

# Welcome

The meeting will begin shortly, in the meantime please,

- Keep your phone muted during the meeting.
- If you have a question/comment during the meeting type it in the chat box and it will be read and addressed during the Call to Public.
- If you experience any technical difficulties, please contact ADWR Help Desk at 602-771-8444 or [tickets@azwater.gov](mailto:tickets@azwater.gov)



# Phoenix AMA GUAC

## September 21, 2023



# Meeting Agenda

1. Call to Order – Welcome & Introductions – *Chair*
2. Meeting Logistics – *Joy Arevalo Vera, ADWR*
3. Colorado River Update – *Emily Young, ADWR*  
Emily will provide an update on Colorado River hydrology
4. Arizona Water Banking Authority – *Rebecca Bernat, AWBA*  
Rebecca will present the AWBA 2024 Preliminary Plan of Operation
5. Groundwater Withdrawal Fee Recommendation & WMAP
  - a. Review withdrawal fee rates and money collected in past five years, WMAP projects, and remaining balance – *Melissa Sikes, ADWR*
  - b. Discuss and recommend to ADWR Director groundwater withdrawal fee rates for reporting year 2024 – *Council*  
*The Council will hear the current status of the WMAP fund and discuss and recommend the withdrawal fee rate for the upcoming reporting year*
6. WMAP Project Updates and Funding Request Renewal
  - a. University of Arizona’s Arizona Project WET – *Lisa Townsend, University of Arizona*
  - b. East Maricopa Natural Resources Conservation District’s Water Conservation Management Program – *Marnie Hunt, EMNRCD*  
*The Council will hear updates and discuss requests for WMAP funding. Based upon such discussion, the Council may vote to make a recommendation to the director with respect to the proposed action*
7. WMAP DCP Completed Project Presentations
  - a. Gary Woodard – Water Resource Consulting’s Water Efficiency Audits for HOA Common Areas and Other Irrigation Customers – *Gary Woodard, Water Resource Consulting*
  - b. Esser Design, L.L.C.’s Bringing the Groundwater System to Light through an Education Outreach Campaign/Video Series Targeting Youth and Adults – *Pam Esser, Esser Design, L.L.C.*
8. AMA Director Report – *Natalie Mast, ADWR*  
Natalie will provide an update on ADWR activities, including staffing, water supply & demand analyses, and the Governor’s Water Policy Council
9. Call to the Council – *Council*
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11. Adjournment - *Chair*



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*Groundwater Users Advisory Council*

*Colorado River Basin Status Update*

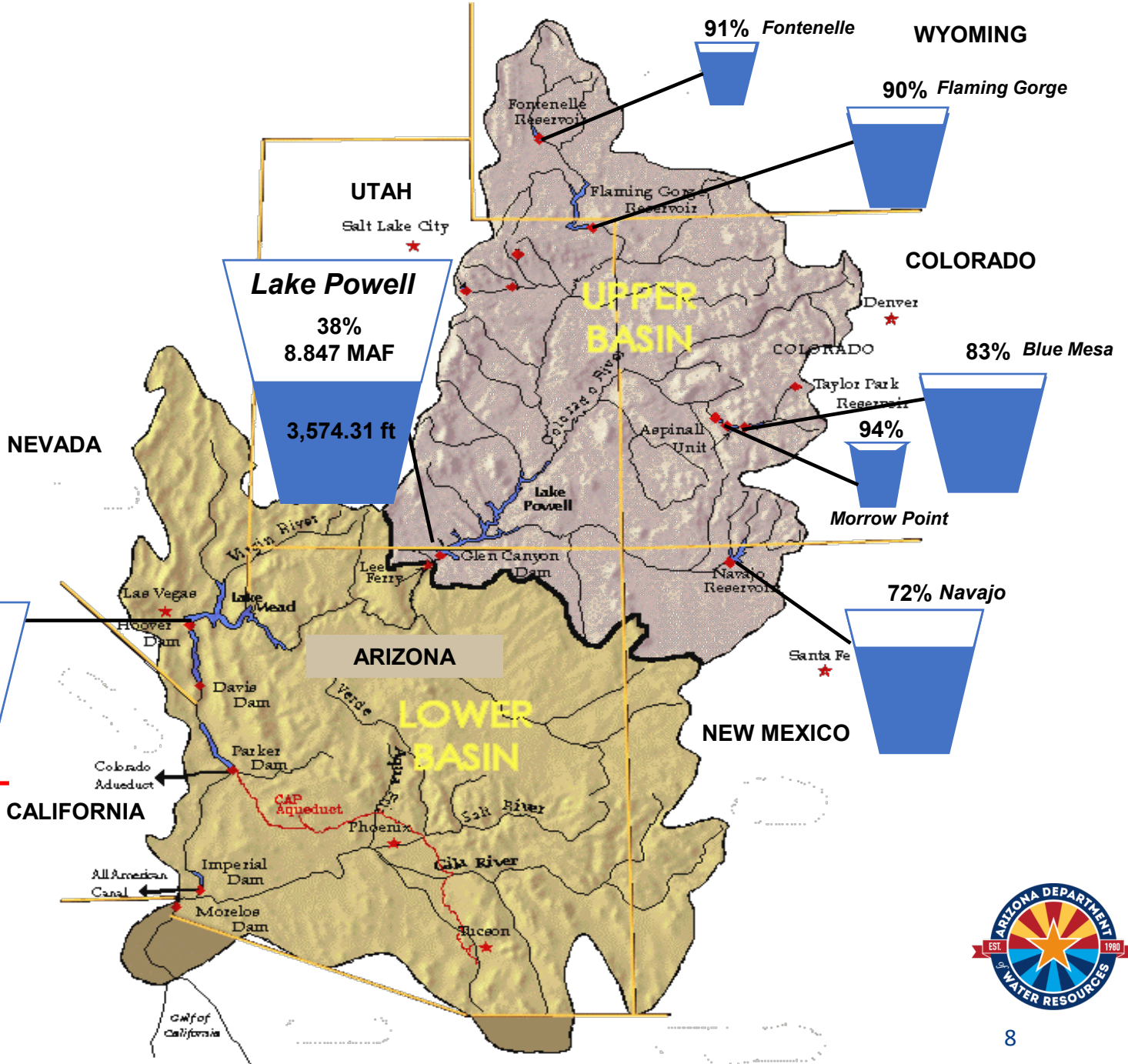
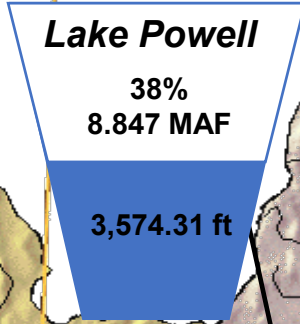
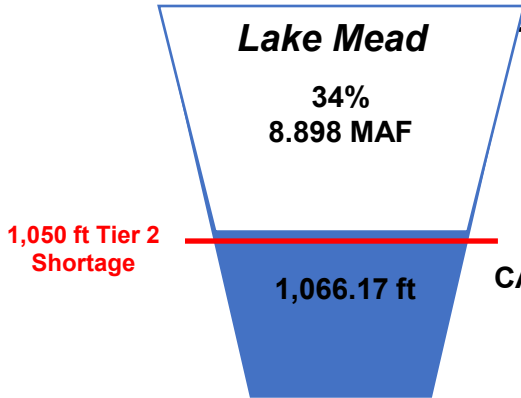
*Colorado River Management Section*  
*Arizona Department of Water Resources*

*September 2023*



# Colorado River System Reservoir Status

	Percent Full	Storage (MAF)
Total System Storage	44	25.62
Total System Storage (this time last year)	34	19.85



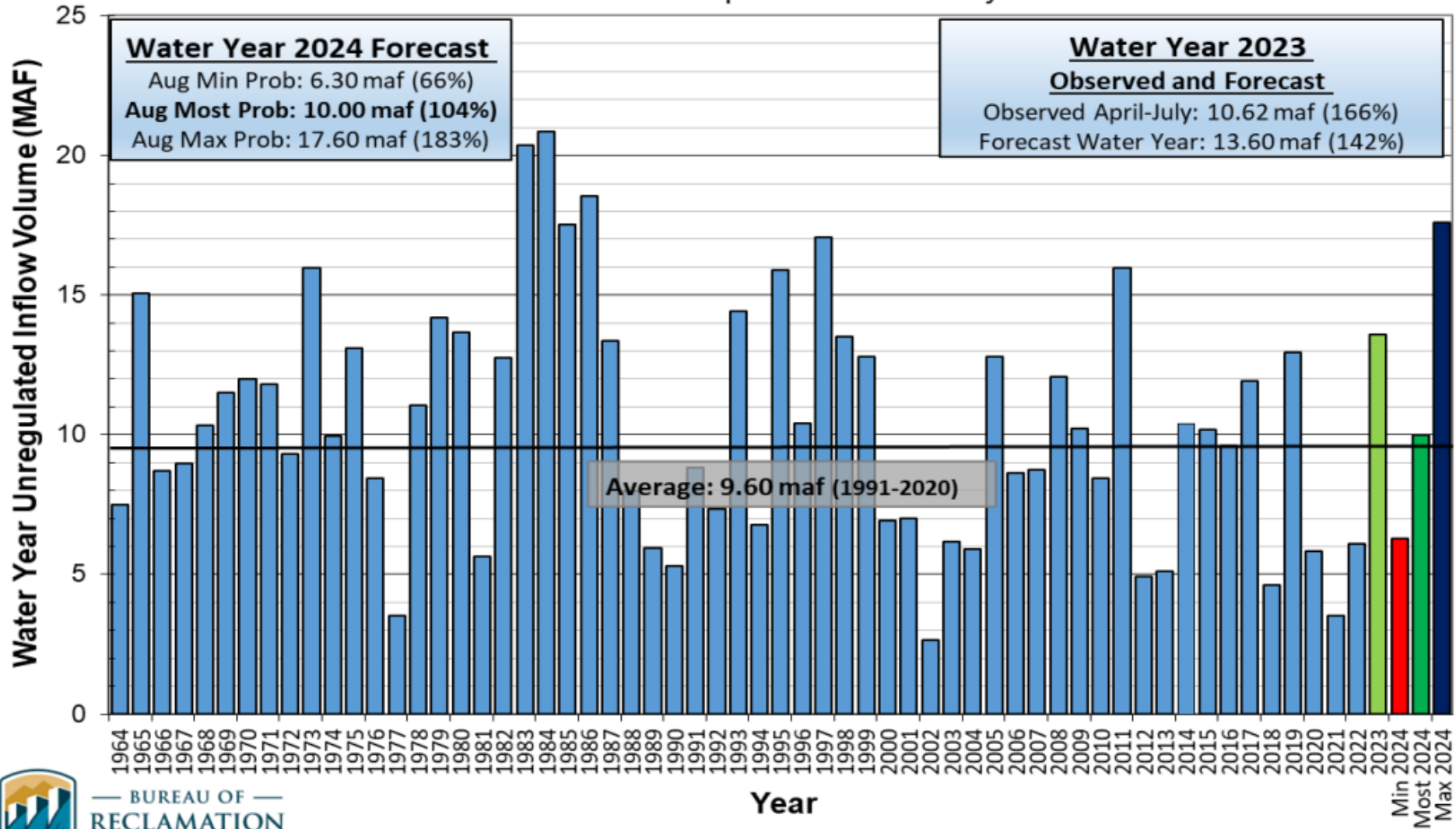
Updated as of Sept 4, 2023  
GUAC Update – September 2023



# Lake Powell Unregulated Inflow

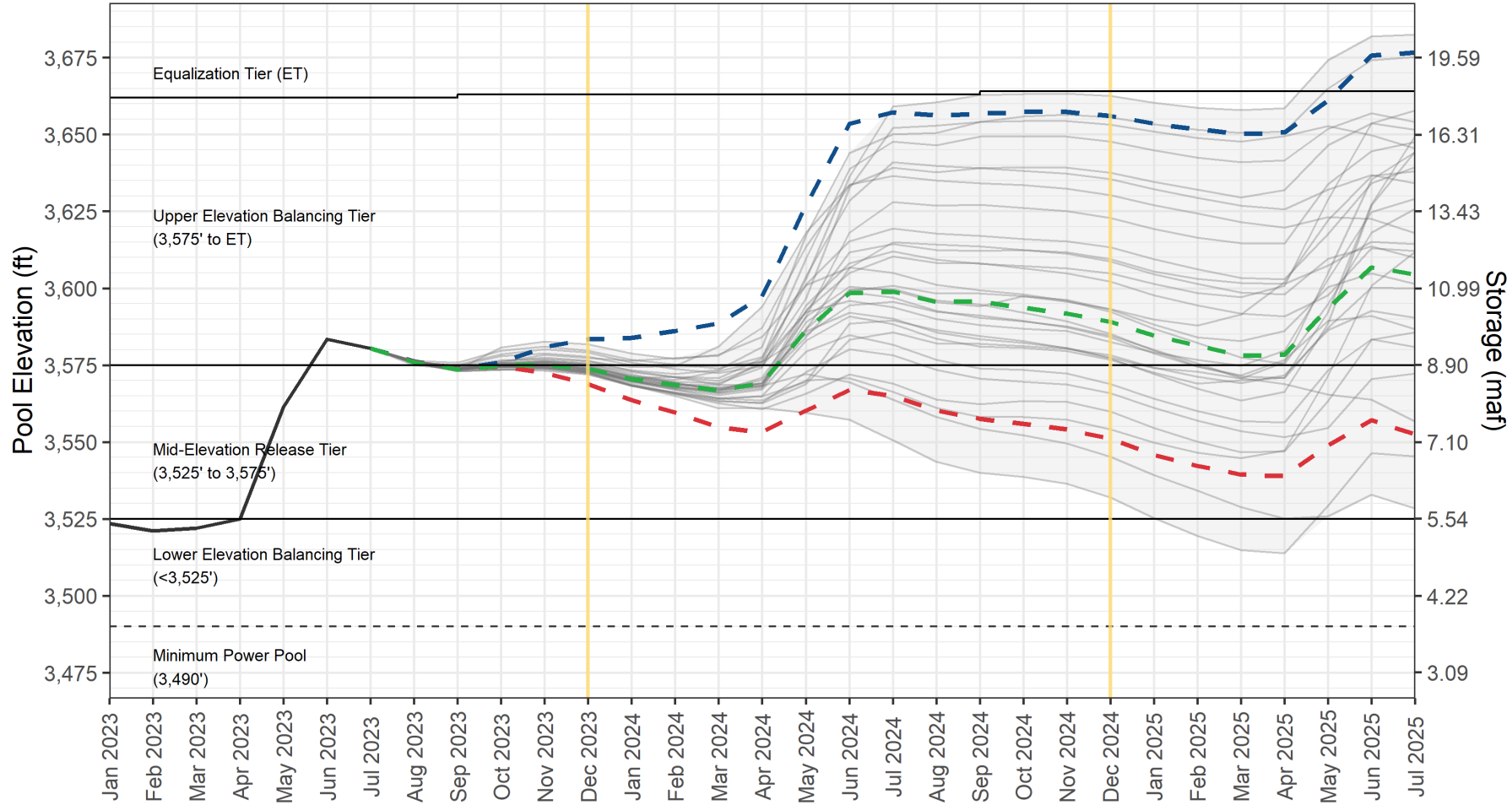
## Water Year 2023 and 2024 Forecast *(issued September 1)*

### Comparison with History



BUREAU OF RECLAMATION

## Lake Powell End-of-Month Elevations CRMMS Projections from August 2023



**End of CY 2023 Projections**

**Most Probable:**  
3,573.68 feet

**Probable Min:**  
3,568.78 feet

**End of CY 2024 Projections**

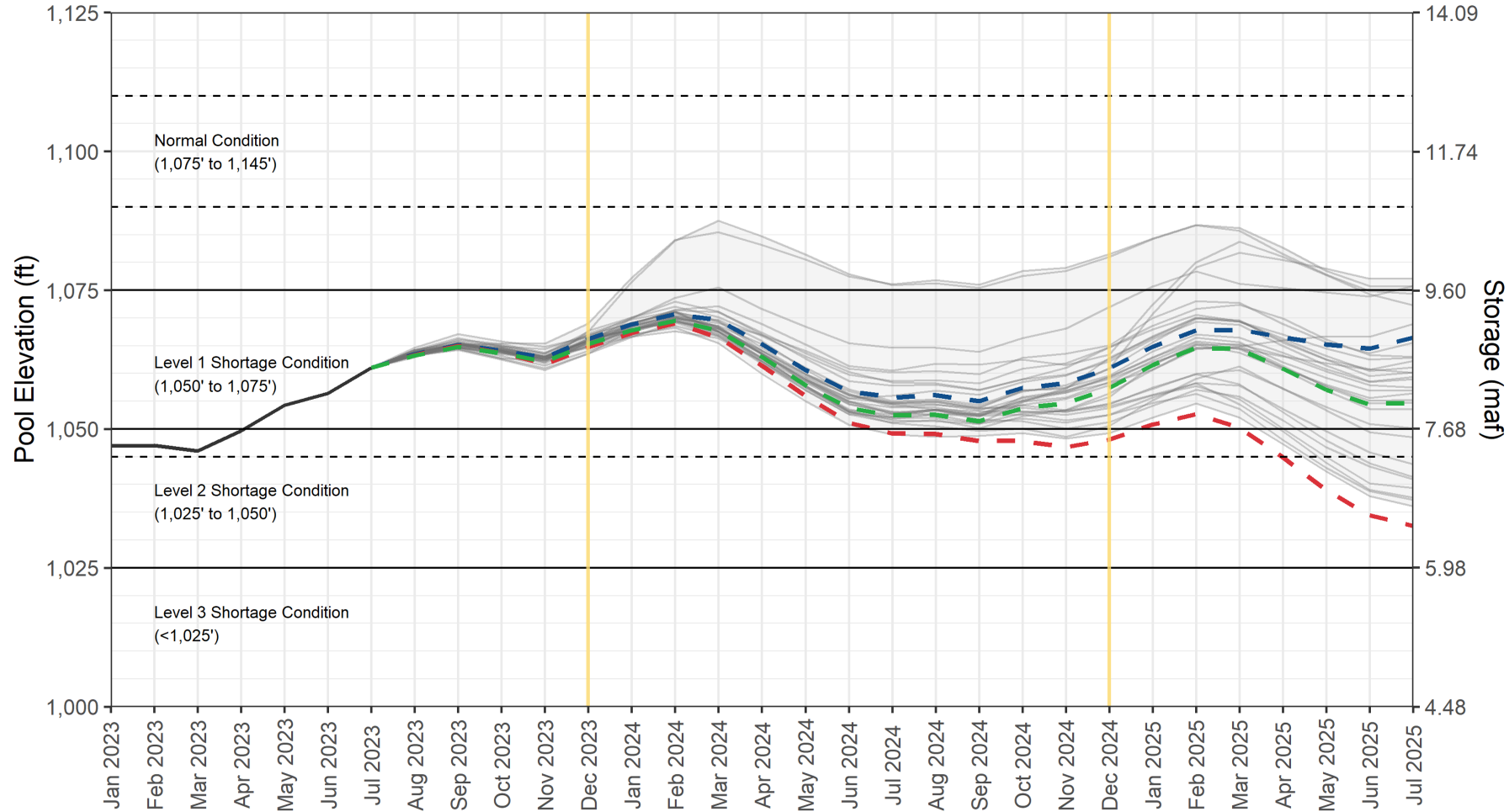
**Most Probable:**  
3,589.09 feet

**Probable Min:**  
3,550.94 feet

- August 2023 Probable Maximum 24-Month Study
- August 2023 Most Probable 24-Month Study
- August 2023 Probable Minimum 24-Month Study
- Historical
- CRMMS-ESP Projection (30 traces)
- CRMMS-ESP Projections Range



### Lake Mead End-of-Month Elevations CRMMS Projections from August 2023



**End of CY 2023 Projections**

**Most Probable:**  
1,065.27 feet

**Probable Min:**  
1,064.74 feet

**End of CY 2024 Projections**

**Most Probable:**  
1,057.43 feet

**Probable Min:**  
1,048.13 feet

- — August 2023 Probable Maximum 24-Month Study
- — August 2023 Most Probable 24-Month Study
- — August 2023 Probable Minimum 24-Month Study
- Historical
- CRMMS-ESP Projection (30 traces)
- CRMMS-ESP Projections Range



# Supplemental EIS Process Update

- Reclamation continues to work on the Supplemental EIS to the 2007 Interim Guidelines and DCP, which was withdrawn in May.
  - Modeling the Lower Basin proposal.
  - New Draft SEIS anticipated in October.
  - Will provide coverage for the remaining interim period.

# Post-2026 NEPA Scoping Comments

ADWR signed two scoping comment letters, which were submitted to the Bureau of Reclamation on August 15<sup>th</sup>:

- A Basin States letter, together with the Principals from the six other states
  - “The Basin States have a unique interest in the management of the Colorado River.”
  - “The unprecedented challenges we face require greater collaboration to achieve sustainable solutions.”
  - “Collaboration with Mexico is also critical.”
- A letter from ADWR
  - “...the burdens associated with protecting the Colorado River System should not fall disproportionately on any particular state, sector, or water user.”
  - If there is implementation of a storage or conservation framework, AZ will also require an intrastate framework.
  - Post-2026 GLs must ensure water user practices are updated to minimize waste throughout the Basin.

Letters are available at: <https://new.azwater.gov/how-do-i/find-info/colorado-river-shortage-preparedness>

# Questions?

**James Heffner**

**Phone:** 602.771.8411

**Email:** [jheffner@azwater.gov](mailto:jheffner@azwater.gov)

**Emily Young**

**Phone:** 602.771.8516

**Email:** [eyoung@azwater.gov](mailto:eyoung@azwater.gov)

**Colorado River Conditions:**

[new.azwater.gov/crm/dashboard](http://new.azwater.gov/crm/dashboard)

**Website:** [new.azwater.gov](http://new.azwater.gov)

**Twitter:** [@azwater](https://twitter.com/azwater)



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# 2024 Preliminary AWBA Plan of Operation

Rebecca Bernat, Ph.D., Manager



Phoenix AMA Groundwater Users Advisory Council  
September 21, 2023

# 2024 Preliminary Plan of Operation

## Credit Development

- No Excess CAP water available to AWBA
- Goals achieved through other means
  - Long-term Storage Credit (LTSC) purchases
  - Intentionally Created Surplus (ICS) Firming Credits



# Funding for 2024 Plan of Operation

Funding Source	Estimated Funds Available		Estimated Funds Utilized		Estimated Credits (AF)	
	AWBA	CAWCD	AWBA	CAWCD	Water Storage	Developed Credits
<b>Withdrawal Fees</b>						
Phoenix AMA <sup>1</sup>	\$ 1,728,924		\$ 1,728,924		0	5,638
Tucson AMA <sup>2</sup>	\$ 764,006		\$ 764,006		0	2,120
<b>Water Storage Tax<sup>3</sup></b>						
Phoenix AMA <sup>4</sup>		\$ 3,321,000		\$ 3,321,000	0	9,260
Pinal AMA					0	0
Tucson AMA <sup>2</sup>		\$ 7,818,000		\$ 7,818,000	0	21,740
<b>Total</b>	<b>\$ 13,631,930</b>		<b>\$ 13,631,930</b>		<b>0</b>	<b>38,758</b>

<sup>1</sup> Funds used to develop ICS Firming Credits at \$276/AF pursuant to AWBA's 2019 IGA with the Community. Developed credits include a 10% loss factor.

<sup>2</sup> The purchase rate of \$360 per LTSC is based on Tier 3 CAP water rate for 2024.

<sup>3</sup> Carryover from funds reserved by the CAWCD Board of Directors for AWBA LTSC purchases in 2021 and 2022.

<sup>4</sup> The purchase rate of \$359 per LTSC is based on Tier 3 CAP water rate for 2024.

# Distribution of Credits

## Firming for 2024

- Tier 1 Shortage condition
- Tribal firming obligation for the Gila River Indian Community (Community): 6,153 AF
  - Firming Proposal for the Community - Tier 1 Shortage in 2024:

Firming Credits Developed (AF)		Firming Credits Utilized (AF)			Remaining Balance (AF)
Year	Firming Credits Developed	CY 2022	CY 2023	CY 2024	Through CY 2024
2015	16,000	6,429	9,571		0
2016	12,000		5,004	6,153	843
2017	7,000				7,000
2018	9,000				9,000
<b>TOTAL</b>	<b>44,000</b>	<b>6,429</b>	<b>14,575</b>	<b>6,153</b>	<b>16,843</b>

- No firming for CAP M&I or on-River (sub)contractors

**No request for Intentionally Created Unused Apportionment**

# Estimated Firming Volumes thru 2024

Objective and Location	Estimated Credits Available as of Dec 31, 2023 <sup>1</sup>	Estimated Credits Used in 2024	Estimated Credits Remaining as of Dec 31, 2024
	Acre-feet		
<b>CAP M&amp;I Firming (4-cent tax)</b>	<b>2,329,457</b>	<b>0</b>	<b>2,329,457</b>
Phoenix AMA	1,582,453	0	1,582,453
Pinal AMA	234,791	0	234,791
Tucson AMA	512,213	0	512,213
<b>On-River M&amp;I Firming (gen. fund)</b>	<b>403,830</b>	<b>0</b>	<b>403,830</b>
<b>Tribal Settlement Obligations:<sup>2</sup></b>	<b>162,176</b>	<b>6,153</b>	<b>156,023</b>
Community - 15,000 AFY	162,176	6,153	156,023
LTSCs	105,390	0	105,390
Firming Credits	22,996	6,153	16,843
ICS Firming Credits	33,790	0	33,790
WMAT - 3,750 AFY	0	0	0
Hualapai - 557.5 AFY	0	0	0
<b>Future Settlements- 4416.5 AFY</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Federal Assistance (SAWRSA)</b>	<b>34,102</b>	<b>0</b>	<b>34,102</b>
<b>Groundwater Mgmt.<sup>3</sup> (W/Fees)</b>	<b>777,591</b>	<b>0</b>	<b>777,591</b>
Phoenix AMA	251,411	38,475	212,936
Pinal AMA <sup>4</sup>	417,706	-43,225	460,931
Tucson AMA	108,474	4,750	103,724
<b>Shortage Reparations<sup>5</sup></b>	<b>109,489</b>	<b>0</b>	<b>109,489</b>
Phoenix AMA	20,642	0	20,642
Pinal AMA	60,507	0	60,507
Tucson AMA	28,340	0	28,340
<b>Pinal Redirect Credits<sup>6</sup></b>	<b>14,125</b>	<b>0</b>	<b>14,125</b>
<b>Interstate - SNWA</b>	<b>613,846</b>	<b>0</b>	<b>613,846</b>

<sup>1</sup> Includes all credits accrued and utilized through 2023

<sup>2</sup> The White Mountain Apache Tribe Water Rights Quantification Act enforceability date is December 30, 2027. The Hualapai Tribe settlement enforceability date is April 15, 2029.

<sup>3</sup> Withdrawal Fee LTSCs may be used for CAP M&I firming and/or Tribal settlement obligations if needed.

<sup>4</sup> Up to 43,225 LTSCs could be credited to the AWBA's account in the Pinal AMA, pursuant to the Lower Basin Drought Contingency Plan ("LBDCP") Implementation Plan: Agreement to Exchange Long-Term Storage Credits between AWBA and the City of Avondale; City of Chandler; City of Goodyear; City of Peoria; City of Phoenix; City of Scottsdale; City of Tucson; Freeport Minerals Corporation; and EPCOR Water Arizona Inc.

<sup>5</sup> LTSCs accrued pursuant to Arizona-Nevada Shortage-Sharing Agreement executed in 2007.

<sup>6</sup> Credits accrued from water provided to Pinal AMA GSFs at full cost to the GSF operators.

# Questions?

Email: [rbernat@azwater.gov](mailto:rbernat@azwater.gov)

Website: <https://waterbank.az.gov>



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# PHOENIX ACTIVE MANAGEMENT AREA Groundwater Withdrawal Information

Year		2018	2019	2020	2021	2022	2023	2024
<b>WMAP</b>	<b>Fee</b>	\$0.25	\$0.25	\$0.25	\$0.25	\$0.25	\$0.25	Max. \$2.00
	<b>Collected</b>	\$217,989	\$190,473	\$192,269	\$189,094	\$204,201	N/A	
<b>Admin &amp; Enforcement</b>	<b>Fee</b>	\$0.50	\$0.50	\$0.50	\$0.50	\$0.50	\$0.50	Min. \$0.50 Max. \$1.00
	<b>Collected</b>	\$435,978	\$380,986	\$385,250	\$380,914	\$408,401	N/A	
<b>Water Bank</b>	<b>Fee</b>	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50	\$2.50
	<b>Collected</b>	\$2,179,890	\$1,904,932	\$1,925,479	\$1,904,572	\$2,042,004	N/A	
<b>Total</b>	<b>Fee</b>	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	\$3.25	TBD
	<b>Collected*</b>	\$3,047,255	\$2,691,035	\$2,730,644	\$2,731,949	\$2,867,164	N/A	

\*In addition to WMAP, Admin & Enforcement and Water Bank, amount includes late fees, recovery wells fee, and Water Quality Fund fee

# Water Management Assistance Program Fund:

Current Balance: \$709,336

Encumbered/committed: \$392,396

**Remaining Balance: \$316,940**

(If APW is renewed for \$75K and WCMP is renewed for \$216K, the remaining balance would be \$25,940)

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# ADWR Phoenix AMA GUAC Meeting

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Lisa Townsend, Director

Pam Justice, Sr. Coordinator

September 21, 2023



COOPERATIVE EXTENSION

**Arizona Project WET**

Maricopa County



COOPERATIVE EXTENSION  
**Arizona Project WET**  
Tucson Education

# WHAT WE DO

Arizona Project WET builds water-literate leaders, educators, professionals, and stewards.

We do this by hosting teacher professional development workshops that deepen water-related content knowledge and support evolving instructional practice.

We offer direct student and community outreach that inspires and engages through relevant, water-focused experiences and we use our expertise as educators to connect community water stewards and the K-12 education system.

Our programs are in the classroom, in “the field”, online, and in blended learning formats.

We have resources for [educators](#), [students](#), and [community members](#).



COOPERATIVE EXTENSION

Arizona Project WET

Maricopa County

## ENGAGE EXPLORE EXPLAIN

Arizona Project WET's instructional practices have students doing, exploring, discovering and explaining, which is in perfect alignment with the Arizona Science Standards approach. We help students figure out how their world works and make sense of phenomena in the natural world. Arizona Project WET lessons provide real world relevancy that makes learning engaging, interesting, and action-oriented for Arizona students at all grade levels.

*The purpose of this program is to educate K-12 students about their interconnected water resources and their importance to Arizona's future in support of Phoenix AMA's statutory goal of safe yield. Project goals are to work towards an understanding of:*

- *Surface water in terms of a watershed's components, its dynamics, and its role in the hydrologic cycle.*
- *The groundwater system in terms of its components, composition, and its role in the hydrologic cycle.*
- *The effect of snowpack on water flow in a watershed*
- *The movement of water through diverse substrates*
- *Surface water and groundwater rights in the Arizona*
- *Surface water management through containment and distribution*
- *Colorado River system allocations and uses.*
- *The Central Arizona Project and the Shortage Sharing Agreements on the Colorado River*
- *Groundwater recharge and the Arizona water bank*
- *Water reuse and augmentation*
- *Water Conservation Technology*
- *The Engineering Design Process*

*Funds granted by this contract will be used to develop and conduct curriculum components, STEM lessons, water saving projects and professional development for teachers. This funding will also expand existing programs to the entire Phoenix AMA region.*



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Arizona Project WET

Maricopa County

## WATER RESOURCES

### WE TELL ARIZONA'S WATER STORY

Arizona Project WET learners grapple with the intricacies of interconnected surface water, groundwater, the hydrologic cycle, as well as climate change, water management, and conservation. We offer real world relevancy based on the best, most up-to-date science, and most pressing issues. All water users have a voice in the study of water-Native Nations, large-scale manufacturers, animals, farmers, plants, and even the river itself.

Arizona Project WET Education digs into Arizona's water resources exploring distinctions about them, relationships between them, and the management of them. We explore the unseen groundwater system that provides 41% of Arizona's water supply and offers water storage unaffected by evaporation. We extol the brilliance of both the SRP and the Hohokam People before them, for their use of gravity to move water where it's needed. We challenge students to match the engineering feat achieved by CAPengineers of moving water 336 miles across the Sonoran Desert uphill 2,900 feet.

We study the long history of water management and use that narrative and current innovations to teach wise water use in a complex and ever-changing mix of water resources.



COOPERATIVE EXTENSION

Arizona Project WET

Maricopa County

## **Teacher Professional Development**

### ***Task 1: Teacher Multi-Day Academy***

*APW shall conduct a multi-day academy, potentially reaching 30 teachers from the Phoenix AMA. Teachers will improve their skills in engaging students in real-world and relevant science, technology, engineering, and math learning that focuses on systems thinking and problem solving. They will leave these workshops with practical applications of these concepts to utilize in their classrooms and as participants, will receive implementation support in the classroom from APW.*

### ***Task 2: Teacher 2-Day Academy***

*APW shall conduct one two-day academy targeted to engage 25 teachers in learning new STEM-oriented instructional practices and systems thinking. Teachers will leave this workshop with practical STEM applications to utilize in their classrooms and, as participants, will receive implementation support in the classroom from APW.*

---

### ***Task 3: 2.0 Teacher One-day Workshops***

*APW shall conduct two one-day workshops focused on the Project WET Curriculum and Activity Guide version 2.0, modeling interdisciplinary inquiry-based lessons, potentially reaching 50 teachers.*



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Arizona Project WET

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# Teacher Professional Development

## Task 1 – SRP

June 19 – 23

12 Teachers

impacting 1,270 students

---

## Task 2 – CAP

June 5 – 6

11 Teachers

impacting 1,255 students

## Task 3 – Ongoing

2022 – 2023 Academic Year

163 Teachers

impacting 4,401 students



COOPERATIVE EXTENSION

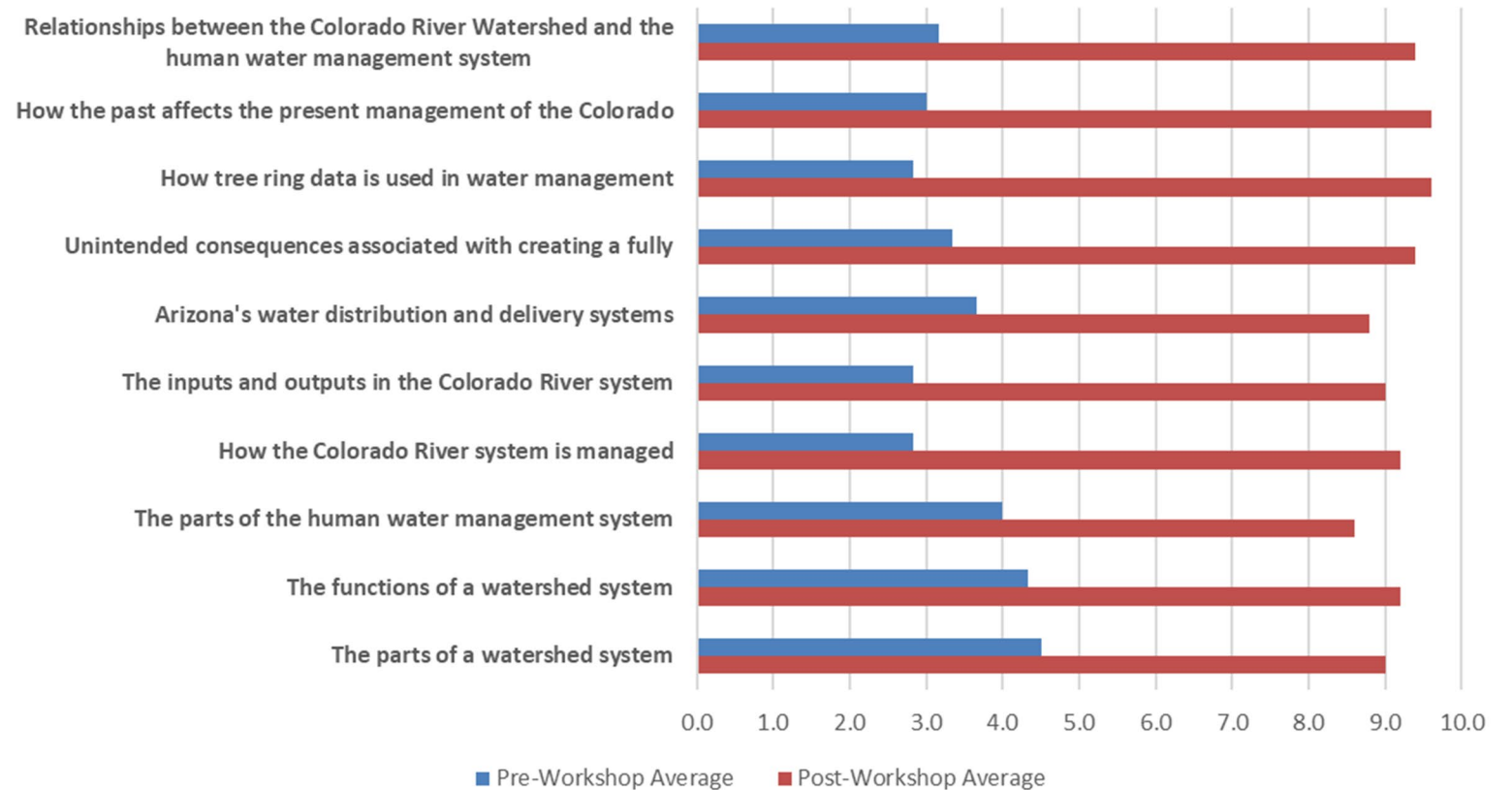
Arizona Project WET

Tucson Education

# Teacher Knowledge Gain



Level of Understanding Pre- and Post-Workshop Evaluation Results



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## *Direct Student Outreach*



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Maricopa County

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### *Task 4: Water Scene Investigations Programs*

*These STEM units engage students in collecting data through a scientific process and calculating water savings based on the installation of water efficient technology. Arizona Project WET Program Coordinators will support teachers who attend our professional development sessions in facilitating these STEM units in their classrooms. APW facilitators will work with at least ten teachers to implement these real-world and relevant STEM units with their students.*

**Task 4** – Delivered to 25 students in 2 classes changing 10 aerators for a total combined annual savings of 27,395 gallons

### *Task 5: Engineering Design Process*

*The E in STEM is the most difficult subject to incorporate for most teachers. APW will support teachers who attend our professional development sessions in facilitating the design of a model of the Central Arizona Project, which brings water uphill 2900 feet across 336 miles to Tucson. APW facilitators will work with at least five teachers to implement these real-world and relevant STEM units with their students.*

**Task 5** – Delivered to 11 teachers impacting 1,255 students

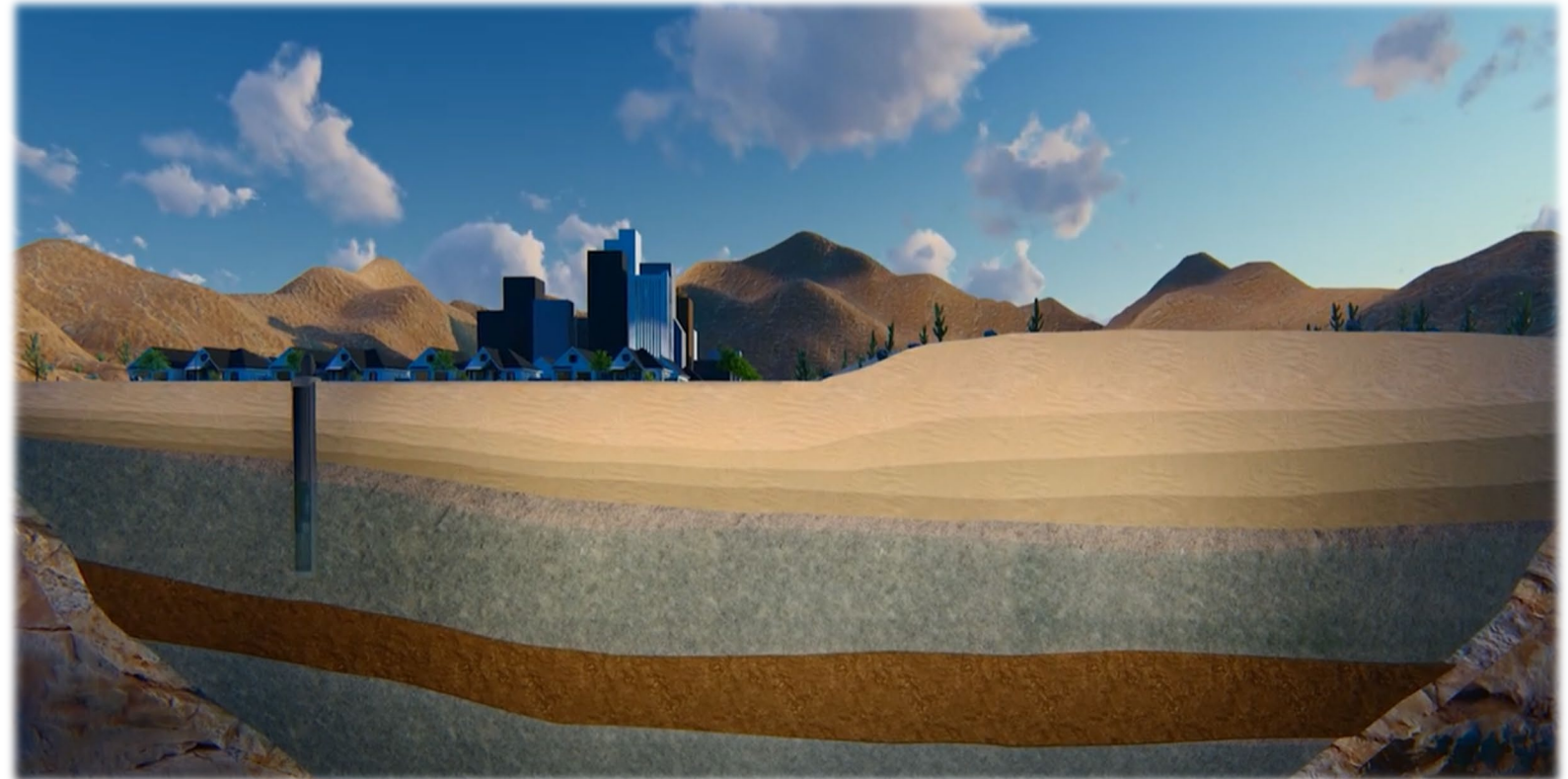
## ***Task 6: The Groundwater System***

*The groundwater system is one of Arizona's most important water reserves. Increasingly, in many areas of the state, we are even managing water storage using the groundwater system. Arizona students need to understand this system as a crucial part of the water cycle to ensure that, as decision makers, we manage this resource for future prosperity. APW will conduct groundwater presentations in at least five teachers' classrooms.*

---

### **Task 6**

Delivered to 56 classes  
impacting 1,491 students



COOPERATIVE EXTENSION

**Arizona Project WET**

Maricopa County

## ***Task 7: Riparian Area Investigations***

*In addition, students need to understand the value of water to all life. APW will support field investigations at Rio Salado Habitat Restoration Area, in partnership with Phoenix Parks and Recreation, if teachers can get their students there. APW will support at least five field days at Rio Salado. APW facilitators will work with at least five teachers to supplement instruction with real-world and relevant learning outside of the classroom.*

---

### **Task 7 – Delivered one field day to 2 classes impacting 37 students**

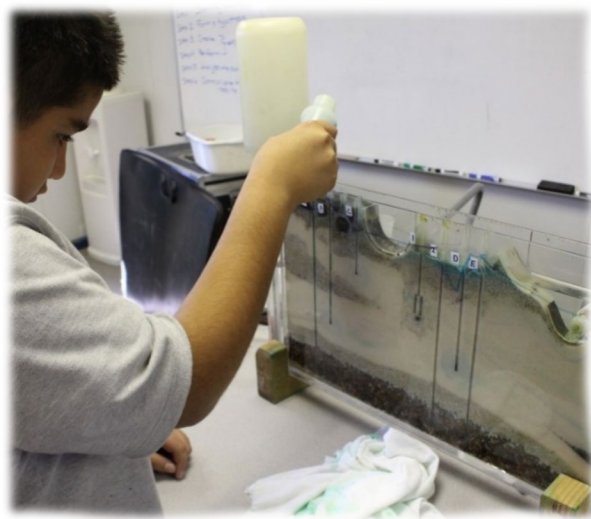




# Groundwater Concepts

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- Arizona's unique hydrological cycle and its impact on groundwater
- The components and composition of the groundwater system
- How water moves through diverse substates within the ground
- Key terms: overdraft, subsidence, safe-yield, recharge, discharge
- The importance of groundwater and impacts of human use



# Let's Keep the Knowledge FLOWING

## CONTINUE

- Teacher Professional Development
- Arizona Water Festivals
- Groundwater Conservation Education

## NEW & IMPROVED

- Rainwater Harvesting
- WSI– Program Evolution

## INVEST IN ENGAGEMENT

- Models
- Engaging, User-Friendly, and Timely Web-Based Communication



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Arizona Project WET

Maricopa County

<b>Activity</b>	<b>Amount</b>	<b>Detail</b>
Water Festival	\$15,000.00	Funding would be used to support Water festivals within the Phoenix AMA
Groundwater presentations	\$11,000.00	Funding would be used to deliver 20 groundwater presentations for 4th grade classes, and 15 groundwater presentations for 6th grade classes.
Model refresh and replace	\$ 2,800.00	Funding would be used to purchase a new groundwater model and refresh existing models for delivery of water festivals and groundwater
Multi day teacher workshop	\$11,200.00	Funding to support the delivery of up to 4 multiday Teacher workshops covering the Phoenix AMA
Program development	\$35,000.00	Funding is requested to support the development of a Rainwater Harvesting program including running 1 pilot of the new program in the Phoenix AMA. Funding is also requested to support the redevelopment of the WSI program including running 1 pilot of the updated program in the Phoenix AMA
<b>Total Funding Requested</b>	<b>\$75,000.00</b>	

# We gratefully acknowledge your support and appreciate your further consideration.

---

Arizona Project WET in respectfully requests:

**\$75,000 over a period of 12 months** to meet and grow our goals in partnership with Arizona Department of Water Resources, Groundwater Users Advisory Council, in the Phoenix Active Management Area.

*Thank you, Chairman Frank Fairbanks, Vice Chairman Stephen Bales, Stephen Cleveland, and Leslie Meyers.*



COOPERATIVE EXTENSION

Arizona Project WET

Maricopa County

# Contact Information

## Lisa Townsend

Director

Arizona Project WET

[lisatownsend@arizona.edu](mailto:lisatownsend@arizona.edu)

520-621-1092

## Pamela Justice

Education Coordinator, Sr.

Arizona Project WET

[pjustice@arizona.edu](mailto:pjustice@arizona.edu)

602-418-0471



@AZProjectWET



@ArizonaProjectWET



@arizonaprojectwet



COOPERATIVE EXTENSION

**Arizona Project WET**

Maricopa County

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WATER CONSERVATION  
MANAGEMENT PROGRAM

# Chris Fredman

Over 25 years experience

Certified Landscape Irrigation Auditor

Arizona irrigation contractor





The WCMP was originally established in 1991 to provide water users in the Phoenix AMA with technical irrigation services as a tangible benefit from the 1987 pump tax.

# ANNUALLY

---

- 40 Standard irrigation system evaluations
- 20 Technical & BMP Services
- 4 Outreach / Promotional Activities



# STANDARD IRRIGATION SYSTEM EVALUATION

Assess various technical components and managerial strategies of an irrigation system. Ultimately, a determination of the irrigation efficiency is established and when plausible, strategies for improvement are developed and discussed with the grower.



## TECHNICAL & Ag BMP SERVICES

Services are designed to aid growers with a specific aspect of irrigation water management. Technical requests include flow rate measurements, irrigation scheduling, and Ag BMP enrollment.



## PROMOTIONAL & OUTREACH ACTIVITIES

An attempt to reach the public as well as maintain contact with past and future cooperators. Activities include workshops, speaking engagements, public events, and newsletters.



## COOPERATOR RESPONSES

“Thank you, I have literally saved half of my annual water use on my alfalfa as a result of working with you and the WCMP”

“knowing the uniformity of our sprinkler has helped us make changes to become more efficient and the crop has improved”

“Thanks Chris, I just used these points for a series on wise water use...”



## PROGRAM BENEFITS

### Fiscal Year 2021 Cooperator Estimates

- Impacted ~ 15,780 acres
- Saved ~ 6,160 acre feet
- ~ 22,000 house holds or over 85,000 people



# Water Conservation Management Program

NEWSLETTER

December 2021

## WHEAT Historical Consumptive Use

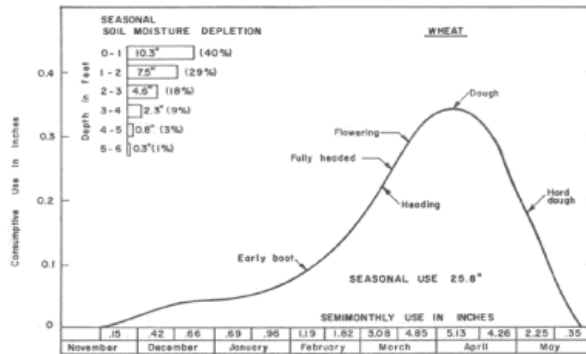


Figure 14.—Mean consumptive use for high-yielding wheats at Mesa, AZ., 1959-70.

Small grain water management has a direct impact on crop productivity and profitability. Scheduling irrigation events to occur when the crop and soil require it is a key management practice that helps maximize irrigation efficiency. There are approximately six critical crop growth stages that are good rules of thumb for timing irrigation events: 5 leaf stage, 2 nodes, pre-boot, heading/flowering, milk, and soft dough. These are good rules of thumb, however, there are several factors that influence when an irrigation event should occur. An evaluation of the active root depth, soil moisture content, crop growth stage, and weather conditions should be considered when making irrigation scheduling decisions.

Attached is a "Mean Consumptive Use Chart" from the University of Arizona that estimates annual water

consumption for Wheat produced in Arizona. The water consumption is separated by months that are further, basically, divided into halves. Divide one of those halves for a given month (whether you're in the beginning half of the month or the second half of the month will determine which of the two numbers to use) by 15 and that indicates an estimated daily consumptive use. Take half of the water holding capacity of a field, divided by the daily consumptive use, to establish a good estimation of the number days between irrigation events to avoid water related crop stress.

The WCMP is available to assist with irrigation scheduling, interpreting consumptive use charts, determining water holding capacities, and many other technical irrigation services to help you become as efficient as possible.

### WCMP SERVICES

- ❖ Irrigation System Performance Evaluations
- ❖ Flow Rate Measurement
- ❖ Ag BMP Enrollment
- ❖ Irrigation Scheduling Assistance
- ❖ Topographic Survey
- ❖ Soil Texture & Water Holding Capacity Identification
- ❖ Root Depth Determination
- ❖ Field & Set Size Measurement

Call the WCMP today!  
480.466.2968

### IRRIGATION RESOURCES

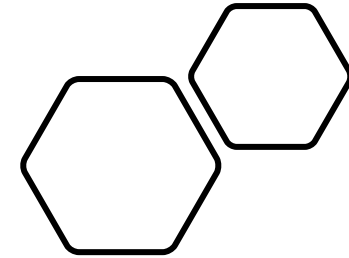
East Maricopa NRCD  
805 E. Warner Road #104  
Chandler, AZ 85225  
480.988.1078  
[www.emnrcd.org](http://www.emnrcd.org)

ADWR  
3550 N. Central Ave  
Phoenix, AZ 85012  
602.771.8500  
[www.azwater.gov](http://www.azwater.gov)

USDA NRCS  
805 E. Warner Road #104  
Chandler, AZ 85225  
480.988.1078  
[www.nrcs.usda.gov](http://www.nrcs.usda.gov)

The WCMP provides irrigation services that help improve irrigation efficiency and save you money. Through a cooperative effort between the East Maricopa Natural Resource Conservation District and the Arizona Department of Water Resources, the WCMP is a free irrigation management services program helping to sustain production agriculture in the Phoenix AMA. The WCMP provides water measurement, slope determination, irrigation scheduling assistance, irrigation system evaluations, pump energy analyses, and practical recommendations to help improve irrigation efficiency.

Call today to experience the value of the WCMP 480.466.2968



NEWSLETTER

**Ag BMP Workshop**





**NRCS Intern IWM Training  
Workshop**

Arizona Farm Bureau –  
Instagram Live  
“Talk to a Farmer;  
Water Conservation”



• Standard Irrigation System Evaluation Report – 1<sup>st</sup> Page

**Surface Irrigation Evaluation Summary Sheet**

Eval No:           

Irrigation Goal: Refill the root zone Date:           

**FIELD INFORMATION:**

Length(ft):	<u>1145</u>	Width (ft):	<u>1200</u>	Set Width (ft):	<u>87</u>
Field Size (ac):	<u>31.5</u>	Set Area (ac):	<u>2.3</u>	Crop:	<u>rye grass</u>
Grade (ft/100ft):	<u>0.40</u>	Side Grade (ft/100ft):	<u>0</u>	Field ID #:	<u>          </u>

**WATER SOURCE:**

Supply Source: IDD \$ per acre foot: \$54.00

**SOILS INFORMATION:**

Primary Soil Series: Laveen Sandy Loam Texture: FSL  
**Average AWHC\*\*\* for a 3 root zone:** 4.8 acre-inches  
 Leaching Needs:            acre-inches  
 Average Amount to Refill Root Zone: 4.0 acre-inches  
**Total Amount Needed:** 4.0 acre-inches  
 Other Soil Info:           

**IRRIGATION INFORMATION:**

Irrigation System: Graded Border Furrows / Borders per set: 2  
 Flow Rate: 400 Miner's Inches 350 Miner's Inches (amount ordered)  
 (measured) 10.0 Cubic Feet per Second  
4500 Gallons Per Minute

Field Time (hrs):	<u>24</u>	Total Depth Applied:	<u>7.61</u> acre inches	Runoff(initial)*:	<u>15%</u>
Amount Infiltrated:	(amount applied - amount of runoff)	<u>6.47</u> acre inches	Runoff (avail)**:	<u>15%</u>	

\*Initial runoff is estimated or measured tailwater leaving the field.

\*\*Available runoff assumes a 15% loss, due to seepage and evaporation, from the initial amount.

\*\*\*AWHC - Available Water Holding Capacity

\*\*\*\*Water Beneficially Used = Total Amount Needed + Assumed Reused Runoff

**RESULTS:**

Application Efficiency (AE) = Total Amount Needed / Total Depth Applied  
**AE = 53%**

Irrigation Efficiency (IE) = Water Beneficially Used\*\*\*\* / Total Depth Applied  
**IE = 62%**



WATER CONSERVATION  
MANAGEMENT PROGRAM



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# Selected Findings from Water Efficiency Audits of HOA Common Areas & Irrigation Meters

Gary Woodard, JD MPP



Roger Van Gelder, PE

Thursday, September 21, 2023  
10:00am via Remote Meeting

Groundwater Conservation Grants  
Final Report to Phoenix AMA GUAC

# The water audit team

## **Gary C. Woodard, JD, MPP**

*Water Resources Consulting*

Gary has 42 years experience in municipal water demand research, including 31 years at the University of Arizona, and 11 years as a consultant. This includes 8 years of CII water audit work for Scottsdale and Tucson.



## **Roger van Gelder, PE**

*Commercial Water Auditing*

Over the past 25 years, Roger van Gelder has conducted water efficiency audits at hundreds of CII facilities, including for Scottsdale Water, Tucson Water, Seattle Public Utilities, and the California Public Utilities Commission.

# Three major goals for all water audits:

- Help the customer save water and money
- Make them look good, and feel good about the process
- Quickly identify leaks and other cost-effective opportunities to significantly reduce water demand

## *Find the low-hanging fruit*



Reviewing data  
with water  
customer

Underground  
leak near  
valve box



# Patterns in CII water audit findings

After conducting scores of CII audits, patterns emerged:

- Leaks in buried irrigation lines are:
  - common (1 in 4 audits)
  - large (5.5 AFY average)
  - costly (\$10K/year)
- When identified, leaks are quickly repaired
- Recommended equipment upgrades typically have a 5-month payback period
- Identified potential water savings average 12% of total water use

Repair of underground leak in irrigation line



# Additional reasons to audit irrigation meters

Broken irrigation heads are common, producing intermittent “leaks”.



Failure to seasonally adjust water schedules is also endemic. Tucson Water estimates that 30-50% of irrigation systems in its service area have significant leaks and/or irrigation scheduling problems.

These irrigation scheduling issues take several forms:

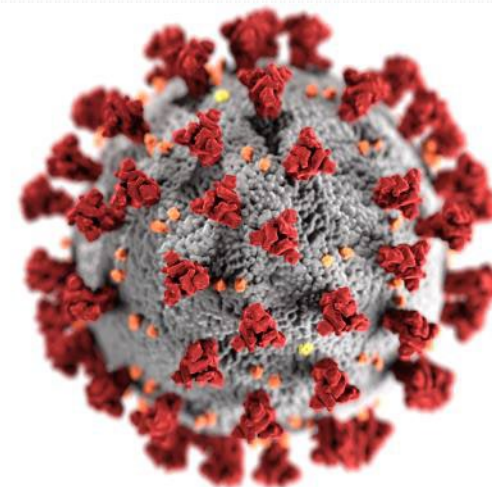
- chronic over-irrigation – too often or too long
- failure to adjust irrigation for precipitation, and
- failure to seasonally adjust the schedule

# Project delays and extension due to pandemic and unexpected level of interest in audits

Silver lining – Many HOAs were already under economic stress. Water and sewer bills were becoming an issue, which intensified during the recession.

In addition, growing drumbeat about megadrought, shortages on the Colorado River, declining Lake Mead levels created an atmosphere highly conducive to water conservation in general.

Audits promised to save HOAs both money and water.



# Budget request & supplemental funding sources

Request was for \$162,960 to complete 60+ audits.

Award was for \$120,000, with suggestion that I request the difference from the CAGR D.

CAGR D provided \$10,000 to support pre-audit steps

Several water providers agreed to cost sharing to fund additional audits:

Goodyear	\$15,000
Arizona Water Co.	\$10,000
Chandler	\$10,000
Queen Creek	\$ 3,000
Avondale	\$ 3,000
Global Water	<u>\$ 1,700</u>
	\$42,700

# HOA/Irrigation Audits differ from CII audits

## Pre-Analysis

- Several years of billing data and remote sensing were used to pre-screen potential sites for those most likely to have leaks and other irrigation issues

## High-frequency Meter Logging

- ERT or logger data was gathered before the initial site visit for sites with suspicious usage levels and/or patterns of use

## Concise Reports

- Short, heavily illustrated reports focused on the audit findings and recommendations

# Step 1 – Preliminary Analysis

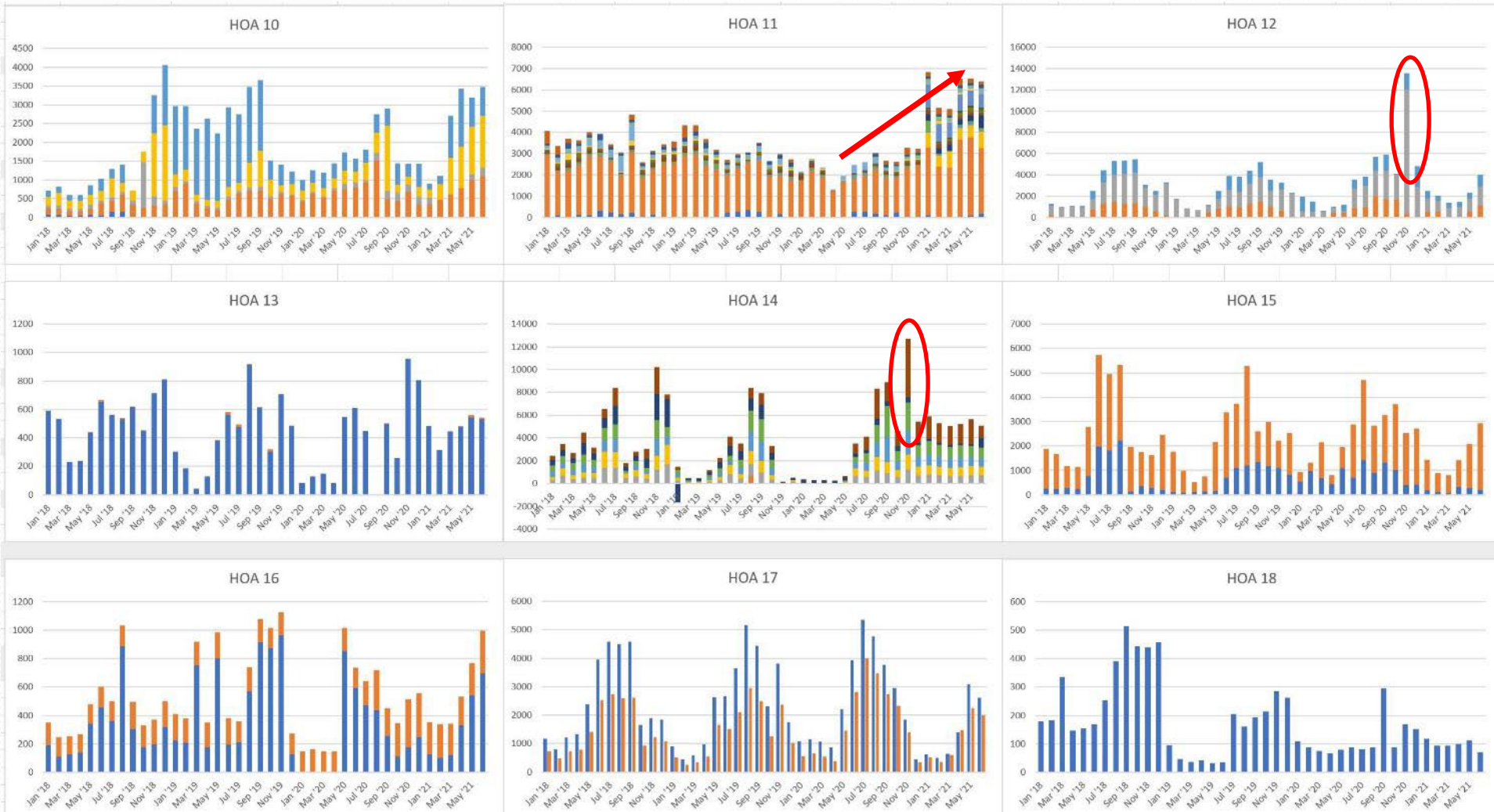
Develop a database of irrigation meter customers for participating municipal providers that includes:

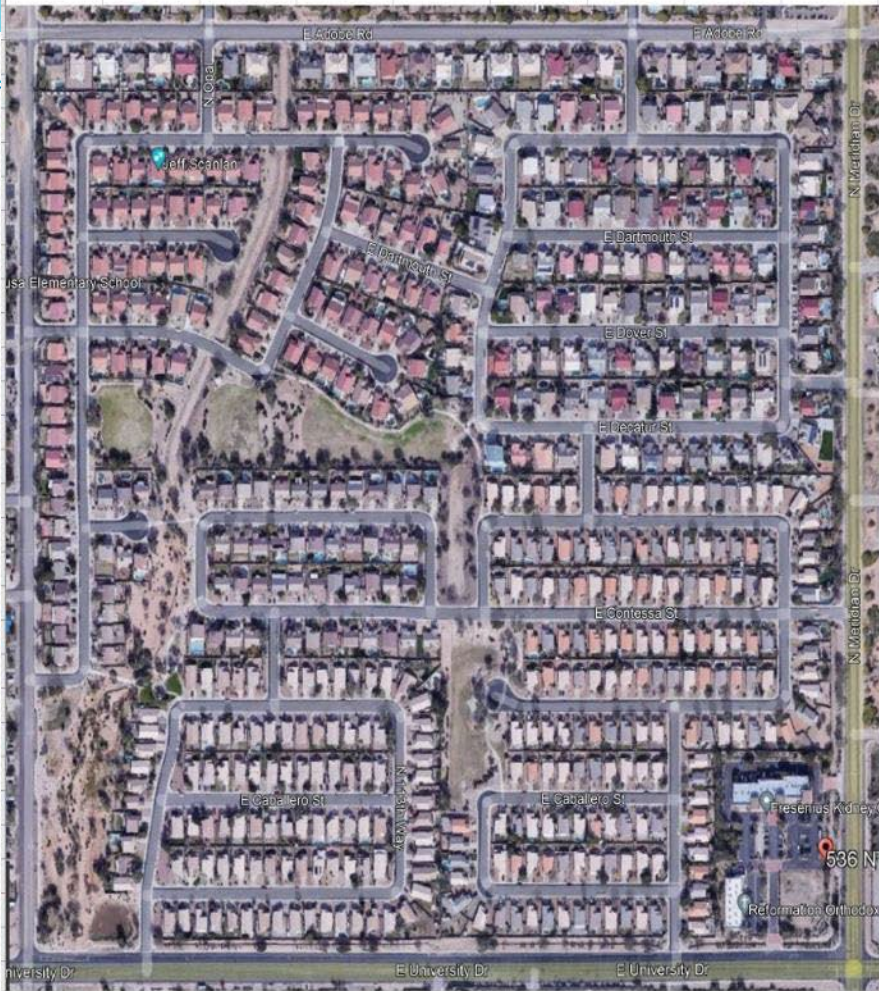
- five years of monthly billing data
- where available, hourly water use from AMR-equipped meters (generally 40 days of hourly readings)
- Remote sensing images from Google Maps or Google Earth

Usage data were examined for:

- Increases in usage over time
- Spikes in usage
- Continuous flows over 24-hour periods
- Lack of expected seasonality
- Rough estimates of irrigation efficiencies

# Preliminary analysis begins with billing records



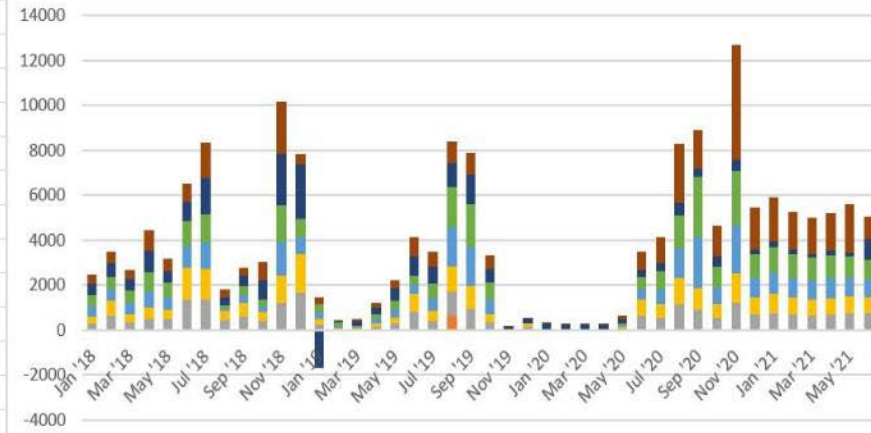


Entire HOA in summer, showing dormant common area turf

Closeup of turfed areas in winter, showing heavy irrigation



HOA 14



**Conclusions:**

There are 6 meters, and the usage through all of them increased dramatically during last winter. This pattern is not consistent with a single leak. It could be consistent with a decision to start overseeding with Rye, which appears to be confirmed through Google Earth data. Need to talk with HOA as to whether something has changed last November or December.

**Conclusion re auditing pending estimation of Rye-only irrigation requirements.**

5 turfed areas, very high quality turf in winter, poor to dormant in summer

Location	sq ft	acres
NW	29,905	0.69
NW	34,248	0.79
NE	54,697	1.26
E	40,348	0.93
SW	16,717	0.38
W	12,674	0.29
<b>TOTAL</b>	<b>188,589</b>	<b>4.33</b>

# Audit decision is based on several factors

These include:

- Date of 1<sup>st</sup> service
- Relative age of irrigation system
- Number of meters
- Total annual water use
- Months of billing record
- Seasonality (none, weak, moderate, strong)
- Trend over time
- Usage over last 12 mos. as % of previous 12 mos.
- Miscellaneous information and other factors

## Step 2 – Recruitment and site visits

Based on this analysis, customers with suspected leaks and scheduling problems were identified and offered free audits, with a priority given to HOAs.

Sites agreeing to audits were typically visited twice during which:

- high-frequency loggers were attached to the irrigation meters
- data were downloaded and analyzed
- site was visually inspected for signs of leaks and broken heads
- conductivity readings were taken of all decorative water features and their source water, and
- ultrasonic meters possibly deployed to pinpoint leak locations

HOA common areas with a swimming pool received additional inspections, beginning With conductivity readings.



# Instruments installed

- Meter loggers were installed on city meters with continuous flows but for which hourly ERT data was not available, or resolution was too low.
- Ultrasonic flow meters were deployed on critical lines where there was no meter.
- Conductivity meters were used to determine pool leaks, fountain issues, source water of puddles.



## Step 3 – Analysis, report writing, follow-up

Audit findings are summarized in a succinct 6-page report.

Follow-up contact verify that necessary repairs and irrigation adjustments have been made.

Project effectiveness is measured by metrics that include:

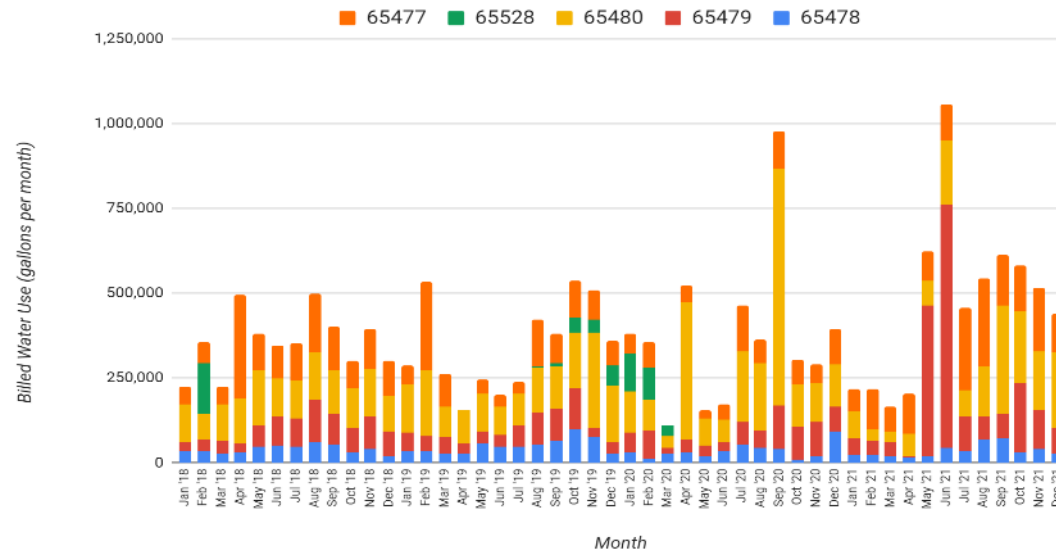
- Estimates of water savings based on quantified leaks and broken heads
- Estimates of water savings based on adjusted irrigation schedules
- Statistical estimates of water savings based on pre- and post-audit billing data

Non-quantifiable measures of effectiveness include opportunities to build or strengthen working relationships between HOAs and their municipal water providers.

# Concise Reports

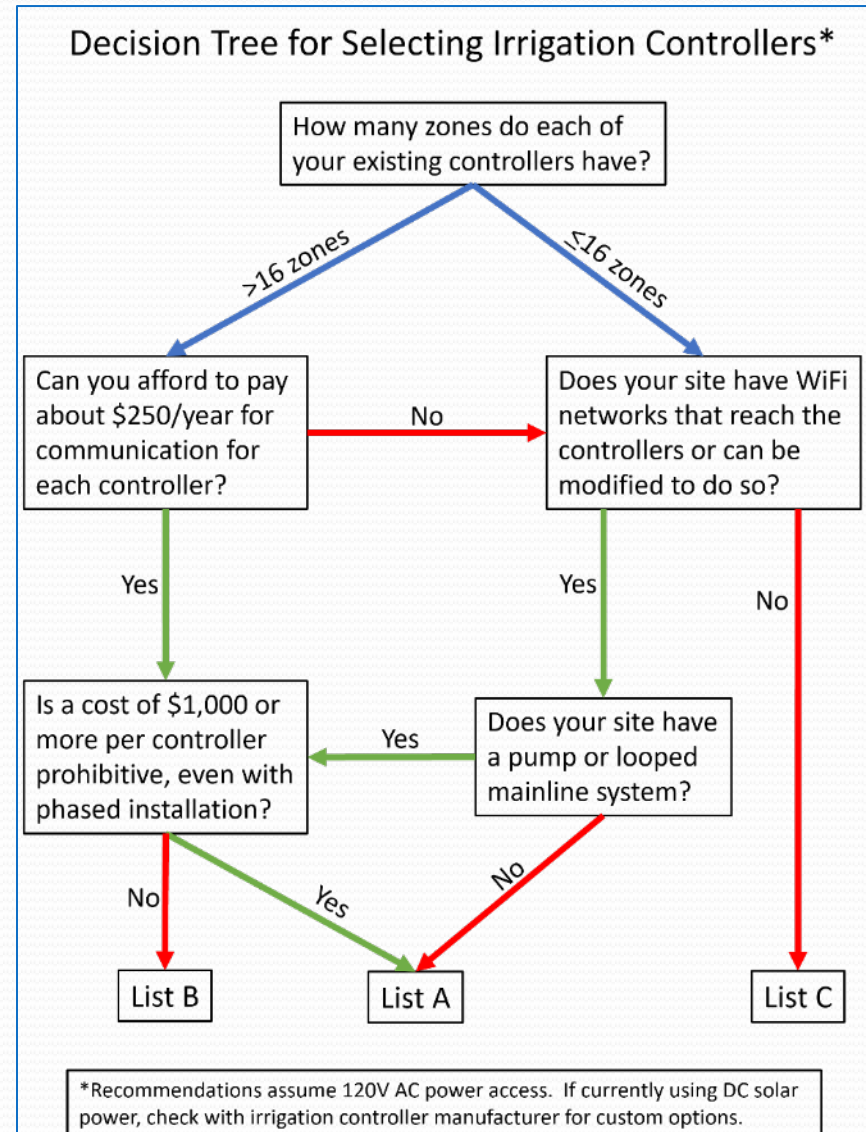
Customers receive a brief report that includes:

- Historical water use and costs analysis
- Detailed descriptions of water uses and efficiency issues by category
- Descriptions, charts, and photos of problems uncovered
- Proposed measures with estimated savings potential



# Follow-up Support included:

- HOA irrigation management BMPs
- Post-audit survey and summary
- Smart controller purchase guide with decision tree
- Workshop on selecting and programming smart meters



# Participating providers and service areas

- Arizona Water Company
  - Apache Junction, Gold Canyon, Superior, White Tanks
- Avondale
- CAGR D
- Chandler
- Global Water
- Goodyear
- Queen Creek
  - (no name), H2O Inc., Diversified Water
- Scottsdale

# Summary of Audit Activity

<u>Number</u>	<u>Activity</u>
500+	Pre-analyses (billing & remote sensing data)
120+	Sites identified for potential audits
82	Unique sites visited
120+	Site visits made
80	Final reports
51	Reports on HOAs (64% of total)
187	Total recommendations made
2.5	Recommendations per report
67	Leaks detected
84%	Percent of sites with at least one leak detected

# Non-HOA Common Area Sites

Sites were highly diverse, and included:

- Schools
- Parks & aquatic centers
- Strip mall landscaping
- Church, cemetery, rest stop

Sites also varied greatly in size and complexity, from 1 meter to over 20 meters, including sites with 57 and 74 meters.

The pre-analysis skewed selected sites towards those with more meters.

# Summary of Audit Findings

379,447	Annual water use (Kgals)
1,164.5	Annual water use (AFY)
70,087	Potential savings (Kgals)
215.1	Potential savings (AFY)
20 %	Percent water savings
\$2,341,599	Annual water bills
\$ 375,892	Potential savings
\$ 10,000	Average potential savings
17%	Percent monetary savings

# HOA/Irrigation audits vs CII audits

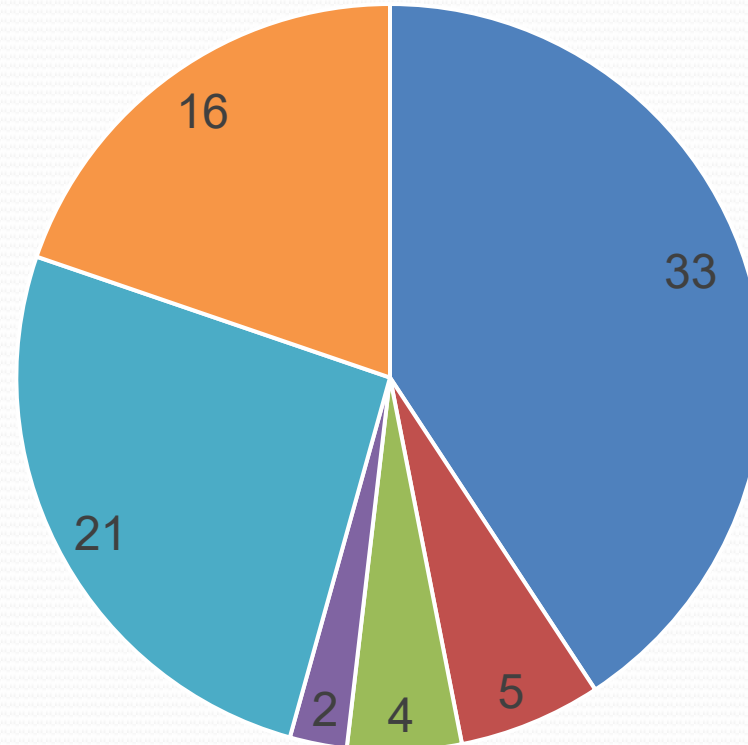
Our proposal to ADWR posited that focusing on HOAs and performing pre-analysis of potential audit sites would **increase the frequency and relative size** of uncovered leaks and other water use inefficiencies compared to CII audits. Here is what we found:

<u>Audit Metric</u>	<u>CII Audits</u>	<u>HOA/Irrig. Audits</u>
Water savings	12% 20%	(67% greater)
Monetary savings	10% 17%	(70% greater)
Irrigation meter leak(s)	25% 47%	(88% greater)

These statistics support our pre-audit assumptions. The pre-analysis led to our focusing on sites with “red flags” in historic use patterns, thereby increasing the frequency of leaks.

These audit results are consistent with the belief that HOA common areas are more likely to have leaks and other inefficiencies than CII customers, but they do not prove this.

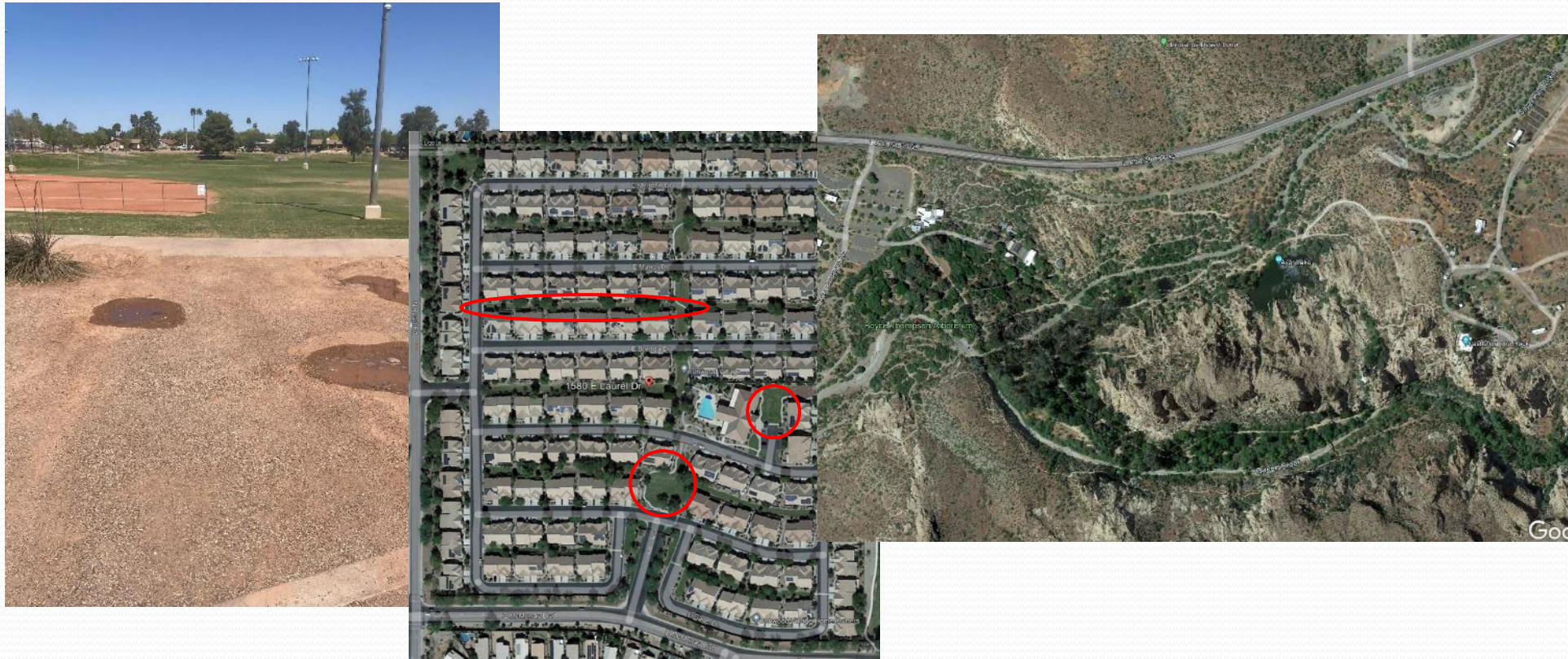
# Recommendations by Type



- Repair Leaks
- Repair/replace valves, emitters
- Replace Controller
- Reprogram Controller
- Enhance Controller
- Other

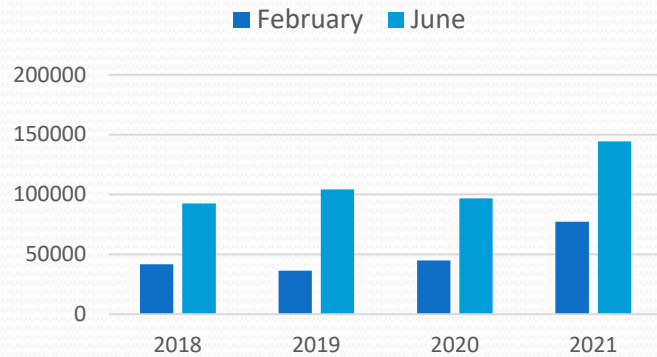
# Examples of “other” recommendations

- Remove irrigation from areas with no landscaping
- Estimate potential water/money savings for removing some turf
- Install more meters and control valves
- Replace failed meter
- Provide guidance on redoing an entire irrigation system



# Broad observation – irrigation water use is increasing

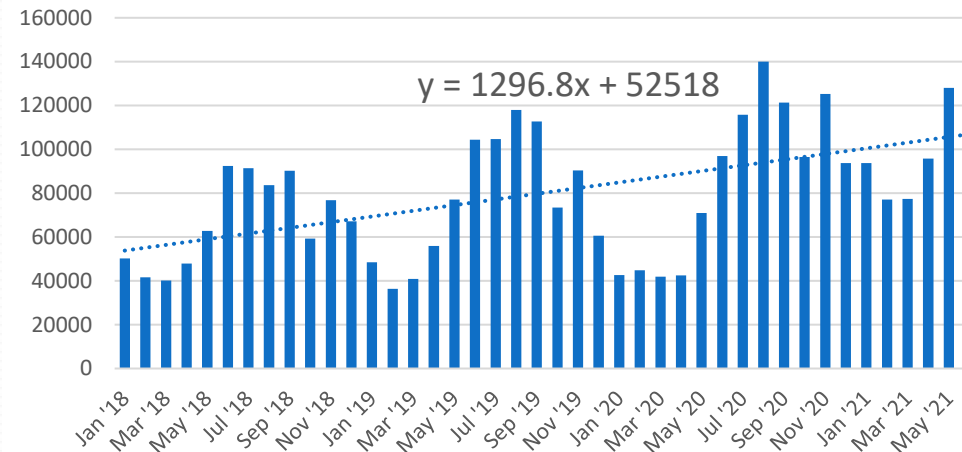
Total for All HOAs in Feb. & June, 2018 - 2021



Water use across a sample of 57 HOA common areas increased in 2021 during both months of low and high demand.

When viewed monthly, use increased fairly steadily across the 4-year period.

Total for All HOAs by Month, Jan '18 - Jun '21



# Questions?

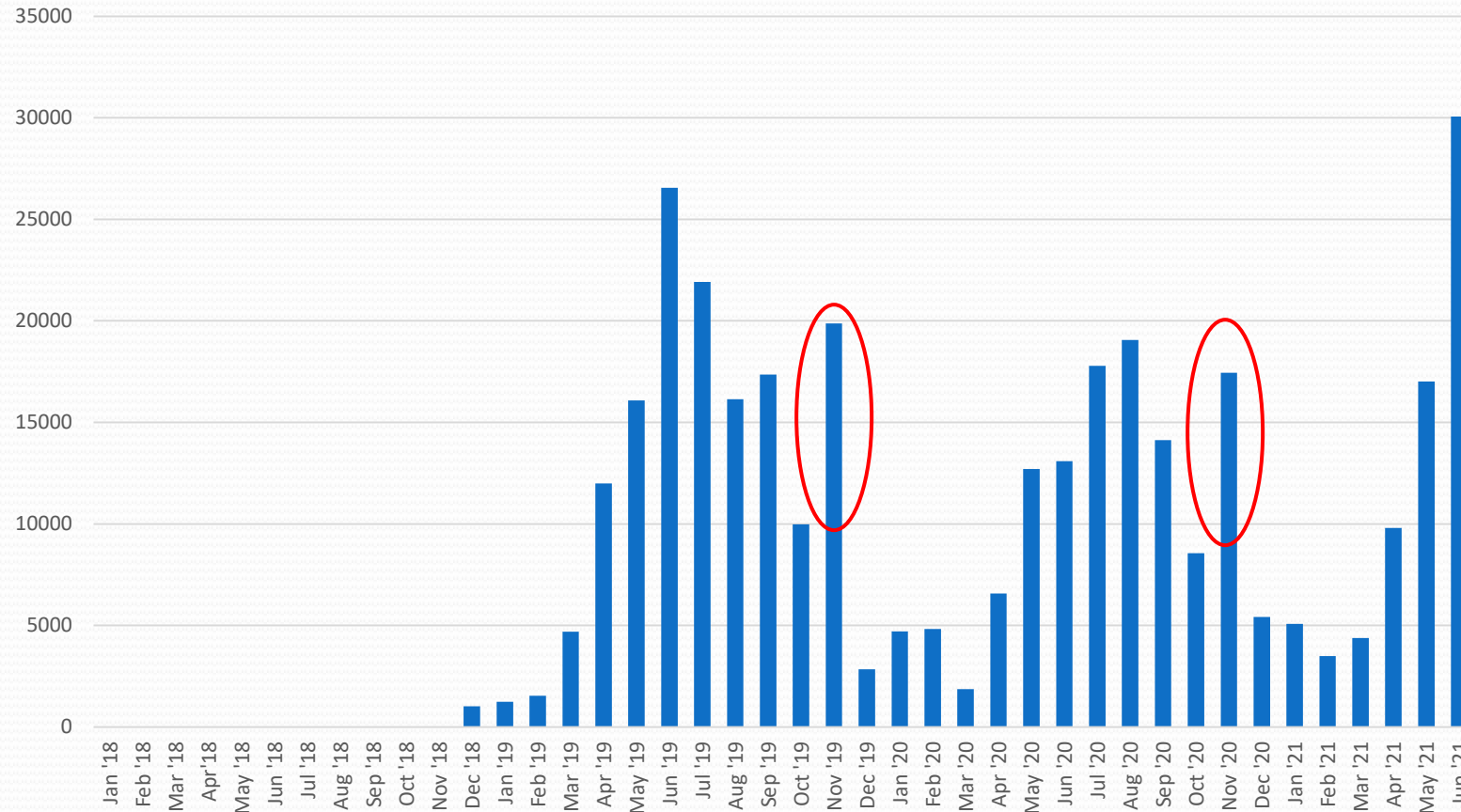
- *Identify customers with irrigation meters and low irrigation efficiencies*
- *Focus on HOA common areas*
- *Identify leaks, especially those with continuous flow*
- *Investigate other sources of leaks*
- *Make recommendations regarding repairs and upgrades to irrigation systems*
- *Follow up to verify actions taken and to quantify water savings*



Deploying an ultrasonic flow meter at a pool to log unmetered flows

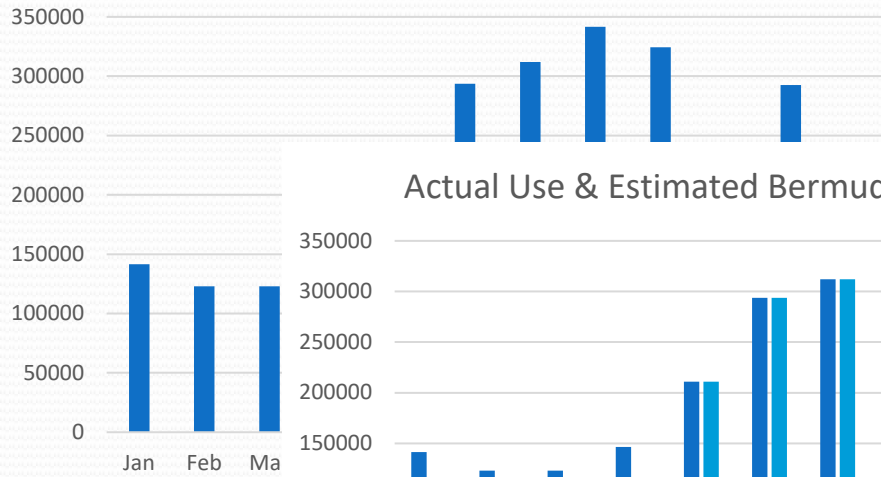
# A frequent observation – over-irrigation of Rye grass

A not unusual finding is that HOAs with winter Rye grass use as much or even more water in November as in the middle of summer.

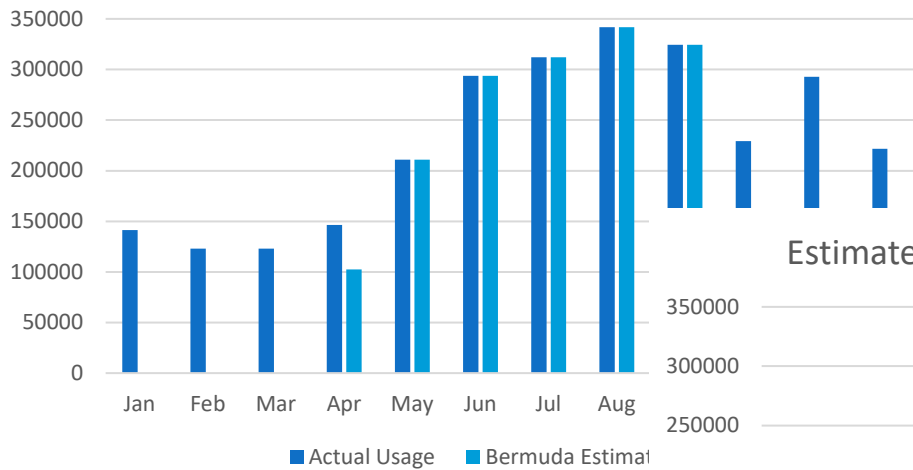


# Rye grass is often heavily over-irrigated in November

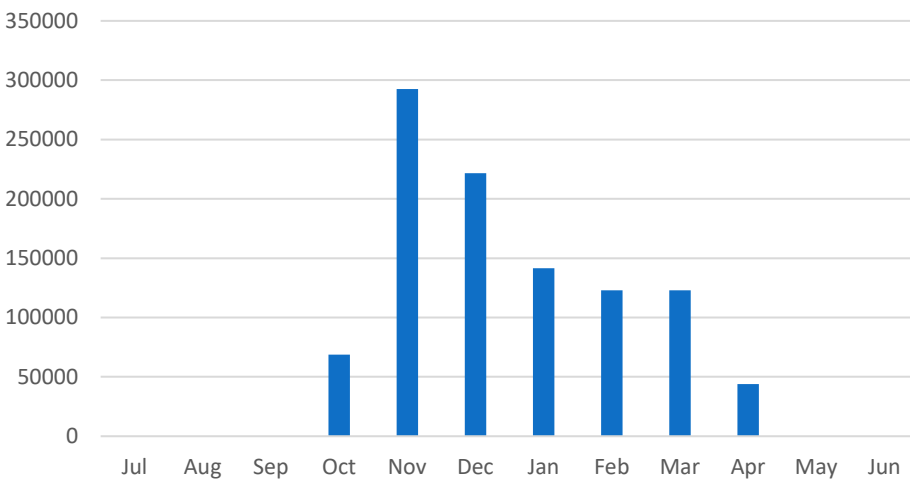
Monthly Irrigation Use, 46 HOAs, 2018-2020



Actual Use & Estimated Bermuda Use, 46 HOAs



Estimated Rye grass Use, 46 HOAs, 2018-2020



# Example issues, traces from audits

A surprising number of irrigation problems are obvious.



Flooded control box



Leak at control valve

Seeping irrigation head



Missing emitter

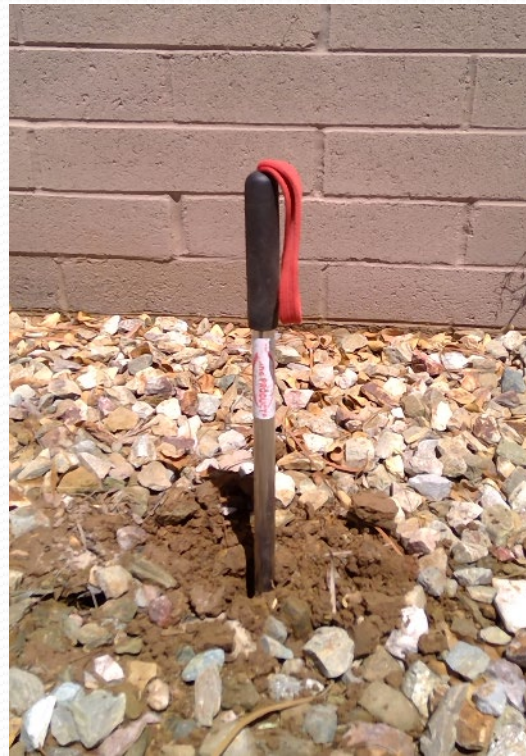


# Others require a bit of detective work



Missing irrigation head by sidewalk resulted in flood irrigation (note pattern of green grass)

A simple metal rod with handle is useful for probing for underground leaks.



Jammed controller cover could not be opened, despite there being no lock. This may partially explain why the controller appears not to have been adjusted in over a year.

# Meter traces are most useful diagnostics

High-frequency water flow traces can be obtained from three sources:

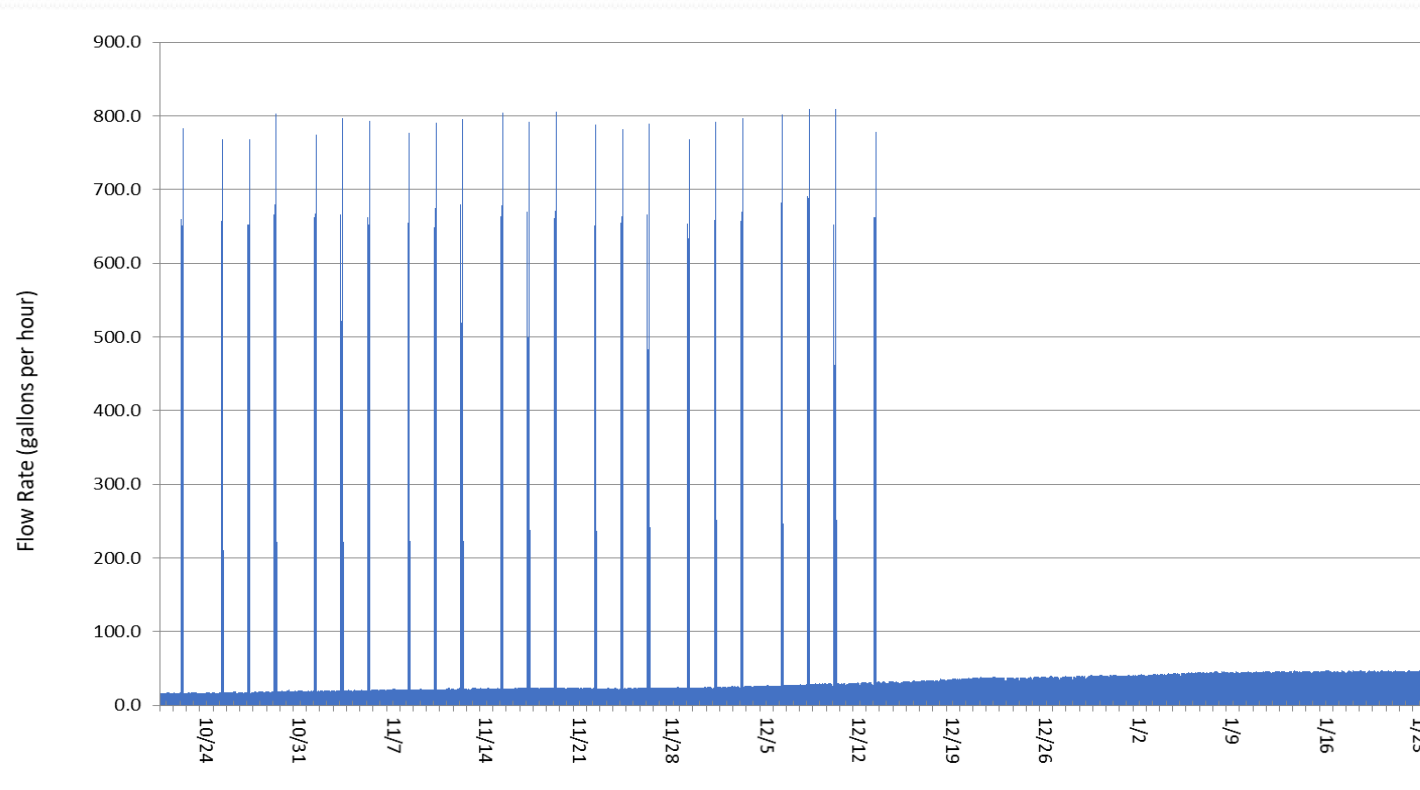
- ERT data from newer meters, 1-hour resolution, 3+ months
- Meter logging from MagneFlow loggers, 5-second resolution, 24 hours to weeks or months
- Ultrasonic meters, 10-second resolution, 24 hours to a week

When combined with historic monthly data and on-site observations, these traces often reveal detailed information about water use issues.

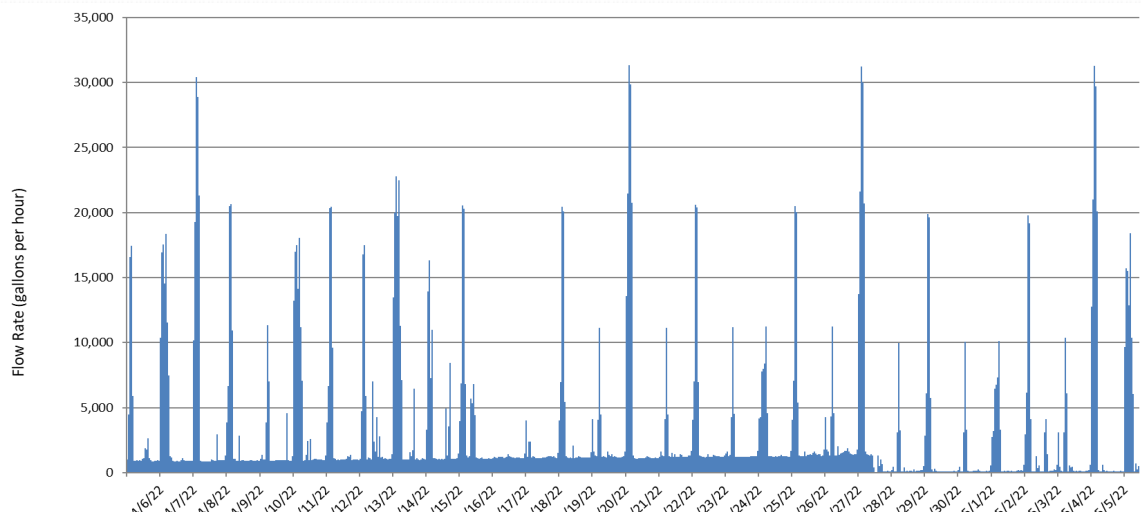


# Classic growth in continuous leak over time

Hourly logging trace shows irrigation was suspended in late December, but a main line leak grew from 16.5 gph to 45.5 gph.

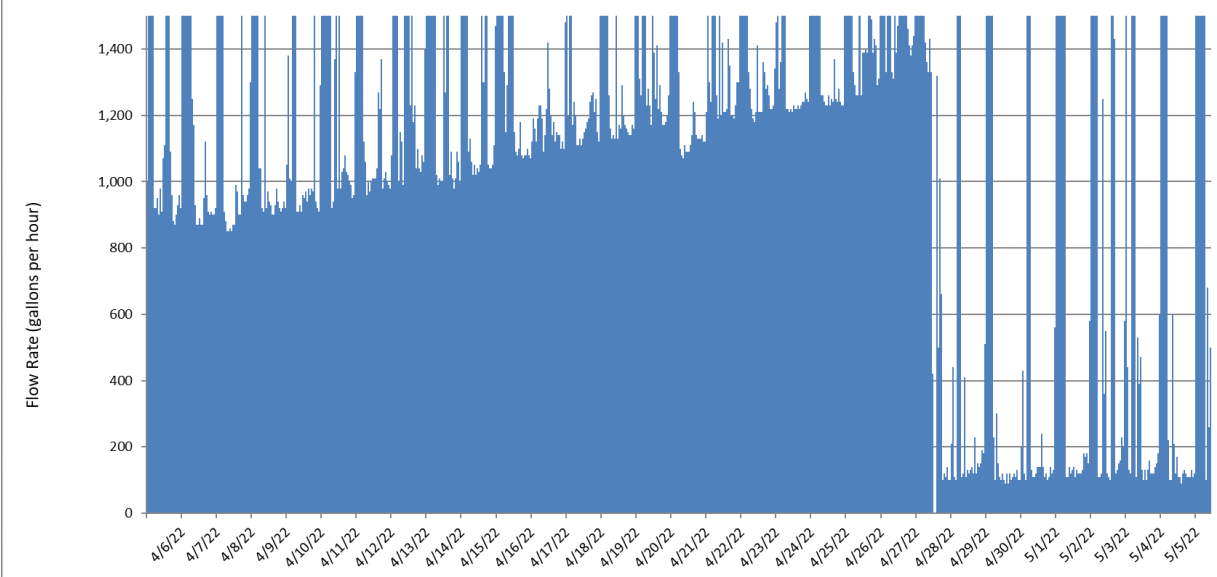


# Example – Obvious and not-so-obvious leak at a park



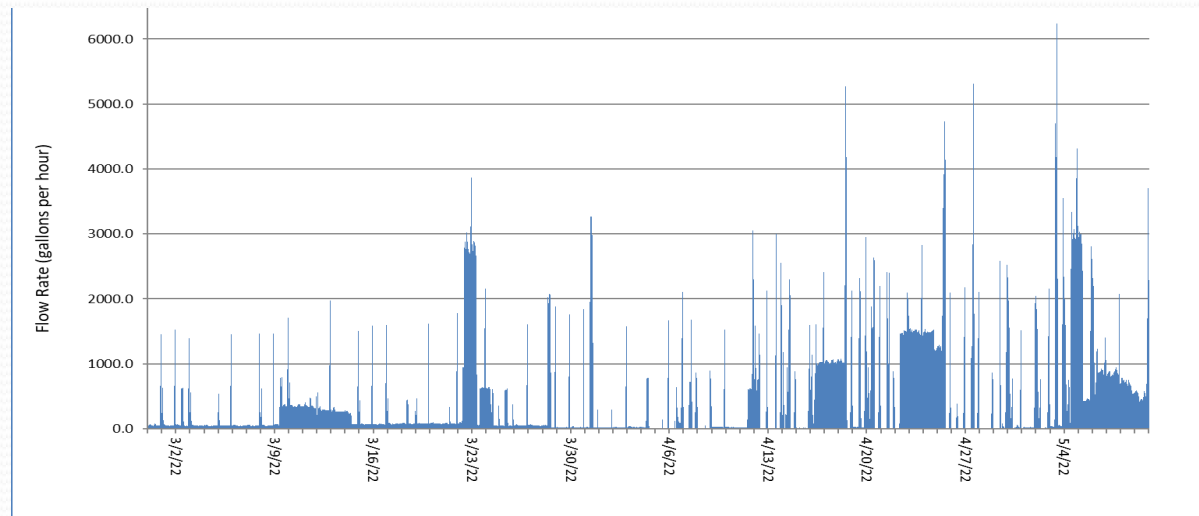
Trace appears to show that a growing leak has been repaired...

...but clipping the Y-axis at 1,500 gph reveals there was a second leak.



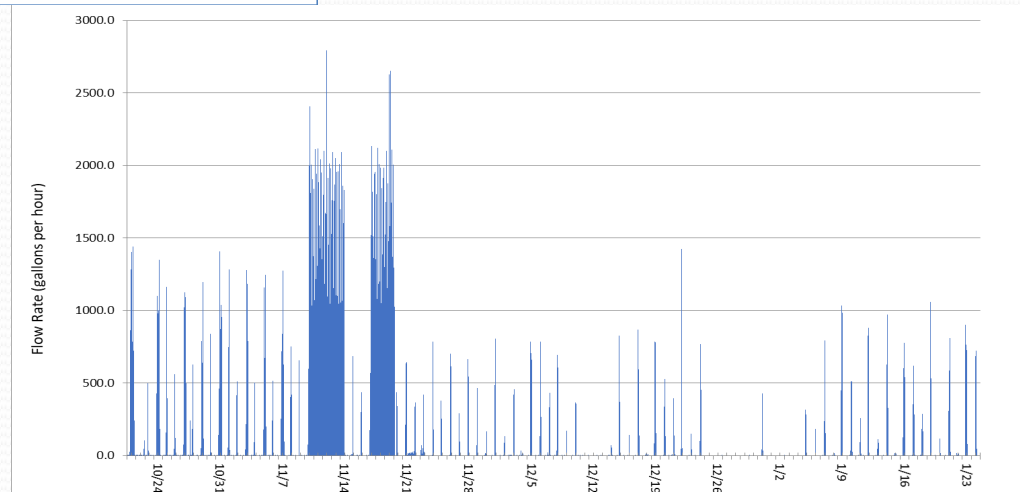
# Recommendations may be based on pre-audit leaks

Sometimes there are no current leaks but maintenance or other recommendations are made based on a history of leaks.

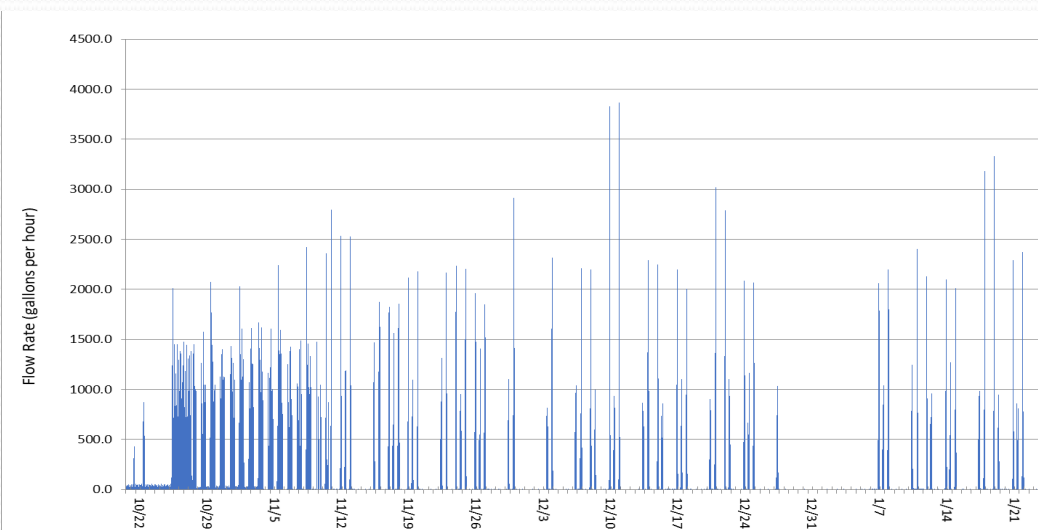
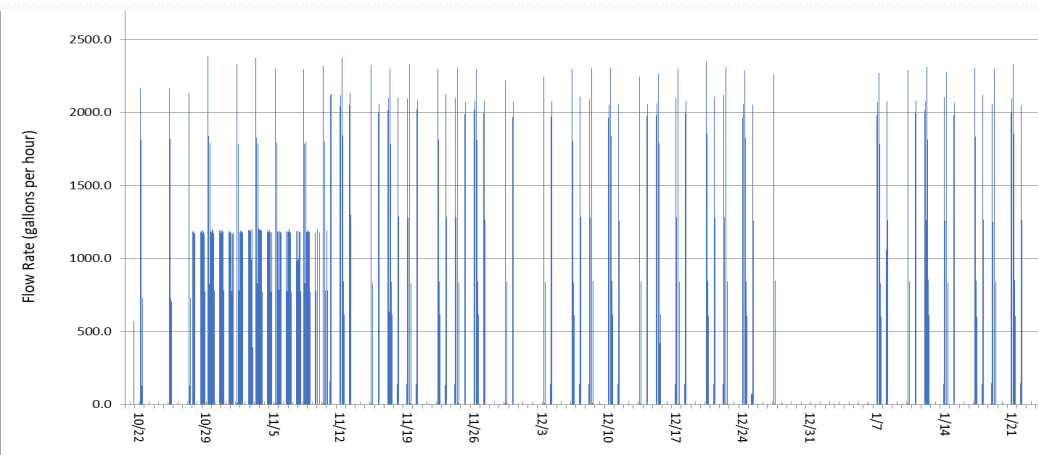


Evidence of several significant leaks in the recent past.

Another example of pre-audit leaks from hourly meter logs, lasting 4 and 3 days and averaging 25 gpm.

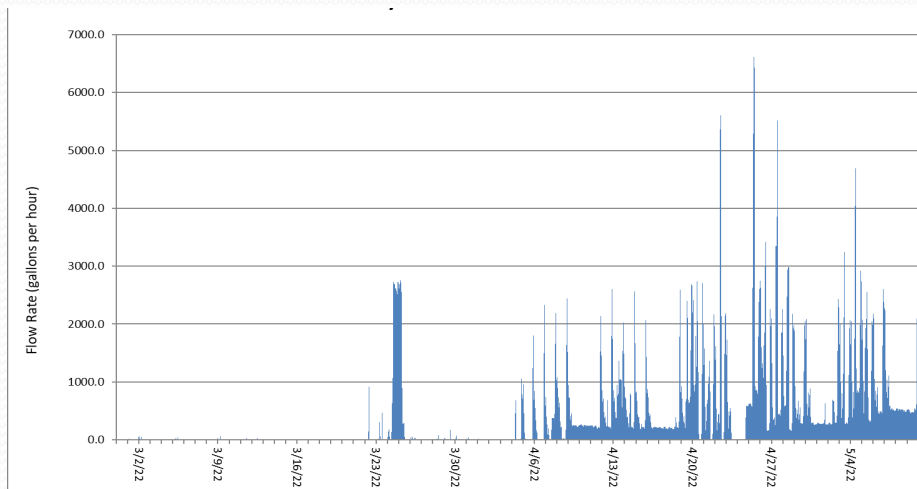
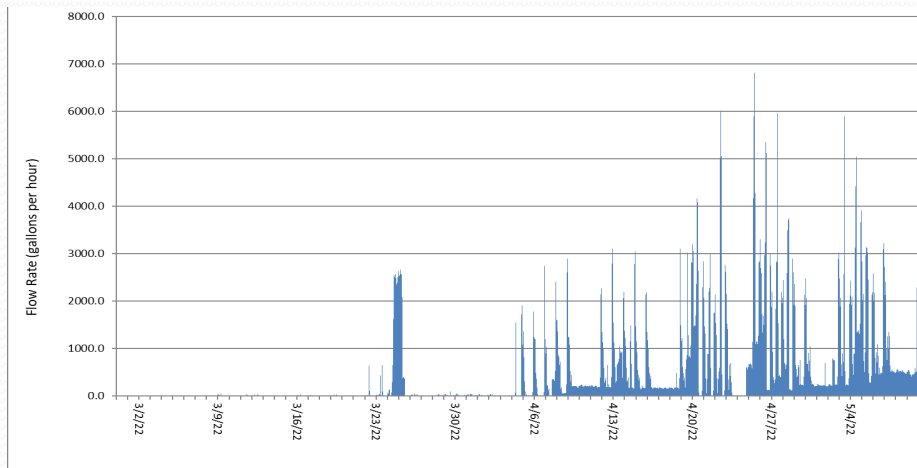


# Evidence of over-irrigation of winter Rye in fall



These traces reveal very heavy irrigation in late October and early November linked to over-seeding with winter Rye.

# Confusion about which meters correspond to particular water uses is common

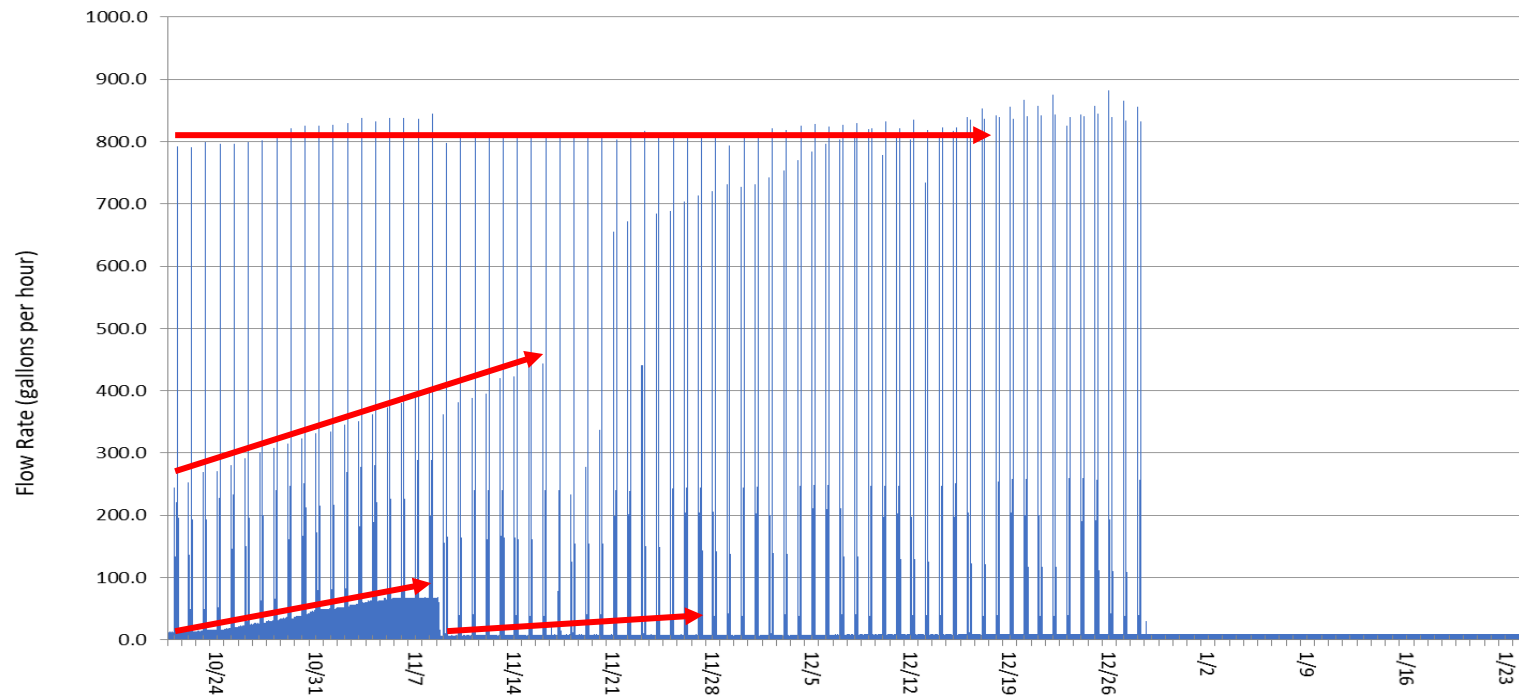


The customer explained which irrigation meter corresponded to different landscaped areas.

But these two irrigation meters are clearly feeding the same irrigation loop.

# One trace reveals four distinct problems

1. One large and growing leak was repaired;
2. Another continuous leak was not repaired, and is growing;
3. Leak in irrigation line is rapidly growing
4. Lack of seasonality suggests there is no weather-based controller



# Spinoff Audits

Some municipal water providers requested and fully funded additional audits outside the Maricopa AMA:

- Arizona Water Co.: Audits for Casa Grande & Coolidge service areas, plus a 3-year contract for audits across all service areas
- Tucson Water: Audits of 9 HOA common areas; more coming
- Chandler: Will begin audits of city facilities in Fall '23; submitted WIFA proposal to fund more audits; also will begin CII audits in Fall '23
- Scottsdale: Second 5-year contract for audits
- Avondale: Submitted WIFA proposal to fund more audits

The value of HOA and other irrigation audits appears to be widely accepted, and the demand is high.

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# Arizona Project Wet Groundwater Video Series and Educational Outreach Media Campaign

Funding through its Drought Contingency Plan Groundwater Conservation Grant  
February 2021 – June 30, 2022



**TASK 1: Updated Arizona ProjectWet Website Design**

**TASK 2: Series of 9 Educational Videos focused on the Groundwater System in Arizona**

**TASK 3: Marketing & Outreach Plan**

**TASK 4: Campaign Implementation and Final Report**

# Educational Videos Target Audience

- Youth and adults in the Phoenix AMA
- Primary and secondary educators statewide
- Policymakers and government leadership
- Those interested in water conservation, the groundwater system in general, and more specifically in Arizona

# Paid Digital Campaign Overview [4/25/22 - 6/19/22]

- Geotargeting Counties based upon population:  
**Maricopa 70%, Pima 20% and Pinal 10%**
- Segments: Demo A30+, homeowners, interest in conservation, socially aware, civic interest/value
- Digital Display, Digital Native and Paid Social (Facebook)
- Budget: \$27,281

# Videos Social Media Engagement Report

[4/25/22 - 6/19/22]

## Website

Sessions	Total Users	New Users	Avg. Visit (min)	Pages/Visit
25,161	21,382	20,834	2:23	1

## Facebook

Page Reach	Page Visits	Page New Likes	Impressions
389,578	865	214	1,368,700

## Instagram

Reach	Profile Visits	New Followers	Impressions
15,024	216	73	17,873

## YouTube

Views	Watch Time (Hrs)	New Subscribers
14,100	592.1	96

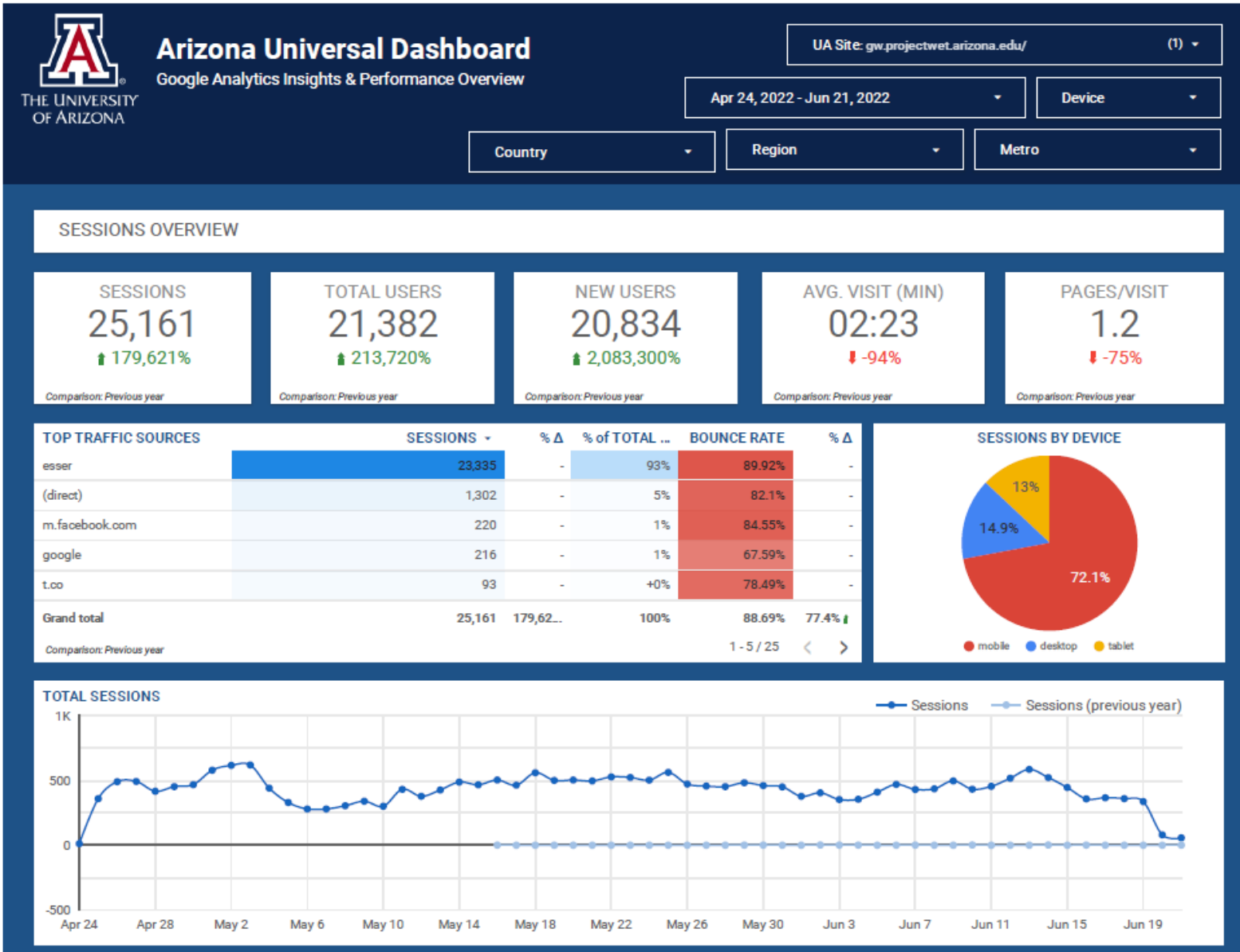
## Twitter

Impressions	Engagements	Engagement Rate	Link Clicks
10,244	461	5.43%	82

## Shares

# Original Posts	# Reshares	Reactions	Comments	Shares & Retweets
43	11	193	3	42

# Groundwater Website Dashboard



# Summary Outreach Media Campaign

The response and interest level about this topic and particularly the Video Series itself has far surpassed traditional expectations.

Social Media Ads delivered a **1.55% link click-thru rate** and **4.46% total click rate** including all activity/engagement with the ads. Both measurements are well above any average or benchmark metric.

**1,027 people** viewed at least half of the 3-min+ videos and **762 viewed in full (95%)** on Facebook.

In total, the paid social campaign delivered **1,401,213 impressions** on Facebook and drove 57,194 TOTAL clicks/engagements and 20,274 link clicks to the landing page/website.

# Next Steps

Our teams recommend additional funding support to extend the life and impact of these important educational and outreach tools

Additional funds to be used for:

- Spanish language versions
- Updating the graphics to reflect current data
- Additional Outreach Media Campaign planning and execution

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