



# THE AZ PURE WATER BREW CHALLENGE: *Behind the Trailer Doors*



Channah Rock, PhD  
The University of Arizona

May 17<sup>th</sup>, 2018



# YOUR PURIFICATION CHALLENGE

*...should you decide to accept it*



# Project Background & Objectives



- 2016 Grant to launch statewide discussion on potable reuse and public perception
  - 27 applicants
  - 5 finalists presented
  - \$250,000 prize
  - \$50,000 support by Water Now Alliance
- Public engagement focused on:
  - Water Quality, Water Treatment Technology, and Potable Reuse

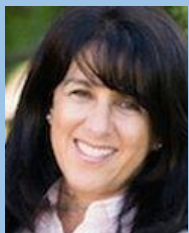


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*"The challenge for us in Arizona is not the issue of water sustainability today, it's our water future."  
- Steve Seleznow, Arizona Community Foundation*

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# THE SOUTHWEST WATER CAMPUS TEAM





# Nearly a Year of Dedicated, Fast-paced Collaboration



- Participating Utilities
- Engineering firms
- Equipment suppliers
- Outreach experts
- State regulators
- Sponsors

*...and craft brewers too!*



# DESIGN-BUILD-IMPROVISE (DBI)



# Fast Track Schedule



- 4-month schedule for design, procurement of equipment and construction
- Process Design
  - Led by Carollo + CH2M Team
  - Completed water balance, process flow schematic and design memo
  - Close vendor coordination
- Trailer & Equipment Procurement/Construction
  - Pima County staff, the chief improvisers!



# Multiple Barrier Treatment Train



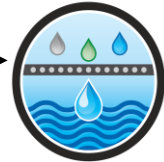
Raw  
Wastewater



Recycled  
Wastewater



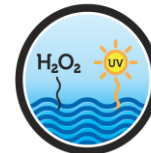
Ultrafiltration



Reverse  
Osmosis



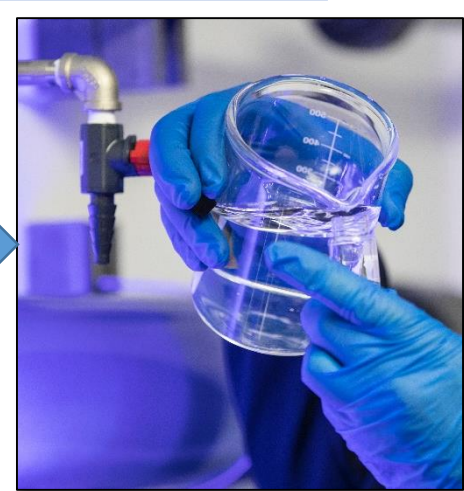
UV/Advanced  
Oxidation



Granular  
Activated Carbon



Chlorine  
Disinfection





# THE GREEN LIGHT

*an Arizona permitting first*



# ADEQ Permit Requirements



## PERMIT

www.azdeq.gov

STATE OF ARIZONA  
INDIVIDUAL RECLAIMED WATER PERMIT NO. R- 512402  
PLACE ID 150824, LTF 65811

### 1.0 AUTHORIZATION

In compliance with the provisions of Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Article 7 and A.A.C. Title 18, Chapter 11, Article 3, and amendments thereto, and the conditions set forth in this permit, the Pima County Pure Water Demonstration Facility is hereby authorized to treat Class A- reclaimed water from the Agua Nueva WRF (APP 100655) and the Rio de Flag WRP (APP 102421), and B+ reclaimed water from the Phoenix 23rd Avenue WRF (APP 100578), in accordance with the limitations, monitoring requirements and other conditions set forth in this permit and in the rules cited above.

This permit becomes effective on the date of the Groundwater Section Manager's signature and will expire five (5) years thereafter, unless suspended or revoked pursuant to A.A.C. R18-9-706(A)(2). Conditions established in this permit are designed to protect public health and safety, and conserve potable water by using reclaimed resources.

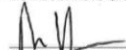
### 1.1 PERMITTEE INFORMATION

**Facility Name:** Water Innovation Challenge - Pure Water Demonstration Facility  
**Facility Physical Address:** Mobile facility; will be parked at Permittee address when not in use.  
**Permittee:** Pima County Regional Wastewater Reclamation Department  
**Permittee Physical Address:** 2955 W. Calle Agua Nueva  
Tucson, Arizona 85745  
**Permittee Mailing Address:** 2955 W. Calle Agua Nueva  
Tucson, Arizona 85745  
**Facility Contact:** Jeff Prevatt, Program Manager  
Pima County Regional Wastewater Reclamation Dept.  
**Emergency Phone No.:** Jeff Prevatt, Program Manager, 520 724 6040

### 1.2 REUSE SITES

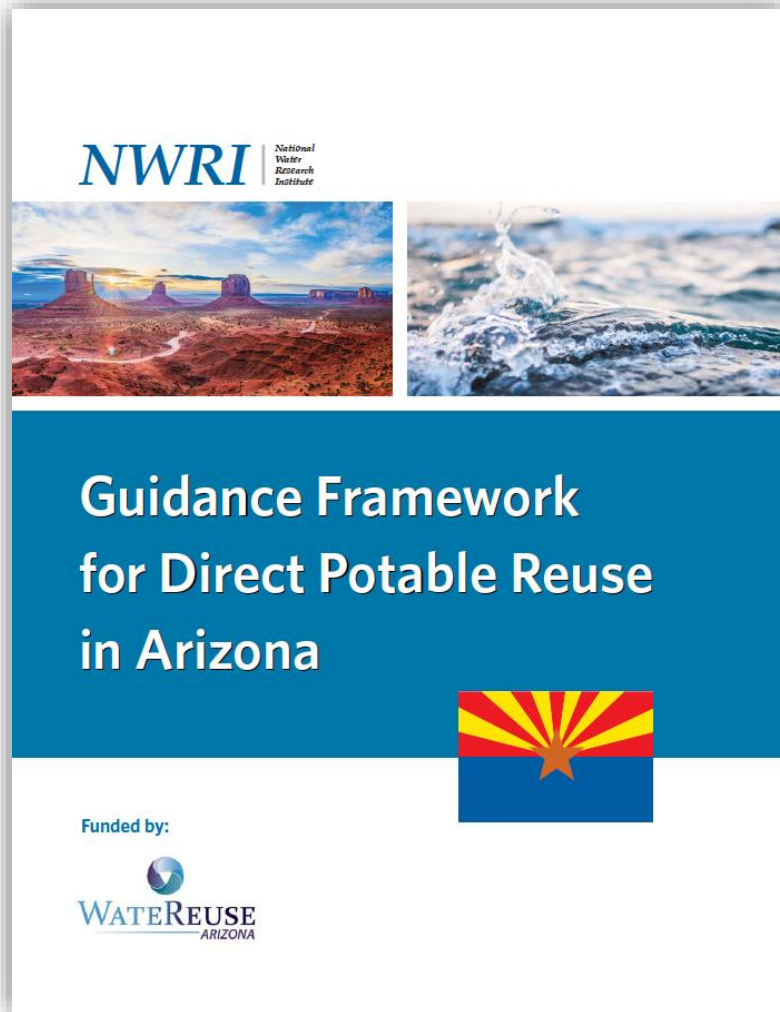
The reclaimed water will be reused in the Water Innovation Challenge-Pure Water Demonstration Facility which is a mobile facility. The mobile facility will be parked at or adjacent to the following addresses:  
Pima County Agua Nueva WRF, 2955 W. Calle Agua Nueva, Tucson, Arizona 85745  
City of Phoenix 23rd Avenue WRF, 2470 S. 22nd Ave., Phoenix, Arizona  
City of Flagstaff Rio de Flag WRP, 600 South Babbitt Drive, Flagstaff, Arizona

### 1.3 AUTHORIZING SIGNATURE

  
David Dunaway, Manager  
Groundwater Section  
Arizona Department of Environmental Quality  
Signed this 24th day of June, 2017

- ADEQ issued an Individual Reclaimed Water Permit to Pima County RWRD
- Key elements included:
  - Reuse sites
  - Allowable limits & monitoring requirements
  - Management practices
  - Contingency actions
  - General provisions
  - End users/consumers
  - Public Awareness

# Supporting Efforts



# THE PROOF

*Pathogen Log Removal  
Water Quality Monitoring*





# Pathogen Log Removal



- Wastewater Effluent from 3 WRFs
  - Agua Nueva, 23<sup>rd</sup> Ave, and Rio de Flag
  - Class A+/B+ per ADEQ guidelines
  - Equivalent to CA Title 22 Recycled Water

## Anticipated Log Removal Values (LRVs) for Mobile AWTF

Unit Process	<i>Giardia</i>	<i>Cryptosporidium</i>	Enteric Virus
UF	4	4	-
RO	1.5	1.5	1.5
UV AOP	6	6	6
GAC	-	-	-
Free Chlorine	-	-	4
<b>Total</b>	<b>11.5</b>	<b>11.5</b>	<b>11.5</b>

### Notes:

- Anticipated LRVs for UF, RO, UV AOP based on *WRRF Framework for Direct Potable Reuse (2015)*
- LRV for free chlorine based on CT = 3 mg-min/L at 20 deg C and pH = 6-9. USEPA CT Tables (2003)

# Pathogen Log Removal



- MS2 Challenge Testing (University of Arizona)
  - UF → Spiked Agua Nueva WRF effluent (dechlorinated)
  - RO → Spiked UF filtrate (dechlorinated)
  - UV AOP → Spiked RO permeate

## Anticipated Log Removal Values (LRVs) for Mobile AWTF

Unit Process	<i>Giardia</i>	<i>Cryptosporidium</i>	Enteric Virus	MS2 Phage
UF	4	4	-	3.6
RO	1.5	1.5	1.5	6.6
UV AOP	6	6	6	> 8.5
GAC	-	-	-	N/A
Free Chlorine	-	-	4	N/A
<b>Total</b>	<b>11.5</b>	<b>11.5</b>	<b>11.5</b>	<b>18.7</b>

## Challenge Testing

### Notes:

- Anticipated LRVs for UF, RO, UV AOP based on *WRRF Framework for Direct Potable Reuse (2015)*
- LRV for free chlorine based on CT = 3 mg-min/L at 20 deg C and pH = 6-9. USEPA CT Tables (2003)
- Challenge testing results reflect geomean of samples collected

# How Purified? Exceptionally!



- Over 3,000 analyses completed over project duration
- Permit compliance focused on drinking water parameters
- Water quality samples analyzed at the following:
  - *Tucson Water Quality Laboratory*
  - *Pima County RWRD Laboratory*
  - *University of Arizona - WEST Center*
  - *City of Phoenix Laboratory*
  - *Eurofins Eaton Analytical Laboratory*

# Purified Water Underwent Rigorous Water Quality Testing



Field parameters  
(e.g., pH,  
conductivity  
temperature)

Microbial

General Organics  
and Inorganics  
(e.g., TOC, TDS, &  
metals)

Volatile Organic  
Compounds

Synthetic Organic  
Compounds

Disinfection  
Byproducts

Trace Constituents  
(CECs)



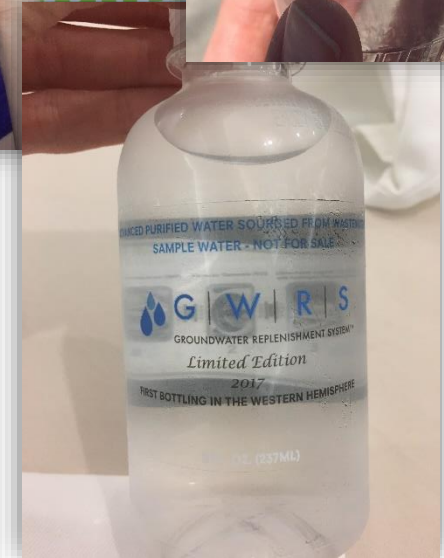
# TAKING THE WATER (AND BEER) TO THE MASSES

*what are ya'll doing this weekend..?*



# We did our homework!

- Orange County Groundwater Replenishment System (GWRS)
- Pure Water San Diego
- The Claude "Bud" Lewis Carlsbad Desalination Plant
- WRRF1302 – Model Communication Plans for Increasing Awareness and Fostering Acceptance of Direct Potable Reuse



# NEW Tools and Resources

Something **NEW** is brewing in Arizona

All water is recycled...



...join the Challenge!



## Water In Arizona – Our Future Depends on it

Arizona currently depends on receiving 39% of its water from the Colorado River – challenge your knowledge and thinking about water, etc.

**Drought** and climate change could make Colorado River and other water dependable in the future. Even with a strong commitment to water conservation and careful management that has protected Arizona's water resources, there will eventually need more, reliable, locally controlled water resources.

What will it be? **Icebergs** from Antarctica? Desalinated ocean water from the sea?

There's a renewable water source that's found in every community in Arizona, it's **wastewater**.

The wastewater leaving Arizona homes and businesses is sent to water reclamation where it is cleaned to safe levels – **it's recycled** – put in to rivers or used for irrigation and other landscaping green and has stretched water supplies in many desert communities.

This **recycled water** has been used for decades in Arizona to keep golf courses, parks, and other landscaping green and has stretched water supplies in many desert communities. It's only a short step from cleaning wastewater for irrigation purposes to using technology to **purify recycled wastewater** to create safe, quality drinking water.

That's what the **AZ Pure Water Brew Challenge** is all about....

We challenge all local **residents**, community **groups**, environmental **organizations** and local **businesses** to learn more about water issues.

Do you **support Pure Water**? Like us, follow us:

@AZPureWaterBrew



#AZPureWater

#AZPureWaterBrew

Want to Know **More**?

Visit [www.AZpurewaterbrew.org](http://www.AZpurewaterbrew.org) to find out more and sign up to participate in the Challenge.

Something **NEW** is brewing in Arizona



Ensuring Arizona's water future

**PURE Water – A Future Water Resource**

- Purified water provides a locally controlled, drought-proof water supply.
- PURE water is **SAFE**!
- Complies with or exceeds strict State and Federal drinking water standards.
- Strictly monitored by the Arizona Department of Environmental Quality (ADEQ).

Did you know....

- All water is recycled! It's recycled by nature.
- The purification process produces water **more pure than many bottled water – near distilled quality.**
- Purified water is **currently used** to supplement drinking water in many communities in the U.S. and around the world.



**Contact us**

To learn more about the **AZ Pure Water Brew Challenge**, **ReNEW Brew** or more about Arizona's water future please contact:

Dr. Channah Rock  
channah@arizona.edu  
Water Quality Specialist & Associate Professor, The University of Arizona

Dr. Jeff Prevatt  
jeff.prevatt@pima.gov  
Pima County Wastewater Reclamation

[AZPUREWATERBREW.ORG](http://AZPUREWATERBREW.ORG)

Follow us on...  
  
#azpurewaterbrew

## The water purification process

Using a multi-barrier purification process, we can transform recycled water into **PURE water** – A Proven Technology. The result is a **Safe, Reliable and Sustainable** water supply.



RECYCLED COMMUNITY WASTEWATER



ULTRAFILTRATION

**Removes:**  
Suspended solids.  
Bacteria.  
Protozoa.  
Cryptosporidium.  
Giardia.



REVERSE OSMOSIS

**Removes:**  
Organics.  
Pharmaceuticals.  
Personal Care Products.  
Inorganics.  
Heavy metals.  
Viruses.



UV/ ADVANCED OXIDATION

**Destroys:**  
Pathogens.  
Trace organics.



GRANULAR ACTIVATED CARBON

**Removes:**  
Trace organics.  
Disinfection byproducts.  
Remaining hydrogen peroxide.



CHLORINE DISINFECTION

**Destroys:**  
Pathogens.  
Viruses.



PURE Water

Beer!



# Volunteer Boot Camp



## VOLUNTEER GUIDE: RUNNERS



## VOLUNTEER GUIDE: STREET TEAM



## VOLUNTEER GUIDE: TECHNICAL EXPERT



## VOLUNTEER GUIDE: SURVEY FACILITATOR





# VOLUNTEER GUIDE: SURVEY FACILITATOR

*Thank you for volunteering to help The Pure Water Brew Challenge. We couldn't do it without you!*

**OVERVIEW:** During the event participants will be asked to complete a survey before and after they interact with the project and learn about potable reuse and other water issues specific to Arizona. The purpose of the survey is to identify if there is a measurable shift in perceptions after interacting with the project, asking questions, and learning.

Your role will be to encourage individuals to participate in the survey and answer questions. Each survey contains just 12 questions and should take about 3-5 minutes to complete.



PUBLIC ENGAGEMENT



TECHNICAL KNOWLEDGE

## DO THIS!

- Prepare! Make yourself familiar with the survey questions and format ahead of time.
- Try to get as many respondents as possible.
- Let respondents know that the survey is anonymous.
- Give respondents time to understand the questions and space to answer honestly.
- Have fun! Smile! Enjoy the day.

## AVOID THIS...

- Try not to influence the participant by over-clarifying questions.
- Avoid prompting respondents with positive or negative questions or comments about water reuse.

## TIPS FOR ADMINISTERING SURVEYS

Be careful not to influence opinions. Be aware of your facial expressions and body language. It's not only what you say that can influence others, but also the expressions and mannerisms you exhibit that can also impact results.

Be patient and make people feel important; no matter what their level of education or view, their perceptions and opinions are instrumental to this project! Explain to them the value of their participation to the project and to Arizona's water future.

- Role Overview
- Level of Public Engagement
- Technical Knowledge
- Tips and Pitfalls
- Major Top Line Messaging

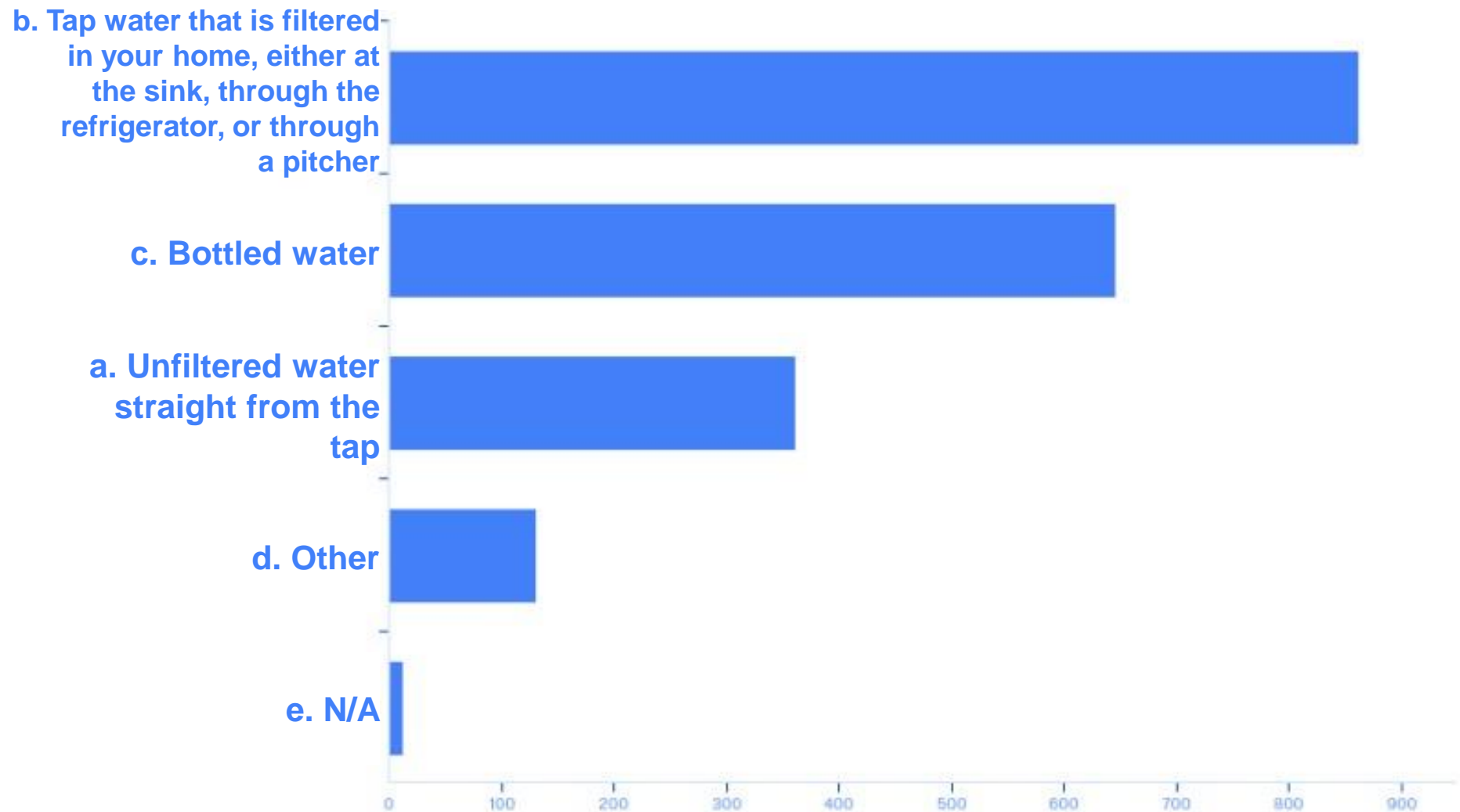
# Survey of Public Perception



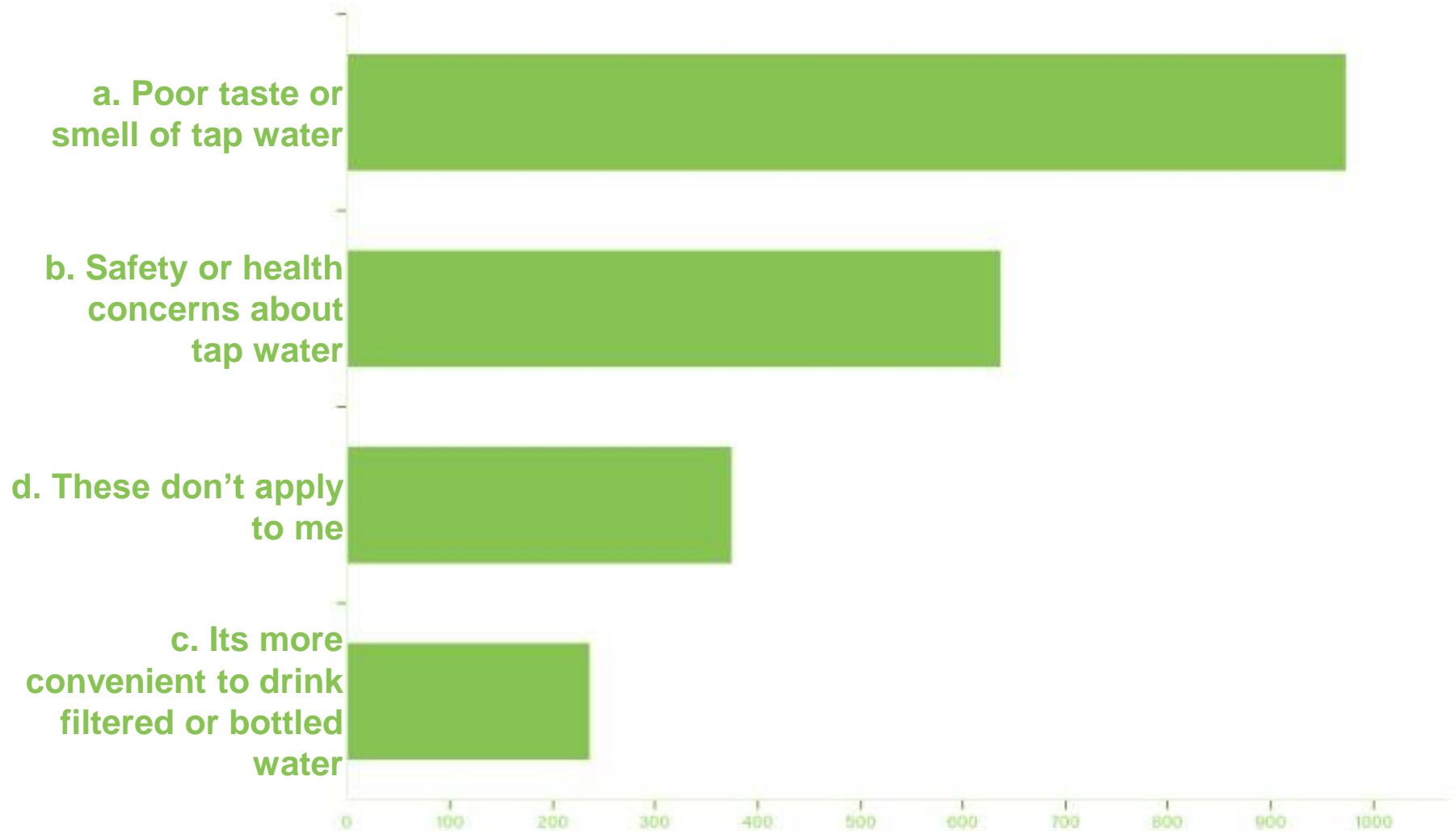
- Common Terms
- Familiarity with Technology
- Sustainability “Ethic”
- Drink the Water/Beer?
- 16 events, 54 Volunteers, 940 hours



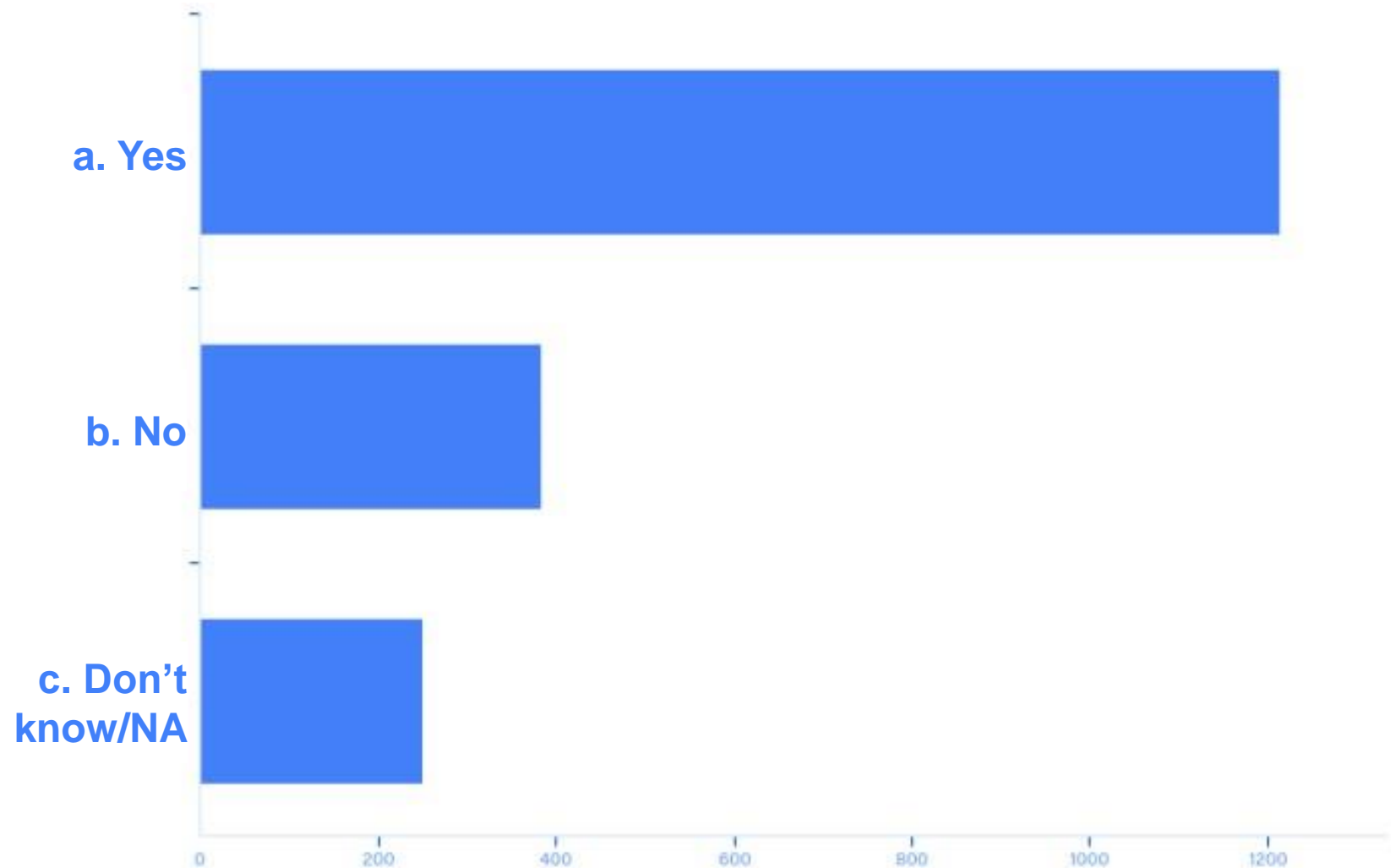
***“Thinking about the water you drink at home,  
do you most often drink”***



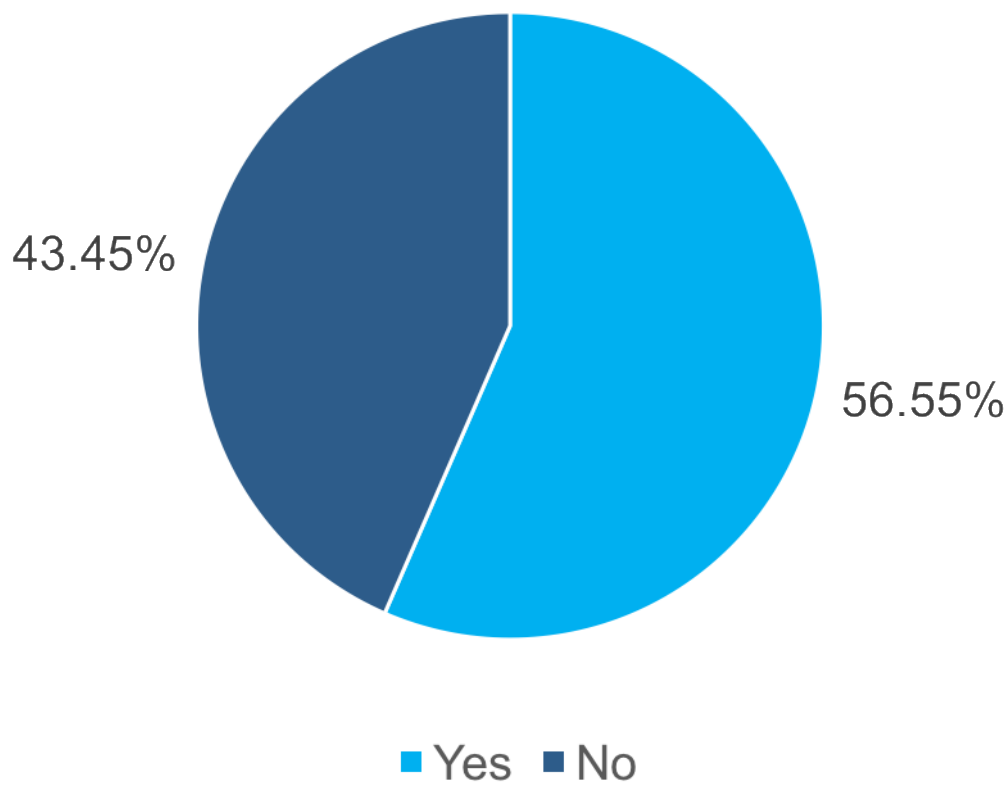
***“Here are some reasons other people have given for not usually drinking water directly from the tap.  
Do any of these apply to you?”***



***“Before today, did you think that it was possible to further treat recycled water used for irrigation to make the water pure and safe for drinking?”***

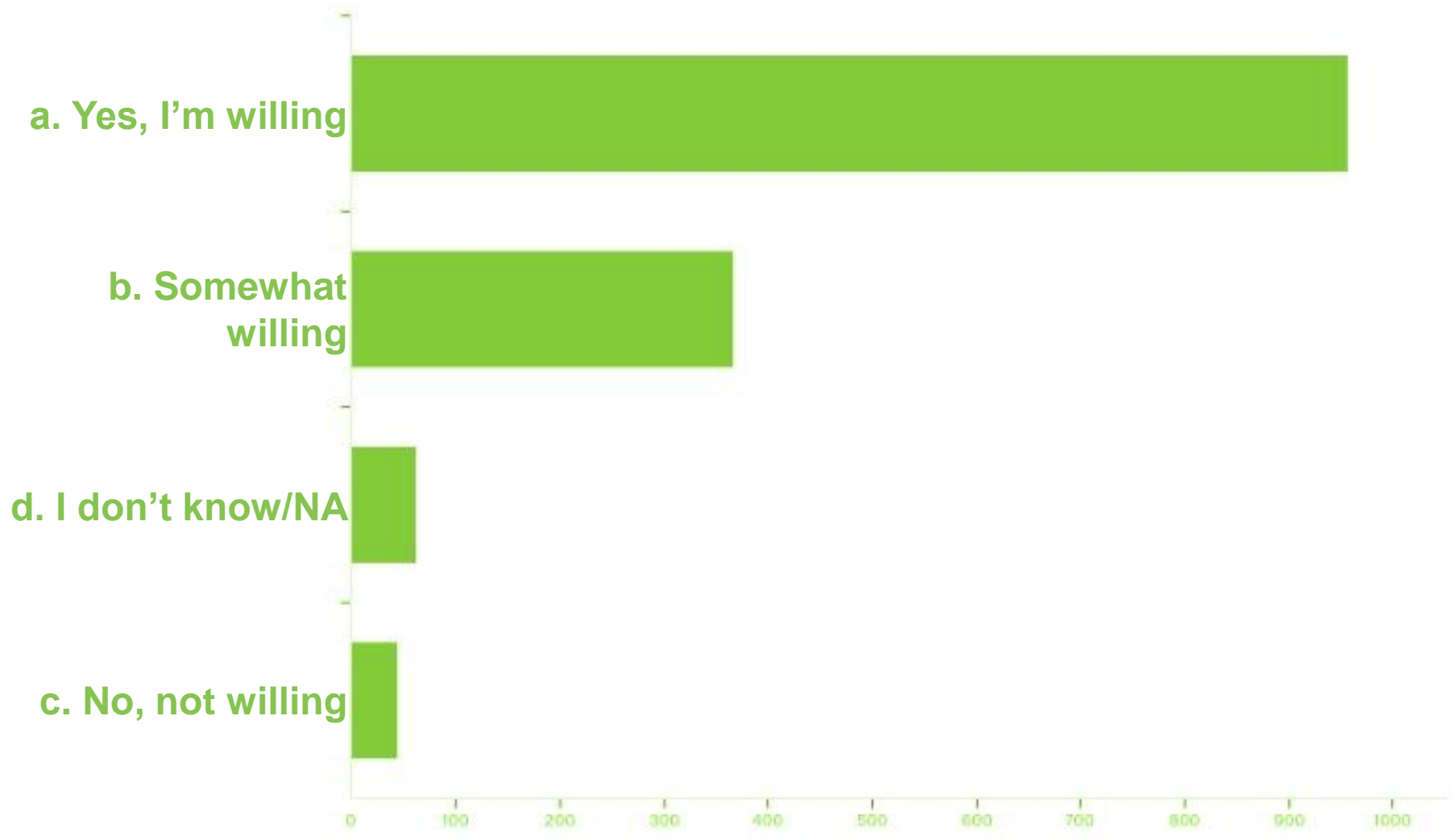


***“Before today, had you heard of advanced treated recycled water?”***

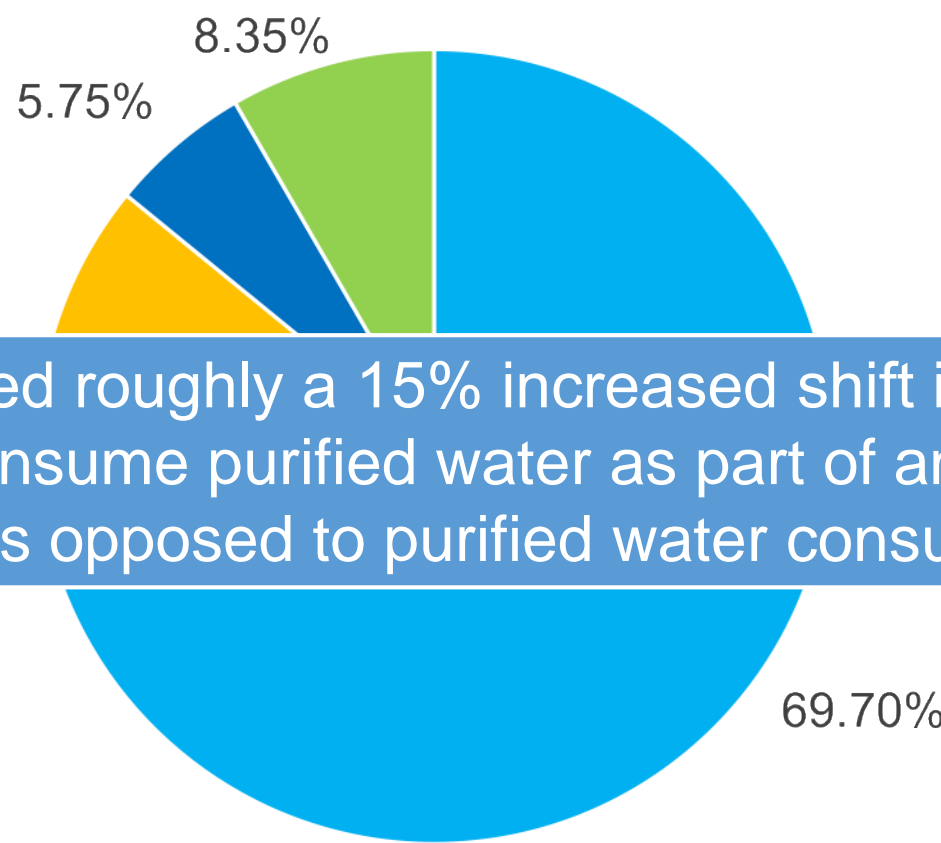




***“How willing would you be to drink purified water made from advanced treated recycled water?”***



***“How willing would you be to drink beer made from purified water?”***



This demonstrated roughly a 15% increased shift in participant’s willingness to consume purified water as part of an added-value product, *beer*, as opposed to purified water consumed directly.

- a. Yes, Im willing
- b. Somewhat willing
- c. No, not willing
- d. I don't know/NA

# Open-ended Comments



“This was an awesome experience.”

“I believe the science.”

“Love this project! Thanks for all your hard work and creativity. Beer is delicious, reclaimed rocks, and you guys are awesome!”

“I said not willing to drink beer with this treated water only because I don't drink alcohol period. Use that water for my lemonade and I'm all in!! ”

“It is the future in the Southwest.”

“Love the traveling treatment trailer!”

“It's about time.”

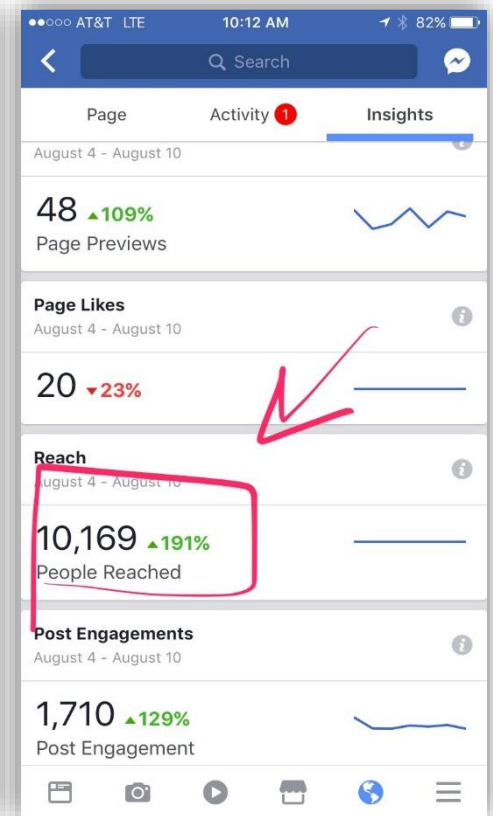
# Social Media (May – Nov, 2017)

## Facebook

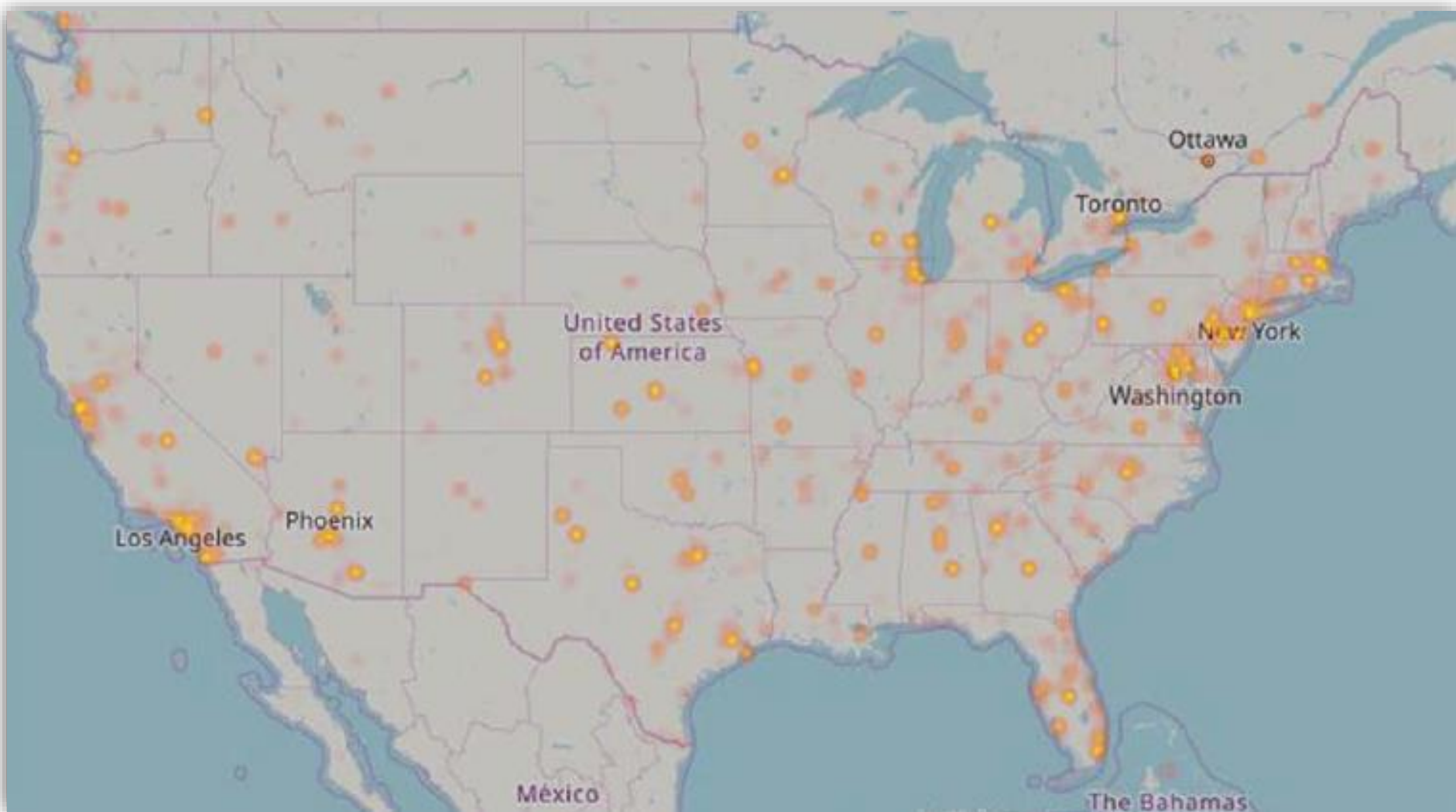
- 465 followers
- 163 total posts
  - 1,869 post reactions
  - 92 shares
  - 33 comments between May and November

## Twitter

- 257 Twitter followers
- 355 tweets from AZPWBC
- 663 tweets from others
  - Content “reach” of ~1.3M additional Twitter “impressions”



# Twitter Heat Map depicting AZ Pure Water Brew Challenge tweets





# Mainstream Media

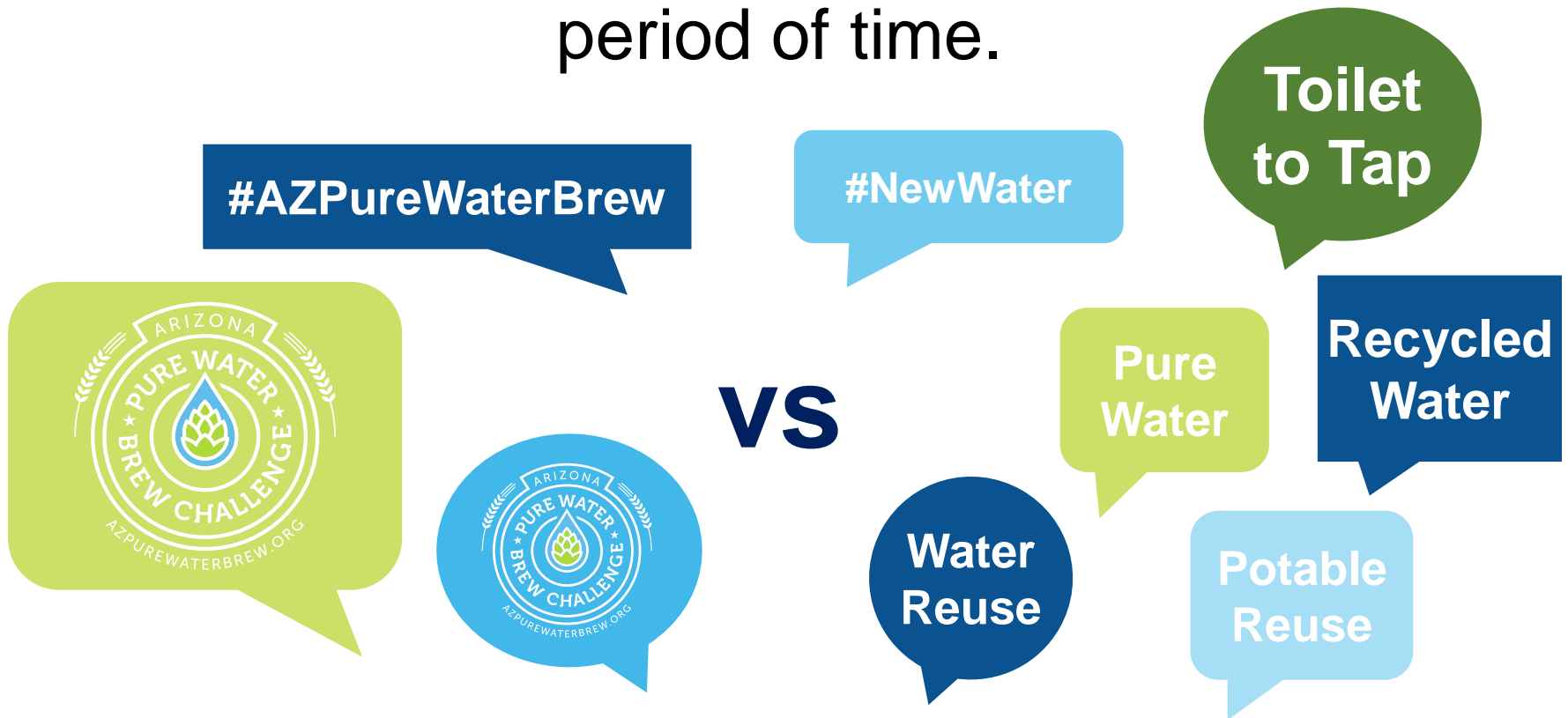
58 stories total

- 17 print articles
  - 13 in newspapers with 1.6M AZ readers
  - Dec issue of Phoenix Mag
    - 80K homes and 350K readers
- 12 television segments
  - 11 in Phoenix (a top-15 media market) with exposure to hundreds of thousands of viewers
- 2 radio pieces



# Longitudinal Media Survey

Observational survey to study fluctuations in behaviors, thoughts, and emotions over a given period of time.



# Longitudinal Media Survey Results

Mainstream Media

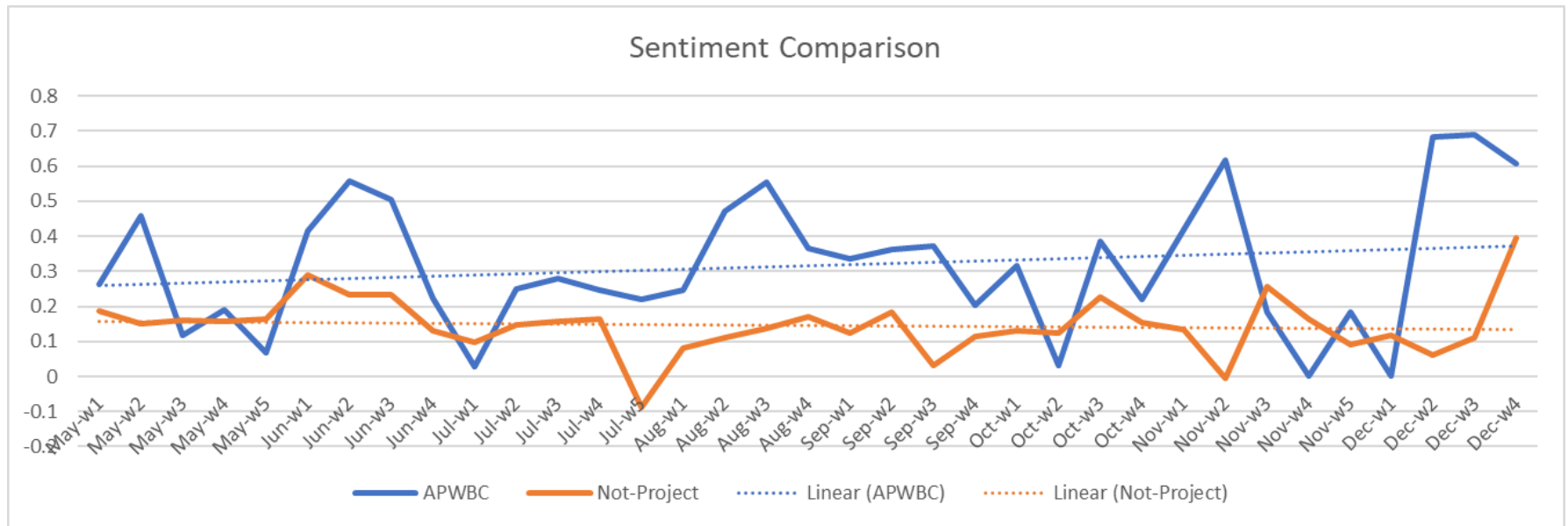
**2x**

more positive

Social Media

**2x**

more positive



# Almost Famous...

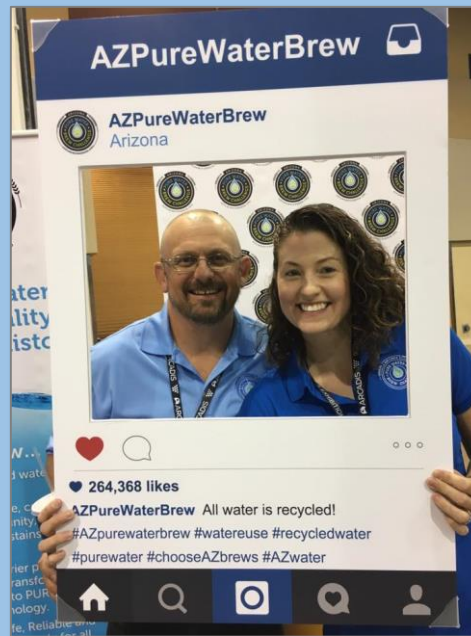


**BILL NYE**  
**SAVES THE WORLD**





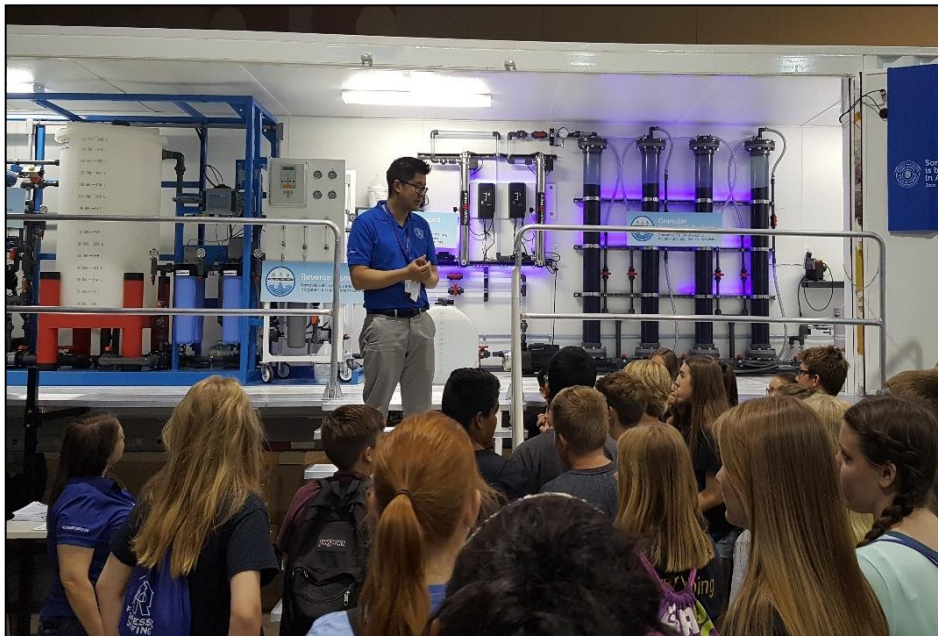
# FRUITS OF SUCCESS





# Achievements

- 141 hours of runtime
- 82,000 gallons of purified water produced
- +5000 miles traveled
- +2,000 surveys completed
- In-kind \$800,500







## Cheers to water recycling and great beer!



We're among the 26 Arizona breweries who joined the AZ Pure Water Brew Challenge to promote water recycling and help people embrace the water of the future. Using proven technology that involves a 5-step water purification process, the AZ Pure Water Challenge transformed recycled community wastewater into PURE water, which we used to craft a delicious new brew.

PURE water is safe, reliable, sustainable and it makes a great BEER, too!



- Monitored by the Arizona Department of Environmental Quality
- Compliant with State and Federal drinking water standards
- Locally sourced from a drought-proof water supply
- More pure than your average bottled water



Cheers to you for taking the Challenge and raising your pint to water recycling, pure water, and delicious beer!

**AZPUREWATERBREW.ORG**

Follow us on:



#azpurewaterbrew #challengeaccepted

### Participating breweries

- |   |  |   |  |
|---|--|---|--|
| <ul style="list-style-type: none"> <li>• Thunder Canyon Brewery</li> <li>• 1919 Brewing Company</li> <li>• Wanderlands Brewing Company</li> <li>• Crooked Tooth Brewing Company</li> <li>• Dangler Brewing Company</li> </ul> | <ul style="list-style-type: none"> <li>• Dragon Brewing Company</li> <li>• Iron Horse Brewing</li> <li>• Public House Brewing</li> <li>• Catalina Brewing Company</li> <li>• Perch Pub and Brewery</li> <li>• National Wilderness Brewing</li> </ul> | <ul style="list-style-type: none"> <li>• Saddle Mountain Brewing Company</li> <li>• Frank's Brewing Company</li> <li>• Florida Arizonan Brewery</li> <li>• Mother Lode Brewing</li> <li>• Ch-90 Brewery</li> <li>• Wren House Brewing Company</li> <li>• Goldwater Brewing Company</li> <li>• Marble Brewing Company</li> </ul> | <ul style="list-style-type: none"> <li>• Two Brothers Tap House &amp; Brewery</li> <li>• Oak Creek Brewing Company</li> <li>• Prison Hill Brewing Company</li> <li>• Dark Sky Brewing Company</li> <li>• Wanderlust Brewing Company</li> <li>• Historic Brewing Company</li> <li>• Granite Mountain Brewing</li> </ul> |
|---|--|---|--|

The Arizona Department of Environmental Quality has issued the first permit authorizing direct recycle access to the AZ Pure Water Brew Challenge team. The permit states "Water recycles issued and produced by this facility to be carbonated, bottled, and sold as beer and bottled for distribution to various consumers and is to be recycled to the same consumer." 10/16/2020







[Thunder Ca](#)  
[1912 Brewin](#)  
[Borderlands](#)  
[Crooked To](#)  
[Dillinger Br](#)  
[Dragoon Br](#)  
[Iron John's](#)  
[Public Brew](#)  
[Catalina Bre](#)  
[Perch Pub &](#)  
[Arizona Wil](#)  
[Saddle Mou](#)  
[Freak'N Bre](#)

[Phoenix](#)  
[Scottsdale](#)  
[Tucson](#)  
[Tempe](#)  
[Mesa](#)  
[Chandler](#)  
[Gilbert](#)  
[Peoria](#)  
[Flagstaff](#)  
[Sedona](#)  
[Prescott](#)  
[Yuma](#)  
[Kingman](#)  
[Bisbee](#)  
[Douglas](#)  
[Payson](#)  
[Tombigha](#)  
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[Maricopa](#)  
[Yavapai](#)  
[Yavuma](#)  
[Mohave](#)  
[Coconino](#)

# Lessons Learned

- In the age of digital technology, instant communication is expected!
- Dedicated Team for Social Media
- Consumer Incentives
- Utilize firms with dedicate resources, marketing teams, professionals!



# Water Public Art Challenge



- 3<sup>rd</sup> Prize will focus on **public art projects** that build connectivity between cultures through creative expression.
- Launches on May 30, **five \$50,000 prizes** to use for the development of a temporary public art project.
- Winning projects will creatively educate and inform the public about the **importance of water** for the historical roots of the Valley of the Sun.
- Registration deadline - August 16th



# Questions?



[www.azpurewaterbrew.org](http://www.azpurewaterbrew.org)  
[channah@cals.arizona.edu](mailto:channah@cals.arizona.edu)

