK

- ❑ Responsible for the operations and maintenance (O&M) of the wastewater microbiology laboratory
- ❑ Conducted research on surfactant biosyntheses and the effect of bio-surfactant on the biodegradation of BTEX compounds

12/1996-07/1998

Design Engineer: Tianjin Municipal Engineering Design & Research Institute, Tianjin, P.R. China

- ❑ Pilot study of Sequential Batch Reactor (SBR)
- ❑ Municipal water/wastewater treatment plants design

PATENT

- ❑ DAT-IAT Batch Reactor. Patent no. ZL 97 1 16662.5 (P.R. China).

PUBLICATIONS/PRESENTATION

- ❑ "Integrated Sustainability and Resource Recovery Efforts in Pima County", AZ Water Energy Management & Sustainability Committee Workshop **2015**
- ❑ "Have You Seen Your Energy Bill?", AZ Water Annual Conference **2015**
- ❑ "Chasing Phosphorus (P) in a Biological Nutrient Removal Facility", AZ Water Annual Conference **2015**

- ❑ “Side Stream Treatment vs. Nutrient Recovery in Pima County”, AZ Water Annual Conference, **2014**
- ❑ “Maximizing Opportunities for Beneficial Use of Biogas for Pima County”, WEF- Residuals and Biosolids Conference, **2013**
- ❑ “Resource Recovery from Wastewater in Pima County”, AZ Water Annual Conference, **2013**
- ❑ “Understanding pH Effects on Trichloroethylene and Perchloroethylene Adsorption to Iron in Permeable Reactive Barriers for Groundwater Remediation”, International Journal of Environmental Science and Technology, accepted June 14, **2012**
- ❑ “Municipal Wastewater Sludge - Waste or Resource?” AZ Water Annual Conference, **2012**
- ❑ “A Successful Startup of a 0.5 MGD Biolac BNR Process”, AZ Water Annual Conference **2009**
- ❑ “Sustainable Biosolids Improvements Roger Road Wastewater Reclamation Facility Pima County Regional Wastewater Reclamation Department”, WEF Residuals and Biosolids Conference, **2009**
- ❑ “Promoting on-site Use of Wastewater Process Models with Customized Simulators”, WEFTEC **2008**
- ❑ “Examination of Hydrophobic Contaminant Adsorption in Mineral Micropores with Grand Canonical Monte Carlo Simulations”, *Environ. Sci. Technol.*, **2003**, 37(9): 1775-1782
- ❑ “Grand canonical Monte Carlo study of sediment-contaminant interactions”, Abstracts of papers of the American Chemical Society, 224: 125-envr part 1 Aug 18 **2002**.
- ❑ “Competitive Adsorption of Trichloroethylene and Water on a High Silica Y-Zeolite at 100% Relative Humidity”, *Microporous and Mesoporous Materials*, **2003**, 59 (2-3): 205-214.
- ❑ “Experimental and Molecular Mechanics, and Ab Initio Investigation of Activated Adsorption and Desorption of Trichloroethylene in Mineral Micropores”, *Environ. Sci. Technol.*, **2002**, 36(7), 1524-1531.
- ❑ “Square Pegs, Round Holes, and Slow Desorption”, presented at the 220th Annual Meeting of the American Chemical Society, August 20-24, **2000**.
- ❑ “Improvement of Anaerobic Digesting Process of Sewage Sludge in China”, International Symposium on Building and Urban Environmental Engineering’97, September **1997**
- ❑ “Investment of Anaerobic Sequence Batch Reactor”, Water and Wastewater, April **1997**(in Chinese)

ASSOCIATION

- ❑ Water Environment Federation (WEF)
- ❑ AZ Water

ILSE ROJAS, Ph.D.

7046 E 5th St.

Tucson, AZ, 85710

ilse.rojas@aatechsolar.com

(520) 339-9453

Profile

Extensive experience in agricultural and bio-systems engineering sciences including renewable energies, soil and water management, irrigation and drainage systems design, crop management and development. More than 9 years of experience collaborating and conducting several research and extension projects, as well as providing mentoring, training, and technical assistance to diverse groups of students, technicians, and farmers in low-income communities.

Education

University of Arizona, Tucson, AZ, USA 2009-2014

PhD in Agricultural and Biosystems Engineering

Minor: Plant Pathology

Adviser: Dr. Donald Slack (slackd@email.arizona.edu)

University of Chile, Chile 2006-2007

Agricultural Engineer (Honors student)

Specialization: Soil and Water Management (2 years of specific course work)

Adviser: Dr. Julio Haberland (jhaberla@uchile.cl)

University of Chile, Chile 2000-2005

Bachelor Degree in Agricultural Sciences

Professional Experience

Project Engineer: Apex Applied Technology, Inc., Tucson, AZ, USA 01/2015 - Present

Managing and implementing on-going projects, driving projects to completion to schedule. Assisting in business development, including, but not limiting to project bidding, grant applications, and other duties assigned. Engineering services and technical assistance and training to socially disadvantaged farmers and ranchers in Arizona.

Graduate Assistant: University of Arizona, Tucson, AZ, USA. 08/2009 – 05/2013

Completed dissertation project under the supervision of advisers. Designed model to conduct experiments in efforts to evaluate, analyze and compare sugars released coupled with respect to ethanol production from lignocellulosic residues. Coordinated various aspects of the field collection in efforts to capture uniform data for analysis and publish findings of the highest integrity.

Graduate Research Assistant: University of Arizona, Tucson, AZ, USA. 05/2011-08/2011

Assisted a colleague conducting the project “Methodology to determine the effect of water stress on sweet sorghum and development of crop coefficients”. Evaluated effects of different levels of water stress in sweet sorghum crop, soil water content measurements, irrigation management and estimation of sugars and ethanol yield using HPLC. Collaborated with team in finding solutions to resolve unforeseen variables in the field in keeping with the objective of completing the study accurately in a time efficient manner.

Graduate Research Assistant: University of Arizona, Tucson, AZ, USA. 08/2010-02/2011

Assisted in project “Ethanol from Sweet sorghum juice”. Measurement of sugars and biomass production, analysis of sugars and ethanol yield using HPLC, conducted experiments to storage and preserve sweet sorghum juice after harvesting. Provided visual display of the collected results through the data analysis program R.

- Irrigation Management Trainer:** University of Chile and National Irrigation Commission (CNR), Chile **06/2006-09/2006**
Trained local farmers in: irrigation/drainage systems, efficiency on use of water, and improvement of crops yield.
- Research Assistant:** University of Chile **01/2006-03/2006**
Project: "Management and seed production of sunflower crop". Compared yield and features of different varieties of sunflower seeds.
- Irrigation Management:** University of Chile **11/2005-12/2005**
Designed and installed of two irrigation systems: drip irrigation and micro-sprinkler systems for crops established in greenhouses and field.
- Professional Internship:** University of Chile **01/2005-04/2005**
Worked on project "Environmental repairing of soils". Activities: supervise the activities in the field to establish 27 ha of plums, design field divisions, soil preparation, irrigation system, crop establishment, and general supervision of labors.
- Quality Control of Grapes Production:** Sociedad Agricola El Recreo. 4th Region, Chile. **12/2004-02/2005**
Supervised and ensured that quality of grapes were optimal before their exportation to UE and USA.

Academic Experience

Instructor: The University of Arizona **Fall 2014**
Spanish Second Semester (SPAN 102)

Developed and taught lectures, evaluated and graded students enrolled in the class. This course was focused in to introduce the Spanish language and the many facets of Hispanic culture, and to develop language skills: speaking, listening, reading, and writing, as well as to communicate satisfactorily in Spanish.

Private Tutor: The University of Arizona **Spring 2014**
Assisted undergraduate students in varying courses dealing with statistical methods and models used to analyze high throughput data, structures and implementation of the methods in the R-based open source project Bioconductor. Worked with students of all academic abilities to achieve highest level of understanding possible.

Guest Lecturer: The University of Arizona **Spring 2014**
Statistical Bioinformatics and Genomic Analysis (ABE/MCB 516A/416A)
Conducted some lectures and discussions, covering techniques incorporated with the statistical analysis of gene expression microarrays, including signal processing, find differentially expressed genes, multiple comparisons, and planning new experiments.

Teacher Assistant of Irrigation and Drainage: University of Chile **2005-2006**
Assisted in teaching practical problems and solving techniques of irrigation/drainage design. Additional responsibilities included collaborating with the professor to create and grade quizzes and exams over 3 semesters.

Teacher Assistant of Crop Physiology: University of Chile **2003-2003**
Assisted in teaching the functions of plant cell organelles, as well as fundamental processes including: respiration, photosynthesis, transpiration, nutrition, and so on; and grading quizzes and exams during 1 semester.

Teacher Assistant of Applied Botany: University of Chile **2001-2002**
Assisted in teaching plant taxonomy and morphology in laboratory and grading quizzes and exams during 2 semesters, as well as being responsible for entering and submitting student grades into the university network.

Projects

Researcher: University of Arizona, Tucson, AZ **08/2009-12/2014**

Project: "Bioconversion of lignocellulosic components of sweet sorghum into fermentable sugars". Activities in the field and laboratory including: field and water management, crop production, crop harvest, design of experiments, hydrolysis of substrate utilizing enzymes and filamentous fungi, fermentation performance, and analysis of ethanol yield and sugars release using HPLC, among others.

Co-researcher: Agricultural Research Institute, Ministry of Agriculture, Chile **06/2007-08/2008**
Project "Possibilities to make genetic improvement in useful species for bioenergy production in Chile".
Activities: Techno- economic evaluation of feasibility of biofuels production in Chile.

Co-researcher: University of Chile and AQUATROLS, USA. **12/2006-06/2007**
Project "Effect of the application of two irrigation coadjutants (*Irrigaid and Irrigaid Gold*) over the wetting bulb opening in different soils". Activities: carry out a trial on a sandy loam soil, evaluate effect of the coadjutants on drip irrigation wetting bulb, physical and chemical soil analysis.

Publications

Rojas, I., D.C. Slack, M.R. Riley and M. Orbach. 2012. Bioconversion of Lignocellulosic Components of Sweet Sorghum Stalks to Ethanol Utilizing Fungi and Yeast. Paper Presented at the 4th KKKU International Engineering Conference. KhonKaen, Thailand. May 10-12, 2012. Published in the Conference Proceedings. 4p.

Campos, A., Munoz, C., **Rojas, I.** 2008. Economic evaluation of genetic improvement in species for bioenergy production in Chile. Boletin Tecnico INIA, Number 180, 126 p.

Rojas, I. 2007. Effect of application of two irrigation coadjutants over the wetting bulb opening in a sandy loam soil. Graduate Shop of Agricultural Engineer. Agronomical Sciences Faculty. University of Chile, Chile. 42 p.

Technological and Career Profiling Skills

- Comprehensive experience in collection and data analysis. Extensive statistic background. Software: Matlab; Statistical Analysis System (SAS); R, JMP, and SPSS.
- Wide experience in laboratory techniques and equipment (HPLC, centrifuges, incubators, autoclave, etc).
- Strong communication, technical writing and presenting skills.
- Broad, logical thinker and planner; ability to plan and design project details with general directions and minimum supervision.
- Ability to quickly analyze progress and data to make recommendations for improvement.

Professional Associations/Membership

- ASABE (American Society of Agricultural and Biosystems Engineering)
- Alpha Epsilon, the Honor Society of Agricultural and Biological Engineers
- Active Member/Peer Travel Grant and Poster Judge Graduate and Professional Student Council, University of Arizona

Honors/Awards

- Graduate with Maximum Distinction **December 2006**
University of Chile
- Fulbright/CONICYT (Chile) **November 2007**
Scholarship to Study English in Chile (during 2008)
- Fulbright Scholarship Award **November 2007**
Scholarship to make a PhD from 2009-2013 in the USA
- ASPB Travel Award **May 2012**
Graduate and Professional Student Council Travel Award, University of Arizona

Languages

Fluent in both spoken and written English and Spanish